ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT

Sinker Swim

Environmental Assessment Number OR-080-2001-20

August 2002

United States Department of Interior
Bureau of Land Management
Oregon State Office
Salem District
Cascades Resource Area
Marion County, Oregon

Responsible Agency:	USDI - Bureau of Land Management
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Abstract: Seven preliminary alternatives were evaluated for timber harvest and watershed restoration activities on federal lands located in Sections 27, 34 and 35 of Township 8 South, Range 3 East, Willamette Meridian; and within the Little Sinker Creek, Fish Creek and Sinker Creek drainages of the Little North Santiam River. The proposed action includes partial cut harvest of mature timber, commercial thinning of immature timber stands, riparian thinning and snag creation, road construction, improvement and decommissioning, and oak woodland restoration.

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FINDING OF NO SIGNIFICANT IMPACT

Introduction

The Bureau of Land Management (BLM) has conducted an environmental analysis (Environmental Assessment Number OR-080-2001-20) for a proposal to harvest timber within the Little North Santiam River watershed in Marion County. This project would occur within Township 8 South, Range 3 East, Sections 27, 34 and 35, Willamette Meridian. The project is within Matrix and Riparian Reserve land use allocations. The environmental assessment (EA) is attached to and incorporated by reference in this Finding of No Significant Impact (FONSI) determination.

Implementation of the project would conform to management actions and direction contained in the Salem District Record of Decision and Resource Management Plan (RMP). The RMP, dated May 1995, is tiered to and incorporates the analysis contained in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement* (*RMP/FEIS*) (September 1994). The proposed action and associated alternatives also conform with direction described in the attached EA.

The EA and FONSI will be made available for public review from ***September 4*** to ***October 4, 2002***. The notice for public comment will be published in a legal notice by local newspapers of general circulation *(Stayton Mail*); sent to those individuals, organizations, and agencies that have requested to be involved in the environmental planning and decision making processes; and posted on the Internet at http://www.or.blm.gov/salem/html/planning/index.htm. Comments received in the Cascades Resource Area Office, 1717 Fabry Road SE, Salem, Oregon 97306, on or before ***October 4, 2002*** at 4:00 P.M., Pacific daylight-saving Time, will be considered in making the final decisions for this project. Office hours are Monday through Friday, 7:30 A.M. to 4:00 P.M., closed on holidays.

Finding of No Significant Impact

Based upon review of the EA and supporting documents, I have determined that the project is not a major federal action and will not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27 and do not exceed those effects described in the *RMP/FEIS.* Therefore, an environmental impact statement is not needed. This finding is based on the following discussion:

Context. The project is a site-specific action directly involving approximately 170 acres of BLM administered land that by itself does not have international, national, region-wide, or state-wide importance. Intensity. The following discussion is organized around the Ten Significance Criteria described in 40 CFR 1508.27.

1. **Impacts may be both beneficial and adverse**. Harvested timber would support local mills and the overall economy of the area. In thinning areas remaining trees would receive more light, water and nutrients and would grow to larger sized trees more rapidly, contributing to structural diversity. Harvest of units A-E would alter the characteristics of wildlife habitat. Additional ***temporary*** roads would be constructed. These new roads along with portions of several existing roads would be blocked or decommissioned resulting in a net decrease in road milage. Short term, local increases in stream turbidity would occur during road construction and hauling (e.g., would only occur during and immediately after construction and/or hauling and is not likely to be visible or measurable downstream from the project area). These effects would be offset by overall reductions in road density as a result of the proposed decommissioning. Oak woodlands would be maintained and would contribute to diversity. Road culverts that are currently blocking fish passage may be removed or rebuilt opening more miles of stream to fish. None of the environmental effects disclosed above and discussed in detail in Chapter 4 of the EA and associated appendices are considered significant, nor do the effects exceed those described in the *RMP/FEIS.*

2. **The degree to which the selected alternative will affect public health or safety.** Public health and safety were not identified as an issue. The project is comparable to other timber management projects which have occurred within the Salem District with no unusual health or safety concerns.

3. **Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farm lands, wetlands, wild and scenic rivers, or ecologically critical areas.** There are no historic or resources, park lands, prime farm lands, wild and scenic rivers, or wildernesses located within the project area (EA Appendix 1).

4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.** Extensive scoping of the project resulted in nine comment letters. In addition, a representative of the City of Salem Water Department participated in planning meetings and field reviews. In response to some of the letters and the City of Salem's concerns, an alternative featuring no regeneration harvest or clear cutting was developed (Alternative 3).

   The effects of the project on the quality of the human environment were adequately understood by the interdisciplinary team to provide an environmental analysis. A complete disclosure of the predicted effects of the project is contained in Chapter 4 of the EA and associated appendices.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.** The project is not unique or unusual. The BLM has experience implementing similar actions in similar areas. The environmental effects to the human environment are fully analyzed in the EA. There are no predicted effects on the human environment which are considered to be highly uncertain or involve unique or unknown risks.

6. **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.** The project does not set a precedent for future actions that may have significant effects, nor does it represent a decision in principle about a future consideration. The project presented is typical of previous actions and is completely consistent with established practices fully analyzed within the RMP. Any future projects will be evaluated through the National Environmental Policy Act (NEPA) process and will stand on their own as to environmental effects.

7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.** The interdisciplinary team evaluated the possible actions in context of past, present and reasonably foreseeable actions. Significant cumulative effects are not predicted. A complete disclosure of the effects of the selected alternative is contained in Chapter 4 of the EA.

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.** The project will not adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places, nor will it cause loss or destruction of significant scientific, cultural, or historical resources (EA, Appendix A).

9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.**

   Wildlife: Section 7 Consultation with the United States Fish and Wildlife Service (USFWS) has been completed (USFWS Biological Opinion (BO) reference #1-7-00-F-155, dated February 14, 2000). The northern spotted owl has been observed in the vicinity. No other threatened or endangered plants or animals were observed in the area. This project "may affect, likely to adversely affect" the spotted owl, according to the criteria described in the BO (p. 25-26). The proposed timber sale area is not located in Critical Habitat for the spotted owl.

As a result of consultation, the USFWS found that the sale would not likely jeopardize the continued existence of the spotted owl (BO p. 29), and authorized incidental take (BO p. 30-31). According to the BO, it is reasonable and prudent to minimize incidental take by minimizing suitable habitat loss and disturbance to spotted owl pairs and their progeny during the nesting season (BO p. 33, Reasonable and Prudent Measure #1). The design features of the project specify that there would be a seasonal restriction during the critical nesting season from March 1 – June 30, which would comply with the terms and conditions and conservation measures of the Biological Opinion (BO p. 31-32, Term and Conditions #1, and p. 33, Conservation Measures #1).

Fish: ESA Section 7 Consultation: A Biological Assessment for the project was submitted to and accepted by the Upper Willamette Province Level I Team on June 13, 2002 in accordance with the Streamlined Consultation process. The effect determination for ESA Fish is "may affect, not likely to adversely affect" Upper Willamette River chinook salmon or steelhead trout. The biological assessment has been submitted to the National Marine Fisheries Service (NMFS) and a letter of concurrence from NMFS is anticipated. A final decision on this action will not be made until a letter of concurrence is received from NMFS.

10. **Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.** The project does not violate any known Federal, State, or local law or requirement imposed for the protection of the environment. State, local, and tribal interests were given the opportunity to participate in the environmental analysis process. Furthermore, the project is consistent with applicable land management plans, policies, and programs.

Prepared By: Randall L. Herrin, IDT Leader — 8/25/2002 Date

Reviewed By: Carolyn Sands, NEPA Coordinator — 8/27/02 Date

Approved By: Richard C. Prather, Cascades Resource Field Manager — 29 AUG 2002 Date

EA CHAPTER 1.0 - PROJECT SCOPE

For the reader's convenience, terms defined in the Glossary (i.e., section 7.0) are shown in ***bold italics*** the first time they appear within the text of this environmental assessment. All numbers (e.g., acres, road lengths, and volumes) are estimates based on GIS mapping and office analysis. Final numbers, determined during field work will vary from these estimates. This variance is not expected to result in a change in effects analyzed in this document.

1.1 Project Location

The project area is located approximately six miles northeast of Mill City, Oregon, in Marion County on forested land managed by the Cascades Resource Area, Salem District, Bureau of Land Management (BLM). The project area lies within the Little Sinker Creek, Sinker Creek and Fish Creek drainages of the Little North Santiam River. The project would occur within Township 8 South, Range 3 East, Sections 27, 34 and 35, Willamette Meridian (see Figure 1).

The proposed project is located within the ***General Forest Management Area (GFMA)*** portion of the ***Matrix,*** and in the ***Riparian Reserve (RR)*** land use allocations (LUA), as identified within the *Salem District Record of Decision and Resource Management Plan* (RMP) dated May 1995. The Little North Santiam River Watershed is a Tier 1 Key Watershed, as defined in the Northwest Forest Plan and is part of the municipal watershed for the City of Salem, Oregon.

1.2 Background

This ***environmental assessment (EA)*** is intended to provide sufficient information to the Cascades Field Manager to determine whether there are any significant environmental effects, and to make an informed decision on which alternative to select. Should the proposed action(s) have significant environmental effects, an ***environmental impact statement*** will be prepared. If the proposed action(s) do not have significant environmental effects, ***a finding of no significant impact*** will be prepared.

1.3 Purpose of and Need for Action

Matrix Land Use Allocation

Development of Multiple Stand Characteristics

Mature Coniferous Forest: The forest stands in sections 34 and 35 are well stocked and past ***Culmination of Mean Annual Increment (CMAI)***. Much of this area was commercially thinned about 30 years ago (1970). The past thinning simplified these stands by removing the smaller trees and reducing the western hemlock component. These stands are also missing structure normally associated with late successional forests (e.g., ***snags***, ***coarse woody debris***).

These stands can be regeneration harvested because they are past CMAI, or they could be partial cut to maintain canopy cover for other resource values and provide for future uneven-aged timber management objectives.

Immature Coniferous Forest: Section 27 was clearcut with tractor skidding equipment in the 1950s. The stands regenerated naturally following harvest and have had no subsequent treatments. These densely stocked stands are about 40 years in advance of CMAI, and are in need of stocking control. The next entry should be a thinning. Management at this level would maintain windfirm stands resistant to insects and diseases, maintain canopy levels for water quality protection, provide a stable timber supply and provide for future management options.

Roads

Several segments of the existing road are in poor condition and are currently contributing to stream sedimentation. Some segments of existing open road are no longer in use and could be blocked or decommissioned to Best Management Practices standards to reduce potential effects to water quality and to meet road density objectives in the watershed. Roads needed for accessing harvest units need to be renovated or improved to meet current safety and Best Management Practices standards.

Timber Management

There is a continuing opportunity to provide a sustainable supply of timber and other forest products which would contribute to local and State economic diversity while maintaining future forest management options and protecting other resource values.

Oak Woodland

As a result of fire suppression, conifers are shading out a native oak woodland area in Sec. 35. There is an opportunity to restore this special habitat.

Riparian Reserve Land Use Allocation

Where past management has occurred, many Riparian Reserves now in the early to mid-seral stages exhibit a simplified stand structure. However, the more diverse stand structure of older forests plays a more prominent role in providing for a healthy, properly functioning riparian system that maintains high water quality and provides quality habitat. Our goal is to restore these types of older forest conditions in Riparian Reserves as quickly as possible (Salem District Record of Decision and Resource Management Plan, 1995).

The Little North Santiam (LNS) is designated as a Tier 1 Key watershed. "Key watersheds that currently contain poor habitat are believed to have the best opportunity for successful restoration and will receive priority in any watershed restoration program." (FEMAT p. V-46) The proposed treatment would help begin the restoration of ecological attributes currently lacking on these sites. The Little North Santiam Watershed Analysis (LNS WA), completed in 1997, recommends the following vegetation restoration treatments in Riparian Reserves:

- "Implement density management to accelerate the development of older forest conditions in RR and LSR (Late Successional Reserve) to develop and maintain older forest stand characteristics in younger age classes." (LNS WA Ch. 7, pg 5)
- "Priorities for density management to accelerate the development of older forest conditions would be highest in RR and second in LSR." (LNS WA Ch. 7, pg 5)
- "Implement riparian restoration projects on federal lands including underplantings, manual release, thinning of existing stands in the Canyon Creek, Evans Creek, Kiel Creek, and Sinker Creek subwatershed basins (SWB's). (LNS WA Ch 7, Pg. 10)

Conclusion

In summary, the purpose of this project is to:

- Develop or maintain multiple stand characteristics in terrestrial habitats to support a diversity of forest species and to maintain future forest management options on Matrix lands;
- Maintain and create ecologically valuable structural components such as down logs, snags, large trees;
- Begin restoration of proper hydrologic functions which have been degraded by past road construction practices;
- Contribute to economic diversity in rural communities by providing timber and other forest products, and contribute to BLM timber management objectives while protecting water quality and other resource values;
- Enhance the development of missing components of stand diversity in Riparian Reserves to progress toward attaining Aquatic Conservation Strategy Objectives; and to
- Restore and maintain an ecologically valuable special habitat (oak woodland).

1.4 Proposed Action

The proposed action (Alternative 3) includes partial cut harvesting of approximately 120 acres of Matrix timber, commercial thinning of approximately 42 acres of Matrix, thinning of approximately 8 acres of Riparian Reserve, restoration of approximately two acres of oak woodland, and road construction, improvement and decommissioning. The proposed action is further described in sections 2.2.3 through 2.2.5.

1.5 Decision to be Made

The Cascades Field Manager will decide whether or not to prepare an environmental impact statement, and which, if any, of the alternatives put forward here, to implement.

1.6 Issues

In compliance with NEPA, the project was listed in the September 2001, March 2001, December 2000 and September 2000 editions of the quarterly *Salem District Project Update* which were mailed to over 1,000 addresses. Also, a ***scoping*** letter was mailed on August 24, 1999 to 24 potentially affected and/or interested individuals, groups, and agencies. A total of nine letters were received as a result of this scoping. In addition, a representative of the City of Salem Water Department participated in planning meetings and field reviews during the environmental analysis.

Issues Raised from Scoping Letters

Issue 1. <u>Soils and Water</u>

Water Quality: Letters from the following groups or individuals contained concerns about adverse effects of commercial harvest and road construction on water quality: City of Salem, Oregon Natural Resources Council (ONRC), American Lands Alliance (ALA), Northwest Environmental Defense Center (NEDC), Shirley Brown, Karen Sjogren, and John Brandt

Alternative 3 (proposed action) was developed to retain more vegetation cover in harvest units containing mature trees, as recommended by the City of Salem to address water quality issues (see section 2.2.3). Design features to protect water quality can be found in sections 2.2.3 and 2.2.4. Existing conditions, which are the effects of the no action alternative, are described in 3.1.2 and effects of the action alternatives on water quality are addressed in 4.1.2 and Appendix 2. A Restoration Only alternative was evaluated and documented in section 2.2.5.

Road Densities / No Road Construction: Letters from the following groups or individuals contained concerns about adverse effects of road construction on hydrology and soil compaction: ALA

A No Road Construction alternative was evaluated and documented in section 2.2.5. Road construction is addressed in sections 2.2.4, 3.1, and 4.1.

Steep Slopes and Soils: Letters from the following groups or individuals contained concerns about adverse effects of commercial harvest on steep slopes: ALA, NEDC, Karen Sjogren, John Brandt

All harvest units occur on slopes less than 55 percent. All tractor skidding would take place on slopes 35 percent or less (see sections 2.2.4, 3.1, 4.1).

Issue 2. Vegetation / Wildlife / Fish

Old Growth and Forest Diversity: Letters from the following groups or individuals contained concerns about adverse effects of commercial harvest and road construction on old growth/late successional species and habitat: ONRC, ALA, NEDC, Shirley Brown, Karen Sjogren, John Brandt

Fish and Wildlife: Letters from the following groups contained concerns about adverse effects of commercial harvest and road construction on special status species: ONRC, ALA, NEDC

These issues are addressed in sections 2.2.4, 3.2 - 3.4 and 4.2 - 4.4, and Appendices 1 and 2.

Issue 3. Recreation

Letters from the following groups or individuals contained concerns about conflicts between log hauling and heavy recreation use: John Brandt, Karen Sjogren

This issue is addressed in sections 2.2.4, 3.6, and 4.6.

The Chapters of the EA will be organized by the following resource categories: soils and water, vegetation, wildlife, fish, fire and fuels, recreation and rural interface resources, visual resources. Additional Elements of the Environment are evaluated in Tables 15 and 16 in Appendix 1.

EA CHAPTER 2.0 - ALTERNATIVES

2.1 Alternative Development

In addition to the required "no action" alternative, the IDT formulated seven preliminary alternatives to the Sinker Swim project to address issues raised by the public during scoping. The IDT assessed those preliminary alternatives and dropped five of them from further study for the reason cited in section 2.3.

2.2 Alternatives Documented in Chapters 3 and 4 of this Analysis

2.2.1 Alternative 1 (No Action)

The BLM would not implement the Sinker Swim project at this time. The local plant and animal communities would be dependent on and respond to ecological processes that would continue to occur based on the existing condition. This alternative serves to set the environmental baseline for comparing effects of the action alternatives.

2.2.2 Alternative 2

Alternative 2 proposes regeneration harvest in units A, B, C, D, E within section 34 and 35 in the Matrix LUA and would leave 10-12 green trees per acre (see section 2.2.4.2). This alternative also includes commercial thinning, riparian thinning, snag and down wood recruitment, restoration of an oak woodland, new road construction, renovation and improvement to facilitate timber harvest, and road blocking and decommissioning. These activities are common to both action alternatives and are described in greater detail in section 2.2.4 and 2.2.5.

2.2.3 Alternative 3 (proposed action)

Alternative 3 proposes to harvest the same areas as Alternative 2 and was developed to address the City of Salem's water quality concerns. Alternative 3 proposes partial cutting in units A, B, C, D, E within section 34 and 35 in the Matrix LUA and would leave 30-60 green trees per acre (see section 2.2.4.2). This alternative also proposes to create 1-2 acre openings for a total of 10 acres across the harvest units in order to increase diversity in the stand, treat pockets of laminated root rot *(Phellinus weirii*), and prepare the stand for future uneven-aged management.

Alternative 3 also includes commercial thinning, riparian thinning, snag and down wood recruitment, restoration of an oak woodland, new road construction, renovation and improvement to facilitate timber harvest, and road blocking and decommissioning. These activities are common to both action alternatives and are described in greater detail in section 2.2.4 and 2.2.5.

2.2.4 Objectives, Actions, Design Features, and Mitigation Measures Common to Alternatives 2 and 3

2.2.4.1 Project Objectives

1. Enhance the future timber-producing capability of the GFMA lands while meeting RMP goals and objectives (Actions 1-6 described in section 2.2.4.2);
2. Contribute to District timber management objectives (Actions 1-6 in described in section 2.2.4.2);
3. Provide for the maintenance of ecologically valuable structural components such as down logs, snags, large trees (Actions 1, 7, 8, 9, 10 described in section 2.2.4.2);
4. Control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy (ACS) objectives (Actions 1, 7, 8, 9, 10 described in section 2.2.4.2);

5. Enhance riparian area stand habitat characteristics and accelerate growth and development of selected residual overstory trees and understory conifers (Actions 7, 8, 9 described in section 2.2.4.2);
6. Create snags and ***large woody debris (LWD)*** near the streams within the Riparian Reserves to enhance future aquatic habitat (Action 9 described in section 2.2.4.2);
7. Provide for the maintenance of an ecologically valuable special habitat (oak woodland) (Action 10 described in section 2.2.4.2); and
8. Begin restoration of proper hydrologic functions which have been degraded by past road construction practices (Actions 11, 12 described in section 2.2.4.2).

2.2.4.2 Actions

Timber Management

Section 27:

1. Commercial thinning of 42 acres of Matrix in units PQ and R;

Section 34 and 35:

2. Both Alternatives propose to harvest 120 acres of Matrix in units A-E (see sections 2.2.2 and 2.2.3.). Alternative 2 proposes regeneration harvest on these acres, leaving 10-12 green trees per acre, and Alternative 3 proposes partial cutting on the same acreage, leaving 30-60 green trees per acre;
3. Brush over three feet in height would be slashed and prescribed fire (e.g., broadcast burning) would be used to reduce the amount of slash and brush to aid in the replanting of mixed conifer and hardwood trees after timber harvest;

Sections 27, 34 and 35:

4. Approximately 5300 feet of new road would be constructed to facilitate timber harvest. These roads may be rocked for wet season haul use, but would probably be used only as a dirt road in the dry season. All new roads would be ***decommissioned*** following harvest and site preparation activities (see Figure 3);
5. Approximately 42,000 feet of existing road segments would be restored to current road management standards. Renovation typically includes brushing, grading, ditch cleaning, spot rocking, and culvert replacement; and
6. Approximately 200 feet of existing road would be improved. This work would consist of replacing two large diameter culverts that are currently failing, and reconstructing the roadway and approaches at these culvert locations.

