# Indian Creek Aquatic Restoration Project
# Environmental Assessment- Preliminary Analysis

**Siuslaw National Forest**
**South Zone District**
**Lane Counties, Oregon**

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| **Lead Agency:** | **USDA Forest Service** |
| **Responsible Official:** | **William Helphinstine, District Ranger**<br>South Zone District<br>Siuslaw National Forest<br>4480 Hwy. 101, Bldg. G<br>Florence, OR 97439 |
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Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record on this proposed action and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who only submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR part 215. Additionally, pursuant to 7 CFR 1.27 (d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Person requesting such confidentiality should be aware that, under the FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets.

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# Why is the project needed, and what evidence established these needs? CHAPTER 1

Chapter titles are framed as questions intended to focus the writing and to alert readers to judge whether the answers provided are adequate. For readers accustomed to earlier environmental documents, chapter 1 is equivalent to the "Purpose and Need for Action" section.

## The Proposed Project

*Introduction*—District Ranger Bill Helphinstine proposed the Indian Creek Aquatic Restoration Project (the Project) to enhance watershed function. The Project lies in the Siuslaw River basin and is about 40 air miles southwest of Corvallis, Oregon. The Project proposes to implement activities, including placing up to 410 large conifer trees—up to 36 inches in diameter at breast height—in streams throughout the Indian Creek $5^{th}$ watershed. Adding large wood to streams may begin as soon as August 2005.

The proposed project was designed to address the problem discussed in The Problem To Be Addressed, page 2. Because some activities have been dropped from the proposed project (see Alternatives Considered But Eliminated from Detailed Study section, pages 5 and 6), Alternative 2 is now considered and displayed as the proposed project**.** Descriptions of the proposed project and other alternatives are located in chapter 2, pages 7 to 12.

*Relationship to the Siuslaw Forest Plan*—The Siuslaw National Forest Land and Resource Management Plan (Siuslaw Forest Plan; USDA 1990), as amended by the Northwest Forest Plan (USDA, USDI 1994), establishes the management direction, desired conditions, and standards and guidelines under which lands administered by the Siuslaw National Forest are managed. These plans are intended to provide for healthy forest ecosystems, including protecting riparian areas and waters as well as providing adequate habitat to maintain viable populations of native vertebrate species. This includes providing suitable habitat for the fresh-water phases of anadromous species, regardless of the influence that ocean conditions have on survival during the ocean phases of their life cycles. All relevant aspects of the amended Siuslaw Forest Plan—such as management area standards and guidelines—apply to this project. Thus, this assessment is tiered to the Final Environmental Impact Statement for the Siuslaw National Forest Land and Resource Management Plan, as amended by the Northwest Forest Plan (the Plan).

## The Planning Area

The planning area includes six sub-watersheds in the Indian Creek $5^{th}$-field watershed and covers about 13,000 acres. The U.S. Forest Service manages about 91 percent of the area, and 9 percent is privately owned. The project area is located in portions of Township 15 South, Ranges 10 West; and Township 16 South, Range 9 and 10 West; Lane County, Oregon. All proposed activities are in the riparian and late-successional reserve land allocations as prescribed in the Northwest Forest Plan.

**The Problem To Be Addressed (Issues)**

Based on available information, including the direction from the Plan and the recommendations from the Indian Deadwood Watershed Analysis, District Ranger Bill Helphinstine identified the following need and associated problem:

- ✓ The shortage of properly functioning aquatic habitat in the Oregon Coast Range, including habitat in the Indian Creek 5th field watershed, limits recovery of cold-water species such as coho salmon. Thus, he saw a need to improve watershed function.

The public and other agencies were asked to provide comments on the proposed action. Comments not outside the scope of the project and not covered by previous environmental review or existing regulations were reviewed for substantive content related to the project. The comments identified the following problems.

- ✓ Wood movement downstream could cause property damage.
- ✓ Sediment production could be increased by placing wood in streams.

**Evidence Used by the District Ranger in Deciding to Address This Problem**

The record of decision (USDA, USDI 1994b) for the Northwest Forest Plan—based on physical, biological, and societal evidence provided in the Forest Ecosystem Management Assessment Team report (USDA, USDI, et al. 1993) and described in the Plan's environmental impact statement (USDA, USDI 1994a)—is intended to provide for healthy forest ecosystems, including protecting riparian areas and waters.

The Plan identified concern for northern spotted owls, marbled murrelets, and anadromous fish in the Oregon Coast Range Province (which includes the Siuslaw National Forest) because of its isolation and harvest history (chapters 3 and 4; p. 21). The record of decision, which amended the Siuslaw Forest Plan, allocated federal lands in the Indian Creek 5th field watershed into one or more of the following:

- ⇨ Tier 1 key watershed (C-7);
- ⇨ Late-successional reserve (pages C-9 to C-20);
- ⇨ Riparian reserve (pages C-30 to C-38); or
- ⇨ Matrix (lands not included in the other two allocations; pages C-39 to C-48).

Map 1 displays land allocations as designated by the Plan and the connection of the project areas with those land allocations.

The Plan identified specific environmental conditions and appropriate commodities and amenities to be produced and maintained in each land allocation. It also outlined the rules and limits governing possible activities for achieving desired conditions in each allocation.

The Rogers, Maria, and West Fork Indian Creek subwatersheds are part of the Indian Creek Tier-1 Key Watershed. All stream reaches in the project area were allocated as part of the riparian reserve system. Late-successional reserve 0268 overlays most of the project area, including the existing forest road system. The majority of the trees to be felled (source areas) are located in LSR 0268, with small segments in riparian reserves and matrix.

The Assessment Report for Federal Lands in and adjacent to the Oregon Coast Province (USDA 1995a) shows the planning area in the central interior block (block 6). The mature conifer stands in block 6 have been extensively clearcut, and few patches of functional late-successional forest remain. The central interior block once supported the largest unfragmented patches of late-successional forest in the Province. The Report recommends managing to accelerate successional development and to aggregate small patches into larger ones.

The Report describes the in-stream fish habitat on federal lands throughout the Province as being in marginal to poor condition. It recommends specific actions to improve fish habitat on federal land by restoring immediate habitat conditions by adding large wood to streams and stabilizing, decommissioning, or obliterating roads.

The Plan's Aquatic Conservation Strategy is intended to restore and maintain the health of watersheds and the aquatic ecosystems they contain. Stream-survey data from the 1990s found that streams least impacted by past agricultural activities, such as timber harvesting and farming, have 40 to 120 pieces of large wood per mile of stream (Cummins/Tenmile Watershed Analysis, USDA 1995b; Drift Creek Watershed Analysis, USDA 1997a). The National Oceanic and Atmospheric Administration (NOAA) Fisheries Department (formerly the National Marine Fisheries Service or NMFS) considers properly functioning fish habitat would have at least 80 pieces of large wood per mile and more than 20 percent of the pools are complex or greater than 3 feet deep (NMFS 1996). The Oregon Water Enhancement Board (OWEB) considers a stream depleted of large wood if it contains less than 32 key pieces per mile (OWEB 1999).

The Indian Deadwood Watershed Analysis (USDA 1996) identified the following existing conditions in the watershed:

- Perennial streams in the Indian Creek watershed project area are considered not properly functioning in terms of large wood present in the streams (less than 25 pieces per mile) and deep complex pools (less than 20 percent of pools). Existing low levels of large wood in streams has resulted in low pool quality, limited off-channel habitat, low habitat quality bedrock reaches, and low storage of water, sediment, and organic material in key salmonid production areas.
- Large conifer in the riparian areas, which are the existing and future large wood sources for streams, are below natural levels.
- The water quality (temperature) of Indian Creek is considered impaired because it exceeds the summer stream-temperature standard of 64°F established by the Oregon

Department of Environmental Quality (DEQ). Tributaries of Indian Creek, including West Fork Indian Creek, Gibson Creek, and Taylor Creek, are also listed by DEQ as water-quality impaired.

## Help From Other Agencies and the Public

After considering the identified problem to be addressed with this project and developing a proposal to correct the problem, letters describing the proposed Indian Creek Aquatic Restoration Project and the North Fork Siuslaw Project that was completed in 2004 and were mailed to about 160 individuals, agencies, and organizations identified as potentially interested in the proposed project and analysis. Public comment on the proposed project was also solicited through the Siuslaw National Forest's quarterly "Project Update" publications, the Siuslaw News in Florence, Oregon, and at the Siuslaw Watershed Council General Meetings. Scoping letters were mailed on December 19, 2003. Comments were requested by January 23, 2004.

Field reviews, including the Oregon Department of Fish and Wildlife, local landowners, Siuslaw Watershed Council, and other concerned citizens, were conducted in the project area during the planning process. Several meetings were held with interested persons and groups to discuss the proposed project, beginning in January 2004.

Ten letters and 2 telephone conversations were received in response to these scoping efforts. Public comments contained a wide variety of suggestions to consider. Comments not outside the scope of the project and not covered by previous environmental review or existing regulations were reviewed for substantive content related to the project. The comments reflect conflicting viewpoints over the movement of wood placed in streams and the potential for that wood to produce sediment transport down the stream system. Thus, the issues of wood movement and sediment production were added to the need and associated problem identified on page 2. Based largely on public comment, some alternatives were considered, but eliminated from detailed study, while others were considered in detail. The alternatives are discussed in chapter 2. Comments, relevant to clarifying how the project would be implemented or disclosing the effects of implementing the project, are addressed in chapters 2, 3, or 4; the project design criteria (appendix A); or the project file.

## Decision Framework

The Responsible Official for this project is the District Ranger for the South Zone District of the Siuslaw National Forest. The environmental assessment for this project provides the alternatives, the environmental effects of implementation, and public comments upon which a decision will be made by the District Ranger. The District Ranger will determine through a Decision Notice:

- To what extent, if any, will activities called for in the proposed project or management alternatives be implemented?
- What management requirements and mitigation measures (project design criteria) will be applied to these activities?

The primary factors that will influence the District Ranger's decision are based on how well the problem on page 2 is addressed. The Decision Notice will document this decision and describe what activities will be implemented to address the problem. The decision will be consistent with the Siuslaw Forest Plan, as amended by the Northwest Forest Plan, and will incorporate the associated project design criteria (appendix A), including the management requirements and mitigation measures.

# What alternatives were developed to meet the identified needs?

# CHAPTER 2

In chapter 2, the District Ranger considered alternative proposals that were not fully developed for reasons disclosed. He guided the development of alternative proposals for resolving the problem and meeting the needs identified in chapter 1. These fully developed alternatives are described in this chapter; it is equivalent to the traditional section, "Alternatives Including the Proposed Action".

We designed the alternatives based in part on priorities and recommendations identified in the Forest's late-successional reserve assessments for LSR RO268, and the Indian Deadwood Watershed Analysis. We also evaluated the project activities—in-stream and riparian restoration and road decommissioning—and their placement, based on the histories and current conditions of those sites. For example, we evaluated stream characteristics—such as gradient, connectivity to flood plains, in-stream large wood, shading, and numbers of conifers in the riparian zone—to help identify areas for restoration. Actions for restoring aquatic function and habitat include placing large wood in streams.

Alternatives were developed to meet the identified need and associated problem, and to be consistent with the standard and guidelines associated with the Siuslaw Forest Plan, as amended by the Northwest Forest Plan. The range of alternatives considered, including those that were considered but eliminated from detailed study, reflects comments received during public scoping for this project, public involvement with recent Forest projects such as the Lower Siuslaw Landscape Management Project (USDA 2002b) and the Five Rivers Landscape Management Project (USDA 2002c) and the Yachats Aquatic Restoration Project (USDA 2004b), the problem identified on page 2, and observations made of past District projects.

**Alternatives Considered But Eliminated from Detailed Study**

The following alternatives represent those that were considered by the District Ranger, but for various reasons, were eliminated from detailed study. These alternatives were considered to address comments raised during public scoping.

*The proposed project*—The proposed project, as described in the December 19, 2003 scoping letter, was not fully developed in Alternative 2. Placement of trees within the mainstem of Indian Creek was eliminated. This portion of the proposed project was eliminated due to the higher risk of movement of placed trees in the mainstem of Indian Creek and the potential for impacts to the private lands below if they would move. In addition, landowners have conflicting viewpoints regarding the proposed project within the mainstem of Indian Creek. Therefore, about 2 miles of large wood placement in the mainstem Indian Creek was eliminated from the proposed project.

Placement of trees in the downstream section of North Fork Indian (Mann Creek), adjacent to FS road 2116, was also eliminated. Due to potential erosion from unstable banks in this section of stream and the concerns raised by local residents about this erosion potential this section was removed from the treatment plan at this time. Future wood placement may be considered here after vegetation has stabilized the banks but will be done under a separate future analysis.

*Place large wood in streams with ground-based equipment*—To reduce costs, ground-based equipment was considered for placing large wood in the streams instead of a helicopter. Large wood pieces greater than 2 bankful widths of the streams are needed to ensure wood placed would remain within the project area through most natural events (Doloff 1994, Robison and Beschta 1990, Hilderbrand et al 1998). However, large-wood pieces would be too long to be transported by trucks and many placement sites are not accessible to ground-based equipment because of steep slopes and lack of access roads. Therefore, this alternative was not fully developed.

