Environmental Assessment

for

Eugene District Aquatic and Riparian Restoration Activities

Environmental Assessment
 # DOI-BLM-OR-090-2009-0009-EA

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
EUGENE DISTRICT

2010

U.S. Department of the Interior, Bureau of Land Management
Eugene District Office
3106 Pierce Parkway, Suite E
Eugene, Oregon 97477

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment –including your personal identifying information –may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

In keeping with Bureau of Land Management policy, the Eugene District posts Environmental Assessments, Findings of No Significant Impact, and Decision Records on the district web page under **Plans & Projects** at www.blm.gov/or/districts/eugene. Individuals desiring a paper copy of such documents will be provided one upon request.

TABLE OF CONTENTS

CHAPTER ONE - PURPOSE AND NEED FOR ACTION
I. Introduction 4
II. Purpose and Need for Action 4
III. Conformance 5
IV. Issues for Analysis 8

CHAPTER TWO - DISCUSSION OF THE ALTERNATIVES
I. Actions and Design Features Common to All Alternatives……..................9
A. Description of Proposed Aquatic and Riparian Restoration Activities…9
B. Project Design Features……………………………………………… 10
II. No Action Alternative……………………………………………………..13
III. Alternative One……………………………………………………………13
IV. Alternative Two……………………………………………………………15
V. Alternative Three……………………………………………………..…16

CHAPTER THREE - AFFECTED ENVIRONMENT
I. Water...19
II. Fish Species and Aquatic Habitat………………….................................20
III. Invasive Plants………………………………………………………..26
V. Wildlife…………………………………………………….……….33

CHAPTER FOUR – ENVIRONMENTAL EFFECTS
I. Water, Fish, Aquatic Habitat……………………………………............39
II. Invasive Plants…………………………….…………………………….47
III. Wildlife…………………………………………………………………….57

CHAPTER FIVE – TRIBES, INDIVIDUALS, ORGRANIZATIONS, OR AGENCIES CONSULTED
I. Agencies, Organizations, and Persons Consulted 62
II. Public Notification 62
III. State, County, and Local Government Agencies 63
IV. Public Comment Period 63

CHAPTER SIX – LIST OF PREPARERS 64

CHAPTER SEVEN – REFERENCES…………………………………………65

APPENDIX A – AQUATIC CONSERVATION STRATEGY………………..73
APPENDIX B – FISHERIES ANALYTICAL METHODOLOGY…………...77
APPENDIX C – INVASIVE PLANTS……………………………………..84
APPENDIX D – WILDLIFE……………………...111

CHAPTER ONE - PURPOSE AND NEED FOR ACTION

I. Introduction

The Bureau of Land Management (BLM) proposes to complete a variety of aquatic and riparian habitat restoration activities on BLM-administered lands and non-BLM-administered lands within the Eugene District and identify watersheds that would have the highest priority for restoration. Given the checkerboard land ownership pattern, restricted ownership in certain watersheds, and limited resources, the BLM recognizes that aquatic restoration cannot be accomplished exclusively by the BLM-administered lands. As such, the BLM partners with other federal agencies (such as the Willamette National Forest), state agencies (such as Oregon Department of Fish & Wildlife and Oregon Department of Environmental Quality), private timber companies, watershed councils and other non-profit organizations to accomplish watershed restoration. Such partnering may include funding or cost-sharing and/or contributions of expertise, materials, or equipment, and may contribute to aquatic restoration work occurring on non-BLM-administered land. This EA considers projects on BLM-administered lands and projects on private lands where the BLM has provided either full funding or partial funding as a partnering agency.

II. Purpose and Need for Action

The purpose of this action is to use aquatic and riparian restoration activities identified in the National Marine Fisheries Service Fish Habitat Consultation for Fish Habitat Restoration Activities in Oregon and Washington Biological Opinion (2008/03506) (ARBO) to improve aquatic and riparian habitat on BLM-administered lands and non-BLM-administered lands, and to prioritize watersheds where aquatic and restoration activities would be emphasized. Project activities would include:

- Large Wood, Boulder, and Gravel Placement
- Fish Passage Culvert and Bridge Projects
- Reconnection of Existing side Channels and Alcove
- Head-cut Stabilization and Associated Fish Passage
- Streambank Restoration
- Reduction of Recreation Impacts
- Riparian vegetation treatments (non-commercial thinning, mechanical treatments, does not include hardwood conversions)
- Riparian Area Invasive Plant Treatment
- Riparian Exclusion Fencing
- Road Treatments

The need for action has been established through the results of aquatic habitat inventories, monitoring, and watershed analysis which indicate that the current condition of many stream channels and riparian areas on BLM-administered lands and non-BLM-administered lands within the Eugene District are not properly functioning.

There is also an opportunity to prioritize watersheds in order to focus restoration in areas with the highest priority. Priority watersheds would be identified where restoration would have a greater benefit to fish species and aquatic habitat. Restoration activities could be emphasized in these watersheds, but would not be limited to these watersheds since other factors may determine where restoration would occur (funding, logistics, partnerships, etc).

Decision To Be Made

The BLM will decide whether to adopt an aquatic and riparian restoration strategy where future aquatic and riparian restoration activities would be emphasized in watersheds identified as having higher priority for fish.

This EA is programmatic in nature, and analyzes the effects of watershed restoration activities within the Eugene District based upon years of professional experience, review of available literature, and consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Because this analysis is broad-scale in nature and covers a variety of restoration actions, this EA does not list every discrete, site-specific proposed action that may occur. The programmatic analysis limits the amount of site-specific detail within the analysis, instead relying on project design features to reduce or avoid impacts to different resources.

This EA is intended to analyze actions in sufficient detail so that we could implement many of the specific restoration actions without additional NEPA analysis, following an eventual decision on the restoration plan. We would implement each specific restoration action (or group of related actions) under the eventual restoration plan with its own Decision Record, prior to which we would conduct a "Determination of NEPA Adequacy" (DNA) to determine whether additional NEPA analysis would be necessary. The DNA itself is not a NEPA document, but is merely an interim step in the BLM internal analysis process. Where site-specific conditions differ, or circumstances change, from those described in the EA, or if a DNA is inappropriate for other reasons, we may need to conduct additional NEPA analysis prior to reaching a decision to implement specific restoration actions. However, such instances would be expected to be the exception. The public would generally receive notice of pending decisions through the District Quarterly Planning Update preceding the specific restoration actions. Specific project locations and site-specific design features would be described at that time.

III. Conformance

All action alternatives analyzed in this EA would be in conformance with the 1995 Eugene District Record of Decision and Resource Management Plan (ROD/RMP), as amended.

The 1995 Eugene District Record of Decision and Resource Management Plan (ROD/RMP), as amended, incorporated the Aquatic Conservation Strategy, a component of the Northwest Forest Plan, to guide the District in meeting watershed restoration objectives, including but not limited to:

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

- Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
- Maintain and restore the sediment regime under which an aquatic ecosystem evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.
- Maintain and restore habitat to support well distributed populations of native plant, invertebrate, and vertebrate riparian dependent species.
- Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability (1995 ROD/RMP, p.19-20).

The 1995 ROD/RMP also explained that “the most important components of a watershed restoration program are control and prevention of road related runoff and sediment, restoration of the condition of riparian vegetation, and restoration of instream habitat complexity” (p. 21). Management Actions/Directions addressing watershed restoration cited the following priorities: completion of restoration plans prior to restoration activities; focusing restoration on the removal of some roads and, where needed, upgrading remaining roads; applying silvicultural treatments to restore large conifers in Riparian Reserves; and using instream structures to restore stream channel complexity in the short term.

Wildlife and botanical clearances would be conducted prior to implementation of specific restoration actions, in accordance with the ROD/RMP, as amended. Special status species sites discovered as a result of clearances or pre-disturbance surveys would be managed consistent with the Special Status Species policy and ROD/RMP requirements.

The proposed action for Eugene District Aquatic and Riparian Restoration Activities presents an approach for a variety of activities, which would be consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Eugene District Resource Management Plan or the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines, as incorporated into the Eugene District Resource Management Plan (2001 ROD), as described below.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Rey, et al.*, No. 08-1067 (W.D. Wash.) (Coughenour, J.), granting Plaintiffs’ motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure.

Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings, and did not enjoin the BLM from proceeding with projects.

Previously, in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter "Pechman exemptions").

Judge Pechman's Order from October 11, 2006 directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

> A. Thinning projects in stands younger than 80 years old (emphasis added):
> B. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
> C. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and
> D. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Following the Court's December 17, 2009 ruling, the Pechman exemptions are still in place. Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings, and did not enjoin the BLM from proceeding with projects. Nevertheless, the BLM has reviewed the proposed Eugene District Aquatic and Riparian Restoration Activities in consideration of both the December 17, 2009 and October 11, 2006 order. Because the proposed Eugene District Aquatic and Riparian Restoration Activities entails riparian and stream improvement projects (where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions); replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned; and riparian vegetation treatments that would only constitute thinning in stands less than 80 years old, I have made the determination that these projects meet Exemptions A, B, and C of the Pechman Exemptions (October 11, 2006 Order), and therefore would still be able to proceed to implementation even if the District Court sets aside or otherwise enjoins use of the 2007 Survey and Manage Record of Decision since the Pechman exemptions would remain valid in such case.

Some boulder and gravel placement, bridge projects, riparian area invasive plant treatment, and road treatments may not be explicitly provided for in the Pechman exemptions. These activities would be implemented consistent with the 2001 ROD.

These activities may proceed even if the District Court sets aside or otherwise enjoins use of the 2007 Survey and Manage Record of Decision. This is because the proposed restoration activities not explicitly provided for in the Pechman exemptions would be implemented to meet the provisions of the last valid Record of Decision, specifically the 2001 ROD (not including subsequent Annual Species Reviews). Many of these activities would not be subject to pre-disturbance surveys and/or management of known sites as directed in the 2001 ROD. For any of those proposed activities that are not explicitly provided for in the Pechman exemptions and are subject to pre-disturbance surveys and management of known sites, pre-disturbance surveys would be implemented and management of known sites provided, as appropriate.

IV. Issues for Analysis

While this analysis is broad-scale, the individual actions that would be proposed in the future to implement the selected approach would be narrow in nature, occurring at a small scale within a limited geography, and affecting specific resources. Considering the type of projects, potential location of projects, resource concerns, and management objectives, the interdisciplinary team determined that several issues must be analyzed to inform decision-making and determine potential significance of environmental impacts.

1.) How would aquatic and riparian restoration activities improve fish habitat and fish productivity?
2.) How would aquatic and riparian restoration activities adversely affect fish, fish habitat, and water quality?
3.) How would aquatic and restoration activities contribute to the spread of invasive plants?
4.) How would aquatic and riparian restoration activities affect migratory birds and BLM special status wildlife species and their habitat?

CHAPTER TWO – ALTERNATIVES

This chapter describes the basic features of the alternatives being analyzed.

I. Actions and Design Features Common to All Alternatives

A. Description of proposed aquatic and riparian restoration activities.

The type of aquatic and riparian activities that would be implemented are common to all alternatives. Table 2-1 (*Description Of Proposed Aquatic And Riparian Restoration Activities*) includes a general description of the proposed aquatic and riparian restoration activities and the type of work that would occur. A full description of the proposed actions can be found (pages 5–37) in the Biological Opinion "Programmatic Consultation for Fish Habitat Restoration Activities in Oregon and Washington" (NMFS No. 2008/03506); which is incorporated here by reference.

The proposed actions included in this programmatic assessment all have predictable effects regardless of where they are carried out and have been implemented repeatedly in the Eugene District. Restoration activities for which the effects are more dependent upon site-specific conditions or have not been repeatedly implemented in the Eugene District (e.g. tree lining, helicopter use) were not included in the proposed action.

TABLE 2-1. DESCRIPTION OF PROPOSED AQUATIC AND RIPARIAN RESTORATION ACTIVITIES.

Category	Activities	Description
Instream	Large wood, boulder, gravel placement[1]	Large wood, boulders, and gravel would be staged on or adjacent to roads and placed in stream channels using a cable yarding system. Yarding equipment would generally remain on existing roads. Large wood and boulders would be dragged through riparian areas into the stream channel. Large wood and boulder projects would be designed to allow fish passage through or over structures at all stream flows. Logs would be either cut from the adjacent riparian stand or hauled to the site using trucks on established roads. Gravel would be placed in the stream channel typically adjacent to large wood and boulder structures.
	Reconnection of existing side channels and alcoves	Side channels and alcoves would be reconnected to stream channels to increase rearing habitat for juvenile fish. Activities would include the removal of fill that blocks water movement.
	Streambank restoration	Activities would include installation of stream bank stabilization structures (*e.g.*, rock barbs, tree revetments, and willow mats) to stabilize stream banks and help riparian vegetation recovery. Stabilization structures would be placed and anchored within the toe and bank areas of stream channels. Stream banks may be contoured to facilitate planting. Heavy equipment may be used to complete these activities, and may be in the stream channel, on banks, or on the road.
Sediment/Roads	Road treatments	Roads would be decommissioned or obliterated. Activities include simple closures and stormproofing (hydrologically disconnecting roads) to full de-compaction and sub-soiling.

[1] Includes log acquisition where there would be no effects to wildlife species.

	Reduction of recreational impacts	Activities would include closing and/or controlling recreational use near streams and within riparian areas. This would include the removal of campgrounds, dispersed camp sites, and foot trails and decommissioning of recreational vehicle trails in riparian areas.
Fish Passage	Culvert and bridge replacements	Activities would include the removal and replacement of existing road stream crossings (culverts and bridges) that restrict fish passage and flow with structures that allow for passage.
	Head cut stabilization and associated fish passage	Activities would include installation of rock/boulder or log-step-pool structures to prevent head cuts and channel degradation and increase fish passage.
Riparian	Riparian exclusion fencing	Activities would include the construction of fences to exclude livestock from riparian areas. Riparian fences will generally be constructed by hand without the use of heavy equipment.
	Riparian Planting	Activities would include planting tree seedling and shrubs in riparian areas currently lacking those species. Hand tools would be used to plant container stock or cuttings of native species suitable for each site.
	Riparian vegetation treatments	Activities would include non-commercial treatments of vegetation in riparian areas such as thinning, alder treatments (except for hardwood conversions), disease pocket treatments, brush removal, planting, animal damage control. The use of herbicides would not be included.
Riparian Invasive	Riparian area invasive plant treatment	Activities would include the treatment of invasive plant infestations in riparian areas with manual and mechanical methods. The use of herbicides would not be included.

B. Project Design Features

Project design features (PDF's) are an important component of the proposed restoration actions and are intended to guide project planners and decision makers in reducing impacts to resources. Specific resource effects will vary by project; therefore the applicability of these design features will vary (design features will be applied as appropriate). For example, not all projects would take place near spotted owl or marbled murrelet nest sites; as such, these design features would not be necessary for those proposals.

The following is a general description of the typical PDF's that would be implemented with the proposed actions. A full description of the PDF's that would be implemented is included in the following documents and incorporated here by reference:

1995 Eugene District Resource Management Plan: (Standards and Guidelines and Best Management Practices, pages 23-25 and pages 155-174).

National Marine Fisheries Service Biological Opinion for Fish Habitat Restoration Activities in Oregon and Washington" (NMFS No. 2008/03506) (pages 5-34, 116, and 117-120).

U.S. Fish and Wildlife Service Biological Opinion for Aquatic Habitat Restoration Activities in Oregon and Washington (07-516) (pages 14-47, 185-192)

To prevent the introduction or spread of invasive plants:

1. Seed all disturbed ground using genetically appropriate, certified weed free, native plant seed and/or other plant materials.
2. Assure that all equipment entering and/or leaving project area is clean of invasive plant material(s), mud, or material that could transport seeds or plant material.
3. Assure that equipment, vehicles, and materials are not staged in known invasive plant populations.
4. Assure that any materials brought into the project area (clean fill, straw, gravel, large wood) are free of invasive plant material(s).
5. Minimize soil disturbance as part of restoration project(s) and retain native vegetation to the extent practical.
6. Where necessary, provide general invasive plant awareness to project workers to reduce spread and improve efficiency of treatment.
7. Coordinate any invasive plant treatments as part of aquatic restoration with Resource Area Invasive Plant Coordinators under current policy/plan direction.
8. Continue to map, identify and treat new infestations as part of the Eugene District Invasive Plant Program; provide follow up treatments where needed.
9. Coordinate weed treatments in a watershed with partners to leverage broader and more successful control efforts.
10. Treat Early Detection and Rapid Response Species.
11. Focus control efforts first on invasive plant species that are deemed to modify riparian before other invasive species.
12. Treat invasive plant populations in the upper portions of the watershed first before populations downstream to prevent re-infesting sites.
13. Develop specific treatment and disposal plans for invasive plants as part of the Eugene District Invasive Plant Program.
14. Initiate invasive plant treatments where invasive plants get established in all project areas.

To minimize impacts to soils:

15. Limit the season of operation for ground disturbing activities by heavy equipment to the dry season to reduce the degree and area extent of soil impacts in riparian and upland areas; when soil moister is approximately less than 25%. The dry season is generally from July 1to October 1, or until the onset of regular autumn rains.
16. Designate equipment access routes on existing trails to the extent possible to minimize soil displacement and compaction and to prevent weed germination and establishment. Minimize equipment entry points between staging area and stream. Utilize existing entry points where possible. Identify sensitive areas to be avoided whenever possible.
17. Minimize use of heavy equipment on slopes exceeding 35%.
18. Decompact access routes during the dry season to ameliorate soil compaction from equipment treads.
19. Where soil is disturbed or compacted, take appropriate measures to revegetate the area, place woody debris and brush over tilled surface, install erosion control measures and improve bank stability. Take appropriate measures to block future access. This may include topsoil replacement, planting or seeding with native species, and weed-free mulching.

To reduce impacts to aquatic resources:

20. Limit the number and length of equipment access points through Riparian Management Areas.
21. Design access routes for individual work sites to reduce exposure of bare soil and extensive streambank shaping.
22. Use waterbars, barricades, seeding, and mulching to stabilize bare soil areas along project access routes prior to the wet season.
23. In well armored channels that are resistant to damage (e.g. bedrock, small boulder, or cobble dominated), consider conducting the majority of the heavy equipment work from within the channel, during low streamflow, to minimize damage to sensitive riparian areas.
24. Place sediment control devices such as water bars, hay bales and other silt trapping devices in areas determined to have high potential for sediment input into the stream.
25. Rehabilitate and stabilize disturbed areas where soil will support seed growth by seeding and planting with native seeds mixes or plants, or using erosion control matting.
26. When using heavy equipment in or adjacent to stream channels during restoration activities, develop and implement and approved spill containment plan that includes having a spill containment kit on-site and at previously identified containment locations.
27. Inspect all mechanized equipment daily for leaks and clean as necessary to help ensure toxic materials, such as fuel and hydraulic fluid, do not enter the stream.
28. Refuel equipment, including chainsaws and other hand power tools, at least 100 feet from water bodies to prevent direct delivery of contaminants into a water body.
29. Do not store equipment in stream channels when not in use.
30. Minimize damage of hardwoods within 50 feet of stream bank.
31. Minimize pulling or felling of trees from within 60ft of streams.
32. Where appropriate, pull or fell trees from the north or east side of a stream rather than the south or west side to minimize the reduction in shade.
33. When replacing culverts, install grade control structures (e.g. boulder vortex weirs or boulder step weirs) where excessive scour would occur.
34. Adhere to the in-water work window as defined by the Oregon Department of Fish and Wildlife (ODFW). Projects outside of this work window would require waivers from ODFW and National Marine Fisheries Service (NMFS).

To minimize the risk of placed logs and boulders moving downstream during flood events:

35. Use key logs that are 1.5 times the active channel width and at least 24" in diameter.
36. Key logs would be wedged between trees on banks to prevent movement in high flow events.
37. Key boulders would be at least one cubic yard in size.