Restoration

7. Up to four of the reserved green trees per acre would be topped in units A-E, PQ, R, and R6-R8 to improve wildlife habitat, diversity and leave tree wind firmness;
8. Approximately 8 acres of Riparian Reserves would be thinned in units R6, R7, and R8 within section 27;

9. Five trees per acre in sections 34 and 35, and 10 trees per acre in section 27 in Riparian Reserves, would be girdled or cut, provided that existing stream shade and soil stability are not compromised. If cut, conifers would be felled into the stream as large woody debris (LWD);
10. Conifers that are encroaching on two acres of oak woodlands would be cut. Felled conifers left on site as ***coarse woody debris (CWD)***;
11. Two thousand feet of existing road segments would be decommissioned; and
12. An additional 5,000 feet of existing road would be blocked to vehicle access.

The next section describes project design features and mitigation measures associated with the above actions.

2.2.4.3 Design Features and Mitigation Measures

Soils and Water (Issue 1)

1. **BMPs, Logging, and Roads:** Road construction, road use and logging requirements would be designed to prevent all but minimal damage to retained trees and soil, and to protect water quality.

   General:
   - Road construction, road use, and logging systems design and *Best Management Practices* would be implemented to minimize erosion and sediment entering streams to keep anticipated sedimentation within State of Oregon Department of Environmental Quality (DEQ) standards.
   - No falling, yarding, or skidding operations would be allowed within thinning units between April 1 and July 1 when the sap is flowing and the bark is loose so that excessive damage would not reduce the quality and/or quantity of timber products produced in the future from retained trees.

   Tractor Skidding:
   - All road construction, road decommissioning, and tractor skidding operations would be restricted to dry soil conditions to minimize compaction, erosion and sediment production.
   - Tractor skidding operations which compact and/or expose soil would not be allowed on slopes greater than 35 percent.
   - Tractor skidding operations would be designed to prevent soil compaction or disturbance of more than 10 percent of the ground surface area.
   - Tractor skid trail spacing, width and location would be approved by the BLM prior to falling timber and would be designed to comply within soil compaction, erosion and productivity standards. Tractor skid trails would be designated and spaced approximately 150 feet apart.
   - Partial Cut/Thinning only: All tractor skid trails would be left intact for use in future partial cut entries to avoid damage to residual trees adjacent to these trails.

- Mechanized felling, forwarding or logging methods other than tractor skidding on designated skid trails would be allowed as long as the soil compaction, erosion and productivity standards criteria are met.

Skyline Yarding Operations:

- Skyline yarding would be designed to prevent soil compaction or disturbance of more than 10 percent of the ground surface area.
- One end suspension log in-haul would be required to reduce soil compaction and disturbance except that full suspension in-haul would be required of any logs yarded across streams or streambanks.
- Lateral yarding from a fixed position on the skyline up to at least 75 feet would be required to minimize damage to leave trees during lateral yarding and to disburse the frequency of skyroads.
- To the extent possible, skyline yarding corridors would be spaced at least 150 feet apart at the widest point.
- Downhill yarding, though not anticipated, would be seasonally restricted to dry soil operations.
- Reserve trees, including trees in the Riparian Reserve, may be used for rigging, except those with unique wildlife characteristics which would be compromised by attaching cables to them.

2. **Hazardous Waste:** Hazardous materials spill kits and containment systems would be required to prevent engine oils, coolants and hydraulic fluids from inadvertently contaminating surface or ground waters.

3. **Riparian Reserves:** Riparian Reserves would be established to minimum slope distances on each side of the stream as shown in Table 1. The distances are based on the site potential tree height, which was measured on all units. Where thinning is proposed within Riparian Reserves (units R6-R8), there would be a 50-foot wide ***no harvest zone*** established on both sides of any stream.

Table 1. Riparian Reserve Widths * no harvest = no tree extraction

Unit(s)	Category		
	Site Potential Tree Heights in Feet	**No Harvest Zone* on Non-fish Bearing Streams in Feet**	**No Harvest Zone on Fish Bearing Streams in Feet**
A, B, C	200	200	N/A = no fish
D	220	220	N/A
E	220	220	440
PQ, R	220	220	N/A
R6-R8	220	50	N/A

Vegetation (Issue 2)

4. **Late-successional forest at the landscape level:** Landscape areas *(watersheds)* where little late-successional forest persists would be managed to retain late-successional patches (*RMP*, p. 22). Federal forest lands within the Little North Santiam River watershed would be managed to retain a minimum of 15 percent in late-successional forest at any point in time. Late-successional forests include forest seral stages that include the mature and old-growth age classes (80 years and older) *(RMP/FEIS,* Chapter 6 p. 7*)*.

5. **Survey and Manage/Protection Buffer Species:**
   a. *General:* All units have been surveyed for Survey and Manage and Protection Buffer species. All species requiring protection have been protected in accordance with established protocols.
   b. *Fungi protection:* No-entry buffers have been established around Survey and Manage fungi species which currently require protection. These buffers have been designed to protect the sites from significant microsite temperature and relative humidity changes compared to pre-disturbance conditions.

6. **Leave Trees in Thinning:** In general, larger trees and minor species would be favored for retention over the smaller, suppressed and intermediate trees.

7. **Individual Tree Treatments without removal:** Within the no harvest zone, up to 10 trees per acre in section 27, and up to five trees per acre in sections 34 and 35 may be top or base girdled or felled into or across stream channels to provide structure and enhance riparian area stand habitat characteristics, accelerate growth on selected residual overstory trees, and enhance development of any advanced conifer regeneration which is present. These treatments would take place within close proximity to the stream in order to provide stream structure (logs and large woody debris) for aquatic species. Trees to be felled would be selected to cause little or no soil disturbance and provide stable locations for stream structure logs. Some of these treatments may be concurrent with the proposed timber harvest while others would be done at a later time as funding is available. Trees to be felled or top or base girdled would be selected based on the most current scientific recommendations for restoring habitats within the Riparian Reserve. These treatments may be phased in over a period of five to seven years so as to minimize the potential for local bark beetle population increases that may jeopardize the health of the residual green standing trees.

8. **Invasive Plant Species:** In order to reduce the potential for establishing additional populations of invasive plant species:
   a. All ground traveling machinery would be cleaned of all mud, plant parts and debris prior to entry onto BLM lands.

b. If noxious weed infestations are found, eradication or containment measures would be taken as directed in BLM manual 9015 and Instruction Memorandum OR-080-93-25.
c. Seed from Native species would be used for all erosion control seeding.
d. The project area would be checked within three years of timber harvest to evaluate the resulting density of the noxious weed populations and to see if any other noxious weeds have invaded the project area. If populations are large enough for biological control to be effective, the BLM would work with the Oregon Department of Agriculture, which has responsibility for noxious weed control, to implement further treatment.

Wildlife (Issue 2)

9. **Snags and Coarse Woody Debris:**
   a. Existing snags would be reserved where possible. Snags with bark attached would be protected by reserving green trees around the snags.
   b. Up to four trees per acre would be topped by blasting, girdling or sawing. Two-thirds of the live crown would be maintained after topping to make them less wind-throw prone and to provide for future nesting and foraging opportunities for species such as the northern spotted owl, pileated woodpecker and American kestrel. Emphasis would be placed on retaining a combination of defective (cull and snag top trees) and sound trees, with the goal to retain the biggest trees.
   c. Approximately two green conifer trees per acre would be retained for future Class 1 CWD recruitment. These trees are expected to fall on their own within five years. These trees would be checked within that time period and would be felled if they have not blown down.
   d. Existing down CWD would be reserved where possible. No trees reserved for CWD recruitment would be cut during implementation of harvest, since it is estimated that these trees would fall in the next five years. The area would be assessed during this time period to determine if natural recruitment has taken place, and if it has not happened, the CWD trees would be felled at that time.

10. **Northern spotted owl:** Timber felling, landing construction, skid trail construction, skidding, yarding, blasting, road construction and burning would not be allowed from March 1 through June 30 to avoid disturbing northern spotted owls which may be nesting nearby. Blasting would not be allowed from March 1 to September 30. If surveys are conducted to USFWS protocol and no owls are found, the seasonal restriction, except for blasting, may be waived for the remainder of that year.

11. **Survey and Manage Species**
    a. **Mollusk protection:** No mollusk species currently requiring protection were found during surveys (see section 3.3.2 and Table11).
    b. **Red tree vole protection:** All portions of the proposal have been surveyed for Red Tree voles, and no nest sites were found.

12. **Red-tailed hawk:** Cutting, yarding, loading, road construction and road decommissioning would not be allowed from March 1 through July 31 within a quarter mile of the red-tailed hawk nest adjacent to unit D. If surveys are conducted and red-tailed hawks are confirmed not to be nesting, the seasonal restriction may be waived for the remainder of that year.

Fish (Issue 2)

13. **Riparian Reserve Widths on Fish Bearing Streams:** A fish bearing stream is located on the east side of Unit E (see Table 1). The stream would be protected by establishing a Riparian Reserve which is two site potential tree heights (440 feet) wide on each side of the stream.

Fire and Fuels

14. **Resource Protection**:
    a. The mechanics of burning would be conducted in a manner to save 90 percent of the reserved trees.
    b. All Riparian Reserves and larger green tree clumps(larger than one acre) would be fire trailed for maximum protection from ground fire.
    c. Some species of retained green trees, specifically western redcedar and hemlock are susceptible to fire damage due to thin bark. To increase their survival rate the combustible fuel less than 6 inches in diameter would be reduced within a 15-foot radius of the bole of trees greater than 20 inches in diameter
    d. A convection column or use of mass ignition equipment such as an aerial drip-torch would be avoided where possible.
    e. Burning would not take place in the portion of unit B that is within TPCC FMR1 (see Table 5)

Recreation (Issue 3) **and Rural Interface Resources**

15. **Seasonal Restrictions and Access:** In an effort to reduce potential conflicts with recreational traffic, log and rock hauling between May and September would be limited to Monday through Friday. Also, log and rock truck hauling would not be allowed on any weekdays that are part of the Memorial Day, July 4th and Labor Day holidays. In addition, all gates would be opened and closed with each trip to help reduce potential encounters between logging traffic and the public.

Visual Resources

16. Limit diversity patches in units A-E (see section 2.2.3) to no more than two acres in size.

Other

17. **Special Forest Products (SFP):** Following harvest of commercial timber, firewood cutters would be allowed to cut and remove firewood from landing piles. Logs contributing to the 240 lineal feet of CWD per acre would be excluded from firewood cutting. SFP permits would be issued for areas designated for road construction prior to the start of construction activities. Permits to collect above ground plant materials (fern fronds, moss, salal, mushrooms, etc.) would be issued prior to harvest activities in any area where prescribed burning is planned.

18. **Cultural Resources:** Surveys for cultural and archeological resources have not identified any sites in the proposed timber harvest units. If any sites are identified during timber harvesting, the operations would be immediately halted and the Field Manager would be notified. Operations would be resumed only with the Field Manager's approval, and only after appropriate mitigation measures were designed and implemented to provide any needed protection of those resources.

2.2.5 Comparison of Alternatives for Selected Parameters

Table 2 displays timber harvest information by yarding method for Alternatives 2 and 3. Alternatives 1, 2, and 3 compared in Table 3.

Table 2. Summary of Timber Harvest Information by Yarding Method

Type of Harvest	Estimated				
	Acres Tractor	Acres Skyline	Total Acres	Volume (MBF) Alternative 2	Volume (MBF) Alternative 3 (Proposed Action)
Regeneration Harvest: (Alternative 2) or Partial Cut: (Alternative 3)	70	50	120	7,200	2,400
Commercial Thinning	20	22	42	500	500
Riparian Thinning	0	8	8	100	100
Total	90	80	170	7,800	3,000

Table 3. Comparison of Alternatives for Selected Parameters					
PARAMETERS			**ALTERNATIVES**		
			Alternative 1 (No Action)	**Alternative 2**	**Alternative 3 (proposed action)**
Acres Treated (approximate)	Matrix	Regeneration Acres Units A, B, C, D, E	0	120	0
		Partial Cut Acres Units A, B, C, D, E	0	0	120
		Commercial Thinning Acres - Units PQ, R	0	42	42
	Riparian Thinning Units R6, R7, R8		0	8	8
	Total Acres Treated		0	170	170
Green Trees per Acre after treatment	Regeneration (Alternative 2) or Partial Cut (Alternative 3)		50 - 110	10 - 12	30 - 60
	Commercial Thinning		345	140	140
	Riparian Thinning		225	90 - 140	90 - 140
Canopy Closure	Regeneration (Alternative 2) or Partial Cut (Alternative 3)		55-70%	Less than 10%	30 - 50%
	Commercial Thinning		75 - 85%	40 - 55%*	40 - 55%*
	Riparian Thinning		75 - 85%	40 - 55%*	40 - 55%*
* Canopy closure on the most heavily thinned portions is expected to not drop below 40 percent. Average canopy closure for the entire treated area is expected to be approximately 50 to 55 percent.					
Logging System Acres (approximate)	Skyline		0	80	80
	Tractor		0	90	90
Estimated Harvest Volume (MBF - thousand board feet)			0	7,800	3,000

Table 3. Comparison of Alternatives for Selected Parameters				
PARAMETERS		**ALTERNATIVES**		
		Alternative 1 (No Action)	**Alternative 2**	**Alternative 3 (proposed action)**
Roads: (approximate)	Maintenance (feet)	normal road maintenance of roads in the vicinity of the project	42,000	42,000
	Renovation (feet)	0	42,000	42,000
	Improvement (feet)	0	200	200
	Construction (feet) would be decommissioned after operations	0	5300	5300
	Blocking existing road (feet)	0	5,000	5,000
	Decommissioning (feet)	0	2,000	2,000

Note: Normal road maintenance would still occur under Alternative 1, to the extent that BLM maintains all roads that are needed for administrative access.

2.3 Alternatives Dropped from Detailed Analysis

The following alternatives to the proposed action were evaluated and dropped for the reasons described below. In addition to the proposed action alternatives, 327 acres were evaluated for some form of timber harvest, but were not included in the project for a variety of reasons.

2.3.1 Alternative - No New Road Construction

Primarily as a result of public comment, an alternative was examined which would utilize a combination of skyline yarding and tractor skidding systems with ***no new road construction***. A no road construction action alternative was not fully developed for the following reasons:

- New road construction for this project consists of several spurs to facilitate logging a portion of the proposed units that could not be reached by the current road system (see Figure 3). Without these spurs these areas would not be harvested due to mandates to harvest areas in the most efficient and economical manner with the least effects to resources.

- Effects associated with road construction are documented in Chapter 4 of the EA. Effects of no road construction are already covered under the No Action Alternative. Therefore the team did not feel it was necessary to develop another action alternative without road construction.

With the current alternatives, the Decision maker has the option of deciding whether or not to go forward with new road construction and the portions of the harvest units dependent on new road construction based on the effects described in Chapter 4.

2.3.2 Alternative - Restoration Only

During public scoping, it was suggested by the American Lands Alliance that the BLM "include at least one alternative that analyzes restoration without commercial timber harvest." It was determined that the suggested "restoration alternative" would not meet the purpose and need for action. As such, the suggested alternative would be outside the scope of this analysis. Several components of what would have been included in a restoration alternative have been incorporated in the proposed project, including oak woodland restoration, riparian reserve treatments, and road decommissioning.

2.3.3 Alternative - Recreation

At least two letters were received expressing concerns about the impact that a timber sale would have on the recreation values in the area. One correspondent requested that we consider a recreation alternative. The impacts that the project might have on the recreation values of the area will be evaluated in the analysis. A separate alternative specifically addressing recreation would be beyond the scope of this project and would not address the purpose and need for action. The recreation potential of this area was previously analyzed in the development of the RMP, which this document is tiered to.

2.3.4 Alternative - Helicopter Yarding

Portions of the proposed area were evaluated for yarding with a helicopter. This alternative was dropped from consideration for a variety of reasons. Primarily, the volume of timber proposed for helicopter-logging does not justify the high cost of this yarding method. Some of the area that would most benefit from helicopter yarding was dropped out of consideration for other reasons.

2.3.5 Alternative - Commercial Thinning & Hardwood Conversion, Section 33

Commercial thinning of 99 acres, hardwood conversion of 36 acres, and Riparian Reserve thinning of 31 acres were evaluated in Section 33 and in the southwest corner of section 27. Specialists on the Interdisciplinary Team (IDT) reviewed these areas and their analysis indicated that these would be viable projects that would benefit the forest environment. The existing roads that access these areas, however are in poor condition and in need of extensive repair. The IDT felt that it was beyond the scope of this action to address the engineering requirements of the road renovation and repair needed to conduct these treatments. The road work associated with these actions will be analyzed under a separate NEPA document at a later date.

EA CHAPTER 3.0 - AFFECTED ENVIRONMENT

Chapter 3.0 describes the present condition (i.e., affected environment) within the project area for the following resource categories: soils and water, vegetation, wildlife, fish, fire and fuels, recreation and rural interface resources, and visual resources. Additional resources or values for which review is required by statute, regulation, Executive Order, or policy, are described in Appendix 1: Elements of the Environment.

3.1 Soils and Water (Issue 1)

3.1.1 Soils

The complex geologic history, described in the Little North Santiam WA (LNS WA Ch. 4, P. 1 and 2) has produced a fairly uniform landscape of U-shaped glaciated valleys with broad outwash-filled bottoms that are separated by steep shallow-soiled headlands and sharp, rocky ridges. Soils on these units formed on mountain foot slopes, on low foothills, and on escarpments of terraces, where they have formed in colluvium (material rolling downhill) that was derived mainly from basalt and sandstone. These soils have a surface layer of loam, clay loam, or silty clay loam and subsoil of loam, silty clay loam or clay. Soil types within proposed units are described in Table 4.

Table 4. Soil Types					
Soil Series	**Location**	**General Characteristics of Each Soil Type** Individual units do not necessarily have all the described characteristics.			
		Depth (Inches)	**Slope (%)**	**Surface Rock Content (%)**	**Management Considerations**
Kinney Cobbly Loam	Units A, D, E, PQ, R, R6,R7, R8	40 to 60	2 to 50	25 to 50	Medium runoff and slight erosion hazard
Henline Very Sandy Loam	Approximately one acre of Unit B	20 to 40	55 to 80	50 to 80	Very rapid runoff and highly susceptible to erosion; rock outcrops numerous and escarpments common; low fertility and moderately rapid permeability. Mitigation Measures to reduce risks associated with this soil type include full leave riparian buffers, cable logging with partial log suspension, no road construction.
Horeb Loam	Units A, B, C, D	60+	2 to 20	15	Medium runoff and slight to moderate hazard of erosion; low fertility and moderate permeability

Large scale slump/earthflow instability has not been a significant factor in slope development or stream channel morphology in this area, except for a few localized reaches. No units within Alternatives 2 and 3 have areas of slump/earthflow instability.

Table 5 describes the Timber Production Capability Classification (TPCC) codes in the proposed units. Timber Production Capability is a method to further define soils in the context of supporting timber harvest. All units contain TPCC codes that are suitable for timber harvest. A map showing the TPCC classification can be found in the Sinker Swim project file.

Table 5. Timber Production Capability Classification (TPCC) Codes			
TPCC Code	**General Description**	**Location**	**Best Management Practices**
FSR2 Suitable	Compacted soils resulting from previous management practices	PQ, R, R6, R7, R8	If ground based yarding, use existing skid trails and yard during dry season.

Table 5. Timber Production Capability Classification (TPCC) Codes			
TPCC Code	**General Description**	**Location**	**Best Management Practices**
FPR1 Suitable	Sites with slow moving slumps or slides in areas of landslide topography; sites occur primarily in undulating topography containing depressions and sag ponds	B	Avoid unloading toe slopes or loading tops of slumps; divert road drainage away from unstable areas; maintain or reestablish natural drainage after harvest operations; design measures to enhance stability of unstable slopes.
RLR1 Suitable	Moist sites having, or will have, hardwood or brush competing species following timber harvest	D	Minimize soil disturbance from yarding; reforest sites with shade-tolerant and larger planting stock; thin out competing brush and hardwood species before they overtop conifers.
RLR2 Suitable	Disturbed sites containing competing vegetation with less than minimum conifer stocking due to shading from competing species	R, R6, R8	Same as RLR1, except more than one thinning operation of competing vegetation may be necessary to obtain adequate conifer stocking.
RPR1 Suitable	Sites containing disease pockets or treatable disease concentrations	A, B, D	Reforest disease pockets with resistant conifer or immune hardwood species; thin out sensitive species during pre-commercial entries in following rotation.
RPR3 Suitable	Sites containing disease infections that are large enough that the entire stand requires treatment	A, B, C, D, E	Same as RPR1, except that entire site requires treatment.
FMR1 Suitable	Sites are normally excessively drained and occurs on steep convex hill slopes in excess of 70%.	B (approx. 1 acre)	Use total log suspension or dry season partial suspension; avoid burning for site prep; leave large debris, on site, to impede soil movement; seed native grass species on disturbed sites.