## Alternatives Considered in Detail

Two alternatives, including No Action (Alternative 1) and the Proposed Project (Alternative 2), were fully developed and are described in this section. The analyses of their effects are described in chapter 3. Actions proposed by alternative 2 were designed to address the problems identified by the District Ranger, the public and other agencies. It incorporates the standards and guides of the Siuslaw Forest Plan as amended by the Northwest Forest Plan, including the Aquatic Conservation Strategy objectives (USDA, USDI 1994b; ROD, page B-11).

*Management requirements, mitigation measures, and monitoring*—Design criteria (appendix A) outline the practices to be used and their timing and duration when planned actions under Alternative 2 are implemented. Measures to avoid or minimize impacts associated with implementing these alternatives have been incorporated into the design criteria. Therefore, we believe that management requirements and mitigation measures for all proposed actions are covered by the design criteria. For the proposed actions, appendix A identifies implementation monitoring (to determine if actions are implemented as designed) and effectiveness monitoring (to determine if the design criteria are effective). Monitoring and observations of past similar actions indicate that the design criteria are effective in protecting natural resources.

*Alternative 1*: No action—The no-action alternative is required by Council of Environmental Quality regulations (40CFR 1502.14(d)). The no-action alternative forms the basis for a comparison between meeting the project needs and **not** meeting the project needs. This alternative provides baseline information for understanding changes associated with the action alternative and expected environmental responses as a result of past management actions. Selecting this alternative means that forest management would rely on natural processes to restore hydrologic conditions.

Currently there are less than 25 pieces of large wood per mile, less than 20 percent pools and few large conifers available for near term recruitment. The current stream deficiencies would continue for several more decades.

*Alternative 2 (Place Large Wood in 6 Streams)*—Large wood would be placed in 6 streams throughout the watershed located only on lands managed by US Forest Service. Specific actions include the following and are illustrated in map 2:

Large wood— To enhance the large-wood component of fish habitat, about 410 trees would be placed along about 10 miles of streams to enhance fish habitat and watershed function. This alternative treats streams identified in the Indian Deadwood WA with a stream gradient less than or equal to 4 percent, having less than 40 pieces of large wood per mile, and a contributing watershed area of less than 5,000 acres in size. The objective would be to increase large-wood component in all identified streams. Table 1 shows the large wood prescriptions for each stream by sub-watershed.

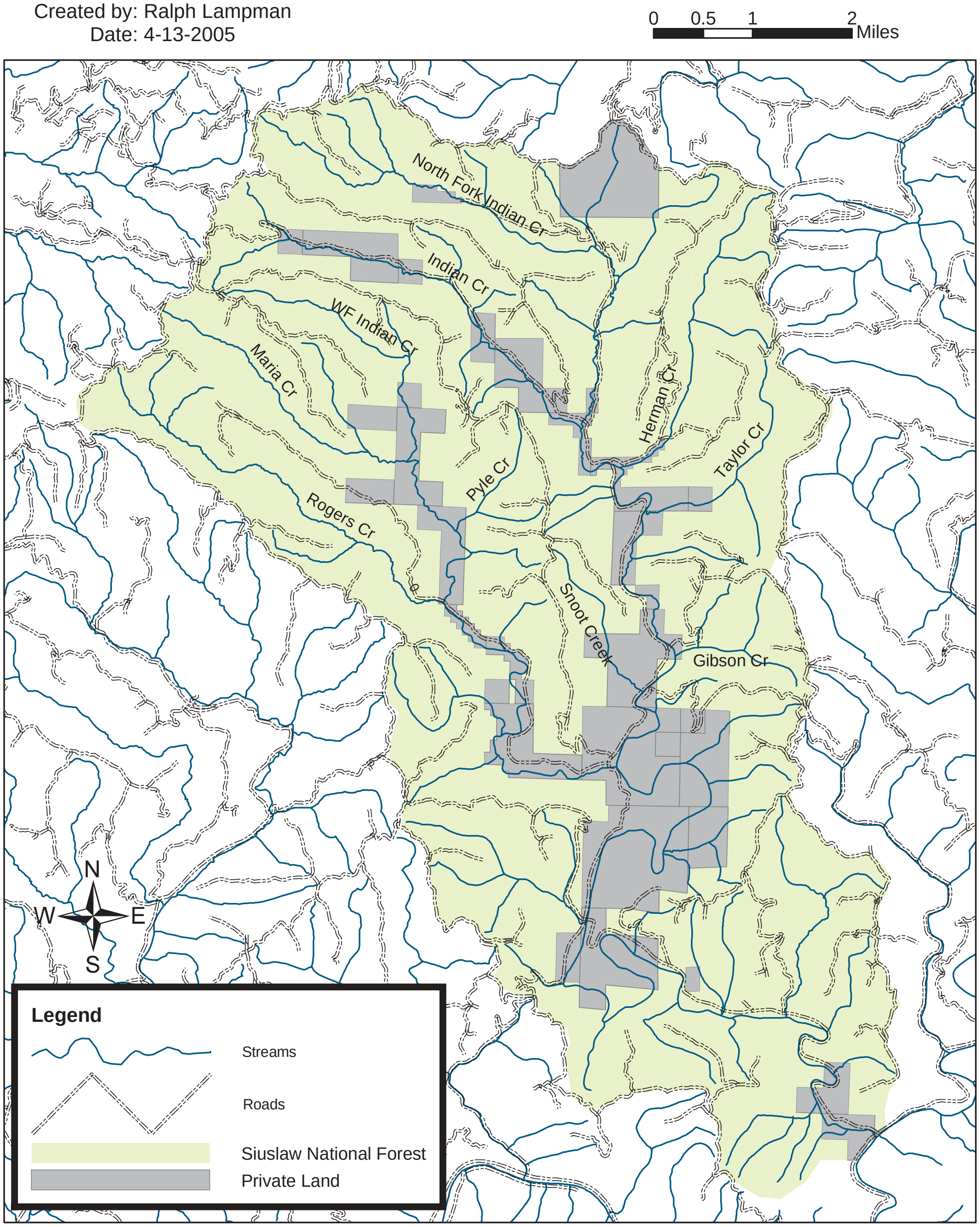
Table 1. Large wood prescription for streams—Alternative 2

| **Sub-watershed** | **Stream** | **Maximum contributing acres*** | **Stream miles proposed for treatment** | **Trees per mile to be added** | **Total number of trees to be added** |
|---|---|---|---|---|---|
| Rogers | Rogers | 2,250 | 3.0 | 43 | 130 |
| Maria | Maria | 3,074 | 2.0 | 40 | 80 |
| | West Fork Indian | | 0.5 | 60 | 30 |
| North Fork Indian | North Fork Indian | 4,149 | 2.0 | 45 | 90 |
| Herman | Taylor | | 1.0 | 40 | 40 |
| | Gibson | 3538 | 1.0 | 40 | 40 |
| **Total** | | | **11.0** | | **410** |

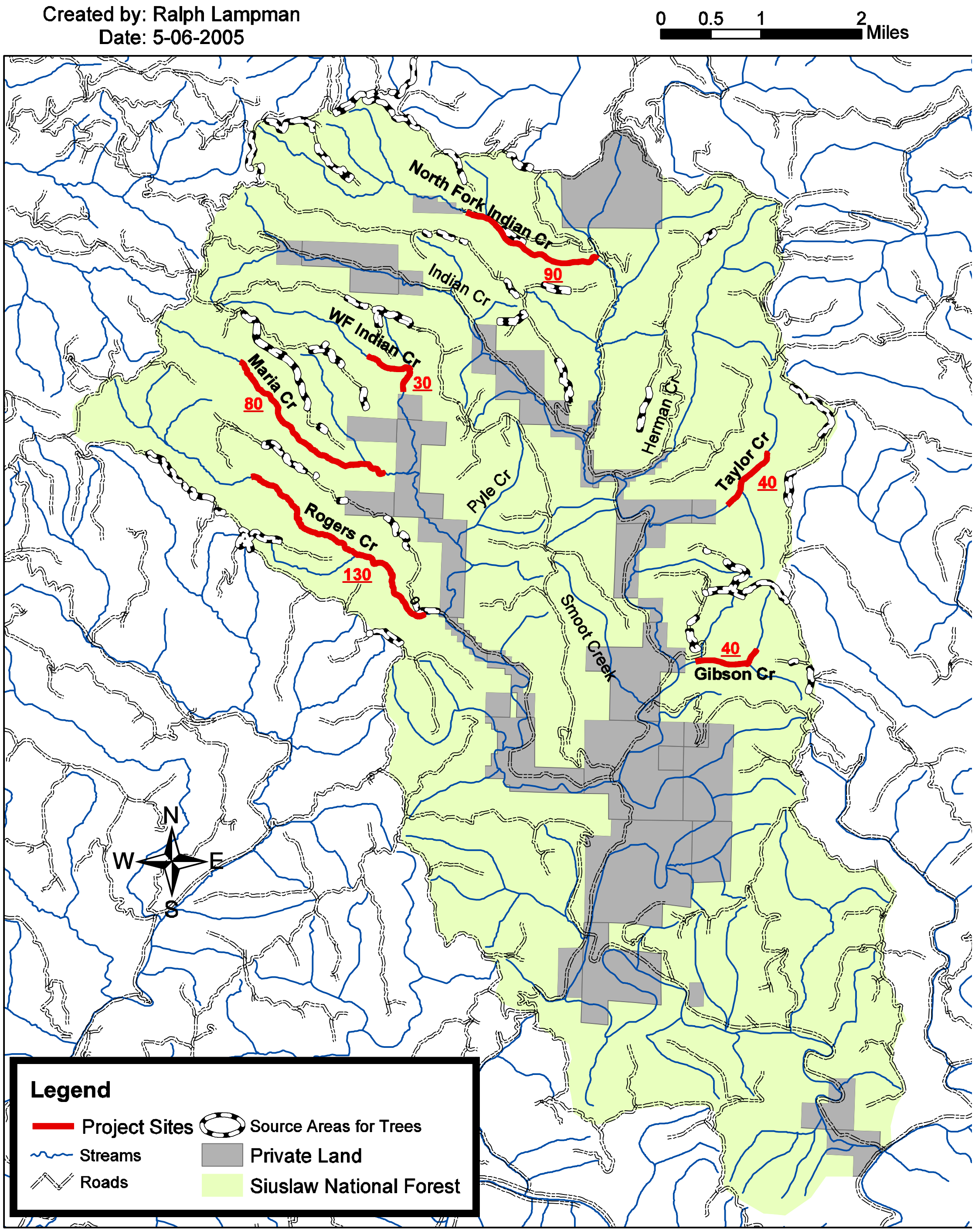
*The watershed area above the lowest treatment site.

# Map 2. Alternative 1 - No Action

Created by: Ralph Lampman
Date: 4-13-2005



# Map 3. Alternative 2



Trees would generally be placed in clumps of 3 to 6 trees to simulate natural wood accumulations (Photo 1). Many of the sites for placement of the trees would be located below tributary junctions where wood would tend to accumulate after debris torrent events. Placement sites would use available gaps or openings in the alder canopy wherever possible and practical.

Photo 1. Example of helicopter tree placement site with multiple trees.

There are reaches of some of the selected streams where the alder canopy is relatively continuous. In these areas, such as in photo 2 in Rogers Creek, alders would be cut and left on site to allow the helicopter to be able to see the stream and allow for safety of the ground crew who are directing the placement. The dropped alder would be incorporated into the structure development. Past helicopter wood placement sites have averaged approximately 5 alders per site with a range from 0-12 trees.

Photo 2. Example of typical low gradient potential tree placement site on Rogers Creek taken 3/2005. Notice low banks, wide floodplain, and lack of large wood/diversity in stream channel.

**Comparison of Alternatives—**Key quantitative differences—based on our estimates—of Alternatives 1, and 2 are compared in table 2.

Table 2. Comparing the key quantitative differences of Alternatives 1, and 2

| Objective | Alternative 1, No Action (Existing Condition) | Alternative 2, Place Large Wood in 6 Streams |
|---|---|---|
| **Place large wood in streams:** | | |
| Number of trees to be added | 0 | 410 |
| Number of streams for large wood | 0 | 6 |
| Miles of stream to be affected | 0 | 10.0 |
| *Miles affected on Federal Lands* | 0 | 10 |
| *Miles affected on Private Lands* | 0 | 0 |
| Pieces of large wood contributing to properly functioning streams (pieces/mile)* | | |
| *Rogers Creek* | 8 | 51 |
| *Maria Creek* | 7 | 47 |
| *West Fork Indian Creek* | 14 | 74 |
| *North Fork Indian Creek* | 11 | 56 |
| *Taylor Creek* | 24 | 64 |
| *Gibson Creek* | 6 | 46 |

*NOAA-Fisheries considers a properly functioning stream to contain more than 80 pieces of large wood per mile. OWEB considers streams containing less than 32 key pieces per mile as depleted of large wood.

# What environmental effects are predicted for each alternative? CHAPTER 3

In chapter 3, we predict the likely effects of each action under each alternative; it is equivalent to the traditional section "Environmental Consequences". The Northwest Forest Plan, FEMAT report, Late-Successional Reserve Assessment, and the Indian Deadwood Watershed Analysis provide evidence for baseline environmental conditions from which direct, indirect, and cumulative effects are analyzed in chapter 3. These broad-based assessments of environmental conditions provide a cumulative view of environmental conditions at different landscape scales and consider past, present, and reasonably foreseeable future actions.