To protect objects of cultural value:

38. If any objects of cultural value (e.g. historic or prehistoric ruins, graves, fossils, or artifacts) are found during the implementation of the proposed action, operations would be suspended until the site has been evaluated to determine the appropriate mitigation action. Mitigation might include avoidance or systematic excavation of a portion of the site.

To reduce impacts to wildlife species:

39. A wildlife biologist will participate in the design of all projects that may affect Threatened and Endangered species, BLM Sensitive species, or migratory birds of conservation concern.

40. Any activity must meet any applicable standards found in the most current Biological Opinion for northern spotted owls and/or marbled murrelets in the appropriate Planning Province in addition to those found in the ARBO.
41. Although permitted under the ARBO, no "take," as defined by the Endangered Species Act, of northern spotted owls or marbled murrelets will be allowed. Determinations of potential take will follow methods described in the most current Biological Opinion in the appropriate Planning Provinces, and will be determined by a wildlife biologist for each project.
42. Any activity must meet the standards of the Bald and Golden Eagle Protection Act, and associated administrative rules and associated BLM Instruction Memoranda.
43. Any activity must meet BLM Special Status Species policy, found in BLM Manual §6840 and associated BLM Instruction Memoranda.
44. Any activity must meet the standards of the Migratory Bird Treaty Act and associated BLM Instruction Memoranda.
45. No activity shall disrupt the normal behavior of a peregrine falcon, bald eagle, northern goshawk, harlequin duck, or purple martin at a known nest site during the breeding season, nor shall habitat-modifying activities remove nest trees or affect the function of known nest sites for these species.
46. No activity shall disrupt the normal behavior of fringed myotis, pallid bats, or Townsend's big-eared bat at known hibernacula or roost sites.
47. No permanent road (as determined by the Eugene District road classification process) would be built in the critical habitat of the northern spotted owl or the marbled murrelet. Temporary road construction or reconstruction in critical habitat would maintain pre-treatment habitat functionality at the stand scale.
48. Snags shall be reserved except as necessary for human safety. Activities shall be relocated away from snags occupied by sensitive species, if feasible. Snags occupied by sensitive species that must be felled shall not be felled when in active use. All felled snags shall be left on site as coarse woody debris.
49. Existing coarse woody debris and rootwads shall be reserved and protected from damage to the extent possible. Coarse woody debris may be moved around project sites to facilitate operations.

I. No Action Alternative

Under the No Action Alternative, aquatic and riparian restoration activities would continue to occur at a similar rate per decade as the previous decade (1998-2008) on BLM-administered lands. Additionally, the BLM would continue to complete projects through partnerships on non-BLM-administered lands to support the Oregon Plan for Salmon and Watersheds. See Appendix B (*Fisheries Planning Criteria*) for the analytical assumptions regarding the locations and levels of treatment that would occur under the No Action alternative.

II. Alternative One – Emphasis on Listed Fish and HIP Regardless of Ownership

Under Alternative 1, the Eugene District BLM would continue to implement aquatic and riparian restoration activities as described in Table 2-1 (*Description Of Proposed Aquatic And Riparian Restoration Activities*) and the Project Design Features. Activities on BLM-administered lands would be emphasized in watersheds with the highest density of stream miles with threatened and endangered fish populations and with the greatest habitat intrinsic potential (HIP), regardless of ownership. The BLM would also continue to complete projects through partnerships on non-

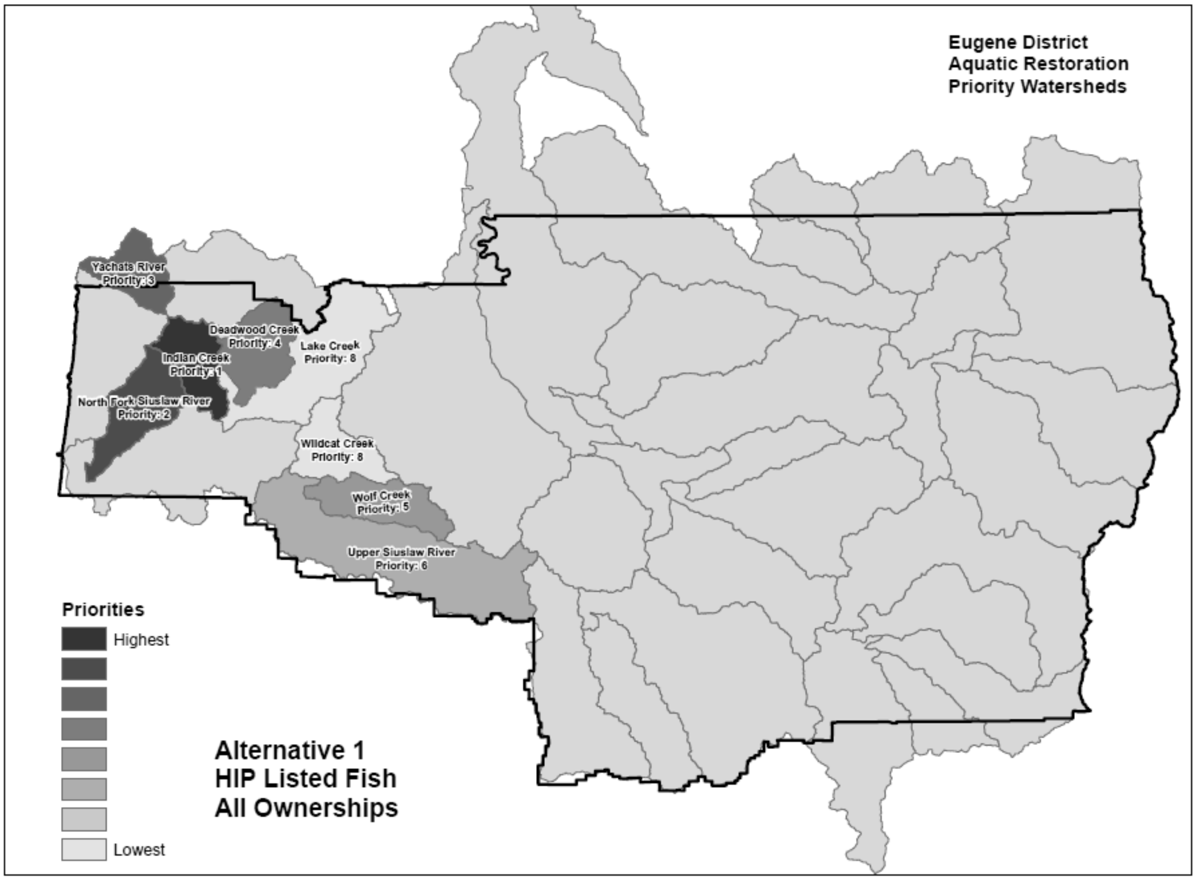
BLM-administered lands to support the Oregon Plan for Salmon and Watersheds, but partnership opportunities would be emphasized in the watersheds described above.

Under Alternative 1, the following approximate levels of treatment would occur per watershed, per decade on both BLM-administered lands and non-BLM-administered lands through partnerships combined. See Table 2-2 (*Alternative 1 Priority Watersheds And Estimates Of Future Aquatic And Riparian Restoration In All Other Watersheds*) and Figure 2-1 (*Alternative 1 Priority Watersheds*).

TABLE 2-2. ALTERNATIVE 1 PRIORITY WATERSHEDS AND ESTIMATES OF FUTURE AQUATIC AND RIPARIAN RESTORATION IN ALL OTHER WATERSHEDS.

Rank	Watershed Name	**Instream** (mi/decade)	**Roads/Sediment** (mi/decade)	**Passage** (#/decade)	**Riparian** (acres/decade)	**Invasive** (acres/decade)
1	Indian Creek	100	50	6	100	200
2	NF Siuslaw River	60	40	5	50	100
3	Yachats River	40	30	4	10	100
4	Deadwood Creek	30	30	3	10	50
5	Wolf Creek	30	30	3	10	50
6	Upper Siuslaw River	30	30	3	10	50
7	Wildcat Creek	30	30	3	10	50
8	Lake Creek	30	30	3	10	50
All Other – Per Watershed		5	10	1	5	10

FIGURE 2-1. ALTERNATIVE 1 PRIORITY WATERSHEDS



III. Alternative Two – Emphasis on Listed Fish and HIP on BLM

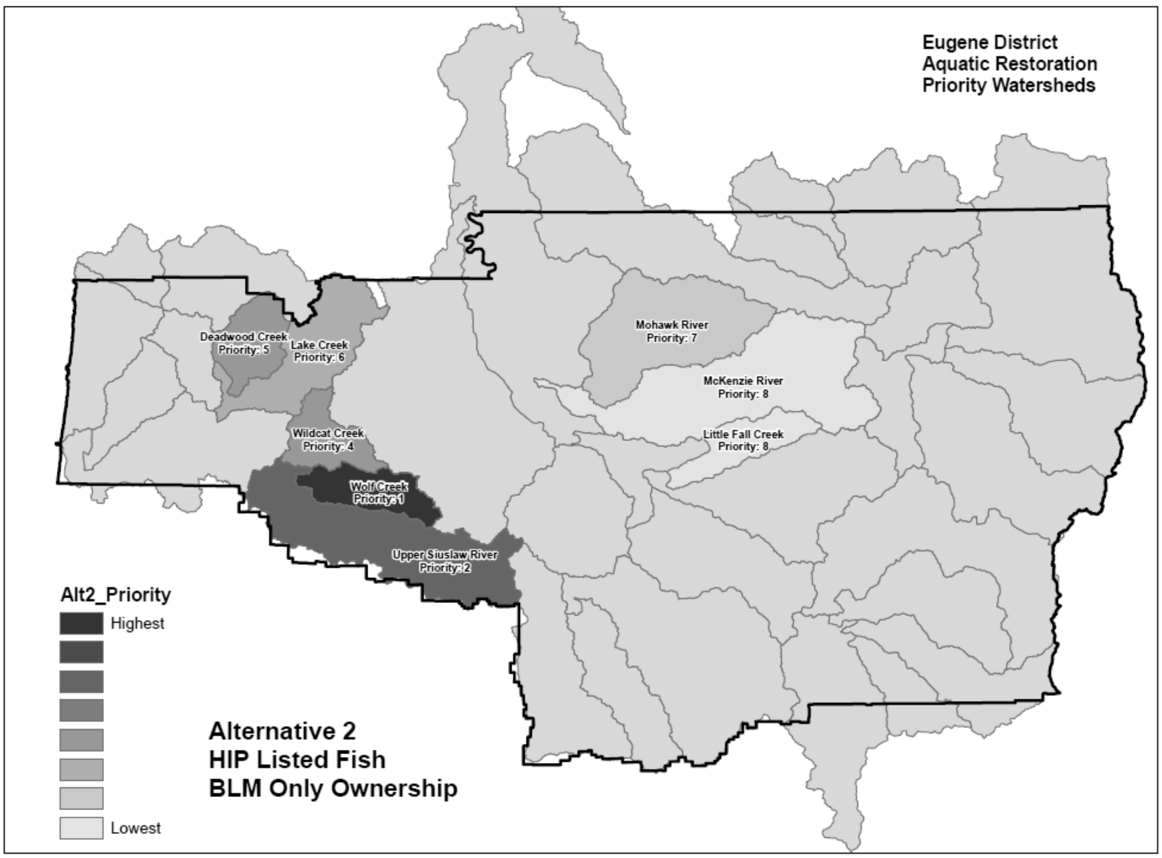
Under Alternative 2, the Eugene District BLM would continue to implement aquatic and riparian restoration activities as described in Table 2-1 (*Description Of Proposed Aquatic And Riparian Restoration Activities*) and Project Design Features. Activities on BLM-administered lands would be emphasized in watersheds with the highest density of stream miles with threatened and endangered fish populations on BLM-administered lands and with the greatest habitat intrinsic potential (HIP) on BLM-administered lands. The BLM would also continue to complete projects through partnerships on non-BLM-administered lands to support the Oregon Plan for Salmon and Watersheds, but partnership opportunities would be emphasized in the watersheds described above.

Under Alternative 2, it is estimated that the following levels of treatment would occur per watershed, per decade on both BLM-administered lands and non-BLM-administered lands through partnerships combined. See Table 2-3 (*Alternative 2 Priority Watersheds And Estimates Of Future Aquatic And Riparian Restoration In All Other Watersheds*) and Figure 2-2 (*Alternative 2 Priority Watersheds*).

TABLE 2-3. ALTERNATIVE 2 PRIORITY WATERSHEDS AND ESTIMATES OF FUTURE AQUATIC AND RIPARIAN RESTORATION IN ALL OTHER WATERSHEDS.

Rank	Watershed Name	**Instream** (mi/decade)	**Roads/Sediment** (mi/decade)	**Passage** (#/decade)	**Riparian** (acres/decade)	**Invasive** (acres/decade)
1	Wolf Creek	100	50	6	100	200
2	Upper Siuslaw River	60	40	5	50	100
3	Wildcat Creek	40	30	4	10	100
4	Deadwood Creek	30	30	3	10	50
5	Lake Creek	30	30	3	10	50
6	Mohawk River	30	30	3	10	50
7	McKenzie River	30	30	3	10	50
8	Little Fall Creek	30	30	3	10	50
All Other Per Watershed		5	10	1	5	10

FIGURE 2-2. ALTERNATIVE 2 PRIORITY WATERSHEDS



IV. Alternative Three – Emphasis on Listed Fish, Resident Fish and HIP on BLM

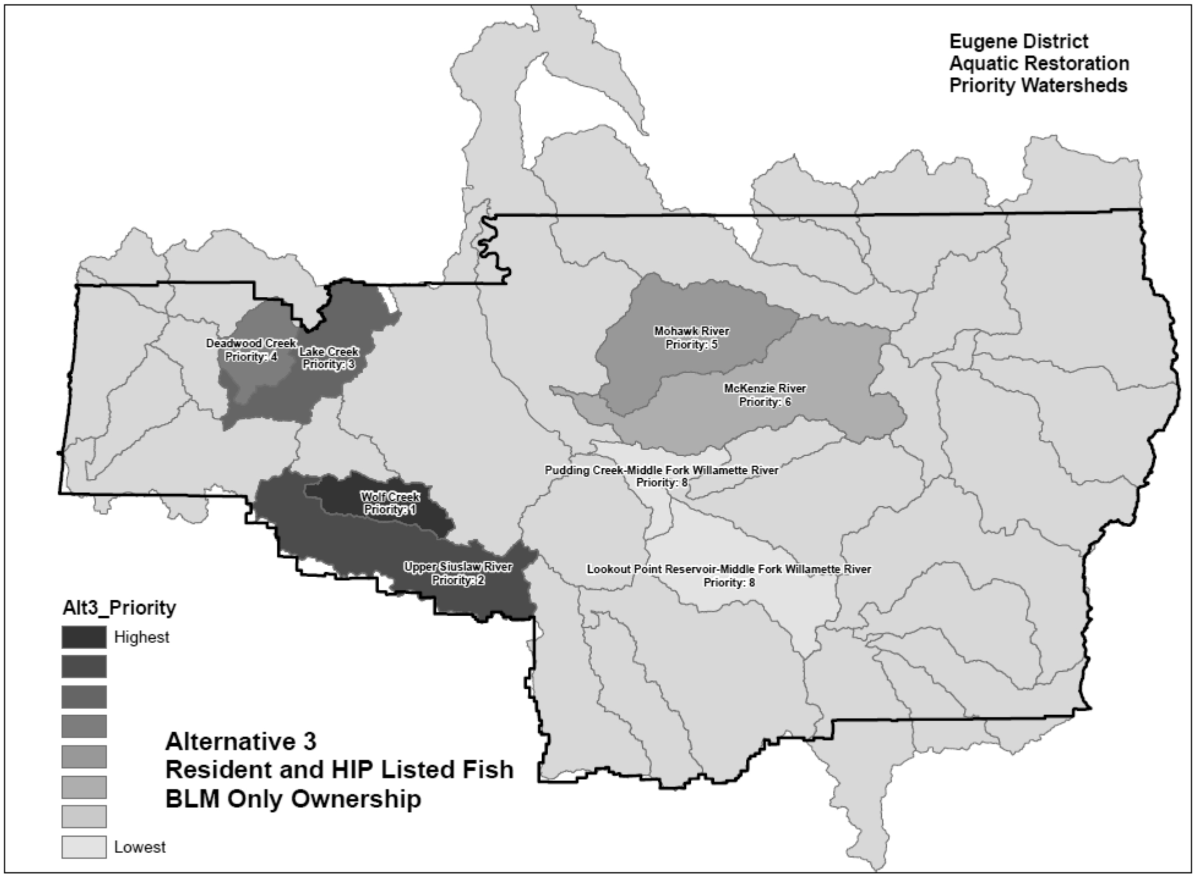
Under Alternative 3, the Eugene District BLM would continue to implement aquatic and riparian restoration activities as described in Table 2-1 (*Description Of Proposed Aquatic And Riparian Restoration Activities*) and Project Design Features. Activities on BLM-administered lands would be emphasized in watersheds that are a high priority for both threatened and endangered fish species and native, resident fish. Restoration would be emphasized in watersheds with a higher density of streams on BLM-administered lands with threatened and endangered fish, and native resident fish and with the greatest habitat intrinsic potential (HIP) on BLM-administered lands. The BLM would also continue to complete projects through partnerships on non-BLM-administered lands to support the Oregon Plan for Salmon and Watersheds, but partnership opportunities would be emphasized in the watersheds described above.

Under Alternative 3, it is estimated that the following levels of treatment would occur per watershed, per decade on both BLM-administered lands and non-BLM-administered lands through partnerships combined. See Table 2-4 (*Alternative 3 Priority Watersheds And Estimates Of Future Aquatic And Riparian Restoration In All Other Watersheds*) and Figure 2-3 (*Alternative 3 Priority Watersheds*).

TABLE 2-4. ALTERNATIVE 3 PRIORITY WATERSHEDS AND ESTIMATES OF FUTURE AQUATIC AND RIPARIAN RESTORATION IN ALL OTHER WATERSHEDS.

Rank	**Watershed Name**	**Instream** (mi/decade)	**Roads/Sediment** (mi/decade)	**Passage** (#/decade)	**Riparian** (acres/decade)	**Invasive** (acres/decade)
1	Wolf Creek	100	60	7	100	200
2	Upper Siuslaw River	60	40	5	50	100
3	Lake Creek	40	30	4	10	100
4	Deadwood Creek	30	30	2	10	50
5	Mohawk River	30	30	2	10	50
6	McKenzie River	30	30	2	10	50
7	Lookout Point Reservoir-MF Willamette River	30	30	2	10	50
8	Pudding Creek-MF Willamette River	30	30	2	10	50
	All Other - Per Watershed	5	10	1	5	10

FIGURE 2-3. ALTERNATIVE 3 PRIORITY WATERSHEDS



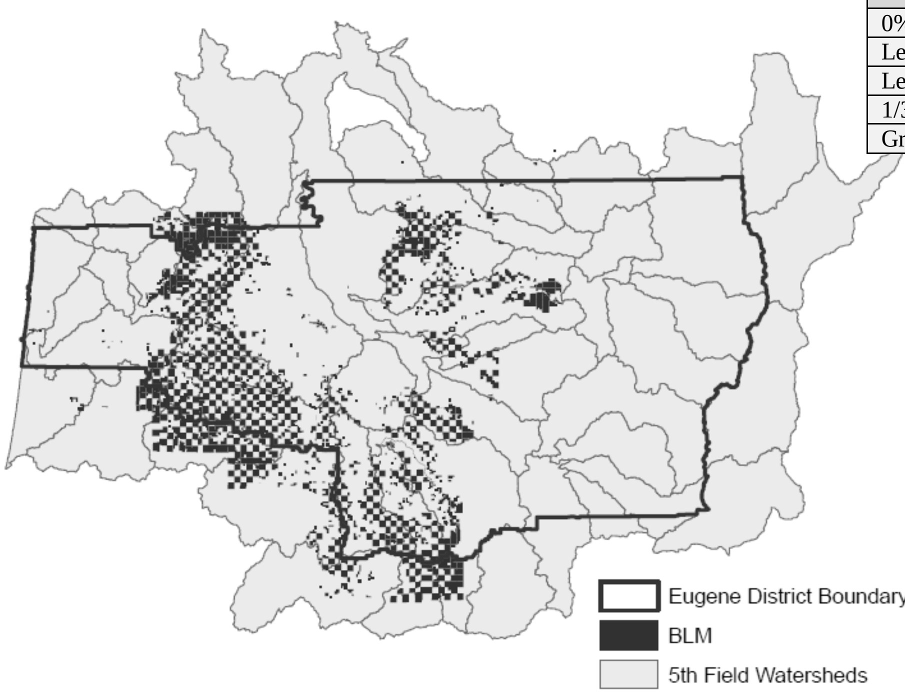
CHAPTER THREE - AFFECTED ENVIRONMENT

This chapter discusses the specific resources potentially affected by the alternatives. The discussion is organized by individual resource in response to the issues for analysis, thereby providing the basis for comparison of the effects between alternatives.