The primary aspect for the units in this timber sale is south, with aspects ranging from southeast to southwest. The majority of the proposed timber sale units are located on the slopes and benches that are midway between the top of Sweet Spring Mountain down to the Little North Santiam River. The remaining units are located on the lower 1/3 of this slope. Unit slopes are quite variable, ranging from less than 10 percent to approximately 55 percent (see Figure 4).

The primary concern of the soils within the timber sale area is compaction susceptibility. As shown in the Little North Santiam Watershed Analysis (LNS WA Map #5), soil compaction exists throughout most of the BLM land in Section 27. This is, primarily, due to previous tractor skidding, where the movement of logging equipment was not restricted to designated skid trails. Consequently, the logging equipment covered a majority of the land base, with soil compaction the end result.

3.1.2 Water

Project Area Precipitation and Basin Hydrology

The project area is located in the Oregon Western Cascades range at elevations between 1,500 - 3,000 feet. In general, most of the project area is subject to rain on snow events (ROS) which have the potential to increase peak flows during winter or spring storms. The project area receives approximately 75 inches of rain annually and has a mean 2-year precipitation event of approximately 4.5 inches in a 24-hour period (N.O.A.A. Precipitation-Frequency Atlas for Oregon, Volume X).

The project area is part of the Sinker Creek Frontal sixth field watershed, which is approximately 14,956 acres (23.4 miles^2) in drainage area. The primary stream draining the watershed is the Little North Fork Santiam River (LNSR), contained in the North Santiam River cataloging unit #17090005 (U.S.D.I.,1974). The Sinker Creek sixth field is a "frontal" watershed: it includes a number of steep, headwater tributary channels which independently drain the slopes adjacent to the LNSR. All of the units in this proposal drain to either Sinker Creek or Big Creek.

Channels in the area have incised into the south slopes of a northeast trending ridgeline formed in tertiary volcanic materials (andesitic-basalts overlying tuffaceous materials). Much of the surface geology in the project area is mapped as landslide debris-flow deposits (Walker, et al.,1991). This material has been continuously eroding from the surrounding bedrock during the Pleistocene and Holocene (2 million years to the present). Evidence of deep-seated earth flows, slumping and landsliding are common features in this terrain, particularly at contacts between basalt and tuffaceous rock.

Project Area Stream Flow

None of the tributary channels in this watershed have been gaged. Streamflow characteristics of the LNSR, which has a gage near its confluence with the North Santiam, are described in the watershed analysis (LNSWA 1997).

Project Area Stream Channels

Small headwater channels, mostly with an ephemeral or intermittent flow regime, predominate in the project area. On stable landforms, Rosgen type "A" channels are common: >10percent gradient, entrenched, low width/depth ratio, low sinuosity.

Reflecting their colluvial nature (dominated by hill-slope geomorphic processes), channel substrates are predominately in the gravel to sand size classes. On the less stable portions of the watershed, Rosgen Aa+ channel types form: very steep, deeply entrenched, debris torrent streams. These channels are more commonly subject to landslides and debris torrents. They have high rates of sediment transport during episodic events, with long periods of valley filling in between. They are filled with large wood and debris and adjacent slopes are moderately unstable. All the channels viewed in the field are currently in "proper functioning condition" (U.S.D.I., 1998)

Utilizing the Montgomery-Buffington typology (Montgomery & Buffington, 1997), these channels would be classified as colluvial: "small, headwater streams at the tips of a channel network that flow over a colluvial valley fill and exhibit weak or ephemeral fluvial transport." Episodic transport by debris flows may account for most of the sediment transport in these steep headwater channels.

Project Area Water Quality

The water quality parameters with the potential to be affected by this proposal include stream temperature, dissolved oxygen (DO) concentrations, hydrogen ion concentration (pH), and turbidity. Additional water quality parameters (e.g., nutrients, pesticide and herbicide residues, bacteria, etc.) are not highly sensitive to forest harvest and road construction (U.S.E.P.A.,1991) and were not reviewed for this analysis.

The State of Oregon has established water quality standards "not to be exceeded" for all waters of the state. For the Willamette Basin these standards are published in the Oregon Administrative Rules, Chapter 340, Division 41, 442- of the Department of Environmental Quality (DEQ).

For Salmonid fish producing waters, no measurable increases in stream temperature are allowed where temperatures are 14.4° C (58° F) or greater. For Non-Salmonid fish waters, no measurable increases in stream temperature are allowed where temperatures are 17.8° C (64° F) or greater.

Dissolved oxygen (DO) concentrations shall not be less than 90 percent saturation at the seasonal low or less than 95 percent of saturation in spawning areas during spawning, incubation, hatching, and fry stages of salmonid fishes.

In Non-Salmonid fish producing waters, DO levels should not fall below 6mg/l. Hydrogen ion concentration (pH) shall not fall outside the range of 6.5-8.5. Turbidity, measured in Nephelometric Turbidity Units (NTUs), shall not increase by more than 10 percent as measured relative to a control point immediately upstream of the turbidity causing activity. Conductivity, which is often measured in combination with pH or other water chemistry parameters, does not have a State standard.

Stream Temperature

Continuous stream temperature measurements have been collected at several sites in the Sinker Creek area and the data was summarized in the watershed analysis (LNS WA., 1997). Summer stream temperatures in the main stem of the LNSR were found to be above the State of Oregon standard at three sites downstream of river mile 15. In addition, several tributaries in the Sinker Creek frontal were identified as potential source areas for high stream temperatures. These data were utilized by the DEQ in it's listing of the LNSR as "water quality limited".

Additional stream temperature data has been collected on tributaries of LNSR, including Sinker Creek and Big Creek, since the watershed analysis. In 1998, seven-day averages on Sinker Creek exceeded 17.8° C for several days in August. In 2001, a year with lower summer flow, 17.8° C was exceeded for only two hours on August 13th. Big Creek remained below the threshold in both years. Little Sinker Creek was monitored in the summer of 2001 and remained below 17.8° C throughout.

Dissolved Oxygen, pH, and Conductivity

No data for these parameters in the Sinker Creek sixth field or the project area was located for this assessment. Data for these parameters are available at the U.S.G.S. gage at Mehama #14182500(http://waterdata.usgs.gov/or/nwis/uv) at the outlet of the Little North Santiam River but are not reviewed for this assessment.

Turbidity

Occasional turbidity grab samples have been collected in the LNSR watershed during winter storm events since 1996 and results were summarized in the watershed analysis (LNS WA., 1997). Sinker Creek, among others, was identified as a source area for high turbidity. Based on grab sample evidence collected during the winter of 1996, the source area for high turbidity in Sinker Creek was isolated to a half mile stretch of the main channel in Section 34 on private land. While the exact cause of the turbidity has not been identified, it is likely to be a result of slumping and earthflow processes that are common in this terrain.

Oregon Department of Environmental Quality

The DEQ's 1998 303d List of Water Quality Limited Streams is a compilation of streams which do not meet the state's water quality standards. The LNSR is listed as not meeting water quality standards for summer stream temperatures from the mouth to headwaters. The DEQ is currently developing a Total Maximum Daily Load (TMDL) for the watershed which is scheduled to be completed in 2003. (http://waterquality.deq.state.or.us/wq/303dlist/303dpage.htm) The DEQ has also published an assessment, the 319 Report, which identifies streams with potential non-point water pollution problems (1988 Oregon Statewide Assessment of Non-point Sources of Water Pollution).

Table 6. 1988 Oregon Statewide Assessment of Non-point Sources of Water Pollution

Watershed/ Stream Reach	Water Quality Conditions Affecting:				
	General WQ	Drinking Water	Recreation/ Shellfish	Fish	Aquatic habitat
LNSR / 60	MD	MD	MD	MD	MD
61	MD	MD	NP	NP	NP
149	MD	NP	NP	MD	MD

NP = No Problem and/Or No Data
MO = Moderate Problem based on Observation (no collaborating data)
MD = Moderate Problem (supported by data)

Portions of the North Santiam River were identified as having moderate water quality problems (with data) which may be affecting general water quality, drinking water supplies, recreation, fish and aquatic habitat. Data sources were not specified but may include the City of Salem. The pollution types include low dissolved oxygen, low flow, sediment, and bacteria/viruses. The probable causes of water quality problems are listed as landslides, erosion, decline in alluvial watertable, animal and human waste, and disturbance of riparian vegetation.

Beneficial Uses

Beneficial uses of surface water from the project area are displayed in Table 7. There are several domestic water users on the mainstem LNSR downstream from the project area as well as water withdrawals for irrigation and livestock watering.

Additional beneficial uses of the stream-flow in the project area include salmonids, resident fish, recreation, and esthetic values. Several miles downstream from the project area the City of Salem withdraws water from the North Santiam for treatment and distribution to city residents and industry.

Table 7. Beneficial Uses Associated with Streams in the Project Area.

Stream (Watershed)	Project	Beneficial Use	Distance from Project	Information Source
Sinker Creek Frontal and Little North Santiam River (LNSR)	Timber harvest: regeneration cut or partial cut, commercial thinning. Road construction renovation decommissioning	Salmonid rearing and spawning	2-3 miles downstream in LNSR and mainstem Sinker Creek	BLM
		Resident fish & Aquatic Life	Immediate	BLM
		Private Domestic Water Supply	3 miles downstream in LNSR	WRIS*
		Irrigation & Livestock watering	3 miles downstream in LNSR	WRIS*
		Municipal (City of Salem)	> 10 miles downstream in North Santiam River	WRIS*

* WRIS = *Water Rights Information System* of the Oregon Department of Water Resources

3.2 Vegetation (Issue 2)

3.2.1 Forest (Upland and Riparian Reserve)

Upland Forest

Figure 5 shows age classes for the stands within sections 27, 34, and 35.

Section 27 (Units PQ, R): Unit PQ is 47 years old (1955 year of origin). Douglas-fir is the dominant species although there are minor amounts of western hemlock, red alder and big leaf maple. This stand is in the Understory Reinitiation structural stage (Oliver, Larson).

There have not been any management treatments since reforestation occurred. Stocking averages 345 trees per acre greater than 7 inches in diameter, and overstory trees average 11.6 inches in diameter. The understory tree layer averages 271 trees per acre and 4.2 inches in diameter. These are clumped, though they are found in all parts of the stand. Unit R is similar to PQ but has fewer but larger diameter trees and more hardwoods.

Sections 34, 35 (Units A through E): These units range in age from 103 to 120 years (1899 to 1882 years of origin). Douglas-fir in the Understory Reinitiation structural stage (Oliver, Larson) dominates the stand although small pockets of western hemlock and red alder can be found. The structure and species composition of these stands was simplified when they were commercially thinned in 1970. Stocking averages 99 trees per acre greater than 7 inches in diameter, and overstory trees average 23.7 inches in diameter. The understory tree layer averages 250 trees per acre and 1.9 inches in diameter, these are clumpy but are found throughout the stands. There is an average of 5.6 snags per acre 20 inches in diameter or greater and 62 lineal feet of class 2 down wood 20 inches or larger diameter at the large end.

Snags and Coarse Woody Material

Section 27: All of section 27 was logged in the1950s. Few, if any, large remnant trees or snags remain. CWD is present and is represented by large cull logs left by the last logging entry, and although they generally do not have bark attached, they are an important resource. Quantities and distribution are not uniform across the two sections. There are no snags 20 inches in diameter or greater and no class 1 or 2 down wood 20 inches or larger.

Sections 34, 35: Generally, large hard snags and CWD are in short supply. Very few large diameter snags are present in units A, B, C, D, and E because the commercial thinning 30 years ago removed most of the defective trees.

Late Successional Habitat

The project is within the Little North Santiam 5th field watershed. Sixty-eight percent of the Little North Santiam Watershed is late successional habitat.

Sections 27: There is no late successional habitat in section 27.

Sections 34 and 35: Stands within units A - E are considered late successional habitat. Although these sections contain areas that have large diameter trees, there are few of the other structural components of late successional habitat such as snags, down wood, or multiple canopy levels.

Riparian Reserve

Section 27: Federal ownership in this section was clearcut in the 1950s. As a result, approximately 100% of the Riparian Reserve acres are 50 years old or younger. Typically, there is little diverse structural development found in these mid-seral managed stands. Overall, species mix is diverse, with Douglas-fir, western hemlock, red alder, and bigleaf maple representing the major species. Very few conifers have late successional characteristics, and little understory development has occurred. As a result, there is no late-successional forest habitat in the Riparian Reserves.

The area proposed for thinning reforested thickly with conifers and is currently 50 years old. Douglas-fir is the predominate tree species, but many western hemlocks are also present. No management (thinning) has occurred since establishment, and it has remained thickly stocked. Suppression mortality is occurring within the smaller intermediate and suppressed size classes. This is providing some small, 4-7 inch diameter snags and down wood. Overstory tree growth rates are low due to the high stocking levels of the areas proposed for treatment. Understory development is also low. Vine maple and other common brush species are present along with sporadic conifers, however they are all suppressed and of low vigor.

Table 8. Existing Stand Conditions Within Riparian Reserve - Section 27	
Timber Type	D3H =- 1950
Trees/acre	225
Ave. Diameter at breast height (DBH)	12.5 inches
Canopy closure	75-85%
Snags/acre Meeting ROD Requirements	0

Sections 34, 35: Most of the Riparian Reserves in Sections 34 and 35 range from 100 to 130 years old. These stands are classed as mature forest and are developing desired structural attributes associated with older forests. However, the area is lacking in large CWD, sound snags and trees exhibiting unique deformities. This is partially due to the fact that part of the area was thinned in 1970, and many of these components were taken out at that time.

3.2.2 T&E, Special Status, and Special Attention Species - Botany

Botanical inventories for fungi were completed in the fall of 1997 and 2000 using established survey methods and the standard protocols for survey and manage component 2 and Protection Buffer fungi species. The standard protocols used include *Survey Protocols for Survey and Manage Fungi (September 1997).*

Table 9. Botany T&E, Special Status, and Special Attention Species Found		
Species	**Status**	**Location**
Gyromitra infula *	Survey and Manage (S & M) - B	Unit A
Sowerbyella rhenana	S & M - B	Unit B, D, E
Ramaria araiospora	S & M - B	Unit B, D, E
Ramaria stunzii	S & M - B	Unit D

* Removed from the Survey and Manage list in the *2001 Survey and Manage Annual Species Review - IM OR-2002-064 (June 2002).* Additional information can be found in the supplemental botanical report (EA Project file).

3.2.3 Invasive Plant Species

The following Priority III noxious weed species were found within or adjacent to the proposed project area, Tansy ragwort (*Senecio jacobaea*), bull and Canada thistles (*Cirsium vulgare* and *C. arvense*), St. John=s wort (*Hypericum perforatum*) and Scotch broom (*Cytisus scoparius*). These noxious weed species are considered to be common components of the roadside plant communities in western Oregon., tending to occupy areas of highlight and ground disturbance (i.e., road corridors and fields).

Although there are Priority II noxious weed sites along the Little North Fork River Access Road, no Priority I or II noxious weed species or other invasive plant species of concern were identified during the field survey of the proposed project sites or surrounding areas.

3.3 Wildlife (Issue 2)

3.3.1 General Wildlife Habitat

A description of snags and coarse woody material and late successional habitat can be found in section 3.2.1.

Special Habitats

Special Habitat surveys conducted in April of 1999 and June of 2001 detected a wet meadow greater than one acre in size located in the northern portion of section 27. That area was subsequently dropped from consideration for timber harvest. Therefore, the project is expected to have no effect on special habitats.

Road Densities

Open road densities within the Sinker Creek sub-watershed of the Little North Santiam Watershed are estimated at 5.7 miles per section, which is considered high for wildlife. An average of 3.5 miles per section or less is considered the target for wildlife. For wildlife purposes, open roads are defined as roads that are open to motorized vehicle traffic.

3.3.2 Special Status[1] and *SEIS* Special Attention[2] and Other Species of Concern - Terrestrial Wildlife

Threatened Species

Northern Spotted Owl *(T)*
Surveys to U.S. Fish and Wildlife Service protocol standards have been completed with the following results:

Table 10. Northern Spotted Owl Survey Results

Survey Year	# of Surveys	Detections
2002	3	none
2001	4	1 detection of a single male
2000	3	none
1999	5	1 detection of a single male
1998	no surveys	none
1997	3	none

Units A through E provide 120 acres of dispersal, roosting, foraging, and marginal nesting (suitable) habitat for the spotted owl. Units PQ, R, R6, R7, and R8 provide 49 acres of dispersal habitat and lack the structure required for suitable habitat. None of the proposed units are within the provincial home range radius (1.2 miles) of a known spotted owl site. The closest known spotted owl site is located two miles to the southeast. The closest owl core area is located seven miles to the south. No habitat within existing spotted owl core areas would be affected by this proposal. None of the units are located within Critical Habitat for the spotted owl.

Other Special Status and SEIS Special Attention (e.g., Survey and Manage)

[1] (T) = Threatened, (BS) = Bureau Sensitive, (BT) = Bureau Tracking

[2] Includes Survey and Manage Species (SM)

Species

Northern Goshawk (*BS*)

The goshawk prefers older forests with dense canopy closures at higher elevations. The proposed units are located at mid-elevations, however there is suitable habitat in the vicinity of the proposed units. Surveys for the Northern Goshawk, a Bureau Sensitive Species, were conducted in 1999 and 2000. There were no detections as a result of these surveys.

Bats (*SM, BS, BT*)

The Action Alternative under the *SM/FSEIS* does not require species-specific surveys to be conducted unless mines, caves, and abandoned wooden bridges or buildings are present. General habitat surveys were conducted in April of 1999, during which no mines, caves, abandoned wooden bridges or buildings were found. Therefore, there are no structures that would require protection under this project. Some bat species are associated with standing cull and snags, though there is generally a lack of standing cull and snags in the units.

Oregon Red Tree Vole *(SM)*

The Survey Protocol for the Oregon Red Tree Vole, dated February 18, 2000, and subsequent Management Recommendations for the Oregon Red Tree Vole, dated September 27, 2000 provide guidance for surveying and managing known nest sites.

Sections 27: Surveys to protocol were conducted in August of 2001 during which no potential nests were detected. Since stands are young and canopy visibility is generally good, no climbing was done.

Section 34, 35: Surveys to protocol were conducted March of 2000 during which 32 potential nests were detected. All 32 were climbed by contract climbers, and none contained Oregon Red Tree Vole nests (active or inactive).

Mollusks *(SM)*

When planning for the project was initiated, eight survey and manage mollusk species were known or suspected to occur within the Cascades Resource Area (see Table 11). Surveys were conducted for all eight species in compliance with the "Survey Protocol for Terrestrial Mollusk Species for the Northwest Forest Plan" Version 2.1 dated 10/98. Since then, four species have been dropped from *Survey and Manage* status.

Table 11. Mollusk Species Surveyed in the Sinker Swim Analysis				
Species	**Species Found Y/n**	**Total # Sites**	**Location**	**Species Status**
SNAILS				
***Megomphix hemphillia* (MEHE)**	N	0	NA	(SM)
Pristiloma arcticum crateris (PRARCR)	N	0	NA	(SM)
Cryptomastix devia (CRDE)	N	0	NA	(SM)
SLUGS				
Deroceras hesperium (DEHE)	N	0	NA	(SM)
Hemphillia glandulosa (HEGL)	N	0	NA	Dropped [6/02] **
Hemphillia malonei (HEMA)	N	0	NA	Dropped [6/02] **
Prophysaon coeruleum (PRCO)	Y	14	section 35 (units A-E)	Dropped [1/01] *
Prophysaon dubium (PRDU)	Y	2	section 35 (Units D, E)	Dropped [1/01] *

* Dropped from Survey and Manage lists in accordance with the *Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines (SM/ROD, January, 2001)*

** Dropped from Survey and Manage lists in accordance with the *2001 Survey and Manage Annual Species Review - IM OR-2002-064 (June 2002).*

Sections 27: Surveys to established protocol were conducted between November 2001 and June 2002 (one spring and one fall survey). No survey and manage species being detected, therefore no mitigation measures are required.

Sections 34, 35: Surveys to established protocol were conducted between November 1999 and April 2000 (one spring and one fall survey). No mitigation measures (i.e., protection buffers) are required because none of the species found during the survey have been dropped from Survey and Manage Lists.

Other Species of Concern

Bureau Tracking Species

Information Bulletin No. OR-2000-092 states that for Tracking Species (BT) "...districts are encouraged to collect occurrence data on species for which more information is needed to determine status within the State or which no longer need active management." Further "...BT will not be considered as Special Status species for management purposes."

Amphibians: Of the six amphibian species detected within the project area, two (Oregon slender salamander and the red-legged frog) are considered Bureau Tracking species based on Information Bulletin No. OR-2000-092, Oregon and Washington Bureau of Land Management Special Status Species List - January 2000.

Other Species of Concern

Red Tailed Hawk (RMP raptor): In 2001 a red tailed hawk was observed defending a nest in an old-growth snag adjacent to proposed unit D. Juveniles were observed in the vicinity during 2002. The nest tree is far enough away from the boundary of unit D that there would be no effects to the nest tree. A seasonal restriction as recommended would minimize disturbance to red-tailed hawks during the nesting season.