One advantage of planning the Indian Creek Aquatic Restoration Project at the 5th-field watershed scale is an improved analysis of cumulative effects. Knowing the site-specific details of all projects in a large geographic area allows us to predict cumulative effects with more certainty than if projects were analyzed individually. The analysis of direct and indirect effects in this chapter inherently includes cumulative effects because all foreseeable future federal actions in the watershed are included in the analysis. Cumulative effects are disclosed under the section titled “Other Predicted Effects” and describe how all actions, including those expected from other landowners, affect each resource.

In this chapter, we predict the likely environmental effects of the proposed alternatives, the outcomes of which are based on the assumption that the Forest standards and guidelines, the project design criteria (appendix A), and terms and conditions of the biological opinions associated with this project, have been followed. The project design criteria are also used during formal consultation with the NOAA Fisheries and the U.S. Fish and Wildlife Service (FWS) to evaluate effects on listed species. The use of these criteria is reflected in the amount of take (NMFS 1996) and in the terms and conditions provided in the biological opinions issued by these agencies.

Based on the science literature and our collective experience, we are confident in the accuracy of our analysis of the **current** conditions discussed in chapter 1. In chapter 3, when we describe the environmental effects of each alternative, we are **predicting** those effects based also on the literature and our collective experience; however, we recognize that predictions are inherently uncertain, some just a little and some highly.

Because of the similarities of environmental conditions and ecological processes found in the planning area, we expect site-specific effects and environmental responses to the proposed actions to be fairly uniform throughout. In the following pages, therefore, we expect our generalized discussions on effects can be applied to any given location in the landscape with a high degree of confidence that the effects described will fit the site.

When the District Ranger chose the members of the interdisciplinary team, he considered possible scenarios for this environmental assessment and determined what disciplines would illuminate decisions about them Team members reviewed areas where actions are proposed, reviewed relevant referred literature and Forest assessments for this planning area, and consulted disciplinary colleagues in the Forest Service, other agencies, universities, and elsewhere. Often, literature reviewed by team members was deemed incomplete and, though studies of similar environments and similar scenarios were reviewed, the expert's professional judgment was required to determine what information can be appropriately used here—and how strongly it supports predictions about what the environmental effects of proposed actions will be. Although team members benefit from the array of research information and the insights of colleagues, they are valued most highly for their experience in and knowledge about the Indian Creek watershed planning area.

Consultation with other experts helps assure that the literature review did not miss a valuable resource, and it provides opportunity to debate and strengthen the team expert's conclusions about how proposed actions are likely to affect the environment. After several team meetings and one-on-one discussions among team members on how each one's predictions might affect or be affected by all of the others, each team member wrote a section of this chapter. Then all of them reviewed the whole chapter to be sure they find the others' predictions clear and supportable.

In this chapter, team members' position titles accompany their written contributions to indicate that they believe the cited references are relevant, the inferences drawn from them are appropriate, and the predictions are supported by the cited literature and their own professional judgment. In this section, when "we" is used, it means one or more other team members concur.

**Soil and Water Resources** (*District Hydrologist*)

**Sediment production**

*Placing large wood in streams*—Currently, all sub-basins in the project area have insufficient wood in the channel and floodplain to retain sediment, or connect streams to their floodplain (USDA 1997). This affects the sediment regime in the basin, allowing some stream banks to erode and decreasing the time sediments—and their nutrients—remain in the stream channel. This was a major issue of concern raised by local residents in Indian Creek during the scoping process.

Alternative 1 (no action)—This alternative would maintain the existing stream-channel conditions. Stream-bank erosion would continue at the present rate and sediments and their nutrients would move through stream systems at the existing rate.

Alternative 2—Alternative 2 would place about 410 pieces of large wood in 6 different streams in the Indian Creek watershed. Effects on water quality in streams result from sedimentation processes inherent in large-wood placement. The short-term effect of wood placement includes displacement of fine sediment into streams during the placement process. This effect is expected to be minor in extent and duration, and no more than 3 cubic yards per site would be introduced by helicopter log placement.

Large wood in channels affects the physical characteristics of streams, including channel type, sediment storage, and substrate roughness (Bilby and Bisson 1998). Stream channels are expected to adjust to the wood additions by displacing sediment in some areas and depositing it in others, largely in the immediate vicinity of the placed wood. In the treated area, stream channel stability would be enhanced, providing sites for trees and other stabilizing riparian vegetation (USDA, USDI, et al. 1993).

Sediment that is stored behind the placed wood would locally raise the water table, increasing stream interaction with the floodplain and hyporheic zone. This interaction would increase stream productivity because of biologic activity in that zone. Floodplain interaction traps sediment and slows velocity during flooding, thus reducing flood impacts (USDA 2002a). Treatment effects are likely to be localized where wood is placed; provide long-term benefits; and cumulatively improve channel stability and water-quality parameters, such as temperature and turbidity.

Table 3 includes estimates of erosion from one section of North Fork Indian Creek treated in the past decade and bank stability surveys of all six streams being treated in this proposed action. The 1.5 miles of lower North Fork Indian Creek represents the highest risk for bank erosion from wood placement due to persistent grazing practices that occurred here until the mid to late 1990's. Wood placed in this area by excavator during the 1990s was placed when bank instability ranged from high to extreme due to height of banks, fine substrate in banks and very little stabilizing vegetation due to grazing. Table 3 below shows a summary of erosion caused by various types of excavator-placed structures as well as two natural wood sites in this 1.5-mile reach.

**Table 3. Estimated average, maximum and minimum cubic yards of material eroded from or deposited behind natural, full channel spanning and off-bank Forest Service structure sites in lower North Fork Indian Creek, Lane County, Oregon.**

| Structure Type | # sampled | Average cubic yds eroded | Maximum cubic yds eroded | Minimum cubic yds eroded | Average cubic yds deposited | Maximum cubic yds deposited | Minimum cubic yds deposited | Average Deposition (+) or Erosion(-) per structure |
|---|---|---|---|---|---|---|---|---|
| Natural sites | 2 | 100 | 100 | 99 | 23 | 40 | 5 | -100 |
| Channel spanning sites | 7 | 110 | 357 | 5 | 35 | 100 | 3 | -75 |
| Off-bank sites (both single and multiple per site) | 9 | 9 | 31 | 0 | 11 | 50 | 0 | +2 |
| Combination of both | 3 | 9 | 0 | 22 | 25 | 40 | 15 | +16 |

A crude but liberal estimate of total cubic yards of material eroding from structures in this section is roughly 1,170 cubic yards while roughly 470 cubic yards were deposited behind these same structures (Hogervorst 2005). This means a net of 700 cubic yards of sediment would have left this 1.5-mile section or approximately 466 cubic yards per mile. These results represent the worst case scenario for sediment erosion from placed wood given the condition of banks and the fact that wood was cabled in place with little ability to move out in big storms.

Erosion from helicopter placed wood as part of Alternative 2 would be much less than excavator-placed wood surveyed in lower North Fork Indian since erosion potential from the planned placement streams are much lower (Hogervorst 2005). Placement sites would focus wood in flats that tend to have lower banks and areas where floodplains can most easily be reconnected. These sites generally have low erosion potential and create higher potential for long-term deposition. Conversely, most placements would be kept away from hill slope impinged areas where banks are extremely high and other heavily confined areas that have high potential for erosion.
Longer whole trees placed by helicopter have less potential to move from the placement sites than smaller equipment placed logs and consequently have less potential to move into downstream areas that are more prone to erosion such as lower North Fork Indian Creek or the lower mainstem Indian Creek. Longer and larger pieces also have higher buoyancy and, left uncabled, they tend to rise and fall during large storms to accommodate high flow and allow water to flow through the site instead of focusing flows through constrained areas.

The actions proposed under Alternative 2 would improve wetland function and enhance riparian vegetation in the Indian Creek area, enhancing the vigor of a unique ecosystem.

**Soil productivity**

Alternative 1 would not implement actions that affect existing soil productivity.

*Placing large wood in streams*—Under Alternative 2, placing large wood in streams may locally displace some soil, although this effect is expected to be minor. Minor, short-term, local stream bank erosion is expected but should be within the range of natural levels in systems with sufficient large wood. As the wood begins to function, stream bank stability should increase as riparian vegetation grows in the stabilized, stored sediment. No soil compaction is expected. In the long-term, soil productivity is expected to increase in affected areas.

Tree falling and removing the trees by helicopter are not expected to measurably affect soil productivity.

**Water quality—temperature**

There are three Oregon DEQ 303(d) listed streams in the Indian Creek sub-basin (DEQ 2002). The main stem of Indian Creek is listed for summer water temperature limitations from mile 0 to 22. West Fork Indian Creek is also listed for summer water temperature limitations from mile 0 to 8.9. Gibson Creek is listed for temperature limitations during spawning time from September 15 to May 31, milepost 0 to 1.5. For Gibson Creek, sampling was done at mile post 0.1 which is on heavily grazed private land that is typically not known for spawning. Most spawning occurs in the proposed treatment reach as part of Alternative 2, about ½ mile above the DEQ sampled site. Rogers, Maria, North Fork Indian, and Taylor Creeks are not listed for any parameter on the 303(d) list.

It should also be noted that the Mapleton District of the Siuslaw National Forest has monitored a site on upper West Fork Indian Creek above private property in 1999 and 2001 through 2004. This same reach is the small section of West Fork Indian Creek that Alternative 2 proposes to treat with helicopter wood (See Map 3). The 7-day average daily maximum for the years surveyed was 64.3°, 62.6°, 62.4°, 62.4°, and 62.0° for 1999, 2001 through2004, respectively. Only in 1999 did summer water temperatures slightly exceed the State standard of 64°. The only other site continuously monitored in summer was Gibson Creek at milepost .75, and the 7-day average daily maximum was 60.1° and 58.1° for 1999 and 2000, respectively.

*Placing large wood in streams*—Alternative 1 would not place large wood in streams. Currently, all sub-basins in the project area have insufficient wood in the channel and floodplain to hold sediment or connect streams to their floodplain. Instability in these areas prevents the establishment of trees to provide shade, protect streams from solar radiation, and moderate stream temperatures.

Alternative 2 would have minor effects on the current effective shade during the summer, but are expected to accelerate vegetation recovery within ten meters of the stream center. No short-term effect on stream temperature is expected from this action, since local vegetation would remain (with the possible exception of alder in the immediate vicinity of placed logs). In the long term, Alternative 2 is expected to enhance stream channel stability in the treated streams and provide sites for trees and other stabilizing vegetation. This in turn would provide shade to reduce the adverse effects of solar radiation and moderate summer stream temperatures (FEMAT 1993). Sediment stored behind the added large wood would locally raise the water table and increase stream interaction with the hyporheic zone. This increased interaction decreases daily water temperature fluctuations (Poole and Berman 2001; Wordzell, pers. comm.; Naiman et al., 2000). Treatments are expected to provide long-term benefits by lowering summer stream temperatures.

In addition to wood placements planned for treatment sections of Alternative 2, the Forest Service has been working on riparian planting in several locations since 1994. Maria and North Fork Indian Creek were planted in 1994 and have advanced riparian conifers well beyond the need for release. Later plantings have occurred in West Fork Indian and Rogers Creek that are still being released each summer. Taylor and Gibson have well developed riparian vegetation in the form of large second growth conifers for a large portion of their main stems but may get some spot planting later. These efforts are geared toward reestablishing long-term shade and wood recruitment in the riparian zones of the treatment reaches for Alternative 2, and wood placement would be done to protect or enhance these plantings.

**Downstream movement of large wood**

A substantial amount of wood naturally enters stream systems as a result of landslides and debris torrents. Additional wood is recruited when individual trees fall into streams from adjacent banks. Researchers have found wide, forested riparian areas and in-channel large wood can reduce downstream effects of floods, because they increase hydraulic roughness and decrease the stream's capacity to transport water, sediment, and wood (Allen et al. 2003, Buffington and Montgomery 1999, Montgomery et al. 1996, Gippel 1995, and Nakamura and Swanson 1992)

Wood movement is influenced by:

- Stream size,

- The size of the wood, both length and diameter;
- Position in the stream channel;
- The proportion of each piece positioned on the stream bank or in the active channel; and
- Its orientation relative to the channel, pointing upstream or downstream

Conifer species would be placed in the stream channel, because they are more durable than hardwood species when exposed to repeated wet and dry conditions as stream levels fluctuate (Bilby et al. 1999). Large wood in small streams is stable and rarely moves downstream except during infrequent large floods; small wood in large streams may move downstream with only minor increases in water flow from seasonal storm events (Lienkaemper and Swanson 1987, May and Gresswell 2003, Braudrick and Grant 2001).