I. Water
There are 52 fifth-field watersheds within the Eugene District boundary. The BLM is rarely the predominant landowner within these fifth-field watersheds. See Figure 3-1 (*BLM land ownership patterns in the Eugene District*). For example, of the 52 fifth-field watershed in the Eugene District 31% have no BLM-administered lands; 11% have less than 1% BLM-administered lands; 42% have less than one-third BLM ownership; and 15% have between one-third and two-thirds BLM ownership. There are no fifth-field watersheds where BLM-administered lands comprise more than two-thirds of the watershed.

FIGURE 3-1. BLM LAND OWNERSHIP PATTERNS IN THE EUGENE DISTRICT.

BLM Ownership	*Number of Watersheds*
0%	16
Less than 1%	6
Less than 1/3	22
1/3 – 2/3	8
Greater than 2/3	0



There are 9,473 perennial stream miles and 13, 682 intermittent stream channels within the Eugene District boundary. Thirteen percent (1,222 miles) of the perennial streams and 12% (1,575 miles) of the intermittent streams occur on BLM-administered lands.

Water Quality

Of the 9,473 miles of perennial streams in the planning area, 1,186 are listed as impaired (303(d) listed) for at least one water quality measure. Of these, 118 miles (10%) occur on BLM-administered lands. The most common listing on BLM-administered lands is for stream temperature. Seventy-seven miles are listed for mercury within the Eugene District, however all 77 miles occur on non-BLM-administered lands. There are currently no water-bodies listed on BLM-administered lands for turbidity.

Fine sediments (sand, silt, and clay less than 2 millimeters) enter and leave river channels naturally, but forest management activities, such as road construction, can lead to accelerated rates of erosion and sediment yield. In the planning area, the background rate of fine sediment delivery entering stream channels ranges from 200-800 tons per square mile per year (per watersheds) in the Coast Range, to between 100-500 tons per square mile per year (per watershed) in the West Cascades (BLM, 2008). Road runoff and landslides are the primary routes of sediment delivery to stream channels (BLM, 2008). There are currently 17,510 miles of roads within the Eugene District. Eleven percent (1,935 miles) of the road miles are located on BLM-administered lands, and 89% (15,575 miles) are located on non-BLM-administered lands. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans described the process, travel distances, and current amount of sediment entering stream channels from the existing road network. Reference road modeling was used to determine the amount of sediment delivery to stream channels from existing roads (BLM, 2008 FEIS Appendix J). The analysis concluded that the average sediment delivery to stream channels from the existing road network in watersheds within the Eugene District range from between an average of 17-43 tons per mile per year. The portions of Chapters 3 (pages 343-347) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the current sediment delivery from roads to streams are incorporated here by reference.

II. Fish Species and Aquatic Habitat

There are over 3,600 miles of fish bearing streams within the Eugene District. Of these streams, 531 miles (14%) occur on BLM-administered lands, and 3,075 miles (83%) occur on non-BLM-administered lands. Within these water-bodies there are over 15 native fish species. Five of the fish population segments are currently listed as threatened or endangered under the Endangered Species Act. See Table 3-1 (*Fish Species And Status Within The Eugene District*). The Oregon Chub occurs within the Eugene District, but does not occur on BLM-administered lands.

TABLE 3-1. FISH SPECIES AND STATUS WITHIN THE EUGENE DISTRICT.

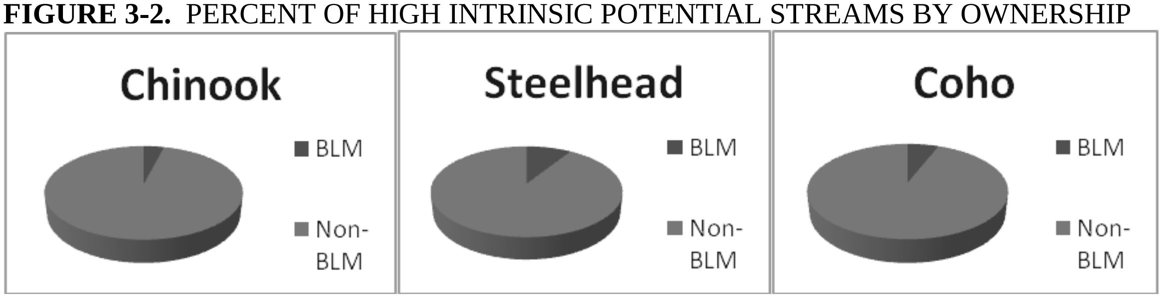
Common Name	Scientific Name	Population	ESA / BLM Status
Chinook Salmon	*Oncorhynchus tshawytscha*	*Upper Willamette River*	*Threatened*
		Oregon Coast	*Not Warranted*
Coho Salmon	*Oncorhynchus kisutch*	*Oregon Coast*	*Threatened*
Steelhead Trout	*Oncorhynchus mykiss*	*Upper Willamette River*[1]	*Threatened*
		Oregon Coast	*Species of Concern/ Bureau Sensitive*
Bull Trout	*Salvelinus confluentus*	*Columbia River*	*Threatened*
Rainbow Trout	*Oncorhynchus mykiss*	*N/A*	*N/A*

Oregon Chub	*Oregonichthys crameri*	*N/A*	*Endangered*
Cutthroat Trout	*Oncorhynchus clarkii ssp.*	*Coastal*	*Species of Concern/ Bureau Sensitive*
Mountain Whitefish	*Prosopium williamsoni*	*N/A*	*N/A*
Longnose Dace	*Rhinichthys cataractae*	*N/A*	*N/A*
Speckled Dace	*Rhinichthys osculus*	*N/A*	*N/A*
Largescale Sucker	*Catastomus macrocheilus*	*N/A*	*N/A*
Pacific Lamprey	*Lampetra tridentata*	*N/A*	*Species of Concern*
Brook Lamprey	*Lampetra richardsoni*	*Western*	*N/A*
Northern Pikeminnow	*Ptychocheilus oregonensis*	*N/A*	*N/A*
Sculpin Species	*Cottidae sp.*	*N/A*	*N/A*
1 The Distinct Population Segment includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive).			

Because of the BLM's land ownership pattern, the BLM's ability to influence aquatic habitat depends not only on the overall amount of land ownership in a watershed, but also on the location of the ownership relative to areas such as high intrinsic potential streams. High intrinsic potential (HIP) streams are streams that have a greater potential to provide high-quality habitat for salmonids. High intrinsic potential is a topographical approach developed by the Pacific Northwest Research Station. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (2008) includes a complete description of the HIP model. Chapter 3 (pages 367-372) and Appendix J (Fish), of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe this approach is incorporated here by reference.

In the Eugene District, 215 miles (7%) of the HIP for coho, steelhead, and chinook (combined) are on BLM-administered lands and 2,858 miles (93%) are on non-BLM-administered lands. See Figure 3-2 (*Percent of High Intrinsic Potential Streams by Ownership*).

FIGURE 3-2. PERCENT OF HIGH INTRINSIC POTENTIAL STREAMS BY OWNERSHIP



The high intrinsic potential of streams to support native resident fish (e.g. cutthroat and rainbow trout) has not been determined. However, similar to the distribution of HIP streams, much (85%) of the native resident fish bearing streams occur on non-BLM-administered lands.

Because of the BLM's land ownership patterns, coordinating restoration activities and completing projects on non-BLM-administered lands is critical to effectively improve fish habitat and passage within these watersheds.

Aquatic Habitat Condition
The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans describes the aquatic ecosystem conditions and processes for ecosystems typical of aquatic habitat within the Eugene District with particular emphasis on watershed conditions and processes. The Final Environmental Impact Statement concluded that:

- Habitat degradation is a factor for decline for most listed fish species in Western Oregon, and is a major risk factor that continues to threaten population segments.
- The abundance and survival of fish species is often closely linked to the abundance of large woody debris in stream channels. The current amount of large woody debris channels is low.
- Eighty-seven percent of streams on BLM-administered lands in the Cascades province, and 75% of streams on BLM-administered lands in the Coast Range Province had less than 22% embeddedness of fine sediment.

The portions of Chapters 3 (pages 365-390) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the aquatic ecosystem conditions and processes are incorporated here by reference.

Within the Eugene District, past management activities on both public and private lands have also degraded aquatic and riparian conditions and contributed to declines in fish populations. Stream cleaning and other activities have resulted in a lack of habitat complexity and a decrease in high quality fish habitat throughout the District. Numerous streams lack deep, complex pools that provide cover to juvenile fish from predators and refuge during high winter flows. Bedrock dominated streams typically have warmer stream temperatures, and decreased spawning and rearing habitat.

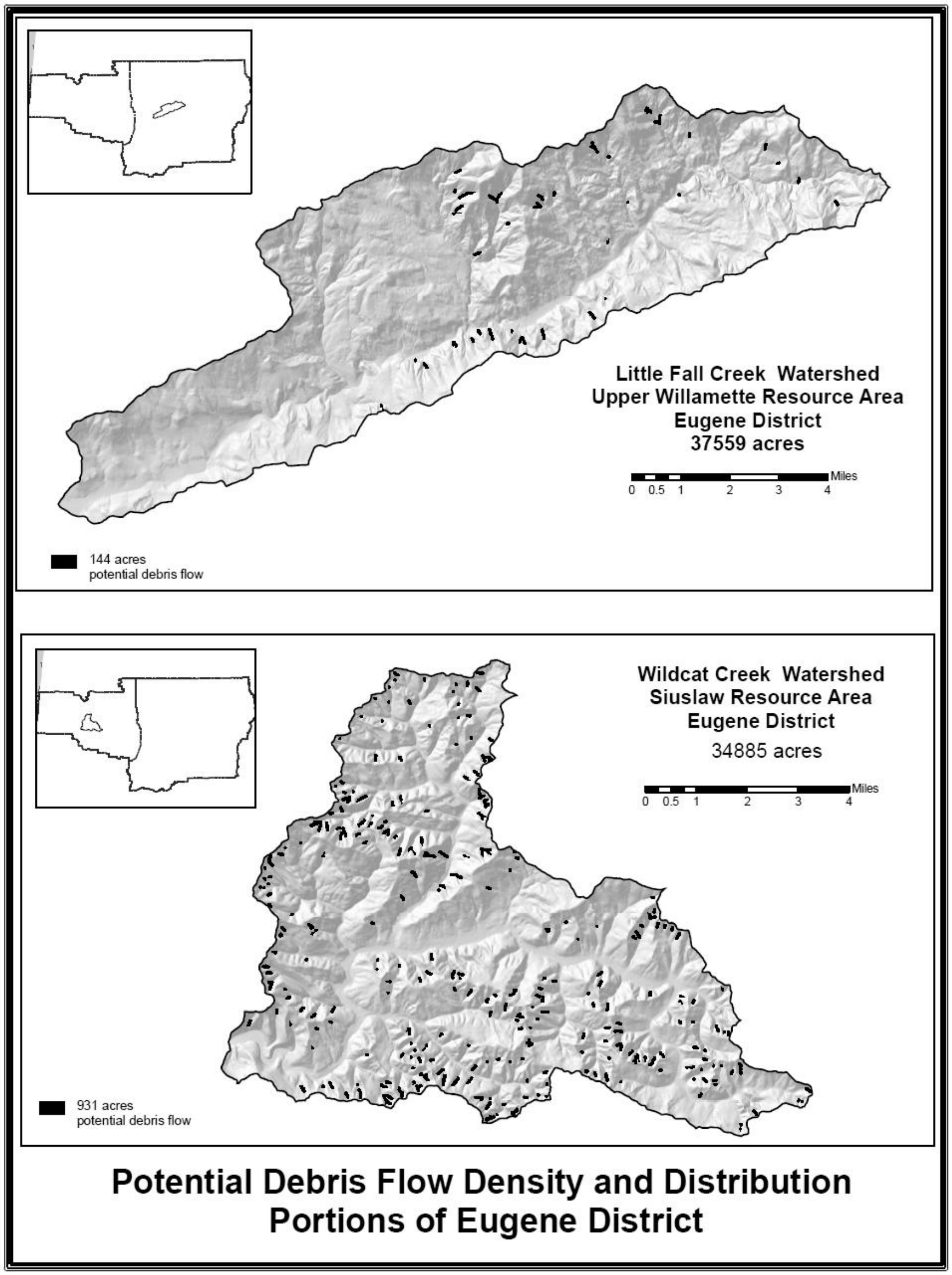
Based on recent research and data collected from the Oregon Coast Range and Willamette Valley, it is estimated, for this analysis, that 50% of the aquatic habitat in the Eugene District would be considered “high quality habitat”; and 50% would be considered “low quality habitat” (ODFW, 2009) for fish species.

The amount of large wood within stream channels is also dependant in part on the amount of trees available on the landscape over time that can be delivered to stream channel from riparian mortality, debris flows or from channel migration. The current amount of large wood in stream channels in the Eugene District, is a reflection of previous timber harvest and other disturbance within riparian areas. Trees in the resultant second-growth forests are generally too small to provide large wood to fish bearing stream channels. Riparian stands that are in the stand establishment structural stage have few trees greater than 20 inches in diameter; whereas riparian stands that are mature and structurally complex contain trees large enough to provide large wood. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (pages 375-383) concluded that approximately 57% of riparian area forests on BLM-administered lands in the Eugene District lack large conifers. In the Eugene District, there are currently 748,276 riparian acres that are in the stand establishment structural stage. Two percent (14,005 acres) of the riparian acres in a stand establishment forest occur on

BLM-administered lands, and 98% (734,271 acres) occur on non-BLM-administered lands. Data from the Oregon Department of Fish and Wildlife aquatic habitat inventories in several watersheds within the Eugene District also indicate that there is generally a lack of conifers greater than 20 inches in diameter within areas that have the potential to deliver large wood to stream channels (ODFW, 1999-2009).

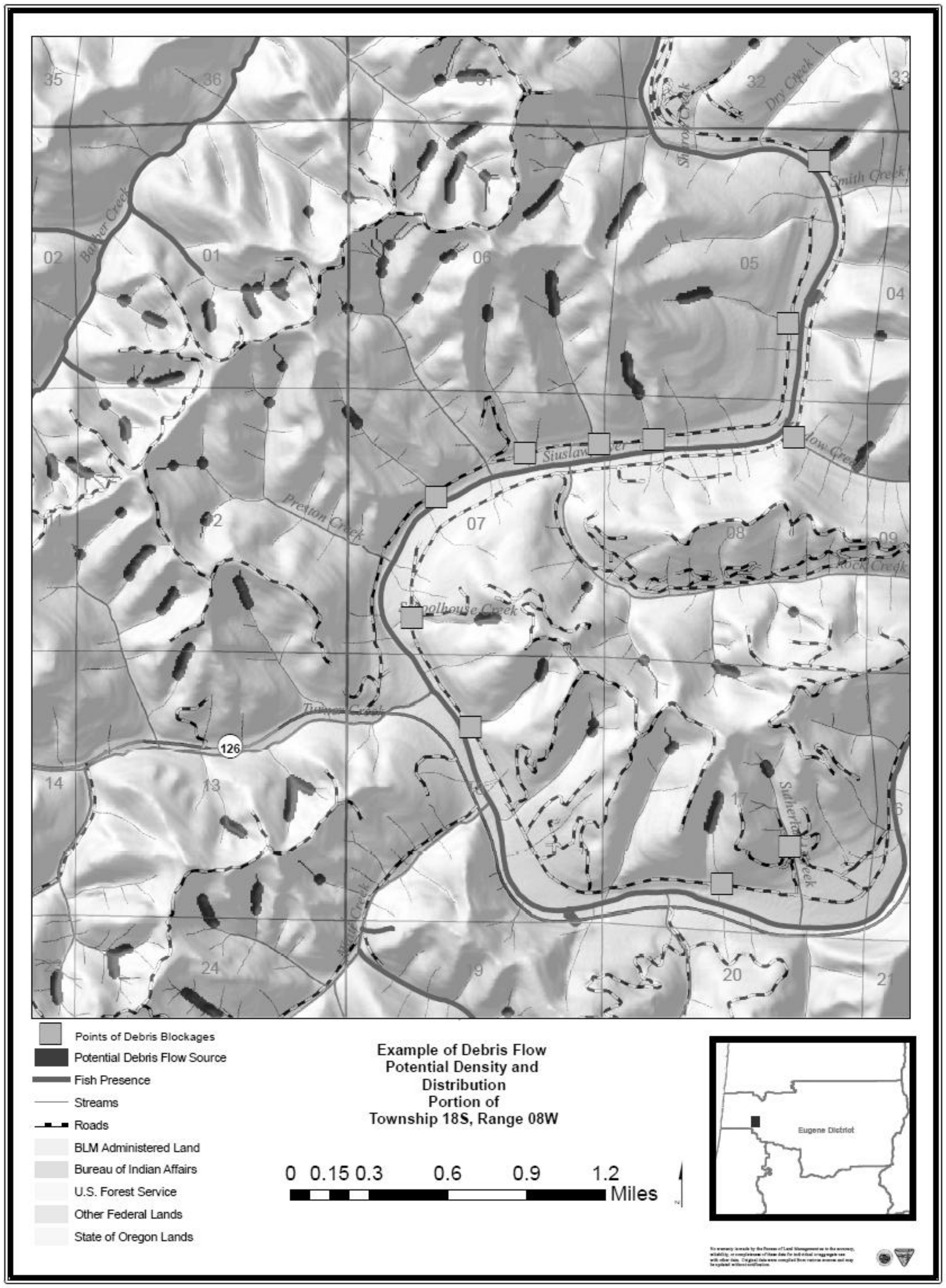
Large wood is delivered from forests to stream channels from both chronic (e.g. riparian tree fall) and episodic events (e.g. landslides and debris flows) (Naiman et al, 2000). Watersheds in the Eugene District differ in the frequency and magnitude of debris flows as a result of differences in topography and climate. For example, topographical differences between Wildcat Creek and Little Fall Creek watersheds result in large differences in the amount of streams that have a higher probability of debris flow wood delivery to stream channels. See Figure 3-3 (*Within And Among Watershed Heterogeneity Of Debris Flow Probability For The Wildcat And Little Fall Creek Watersheds*).

FIGURE 3-3. WITHIN AND AMONG WATERSHED HETEROGENEITY OF DEBRIS FLOW PROBABILITY FOR THE LITTLE FALL CREEK AND WILDCAT CREEK WATERSHEDS.