3.4 Fish (Issue 2)

3.4.1 General Fish Habitat

All of the major streams in the vicinity of the project area (Sinker Creek, Little Sinker Creek, Big Creek) are fish-bearing in their lower reaches, supporting populations of resident cutthroat trout (*Oncorhynchus (O) clarki*). Little Sinker Creek is fish-bearing in the vicinity of proposed harvest units A and E in Section 35, but fish distribution does not extend as far upstream as any of the units in Section 27. Fish presence/absence survey reports are available in EA file.

Downstream of the proposed sale area the Little North Santiam River supports native populations of winter steelhead (*O.mykiss*) and cutthroat trout, Pacific lamprey (*Entosphenus tridentatus)*, mountain whitefish (*Prosopium williamsoni*), suckers (*Catostomus spp.*), dace (*Rhinicthys spp.*), redside shiner (*Richardsonius balteatus*) and northern pikeminnow (*Ptychocheilus oregonensis*). Introduced fish stocks found in the Little North Santiam River include summer steelhead (*O. mykiss*), resident rainbow trout (*O. mykiss*), and spring chinook salmon (*O. tshawytscha*). Spring chinook salmon are native to the Santiam basin, however, the native run is believed to be extinct. The existing run is the result of hatchery planting of Willamette stock chinook by the Oregon Department of Fish and Wildlife.

Generally fish habitat in the mainstem Little North Santiam River is in fair to good condition. Abundant deep pools and gravel riffles provide rearing and spawning habitat for resident and anadromous fish, though large woody debris (LWD) loading levels are generally low throughout the main-stem reaches.

3.4.2 Special Status and Special Attention Species - Fish

The Upper Willamette River Evolutionarily Significant Units of winter steelhead trout and spring chinook salmon were listed as threatened by the National Marine Fisheries Service (NMFS) in March 1999. Consultation with the NMFS on this proposed project is in progress.

Sinker Creek supports a population of winter steelhead up to a barrier falls at river mile 0.7, approximately three miles downstream of the nearest proposed harvest units (Units R6 and PQ). Sinker Creek is one of only two tributaries to the Little North Santiam River in which steelhead spawning is well documented, and is considered to be an important stream for steelhead production due to its low gradient and gravel-rich floodplain in the lower half-mile.

Table 12. Fish Species and Status within the Little North Santiam Watershed

Common Name	Scientific Name	Status
steelhead trout	*Oncorhynchus mykiss*	federal threatened
chinook salmon	*O. tshawytscha*	federal threatened
cutthroat trout	*O. clarki*	species of concern
Pacific lamprey	*Entosphenus tridentatus*	Bureau tracking
mountain whitefish	*Prosopium williamsoni*	none
suckers	*Catostomus spp.*	none
dace	*Rhinicthys spp.*	none
redside shiner	*Richardsonius balteatus*	none
northern pikeminnow	*Ptychocheilus oregonensis*	none

3.5 Fire and Fuels

Units A, B, D and E show signs of past fire activity (charred snags, charcoal in the soil, charred down logs). In all Units the down woody component is relatively low. The remnant fire snags are in decay classes 2 thru 5. Units A, B and E average about four snags per acre. Unit D averages 11 snags per acre. The snags vary in height but the majority are less than 50 feet tall. Charred snags with fire wound scars suggest more than two historic fires in the proposed sale area. It is hard to speculate on the cause of historic fire in the watershed. One cause is anthropogenic from Native Americans, the second are fires associated with the settlement period, and third is lightning.

A regional annual lightning pattern map of Oregon shows this area has the potential for 1 to 2 lightning storms a year, a low risk of fire. The fire regime for this site could be described as: III B, 50-100 years mixed severity and III C, 100-200 years mixed severity. The fire regime information is draft data from a Salem District fire regime project that is currently in progress.

The 1 inch layer of duff within the proposed units is an indicator that these sites utilize the organic matter as fast as it is produced by the plant community. This indicates that the litter fall is recycled quickly through the system keeping fuel loadings low during early and mid-seral stages. The climate is mild and wet in the winter with light or no snow pack most winters. Summers are warm with periods of dry weather usually during the months of July and August. During average weather years the conditions under the forest canopy remains relatively moist. As a result the hazard of wildfire remains low. Risk of ignitions may be higher from humans than other sources. East wind events in any case would have an influence on any fire event.

3.6 Recreation (Issue 3) and Rural Interface Resources

During public scoping, potential safety concerns associated with log truck traffic and recreational traffic was specifically mentioned. Development of a primitive day-use area in the vicinity of the proposed units was also suggested.

No unique or sensitive recreation resources were identified for the area around the proposed units in the Little North Santiam Watershed Analysis (LNS WA). The LNS WA identified the area surrounding and including the proposed units as falling under a *Roaded Modified* setting (Ch. 5, Pg. 63). This setting is characterized by a forest or other natural environment, with obvious modifications such as logging, mining activities, road access, and some facility development. The natural setting on private and public lands in the area surrounding and including the proposed units has been modified with activities associated with logging and road building. The WA indicated that these activities are likely to continue on BLM-administered lands that have a General Forest Management or Connectivity Land Use Allocation. Units A-E, PQ and R are within the General Forest Management Land Use Allocation. These activities are also likely to continue on state and private forest lands.

All of the roads leading to the units are privately controlled and gated, with limited parking available at each gate. While the BLM has administrative access to all of the proposed units, it does not have the authority to grant public access on these private roads. At the discretion of the private landowners, some of these gates may be opened during the fall hunting season. However, their general practice has been to leave them closed during the peak recreation summer season, due to problems with unsafe fire use, garbage dumping, equipment vandalism, vehicle abandonment and long term occupancy. Alternative public vehicle access routes are unavailable.

As a result, recreational use of the proposed project vicinity is most likely low and limited to occasional non-motorized uses such as mountain biking, horse back riding, hiking and tent camping. No indications of significant recreation use (garbage, fire rings, trails, etc.) in the vicinity of the proposed units were identified in the field review.

The most likely haul route for proposed units in Sections 27, 34 and 35 is the use of Road 9-3E-11. Logging trucks would then use approximately 12 miles of North Fork Road to access State Highway 22. North Fork Road is a paved two-lane, winding county road, with two-way traffic. This road experiences relatively high recreation traffic during the summer season between the months of May through September. Logging traffic from both BLM-administered, private, and state lands has occurred for several years.

Rural Interface Areas: None of the proposed units fall within a rural interface area. There are several residences along the first 0.3 miles of Road 9-3E-11. There are also several residences along North Fork Road.

3.7 Visual Resources

All of the proposed units are classified as Visual Resource Management (VRM) Class III. Management Objectives for Class III lands call for partial retention of the existing landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer.

All of the proposed units are on the north side of the Little North Santiam River and the North Fork Road. The Little North Santiam Watershed Analysis indicated that the Little North Santiam River and North Fork Road are potential key observation areas, but called for a project level review. Timber management activities are observable in the foreground, middleground and background from North Fork Road and to a more limited extent from the Little North Santiam River. A field review for this project was conducted and areas where units might be observable from sensitive locations (i.e., Little North Santiam River, developed recreation sites etc.) were identified (see Figure 6).

It does not appear that any of the proposed units would be observable from along the Little North Santiam River, any of the recreation sites (Canyon Creek, Bear Creek, Elkhorn Valley, or Salmon Falls), or from Camp Cascade or Elkhorn Woods, due to topographic barriers and road side vegetation. Locations from along North Fork Road, where proposed units in Section 27 could be observed, were not found in the field review. Topographic barriers and roadside vegetation may screen these units from view. However, areas where the units may be observable from North Fork County Road may be present.

Portions of the proposed units in Sections 34 and 35 appear to be observable from North Fork Road (especially traveling northeast) along Elkhorn Valley Golf Course and from the golf course itself (see Figure 6). Hardwood trees between the golf course and North Fork Road help screen the units from view when traveling along North Fork Road, especially when the trees have leaves. Hardwood and conifer trees around the golf course also help screen views of the proposed units from the golf course. It appears that the trees in Unit C currently screen a past harvest unit.

All of the units would be observable from the roads accessing the units. Other past harvest units on private and BLM-administered lands are also observable from roads accessing the units. Visual resource concerns in the immediate vicinity of the proposed units are often more closely associated with providing a visual setting for recreation activities. Public use of the units is estimated to be low, given that the roads accessing the units are privately controlled and gated.

EA CHAPTER 4.0 - ENVIRONMENTAL EFFECTS

Chapter 4.0 summarizes the changes that can be expected as a result of implementing the alternatives. The "no action" alternative sets the environmental base line for comparing effects of the action alternatives. The environmental effects (changes from present base line condition) that are described in this chapter cover the following resource categories: soils and water, vegetation, wildlife, fish, fire and fuels, recreation and rural interface resources, visual resources. For those resources or values which review is required by statute, regulation, Executive Order, or policy, Appendix 1 contains the appropriate documentation as to the effects of the project on those resources or values. For a full discussion of the physical, biological, and social resources of the Salem District, refer to *RMP/FEIS.* The discussion in this document is site-specific[3] and supplements the discussion in the *RMP/FEIS.* Resource values are not identified in this section when there are no site specific impacts, site specific impacts are considered negligible, or the cumulative impacts described in chapters 3 and 4 of the *RMP/FEIS* are considered adequate.

4.1 Soils and Water (Issue 1)

Alternatives 2 and 3 contain applicable Best Management Practices described in the RMP, Appendix C, to maintain water quality and reduce impacts to soil productivity while meeting other resource management objectives.

[3] This EA does not attempt to re-analyze all possible impacts that have already been analyzed in the *RMP/FEIS*, but rather to identify the particular site specific impacts that could reasonably occur.

4.1.1 Soils

Soil compaction, organic matter and erosion potential are generally considered to be the most important determinants in which forest management activities can affect future forest productivity. Erosion rates are usually not good indicators of loss in productivity. Erosion generally has more significance for water quality impacts than soil productivity. Refer to section 4.2 for a discussion of impacts of the alternatives related to soil erosion.

Soil Compaction

Alternative 1 (No Action): Under this alternative existing soil conditions would continue as discussed in section 3.1.1. There would be no new harvesting activity. Compaction levels would continue to decrease as trees grow on the site and break up existing compaction. Soil productivity would slowly improve until the next major disturbance (e.g., logging, wildland fire, earthquake). The opportunity to decommission 2000 feet of existing roads would not be realized, losing the opportunity to stabilize road drainage system by replacing rotting wooden culverts, etc.

Alternative 2 and Alternative 3 (proposed action)

a. *General:* There would be a similar number of yarding corridors and skid trails in Alternatives 2 and 3. Both alternatives would generally have the same amount of skyline yarding and tractor skidding. However, skyline yarding corridors of Alternative 2 would be concentrated at landings of regeneration harvest settings like the spokes of a wagon wheel hub, as compared to not more than three converging corridors at landings of partial cut harvest settings of Section 27 or Alternative 3.

b. *Skyline Yarding*: Skyline yarding approximately 80 acres with partial (one end) suspension would result in 1-5 percent soil compaction, resulting in 1-3 percent loss in long-term productivity (depending on season of yarding) compared with the same area without compaction.

c. *Tractor Skidding:* Use of designated skid trails, spaced 150 feet apart with logging occurring only during dry soil conditions would minimize the amount of surface area compacted to approximately 10 percent of each unit on the approximately 90 acres designated for tractor skidding. Partial Cut Areas: In order to minimize damage to residual trees, all skid trails would be left intact, and may be used in future partial cut entries.

d. *Road Construction:* Approximately 5,300 ft of new road construction would result in 1 -3 percent loss in long-term soil productivity.

Soil Organic Matter

Alternative 1 (No Action)*:* Under this alternative existing soil conditions would remain as discussed in section 3.1.1.

Alternative 2 and Alternative 3 (proposed action)
Site Preparation: Low intensity broadcast burning or underburning on these timber sale units should result in a low to moderate nitrogen loss (200 to 300 kg N/ha) from the areas treated. Atmospheric inputs would replace this within a 60-year period. If nitrogen fixing plants occupy a site or are planted on a harvest area, nitrogen replacement would occur within 5 to 20 years. The inherent productivity of these soils is moderate to high and they are moderately tolerant to burning (the only exception is the Henline Soil Series in approximately one acre of Unit B).

Soil Erosion Potential

Alternative 1 (No Action): Soils for the Sinker Swim Timber Sale units were previously discussed in section 3.1.1. The erodability of these soils under undisturbed conditions can be assessed, based upon slope class and detachability of the soils (see Table 13). There would be no change in current erodability in the no action alternative.

Alternative 2 and Alternative 3 (proposed action): Because unit slopes are less than 55%, all soils on the proposed timber sale units have a low to a moderate erodability rating. All units have a K (soil particle detachability) index of less than 0.25, which means they are not easily detached (see Table 13). Units A, C, D, E, PQ, R, R6, R7, R8, and all but approximately one acre of unit B have a low erodability rating.

Table 13. Erodability Ratings: Based on the K [Soil Particle Detachability] Index and Slope

Slope Class (%)	K < 0.25 Not easily detached	0.25< K < 0.40 Moderately detachable	K > 0.40 Easily detached
less than 30	Low	Low	Moderate
30 - 65	Low	High	High
more than 65	Moderate	High	High

(from Washington DNR Watershed Analysis Handbook, Version 2.1)

Road Construction and Decommissioning

Road construction would be done during periods of dry soil conditions and would reduce potential soil erosion. Two thousand feet of existing roads would be decommissioned following timber sale harvest and site preparation, which would further reduce potential soil erosion by increasing infiltration and returning the land to productive timber base. An additional 5,000 feet of existing road would be blocked which would reduce sediment runoff due to traffic and road maintenance.

Differences between Alternatives 2 and 3: Soil compaction would be somewhat less under Alternative 3, because less harvest volume would be transported over skid trails and skyline corridors during harvest of these units. However, both alternatives would implement the Best Management Practices listed in Appendix C of Salem District Record of Decision and Resource Management Plan.

4.1.2 Water

Summary

Alternative 1 (No Action)*:* Under this alternative the existing water quality conditions, stream flows, and channel conditions at the project site would continue their current trends of change (see section 3.1.2). There would be no construction or harvesting activity that could cause some minor erosion.

Alternative 2 and Alternative 3 (proposed action)
There is a low probability of measurable direct and indirect effects to stream flow, channel function, and water quality as a result of the action alternatives. Both alternatives are unlikely to alter the current condition of the aquatic system either by affecting its physical integrity, water quality, sediment regime or in-stream flows.

This proposal is unlikely to directly alter base flow or peak flow events in a measurable manner. Tree removal and road construction would not occur on steep, unstable slopes where the potential for mass wasting adjacent to stream reaches is high. Therefore, increases in sediment delivery to streams due to mass wasting are unlikely to result from this action. In addition, potential impacts resulting from tree harvest and road construction would be mitigated and, with the implementation of Best Management Practices (BMPs), are unlikely to contribute measurable amounts of sediment to streams. The riparian canopy would be maintained in units A-E, PQ and R with the retention of full leave Riparian Reserves. Within the 8 acres of riparian thinning (units R6-R8), substantial portions of the riparian canopy would be retained, thus maintaining riparian microclimate conditions and protecting streams from increases in temperature.

To the extent that this proposal would influence overall watershed condition, it potentially could result in short term, local increases in stream turbidity during road construction and hauling (e.g., would only occur during and immediately after construction and/or hauling and is not likely to be visible or measurable downstream from the project area). These effects would be offset by overall reductions in road density as a result of the proposed decommissioning. This proposal is unlikely to impede and/or prevent attainment of the stream flow and basin hydrology, channel function, or water quality objectives of the Aquatic Conservation Strategy (ACS).

Differences between Alternatives 2 and 3: The difference between the two alternatives relative to water quality, channel condition, and hydrology is qualitative. Both alternatives would renovate, build and decommission several thousand feet of road which is the activity that carries the highest risk for affecting watershed hydrology and water quality. However, Alternative 3 leaves more forest cover and therefore, has a reduced risk of affecting hydrologic response on forested slopes and would result in less hauling, thus reducing the potential for delivering fines to adjacent streams along the haul route.

Aquatic Conservation Strategy Objectives

All action alternatives are predicted to result in the maintenance of Aquatic Conservation Strategy Objectives (ACSOs) (see the rest of section 4.1.2, section 3.1.2, and Appendix 2).

Project Area Stream Flow (ACSO # 6 & 7)

Alternative 1 (No Action): The no action alternative would have no effect on project stream flows. Existing conditions would continue (see section 3.1.2 and Appendix 2, Table 18).

Alternative 2 and Alternative 3 (proposed action)

Mean Annual Water Yield: Increases in mean annual water yield following the removal of watershed vegetation have been documented in numerous studies around the world (Bosch et al., 1982). Presumably, vegetation intercepts and evapotranspires precipitation that might otherwise become runoff. Thus, it can be assumed that the action alternatives considered under this proposal would likely result in some small increase in water yield which correlates with the removal of the conifer over-story. However, other than increased peak flows (discussed below) the "increase in fall and winter discharge from forest activities is likely to have little biological or physical significance" (U.S.E.P.A.,1991).

Base Flow: Outside of fog-drip areas, removal of the forest cover usually results in an increase in summer base flow; presumably due to the reduction in evapotranspiration and interception (Harr et al., 1979).

Thus, it can be assumed that the action alternatives would likely result in some small increase in summer water yield which correlates with the removal of the conifer over-story. Hypothetically, this action could have a beneficial indirect effect on the aquatic community of Sinker Creek by increasing summer base flow. However, considering the small percentage of the watershed's coniferous forest that would be altered, this effect is not likely to be significant or measurable.

Peak Flow: Peak flows refer to the instantaneous maximum discharge associated with individual storm or snowmelt events (U.S.E.P.A.,1991). Since most of the project area is above 2,000 feet, it can be assumed that the removal of portions of the conifer overstory would likely result in some small increase in water yield as a result of increases in snow accumulation and melting during rain-on-snow (ROS) events. The direct effects on streamflow of the action alternatives are all likely too small to be measured. The action was also analyzed for its potential contribution to cumulative effects to peak flows in this watershed (see section 4.1.3).

Project Area Stream Channels (ACSO # 3)

Alternative 1 (No Action): The no action alternative would have no effect on project stream channels. Existing conditions would continue (see section 3.1.2)

Alternative 2 and Alternative 3 (proposed action)
Some channels in the project area are currently functioning at the low end of the range expected under "reference conditions." Other channels are functioning normally. In the short term, this proposal is unlikely to alter the current condition of channels in the project area. Minimization of direct disturbances from the project (e.g., increased flows or sediment delivery) with the implementation of project design features and mitigation measures is likely to result in the maintenance of stream channels in their current condition.

Riparian Thinning: Over the long term, reductions in stand density within the Riparian thinning units would likely increase riparian forest health and tree size. This would lead to increased large wood recruitment for stream channels, an important factor in proper channel function. In addition, more open stands would allow for the growth of important riparian species in the understory, such as western red cedar, which are currently suppressed. In the mainstem LNSR large wood structure in the channel is particularly important because it has been depleted to levels far below its natural range. Large wood in the channel would ultimately slow stream velocity, increase retention of organic material, capture bedload, and improve aquatic habitat.

Project Area Water Quality (ACSO # 4)

Stream Temperature (ACSO # 4)

Shading along all the tributaries in the project area is currently adequate and this proposal would not substantially alter stream side shading here. Forest density and hence shading immediately adjacent to the mainstem of both Sinker Creek and Big Creek would be left unaltered under this proposal. Riparian no harvest zones were specifically placed to protect portions of tributary channels where forest shade helps to maintain the current stream temperature regime. Overall, this proposal is unlikely to have any measurable effect on stream temperatures in this watershed. The headwaters of most channels in the project area have an intermittent flow regime and do not flow on the surface during most summers. These channels have very little potential to be heated by exposure to direct solar radiation. Stream temperature regimes in headwater channels are closely linked to ground water temperature. In many cases, topographic shading together with brush and woody debris cover precludes extensive portions of these channels from direct exposure to sunlight.

Alternative 1 (No Action): The no action alternative would have no effect on project stream temperature. Existing conditions would continue (see section 3.1.2)

Alternative 2 and Alternative 3 (proposed action)
Headwater channels are not expected to gain heat with the retention of Riparian Reserve vegetation. This is particularly true in colluvial channels which have substantial quantities of cover and gravel or smaller sized substrate.

In the case of stand thinning within Riparian Reserves, both small scale cover and significant portions of upper story cover remain intact. In addition, the proposed project retains a 50-foot minimum no harvest zone adjacent each side of all streams including intermittent and ephemeral channels with no surface flow in summer. This zone, which extends above the stream adjacent slope break, provides substantial shading along all streams.