In October 1996, after the flood of February 1996, large wood was placed in Tenmile Creek, under the Tenmile Creek Restoration Project. The large wood pieces (241 pieces comprised primarily of whole trees) were tagged and their movement and function have been monitored annually. Based on the monitoring observations, the large wood has been observed to increase storage of water, sediment, and wood at the placement sites that otherwise would have been transported downstream during high-water flows. Considering all 241 pieces, 49 percent of the short pieces (20 to 75 ft.) have moved while only 18 percent of the long pieces (80 to 140 ft.) have moved. Wood placed in upper Tenmile Creek, which is similar in size to streams proposed for treatment in Alternative 3, has been very stable. Only 11 pieces of wood (13 percent of the total) placed and tagged have moved downstream in seven years. Six of the 11 pieces were placed with the expectation that they would float and collect in jams downstream, which they did. The maximum distance that any of these pieces moved was about 0.1 mile, although one short piece (30 ft.) that was a planned floater moved 0.6 mile. Only five pieces of wood that were not planned to float moved downstream for a maximum distance 0.1 of a mile. All five of these pieces moved during two high-water flows. These flows had estimated return interval of about 20 years.

Downstream movement of large wood pieces during rare natural floods (greater than 20-year return period) is expected to be greater than during smaller floods. During these events in addition to large wood movement, other flood components, such as debris torrents, large bed load movement or the erosive power of flowing water, can change stream banks and flood plains, thus the downstream effects from a given component is difficult to predict. Existing wood in most larger stream channels would be shifted or mobilized and deposited in new areas. Some steeper channels may deliver large volumes of wood and sediment to lower-gradient streams through debris torrents. For example, three late-1990 floods (less than 20-year return intervals) added two to three times the amount of large wood to Tenmile Creek than had been placed in the channel in the fall of 1996 (Johnson, ODFW, pers. comm.).

Alternative 1 (no action)—The no-action alternative would maintain the existing levels of large wood in the system. Seasonal high water, that occurs every year or two, rarely moves larger pieces of existing wood from smaller streams. As flood events increase in size, the opportunity to capture or slow the movement of large wood through the system is reduced. In the watershed, effects associated with the movement of large wood during larger flood events (greater than 20 years) are expected to be similar to past events.

Alternative 2—This alternative would place up to 410 pieces of large wood in 6 streams of the Indian Creek watershed (table 1). All of the streams have a bank-full width of less than 42 feet. Each piece to be placed would be over two times bank-full width of the affected stream and would be stable habitat elements in these low-gradient headwater streams. The gradient and basin size of the Indian Creek reaches being proposed for treatment are about the same as those in the Tenmile project. The gradient in the lower reaches of the Indian Creek reaches are about half the gradient of similar-sized basins treated in the Tenmile project. Movement of placed wood is subject to the same flood events as wood currently in the system. Considering wood placement would be designed to be more stable in Indian compared to Tenmile, we expect large wood to be more stable in flood events than that observed in Tenmile Creek. Thus, during seasonal high water, as well as during high water events, with return intervals of less than 20 years, placed wood would remain on site. Placed wood is expected to increase storage of water, sediment and additional recruited wood that would have been transported downstream during high-water flows. Larger (greater than 20 years) flood events can add 2 to 3 times the amount of wood than proposed by this alternative, and influence other factors, such as debris torrents and movement of large bed loads. Since it is difficult to predict how placed wood would respond during a major flood, that may include large inputs of sediment and wood from tributary debris torrents, it is reasonable to consider the response to fall within a range of outcomes—from modifying the duration and intensity of the flood by capturing wood and sediment to becoming entrained as part of the flood and moving down stream with other flood elements.

**Aquatic Species** (*District Fish Biologist*)

**Fish habitat**

Existing fish habitat and riparian area conditions for the Indian Creek Watershed are described in Indian Deadwood Watershed Analysis (USDA 1996), Siuslaw Basin Watershed Assessment (Ecotrust, 2002) and stream habitat surveys (USFS 1988-2004). Existing habitat conditions described in these documents indicate quality fish habitat is lacking. Key components of quality fish habitat include slack-water refuges during high flows for freshwater salmonid survival, food availability, and sediment storage capacity. These documents indicate that large woody debris was removed from several streams throughout the watershed. There are about 68 miles of coho habitat about equally divided between private (44 percent) and federal (56 percent) ownership.

Past activities which include timber harvest, homesteading, agriculture and stream cleanout are the causative factors in most of these streams. Taylor Creek, the stream least impacted by past human activity, has about 24 pieces of large wood per mile.

*Placing large wood in streams*—Large wood, generally greater than 24 inches in diameter and longer than bank-full width (OWEB 1999), is an essential habitat element for fish. Large wood helps to create quality fish habitat by:

- Creating deep pools with abundant cover and backwater areas for fish. This increases winter and summer rearing habitat for salmonids by providing more physical space and greater habitat diversity (Dolloff 1994);

- Providing slow slack-water refuges during high flows and increasing floodplain connection. These habitat components provide refuges for juvenile salmonids and increase the over-winter survival by reducing the potential for young fish being flushed downstream (Solazzi et al. 1998);
- Trapping, sorting, and storing gravels (sediment) that are required for spawning habitat;
- Increasing fine sediment storage adjacent to streams, which provides additional soil for establishing riparian vegetation. Riparian vegetation can improve stream shade, potentially reducing stream temperatures and increasing the availability of suitable habitat for salmonids; and (Bjornn and Reiser 1991)
- Providing nutrients, which increase salmonid food availability by creating suitable substrate for aquatic insects and by trapping leaves and other detritus that feed the insects.

**History of Indian Creek Streamside Management Within Project Area**

Siuslaw National Forest has implemented various instream structure projects over the course of 30 years within the Indian Creek Basin. North Fork Indian Creek (Mann Creek) has gone through an intense bank stabilization project in 1978 due to the risk of road failure from flooding. Instead of relocating the road, the decision was to relocate the stream so as to minimize the road erosion and the potential road failure. Eighty-two cubic yards of gabions were used along with 32 cubic yard of riprap material.

Photo 3. Picture of reach of Rogers Creek that had wood removed during 1970's. Cut at arrow is evidence of past stream cleanout.

In 1970s through early 1980s, woody debris removal was one of the major instream projects that took place in the Oregon Mid-Coast Region. Large woody debris was intentionally removed from the streams to reduce the risk of flooding and with the intent to provide better fish (salmon and trout) passage. At this time some biologists believed that the removal of this wood would allow the fish easier access to the stream and that flood waters would move quickly out of the small streams and be less likely to impact the fish. The actual result was something very different. Many areas saw a reduction in the amount of spawning gravel since the fast moving flood waters were able to more efficiently move materials in the stream bed downstream. The loss of the stream bed also meant a reduction in the amount of deep pools that would be capable of supporting juvenile fish such as coho that remain in the stream for a year before outmigrating to the ocean. Many of the Coho-bearing streams within Indian Creek Basin have had large woody debris removed during that period, such as Gibson Creek in 1982 and Rogers Creek in 1984.

After recognizing the negative effects of removal of large wood debris on salmonids habitat and overall stream function in the early 1980's by aquatic specialists, large wood debris "placement" projects were implemented. Most of the LWD placement projects in the 1980s incorporated weir designs, using either one (single log sill), two (V dam), or three (K dam) 20 to 40 foot logs to create small scale dams that would slow down the water flow in addition to creating plunge pools downstream from the log sill structures. Boulders and cables were used at some sites to anchor the short logs in place so that they would not move downstream during storm events. Examples of streams that received this type of treatment in Indian Creek Basin are Maria Creek in 1983, Rogers Creek in 1984, and North Fork Indian Creek in 1984.

In 1993, approximately 20 bank stabilization structures were placed in North Fork Indian to collect sediment and allow vegetation to colonize raw 3 to 4 foot eroding banks (photo 4). At the same time a special use grazing permit was changed to aid conditions to reduce the impact to streamside vegetation. Fences were also installed in many areas to restrict livestock access to stream banks. Placement of anchored material in an unconfined valley with fine sediments in the banks is accompanied with risks of the stream finding an easier way around those structures. A review of these structures revealed that 4 of the 20 structures did not function as designed. The other 16 sites have accomplished the tasks that they were designed to accomplish. Stream banks have been stabilized and woody vegetation has begun to provide some root strength on the banks (Photo 5). The 4 sites that did not function as designed did provide complexity to the stream channel, a desired but unplanned outcome. However, they caused the stream to erode the bank. One of those sites actually established a new meander for the stream (photo 6). The end result 12 years later is a more complex stream channel but this structure was not designed to create a new meander at this site.

Photo 4. 1993 photo taken just after structure placement in North Fork Indian (Mann Creek) Note raw eroding banks and lack of woody vegetation.

Photo 5. 2004 photo at same site. Note establishment of woody vegetation, banks are vegetated and angled. Also see at arrow structure buried in retained sediments.

Based on results from earlier habitat improvement projects, large wood structure placement evolved again. In the mid 1990's, structure placement on the Mapleton District began using much more complex structures that were designed to restore stream function and not just focus on one aspect of fish habitat like creating pools. These structures used logs, boulders and rootwads in combination that resemble wood accumulations formed during large storm events. These accumulations are inherently tied to the function of the stream as well as providing fish habitat. Complex structures are designed to capture materials (small wood, leaves, fine sediment) during storm events and provide slow velocity areas for juvenile fish to find refuge from high water velocities in large storm events. These structures increase the amount of time that materials remain in the creek and improve the nutrient retention in the streams. Complex structure placement projects within the Indian Creek Helicopter project area include Rogers (1997), West Fork Indian (1999) and North Fork Indian (2000). The majority of the Rogers Creek structures and all of the West Fork Indian Structures were not anchored. From the Mapleton District monitoring program, that establishes a schedule to monitor projects through the first year and then routinely to re-examine structures after large storm events, we have not seen any downstream movement of these structures since they were placed.

Periodic monitoring of the Indian Creek restoration sites has revealed that fish habitat and bank stability is improving as spawning gravels accumulate over bedrock reaches and vegetation becomes established on what had previously been vertical eroding banks.

A few of the structures have caused the stream to erode the banks around the side of the structures. While channel migration often happens naturally in streams when large wood falls into the stream, channel migration associated with placed structures is viewed as negative by many people. Some

Photo 6. Example of full spanning structure that was intended to jam up stream and back water and collect substrate behind structure. The creek, however, established a new meander around the structure. The structure still provides good summer cover and excellent winter cover during storm events although not as designed. Adult salmon have been recorded spawning on this gravel bar to the left of the structure where the creek eroded a new meander.

large-wood pieces have moved downstream. Although theses pieces were expected to stay in place, the short length (20 to 40 foot) relative to stream width made these pieces more likely to move downstream. The function of the pieces that have moved downstream is not known, but based on past monitoring; their deposition sites are likely enhancing aquatic and riparian habitats, considering the low abundance of large wood throughout the Indian Creek watershed. The fish population responses to the restoration work has not been determined in the Indian Creek watershed, but other large-wood placement projects in other Oregon Coastal watersheds have documented increases in rearing densities (Nickelson et al 1992; USDA 2004) and freshwater survival (Solazzi et al 2000; Steve Johnson et al. 2005).

Alternative 1 (no action)—Alternative 1 maintains the existing habitat conditions, riparian succession, and large wood recruitment rates in the Indian Creek Watershed, resulting in a much slower recovery rate for fish habitat than under the action alternatives. The streams are below NOAA Fisheries minimum levels of 80 pieces of large wood per mile; thus, they are not considered to be properly functioning for this habitat component. Since they contain less than 32 pieces of large wood, OWEB considers them to be depleted of large wood (table 3). Some areas would continue to degrade before they begin to recover because it would be decades before large trees develop and become sources of large wood that can be recruited into the streams. The current riparian area of alder and some small conifer would add an occasional piece of small wood to streams. Small wood (generally less than 24 inches in diameter and less than bank-full width in length) benefits both small and large streams. However, its beneficial effects on aquatic processes are much less than large wood because it is more easily moved during high flows and deteriorates more quickly. In addition, small trees are much more abundant in riparian areas of the Indian Creek watershed than large trees.

Alternative 2—Most Oregon coastal streams have been identified as limited in winter-rearing habitat for salmonids (Nickelson et al 1992). Alternative 2 partially addresses this limitation by placing up to 410 trees in 6 different streams in the Indian Creek $5^{th}$-field watershed (Map 2). These wood additions would directly affect about 16 percent of the available habitat for salmonids, improving about 29 percent of the coho streams on federal lands. Upon completion of the project, all the creeks would exceed OWEB's benchmark for depleted streams (table 3). The balance of treated streams would continue to be below the minimum level of large wood found in properly functioning streams (table 3). We anticipate in many of those streams that natural mature stands that do remain would continue to slowly add large wood to the stream and bring those streams up to the functioning level. For example the lower 1.3 miles reach of Rogers Creek has stream surveys from 1990, 1999, and a pre-project survey completed in March 2005. In the 1990 and 1999 stream surveys 12 and 9 pieces of large wood were noted in this reach respectively. In the 1999 survey large wood added in 1997 made up all but 1 piece of large wood in this reach, the other pieces noted in 1990 likely either moved out of the reach in the 1996 flood event or the stream channel migrated around those pieces present or those pieces were buried in the large amount of sediment that moved down the system in the 1996 flood. The March 2005 survey showed that no additional large wood has entered the channel over the last 6 years. Therefore, even though mature stands of conifer exist adjacent to the valley floor, recruitment to the stream is very slow. At the current rate, hundreds of years would need to pass before natural recruitment of large wood would bring levels of large wood anywhere near a functioning level.