Wood loading from debris flow sources to downstream fish bearing reaches has declined over time (BLM, 2008). Currently, roads constructed across stream channels limit the downstream delivery of debris flow wood to fish bearing stream channels. See Figure 3-4 (*Example of debris flow potential and road crossings that limit wood loading*).

FIGURE 3-4. EXAMPLE OF DEBRIS FLOW POTENTIAL AND ROAD CROSSINGS THAT LIMIT WOOD LOADING.



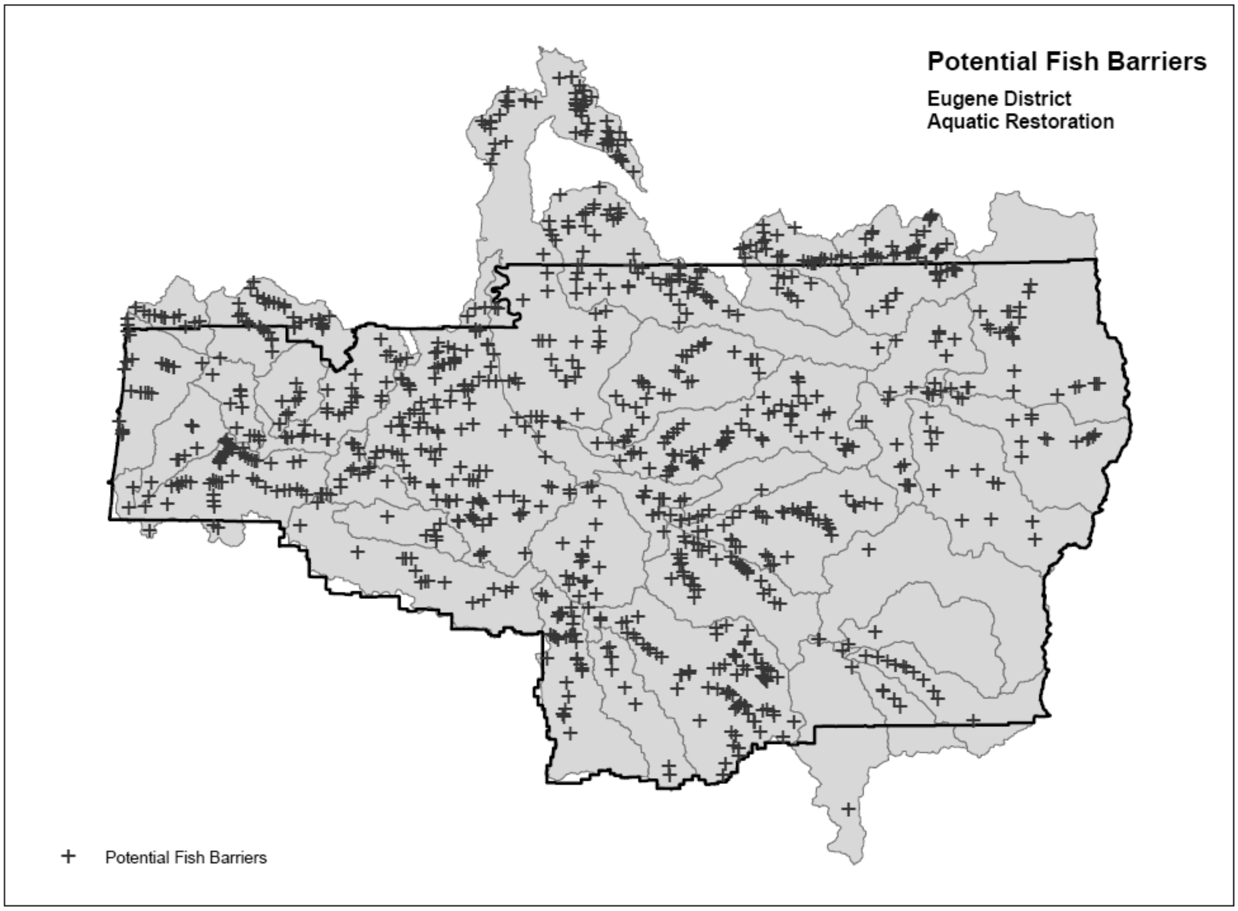
Sediment

In 2004, the Oregon Department of Environmental Quality reported the results of stream channel conditions, including watersheds within the Eugene District. For watersheds in the Coast Range, 42% of stream channels were rated as “good” (<22% embeddness); 17% were rated “fair” (22-35% embeddness), and 41% were rated “poor” (>35% embeddness). For watersheds in the Willamette Valley, 7% of stream channels were rated as “good”, 3% were rated as “fair”, and 90% were rated as “poor”. These results represent the conditions across all ownerships and do not necessarily represent the conditions on BLM-administered lands. For example, for stream channels on BLM-administered lands in the Coast Range, 75% were rated as "good", 15% fair, and 8% were rated as "poor".

Fish Passage

From 1995 to 2004, the BLM replaced over 100 fish passage barriers within the Eugene District that were barriers for anadromous and/or listed fish. As a result, approximately 80 stream miles have become accessible to adult and juvenile fish. Although many fish-passage barriers have been corrected, there are still over 1,000 fish passage barriers within the Eugene District, blocking access to aquatic habitat for several fish species (BLM, 2008). See Figure 3-5 (*Fish Passage Barriers On BLM-Administered Lands*).

FIGURE 3-5. FISH PASSAGE BARRIERS ON BLM-ADMINISTERED LANDS *(*Not all barriers shown are complete barriers, but may only limit fish passage or limit juvenile fish passage)*.



III. Invasive Plants

Invasive plant species are plants that have been introduced into environments outside of their native range where they have few or no natural enemies to limit reproduction and spread (OSU Extension 2003). "Noxious weeds" are nonnative plants that have been legally designated as serious plant pests because of economic loss or harm to the environment. Oregon has a state-designated Noxious Weed List managed by the Oregon Department of Agriculture. Both noxious and invasive plants are termed “invasive plants” in this document. Invasive plant species are spreading at a rate of around ten to fifteen percent per year on BLM-administered lands in Western Oregon (BLM, 2009).

Activities such as recreation, vehicle travel and the movement of contaminated equipment can increase both the rate and distance of spread of invasive plants (Oregon Noxious Weed Strategic Plan 2001). Thousands of acres of invasive species are treated annually within the planning area through Integrated Pest Management Programs (IPM). For example, in 2009, the Eugene District BLM treated over 1,600 acres with invasive plants.

Weedmapper (2009) reports 39 species of management concern with the Eugene District boundary. A full list of invasive plants is included in Appendix C (*Invasive Plants*). Invasive species that do not currently occur within the Eugene District, but have the potential to invade various habitats within the District are considered “Early Detection and Rapid Response Species”. Other species occur more frequently across the District in a wide variety of habitat types. Some species are short-lived, and occur following a disturbance event, while others persist and modify habitats over a longer time-period.

The information and data used for this analysis regarding the distribution of invasive plants was from Weedmapper (2009) and is currently the most comprehensive data set available that identifies infestations on both federal and non-federal lands. See Appendix C (*Invasive Plants*).

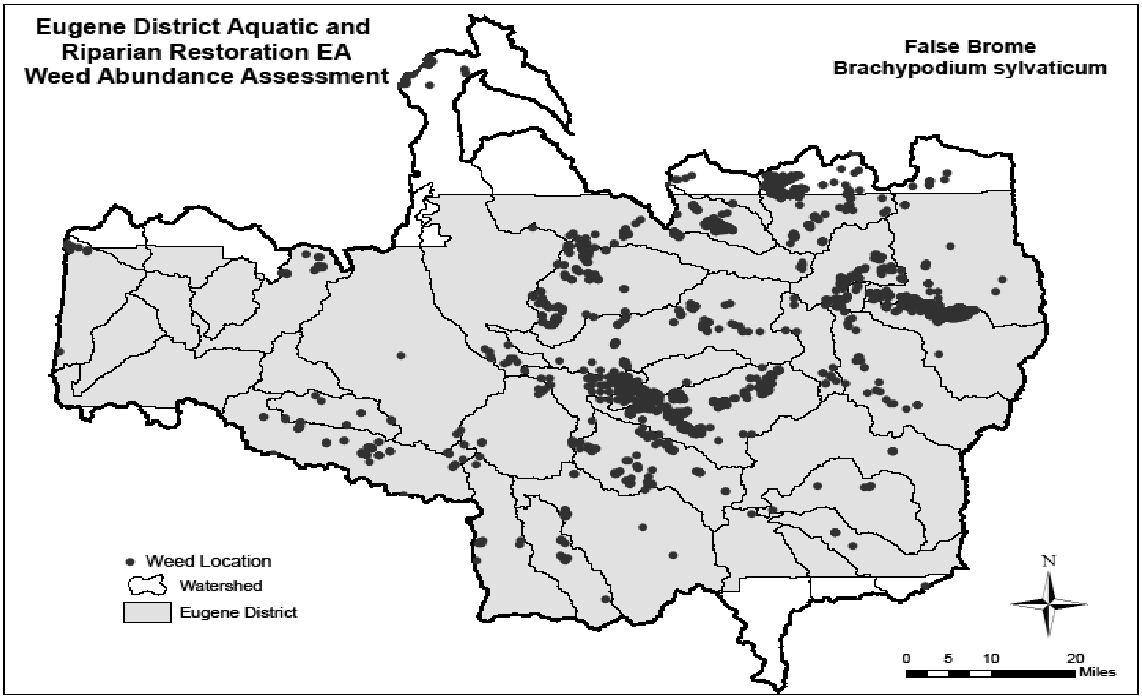
The following five plant species will be used for this analysis because of known potential to occur and spread in riparian areas and existing quantified data on current distribution.

Brachypodium sylvaticum **(false brome)**
False brome is a perennial grass that forms short bunches. False brome reproduces rapidly from seed and although not rhizomatous, can sprout from small stems or root fragments when cut. It has been suggested that the seed bank is not persistent, and lasts two to three years (Fitzpatrick and Kaye 2006).

False brome thrives in both full sunlight and shade, is an aggressive invader, and can quickly form dense stands in a wide variety of habitats. Once established, it typically outcompetes native forbs, grasses and tree seedlings. The change in vegetation composition caused by false brome could alter habitat for small mammals, native insects, reptiles, song birds and other wildlife (Kaye 2001, Blakeley-Smith 2007). Little quantitative plant community work has been done on this species so it is unknown if streams bordered by false brome versus those that do not have different aquatic insect assemblages (T. Kaye, pers. comm.)

The species is commonly found in riparian areas where it is believed to spread downstream and onto floodplains (Getty 2009). Dense patches of false brome may inhibit the establishment of riparian trees, which are important sources of shade and structure to streams (Kaye 2001, Tu 2002). Getty (2009) speculates that the species presence along waterways may reduce some fish populations over time due to the plants successful competition with tree seedlings, causing a reduction in riparian woody debris, important for aquatic habitats. Getty (2009) also suggests that tree seedling mortality may increase as rodents utilize false brome as habitat and feed on tree seedlings. The main vectors for spread are forest management equipment, vehicles, recreation, deer, and streams (Johnson 2009, Kaye 2001). The species is often first found along roads and trails where it can then successfully invade disturbed or non-disturbed habitats (Getty 2009 and Kaye 2001), including riparian zones. See Figure 3-6 (*False brome sites in the Eugene District*).

FIGURE 3-6. FALSE BROME SITES IN THE EUGENE DISTRICT (WEEDMAPPER, RETRIEVED 2009).



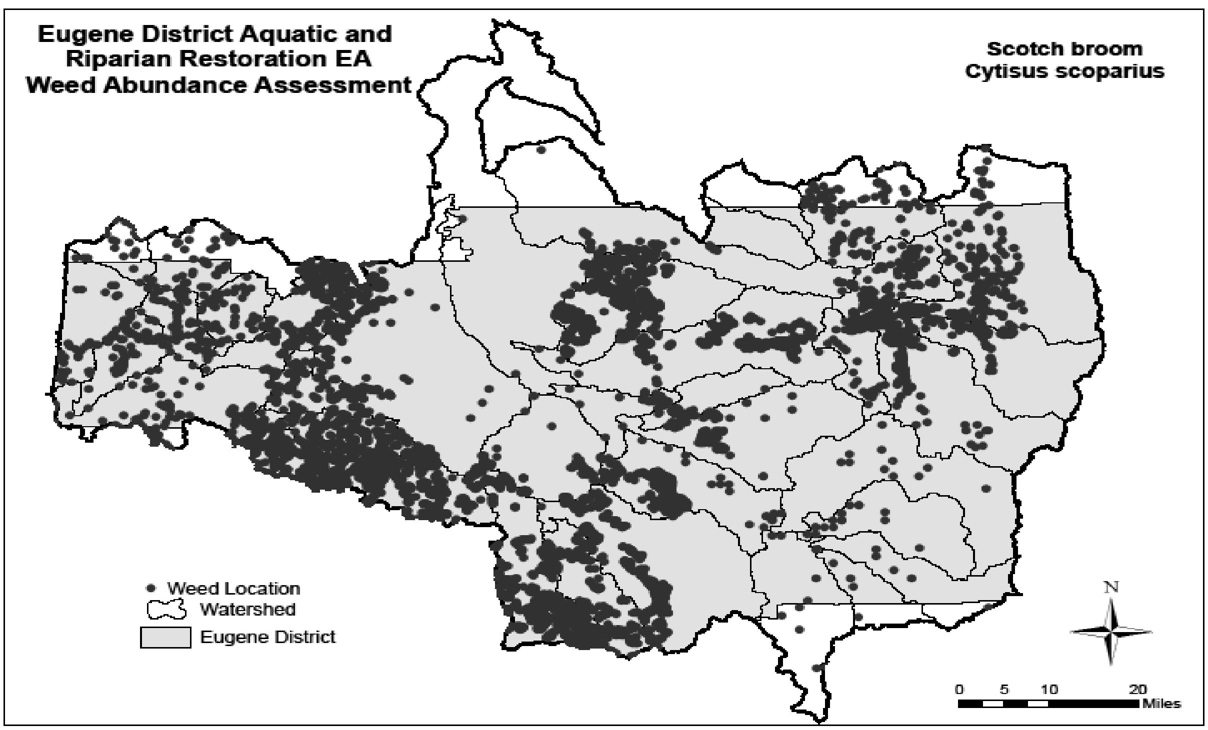
Cytisus scoparius – Scotch broom

Scotch broom is a perennial species that can remain viable for over 80 years. Individual shrubs can produce up to 60 seedpods per bush by the second year and hundreds when plants are mature. Seeds can rapidly spread over long distances including from gravel hauled from river bottoms or during flooding events (Huckins and Sol 2004).

Like most invasive species, Scotch broom can change the structure and composition of plant communities where it concentrates, including riparian habitats. As a pioneer species, it is known to displace native plant species in a wide range of habitats and conditions. See Figure 3-7 (*Scotch broom sites in the Eugene District*). Like many weeds it is often found in disturbed areas. Watterson and Jones (2006) found that scotch broom seeds float and survive transport in water, and once introduced into the stream (often by road systems), boulders, wood placement, stream gradient and channel width all affect the plant's distribution. Flooding is a primary mechanism that redistributes the species in the stream network. The removal of vegetation in the floodplain creates high light levels and warmer ground temperatures which are conditions that increase seed germination. Scotch broom is often observed in middle stream reaches where the unvegetated floodplain is wide and stream gradients are low. The species survives on cobble bars or terraces, often in areas protected from scouring such as behind large wood or boulders. Scotch broom can find safe sites for seed germination and seedling establishment between cobbles and fine sediment in these areas.

Hoshovsky (1986) states that the success of Scotch broom is due to 1) wide tolerance to soil conditions 2) ability to fix nitrogen and grow for most of the year given adequate precipitation and mild climates and 3) the abundant production of seeds and a long-lived seed bank. Scotch broom is tolerant of low-nutrient soils and can be found in a range of soil moisture conditions (Weedmapper, retrieved 2009). While the species optimum habitat is in dry, well-drained, sunny locations (Weedmapper, retrieved 2009), it is commonly found on riverbanks (Washington Department of Natural Resources, King County 2008), riparian areas and floodplains (Huckins and Sol 2004; Kris 2005) where it effectively displaces native vegetation. Scotch broom can continue to grow and compete for moisture, space and nutrients under partial tree canopy. In optimum habitats the species can dominate a plant community, forming a dense, monospecific stand. Most vegetation dies in the understory which leads to loss of herbaceous plants and tree seedlings on sites where it is abundant. Scotch broom invasions may also change native insects and animals by altering plant community and structure (Kris 2005).

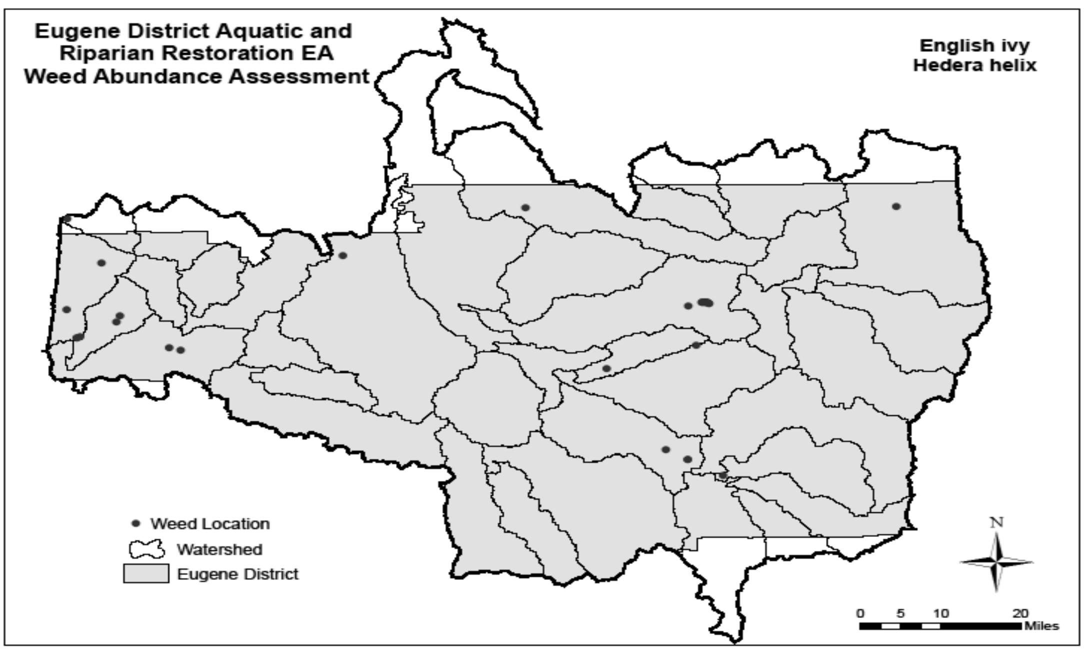
FIGURE 3-7. SCOTCH BROOM SITES IN THE EUGENE DISTRICT (WEEDMAPPER, RETRIEVED 2009).



*Hedera helix (*English Ivy) and *Hedera hibernica* (Irish Ivy)

During its juvenile stage, ivy spreads rapidly by vegetative growth. Mature plants can also spread by seed. Ivy is an aggressive invader that threatens most forest types in the Northwest. Ivy is a vigorous growing vine that impacts all levels of disturbed and undisturbed forested areas, growing both as a ground cover and as a climbing vine (OSU Extension 2008). The species displaces native vegetation by creating dense monocultures on the forest floor which outcompete grasses, herbs, and trees, often reducing habitat for animal species. As a groundcover, ivy can protect soils from erosion, but it lacks the deeper soil stabilization capability of mature trees and shrubs (OSU Extension 2008). Ivy has also been known to reduce streamside vegetation that stabilizes stream banks and provides stream shade. Natural forest regeneration in heavily infested areas is greatly reduced where there is an absence of understory and ground cover plants as a result of the dense thick mat of ivy groundcover. As the ivy climbs in search of increased light, it covers and kills branches by blocking light from reaching the host tree's leaves. Branch dieback proceeds from the lower to upper branches. The added weight of the vines makes infested trees much more susceptible to being blown over during high rain and wind events and heavy snowfalls (Plant Conservation Alliance 2009). In some areas within the Eugene District, trees have been observed dying or collapsing due to the weight of ivy. Ivy has also been documented in riparian forests, particularly in lower gradient stream systems. See Figure 3-8 (*English and Ivy Sites In The Eugene District*).