Dissolved Oxygen and pH and Conductivity (ACSO # 4)

Alternative 1 (No Action)*:* The no action alternative would have no effect on dissolved oxygen and pH and conductivity. Existing conditions would continue (see section 3.1.2)

Alternative 2 and Alternative 3 (proposed action)
Heavy inputs of fine fresh organic materials, particularly when combined with increases in stream temperature, sedimentation and reduced reaeration, can severely reduce the concentration of dissolved oxygen in small forested streams (Hall and Lantz, 1969).

The project is unlikely to result in any measurable increase in stream temperature or sedimentation with the retention of full leave Riparian Reserves within units A - E, PQ,

and R and leaving most of the canopy in the Riparian thinning areas (units R6-R8). Retention of full leave riparian, implementation of Best Management Practices and low to moderate soil erosion potential within in the area would further reduce the risk of placing large amounts of fine organic material in the stream and would not alter reaeration. Therefore, it is unlikely that this proposal would have any measurable effect on dissolved oxygen levels in project area streams. Available data indicates that most forest management activities have little effect on pH or conductivity (U.S.E.P.A.,1991). Therefore, it is unlikely that the project would have any measurable effect on pH or conductivity in project area streams.

Sediment Transport, Turbidity and Channel Substrates (ACSO # 5)

Two natural erosion processes, mass wasting and surface erosion, are the primary sources of sediment in steep terrain. However, sources of sediment are only half the equation. Before water quality can be affected, the sediment must be transported to a stream. In addition to mass wasting, channel cutting and bank erosion are the other important processes that have the potential to increase sediment supplies in streams. The potential effects of the proposed alternatives on each of these processes is considered below.

Mass wasting in this watershed is generally limited to hillslopes with gradients steeper than 60 percent (U.S.D.I., 1997). Management on slopes steeper than this may accelerate mass wasting processes. Two factors have been proposed as the primary mechanisms for increased rates of mass wasting:1) loss of root strength following tree felling resulting in reductions in hillslope stability and, 2) increases in soil pore pressure due to the concentration of water on mass wasting susceptible areas on the hillslope.

Surface erosion on forested land in Western Oregon is rare due to the high infiltration capacity of native soils, heavy vegetative growth and deep layers of surface organic material. However, practices that compact the soil surface, remove the “duff layer” or concentrate runoff may lead to surface erosion with the potential for delivery to streams and a degradation of water quality.

Streambank erosion and channel cutting may be accelerated by reductions in channel roughness or resistance, increases in stream energy or the redirection of streamflow. Channel roughness is altered by the direct removal or placement of material into channels. Historically, in forested regions of the Cascades, channel roughness was quite high due to large quantities of wood in channels. Roughness is also provided by vegetation on streambanks and removal of this vegetation can lead to increased bank erosion. Placement or removal of any of these materials would also likely result in a redirection of streamflow which may result in increased bank erosion.

Increases in stream energy result from increases in runoff (i.e., increased peak flows), increased flow depth from narrowing or laterally restricting flow or increased channel gradient (e.g., following channel straightening).

In most cases, management practices with the potential to accelerate erosion fall into three categories: road construction and hauling, timber harvest, and site preparation (particularly prescribed burning). BMPs and mitigation measures are proposed to eliminate and/or limit acceleration of sediment delivery to streams in the project area. As a result, it is unlikely that this proposal would lead to a measurable increase in sediment delivered to streams, stream turbidity, the alteration of stream substrate composition, or sediment transport regime.

Alternative 1 (No Action)*:* The no action alternative would have no effect on sediment transport, turbidity and channel substrates. Existing conditions would continue (see section 3.1.2).

Alternative 2 and Alternative 3 (proposed action)

Road Construction and Hauling: All road construction would occur outside of riparian reserves on low to moderate slopes with stable surfaces emanating from the existing road network. The risk of road related landslides in these locations is minimal. Since no additional stream crossings would be constructed, road construction in this proposal would not cause an expansion of the stream network nor would it provide additional opportunities for road sediment from fill failures or ditch-line runoff to enter stream channels. All road construction would utilize the BMPs required by the Federal Clean Water Act (as amended by the Water Quality Act of 1987) to reduce non-point source pollution to the maximum extent practicable. BMPs recognize and make use of the fact that, although road construction does lead to an inevitable increase in sediment available for erosion, without *pathways* or mechanisms for that sediment to enter streams, it would not affect water quality.

Finally, the proposal includes decommissioning 2,000 feet of existing roads and blocking 5,000 feet of existing roads which would reduce road stream interactions with long term benefits for water quality and watershed hydrology. In conclusion, the road construction and decommissioning proposed under both alternatives are unlikely to have any measurable, detrimental effect on watershed hydrology or water quality.

The main haul routes would be on rocked forest roads to the paved North Fork County Road. Timber hauling during periods when water is flowing on roads and into ditches could potentially increase stream turbidity if flows from ditches are large enough to enter streams. Mitigation measures to deal with this potential problem are cited under design features.

Tree Harvest and Yarding

Yarding corridors, if sufficiently compacted, may route surface water and sediment into streams. However, several factors limit the potential for this to occur: 1) even if compacted, high levels of residual slash on yarding corridors would contribute to reducing the accumulation of runoff by deflecting and redistributing overland flow laterally to areas where it would infiltrate into the soil, 2) gentle to moderate hillslope gradients in this project area provide little opportunity for surface water to flow, 3) the no harvest zones in riparian areas have high surface roughness which functions to trap any overland flow and sediment before reaching streams, and 4) the small size of trees being yarded would limit surface disturbance to minimal levels.

Areas with potential for slope instability and mass wasting were mapped in the watershed analysis. All proposed treatment units are outside of any areas mapped as unstable. Tree removal is not proposed on steep unstable slopes where the potential for mass wasting adjacent to stream reaches is high. Therefore, increases in sediment delivery to streams due to mass wasting induced by loss of root strength are unlikely to result from this action. In addition, the minimal levels of surface disturbance under this proposal are unlikely to result in the concentration of runoff on mass wasting susceptible hillslopes. Tree falling and yarding across stream courses would be minimal under this proposal. The 50-foot no harvest zones around all streams would eliminate most disturbance of stream side vegetation.

Therefore, it is unlikely that this proposal would increase bank erosion or channel cutting by altering channel roughness, redirecting flows or altering bank stabilizing vegetation. The potential for increases in stream energy due to alterations of peak flows is discussed under cumulative effects.

Site Preparation

Post treatment site preparation by broadcast burning or underburning is proposed for units A-E. This would slightly increase the risk for delivery of small quantities of soil to streams during large storm events. This is discussed below under the WEPP model results.

WEPP (Water Erosion Prediction Project)

The *Water Erosion Prediction Project* (WEPP) soil erosion model was used to predict potential changes in erosion and sediment yield from actions proposed in this EA. Documentation of the WEPP model is available at the following web site: http://fsweb.moscow.rmrs.fs.fed.us/fswepp.

The "Disturbed WEPP" module was utilized to predict runoff and sediment yield due to timber harvest, yarding and site treatment for the alternatives. Predicted erosion and sediment values are estimated to be accurate within plus or minus 50 percent of the true value (Elliot et. al., 1997). Sediment yields from road construction, renovation, use, or decommissioning were not evaluated with the WEPP model. Roads were evaluated during field reconnaissance by resource specialists. Units associated with unstable roads were dropped from the proposal.

Alternative 2 and Alternative 3 (proposed action)

All of the proposed units currently have an estimated 17 percent "probability" of sediment delivery in any given year. The quantity of delivered sediment ranged from 0 to 0.02 tons/acre/year with an average of 0.01 ton/acre/year. Under both alternatives, harvesting and yarding would increase the probability of sediment delivery in the first year following treatment from 17 percent to an average of 30 percent, for all units.

The quantity of delivered sediment ranged from 0 to 0.05 tons/acre/year but continued to average 0.01 ton/acre/year. Finally, broadcast burning under both alternatives would increase the probability of sediment delivery in the first year following treatment from 17 percent to an average of 60 percent, for all units. The quantity of delivered sediment ranged from 0 to 0.26 tons/acre/year with an average of 0.04 ton/acre/year.

The probability or risk of surface erosion with delivery to streams in the first year following treatment is increased under both action alternatives, but the quantity of sediment remains quite small. The probability of surface erosion and delivery of sediment would drop back to current levels within three to five years. Without broadcast burning, the average quantity of sediment delivered to streams remains at current levels (0.01 ton/acre/year). With burning it increases to 0.04 tons/acre/year.

Under all alternatives, the quantity of sediment delivered to stream channels as a result of surface erosion is quite small relative to total sediment yields in the watershed. Total sediment yields for small, forested watersheds in the Pacific Northwest range from 0.02 - 19.43 with a mean of 1.752 tons/acre/year (Patric, 1984). An increase to 0.04 tons/acre/year following broadcast burning is approximately 2 percent of mean annual yields and, given the inherent variability in sediment yield measurements, is not a measurable effect.

4.1.3 Soils and Water Cumulative Effects **(ACSO # 6 & 7)**

Alternative 1 (No Action): There would be no soils and water cumulative effects associated with the no action alternative. Existing conditions would continue.

Alternative 2 and Alternative 3 (proposed action)

Water Available for Runoff (WAR)

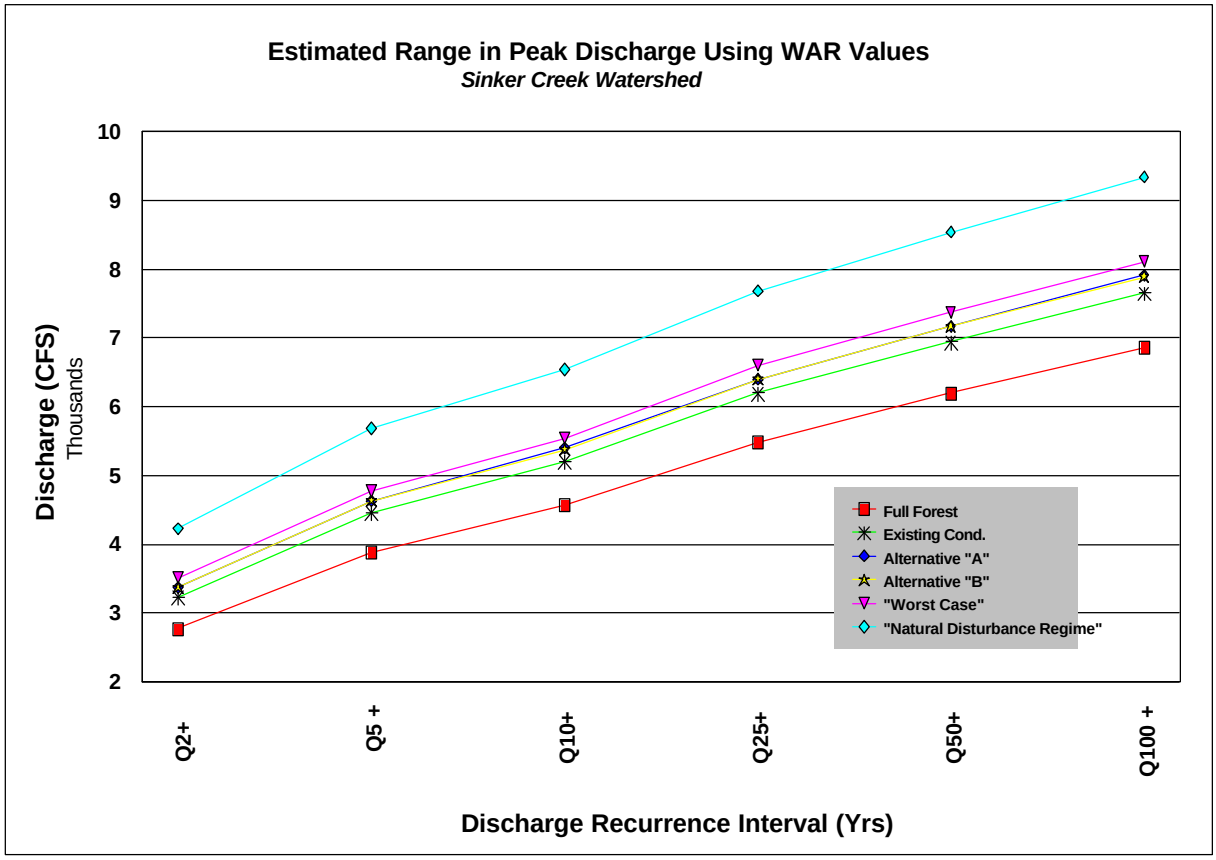
Jones and Grant (1996), among others, hypothesize that forest management leads to increases in stormflow volume while road construction and wood removal from channels results in earlier, higher peak flows. Stream channel dimensions and characteristics adjust to accommodate the bankfull flows, which correspond to the 1-2 year event in lower gradient streams and apparently to the 5-year event in steeper mountain streams (Wolman and Miller 1960, Lisle 1981). Change in the magnitude of frequent flood flows can affect channel scour and may affect fish habitat. Under these circumstances, the cumulative effect of increases in runoff can be large, causing flooding, stream channel and bank damage. Alterations in peak flow timing and quantity are particularly of concern in watersheds with potential for snow accumulation and quick melt-off during rain-on-snow events (ROS) such as occurred in the 1996 flood. The Water Available for Runoff (WAR) analysis estimates potential increases in peak flows during rain on snow events due to increasing openings in the forest canopy.

A level 1 analysis for increases in peak flow was conducted using the Washington State Department of Natural Resources (DNR) watershed analysis methods (Washington Forest Practice Board, 1997). Details of the analysis are contained in a supplemental report (Cumulative Effects Analysis for the Sinker Creek Watershed) available in the EA file.

The Sinker Creek sixth field watershed was analyzed using a weighting system based on the dominant precipitation type (rain, transient snow, snow), and the percent of the area with canopy cover in three different categories (open, sparse, small or large dense). The equations given in the Washington publication were modified using data from northern Oregon Cascade climate stations. Using this method, the change in water available for runoff (WAR) from rain on snow events were calculated. The WAR values were then used to estimate increases in peak flows during storms using the USGS publication: *Magnitude and Frequency of Floods in Western Oregon* (Harris et al.,1979).

Return periods are the peak flows resulting from 24-hour precipitation amounts expected at a given level of frequency; for example, once in 5 years for the 5-year return period or once in 50 years for the 50-year return period. The plus (+) sign denotes a given return period precipitation event with the addition of a heavier snow pack on the ground than average, and a warmer storm than average. This situation is often responsible for the severe flood events experienced in the Pacific Northwest.

The graph below displays the range of peak discharge values that WAR predicts for Sinker Creek in cubic feet per second (cfs) estimated for a fully forested condition, current condition, proposed condition (Alternative A = Alternative 3, and Alternative B= Alternative 2), a "worst case" scenario, and a "natural disturbance regime" scenario assuming a stand replacement fire removed most cover in the watershed. The graph displays only the results for unusual storm events. The graph shows that Alternatives A and B (Alternatives 3 and 2) overlap.



Due to the inherent error in the peakflow prediction method, changes up to 10 percent are usually below the detection limits of stream gages. Given this limitation, hydrologic change may not become visible until the percent change over fully forested condition approaches 10 percent. An increase in volume of 20 percent has been suggested as a general rule of thumb to move a 5-year flow event to a two-year flow event (Washington Forest Practices Board 1993). The analysis found low sensitivity to increases in peak flows and low potential risks for aquatic resources for normal storm events. It found an "indeterminate" risk for "unusual" peak flow events associated with a 2-yr+ and greater return interval storm event.

The indeterminate rating does not require that the actions considered under this proposal be delayed or postponed. Rather, it points to the possibility of impacts to the aquatic ecosystem in the Sinker Creek watershed at some point during the ten year analysis period. In fact, the WAR analysis found that the 10 percent threshold has already been exceeded.

When public actions are separated from assumed private actions in the watershed, WAR estimated a 1.4 percent and 1 percent increase in 2-yr + peak flows over current conditions due to the actions taken on BLM lands under the action alternatives. Thus, private actions alone are likely to push WAR values to near or beyond the 20 percent increase in a 2-yr peak flow given as a threshold value for considering the effects of increased bed mobility and bed scour.

However, evaluating WAR values relative to an assumed "full forest cover condition" may be misleading. Under a natural disturbance regime in which large portions of the watershed are burned (a so called "stand replacement fire") WAR predicted a 52 percent increase in peak flows relative to full cover for an unusual 2-yr event. When viewed in this manner, the existing condition of the watershed is well within the range of flows that we would likely measure at a given point in time during the past. Alternatives A and B, as well as the "worst case" scenario also appear to be near the middle of the range of peak flows that would be measured in this watershed under such a scenario. In other words, all actions reviewed under this proposal are likely to maintain peak flows within the range that occurred under a "natural" disturbance regime, the overall goal of the ACS.

WAR values, in and of themselves, do not indicate the current condition of stream channels, fish habitat and downstream public resources; these must be evaluated in order to place estimated peak flows into a context for evaluating risks. Thus, the Washington State manual states, "The significance of the estimated changes in peak flows must be related to the likelihood of delivering adverse impacts to public resources" (C-37, "Effects of Peak Flow Changes on Public Resources"). Further evaluation of risks to public resources are discussed in the fish section of this report.

Summary and Conclusion

The risk of this proposal for contributing to cumulative effects to hydrologic processes or water quality in these watersheds is low. To the extent that this proposal would influence overall watershed condition, it potentially could result in short term, local increases in stream turbidity during road construction and hauling (e.g., would only occur during and immediately after construction and/or hauling and is not likely to be visible or measurable downstream from the project area). These effects would be offset by overall reductions in road density as a result of the proposed decommissioning.

The risk to public resources from increases in peak flows are “indeterminate” and would be further evaluated over time. Meanwhile, since LWD and pool habitat are “at risk” in these streams (see LNSR WA) long term LWD supply to streams is likely the most critical factor for maintenance of aquatic habitat in these watersheds that we can actively manage. This proposal is expected to maintain and/or increase LWD recruitment.

4.2 Vegetation (Issue 2)

4.2.1 Forest Vegetation (Riparian Reserve and Upland Forest)

Upland Forest

Snags and Coarse Woody Material

Section 27:

Alternative 1 (No Action): Natural processes would continue, and overstory trees would continue to self thin. Small snags and small coarse woody debris would be generated but none would attain 20 inch diameter size for decades.

Alternative 2 and Alternative 3 (proposed action): Growth of trees destined to become snags and future coarse woody debris would be accelerated as competition is reduced by thinnings, reducing the time required to attain large diameters.

Sections 34 & 35

Alternative 1 (No Action): As a result of laminated root rot, some of parts of these stands would continue to produce some snags and coarse woody debris that meet the minimum sizes specified in the Northwest Forest Plan. Other generally healthy areas within these stands may take decades before more than a small number of snags would be created or a minor amount of coarse woody debris would be produced.

Alternative 2 and Alternative 3 (proposed action): Existing snags and CWD would be retained for primary cavity excavator nest trees and foraging habitat. The additional hard snags which would be created would result in additional nest tree opportunities for primary cavity excavators (woodpeckers). Secondary cavity nesting species would benefit as the overall number of nest cavities are created, used and abandoned. The addition of CWD which results from falling or incidental mortality, as well as from rotting stumps, would increase wood-boring insect populations and foraging opportunities for larger woodpeckers (pileated woodpecker and common flicker).

Additional CWD as well as crown cover from residuals would provide shade and

microclimates which would assist amphibian, mollusk and other invertebrate species to persist. Green trees which would be topped may provide platforms for stick-nesting raptors.

Late Successional Habitat

Section 27:

Alternative 1 (No Action): Late successional structure might not occur in these stands without management intervention. Douglas-fir dominated stands are unlikely to develop large limbs when dense canopies limit live crown extent. Good differentiation of overstory trees is required to allow dominant trees to achieve competitive advantage and local disturbance factors are necessary to allow development towards late successional habitat. Often these stands succumb to natural disturbances before late successional habitat develops.

Alternative 2 and Alternative 3 (proposed action) - Commercial Thinning of Units PQ & R: The thinning prescription is expected to accelerate the development of late successional structure, with variable spacing and creation of small gaps and unthinned areas, and the retention of all minor tree species. In some areas stocking may be reduced enough for underplanting to occur, but active management would be required to allow long term survival of planted trees.

Sections 34 & 35

Alternative 1 (No Action): Although the large tree size component of late successional habitat is already present, other components such as snags, down wood, tolerant tree species and multiple canopy layers are largely absent and would develop at a very slow rate.

Alternative 2 - Regeneration Harvest of Units A through E: Currently, federal lands are above the 15 percent late successional guideline with 68 percent of the LNS in late successional habitat. The watershed would remain above the 15 percent guideline after harvest. In the long term, late successional habitat conditions in these units would not be achieved until the regenerated stands developed in size, a time estimated to be at least 7 to 10 decades.

Alternative 3 (proposed action) - Partial Cut of Units A through E: The effects of Alternatives 2 and 3 on late successional habitat are similar, except that in Alternative 3, all or at least major portions of the treatment area are likely to develop late successional habitat conditions sooner than would occur under Alternative 2.