Large wood has a major influence on the long-term retention capability of the stream (Flitcroft et al. 2002). Large wood plays a key role in collecting and storing smaller pieces of wood and other material, such as leaves, needles, and salmon carcasses. A major effect of adding large wood to streams is the increased amount of mobile sediment that would be collected and stored near the large-wood sites (Montgomery et al. 1996; Nakamura and Swanson 1992; Jeffries et al. 2002). Deep sediment deposits near the large-wood sites would create more stable spawning gravels during high flows, thus increasing egg-to-fry survival. This stored sediment would increase the frequency of over-bank flows, allowing juvenile salmonids access to off-channel habitats that are preferred for over-winter rearing (Nickelson et al. 1992). Deep sediment deposits would also form the structure for deep pools needed for salmonids in summer and winter. More frequent over-bank flows, a more aggraded stream channel, and more abundant pool and riffle sequences are expected to increase surface and ground water exchange (Poole and Berman 2001). Ground water can buffer natural stream-heating processes (Poole and Berman 2001) and increase the availability of preferred summer-stream temperatures for salmonids in the Indian Creek watershed.

As streams adjust to and orient the added large wood, a few localized banks would erode. Fine sediment would be transported downstream during high flows. This sediment is expected to decline over time and is not expected to impact fish or their habitat. Large wood is expected to collect and store much more sediment than it would introduce with bank erosion, except in areas of extreme erosion potential. Where streams adjust to added large wood, bank erosion may occasionally cause some small trees to fall into the channels and be captured by the large wood. These small trees would add complexity to fish habitat.

Large wood allows pockets of fine sediments and organics to collect in slow-water areas. Fine sediment and organic material create quality habitat for other aquatic species such as the Pacific lamprey (*Lampetra tridentata*). During its larvae stage the lamprey burrows into soft sediment in shallow areas where it lives and feeds from four to six years (Close et al. 2002).

Studies of salmonid response to turbidity, however, indicate that minor, short-term increases in turbidity do not alter fish behavior. Bisson and Bilby (1982) found that juvenile coho salmon acclimated to clear and low-turbidity water did not exhibit significant sediment avoidance until turbidity reached high levels. Similarly, Berg and Northcote (1985) found that a gradual increase in suspended sediment did not alter behavior of coho salmon juveniles in laboratory streams.

**Fish Populations**

Salmonids present in the Indian Creek watershed include Oregon coast coho salmon (*Oncorhynchus kisutch;* currently proposed for federal listing as threatened), Oregon coast chinook salmon (*Oncorhynchus tshawytscha)*, Oregon coast steelhead, (*Oncorhynchus mykiss irideus)*, and resident cutthroat trout *(Oncorhynchus clarki clarki)*. All salmonid stocks in the Indian Creek 5$^{th}$-field watershed, except chinook salmon, are depressed or have low population abundance, with some stocks having a moderate risk of extinction (ODFW 1997). Abundance of juveniles has shown an increase in portions of the Siuslaw Basin from 1998 to 2002 a time period when other coastal watersheds are seeing increasing fish populations (Bob Buckman, pers. comm.). Lawson (1993) states that increased ocean productivity can increase fish populations in the short term even though freshwater habitat quality may be decreasing. He explains that further reductions in freshwater habitat quality may increase the likelihood of species extinction during the next cycle of low ocean productivity. He concluded that the continued survival of wild salmon populations in the Pacific Northwest depends on reversing the degradation of fresh water habitat quality.

Alternative 1 (no action)—Since the no-action alternative retains the existing habitat conditions, this alternative would perpetuate existing low fresh-water survival rates of salmonids in most streams. Fresh water survival rates may decrease in streams with early-successional conditions adjacent to streams and low flood-plain interaction, such as the North Fork Indian Creek and Maria Creek, until large trees become established and incorporated into channels as large wood, creating floodplain interactions. During periods of improved ocean survival, fish populations may have a slower rate of recovery.

Alternative 2—This alternative would add large wood to stream channels to improve fish production. Restoration projects in similar Oregon coast streams have resulted in increased production of anadromous salmonids. Coho salmon over-winter survival rates increased about three fold after implementation of habitat restoration activities in upper Lobster Creek of the Alsea Basin and in East Creek of the Nestucca Basin, while survival in the reference streams (reference streams receive no treatment) decreased or remained virtually unchanged (Solazzi et al. 2000). Average coho summer-rearing densities in the treatment reach of Bailey Creek, a tributary to Mercer Lake, have increased by six times, while the reference reach densities have increased two fold (USFS 2004). Freshwater survival of steelhead and coho increased about two times in Tenmile Creek following additions of large wood—similar in design to Alternative 2—but did not change in the Cummins Creek reference stream (S. Johnson, ODFW pers. comm.). Based on these and other similar studies, we expect to see improved freshwater survival in areas where large wood is added to streams.

Effects on fish from adding large wood may include some short-term disturbance during log placement. Fish would disperse, but observations made during past, similar helicopter projects have shown that fish re-colonize the project area within a few minutes after large-wood placement. Fish could be struck by logs during placement, but this event is unlikely.

*Essential fish habitat* (*Magnuson-Stevens Act*)—Based on the rationale and effects outlined in this document; Alternative 2 is not likely to adversely affect Oregon coast coho salmon and Oregon coast chinook salmon habitat. In the long-term, habitat quantity and quality are expected to increase as a result of project activities.

*Regional Forester's sensitive species*—Based on the rationale and effects outlined in this document, Alternative 2 is expected to prevent adverse impacts to Regional Forester's sensitive species in the project area that include Oregon coast chinook salmon, chum salmon (*Oncorhynchus keta*), Oregon coast steelhead, and coastal cutthroat trout. In the long term, habitat quantity and quality are expected to increase as a result of project activities. Regional Forester's sensitive species Umpqua dace (*Rhinichthys evermanii*) are not known to occur in the project area.

## Terrestrial Species

**Wildlife** (*Enterprise Team Biologist*)

## USFWS Consultation

For individual removal of mature conifers, as proposed under this project, consultation with the U.S. Fish and Wildlife Service (FWS) for terrestrial species was conducted. The FWS responded with the <u>Biological Opinion and Letter of Concurrence for Effects to Bald Eagles, Northern Spotted Owls, Marbled Murrelets, Northern Spotted Owl Critical Habitat, and Marbled Murrelet Critical Habitat from the U.S. Department of the Interior, Bureau of Land Management, Eugene District and Salem District, and U.S. Department of Agriculture, Siuslaw National Forest fiscal year 2005/2006 habitat modification activities within the North Coast Province</u> (Habitat Modification BO, FWS Reference Number 1-7-05-F-0005). Standards set forth in the biological opinion have been incorporated into the project design, or added as project design criteria to be followed as part of *Management Requirements Applied to All Project Activities*.

**Evaluation Of Effects**

Effects of the proposed projects were evaluated in relationship to (1) habitat components, (2) designated critical habitat, and (3) disturbance. All of the projects were assumed to be located within 0.25 miles of marbled murrelet, spotted owl habitat that was suitable but unsurveyed, or contained a murrelet occupied site.

**Effects Analysis (Listed Species)**

Potential effects related to implementation of the Indian Creek Aquatic Restoration Project are assessed for the following species. Supporting information is provided in the Habitat Modification Biological Assessment (USDA, USDI 2004).

**Marbled Murrelet**

**No Action**

No impacts would occur as a result of the no-action alternative.

**Alternative 2**

<u>Direct/Indirect Effects</u>
Removal of 410 mature trees to be used as structures for stream enhancement is proposed within the North Fork Indian, Rogers, Maria, and Herman subwatersheds.

Mature tree removal has the potential to alter suitable and designated critical habitat. An estimated 95 percent of selected trees would be removed from areas within murrelet designated critical habitat. Trees selected for removal would follow a protocol designed to minimize potential impacts to both suitable and designated critical habitat. Elements of the protocol include avoiding known nest trees and trees with suitable nesting habitat, buffering trees with suitable nesting characteristics, spacing selected trees, and removal of trees located only along an existing road or forest edge (see *Management Requirements Applied to All Project Activities*). Tree selection areas total approximately 15 miles, with an estimated average of just over 27 trees per linear mile projected for removal.

Tree felling would occur after August 5. Sites selected for mature tree removal are at least ¼ mile from known murrelet locations. However, much of the project area encompasses unsurveyed suitable habitat. Activities that occur during the nesting season, including tree felling, may disturb nesting birds. Such activities would occur during the latter part of the nesting season, and are subject to hourly restrictions. Therefore, the potential impact due to disturbance is reduced. Helicopter activities are proposed to occur outside the murrelet nesting season, thereby avoiding potential disturbance to nesting.

<u>Determinations</u>
Removal of individual mature trees for in-stream placement **may affect, but is not likely to adversely affect,** murrelet suitable habitat. The project **may affect** designated critical habitat;

however, no suitable nest trees would be removed, and the application of project design criteria and the dispersed nature of individual tree removal over the landscape aid in minimizing effects to murrelet critical habitat. Tree felling is scheduled to occur during the latter portion of the murrelet breeding season, with hourly restrictions. Therefore, felling **may affect, but is not likely to adversely affect**, nesting murrelets. Helicopter operations would occur outside the nesting season, and would have **no effect** on marbled murrelet nesting due to disturbance.

**Northern Bald Eagle**

**No Action**

No impacts would occur as a result of the no-action alternative.

**Alternative 2**

<u>Direct/Indirect Effects</u>
No known eagle nests are located within ¼ mile (½ mile line of sight) of the project area. The nearest active bald eagle nest occurs approximately 3.7 miles from proposed activities. None of the project area falls within potentially suitable bald eagle habitat (within 1 mile of a major river or within ½ mile of a major tributary). Project design criteria are designed to avoid trees that exhibit suitable nesting characteristics.

Tree felling would occur during the eagle nesting season, but outside potentially suitable nesting habitat. Helicopter activities are scheduled to occur outside the bald eagle nesting season; therefore, no disturbance to nesting eagles is expected to occur.

<u>Determination</u>
Removal of mature trees for use as in-stream structures are expected to have **no effect** on bald eagle suitable habitat since project design criteria state that no suitable nest trees would be selected for removal. In addition, trees proposed for removal fall outside potentially suitable bald eagle habitat.

No treatments are scheduled to occur within 0.25 mile or 0.5 mile line-of-sight of a known nest site or unsurveyed suitable habitat. In addition, project activities would occur outside the potentially suitable bald eagle habitat. Therefore, project activities would have **no effect** on nesting bald eagles.

**Northern Spotted Owl**

**No Action**

No impacts would occur as a result of the no-action alternative.

**Alternative 2**

Direct/Indirect Effects
Removal of mature trees to be used as structure for stream enhancement is proposed within suitable and designated critical spotted owl habitat. The manner of selecting trees for removal has the potential to adversely affect spotted owl nesting habitat. Therefore, project design criteria established to minimize the risk of adverse impacts have been incorporated into the project. No suitable nest trees or known nest trees would be selected for removal at any time. In addition, removal is expected to have minimal impact on habitat function because trees are scattered throughout the watershed and located along roads and existing edges.

Project activities would occur during the latter portion of the spotted owl nesting season creating potential for disturbance. The project lies within an area surveyed as part of the spotted owl demographic study conducted by the Pacific Northwest Forest Research station (PNW). Up until 2000, comprehensive owl surveys occurred within the watershed. Since 2000, opportunistic surveys have been conducted, and the project area is no longer considered 100 percent surveyed for owl presence. Therefore, portions of the project area are considered unsurveyed suitable habitat. Areas proposed for tree removal are located more than ¼ mile from known spotted owl nest sites. To minimize the potential for disturbance, 2005 PNW owl survey results would be obtained to determine up-to-date owl locations in relation to proposed activities. Mature tree removal would then be avoided within ¼ mile of known owl nest sites.

Tree felling would occur during the latter portion of the breeding season, in areas that may encompass unsurveyed suitable habitat. Therefore, there is potential for nesting disturbance. Helicopter activities would occur outside the nesting season and are not expected to impact owl nesting due to disturbance.

Determination
Mature tree removal for in-stream placement **may affect, but is not likely to adversely affect** spotted owl suitable habitat. Removal of mature trees for in-stream placement **may affect** critical habitat; however, since these trees are scattered throughout the watershed, removal is not expected to alter the function of critical habitat. Tree felling that occurs during the period August 6 – September 30 **may affect, but is not likely to adversely affect** nesting owls. Helicopter activities are expected to have **no effect** on nesting owls due to disturbance.

**Impacts to Sensitive Wildlife Species**

Of sensitive species listed on the Regional Foresters Sensitive Species list, the following may occur in the project area:

Pacific shrew
Baird’s shrew
Pacific fringe-tailed bat
Red tree vole

Remaining species from the list either do not occur within the project area or suitable habitat elements for these species are lacking in and adjacent to the project area.

**Pacific Shrew and Baird's Shrew**

Both of these species appear to be associated with riparian areas and down decayed logs in forested habitats of coastal Oregon (Csuti et al. 1998). The Pacific shrew may be less associated with mature conifer stands.

**No Action**

This alternative maintains existing habitat conditions. No impact would occur under this alternative.