FIGURE 3-8. ENGLISH AND IRISH IVY SITES IN THE EUGENE DISTRICT (WEEDMAPPER, RETRIEVED 2009).



***Polygonum cuspidatum (*Japanese knotweed) and *Polygonum sachalinense* (giant knotweed)**
Giant knotweed is a perennial species that grows over 12 feet tall and is closely related and similar to Japanese knotweed. Japanese knotweed grows vigorously along roadsides, waste areas, streams and ditch banks where it creates dense colonies that exclude native vegetation and greatly alter natural tree regeneration. In riparian areas, it can disperse quickly during flood events and rapidly colonize scoured shorelines, islands and adjacent forest land (WeedMapper, retrieved 2009). See Figure 3-9 (*Japanese and Giant Knotweed sites in the Eugene District*).

Giant knotweed is the largest of the knotweeds, enabling this species to dominate and out-compete native plants. In riparian areas, Giant knotweed can prevents streamside tree regeneration (Urgenson et al, 2009).

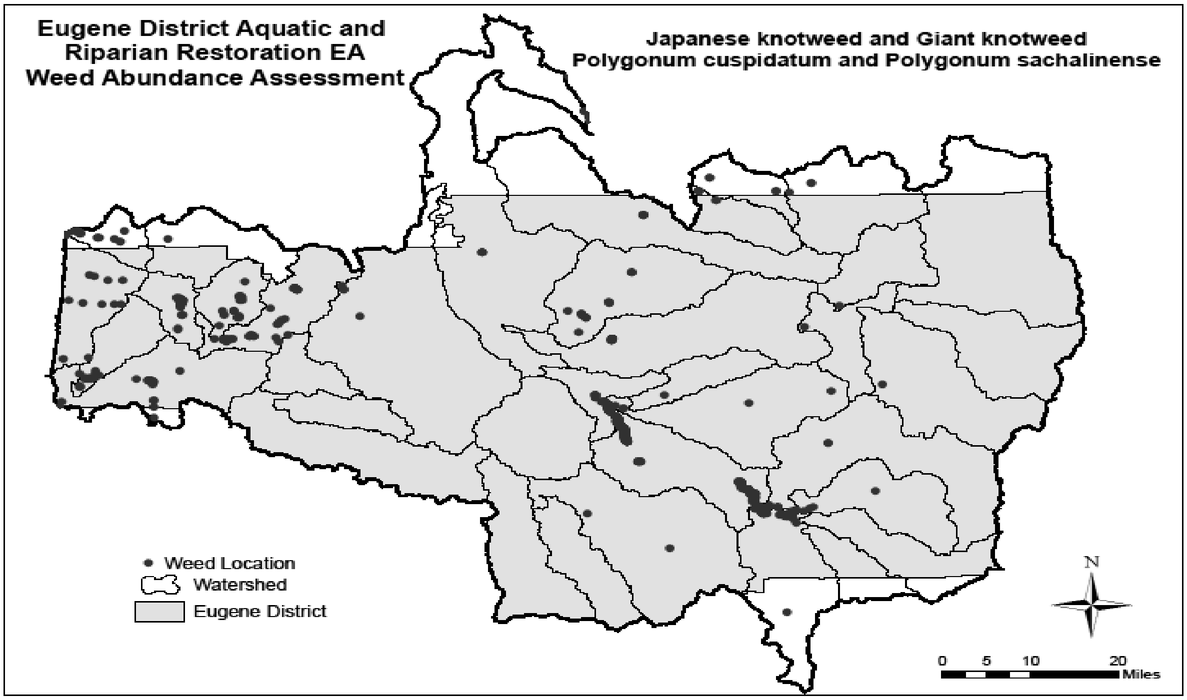
Washington Department of Natural Resources, King County (2008) summarizes as follows: Both species can grow in partial shade or full sun. Knotweeds thrive in any moist soil or river coble, but can also grow in dry areas. The species is most commonly found in the flood zone along rivers and creeks. It also can grow in roadside ditches, wetlands and other moist areas. Dispersal can be from natural flooding, erosion or human-caused dispersal such as roadside clearing or contaminated fill. The species is difficult to control because rhizomes are vigorous and form deep dense mats. Seeds can be viable for 15 years. Seeds in the upper one inch of soils generally last 4-5 years and below one inch, remain dormant longer.

Urgenson et.al. (2009) found that the species richness and abundance of native herbs, shrubs and juvenile trees were negatively correlated with knotweed density. Litter mass of native species was reduced by 70%. By displacing native species and reducing nutrient quality of litter inputs, knotweed invasion has the potential to cause long-term changes in the structure and function of riparian forest and adjacent habitats. Changes in the composition and quality of riparian litterfall may also affect aquatic food-webs. By reducing litter from native species and replacing it with litter of lower nutritional quality, knotweed invasion could affect the productivity of aquatic marcoinvertebrates, thus reducing the food base for fish species.

In summary, knotweed has the potential to:

- Alter the quality, quantity and timing of streamside litter input
- Modify the riparian microclimate
- Alter soil nutrient cycling
- Lead to an increase of sediment delivery to streams
- Lower the density and diversity of phytophagous (plant-eating) insects
- Displace of native riparian vegetation due to its aggressive growth, altering species richness and percent cover.
- Reduce quality of riparian habitat for fish and wildlife.
- Block smaller waterways.
- Degrade native plant and animal habitat by forming dense stands that crowd out all other vegetation.

FIGURE 3-9. JAPANESE AND GIANT KNOTWEED SITES IN THE EUGENE DISTRICT (WEEDMAPPER RETRIEVED, 2009)

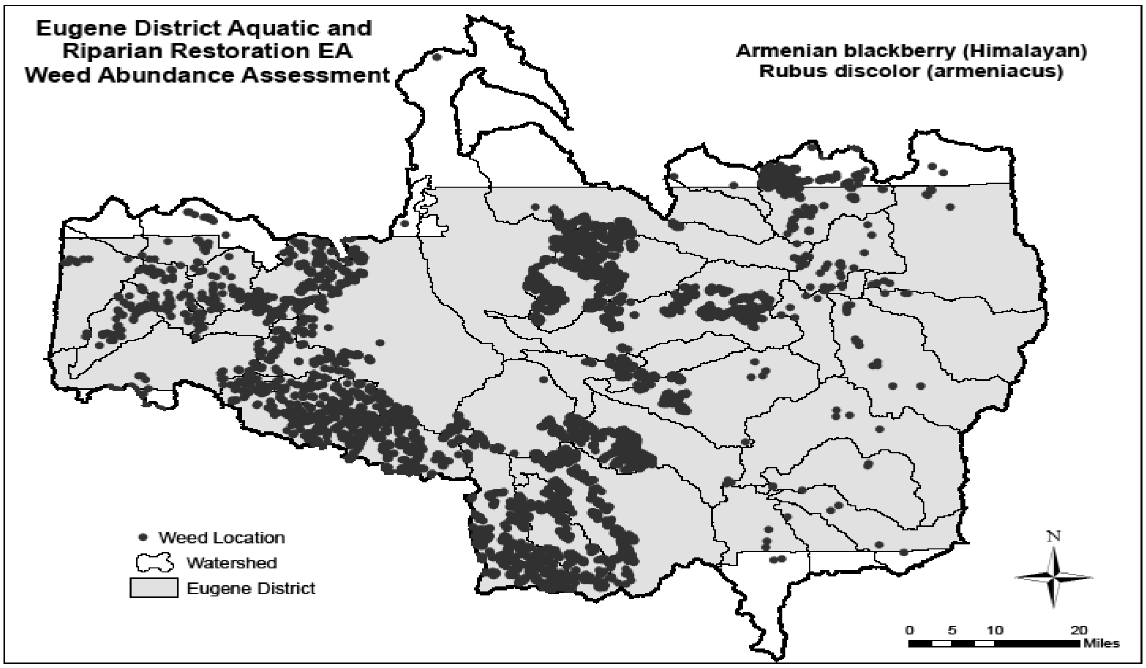


***Rubus armeniacus (*formerly *Rubus discolor)* – Himalayan/Armenian blackberry**

Himalayan/Armenian blackberry can grow up to ten feet high, sprouts vigorously from rhizomes and root crowns, and can produce between 7,000 and 13,000 seeds per square meter that remain viable in soil for several years (Hoshovsky 1989). Himalayan/Armenian blackberry is the most widespread and economically disruptive of all invasive plants in western Oregon. See Figure 3-10 (*Himalayan/Armenian Blackberry Sites In The Eugene District*). It can aggressively displace native plant species and dominate riparian habitats. The ability of the species to persist in partial shade, sprout rapidly after cutting, and propagate both vegetatively and sexually make this species difficult to eradicate (Bennett 2004). Chan (2006) suggests that the presence of Himalayan/Armenian blackberry in riparian areas indicates degraded conditions such as incised channels and loss of hydrologic connectivity between channel and floodplain.

The species is found on historical floodplains of streams and rivers that now have incised channels and where down cutting has occurred. Himalayan/Armenian blackberry rapidly occupies disturbed areas and is very difficult to eradicate, leading to a loss of instream structure, and increased runoff from upland areas. Floodplain soils that once stored flood waters and released the water into the channel at drier periods of the year are now drained and dry enough for Himalayan/Armenian blackberry to spread into the riparian areas (Bennet 2007). Himalayan/Armenian blackberry has a shallow root system compared to riparian tree species. When the species grows on banks of streams, shallow root systems do not prevent banks from being undercut. Once undercut, banks collapse under the weight of the brambles resulting in channel widening. Himalayan/Armenian blackberry tends to out-compete native vegetation for light and moisture (especially native trees and shrubs) making restoration difficult. Grubbing and mechanically removing roots, combined with the loss of channel roughness can lead to additional bank erosion (Bennet 2007).

FIGURE 3-10. HIMALAYAN/ARMENIAN BLACKBERRY SITES IN THE EUGENE DISTRICT (WEEDMAPPER RETRIEVED 2009).



V. Wildlife

There are 45 special status (ESA-listed and BLM Sensitive) wildlife species and migratory birds of conservation concern that are known or suspected to occur in the Eugene District. The proposed actions would not affect 26 of these species because they are out of the species' ranges or because suitable habitat would not be present. See Appendix D (*Wildlife*). The remaining 19 species are discussed below.

Federally-listed Threatened, Endangered and Proposed Species

Northern Spotted Owl

Spotted owls occupy conifer-dominated forest throughout the Eugene District. Suitable habitat for the northern spotted owl was described by Thomas et al. (1990:164) as "multi-layered, multispecies canopy dominated by large (greater than 30 inches diameter at breast height) conifer overstory trees, and an understory of shade-tolerant conifers or hardwoods; a moderate to high (60 to 80 %) canopy closure; substantial decadence in the form of large, live conifer trees with deformities (such as cavities, broken tops, and dwarf mistletoe infections; numerous large snags; ground cover characterized by large accumulations of logs and other woody debris; and a canopy that is open enough to allow owls to fly within and beneath it). Dispersal habitat for the northern spotted owl supports owl movement and survival but not nesting. It is comprised of forest stands with an average diameter at breast height of 11 inches or greater, an average canopy closure of 40 percent or greater, and structural components like snags and coarse woody debris that support prey species.

There are 108,000 acres of suitable habitat and an additional 157,000 acres of dispersal habitat on BLM-administered land in the Eugene District. BLM-administered lands support 175 known spotted owl nest sites and potentially support another 98 nest sites as predicted by the US Fish and Wildlife Service (USDA/USDI 2008). Spotted owl habitat in the Eugene District is concentrated in the Cascades West and Coast Range physiographic provinces; negligible amounts occur in the Willamette Valley Physiographic Province.

Marbled Murrelet

Marbled murrelets nest in forested communities with nesting structure within 50 miles of the coast (Coast Range Physiographic Province) between April 1 and September 30. Within this area, BLM-administered lands support 53,000 acres of suitable nesting habitat or habitat that contains nesting structure. Trees and forest stands are considered to have nesting structure if they include the following characteristics:

- Occur below 2,925 ft. elevation (Burger 2002) and within 50 miles of the coast (USDI 1997b),
- Are one of four species: western hemlock, Douglas-fir, Sitka spruce or western red cedar (Nelson and Wilson 2002),
- Are greater than or equal to 19.1 inches in diameter and greater than 107 feet in height, have at least one platform greater than or equal to 5.9 inches in diameter, have nesting substrate (e.g., moss, epiphytes, duff) on the platform, have access routes through the canopy that a murrelet could use to approach and land on platforms, and have a tree branch or foliage, either on the tree with structure or on a surrounding tree that provides protective cover over the platform (Burger 2002, Nelson and Wilson 2002).

Currently, twenty-one occupied sites are known to occur on BLM-administered lands within the Eugene District. Murrelets generally do not occupy BLM-administered lands between October 1 and March 31.

Designated and Proposed Critical Habitat

Critical Habitat Units are areas identified by the US Fish and Wildlife Service as essential for the conservation and recovery of listed species.

Northern Spotted Owl Critical Habitat

BLM-administered lands on the Eugene District support 136,000 acres of critical habitat in ten critical habitat units, of which 57,000 acres support suitable habitat and an additional 29,000 acres support dispersal habitat. The primary constituent elements of spotted owl critical habitat include space for individual and population growth and for normal behavior; food, water or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproducing, rearing of offspring; and habitats that are protected from disturbance or are representative of the historic geographic and ecological distributions of a species. Therefore, all forest-capable lands within critical habitat units are critical habitat, regardless of habitat condition.

Marbled Murrelet Critical Habitat

BLM-administered lands support 43,300 acres of critical habitat in four critical habitat units. The precise acreage of critical habitat is unknown because murrelet critical habitat is defined by the occurrences of primary constituent elements in individual stands. The primary constituent elements of murrelet critical habitat include individual trees with nesting platforms, and forested areas within one-half mile of individual trees with potential nesting platforms and a canopy height of at least one-half the site-potential tree height. Thus, only those lands that occur within critical habitat units *and* support these habitat characteristics are critical habitat.

BLM Sensitive Species and Migratory Birds

Crater Lake Tightcoil

This microsnail is found in perennially wet habitats, such as springs, seeps, and wetlands, at elevations above 2000 feet throughout the Oregon Cascades. Specific habitat features used by the snail include large coarse woody debris, rocks, surface vegetation, moss, and uncompacted soil (Duncan et al. 2003).

Evening Fieldslug

This slug is known from widely separated sites in Oregon, Washington, and British Columbia and it is reasonable to assume that it may occur in suitable habitats on both sides of the Cascade Mountains from the Klamath Basin to the Canadian Border, and in the Coast Range from the Elliot State Forest to the Olympic Mountains. No specimens are recorded from the Eugene District, but it is probable that the Evening Fieldslug occurs here. Suitable habitat is thought to consist of moist, cool forest near streams, springs, or seeps that offers refugia such as large coarse woody debris or rock.

Salamander Slug and Spotted Taildropper

Little is known about the life history and habitat requirements of these species. Specimens have been found in the Oregon Coast Ranges and Western Cascades; given this distribution they are likely to occur on the Eugene District. Sites where salamander slugs have been found included moist conditions, leaf litter, herbaceous and shrub vegetation, and large coarse woody debris. Similar mollusk species require leaf litter, fungus, feces, and/or detritus as food sources, as well as refugia from desiccation during dry periods. Possible refugia include interstices in rock habitat, soil fissures, or the interior of large woody debris. These slugs likely use herbaceous vegetation, ferns, leaf litter, or moss mats in moist, shaded areas near refugia when active.

Tillamook Westernslug

Although surveys have not been completed for this species on BLM-administered lands, it is found regularly in mid-seral forest communities on the Siuslaw National Forest and on BLM-administered lands in the Tillamook Resource Area (North Coast Physiographic Province). Its habitat needs are not well known; though it has been documented that it is associated with the organic duff layer and moss on the floor of cool forests that contain coarse woody debris, sword ferns and hardwood shrubs.

Roth's Blind Ground Beetle
Only four records of this species exist, all from Benton and Lincoln Counties in the Coast Range. Based on conditions at these sites, it is thought that Roth's Blind Ground Beetle requires cool, moist conditions in mature, closed-canopy conifer forest with deep, well-drained soils. This species has not been detected on the Eugene District, but it could occur in the Siuslaw Resource Area.

Oregon Slender Salamander
The Oregon Slender Salamander is found in conifer forest up to 4400 feet elevation, associated with cool, moist habitats and refugia such as large coarse woody debris, bark piles, or rock habitat. Limited surveys on the District suggest that the species is uncommon and associated with mature and old-growth stands, although younger stands with abundant large, decayed logs or talus may also be suitable.

Foothill Yellow-legged Frog
This species has been found in five locations within the District. These scattered locations suggest that this species was formerly widespread along the rocky parts of the Willamette River and its larger tributaries in the Cascade foothills as far east as Vida and Oakridge. There are also several records from the Smith River in northwestern Douglas County so this species might be present in the Coast Range portion of the District. In western Oregon this is a low-elevation species that has been found from sea level to 1,800 feet; typical habitat is a low-gradient stream six to twelve feet wide with pebble or larger substrate and frequent open stretches of sand and gravel stream banks. Dispersal occurs through uplands, in and along medium sized streams and, to a much lesser degree, larger rivers.

Western Pond Turtle
This species utilizes a wide variety of aquatic habitats, generally from sea level to approximately 5,000 feet elevation. In Oregon this species is found primarily in slow portions of rivers, streams and wetland habitats. Aquatic habitats generally have basking sites in the form of logs, rocks and/or emergent aquatic vegetation. Pond turtles typically utilize separate terrestrial habitats to lay eggs, move between aquatic habitats and aestivate/hibernate. They overwinter in the duff and/or soil of upland habitats that are usually within 500 yards of their aquatic habitat. Pond turtles lay their eggs in relatively open areas of short grasses or forbs, usually within 150 yards of the water and on gentle slopes. Nesting habitat is the most specialized habitat for this species and juveniles experience the highest rate of mortality. Because of this, nesting habitat is the most limited and most at risk habitat component for this species in many areas.

American Peregrine Falcon
This raptor is found across North America and was once designated as a Threatened species under the ESA. Peregrine falcons prey on other birds, which they catch on the wing. The species builds nests (or aeries) on cliffs or other sheer vertical structures with suitable ledges. Only one peregrine falcon nest is known on the District and suitable nest sites are uncommon; however it is likely that other nests are present given the species' increasing numbers.

Peregrine falcons nest on cliffs or other sheer vertical structures with suitable ledges and commonly hunt birds along rivers and over wetlands throughout the year. Currently, there is one known nest location on BLM-administered lands within the Eugene District. The occurrence of additional nests on BLM-administered lands is probable given recent population increases in the Pacific Northwest, but is likely very limited due to the low number of cliffs that would provide suitable nest locations.

Bald Eagle

Bald eagles are large raptors that feed on a variety of prey, including fish, waterfowl, and carrion. They are a migratory species that will both overwinter and nest on the District. Bald eagles typically choose to nest in large trees with open canopies near large bodies of water, and are sensitive to disturbance while nesting (Buehler 2000, Isaacs and Anthony 2003).