Riparian Reserve

Alternative 1 (No Action): The No Action alternative would maintain the development of the existing vegetation and associated stand structure at its present rate. The growth rate of the overstory and understory is presently low, and would remain low for many years. As such, structural development is presently minimal and would remain repressed for many decades. As a result, the ACS objectives regarding watershed and landscape scale structural diversity/complexity, connectivity, and habitat goals would not be fully met.

Alternative 2 and Alternative 3 (proposed action): The amount and type of silvicultural treatment in Riparian Reserves within units R6-R8 would be identical in each action alternative, therefore there is no difference in effects. Riparian thinning would result in spacing variability to the overstory. Spacing of the residual trees would range between 90 and 140 trees per acre in section 27. Canopy closure on the most heavily thinned portions would remain above 40 percent. Average canopy closure for the entire treatment area would be approximately 50 to 55 percent.

Existing species diversity and size class distribution would be maintained while initiating enhanced understory development. Biological legacies, hardwoods and western redcedar would be retained. Individual tree growth would be accelerated, providing the treatment area with enhanced large woody debris recruitment potential. Both understory conifer and brush species would benefit from increased vigor, allowing for vertical canopy layering to develop.

Individual Tree Treatments Without Wood Removal: Girdling or felling of approximately 5-10 trees per acre within the no harvest zones would enhance riparian area stand habitat characteristics and structure, accelerate growth on selected residual overstory trees, and enhance development of any advanced conifer regeneration which is present. Trees to be felled would be selected to cause little or no soil disturbance and to provide stable locations for stream structure logs. Careful tree selection in each project area would ensure that no increase in water temperature from loss of stream shade would occur.

Effect of the Riparian Treatments on Aquatic Conservation Strategy Objectives
Thinning in units R6 - R8 and snag creation treatments in Riparian Reserves in sections 27, 34, and 35 are being proposed as a means of attaining the Aquatic Conservation Strategy objectives concerning watershed and landscape scale structural diversity/complexity, connectivity, and habitat goals. This treatment is expected to accelerate the development of a more complex and diverse stand structure (Bailey and Tappeiner 1998). The ecological values of such diverse forest structure have been described as a driver of ecosystem processes and biological diversity (Spies 1998).

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.

Over time, the proposed treatments are expected to result in forest stands that exhibit attributes typically associated with stands of a more advanced age and stage of structural development in Section 27, and restore a large dead wood component in Sections 34 and 35. The proposed treatments would be a catalyst to create conditions favorable to initiating understory development and accelerating the attainment of other older forest stand attributes such as large diameter conifers, a larger dead wood component that includes additional stream channel structure, and small canopy gaps. The net effect of this would be a more diverse and structurally complex landscape that would help to protect and enhance adjacent aquatic ecosystems.

ACS Objective 2: Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connectivity include floodplains, wetlands, upslope areas, headway 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-dependant species.

The proposed Riparian Reserve treatments would have little direct effect on connectivity between watersheds due to the discontinuous ownership patterns that exist. However, by restoring stand structural elements that provide habitat and refugia, it is anticipated that it would help to strengthen local connectivity within the watershed.

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 and channel migration, and to supply amounts and distributions of large wood sufficient to sustain physical complexity and stability.

Species composition would be maintained throughout the proposed treatment areas. The minimum 50 foot wide no harvest zone would maintain bank stability and existing surface erosion rates, and enhance stream channel dynamics. It would also provide the added benefits of releasing small areas of existing conifer understory vegetation and increasing growth rates on a small number of residual overstory trees. High canopy closure and existing stream channel shade levels would be maintained to provide adequate summer and winter thermal regulation.

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

Elements of structural diversity would be restored to the portions of Riparian Reserves selected for treatment. These attributes would help to provide resources currently lacking or of low quality, and over the long-term, would benefit both aquatic and terrestrial species.

4.2.2 T/E, Special Status, and Special Attention Species[4] - Botany

All alternatives are predicted not to result in a trend toward federal listing, loss of population viability, or elevation of status to any higher level of concern.

Alternative 1 (No Action): Since there would be no disturbance associated with this alternative, the species currently present would continue under existing conditions.

Alternative 2 and Alternative 3 (proposed action)

As there would be no timber cutting within protection buffers where S&M species were located, there would be no adverse environmental effect upon any species of concern due to these alternatives. Alternative 3 would be similar to Alternative 2 with the exception that fewer trees surrounding the protection buffers would be removed.

4.2.3 Invasive Plant Species

Alternative 1 (No Action)

Since there are no ground disturbing or light increasing actions associated with this alternative, weed populations are expected to decline or at least remain stable.

Alternative 2 and Alternative 3 (proposed action)

An increase in the overall number of weed species is likely to occur immediately following any ground disturbing or light increasing activity associated with the action alternatives. These species are always expected some level along road corridors, and provide a seedbank which can spread the population along the road system. Most of the weed species currently in the area do not have very mobile seeds and so will be slow to invade new areas. Since ground disturbing machinery would be cleaned of mud, dirt and vegetative material, no new introduction of non native species is anticipated.

[4] Includes survey and manage/protection buffer species

Populations would persist longer along the roads due to more frequent disturbances and higher light levels for longer periods of time than in surrounding forest stands, but in time populations would decline to low levels as the canopy closes and native vegetation returns. The use of existing skid trails would reduce the amount of newly disturbed areas, and the seeding/planting of native vegetation on roads which are decommissioned would re-establish desirable vegetation over weeds. The action alternatives are not expected to adversely increase noxious/exotic weeds beyond controllable levels.

4.3 Wildlife (Issue 2)

4.3.1 General Wildlife Habitat

Effects of the alternatives on snags and coarse woody material and late successional habitat can be found in section 4.2.1. The effects to special habitats are described in section 3.3.1.

Road Densities:
Alternative 1 (No Action): Road densities would remain at 5.7 miles per section.

Alternative 2 and Alternative 3 (proposed action): With recent and planned road closures, open road densities are expected to decrease slightly from 5.7 miles per section.

4.3.2 Special Status and *SEIS* Special Attention and Other Species of Concern - Terrestrial Wildlife

All of the alternatives are predicted to not result in a trend toward federal listing, loss of population viability, or elevation of status to any higher level of concern.

Threatened Species

Northern Spotted Owl *(T)*

Alternative 1 (No Action): There would be no change in spotted owl habitat and no effect to spotted owls (see section 3.3.2).

Alternative 2 and Alternative 3 (proposed action) in section 27 (Units PQ, R, R6-R8)
There would be no effect to suitable habitat since there is no suitable habitat within these proposed units. Approximately 50 acres of dispersal habitat would be altered as a result of thinning. The units would be maintained as dispersal habitat after harvest. Long term, canopy closures would increase and these units could attain suitable habitat conditions within 30 to 40 years.

Alternative 2 and Alternative 3 (proposed action) in sections 34 and 35 (Units A-E)
The ESA effect call is "may affect, likely to adversely affect" the spotted owl (see section 5.0) due to habitat modification. However, spotted owls were not detected in the project area during the 2002 survey season (see section 3.3.2).

Alternative 2 in sections 34 and 35 (Units A-E)
There would be a net loss of approximately 120 acres of suitable (nesting, roosting, foraging) and dispersal habitat for the spotted owl.

Alternative 3 (proposed action) in sections 34 and 35 (Units A-E)
In the short term, approximately 50 acres of suitable habitat would be downgraded to dispersal habitat for spotted owls, and approximately 70 acres of suitable and dispersal spotted owl habitat would be removed, as a result of timber harvest. In the long term, all or major portions of the treatment area could grow into suitable habitat sooner than would occur under Alternative 2.

Other Special Status and SEIS Special Attention (e.g., Survey and Manage) Species

Northern Goshawk *(BS)*: Under Alternatives 2 and 3, there would be a loss of approximately 120 acres of marginal goshawk habitat. Though there is suitable habitat in the vicinity of the proposed units, goshawks prefer older forests with dense canopy closures at higher elevations. No goshawks were detected in the project area as a result of surveys.

Oregon Red Tree Vole *(SM)*
Alternative 1 (No Action): There would be no effect on red tree voles. Habitat conditions would remain as described in section 3.3.2.

Alternative 2 and Alternative 3 (proposed action): Surveys followed the latest protocols and no nests were found. There may be a loss of habitat for red tree voles that were not detected. However, reserve islands, Riparian Reserves and areas not included in the action alternatives would provide habitat for red tree voles.

Mollusks *(SM)*
Alternative 1 (No Action): There would be no effect on mollusks. Habitat conditions would remain as described in section 3.3.2.

Alternative 2 and Alternative 3 (proposed action): No currently listed S&M mollusk species were detected in the project area. There may be a loss of habitat for mollusks that were not detected. However, reserve islands, riparian reserves and areas not included in the action alternatives would provide habitat for mollusks. Additional CWD as well as crown cover from residuals would provide shade and microclimates which would assist mollusk species to persist.

Other Species of Concern

In the short term, retention of existing snags and CWD would reserve habitat for Oregon slender salamanders, and bats. Micro-habitat drying and direct impacts to snags and CWD due to logging and site preparation activities could have short term adverse impacts on these species. Green tree retention would help mitigate micro-habitat drying by providing shade.
In the long term, green tree retention, snag creation and additional CWD recruitment would contribute to habitat for Oregon slender salamanders and bat species in future stands.

Riparian Reserves would adequately protect red-legged frogs, and provide some protection for foraging bats. The intent within the NWFP was to provide, through riparian reserves, a network of corridors and reserves that would benefit an array of species.

Pg 7 of the SEIS/ROD states: *"The main purpose of the reserves is to protect the health of the aquatic system and its dependent species; the reserves also provide incidental benefits to upland species. These reserves will help maintain and restore riparian structures and function, benefit fish and riparian-dependent non-fish species, enhance habitat conservation for organisms dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for terrestrial animals and plants, and provide for greater connectivity of late-successional forest habitat"* The reserves as proposed under the action alternatives would provide adequate connectivity and refugia for species identified as present or as potential inhabitants of the project area.

4.3.3 Wildlife Cumulative Effects

Late Successional Habitat: Currently, 19 percent of the Sinker Creek SWB is late successional forest habitat (80 years plus). Approximately 17 percent of the remaining late successional habitat in Sinker Creek SWB is planned for harvest in the foreseeable future. The 17 percent figure includes this project, a small portion of the Fawn Creek timber sale that occurs within Sinker Creek SWB, and potential timber harvest of non-federal lands in the Sinker Creek SWB.

After harvest, 16 percent of the SWB would remain in late successional habitat on all ownerships. Currently, 46 percent of the federal lands in the Sinker Creek SWB are late successional forest. After harvest, 39 percent of these lands would remain in late successional forest habitat.

4.4 Fish (Issue 2)

4.4.1 General Fish Habitat

Alternative 1 (No Action): No direct or indirect effects would occur to fish habitat. Expected acceleration of tree growth and the development of complex stand structure in the Riparian Reserves proposed for treatment would not be realized.

Alternative 2 and Alternative 3 (proposed action)

Units A - E, PQ and R
Riparian Reserves (see Table 1) will be adequate to protect the aquatic and riparian resources and habitat within the project area from any effects of the proposed timber harvest. The reserves will also be sufficient to protect the aquatic and riparian resources of the Little North Santiam River from effects of the project.

In general, the prescribed treatment of the no harvest zones is expected to provide in-stream structure and enhance riparian habitat characteristics, accelerate growth of residual overstory trees, and enhance development of existing advanced conifer regeneration. Careful selection and treatment of trees to be topped, girdled, or felled would ensure that no increase in water temperature results from loss of stream shade.

Units R6 - R8
The Riparian Reserve thinning is expected to accelerate individual tree growth, increase large woody debris recruitment potential, and provide long-term benefits to the aquatic system. The no-harvest zone of 50 feet away from stream banks is expected to be adequate to protect the aquatic habitat and riparian resources from any adverse effects of the proposed thinning.

Road Construction and Decommissioning
All new roads constructed for the project would be decommissioned upon completion of site preparation, and therefore would not contribute to any long-term increase in road density or drainage network. The decommissioning of approximately 2000 feet of existing roads would reduce the number of road/stream intersections as well as reduce road density, increase soil infiltration, restore natural drainage patterns and eliminate potential sources of erosion.

All road construction and decommissioning would be conducted during the dry season and any culvert removal and decommissioning of roads at live stream crossings would be conducted during the in-water work period (July 15-Sept. 30) to minimize sediment input to stream channels.

All pertinent BMPs for sediment control would be implemented at road/stream intersections during road decommissioning. Road related actions are not expected to result in adverse impacts to any fish species present in or downstream from the proposed project area.

4.4.2 Special Status and Special Attention Species - Fish

ESA Section 7 Consultation: A Biological Assessment for the project was submitted to and accepted by the Upper Willamette Province Level I Team on June 13, 2002 in accordance with the Streamlined Consultation process. The effect determination for ESA Fish is "may affect, not likely to adversely affect" Upper Willamette River chinook salmon or steelhead trout. The biological assessment has been submitted to the National Marine Fisheries Service (NMFS) and a letter of concurrence from NMFS is anticipated. A final decision on this action would not be made until a letter of concurrence is received from NMFS.

4.5 Fire and Fuels

Alternative 1: There would be no change to the current fuel levels described in section 3.5.

Alternative 2 and Alternative 3 (proposed action)

Alternatives 2 and 3 contain fuel management activities that would adhere to smoke management/air quality standards and meet ACS objectives. Fuel loadings after yarding merchantable logs would be approximately 45-65 tons per acre, for both alternatives. These fuel loadings would leave a moderate to high hazard of wildfire. Broadcast burning would further reduce the fuel loading to approximately 20-30 tons per acre, very little of which would be less than three inches diameter - a low hazard of wildfire (both alternatives).

Due to the fact that the current down woody component is low to nonexistent, (in all decay classes), there is little threat for hold-over fire after mop-up is completed. Burning with 1000 hour fuel moistures > 30 percent and when most of the duff layer is saturated would protect the duff layer and soil productivity.

Recent prescribed burning projects indicate that there is a low probability that retained green trees would be damaged or killed by heat to the bole or excessive scorch to the crowns. To minimize damage to thin barked trees larger than 16 inches in diameter an area within a 15 foot radius of the bole would be cleaned of combustible material less than 6 inches in diameter. The ignition pattern for the prescribed burn would be designed to minimize the development of a convection column, which would minimize heat damage to the crowns of the retained green trees.

4.6 Recreation (Issue 3) and Rural Interface Resources

Alternative 1 (No Action)

With the exception of unexpected changes (e.g..,wildfire or disease), the recreation setting of the general area around the proposed units would continue to be *roaded modified*. The forest setting of the units themselves would be maintained.

Motorized access to the proposed units would continue to be restricted by gates on private land, unless otherwise changed by the private landowners. Under the current public access and land ownership pattern, any recreation facility development is unlikely. With motorized access limited, recreational use of the area surrounding and including the proposed units would expected to be low. Logging traffic on North Fork Road would most likely still occur as a result of harvest activities on private and state lands.

Alternative 2 and Alternative 3 (proposed action)

Under the current public access and land ownership pattern, any recreation facility development is unlikely. With access limited, recreational use of the area surrounding and including the proposed units would expected to be low. Setting aside the limited motorized access available to the proposed units, the opening of the stands both in the regeneration and partial cut units, may make these areas less desirable to those seeking a forested setting. Other opportunities for recreational activities in a forested setting are available in this watershed. The opening of the stands may also make the proposed units more desirable to those seeking a younger forest and more open setting.

Old landings in past harvest units are often used as dispersed campsites because they are flat and may offer scenic viewpoints. The opened stands may also attract game animals and provide better hunting visibility. As the stand matures, it may again become more desirable to those seeking a forested setting and less desirable to those seeking more open areas.

The residences along the haul route for proposed units in Sections 34 and 35 would likely experience increases in noise and dust associated with log truck traffic. The residences may also experience increases in smoke associated with broadcast burning the proposed units. These impacts would be relatively short in duration (months for log truck hauling and days for smoke).

Log truck and rock hauling along North Fork County Road is likely to increase the potential for conflict with other traffic. The potential for such conflict is greatest when recreational traffic is high, during the peak summer months between May and September. In an effort to reduce potential conflicts, log hauling during this period would be limited to Monday through Friday to help avoid weekend traffic.

In addition, log and rock truck hauling would not be allowed on any weekdays that are

part of Memorial Day, July 4th and Labor Day holiday weekends. Any gates would be opened and closed with each trip, to help reduce potential encounters between logging traffic and the public.

Differences between Alternative 2 and 3

The effects of Alternative 3 would be very similar to those described for Alternative 2. There would be less log truck hauling in Alternative 3 than in Alternative 2 due to the reduction in the number of trees harvested. In addition, more of the forested setting would be maintained in the units that were not regeneration harvested.

4.7 Visual Resources

All alternatives are consistent with the visual resource management objectives.

Alternative 1 (No Action Alternative)

With the exception of unexpected changes (e.g.,wildfire or disease), the forest setting in the units would be maintained to the greatest extent of all of the alternatives proposed. Under this alternative, no contrast changes in landscape features (form, line, color and texture) would be expected.

Alternative 2

Regeneration Harvest of Units A - E in Sections 34 and 35

The regeneration harvest of these units would most likely be observable from several locations along North Fork Road, especially from the locations identified in the field review. Changes in contrast for land and structure features are expected to be low as a result of harvesting the units. Vegetation would be the feature that shows the greatest degree of contrast as a result of harvesting the trees on the units. The changes in vegetation form, line, color and texture may attract, but should not dominate the view of the casual observer.

Vegetation form in the observed areas would change, with the harvested units creating irregular shaped patches. Vegetation line in the observed areas would change with the harvested units interrupting the tree line of remaining trees. Vegetation color would most likely be most observable with the harvested units appearing dark brown to black for one to two years following broadcast burning of the site. The units would most likely continue to appear brown for approximately five to seven years and then light green, (rather than dark green) as vegetation returns, for several years after that. There would be a moderate change in vegetation texture, with the harvested units having a smoother appearance than the remaining unharvested lands. The irregular shape of the units and adjacent riparian reserves should help make the units appear more natural.

Remaining trees around the units may provide some screening and help reduce the apparent size of the units. Regeneration harvest in Unit C may make a past harvest unit more observable. It is not expected that this would increase the contrast of any of the visual features above moderate.

Alternative 3 (proposed action)

Partial Cut Harvest of Units A - E in Sections 34 and 35

Any open areas that are observable within the partial cut units would have changes in contrast similar to those described for the regeneration harvest of proposed units in Sections 34 and 35. However, the overall changes in contrast for land, vegetation and structure features are expected to be low, given the small size of the openings and buffering from remaining trees. Retaining forest cover in Unit C may help to continue to buffer the past harvest unit.

Common to Alternative 2 and Alternative 3 (proposed action)

All Units

The changes in visual resources around the immediate vicinity of the units are discussed as part of the recreation setting in the recreation resources.

Commercial Thinning of Units PQ and R in Sections 27

These proposed units could not be observed along North Fork Road and the Little North Santiam River from any specific location during the field review. While some changes in the characteristic landscape may be observable, overall changes in contrast for land, vegetation and structure features associated with the thinning harvest of the proposed units in Sections 27 are not expected to dominate the view of the casual observer.

Regeneration Harvest (Alternative 2) or Partial Cut (Alternative 3) in Sections 34 and 35

There would also be some short term (lasting days) decline in visual quality as a result of the smoke created when the units are broadcast burned. However, the units would be burned in compliance with state smoke management regulations.

4.7.1 Visual Cumulative Effect

Alternative 1 (No Action)

There would be no visual cumulative effects associated with the no action alternative. Existing conditions would continue (see section 3.7.2).

Alternative 2 and Alternative 3 (proposed action)

The harvest of Unit C may make a past harvest unit more observable. It is not expected that this would increase the contrast of any of the visual features to the point that the changes would dominate the view of the casual observer.

4.8 Conformance With Land Use Plans, Policies, and Programs

The proposed action and associated alternatives, unless otherwise noted, are in conformance with the following documents which provide the legal framework, standards, and guidelines for management of BLM lands in the Cascades Resource Area:

- ❑ *(RMP) Salem District Record of Decision and Resource Management Plan*, May 1995, pp. 5-6 (ACS objectives), 9-15 (Riparian Reserves), 28-32 (Special Status/Attention Species and Habitat), 36-37 (Visual Resources), 42 (Socioeconomic Conditions), 64-67 (Noxious Weeds; Fire/Fuels Management), Appendix C (Best Management Practices).
  - ACS Objectives and Riparian Reserves: All alternatives are predicted to result in the maintenance of ACS objectives. Alternatives 2 and 3 would accelerate the development of some late-successional forest structural features, including large trees, gaps in the canopy, snags and down wood, various levels of overstory tree densities, and various levels of understory development within the Riparian Reserve LUA. (see sections 4.2.1, Appendix 2).
  - Special Status/Attention Species and Habitats: Required surveys have taken place for Special status /special attention species (including Surveys for Appendix B-1 "Survey and manage (S&M) Species" and "protection buffers" species). All alternatives are predicted <u>not</u> to result in a trend toward federal listing, loss of population viability, or elevation of status to any higher level of concern (see sections 4.2.2 and 4.3.2).
  - Visual Resources: All alternatives are consistent with the visual resource management objectives (see section 4.7.2).
  - Socioeconomic: The action alternatives provide social and economic benefits to local communities through the supply of timber to local mills and contract work associated with the project. Alternative 1 appears not to be in conformance because it does not contain a provision for the supply of timber or contract work that could contribute to the local economy.
  - Invasive Plant Species: All alternatives are predicted to avoid increasing noxious weeds beyond controllable levels (see section 4.2.3).
  - Fire/Fuels Management: Alternatives 2 and 3 contain fuel management activities (i.e., slash at landings would either be made available for public firewood removal permits or burned) that would adhere to smoke management/air quality standards and meet ACS objectives.
  - Best Management Practices: Alternatives 2 and 3 contain applicable Best Management Practices described in the RMP, Appendix C, to maintain water quality and reduce impacts to soil productivity while meeting other resource management objectives (see sections 2.2.4.3, 4.1.1; 4.1.2).