**Alternative 2**

Removal of mature trees along roads and openings would occur outside riparian areas, thereby avoiding habitat suitable for both shrew species. Placement of large logs for in-stream enhancement, some of which rest outside creeks, is expected to enhance habitat for both species. No removal of existing down logs is proposed under this project.

The proposed action may impact individuals, but is not expected to impact species viability or cause a trend toward federal listing.

**Pacific Fringe-tailed Bat**

Christy and West (1993) describe fringe-tailed bats as utilizing caves, mines, and buildings for hibernation, maternity, and solitary roosts. In addition, this species is known to utilize larger snags in lower canopy cover as roost sites (Weller and Zabel 2001). They feed predominately on moths along forest edges, roads, or open areas within the forest.

**No Action**

No changes would occur under this alternative. The no action would have no impact on Pacific fringe-tailed bats.

**Alternative 2**

Proposed treatments would have no impact on caves, mines, or buildings that represent potential hibernation or maternity sites. Trees selected for removal are live, thereby avoiding removal of roosting habitat provided by snags. There is potential for felling of snags adjacent to trees selected for removal to reduce hazards for operations. However, this is expected to be rare.

Alternative 2 may impact individuals, but is not expected to impact species viability or cause a trend toward federal listing.

## Red Tree Vole

### No Action

This alternative would not change existing conditions. No impact to red tree voles would occur.

### Alternative 2

The project area occurs within the known geographic range of the red tree vole and within suitable habitat as described by Biswell et al. (2002). Affected trees would be individuals or, less common, scattered small groups (up to 3 to 4 trees) and sparsely distributed across the landscape, occurring only along existing plantations or openings.

The proposed action may impact individuals, but is not expected to impact species viability or cause a trend toward federal listing.

## Wildlife Management Indicator Species (MIS)

The following species are identified as management-indicator species (MIS): Marten, spotted owl, pileated woodpecker, primary cavity nesters, and ruffed grouse.

### No Action

Existing habitat conditions would be maintained under this alternative. No impacts would occur.

### Alternative 2

Removal of mature trees for in-stream placement would occur along edges of mature stands. Since live trees would be used, and such trees would be scattered, the potential for impacts to martens, pileated woodpeckers, and primary cavity nesters should be minimal. Impacts to spotted owls are discussed under the *Listed Species* section.

Project activities may impact individuals, but are not expected to impact local populations of wildlife management indicator species. No impacts to ruffed grouse are expected.

## Landbird Assessment

Landbirds, including migrant and resident species, are those that generally use terrestrial and wetland habitats. Habitats these species could be found using in the Indian Creek Project Area include forest canopies, snags, understories, ground vegetation/structure, and existing openings. Some landbirds expected in the project area include Hammond’s flycatcher, tree swallow, Swainson’s thrush, and black-throated gray warbler.

### No Action

No impacts would occur under this alternative.

**Alternative 2**

There is potential for physical disruption of land bird nesting by mature tree removal operations conducted during the breeding season. Mature tree removal and placement would occur in August through October, which is expected to be past the nesting period for most landbirds (see *Seasonal Activity and Behavior* descriptions for various landbirds species in Marshall et al. 2003). Loss of habitat caused by mature tree removal is likely to be minimal due to project design criteria applied for TES species.

**Plants** *(Forest Botanist)*

*Federally listed species*—The planning area contains no suitable habitat for Nelson's checker mallow (Sid*alcea nelsoniana*) or western lily (*Lilium occidentale*). Neither Alternative affects these species.

*Sensitive plants and fungi*— At the time of project initiation, there were no documented sensitive plant or fungi sites within or adjacent to the proposed project area. The biological evaluation determined that potential habitat was likely for three bryophyte (mosses and liverworts), nine lichen and 10 fungi species. A field reconnaissance of the project area confirmed the presence of *Usnea longissima*, a sensitive lichen species, from fifteen sites.

The field reconnaissance did not attempt to detect any of the 10 fungi with potential habitat in the project area. Since surveys were not conducted for fungi, the biological evaluation assumed that the ten species with potential habitat are present in the project area.

For the following species alternative 1 would have no effect and alternative 2 would not impact on the persistence of this species in the project area, nor would implementation lead to a trend toward federal listing.

- *Usnea longissima*
- *Cordyceps capitata*
- *Leucogaster citrinus*
- *Phaeocollybia attenuate*
- *Phaeocollybia californica*
- *Phaeocollybia dissiliens*
- *Phaeocollybia piceae*
- *Phaeocollybia pseudofestiva*
- *Phaeocollybia sipei*
- *Phaeocollybia spadicea*
- *Sowerbyella rhenana*

*Noxious and undesirable weeds*—Ground-disturbing activities that expose mineral soil on sites with moderate to full sunlight exposure greatly increase the potential for noxious or undesirable weed colonization and establishment.

The Siuslaw National Forest weed database has record of established infestations of bull thistle (*Cirsium vulgare*) and Japanese knotweed (*Polygonum cuspidatum*) in the vicinity of the project area.

Alternative 1 would not increase the risk of weed colonization. The spread of weeds in the project area would continue at background levels, primarily along roads and riparian areas.

Alternative 2. Bull thistle is currently present in areas proposed for tree harvest. Opening the tree canopy would favor the expansion of bull thistle until the canopy closes. Japanese knotweed is not known to occur within any of the sites targeted for tree harvest or log placement; however, there are sites within close proximity. Mitigations built into the project design to limit the amount of soil disturbance to the greatest extent practical, and assure that weed spread does not occur from contaminated equipment would reduce the risk of weed establishment or expansion to acceptable levels. Specific prevention measures are in Appendix A.

**Public and Management Access** (*Forest Transportation Planner*)

Access in the project area would be temporarily affected during two time periods. The first time period is when the source trees would be felled. Access would be stopped only during felling along road systems where vehicular access currently occurs. In non-vehicular areas, USFS personnel would be on site to ensure unauthorized personnel do not enter the felling area in order to ensure their safety.

The second time when access would be affected is when the helicopter is flying the trees. Again to ensure public safety, source areas and the associated roads would be closed temporarily only in areas where the helicopter is currently operating. Other roads within the project area would remain open.

**Fire** (*Forest Fuels/Fire Planner*)

Alternative 1 (no action) would not change existing fuel conditions in the watershed. Under Alternative 2, placing logs in streams would not substantially change existing fuel conditions in the watershed because of proximity to streams. The humidity is higher near streams, resulting in higher fuel moisture content for large wood. The higher fuel moistures generally keep the risk of fire hazard low.

**Human Uses and Influences**

*Heritage resources (Forest Archaeologist)*—Alternative 1 would have no effect on heritage resources. Actions proposed under Alternative 2 would generally take place on disturbed ground and not require field inventories or concurrence from the State Historic Preservation Office (SHPO) before implementation. No adverse effects are anticipated at known sites, because of protection and avoidance measures to be taken where large wood is placed in streams. These actions would be reviewed according to our programmatic agreement with the SHPO and would meet the requirements of the National Historic Preservation Act. No treaty resources are in the project planning area.

*Recreation (District Resource Planner)*—Alternative 1 would retain the existing dispersed recreational experience, including fishing and boating opportunities.

Under Alternative 2, existing open roads would not be affected. Adding large wood to streams would occur upstream from areas traditionally used for recreational boating. No known effects on the ability to fish would occur, because of project locations (map 2) and design criteria (appendix A). Fishing success may increase in the long term, based on fish population responses to similar previous activities, such as those associated with the Tenmile Restoration Project that was implemented in October 1996.

*Scenery (Forest Landscape Architect)*—Alternative 1 retains the existing scenery. Alternative 2 propose adding large wood to streams to improve the function of streams in the Indian Creek watershed. These actions are consistent with scenic-quality objectives for the area. Natural deposits of trees and rocks are preferable to those added in restoration projects for natural appearance, function, and distribution. By using whole trees instead of cabling and anchoring logs in streams, the two alternatives retain a more natural appearance. The proposed addition of whole trees to streams at natural accumulation points along stream systems is expected to improve their natural appearance and restore scenic integrity while enhancing scenic quality.

*Special forest products (District Forester)*—Alternative 1 does not affect the gathering of special forest products, such as mushrooms, ferns, moss, salal, etc. Proposed actions under Alternative 2, like adding large wood to streams are not expected to affect the ability to gather special forest products through required permits or leases because they would not change existing vehicle access.

*Domestic water sources (Special Use coordinator)*—Based on a review of special-use records regarding location of water diversion points, none of the proposed activities under Alternative 2 would impact known water systems on National Forest System lands.

**Summary of Project Costs** *(District Fish Biologist)*

The project would be done in conjunction with one other project (Yachats River) on the Siuslaw National Forest to help save implementation costs. Estimated cost for Alternative 2 is $763,350. The following are estimates for major cost items of the project:

- Personnel - $29,600
- Helicopter Contract (including hiring of local fellers to cut trees) - $297,000
- Value of 410 trees - $410,000

## Other Predicted Effects

### Cumulative Effects *(The Team)*

The Council on Environmental Quality defines cumulative effects on the environment as those that result from the incremental actions of a proposal added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes them (40 CFR 1508.7).

For purposes of analyzing cumulative effects, the geographic area potentially affected by Alternative 2 is the 13,000-acre planning area in the Indian Creek 5$^{th}$ field watershed. The Team considered the need to extend the geographic area for each of the affected resources, but we believed that effects were not meaningful or measurable beyond the project planning area.

It is likely within the next 5 years that a landscape based environmental analysis would occur in the Indian Creek watershed. This EA would likely cover thinning of plantations throughout the watershed and a roads analysis. Other likely future actions on federal lands in the project planning area include ongoing road maintenance, repair of key forest roads, harvesting of special forest products such as firewood, salal, sword fern, and moss, riparian planting and release, and early seral meadow maintenance.

On state and county land, actions are expected to be limited to maintaining roads. Lane County—through the Siuslaw Watershed Council—is replacing culverts that hinder fish passage, although none are planned for the Indian Creek watershed in 2005.

On non-federal land, which comprises 9 percent of the project area, the Team expects private landowners to continue current practices and uses of their land, with no changes to current county and state land-use regulations. Current uses include industrial timber harvesting, rural residential, farming, livestock grazing, and limited non-industrial timber harvesting. Based on local industrial timber management objectives and practices, we expect harvest activities on industrial lands before those stands reach 80 years of age. Currently, many of these stands are younger than 25 years. Based on current observations, industrial timber harvesting is occurring, primarily in the Mainstem Indian subwatershed. Some landowners are making efforts to control noxious weeds on their properties. Others have begun to plant trees and shrubs along the stream.

Cumulative effects are measured relative to the baseline conditions. Where specific effects are not described for a particular resource, cumulative effects are not expected to be measurably different from those under baseline conditions. When added to the effects of past, present, and reasonably foreseeable future actions on federal and non-federal lands in the watershed, Alternatives 1 and 2 are expected to have the following cumulative effects:

<u>Alternative 1, no action</u>

Aquatic species habitat recovery would depend on natural processes and take much longer than expected under Alternative 2. Short-term cumulative effects on forest dwelling species would be limited to noise disturbance from maintaining and repairing key forest roads. Considering current county and state land use regulations, as well as the location of existing facilities and land uses, rivers and flood plains would be subject to the effects of flood events at about the same frequency and intensity as current levels.

Alternative 2

Sediment production—Other inputs to the sediment budget for Indian Creek over the last 10 years include periodic deep-seated rotational slumps and debris torrents occurring throughout the Indian Creek watershed. There are at least four known large, deep-seated rotational slumps that have actively contributed to streams within the Indian Creek sub-basin over the last 10 years. One such large-scale event occurred in a tributary to West Fork Indian Creek, just above the junction with Rogers Creek in the late 1990s. Due to hill slope instability caused by a large rotational slump on approximately 3 acres, two headwalls have failed and slide tracks have joined to form one large track that scoured material for approximately 2/3 of a mile before hitting West Fork Indian Creek.

In general, the majority of erosion and scour is located on steeper National Forest land and most of the deposition occurred at the lower gradient section of this tributary on private land below as well as in the floodplain and channel of West Fork Indian Creek. From the hydrologist report (Hogervorst, 2005) a minimum of 18,000 cubic yards came out of this one slide alone. Due to the conservative methods of estimation, this number could be only half the true amount.
Although it is very difficult to estimate slide volumes and how much material contributes to the stream, this exercise illustrates the fact that even if one tenth of the conservatively estimated slide material reached the main stem of West Fork Indian Creek, this amount would still be more than double the net sediment that was liberally estimated to have eroded from structures placed in North Fork Indian Creek. Given that there are at least three other such slumps in the sub-basin, structure-related erosion comprises a very small percentage of the total sediment budget for the sub-basin over the last 10 years of concern.

One other contribution to the sediment budget that was not directly analyzed in the field for this report is the amount of main stem stream bank with extreme potential for erosion due to grazing and vegetation loss on private land. Over 4.5 miles of bank are in bare, unvegetated condition that would likely be rated extreme in Rosgen's bank erosion index (Hogervorst 2005). Active erosion is occurring in many of these reaches and contributes to downstream sedimentation.

Placing large wood in streams would increase sedimentation in the short term, but would reduce sedimentation in the long term. Overall, Alternative 2 is not expected to measurably increase or decrease sediment production in the project planning area.