Harlequin Duck

This diving duck breeds along larger, fast-flowing inland streams before migrating to coastal Canada and Alaska to overwinter. Typical food items include terrestrial and aquatic invertebrates and fish eggs (Thompson et al 1993, Robertson and Goudie 1999). Harlequin ducks nest on the ground, in tree cavities, on cliffs or on stumps, usually within 5 meters of water although distances of up to 150 feet have been recorded. Other important habitat features include a somewhat open canopy, ground cover, and in-stream resting sites like logs or boulders. This species has been detected on the District in the McKenzie River and in Marten Creek.

Purple Martin

The purple martin is the largest North American swallow. It breeds throughout the eastern U.S., coastal areas of the Pacific Northwest, and the southern Rocky Mountains. Although many purple martin populations nest in birdhouses or other artificial structures, other populations nest in tree cavities. Snags with woodpecker cavities are thought to be the most important habitat features for these populations (Brown 1997). Purple martin nests are typically found in open areas near water (Brown 1997, Horvath 2003); in forested habitats on the Eugene District purple martins are typically found in large snags over recent clear cut harvests.

Northern Goshawk

Goshawks are large forest-dwelling raptors found throughout temperate forested regions of the northern hemisphere. Goshawks forage below the forest canopy for a variety of birds and small mammals. Stands used for foraging and nesting in the northwest are generally mature with large trees, a closed canopy, and a relatively open understory, but goshawks do use mid-seral habitat as well. Both types of habitat have been used for nesting on the Eugene District.

Fringed Myotis.

The Fringed Myotis is an insectivorous bat species found throughout the western U.S. The species appears to utilize a range of habitats, from sagebrush to Douglas-fir forest (reviewed in Verts and Carraway 1998). Known hibernacula and roost sites include caves, mines, buildings, and large snags (Weller and Zabel 2001). Fringed myotis have been detected across the District; proximity to stream channels may be a factor in roost site selection due to the species use of stream channels as foraging and travel corridors.

Pallid Bat

West of the Cascades this species is restricted to drier interior valleys of southern Oregon. In Lane County it occurs at low elevations and near the valley floor. This species is a crevice dweller associated with rock outcrops, large hollow trees and snags, and human structures. It is usually found in brushy and rocky terrain, but pallid bats have been observed along edges of coniferous and deciduous woods and open farmlands.

Townsend's Big-Eared Bat

Townsend's Big-Eared Bat is an insectivorous species is found throughout the western U.S. and the Ozark and Appalachian Mountains. It is associated with a variety of habitats, including desert scrub, pinyon-juniper, and coniferous forest (reviewed in Verts and Carraway 1998). Townsend's big-eared bat typically roosts and hibernates in mines and caves, but it has also been found roosting in hollow trees, in human structures, and under bridges (Pierson et al 1999, Fellers and Pierson 2002).

CHAPTER FOUR – ENVIRONMENTAL EFFECTS

The following section includes a description of the known and predicted effects that are related to the identified issues.

I. Water, Fish, Aquatic Habitat

Issue: How would the proposed aquatic and riparian restoration activities improve fish habitat and fish productivity?

This analysis used a spatially explicit, GIS-based scoring system to estimate how fish habitat and fish productivity would improve in each fifth-field watershed, over a ten year period, under each alternative. The analysis organized predictions of physical and biological outcomes under each restoration strategy using various indicators. See Appendix B (*Fisheries Analytical Methodology*). In order to compare and contrast different watershed prioritization strategies, various levels of restoration actions were assumed for each watershed over a period of ten years; for BLM-administered lands and non-BLM-administered lands combined. The level of treatment for each watershed was determined based on the priority ranking of each watershed under each alternative, the level of restoration allowed annually in any watershed under the Biological Opinions, and the level of restoration completed on the Eugene District from 1997 to 2007. For a detailed description of the analytical assumptions and methods used for this analysis see Appendix B (*Fisheries Analytical Methodology*).

A reference analysis is also included in this environmental assessment. A reference analysis provides additional information that is useful to understand more fully the effects of the alternatives. The reference analysis is focused and limited to a specific analytical question. The reference analysis is not selectable during decision making, because it would not meet the purpose and need for action. The reference analysis used for this environmental assessment provides information about the maximum restoration potential for each watershed. The reference analysis represents a probable habitat restoration potential and in some locations may not reflect actual site conditions. However, for this analysis, the reference analysis provides a point of comparison for the effects of the alternatives. For a description of the analytical assumptions used for the reference analysis see Appendix B (*Fisheries Analytical Methodology*).

This analytical approach utilized quantitative information, consistently across the Eugene District. Fifteen watersheds were excluded from the analysis, because only a small portion of these watersheds were within the Eugene District boundary. Although these watersheds were excluded from the analysis, the results of the analysis were extrapolated to these watersheds, since the fish habitat within these watersheds are similar enough to those included in the analysis.

In order to evaluate the degree to which fish and riparian habitat improved in each watershed, under each alternative, over a ten year period; a score-based ranking system was used. If the level of treatment over ten years was within 60% to 100% of the maximum restoration potential, then the watershed was considered to have a High potential of fish habitat improvement. If the level of treatment over ten years was within 20% to 59% of the maximum restoration potential, then the watershed was considered to have a Medium potential of fish habitat improvement. If the level of treatment over ten years was within 0% to 19% of the maximum restoration potential, then the watershed was considered to have a Low potential of fish habitat improvement.

Fish and riparian habitat would improve under all alternatives, since all watersheds would receive some level of treatment over the next ten years. However, the greatest increase in fish habitat would occur under Alternative 1 (21%), which emphasizes restoration in watersheds with the highest density of high intrinsic potential streams and the highest density of threatened and endangered fish species. The number of watersheds that would have a high potential to be restored is less under Alternative 2 (19%), which emphasizes restoration in watersheds with the highest density of high intrinsic potential streams and threatened and endangered species on BLM-administered lands; and Alternative 3 (16%), which emphasizes restoration in watersheds with the highest density of high intrinsic potential streams and highest density of native, resident fish species on BLM-administered lands. The smallest number of watersheds with a high potential, would occur under the No Action alternative (9%), which does not include a watershed prioritization strategy. See Table 4-1 (*Number Of Watersheds With High, Medium, Or Low Potential To Restore Watershed And Improve Fish Habitat*).

TABLE 4-1. NUMBER OF WATERSHEDS WITH HIGH, MEDIUM, OR LOW POTENTIAL TO RESTORE WATERSHED AND IMPROVE FISH HABITAT.

	Instream			Sediment/Roads			Fish Passage			Riparian[2]			Overall (Avg)		
	High	**Med**	**Low**	**High**	**Med**	**Low**	**High**	**Med**	**Low**	**High**	**Med**	**Low**	**High**	**Med**	**Low**
No Action	5	12	18	2	16	17	3	9	25	0	0	37	**9%**	32%	54%
Alt 1	10	10	17	7	12	18	7	5	25	0	0	37	**21%**	24%	55%
Alt 2	10	9	18	5	16	16	5	8	24	0	0	37	**19%**	28%	53%
Alt 3	10	10	17	4	18	15	5	8	24	0	0	37	**16%**	34%	50%

*HIGH: High Potential to restore watershed: 60%-100% of reference analysis (maximum potential)
*MED: Medium Potential to restore watershed: 20%-59% of reference analysis (maximum potential)
*LOW: Low Potential to restore watershed: 0%-19% of reference analysis (maximum potential)

In order to determine how each outcome effects fish productivity, a fish productivity index and scoring approach was developed and used for this analysis. This model provides the best information to evaluate the effects of fish habitat restoration on fish productivity in the absence of watershed and species-specific population models. The index is not a prediction of absolute productivity numbers or outcomes, but allows for a comparative analysis of the effects of each alternative.

[2] The number of watersheds in the Riparian category were not included in the overall average including the results masked the differences between the alternatives (since all watersheds in the riparian category were “Low”).

The fish productivity index is based the number of watersheds with a high potential for recovery occur within a stronghold watershed. A watershed rating system is used to determine if each watershed is a “stronghold watershed” for threatened and endangered fish species and native, resident fish species. For threatened and endangered fish species, the watershed was considered a “stronghold” if it had more than .0013 miles per square mile of high intrinsic potential streams and if no significant dams within the watershed. For native, resident fish species, the watershed was considered a “stronghold” if the density of stream miles with native, resident fish was greater than 1.15 miles per square mile and there were no significant dams in the watershed. The number of watersheds with a high potential of restoration were then summed for each High fish productivity watershed. If more than one category (e.g. fish passage and instream) had a High rating, the watershed was counted once for each category. For example, if the Indian Creek watershed scored High for fish passage and instream restoration, then it received two points. Since there are three indicators that could receive a score (Instream, Sediment, and Fish Passage), then the maximum potential fish productivity score under the reference analysis would be 111 (37 watersheds x 3 indicators). The score under each alternative is based on the percent of the total score.

The potential to contribute to fish productivity would increase under each alternative, since watersheds would be restored over the next ten years within at least one stronghold watershed. However, the greatest contribution to fish productivity would occur under Alternative 1, since 15 of the watersheds (or indicators) that would be restored would occur in stronghold watershed for threatened and endangered fish species; and 13 of the watersheds (or indicators) would occur in stronghold watersheds for native resident fish species. In other words, implementing the restoration priority strategy under Alternative 1 would restore the highest amount of watersheds overall, and the highest number that are considered stronghold watersheds for both threatened and endangered and native, resident fish species.

A smaller amount of stronghold watersheds would be restored under Alternative 2 and Alternative 3. Under Alternative 2, seven of the watersheds (or indicators) that would be restored would occur in stronghold watershed for threatened and endangered fish species; and seven would occur in stronghold watersheds for native resident fish species. Under Alternative 3, six of the watersheds (or indicators) that would be restored would occur in stronghold watershed for threatened and endangered fish species; and six would occur in stronghold watersheds for native resident fish species. The smallest amount would occur under the No Action Alternative, with five watersheds (or indicators) restored in stronghold watershed for threatened and endangered fish species, and two restored in stronghold watersheds for native, resident fish species. See Table 4-2 (*Number Of Watersheds With The Highest Contribution To Fish Productivity And Fish Productivity Index Score*).

TABLE 4-2. NUMBER OF WATERSHEDS WITH THE HIGHEST CONTRIBUTION TO FISH PRODUCTIVITY AND FISH PRODUCTIVITY INDEX SCORE.

	# Watersheds - Contribution to Fish Productivity		
	Threatened and Endangered Fish	Native, Resident Fish	Index Score (% of Reference Analysis)
No Action	4	2	**5**
Alt 1	18	13	**28**
Alt 2	10	9	**17**
Alt 3	8	9	**15**
Reference Analysis	37	37	111

Under all alternatives, the proposed actions would be consistent with the Aquatic Conservation Strategy. See Appendix A (*Aquatic Conservation Strategy*) for a full description of how the alternatives would be consistent with Aquatic Conservation Strategy objectives.

Issue: How would aquatic and riparian restoration activities adversely affect fish, fish habitat, and water quality?

Restoration activities that are beneficial to fish and fish habitat can also result in short-term adverse effects. The National Marine Fisheries Service ARBO (pages 78-112) concluded that aquatic and riparian restoration activities would have both long-term beneficial effects and minor, short-term adverse effects to fish species, such as increased turbidity. The National Marine Fisheries Service also concluded in the ARBO (pages 114-115) that the proposed actions are not likely to jeopardize the continued existence of listed fish species, nor would they destroy or adversely modify designated critical habitat (NMFS, 2008). The portions of the ARBO (pages 78-112, 114-115) that describe the short term adverse effects and the conclusions are incorporated here by reference.

Sediment and Turbidity

Fine sediments enter and leave river channels naturally, but increased suspended sediment (turbidity) and sedimentation (embeddedness) can adversely affect fish (Anderson et al. 1996). Suttle et al. (2004) suggests that there is no threshold below which fine sediment would be harmless to fish, and the increase of fine sediment in stream channels (even at low concentrations) can decrease the growth of salmonids.

Several of the proposed actions, including instream restoration, culvert and bridge projects, road decommissioning, streambank restoration, and head-cut stabilization, require the operation of heavy equipment in the riparian area and stream channel. These activities would increase the amount of fine sediment delivered to stream channels and would increase turbidity, though the effects would be short-term and localized in nature. The increase in sediment load to stream channels would occur during project implementation (typically no more than 1-2 weeks) and during the first winter storm runoff period following the project (less than one year). Increases in turbidity plumes within stream channels would typically last less than eight hours per day over a one to two week period, since turbidity plums generally dissipate within 1-2 hours after equipment is removed from the stream.

In order to estimate the amount of the short-term increase in fine sediment delivery to stream channels from the proposed actions under each alternative, the following assumptions were made for the purpose of this analysis. First, 1 ton/mile/year is equivalent to between .75 cubic yards/mi/year and 1.25 cubic/yards/mi/year. Therefore, for this analysis the average (1.0) is used to convert tons/mi/year to cubic yards/mi/year. Second, it is assumed that approximately 2.6 cubic yards of sediment would be delivered to stream channels from fish passage (e.g. culvert removal) actions; 1 cubic yard from instream restoration actions; and 32 cubic yards from road related actions (e.g. decommissioning) (Keppeler et al. 2007). Third, the implementation of Project Design Features and Best Management Practices such as straw mulching and sediment fences would reduce sediment delivery to streams by 90-95% (URS, 2000).

For this analysis, the overall level of treatment (District-wide total/decade) under the action alternatives does not vary; rather the level of treatment varies by location (watershed). Therefore, overall amount of fine sediment that would be delivered to stream channels from the proposed actions would vary by location, not total amount. Under the action alternatives, the amount of fine sediment delivered to stream channels from instream restoration actions would be 50 cubic yards per year; 1,792 cubic yards per year from road related actions; and 15.3 cubic yards per year from fish passage actions. See Table 4-3 (*Current And Overall Estimate Of Fine Sediment Delivered To Stream Channels Under The No Action And Action Alternatives*).

TABLE 4-3. CURRENT AND OVERALL ESTIMATE OF FINE SEDIMENT DELIVERED TO STREAM CHANNELS UNDER THE NO ACTION AND ACTION ALTERNATIVES.

	Instream	Roads	Fish Passage	Total (District-wide)	Total With PDF's and BMP's (URS, 2000)
	cubic yards/year				
Current	0	246,870*	0	246,870	N/A
No Action	30.5	1280	13.7	1324.20	67-133
Action Alternatives	50	1792	15.3	1857.3	93-186

*Average input from existing roads

Since the amount of sediment delivered varies by watershed under each alternative, Table 4-4 (*Total Sediment Load Increase In All Stronghold Watersheds Combined By Alternative*) shows the increase in stronghold watersheds for each alternative.

TABLE 4-4. TOTAL SEDIMENT LOAD INCREASE IN ALL STRONGHOLD WATERSHEDS COMBINED, BY ALTERNATIVE.

	T&E Fish	T&E Fish (With PDF's/ BMP's)	Native, Resident Fish	Native, Resident Fish (With PDF's/BMP's)
	cubic yards/year			
No Action	406	41	405	40
Alt 1	939	94	837	84
Alt 2	738	74	847	85
Alt 3	671	76	838	84
Reference Analysis	1772	178	2592	260

The greatest short-term increase in fine sediment delivery to stream channels in stronghold watersheds would occur under Alternative 1, since the highest level of treatment would be emphasized in the stronghold watersheds. Under Alternative 1, the total sediment load per year would increase by 0.25% from the existing amount of sediment delivered in stronghold watersheds (36,805 cubic yards/year). A smaller increase would occur under Alternatives 2, 3 and the No Action Alternative. Under Alternative 2 and Alternative 3, the total sediment load per year would increase by 0.20% from the existing amount of sediment delivered in stronghold watersheds. Under the No Action Alternative, the total sediment load per year would increase by 0.11%.

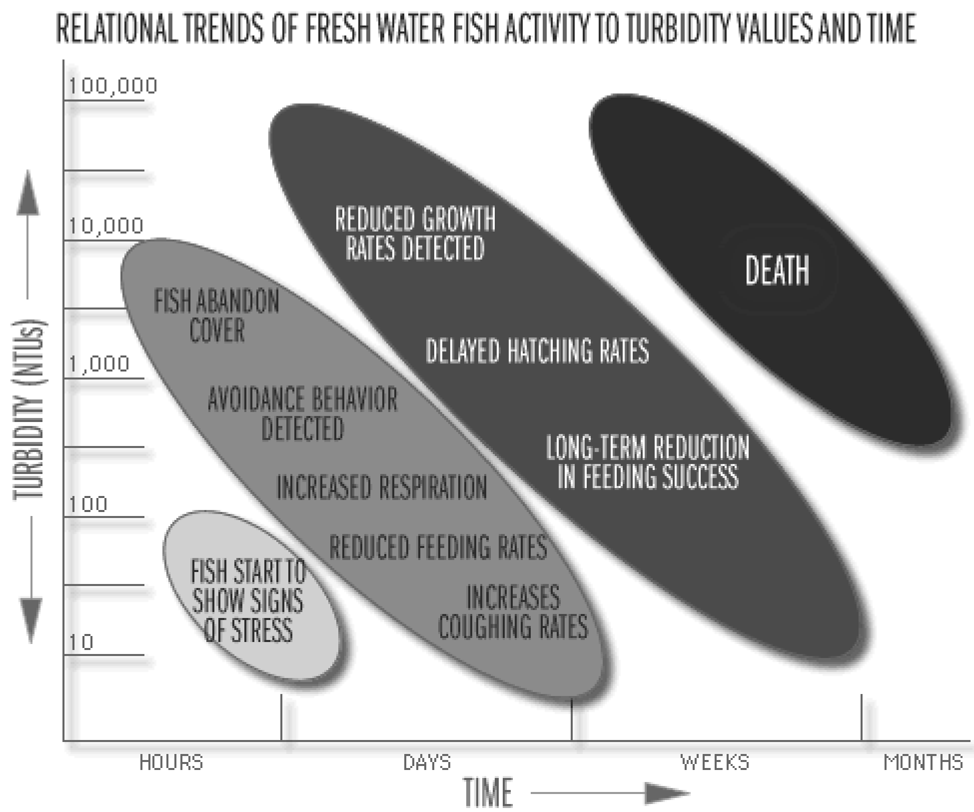
In order to determine the effect on spawning and incubating gravels, a relationship established by Greig and co-authors (2005) between sediment load and the actual accumulation of sediment (embeddness) is used. Greig and co-authors found fine sediments that entered stream channels typically mobilized and moved out of the stream system during fall rains and that the accumulation of fines within spawning redds involved less than 0.1% of the available sediment load. Using this assumption, the amount of sediment that would affect spawning habitat and fish survival in the short-term under all alternatives would be less than a 0.002% (73 cubic yards/year/all stronghold watersheds) increase from the current amount sediment input. Assuming an average of 625 stream miles per watershed, the increase per mile in each watershed would be less than 0.011 cubic yards per stream mile. Lisle and co-authors (1992) established a relationship between the volume of fine sediment accumulated in streambeds and spawning gravels, and fish survival rates. Based on the relationship described by Lisle (1992), an increase of 0.011 cubic yards/mi/year would not be an amount that would affect spawning habitat or fish survival. Therefore, under all alternatives the effects of fine sediment delivery would be below the threshold for measurable effects on fish survival.

A short term increase in turbidity would also occur under all alternatives from instream disturbance. Several studies have documented the range of turbidity increases from restoration actions such as instream restoration and culvert removals. For example, turbidity levels generally range between 0.8 and 250 nephelometric turbidity units for instream restoration actions and between 616 and 2,000 nephelometric turbidity units for culvert replacement actions. The increase would be short term; occurring downstream from the project area (1000 feet) for 2-8 hours, over a one day to two week period (USDA, 2006). These turbidity levels are based on the use of sediment traps and filters which generally reduce the increase turbidity downstream of the project area by 76%-96% (Foltz et al. 2008). Turbidity levels would generally return to background levels within several hours of the disturbance (USDA, 2006, Foltz et al. 2008).