- ❑ *(RMP/FEIS) Salem District Proposed Resource Management Plan/Final Environmental Impact Statement,* September 1994.

- ❑ *(SEIS/ROD) Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* and *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl,* April 1994. The RMP was designed to be consistent with the *SEIS/ROD* and incorporated the analysis in the *SEIS* (RMP p.3).

- ❑ *(SEIS) Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl,* February 1994.

- ❑ *(FEMAT) Forest Ecosystem Management: An Ecological, Economic, and Social Assessment: Report of the Forest Ecosystem Management Assessment Team,* July 1993.

- ❑ *(LNS WA) Little North Santiam Watershed Assessment*, December 1997. Alternatives 2 and 3 are consistent with the applicable management recommendations contained in the watershed analysis.

- ❑ *(SM/ROD) Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines*, January, 2001. Alternatives 2 and 3 follow survey protocols described in the *SM/ROD*.

- ❑ *(SM/FEIS) Final Supplemental Environmental Impact Statement for Survey and Manage, Protection Buffers, and Other Mitigation Measures in the Northwest Forest Plan*, November 2000.

- ❑ *(IM OR-2002-064*) *2001 Survey and Manage Annual Species Review,* June 2002. Alternatives 2 and 3 follow direction described in this document.

EA CHAPTER 5.0 -CONSULTATION

ESA Consultation: Section 7 Consultation with the United States Fish and Wildlife Service (USFWS) has been completed (USFWS Biological Opinion (BO) reference #1-7-00-F-155, dated February 14, 2000). The northern spotted owl has been observed in the vicinity. No other threatened or endangered plants or animals were observed in the area. This project "may affect, likely to adversely affect" the spotted owl, according to the criteria described in the BO (p. 25-26). The proposed timber sale area is not located in Critical Habitat for the spotted owl. As a result of consultation, the USFWS found that the sale would not likely jeopardize the continued existence of the spotted owl (BO p. 29), and authorized incidental take (BO p. 30-31). According to the BO, it is reasonable and prudent to minimize incidental take by minimizing suitable habitat loss and disturbance to spotted owl pairs and their progeny during the nesting season (BO p. 33, Reasonable and Prudent Measure #1). The design features of the project specify that there would be a seasonal restriction during the critical nesting season from March 1 – June 30, which would comply with the terms and conditions and conservation measures of the Biological Opinion (BO p. 31-32, Term and Conditions #1, and p. 33, Conservation Measures #1).

Fish: ESA Section 7 Consultation: A Biological Assessment for the project was submitted to and accepted by the Upper Willamette Province Level I Team on June 13, 2002 in accordance with the Streamlined Consultation process.

The effect determination for ESA Fish is "may affect, not likely to adversely affect" Upper Willamette River chinook salmon or steelhead trout. The biological assessment has been submitted to the National Marine Fisheries Service (NMFS) and a letter of concurrence from NMFS is anticipated. A final decision on this action would not be made until a letter of concurrence is received from NMFS.

City of Salem: Representatives of the City of Salem Water Department participated in the planning process for this project. They attended most interdisciplinary team meetings and provided input with regard to the City's concerns about their municipal watershed.

Other Consultation: State, local, and tribal interests were given the opportunity to participate in the environmental analysis process. In compliance with NEPA, the project was listed in the September 2001, March 2001, December 2000 and September 2000 editions of the quarterly *Salem District Project Update* which were mailed to over 1,000 addresses, as well as a letter mailed on August 24, 1999 to 24 potentially affected and/or interested individuals, groups, and agencies. A total of nine letters were received as a result of this scoping.

EA CHAPTER 6.0 - LIST OF PREPARERS

Table 14 contains a list of those individuals that prepared or contributed to the environmental analysis as documented in Environmental Assessment Number OR-086-02-20.

Table 14. List of Preparers

NAME	RESOURCE	Initials	Date
Randy Herrin	Project Leader	RH	8/26/02
Terry Fennell	Special Status/Special Attention Plant Species and Noxious Weeds	TF	8/26/02
Floyd Freeman	Silviculture	FF	8-27-02
Jim Irving	Wildlife	JIZ	8/26/02
Dave Roberts	Fisheries	DR	8/26/02
John Caruso	Soils and Cultural Resources	JC	8/26/02
Patrick Hawe	Hydrology	PH	8/26/02
Michael Barger	Logging Systems	MBB	8/29/02
Dave Rosling Laura Graves	Riparian Ecology Recreation and Visual Resources	DSR LG	8/26/02 8/26/2002
Bob Jordan	Roads	DN	8/27/02
Fran Philipek	Cultural Resources	FMP	8/26/02
Hank Wujcik	Water Quality - City of Salem	reviewed msg. in Project File	8/26/02

EA CHAPTER 7.0 - GLOSSARY

Aquatic Conservation Strategy (ACS) - The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on federal lands managed by the Forest Service and the Bureau of Land Management within the range of Pacific anadromy. Compliance with the nine Aquatic Conservation Strategy objectives means that an agency must manage the riparian-dependent resources to maintain the existing condition or implement actions to restore biological and physical processes within their ranges of natural variability.

Coarse Woody Debris (CWD) - The portion of a tree that has fallen or has been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter. (SEIS/ROD p. F- 4)

Culmination of Mean Annual Increment (CMAI) - The age in the growth cycle of a tree or stand at which the mean annual increment (increase) for height, diameter, basal area, or volume is at a maximum.

Decommission (Road) - To remove those elements of a road that reroute hillslope drainage, and present slope stability hazards.

Environmental Analysis - A systematic process of developing reasonable alternatives and predicting the probable environmental effects of a proposed action and associated alternatives.

Environmental Assessment (EA)- A systematic analysis of site-specific activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required (RMP Chapter 6-4); a concise public document required by the regulations for implementing the procedural requirements of the National Environmental Policy Act (40 CFR 1508.9).

Environmental Impact Statement - A formal document to be filed with the Environmental Protection Agency that considers significant environmental impacts expected from implementation of a major federal action; a detailed written statement as required by section 102(2)(C) of the [National Environmental Policy] Act, as amended (40 CFR 1508.11).

Finding of No Significant Impact - A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded (40 CFR 1508.4), will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared (40 CFR 1508.13).

Interdisciplinary Team (IDT)- A group of environmental experts who conduct the environmental analysis.

Land Use Allocations (LUA) - All Federal lands covered by the Northwest Forest Plan are identified to be in one of seven designations called Land Use Allocations. The NFP (*SEIS/ROD*) and RMP describe what activities are allowed in each LUA.

Large Woody Debris (LWD) - Large logs or trees in contact or within streams to provide habitat for aquatic species.

Issue - A major point of discussion, debate, or dispute about environmental effects of the proposed action. For the purposes of the National Environmental Policy Act, an issue is a concern within the scope of a proposed action, which is used to formulate alternatives, develop mitigation measures, or is important in tracking effects.

Matrix - Federal Lands outside of reserves, withdrawn areas, and Managed Late-Successional areas. These areas are also expected to be available for timber harvest at varying levels. A federal (BLM and USFS) land allocation which is managed to meet several objectives including but not limited to, the production of a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability.

National Environmental Policy Act (**NEPA**) - The basic national charter for the protection of the environment. It establishes policy, sets goals (section 101), and provides means (Section 102) for carrying out the policy.

No Harvest Zone - That portion of a Riparian Reserve where no tree extraction would take place. Individual tree treatments such as top or base girdling, or felling to provide coarse woody debris or large woody debris could take place, where appropriate, to increase diversity in these stands and to contribute to Aquatic Conservation Strategy Objectives 1, 2, 8, and 9. In Riparian thinning units R6-R8, the no harvest zone is a minimum of 50 feet from both sides of intermittent and perennial streams. In units A-E, PQ, and R, the no harvest zone is defined by the site potential tree height for these stands (see Table 1).

Riparian Reserves (**RR)** - Riparian Reserves are LUAs that include those portions of a watershed directly coupled to streams and rivers. They occur at the margins of standing and flowing water, intermittent stream channels and ephemeral ponds, and wetlands. Riparian Reserves generally parallel the stream network but also include other areas necessary for maintaining hydrologic, geomorphic and ecologic processes.

Scoping - An ongoing process to determine the breadth and depth of an environmental analysis.

Semi-Permanent Road - Language used primarily by the National Marine Fisheries Service (NMFS) to indicate roads that will not be obliterated the same construction season that they were built. **(**see **temporary roads)**

Snags - Any standing dead tree.

Temporary Roads - **1/** (BLM definition) Roads constructed for a project that will be obliterated at the end of the same project. **2/** (NMFS definition) Roads constructed for a project that will be obliterated the same construction season that they were built.

EA APPENDIX 1 - ENVIRONMENTAL ELEMENTS

In accordance with law, regulation, executive order and policy, the Sinker Swim interdisciplinary team reviewed the Elements of the Environment to determine if they would be affected by either of the action alternatives described in Chapter 2. The following two tables summarize the results of that review. Chapter 4 contains a discussion of the environmental effects covering the following resource categories: soils and water, vegetation, wildlife, fish, fire and fuels, recreation and rural interface resources, and visual resources.

Table 15 lists the critical elements of the environment which are subject to requirements specified in statute, regulation, or executive order and the interdisciplinary team's predicted environmental impact per element the project described in Chapter 2 of the Environmental Assessment was implemented.

Table 15. Critical Elements of the Environment

Critical Elements of the Environment	**Affected/Not Affected/ NA** (not present within the project area)	**Interdisciplinary Team's Comments**
Air Quality	Affected	The major sources of potential air pollutants associated with the project are smoke from prescribed burning (e.g., burning of landing debris if determined to be a fire hazard), and dust from the use of unsurfaced roads and road maintenance (Salem District Resource Management Plan Final Environmental Impact Statement, p. Chapter 4-8). The proposed haul route (e.g., Little North Santiam County Road) is primarily paved with only a few miles of gravel or natural-surface roads. The project area is not within an Oregon Smoke Management designated area. Since burning would be conducted in accordance with the *Oregon State Implementation Plan* and *Oregon Smoke Management Plan*, the impact of smoke on air quality is predicted to be local and of short duration. Dust created from vehicle traffic on gravel or natural-surface roads, road maintenance, and logging operations is predicted to be localized and of short duration. As such, the project would have no adverse impact on air quality and would comply with the provisions of the Clean Air Act.
Areas of Critical Environmental Concern	NA	There is no ACEC located within the project area.

Table 15. Critical Elements of the Environment		
Critical Elements of the Environment	**Affected/Not Affected/ NA** (not present within the project area)	**Interdisciplinary Team's Comments**
Cultural, Historic, Paleontological	Not Affected	There are no known cultural sites located within the project area. The proposed project was surveyed for cultural sites in October, 1999 in accordance with Survey Techniques for Densely Vegetated Areas of Western Oregon pursuant to the August 1998 Protocol for Managing Cultural Resources on Lands Administered by the BLM in Oregon, Appendix A. No sites/historic properties were identified as a result of this survey. If during the implementation of the project cultural resources are found, the project may be redesigned to protect the cultural resource values present, or evaluation and mitigation procedures would be implemented based on recommendations from the District Archaeologist.
Environmental Justice (Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, 2/11/94)	Affected	The Sinker Swim project would yield between approximately 3.0 and 7.8 million board feet of merchantable timber over a three-year period. Additionally, considering the information contained in Chapter 4 of the EA, the project is not anticipated to have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.
Flood Plains	Affected	See section 4.1.2 of the EA
Hazardous or Solid Wastes	Not Affected	No environmental effects associated with this element are expected due to the implementation of the Best Management Practices contained in the *Salem District Resource Management Plan* and the terms/conditions of the timber sale contract, including section 26 (refuse control and disposition of waste material), section 27 (storage and handling of hazardous waste), and section 28 (safety and health). Failure to comply with the terms and condition of the timber sale contract can result in violations, suspension or cancellation of the contract per section 10.
Invasive, Nonnative Species (includes Executive Order 13112, Invasive Species, 2/3/99)	Affected	See section 4.2.3 of the EA

Table 15. Critical Elements of the Environment		
Critical Elements of the Environment	**Affected/Not Affected/ NA** (not present within the project area)	**Interdisciplinary Team's Comments**
Native American Religious Concerns	Not Affected	Tribes were contacted during scoping and no Native American religious concerns were identified
Prime or Unique Farm Lands	NA	There are no prime or unique farm lands located within the project area.
Threatened or Endangered Plant Species or Habitat	Not Affected	No threatened or endangered plant species or habitat are located within the project area.
Threatened or Endangered Wildlife Species or Habitat	Affected	See section 4.3.2 of the EA
Threatened or Endangered Fish Species or Habitat	Affected	See section 4.4.2 of the EA
Water Quality (Surface and Ground)	Affected	See sections 4.1.2 and 4.1.3 of the EA.
Wetlands/Riparian Zones (Executive Order 11990, Protection of Wetlands, 5/24/77)	Affected	See sections 4.1.2 and 4.2.1 of the EA
Wild and Scenic Rivers	NA	There is no wild and scenic river located within the project area.
Wilderness	NA	There is no wilderness located within the project area.

Table 16 lists other elements of the environment which are subject to requirements specified in law, regulation, policy, or management direction and the interdisciplinary team's predicted environmental impact per element if the project described in Chapter 2 of the Environmental Assessment was implemented.

Table 16. Other Elements of the Environment.		
Elements of the Environment	**Affected/Not Affected/ NA (not present within the project area)**	**Interdisciplinary Team's Comments**
Fish Species with Bureau Status	Affected	See section 4.4.1 of the EA
Land Uses (including mining claims, mineral leases, etc.)	NA	There are no known mining claims, mineral leases, etc. located within the project area.
Minerals	NA	The project does not include the extraction of any mineral resource. As such, this element will not be affected by the project.
Bureau Sensitive and Special Attention Plant Species/Habitat (including Survey and Manage, and protection buffer species)	Affected	See section 4.2.1 of the EA
Recreation	Affected	See section 4.6.1 of the EA
Rural Interface Areas	Not Affected	None of the units in the project are no rural interface areas located within the project area.
Soils	Affected	See section 4.1.1 of the EA
Visual Resources	Affected	See section 4.7.1 of the EA
Water Resources	Affected	See section 4.1.1 of the EA and Appendix 2
Bureau Sensitive and Special Attention Wildlife Species/Habitat, (including Survey and Manage)	Affected	See section 4.3.2 of the EA
Adverse Impacts on the National Energy Policy (Executive order 13212)	NA	This project does not propose any activities related to energy development, production or distribution.
Within or Adjacent to Special Areas	NA	This project does not propose any activities within or adjacent to Special Areas.

EA APPENDIX 2 - AQUATIC CONSERVATION STRATEGY OBJECTIVES

Table 17. Documentation of the Sinker Swim Project's Consistency with the Four Components of the Aquatic Conservation Strategy

Component 1 - Riparian Reserves: The Record of Decision (C-30) and the Salem District Resource Management Plan (p. 10) specify Riparian Reserve widths. The Riparian Reserve boundaries would be established consistent with this direction. Additionally, stream bank stability and water temperature would be protected by maintaining a no harvest zone along all streams and the wetlands in all units. See section 2.2.4.3.
Component 2 - Key Watershed: The project is located within the Little North Santiam River watershed which is a designated key watershed (see page 1 of the environmental assessment).
Component 3 - Watershed Analysis: The first iteration of the *Little North Santiam River Watershed Analysis* was completed in 1997. The project has incorporated some of the recommendations described in Chapter 7.
Component 4 - Watershed Restoration: Proposed Riparian Reserve treatments would maintain and restore 1) the distribution, diversity and complexity of the forest types within the watershed while ensuring protection of the aquatic systems; 2) the species composition and structural diversity of plant communities within the Reserves; and 3) a future supply of larger-sized trees, which could become longer lasting coarse woody debris. Road decommissioning would begin to restore the complexity of watershed and landscape-scale features by decompacting the soil and speeding up re-vegetation, and also begin to restore connectivity within watersheds.

Table 18. Documentation of the Sinker Swim Project's Consistency with the Nine Aquatic Conservation Strategy Objectives

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 action):* The current distribution, diversity and complexity of watershed and landscape-scale features would be maintained. **Does not retard or prevent the attainment of ACS Objective 1.** *Alternative 2 and Alternative 3 (Proposed Action):* **Does not retard or prevent the attainment of ACS Objective 1.** Effects of the project on Aquatic Conservation Strategy 1 are described in section 4.2.1 of the EA under *Riparian Reserves.*
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. The network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian dependent species. *Alternative 1 (no action):* The current condition of connectivity would be maintained. **Does not retard or prevent the attainment of ACS Objective 2.** *Alternative 2 and Alternative 3 (Proposed Action):* **Do not retard or prevent the attainment of ACS Objective 2.** Effects of the project on Aquatic Conservation Strategy 2 are described in section 4.2.1 of the EA under *Riparian Reserves.*

Table 18. Documentation of the Sinker Swim Project's Consistency with the Nine Aquatic Conservation Strategy Objectives

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

Alternative 1 (no action): The current condition of the physical integrity of the aquatic system would be maintained. **Does not retard or prevent the attainment of ACS Objective 3.**

Alternative 2 and Alternative 3 (Proposed Action): **Do not retard or prevent the attainment of ACS Objective 3**. Effects of the project on Aquatic Conservation Strategy 3 are described in section 4.1.2 of the EA under *Project Area Stream Channels.*

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 (no action): The current condition of water quality would be maintained. **Does not retard or prevent the attainment of ACS Objective 4.**

Alternative 2 and Alternative 3 (Proposed Action): **Do not retard or prevent the attainment of ACS Objective 4.**. Effects of the project on Aquatic Conservation Strategy 4 are described in section 4.1.2 of the EA under *Project Area Water Quality*.