Water use—Alternative 2 is not expected to measurably increase or decrease water flow.

Soil productivity— The effect of removing 410 trees from along approximately 15.5 miles of road and placing those trees in the creek bottoms would not be measurable at this scale. Thus, none of the proposed activities are expected to adversely affect soil productivity in the watershed.

Stream flow—Adding large wood to streams help to disperse stream velocities associated with peak and storm flows, resulting in a net cumulative decrease over the long term. Considering existing county and state land use regulations as well as the location of infrastructure and existing facilities on the flood plain, the effects of flood events are unchanged in frequency and intensity from current levels.

Stream temperature (water quality)—Based on project design, adding large wood to streams is expected to improve watershed function and lower stream temperatures at a local scale. A cumulative decrease in temperature at the Indian Creek watershed scale is not likely due to the much larger impact of the mainstem of Indian Creek. Private lands along the mainstem are lacking riparian shade and the mainstem has a predominantly bedrock substrate. Shade will be reduced in areas of log placement due to dropping of alders for log placement safety and accessibility and from rotor wash of helicopter resulting in alder breakage.

Aquatic species—When viewed as a whole, Alternative 2 is likely to have minor adverse effects on aquatic species during project implementation and up to two years later. In the long term, net improvements to aquatic habitat are expected to accrue with increased stream complexity, increased spawning habitat for fish, and reduced sedimentation. These actions are expected to substantially benefit aquatic species and reduce adverse cumulative effects that may result from other activities in the watershed.

Terrestrial species (listed, sensitive, management indicator species, landbirds)—In the short term, noise disturbances from activities, such as felling trees and placing them in streams, are likely to have minor adverse effects on all terrestrial species to some degree. The dispersal in timing and distribution of these actions across the watershed, however, are such that impacts are expected to be localized and not lead to adverse cumulative effects based on disturbance. Tree-removal sites for large wood are scattered across the landscape and are not expected to measurably add to the existing fragmented condition of late-successional forest habitat.

About 82 percent (25,377 acres) of the Indian Creek watershed are National Forest lands. Timber stands on an estimated 44 percent of Forest Service acres are managed, consisting primarily of stands regenerated from clear-cuts created in the 1950s through early 1990s. The remainder exists in natural stands composed mainly of mature Douglas-fir forest (50.1 percent), or alder with a Douglas-fir component (5.8 percent). Proposed treatments would remove up to 410 trees, estimated to be equivalent to about 10 acres of mature Douglas-fir forest. Removal of 10 acres would continue to retain approximately 50.1 percent of mature stands within the watershed. Due to the scattered nature of mature trees to proposed for removal, and the location (along roads and edges), the effect of removal on suitable and designated critical habitat is expected to be minimal.

Other past actions on Forest Service lands within the watershed that had potential to impact mature stands include commercial thinning (removal of hazard trees) road construction (removal of forested habitat), salvage, road decommissioning, and salvage. In addition, previous in-stream restoration projects utilizing mature trees have occurred. An estimated 54 trees were taken from road sides in 1993, 1997, and 2000.

Reasonably foreseeable future actions on Forest Service lands within the watershed include commercial thinning and associated activities, road reconstruction, and issuance of various special use permits.

Past activities on private lands have included regeneration harvesting, road construction, rural development, and ranching and cattle grazing. Clear-cutting and road construction have contributed to loss of mature forest. Very little mature forest remains on private lands within the Indian Creek watershed. Future activities on private lands are likely to mirror past actions, with the exception that regeneration harvest is likely to remove younger trees, probably in the 30 to 50 year age range.

While these projects contributed to some loss of mature trees and increases in disturbance within the watershed, additional effects due to the proposed action are not expected to be significant.

Fire—Project activities are not expected to cumulatively increase the risk of human-caused fire ignition in the watershed in the long term because cut trees would be in or near streams where humidity levels are much higher than surrounding areas; high humidity levels substantially reduce risk of fire ignition.

Heritage resources—Adverse cumulative effects are not expected because proposed activities generally occur on previously disturbed ground, resulting in minimal risk to heritage resources.

Recreation—Proposed actions are not expected to cumulatively affect the existing recreation experience because proposed activities would maintain recreation opportunities for forest users.

Scenery—Some activities on other ownerships may cumulatively reduce visual quality in the watershed until the landscape recovers. Actions proposed under Alternative 2 would be consistent with the scenic quality objectives for the planning area and are expected to improve the scenic quality of the area in the long term.

Public and management access—Proposed actions would not change public and management vehicle access to public lands.

Listed, and sensitive plants—Based on project design criteria in appendix A, project activities are not expected to cumulatively impact listed or sensitive plants.

Noxious weeds—Some activities on other ownerships may cumulatively increase the presence of noxious weeds in the watershed until the landscape recovers. Activities under Alternative 2 would maintain current weed infestation levels on federal land. Infestation levels are expected to decline in the watershed in the foreseeable future as native vegetation recovers on disturbed areas and plantation trees grow, increasing shade over areas adjacent to roads.

In summary, considering other ongoing and likely actions on federal, state, county, and private lands in the Indian Creek watershed, Alternative 2 is expected to reduce the adverse cumulative effects on the landscape, thereby accruing net beneficial cumulative effects for most resources. The cumulative effects are generally beneficial over time and an improvement over existing conditions.

**Aquatic Conservation Strategy** *(The Team)*

On March 22, 2004 the USDA Under Secretary for Natural Resources and the Environment signed Record of Decision (ROD) amending the Northwest Forest Plan. The decision clarifies provisions relating to the application of the ACS. Specifically, the amendment removes the need for deciding officials to certify that individual projects meet ACS objectives at the site-specific level and short time frames. Instead, the ROD requires individual projects to meet ACS standards and guides and that ACS objectives be met at watershed or larger scales ($5^{th}$ field hydrologic fields or greater) and over longer time periods of decades or more. Project records must also demonstrate how the decision maker used relevant information from watershed analysis to provide context for project planning.

The $5^{th}$-field Indian Deadwood Watershed Analysis describes the existing conditions in the watershed, including those that are having adverse effects on watershed health (page 3). The Indian Creek Aquatic Restoration Project is designed to restore watershed health by increasing the levels of large wood in streams which would improve the overall function of the stream system. By improving watershed health, the project meets ACS objectives, standards, and guidelines in the short term and long term at the watershed scale.

**Short-Term Uses and Long-Term Productivity** (*The Team*)

The use or protection of natural resources for long-term, sustained yield is the legislated basis of management and direction for the Forest Service (USDA, USDI 1994a, p. 321). Short-term uses include actions such as preparation of wood placement sites. The design criteria were developed to incorporate the standards and guides of the Siuslaw Forest Plan as amended by the Northwest Forest Plan. We expect that applying them to the proposed management actions (falling alders) would reduce the potential for long-term loss in productivity of riparian areas that may result from short-term uses. They would also allow for the long-term development of late-successional habitat and restoring aquatic ecosystems.

**Unavoidable Adverse Effects** (*The Team*)

Implementing any alternative would result in some adverse environmental effects that cannot be avoided. The design criteria, along with Forest standards and guides, are intended to keep the extent and duration of these effects within acceptable rates, but adverse effects cannot be completely eliminated. The following adverse environmental consequences would be associated to some extent with Alternative 2:

- Short-term, localized reductions in air quality from dust, smoke, and vehicle emissions resulting from management actions and forest users.
- Disturbance to wildlife when their habitat is disturbed by management actions or recreation activities.
- Temporary increase in large vehicle traffic during large-wood addition.

**Irreversible Resource Commitments** (*The Team*)

Irreversible commitments of resources are actions that disturb either a non-renewable resource (for example, heritage resources) or other resources to the point that they can only be renewed over 100 years or not at all. The design criteria—along with Forest standards and guides—are intended to reduce these commitments, but adverse effects cannot be completely eliminated. For example, the felling of the mature conifers for the helicopter trees is an irreversible commitment of the timber resource because of the long time needed for the trees to grow to this size again (over 120 years)

**Irretrievable Commitment of Resources** (*The Team*)

An irretrievable commitment is the loss of opportunities for producing or using a renewable resource for a period of time. Almost all activities produce varying degrees of irretrievable resource commitments. They parallel the effects for each resource discussed earlier in this chapter. They are not irreversible because they could be reversed by changing management direction. The irretrievable commitment of resources, such as placement of trees for large wood placement in streams, would be associated to some extent with Alternative 2.

**Environmental Justice** (*Resource Planner*)

Based on local knowledge, small pockets of low-income populations live in the planning area and some augment incomes through actions such as gathering firewood and picking brush to sell. Some farms exist in the planning area and domestic-use water systems include individual wells and spring-fed systems.

Proposed activities are not expected to affect opportunities for gathering firewood or commercially harvesting shrubs. Some proposed actions in the Indian Creek watershed may provide opportunities for jobs. None of the proposed actions are expected to physically affect farms or water quality of domestic-use water systems.

In summary, effects of alternatives on the human environment (including minority and low-income populations) are expected to be similar for all human populations regardless of nationality, gender, race, or income. No disproportionately high and adverse human health or environmental effects on minority populations and low-income populations are expected as a result of implementing actions described for Alternative 2.

**Other Disclosures** (*The Team*)

Based on the Team's evaluation of the effects, we concluded:

- ⇨ None of the alternatives would affect minority groups, women, and consumers differently from other groups. These groups may benefit from employment opportunities that proposed activities would provide; the no-action alternative would have neither adverse nor beneficial effects. None of the alternatives adversely affects civil rights. All contracts that may be awarded as a result of implementation would meet equal employment opportunity requirements.

- ⇨ None of the proposed activities would affect known prehistoric or historic sites because no new disturbance on previously undisturbed ground is expected. As outlined in the American Indian Religious Freedom Act, no effects are anticipated on American Indian social, economic, subsistence rights, or sacred sites.
- ⇨ No adverse effects on wetlands and flood plains are anticipated. No farmland, parkland, rangeland, wilderness, or wild and scenic rivers would be affected.
- ⇨ This environmental assessment is tiered to the Siuslaw Forest Plan FEIS, as amended by the Northwest Forest Plan, and is consistent with those plans and their requirements.
- ⇨ Proposed activities are not in or adjacent to an inventoried roadless area.
- ⇨ Proposed activities are consistent with the Coastal Zone Management program.
- ⇨ None of the proposed activities are expected to substantially affect human health and safety.
- ⇨ Proposed activities are consistent with the Clean Air Act because effects from use of heavy equipment that can generate dust and exhaust are localized and short-term.
- ⇨ Because of the design criteria (appendix A) to be applied, this project is expected to be consistent with the Clean Water Act.
- ⇨ The proposed activities are not expected to measurably affect global warming. The USDA Forest Service would continue an active leadership role in agriculture and forestry regarding the reduction of greenhouse gas emissions.
- ⇨ These actions do not set a precedent for future actions because they are similar to actions implemented in the past.

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# Glossary

Most definitions of the terms in this glossary were taken from, or adapted from, the glossaries of the following documents:

- 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 (USDA, USDI 1994a);
- Forest Ecosystem Management: An Ecological, Economic, and Social Assessment (USDA, USDI et al. 1993);
- Forest Stand Dynamics: Update Edition (Oliver and Larson 1996); and
- Siuslaw National Forest Road Analysis (USDA 2003c).

**Adaptive management**--Changing practices based on management activities that are planned, monitored, and evaluated, with learning considered along with resource objectives. Because learning from forest practices often takes many years, adaptive management must initially focus on providing information for future decisions. Adding aspects of the scientific method to management practices can increase confidence in the interpretation of outcomes.

**Aquatic ecosystem**--Any body of water, such as a stream, lake, or estuary, and all organisms and nonliving components within it, functioning as a natural system.

**Bank-full flow**—Stream flow during which the stream reaches the top of its banks. Bank-full flow is reached or exceeded only 25 percent of the time. This type of flow is important because most of the geomorphic work—changes in channel form and movement of sediment—is done at this flow.

**Best management practices (BMP)**--Methods, measures, or practices designed to prevent or reduce water pollution or other environmental damage.

**Biodiversity**--The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

**Biological opinion**--The document resulting from formal consultation with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, stating a finding about whether a federal action is likely to jeopardize the continued existence of listed species or result in destroying or adversely modifying critical habitat.

**Classified road**--A road wholly or partially in or adjacent to National Forest system lands that are determined to be needed for long-term motor vehicle access, including state, county, and private roads, National Forest system roads, and other roads authorized by the Forest Service.

**Code of Federal Regulations (CFR)**--A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

**Conservation strategy**--A management plan for a species, group of species, or ecosystem that prescribes standards and guidelines which, if implemented, provide high likelihood that the species, groups of species, or ecosystem, with its full complement of species and processes, will continue to exist, well-distributed, throughout a planning area.

**Critical habitat**--For listed species, specific parts of the geographic area occupied by a federally listed species that have physical and biological features essential to conserving the species, and that may require special management consideration or protection; also specific areas outside the geographical area occupied by a species but essential for its conservation. Designated critical habitats are described in 50 CFR 17 and 226.

**Debris flow**--A rapidly moving mass of rock fragments, soil, and mud, with more than half of the particles larger than sand.

**Dispersed recreation**--Recreation use outside developed recreation sites, including activities like hunting, fishing, scenic driving, hiking, bicycling, horseback riding, and recreation in primitive environments.