The amount and extent of the turbidity generated would generally be the same at each site and would not vary by alternative. However, the number of sites that would be treated in a watershed would vary. In order to compare alternatives, the number of sites disturbed within stronghold watersheds is used as an indicator for the effects to fish species. More actions would occur in stronghold watersheds over the next decade under Alternative 1, so the greatest number of sites with increases in turbidity would occur under this alternative. A smaller increase would occur under Alternatives 2, 3 and the No Action Alternative; since fewer projects would occur in stronghold watersheds.

Fish species have the ability to cope with some level of turbidity at various life stages, and increases in turbidity can have both beneficial and detrimental effects to salmon and other fish species (BLM, 2008). At certain levels, elevated turbidity can increase cover, reduce predation rates, and improve survival (NMFS, 2008). Many studies have shown that fish can tolerate sediment exposure for short periods (McLeay et al. 1983); typically 3-5 days (Sigler et al, 1984) before adverse effects occur. However, chronic exposure and increased greater than 25 nephelometric turbidity units can cause physiological stress responses that reduce feeding and growth in coho salmon (BLM, 2008). Bisson and Bilby (1982) found that juvenile coho salmon avoided water with turbidities that exceeded 70 nephelometric turbidity units. However, the timing, frequency, and duration of exposure is often more important in determining the effects to fish that the overall concentration or amount (BLM, 2008; NMFS, 2008). Figure 4-1 (*Relational Trends of Freshwater Fish Activity to Turbidity Values and Time*) shows the relational trend between the effects to fish and turbidity values over time (Schematic adapted from adapted from "Turbidity: A Water Quality Measure", Water Action Volunteers, Monitoring Factsheet Series, UW-Extension, Environmental Resources Center, which is a generic, un-calibrated impact assessment model based on Newcombe and Jensen (1996) ("Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact". North American Journal of Fisheries Management. 16: 693-727).

FIGURE 4-1. RELATIONAL TRENDS OF FRESHWATER FISH ACTIVITY TO TURBIDITY VALUES AND TIME.



Under all alternatives, if Best Management Practices such as sediment traps are utilized, the increases in turbidity would be below the threshold that would cause direct mortality of fish.

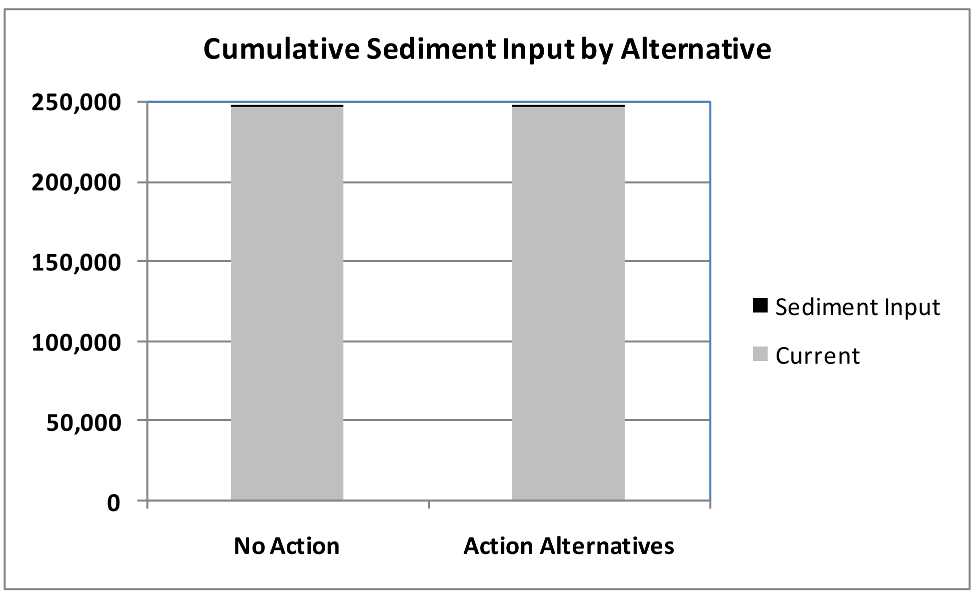
Adverse effects to fish species would include temporary avoidance, reduced feeding, and gill stress (Suttle et al, 2004, Bash et al, 2001, Newcomb et al. 1996) since the duration of the increase would occur beyond 3-5 days and at concentrations above 25 nephelometric turbidity units.

Cumulative Effects:

In order to determine the current rate of sediment delivery to stream channels in watersheds the following assumptions were made. First, sediment input from existing roads accounts for approximately 67% of the total annual sediment input to stream channels (BLM 2008, pg. 343). Second, the portion of the road within 200 feet of a stream crossing delivers the majority of the sediment to stream channels. Lastly, it assumed that the current rate of sediment delivery would continue at a similar rate occur over the next decade. Based on these assumptions, the current amount of fine sediment delivered to stream channels in all watersheds within the Eugene District boundary, is approximately 30 tons per mile per year in each watershed or 246,870 tons per year total.

Under the action alternatives, fine sediment delivery would increase in the short-term by 93 to 186 cubic yards per year; a 0.003% to 0.007% increase from the current 246,870 cubic yards. Under the No Action Alternative, fine sediment would increase in the short term by 67 to 133 cubic yards per year; a 0.002% to 0.005% increase from the current 246,870 cubic yards. See Figure 4-2 (*Cumulative Sediment Input By Alternative*).

FIGURE 4-2. CUMULATIVE SEDIMENT INPUT BY ALTERNATIVE.



The amount of sediment that would affect spawning habitat and fish survival in the short-term under all alternatives would be less than a 0.002% increase from the current amount sediment input. Based on the relationship established between the volume of fine sediment accumulated in streambeds and spawning gravels, and fish survival (Lisle et al. 1992), an increase of 0.002% would be below the threshold for measurable effects on fish survival and would not measurably add to the existing amount of embeddness in stream channels.

In the long term (greater than one year), there would be an overall decrease in the amount of sediment delivered to stream channels under all alternatives as a result of culvert replacements, road decommissioning, reduction of recreational use damage, and other similar activities. For example, there are approximately 2,034 stream crossing culverts that would be at a risk of failure over the next decade because they are undersized, plugged, or currently failing. Calculating the amount of sediment delivered to streams if these culverts were to fail requires the following assumptions. In order to calculate the estimated sediment volume that would be delivered to streams if these culverts failed, it is assumed that an average road prism width is 40 feet, because this is the typical BLM road width; an 18" culvert has a 4'active channel width, a 24" culvert has a 6' active channel width, a 32" culvert has a 7' active channel width, a 56" culvert has a 12' active channel width, and a 72" culvert has a 20' active channel width; and the average fill depth is 10'. It is assumed that the depth of fill multiplied by the active channel width multiplied by 1.5 (to account for the slope above the culvert failure) multiplied by the average road prism width would give an approximate estimate of how much sediment would be delivered to streams if high-risk culverts were to fail. Based on these assumptions, it is estimated that the amount of sediment that would enter the stream channel from the existing culverts failing would increase by 35 cubic yards for an 18" culvert to 177 cubic yards for a 72" culvert.

Although the timing of culvert and road failure is unpredictable, the amount of sediment delivered to stream channels would increase (35-177 cubic yards) at 2,034 locations; approximately 71,190 cubic yards total. However, this is likely an overestimate since it assumes all culverts would fail simultaneously, when there is a greater probability that they would vary temporally. Under the No Action Alternative, there would be an overall decrease in fine sediment delivery of approximately 71,057 cubic yards from culvert replacements. Under the action alternatives, there would be an overall decrease in fine sediment delivery of approximately 71,004 cubic yards from culvert replacements.

In order to estimate the reduction of sediment from road decommissioning, it is assumed that 246,870 cubic yards occur from the existing roads. Under the No Action Alternative, it is assumed that approximately 60 miles of roads would be decommissioned and 340 miles would be improved resulting in a net decrease of fine sediment delivered to stream channels of 12,000 cubic yards or 5%. Under the Action Alternatives, it is assumed that approximately 60 miles of roads would be decommissioned and 500 miles would be improved resulting in a net decrease of fine sediment delivered to stream channels of 67,600 cubic yards or 23%.

II. Invasive Plants

Issue: How would aquatic and restoration activities contribute to the potential introduction and spread of invasive weeds?

This analysis examines how the alternatives would contribute to the potential spread of invasive weeds. This analysis uses a fifth-field watershed risk rating approach to determine the effects of aquatic restoration actions on the introduction and spread of invasive plant species. The following general assumptions were made in order to quantify the risk of potential spread:

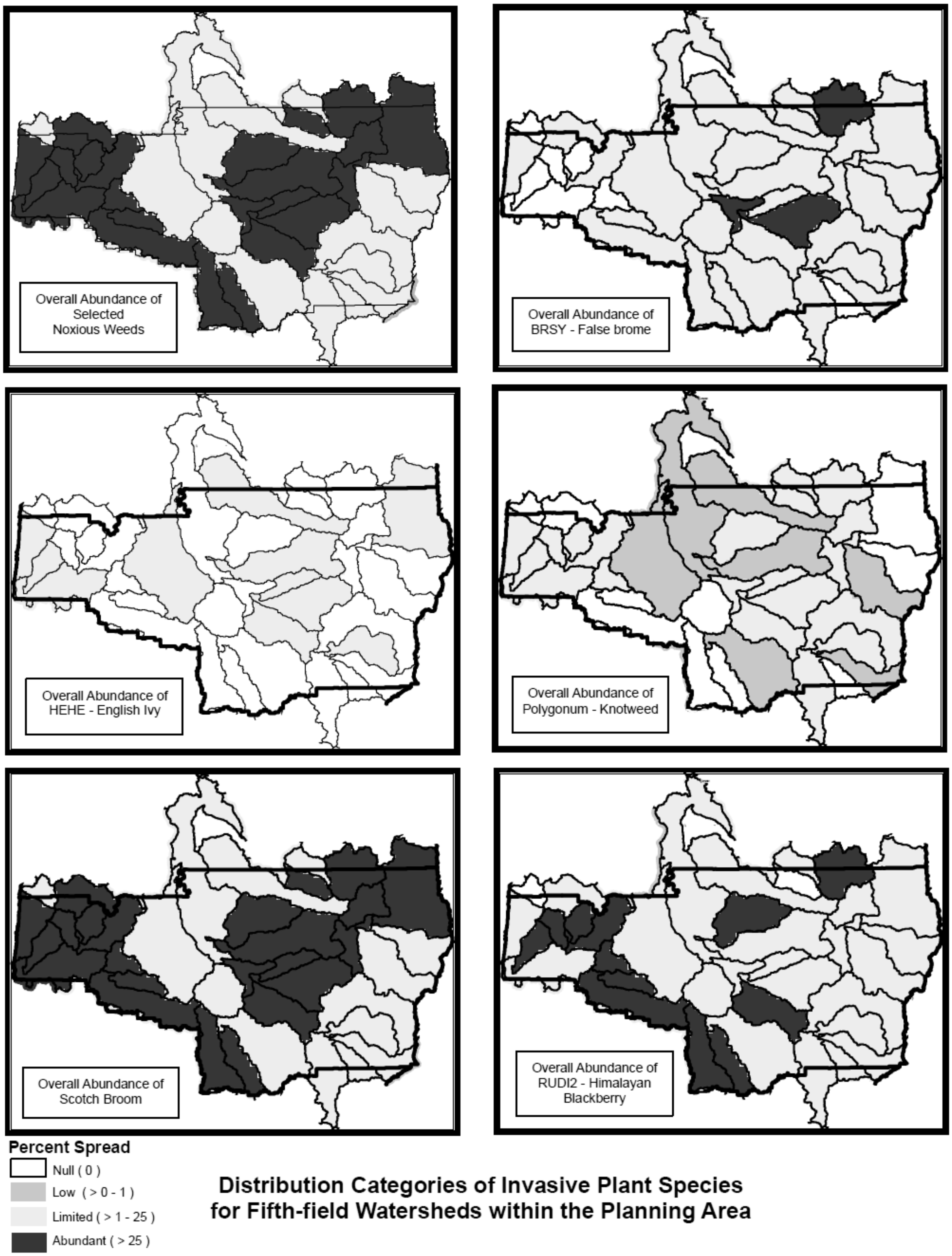
- Aquatic restoration activities can create susceptibility for invasive plant species introduction.
- The potential for infestation and spread occur more readily in areas that currently have a greater distribution and abundance of invasive plant species and where greater disturbance is planned.
- Actions, other than aquatic restoration actions, (e.g. recreation, timber harvest, road use) would continue to occur at similar rate as the previous ten years.
- Natural disturbance (e.g. flooding) in the riparian area would continue and contribute to the introduction and spread of invasive plant species.

In order to determine a risk rating under each alternative, species distribution information is generated for each watershed (Invasive Species Distribution Category). This category weighted against the number of acres with ground disturbance or modified riparian canopy (Susceptibility Value) to calculate the final risk rating. The risk rating is the potential for invasive plant species introduction within ten years from aquatic and riparian restoration actions within each watershed.

Invasive Species Distribution Category

The current invasive plant species distribution was generated for each watershed and assigned a rating of “Low”, “Limited”, or “Abundant” (Invasive Species Distribution Category). The distribution information was derived from the spatially explicit data base Weed Mapper (2009)**.** Figures 4-3 (*Species Distribution Category*) shows current Species Distribution Category rating (Low, Limited, and Abundant) for each watershed, based on the current species distribution and abundance of all five invasive plant species combined. See Chapter 3 *(Invasive Plants*).

FIGURE 4-3. SPECIES DISTRIBUTION CATEGORY



Watershed Susceptibility Value

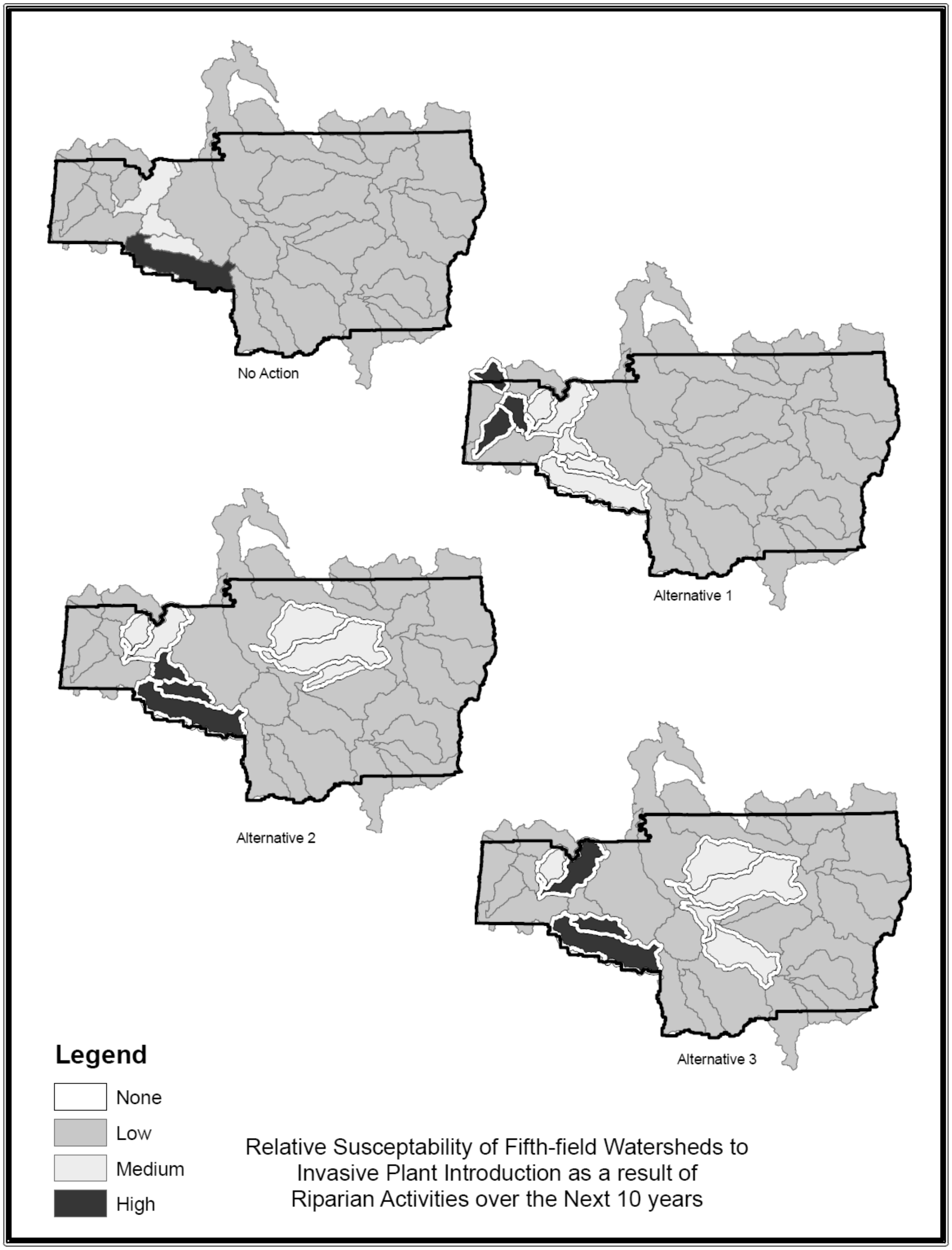
Each watershed is assigned a watershed susceptibly value of “Low”, “Moderately Low”, “Medium” , “Moderate”, “Moderately High”, “High”, or “Highest”; which represents the susceptibility of the watershed to invasive plant introductions and spread. The following matrix was used to determine the risk rating. See Table 4-5 (*Matrix Used to Determine Relative Risk for the Introduction of Invasive Plant Species Associated With Riparian Restoration Actions Over the Next Ten Years*). Results for each watershed can be found in Appendix C (*Invasive Plants*).

TABLE 4-5. MATRIX USED TO DETERMINE RELATIVE RISK FOR THE INTRODUCTION OF INVASIVE PLANT SPECIES ASSOCIATED WITH RIPARIAN RESTORATION ACTIONS OVER THE NEXT TEN YEARS.

Species Distribution Categories	Susceptibility Categories for Introduction of Invasive Plant Species From Riparian Restoration Activities		
	LOW (1)	MEDIUM (5)	HIGH (10)
LOW (1)	LOW (1)	MODERATELY LOW (5)	MODERATE (10)
LIMITED (5)	MODERATELY LOW (5)	MODERATELY HIGH (25)	HIGH (50)
ABUNDANT (10)	MODERATE (10)	HIGH (50)	HIGHEST (100)

The watershed susceptibility value for each alternative is based on the number of acres of ground disturbance or canopy modification from aquatic and riparian restoration actions under each alternative. Figure 4-4 (*Watershed Susceptibility Values*) shows the disturbance level and category for each watershed and alternative.

FIGURE 4-4. WATERSHED SUSCEPTIBILITY VALUES



Risk Rating

Using this matrix, a risk rating was calculated for each watershed. The risk rating represents the potential for invasive plant species introduction into the project area within the first ten years following aquatic restoration activities. A baseline risk rating was also calculated as a point of reference. The baseline risk rating represents the current risk for invasive plant introductions in each watershed.