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 (no action): The current condition of the sediment regime would be maintained. **Does not retard or prevent the attainment of ACS Objective 5.**

Alternative 2 and Alternative 3 (Proposed Action): **Do not retard or prevent the attainment of ACS Objective 5**. Effects of the project on Aquatic Conservation Strategy 5 are described in section 4.1.2 of the EA under *Project Area Water Quality.*

ACS Objective 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Alternative 1 (no action): The current condition of in-stream flows would be maintained. **Does not retard or prevent the attainment of ACS Objective 6.**

Alternative 2 and Alternative 3 (Proposed Action): **Do not retard or prevent the attainment of ACS Objective 6.** Effects of the project on Aquatic Conservation Strategy 6 are described in section 4.1.2 of the EA under *Project Area Stream Flow* and section 4.1.3 under *Soil/Water Cumulative Effects.*

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

Alternative 1 (no action): The current condition of floodplain inundation and water tables would be maintained. **Does not retard or prevent the attainment of ACS Objective 7.**

Alternative 2 and Alternative 3 (Proposed Action): **Do not retard or prevent the attainment of ACS Objective 7**. Effects of the project on Aquatic Conservation Strategy 7 are described in section 4.1.2 of the EA under *Project Area Stream Flow* and section 4.1.3 under *Soil/Water Cumulative Effects.*

Table 18. Documentation of the Sinker Swim Project's Consistency with the Nine Aquatic Conservation Strategy Objectives

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

Alternative 1 (no action): The current condition of plant communities within riparian areas would be maintained. **Does not retard or prevent the attainment of ACS Objective 8.**

Alternative 2 and Alternative 3 (Proposed Action): No harvest zones along streams (both perennial and intermittent) would maintain thermal regulation and supply nutrients, LWD, and bank protection. The small amount of thinning within RR would have almost no impact on species composition and structural diversity of riparian plant communities. **Does not retard or prevent the attainment of ACS Objective 8.** Effects of the project on Aquatic Conservation Strategy 1 are further described in section 4.2.1 of the EA under *Riparian Reserves.*

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

Alternative 1 (no action): The current condition of habitat to support riparian-dependent species would be maintained. **Does not retard or prevent the attainment of ACS Objective 9.**

Alternative 2 and Alternative 3 (Proposed Action): No harvest zones along streams (both perennial and intermittent would maintain the habitat for riparian-dependent species. The small amount of thinning within RR would have no impact on habitat for riparian-dependent species. **Does not retard or prevent the attainment of ACS Objective 9.** Effects of the project on Aquatic Conservation Strategy 1 are further described in section 4.2.1 of the EA under *Riparian Reserves.*

Figure 1

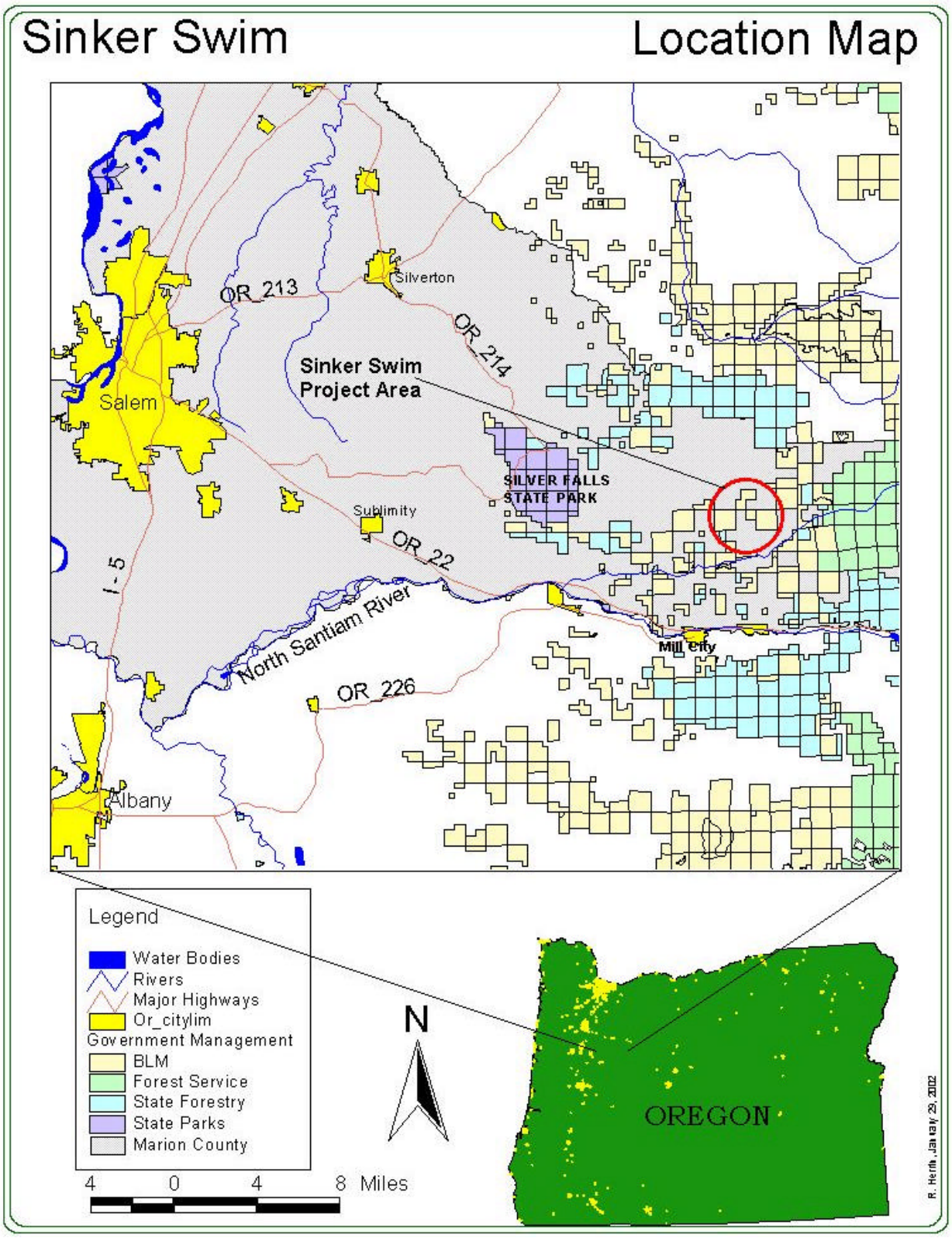

Sinker Swim
Location Map
Silverton
OR_213
OR_214
Sinker Swim
Project Area
Salem
SILVER FALLS
STATE PARK
Sublimity
OR_22
I-5
North Santiam River
Mill City
OR_226
Albany
Legend
Water Bodies
Rivers
Major Highways
Or_citylim
Government Management
BLM
Forest Service
State Forestry
State Parks
Marion County
4 0 4 8 Miles
N
OREGON
R. Herth, January 29, 2002

Figure 2

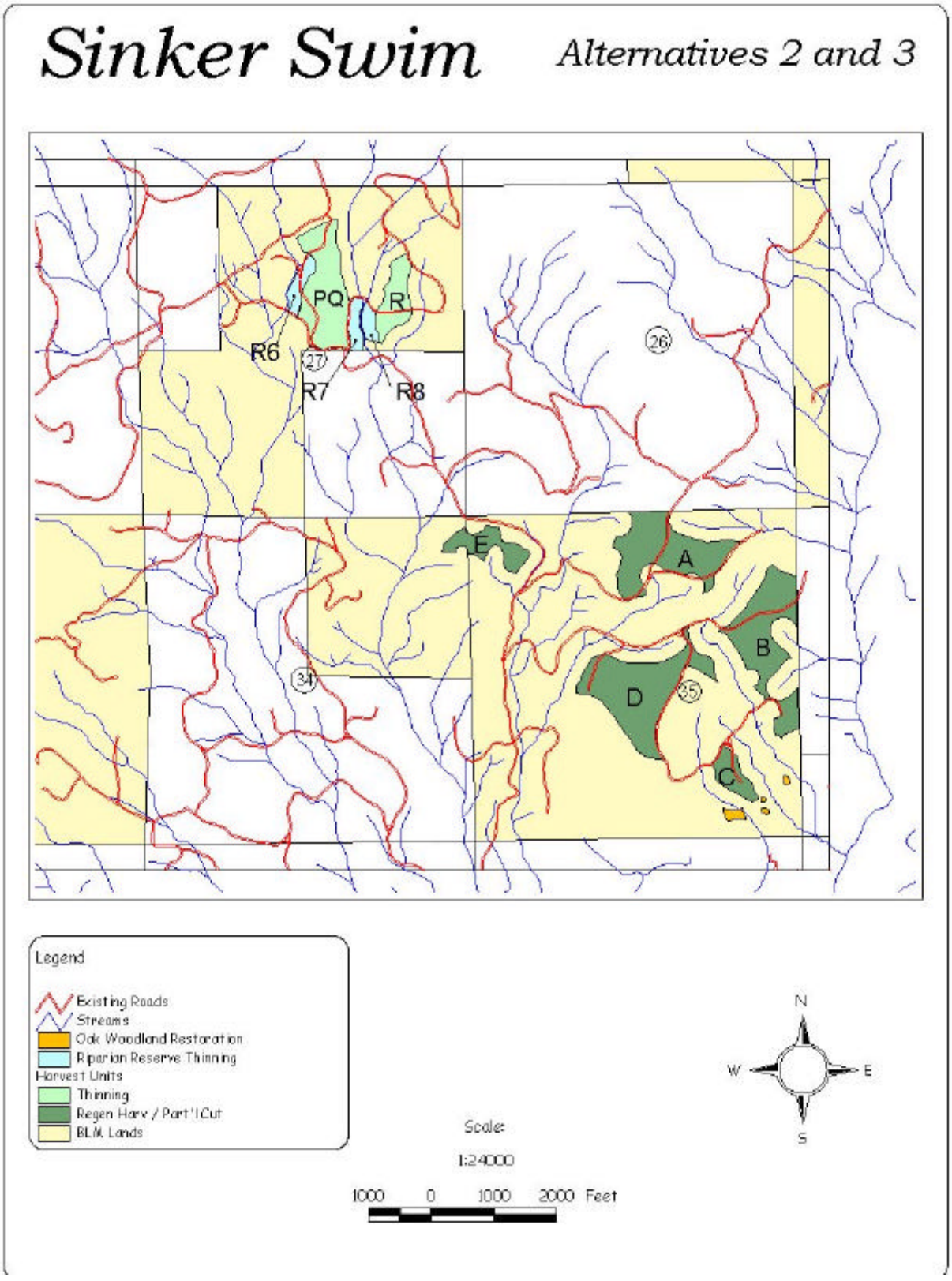

Sinker Swim
Alternatives 2 and 3
PQ
R1
R6
27
R7
R8
26
E
A
B
D
35
34
C
Legend
Existing Roads
Streams
Oak Woodland Restoration
Riparian Reserve Thinning
Harvest Units
Thinning
Regen Harv / Part'l Cut
BLM Lands
N
W
E
S
Scale
1:24000
1000 0 1000 2000 Feet

Figure 3

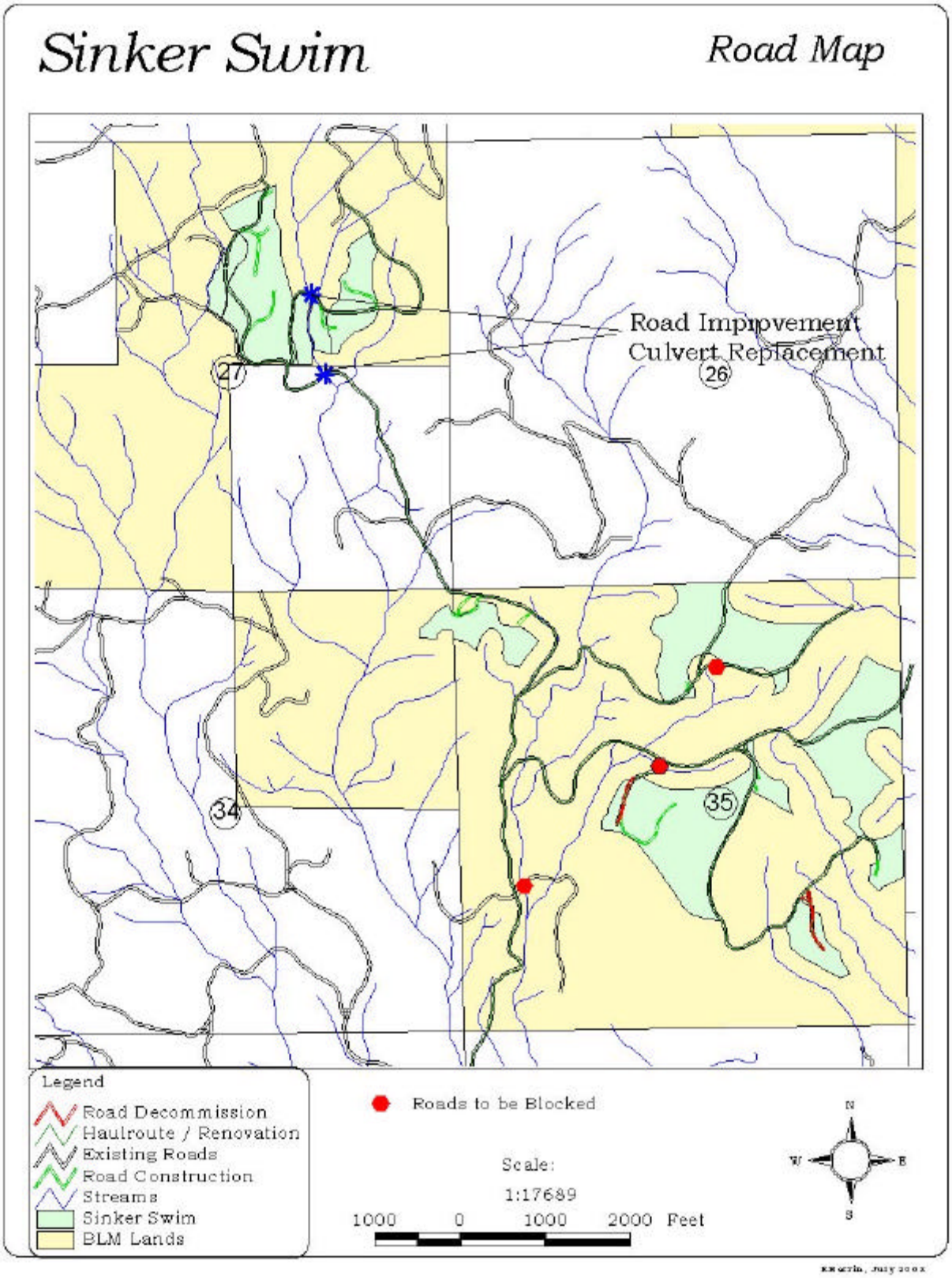

Sinker Swim
Road Map
Road Improvement
Culvert Replacement
26
27
34
35
Legend
Road Decommission
Haulroute / Renovation
Existing Roads
Road Construction
Streams
Sinker Swim
BLM Lands
Roads to be Blocked
Scale:
1:17689
1000 0 1000 2000 Feet
N
W
E
S

Figure 4

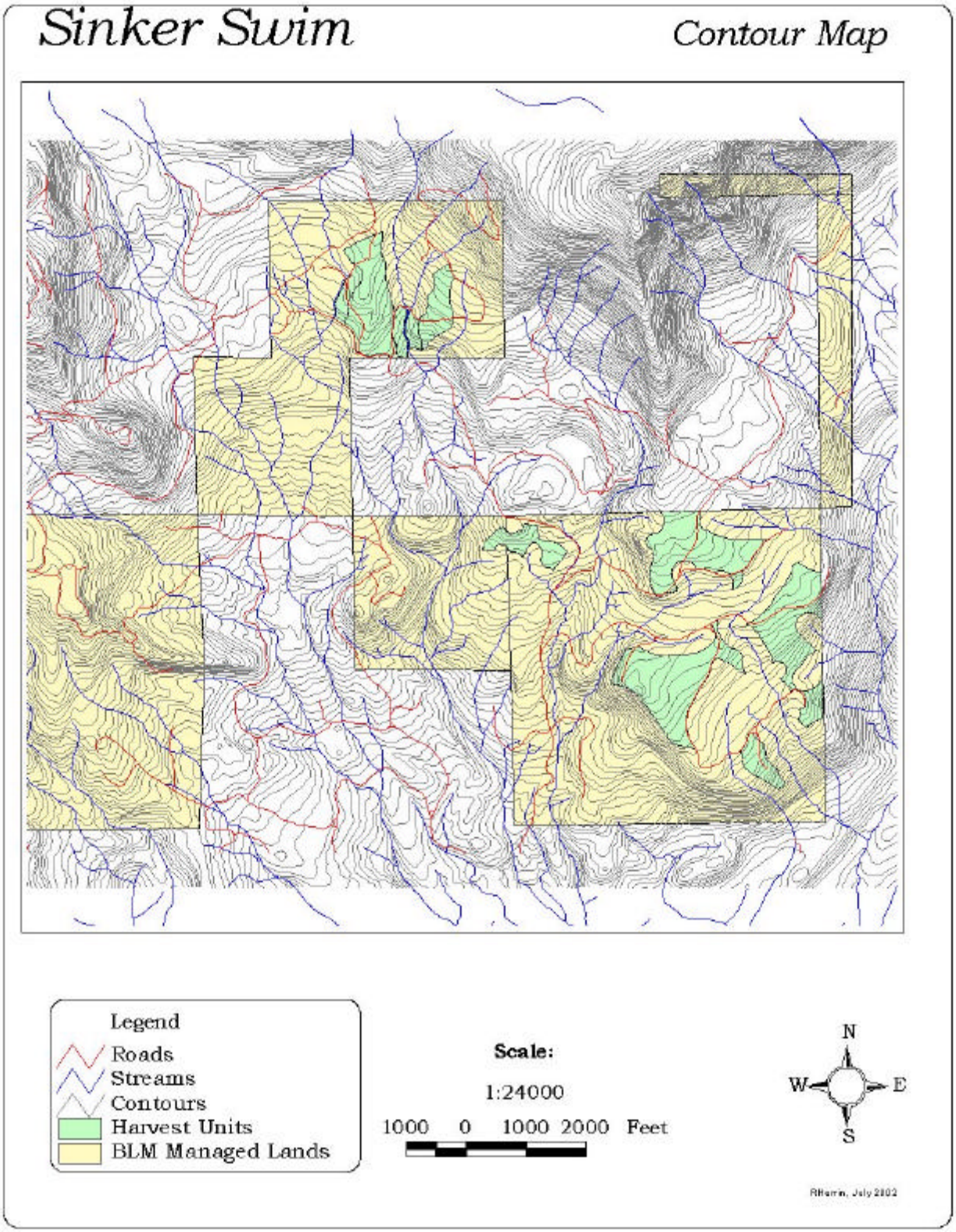

Sinker Swim
Contour Map
Legend
Roads
Streams
Contours
Harvest Units
BLM Managed Lands
Scale:
1:24000
1000 0 1000 2000 Feet
N
W
E
S

Figure 5

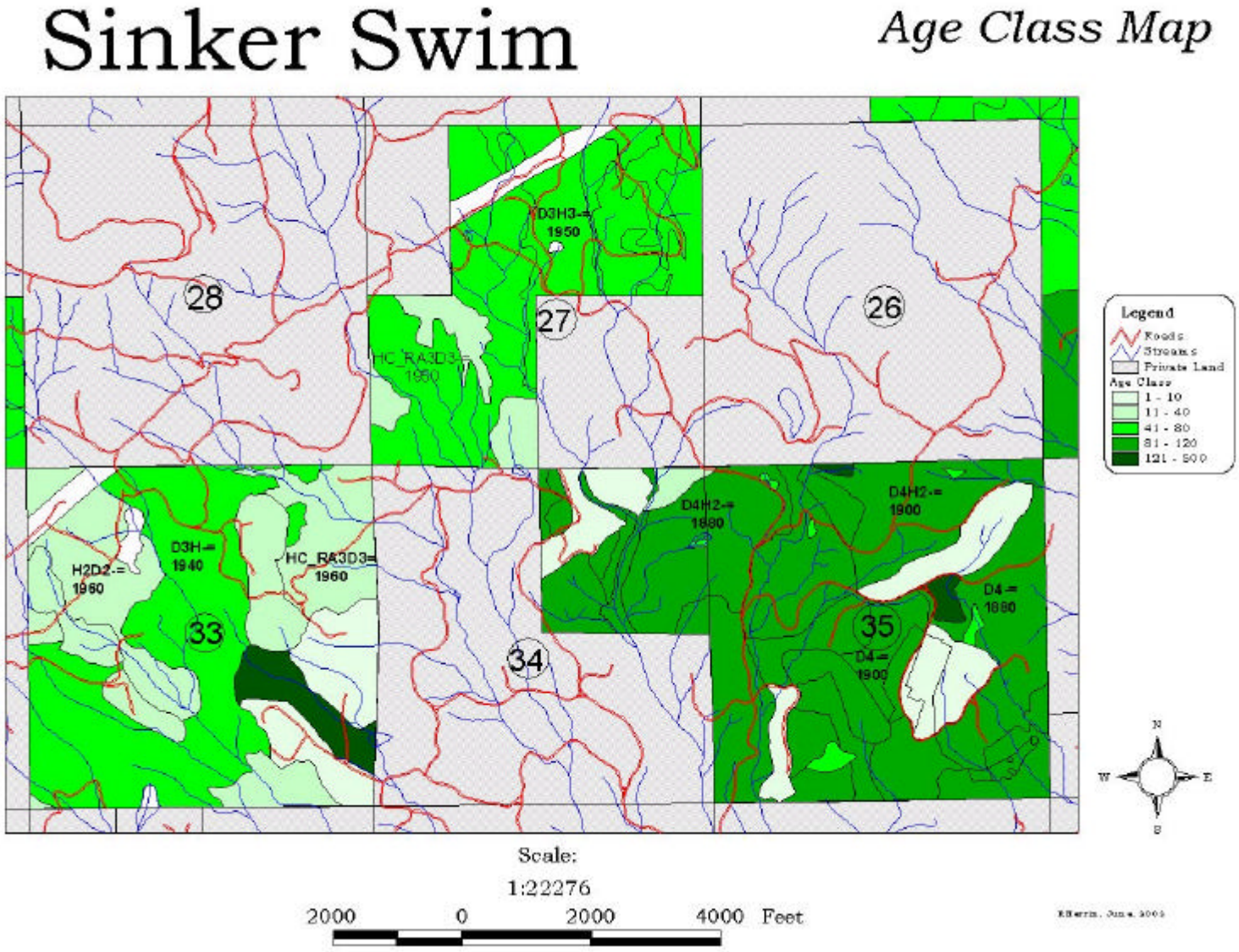

Sinker Swim
Age Class Map
28
27
26
33
34
35
D3H3-=
1950
HC_RA3D3-=
1950
D4H2-=
1980
D4H2-=
1900
D3H-=
1940
H2D2-=
1960
HC_RA3D3=
1960
D4-=
1980
D4-=
1900
Legend
Roads
Streams
Private Land
Age Class
1 - 10
11 - 40
41 - 80
81 - 120
121 - 900
N
W
E
S
Scale:
1:22276
2000 0 2000 4000 Feet

Figure 6: Sinker Swim Observable Areas Map