**Domestic water sources—**Streams on National Forest System lands used as sources for providing surface waters to facilities that treat and/or distribute water for domestic purposes. These purposes include normal household uses such as drinking, food preparation, bathing, washing clothes and dishes, watering lawns and gardens, and other similar uses.

**Ecosystem management**--At the core of ecosystem management is the idea that ecosystems are complex assemblages of organisms interacting with their environment and changing in complex ways over time. Science-based knowledge of how ecosystems work is important to managing forests to maintain their biodiversity and long-term productivity. The first step has often been to reallocate or rezone forests to meet new primary objectives. Concepts of joint production are emerging, however, that attempt to manage for multiple objectives, with no single objective considered primary, and focusing on finding compatible groupings of objectives where possible. An alternative concept to reallocation being proposed and tested is disturbance-ecology-based management. This idea centers on the concept that organisms are more adapted to the historical disturbance patterns than to specific successional states, and that management could more closely emulate natural disturbances and ecosystem responses to disturbance, as a way to maintain diversity and long-term productivity and at the same time continue limited resource extractions.

**Effective shade—**Percent of a given day a point on a stream is shaded. Takes into account local factors such as topography, vegetation height and density, and stream orientation; as well as characteristics of the sun, including path during the day and solar intensity.

**Fifth-field watershed**--The geographical area of a watershed that is generally 50,000 to 100,000 acres in size.

**Floodplain—**A level lowland bordering a stream or river onto which the stream flow spreads at flood stage.

**Forest ecosystem**--The entire assemblage of organisms (trees, shrubs, herbs, bacteria, fungi, and animals, including people) together with their environmental substrate (the surrounding air, water, soil, organic debris, and rocks), interacting inside a defined boundary. Because ecosystem boundaries are arbitrarily set as a research tool, they can be defined at many scales, from a leaf surface to the entire planet. Forest ecosystems are often studied in bounded watersheds draining to a monitored stream.

**Heritage resource**--The remains of sites, structures, or objects resulting from past human activity that have important socio-cultural value, whether historic, prehistoric, archaeological, or architectural. For this project, “heritage resource” refers only to actual physical things--places, structures, or artifacts that are material evidence of a past way of life--rather than to traditions, customs, or modern life styles. Heritage resources are fragile and nonrenewable; their values, once destroyed, cannot be recreated.

**Heritage site**--Any definite place of past human activity with important socio-cultural value--historic, prehistoric, archaeological, or architectural--identifiable through field survey, historical documentation, or oral evidence.

**Hyporheic zone**—Area where subsurface water flows under the stream channel and floodplain and contributes to a stream. This contribution is important because it moderates daily fluctuations in stream temperature—especially important during the summer season.

**Landscape**--A heterogeneous land area with interacting ecosystems repeated in similar form throughout.

**Late-successional forest**--Forest in the seral stages that include mature and old-growth age-classes.

**Late-successional reserve**--A mature or old-growth forest reserved under the record of decision for the Northwest Forest Plan.

**Listed species**--Those plant and animal species listed in the Federal Register as threatened or endangered.

**Management-indicator species--**Species identified in the Siuslaw National Forest Land and Resource Management Plan for special consideration because their population changes are believed to indicate the effects of management activities on the health of mature forests.

**Mature conifer stand**--A stand of trees where the annual net rate of growth has peaked. Stands are generally older than 80-100 years and younger than 180-200 years. Stand age, diameter of dominant trees, and stand structure at maturity vary by forest cover types and local site conditions. Mature stands generally contain trees with smaller average diameter, less age-class variation, and less structural complexity than do old-growth stands of the same forest type.

**Matrix**--Federal lands outside reserves, withdrawn areas, and managed late-successional areas and primarily managed for timber harvest.

**Mitigation measures**--Modifications of actions to avoid adverse effects by not taking a certain action or parts of an action; minimizing adverse effects by limiting the scope or intensity of the action; rectifying adverse effects by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating adverse effects over time by preserving and maintaining operations during the life of the action; or compensating for adverse effects by replacing or providing substitute resources or environments.

**Monitoring**--A process of collecting information to evaluate whether the objective and anticipated or assumed results of a management plan or project are being realized or whether projects are being implemented as planned.

**Noxious weed**--A plant specified by law as being especially undesirable, troublesome, and difficult to control.

**Overstory**--Trees that provide the uppermost layer of foliage in a forest with more than one roughly horizontal layer of foliage.

**Peak flow**--The highest amount of stream or river flow in a year or from a single storm event.

**Redd—**The spawning area in the stream gravel that holds the fertilized eggs of salmon or trout.

**Release—**Freeing a tree or group of trees from immediate competition for nutrients and sunlight by eliminating or over-topping closely surrounding vegetation.

**Riparian area**--A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it; it includes floodplain, woodlands, and all areas within a horizontal distance of about 100 feet from the stream channel's normal high-water line or from the shoreline of a standing body of water.

**Riparian reserve**--Designated riparian areas outside late-successional reserves and reserved under the record of decision for the Northwest Forest Plan.

**Road analysis--**An integrated ecological, social, and economic science-based approach to transportation planning that addresses existing and future road management options.

**Root wad—**A mass of roots attached to trees.

**Sediment—**Soil, rock, particles, organic matter, or other dissolved or suspended debris that is transported through a cross-section of stream in a given period. Consists in dissolved load, suspended load, and bed load. Fine sediment is sand size or smaller and is carried by the water column in a suspended fashion. Bed load is too large to be moved by water in the water column; it is moved by rolling along the stream bed. Sediment is measured in dry weight or by volume.

**Sensitive species**--Species mentioned in the Federal Register as proposed for classification or under consideration for official listing as endangered or threatened species, on an official state list, or recognized by the Forest Service or other management agencies as needing special management to prevent their being placed on federal or state lists.

**Seral**--A biotic community that is in a developmental, transitory stage in an ecological succession.

**Site productivity**--The ability of a geographic area to produce biomass (total quantity of living organisms), as determined by conditions (for example, soil type and depth, rainfall, temperature) in that area.

**Soil compaction**--An increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure. The actual physical change is primarily reduction of noncapillary pore space, which in turn reduces infiltration, permeability, and gaseous exchange.

**Soil displacement--**The removal and horizontal movement of soil from one place to another by mechanical forces such as a bulldozer blade.

**Special forest products**--Forest products sold for commercial use such as fern, salal, and moss; also others offered for personal use such as shrubs for transplanting, Christmas trees, and firewood.

**Species richness—**The measure of the number of species that inhabit a particular area. Areas can be an ecological type, such as a temperate old-growth forest, or a geographical type, such as an island. It is also a measure of how complete the web of life is in a particular area. If an area is occupied by all the native species that historically lived there, then the species richness is very high. If occupancy is below historic, native levels, then species richness is lower than optimal.

**Standards and guides**--The primary instructions for public land managers. Standards address mandatory actions, and guides are recommended actions necessary to a land management decision.

**Stream reach**--An individual first-order stream or a segment of another stream that has beginning and ending points at a stream confluence. Reach points are normally designated where a tributary confluence changes the channel character or order. Stream reaches are normally 0.5 to 1.5 miles long.

**Subwatershed**--A land area (basin) bounded by ridges or similar topographic features, encompassing only part of a watershed.

**Survey-and-manage species**--Species that are closely associated with late-successional or old-growth forests whose long-term persistence is a concern; in this document, those with ranges in the Lower Siuslaw watershed. Species are listed in the record of decision (table C-3) for the Northwest Forest Plan. Mitigation measures and standards and guidelines for managing survey-and-manage species are amended by the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines (USDI, USDA 2001).

**Take—**The Endangered Species Act (Section 3) defines take as “to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect, or attempt to engage in any such conduct”. The US Fish and

Wildlife Service further defines “harm” as “significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering”, and “harass” as “actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering”.

**Threatened species**--Those plant or animal species likely to become endangered throughout all or a significant portion of their range in the near future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

**Turbidity—**An indicator, but not a direct measure of, suspended sediment. Turbidity affects the depth of watercolor and the ability of fish to see prey.

**Unclassified road**--A road on National Forest System land that is not managed as part of the National Forest transportation system, such as an unplanned road, abandoned travelway, and off-road vehicle track that has not been designated and managed as a trail; and those roads that were under permit or other authorization and were not decommissioned upon termination of the authorization.

**Waterbar**--A berm or ditch-and-berm combination that cuts across roads at an angle so that all surface water running on the road and in the road ditch is intercepted and deposited over the outside edge of the road. Water bars normally allow high-clearance vehicles to pass.

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

**Watershed analysis**--A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis provides a basis for ecosystem management planning to be applied to watersheds of about 20 to 200 square miles.

**Wildfire**--Any wildland fire that does not meet management objectives, thus requiring a fire-suppression response. Once a fire is declared wild, it is no longer considered a prescribed fire.

APPENDIX A.
Design criteria

**Management Requirements Applied to All Project Activities**

The following project design criteria would be applied to all management activities analyzed under the Indian Creek Aquatic Restoration Project:

- The use of ISC Type I and Type II helicopters within 0.5 mile of spotted owl or marbled murrelet occupied or unsurveyed suitable habitat during the breeding periods March 1 through August 6 would not occur. Use of Type 1 helicopters within 0.5 mile of suitable murrelet and spotted owl habitat during the period August 6 through September 30 would require re-initiation of formal consultation with US Fish and Wildlife Service.

- No suitable nesting trees or trees greater than 36 inches dbh would be removed. Selected single trees or small groups of trees (2 to 4 trees) would be (1) along the periphery of permanent openings (*e.g.*, rights-of-way, powerlines, etc.), or along the periphery of non-permanent openings (*e.g.*, along plantation edges, along recent clearcuts [less than 40 years old]); (2) single trees may only be removed from the first two lines of trees and would be dispersed along these edges but may not be adjacent to one another; (3) single trees or small groups of trees (2 to 4 trees) must be spaced at least one site potential tree height apart and at least one crown width from any trees with potential nesting structure for any listed species (for streamside operations, spacing requirements apply to each bank independently). For those projects proposing to remove trees greater than 32 inches dbh, or vary the selection criteria, administrative units would obtain approval from the FWS prior to implementation under this assessment.

- Activities that generate elevated noise levels within 0.25 mile (0.5 mile for aircraft operations) of known occupied, unsurveyed suitable or unsurveyed potential marbled murrelet habitat, and implemented between April 1 and September 15, would not begin until 2 hours after sunrise and would end 2 hours before sunset.

- To minimize the risk of attracting predators to activity areas, all garbage (especially food products) would be contained or removed daily from the vicinity of any activity.

- No blasting would occur during the period as part of any proposed activity under this project.

- No activity within 0.25 mile (0.5 mile for aircraft operations) or 0.5 mile sight distance of a known bald eagle nest site would be implemented between January 1 and August 31, unless a wildlife biologist has determined that the nest site is unoccupied.

- If a new bald eagle, marbled murrelet, or spotted owl nest is discovered within the project area, any activity within 0.25 mile of the nest site (0.5 mile line-of-sight for bald eagle nests) would immediately be evaluated for potential effects and restricted to prevent disturbance.

- Project activities that create elevated noise levels (including hauling, tree felling, *etc*.) shall not take place prior to August 5.

- A wildlife biologist would be involved in any activity that proposed to remove mature conifers.

- Current levels of mature tree removal for in-stream use within the Indian Creek watershed consulted on total 200 trees. For additional trees to be removed within this watershed, tree allotments in neighboring watersheds may be used, with no net increase in total trees allotted within the 2005-2006 Habitat Modification BO. Notification of the US Fish and Wildlife Service of such changes must occur prior to completion of the planning process for this project.

Appendix B

# Indian Creek Aquatic Restoration Project

## List of Preparers

### The Team

| Name | Position Title | Primary Responsibilities |
|---|---|---|
| Paul Burns | District Fishery Biologist | Project coordinator, EA, NEPA process, fisheries effects, fisheries biological evaluation |
| Jessica Dole | Forest Landscape Architect | Scenery effects |
| Edward Garza | Forest Fuels/Fire Planner | Fire hazard effects |
| Ken McCall | Forest Transportation Planner | Forest transportation system effects, roads analysis |
| Doug Middlebrook | Enterprise Wildlife Biologist | Wildlife effects; wildlife specialist report, including the biological evaluation |
| Johan Hogervorst | District Hydrologist | Hydrologic and soils effects, system roads stability assessment, water quality restoration plan |
| Marty Stein | Forest Botanist | Listed, sensitive, and survey-and-manage plant effects, effects on noxious and undesirable weeds |
| Phyllis Steeves | Forest Archaeologist | Heritage resource effects |
| Jennifer Wade | Recreation | Recreation use effects |

Appendix C

**Contributors**

| Name | Position Title | Primary Responsibilities |
| --- | --- | --- |
| Bruce Buckley | Resource Planner | EA Guide |
| Frank Davis | Forest Environmental Coordinator | NEPA guide |
| Bill Helphinstine | District Ranger | Process guide |
| Paul Thomas | Resource Staff Officer | EA guide |
| Ralph Lampman | District Fish Biologist | Fisheries consultant, GIS mapping |
| John Zapell | District Public Affairs Specialist | Public notification |