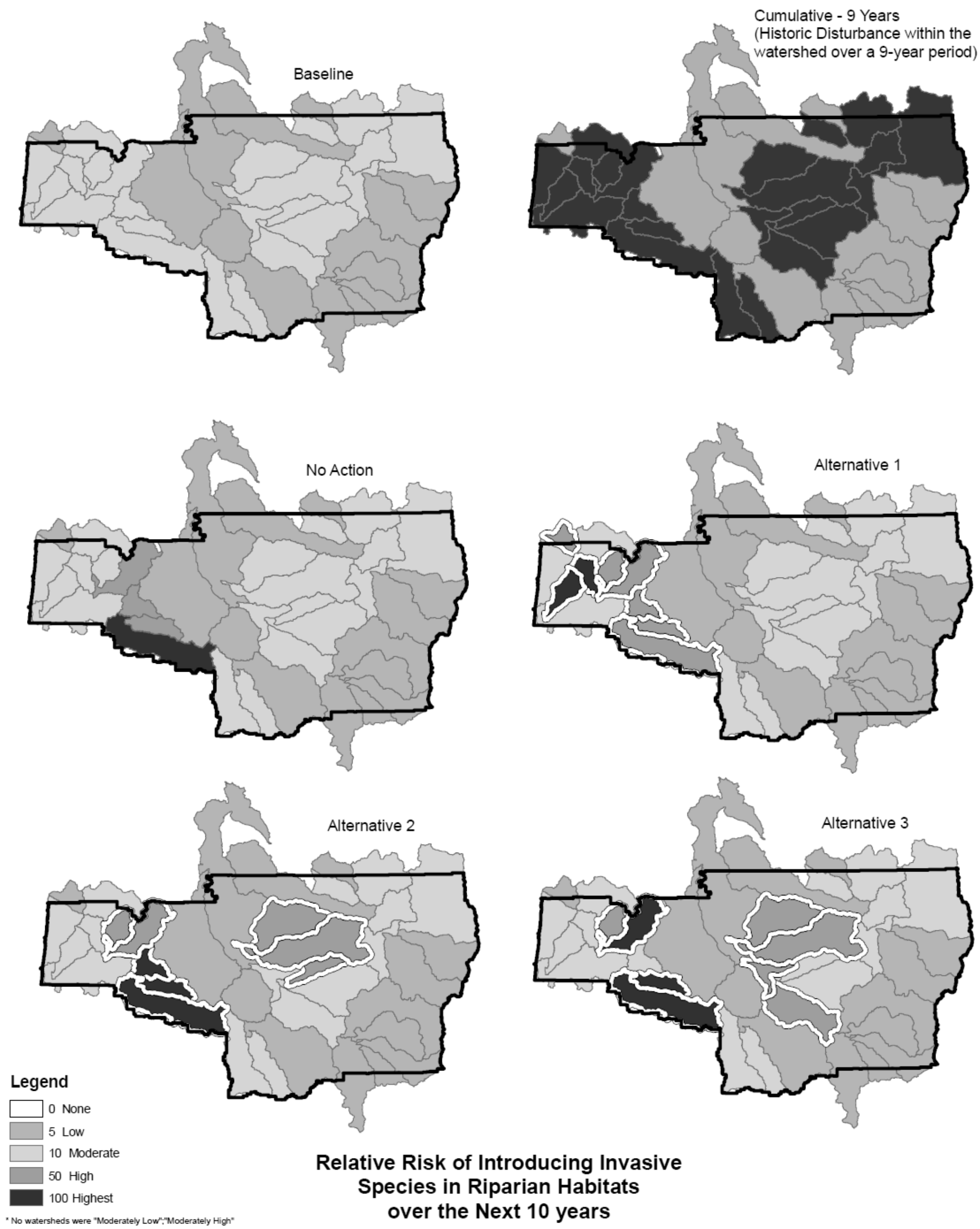
The potential for invasive plant species introduction would increase from the baseline condition under all alternatives. However, the increase in risk would be the same under Alternatives 1, 2 and 3. Under Alternatives 1, 2, and 3 eight watersheds (21%) would change from having a "Moderately Low" or "Moderate" risk rating to having a "High" or "Highest" risk rating. Fewer watersheds would increase under the No Action Alternative; where four watersheds (10%) would change from having a "Moderately Low" or "Moderate" risk rating to having a "High" or "Highest" risk rating. See Table 4-6 (*Number Of Watersheds In Each Watershed Risk Rating By Alternative*) and Figure 4-5 (*Watershed Risk Ratings)*.

TABLE 4-6. NUMBER OF WATERSHEDS IN EACH WATERSHED RISK RATING, BY ALTERNATIVE.

	Low (1)	**Mod Low (5)**	**Mod (10)**	**Mod High (25)**	**High (50)**	**Highest (100)**	**Total Increase**
Baseline	0	15	22	0	0	0	N/A
No Action	0	14	19	0	3	1	4 (10%)
Alt 1	0	15	14	0	6	2	8 (21%)
Alt 2	0	15	14	0	5	3	8 (21%)
Alt 3	0	14	15	0	5	3	8 (21%)

Although several watersheds have higher risk ratings over the ten year period, these watersheds also started with moderate levels of risk without the addition of aquatic restoration activities. In other words, no watersheds are risk free with or without the proposed actions.

FIGURE 4-5. WATERSHED RISK RATINGS



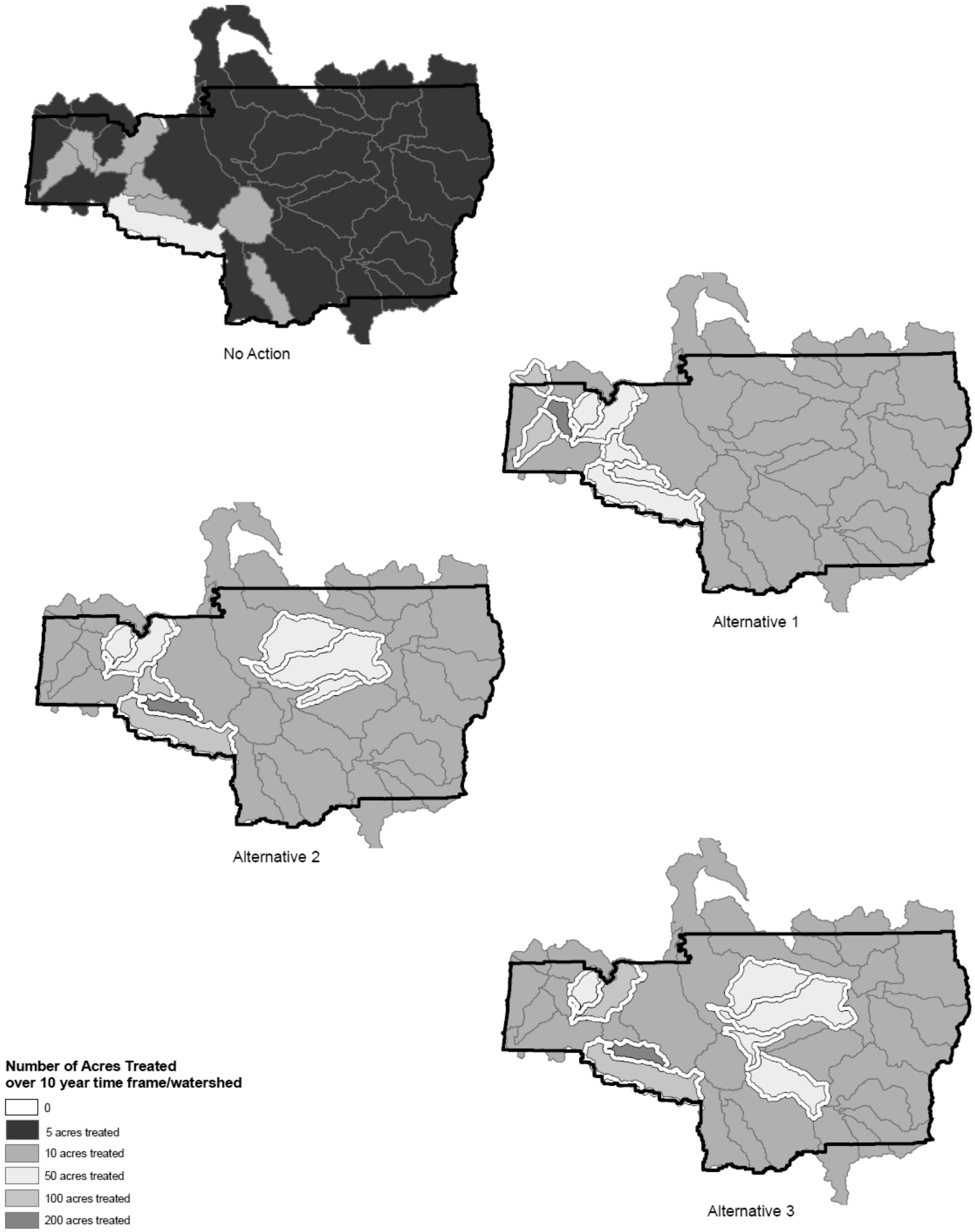
The risk rating does not account for the number of invasive plant species that would be removed over the next ten years under each alternative. In the short term, the potential for the introduction and spread of invasive plant species would be higher under Alternatives 1, 2, and 3. However, over the long-term (>10 years), the overall abundance and distribution of new and existing invasive plant populations would decrease under Alternatives 1, 2, and 3 since the number of acres treated would be greater than the number of acres disturbed. This overall decrease would not occur under the No Action Alternative, since there would be a greater number of acres disturbed than treated over a ten year period. For example, if all disturbed acres (312 acres) became infested under the No Action Alternative, and 265 acres were treated; there would still be potential net increase of 47 acres. If all disturbed areas (413 acres) become infested under Alternatives 1, 2 or 3, and 940 acres were treated for invasive plant species; there would be a net decrease of 527 acres. Table 4-7 (*Overall change in invasive plant species spread under each alternative*) and Figure 4-6 (*Assumed Invasive Plant Treatment Levels per Decade, by Alternative*) shows the relative risk of the long-term introduction and spread of invasive plants species into project areas by Alternative, coupled with the benefit of invasive plant treatments over ten years.

TABLE 4-7. OVERALL CHANGE IN INVASIVE PLANT SPECIES SPREAD UNDER EACH ALTERNATIVE.

	Acres Disturbed	Acres Treated	Net Change*
No Action	312	265	47
Alt 1	413	940	(527)
Alt 2	413	940	(527)
Alt 3	413	940	(527)

***Numbers in parenthesis are negative.**

FIGURE 4-6. ASSUMED INVASIVE PLANT TREATMENT LEVELS PER DECADE, BY ALTERNATIVE.



Invasive plant species treatment levels over 10 years

Cumulative Effects
Under all alternatives, there would be a short term increase of increase in the area susceptible to invasive plant establishment. Under Alternatives 1, 2 and 3 there would also be an overall, long term decrease as a result of invasive plant treatment. The short term increase under all alternatives would be immeasurably small on the landscape when compared to the hundreds of acres that would be disturbed within each watershed from other activities (non-restorative activities).

Table 4-8 (*Disturbance Levels Under Alternatives Compared to Levels From Timber Harvest and Wildfire*) shows the amount of disturbance as a result of timber harvest and wildfire that occurred from 1994 to 2005. For this analysis, it is assumed that these disturbances would occur at a similar rate over the next ten years. Under all alternatives, the greatest number of acres of disturbed (canopy removal) in the short term (< 10 years) would be between 7 and 30 acres in any one watershed. Therefore, the short term increase under any alternative would range from 0% to 7% of the acres from all other activities. See Table 4-8 (*Disturbance Levels Under Alternatives Compared to Levels From Timber Harvest and Wildfire*). Under all alternatives, when compared to other disturbances across the landscape; a short term increase of additional disturbance (up to 30 acres) from restoration activities would be a very small (less than 1% on average).

TABLE 4-8. DISTURBANCE LEVELS UNDER ALTERNATIVES COMPARED TO LEVELS FROM TIMBER HARVEST AND WILDFIRE.

Watershed	Timber/Fire (1995-2004)	NA		Alt 1		Alt 2		Alt 3	
	Acres	Acres	%	Acres	%	Acres	%	Acres	%
Blue River	317	7	2%	9	3%	9	3%	9	3%
Deadwood Creek	215	7	3%	16	7%	16	7%	16	7%
Fall Creek	5,128	7	0%	9	0%	9	0%	9	0%
Five Rivers	1,177	7	1%	16	1%	30	3%	16	1%
Headwaters McKenzie River	5,352	7	0%	9	0%	9	0%	9	0%
Hills Creek	491	7	1%	9	2%	9	2%	9	2%
Hills Creek Reservoir-MF Willamette River	1,040	7	1%	9	1%	9	1%	9	1%
Horse Creek	123	7	6%	9	7%	9	7%	9	7%
Indian Creek	491	9	2%	30	6%	9	2%	9	2%
Lake Creek	4,598	13	0%	9	0%	16	0%	30	1%
Little Fall Creek	4,832	7	0%	9	0%	9	0%	9	0%
Long Tom River	15,959	7	0%	9	0%	9	0%	9	0%
Lookout Point Reservoir-MF Willamette	3,471	7	0%	9	0%	9	0%	14	0%
Lower Coast Fork Willamette River	3,622	9	0%	9	0%	9	0%	9	0%
Lower Siuslaw River	5,768	7	0%	9	0%	9	0%	9	0%
McKenzie River	12,550	7	0%	9	0%	14	0%	16	0%
Mohawk River	14,581	7	0%	9	0%	16	0%	16	0%
Mosby Creek	1,933	9	0%	9	0%	9	0%	9	0%
Muddy Creek-Willamette River	1,449	7	0%	9	1%	9	1%	9	1%

North Fork Middle Fork Willamette River	10,262	7	0%	9	0%	9	0%	9	0%
North Fork Siuslaw River	522	9	2%	30	6%	9	2%	9	2%
Pudding Creek-MF Willamette River	1,949	7	0%	9	0%	9	0%	9	0%
Quartz Creek-McKenzie River	3,762	7	0%	9	0%	9	0%	9	0%
Row River	7,842	7	0%	9	0%	9	0%	9	0%
Salmon Creek	428	7	2%	9	2%	9	2%	9	2%
Salt Creek	229	7	3%	9	4%	9	4%	9	4%
South Fork McKenzie River	813	7	1%	9	1%	9	1%	9	1%
South Santiam River	1,126	7	1%	9	1%	9	1%	9	1%
South Santiam River-Foster Reservoir	4,941	7	0%	9	0%	9	0%	9	0%
Tenmile Creek-Frontal Pacific Ocean	567	7	1%	9	2%	9	2%	9	2%
Upper Calapooia River	10,214	7	0%	9	0%	9	0%	9	0%
Upper Coast Fork Willamette River	6,291	7	0%	9	0%	9	0%	9	0%
Upper Siuslaw River	13,418	30	0%	16	0%	30	0%	30	0%
Wildcat Creek	4,026	13	0%	14	0%	16	0%	9	0%
Wiley Creek	3,409	7	0%	9	0%	9	0%	9	0%
Wolf Creek	4,684	13	0%	16	0%	30	1%	30	1%
Yachats River	790	7	1%	30	4%	9	1%	9	1%

A risk rating associated with the assumed disturbance level from all other activities (e.g. timber harvest) was calculated as a point of reference, since it illustrates that all watersheds would have (under similar disturbance regimes and similar infestation levels over a ten year period) high risk ratings within ten years, regardless of the additional disturbance from aquatic and riparian habitat restoration activities. See Figure 4-5 (*Relative Risk Ratings*) which also includes the cumulative disturbance risk rating for activities other than aquatic and riparian restoration.

III. Wildlife

Issue: How would aquatic and riparian restoration activities affect migratory birds and BLM special status wildlife species and their habitat?

Under the No Action Alternative, the effects to wildlife or habitat from aquatic restoration would continue at levels and locations similar to those observed over that past decade. See Appendix D (*Wildlife*). Project Design Features found in the ARBO would be continue to be implemented if northern spotted owls, marbled murrelets, or designated Critical Habitat would be affected.

The effects to wildlife species would not differ among the action alternatives since the projects under each alternative would have the same amount of disturbance (acres and stream miles). Additionally, although the spatial location would be different under each alternative, the effects to wildlife would be the same because the same project design features would be implemented.

Northern Spotted Owl

Habitat
Project activities could modify spotted owl dispersal or suitable habitat by treatments to overstory trees, shrubs, and herbaceous vegetation, damage to coarse woody debris, and falling of snags. However, the PDFs listed above would be implemented to eliminate the potential for spotted owl take, protect suitable habitat features, and maintain habitat function. Additionally, individual projects would not exceed one acre in size, would be well distributed across the landscape, and would occur primarily along existing roads in previously impacted areas that are not suitable habitat. Consequently, the intensity, scale, and spatial arrangement of habitat effects from any project would not negatively impact any spotted owl dispersal, suitable, or critical habitat at the stand scale, affect owl use of project areas, or cause take. Projects could benefit spotted owls in the long term by maintaining or promoting the development of late-seral habitat and restoring riparian function, thereby improving project areas for nesting, roosting, foraging, dispersal, and/or breeding.

Disruption
All project activities with the potential for negative impacts to nesting spotted owls at known sites through noise or smoke would occur beyond appropriate disruption distances or outside of the nesting period. The probability of disruption to unknown nesting spotted owls in unsurveyed suitable habitat is small enough to be disregarded (USDI 2009, pg. 15). Therefore, the proposed actions would not cause negative impacts to spotted owls to from premature fledging, missed feeding visits, or increased exposure to predation during the breeding season; after breeding season spotted owls would be able to distance themselves from disrupting activities.

Critical Habitat
Actions would not affect the quantity or function of suitable or dispersal habitat, would not remove known nest trees, and would not affect the ability of stands to provide spotted owl habitat in the future. Additionally, the extent of individual projects would be less than an acre in size and dispersed across the landscape. Consequently, no negative impacts to spotted owl critical habitat would occur at the stand, Critical Habitat Unit, province, or range scales (ARBO pg. 6).

Marbled Murrelet

Habitat
Project activities may modify suitable murrelet habitat by treatments to overstory trees, shrubs, and herbaceous vegetation. However, the PDFs listed above would be implemented to eliminate the potential for murrelet take, protect suitable habitat features, and maintain habitat function. Specific actions taken would include retaining potential nest trees and maintaining necessary cover and microclimate at nest platforms. Additionally, individual projects would not exceed one acre in size, would be well distributed across the landscape, and would occur primarily along existing roads in previously impacted, unsuitable habitat. Consequently, the intensity, scale, and

spatial arrangement of habitat effects from any project implemented under this EA would not negatively impact any murrelet suitable or critical habitat at the stand scale, affect murrelet use of project areas, or cause take. Projects could benefit murrelets in the long term by maintaining or promoting the development of late-seral habitat and suitable nesting platforms.

Disruption
All project activities with the potential for disruption to known murrelet nest sites through noise or smoke would occur beyond appropriate disruption distances or outside of the critical nesting period (April 1 to August 5), and those occurring during the late breeding season (August 6 to September 16) would observe daily timing restrictions. All projects occurring within disruption distances of unsurveyed suitable habitat during the murrelet breeding season would observe daily timing restrictions, and the probability of disruption to unknown nesting murrelets is low enough to be disregarded (USDI 2009, pg. 16). Therefore, the proposed actions would not cause negative impacts to murrelets to from premature fledging, missed feeding visits, or increased exposure to predation because non-nesting murrelets would be able to distance themselves from disruption, nesting at known sites would not be subject to disruption, and nesting in unsurveyed habitat would be unlikely to be adjacent to project sites and would be protected from disruption during the crepuscular murrelet activity periods.

Critical Habitat
Projects activities would be designed to avoid adverse impacts to murrelet critical habitat. Specifically, the function of primary constituent elements of murrelet critical habitat would not be negatively affected, and projects would primarily occur along roads in previously-impacted, unsuitable habitat (ARBO pg. 7).

<u>Invertebrates and Amphibians: Crater Lake Tightcoil, Evening Fieldslug, Salamander Slug, Spotted Tail-Dropper, Tillamook Westernslug, Roth's Blind Ground Beetle, Foothill Yellow-Legged Frog, and Oregon Slender Salamander</u>

Potential negative effects to these species from project activities could occur from the modification of habitat features like refugia (large coarse woody debris, interstices in soil or rock), food sources (amount and composition of herbaceous cover, leaf litter), or temperature or moisture regimes. However, the likelihood of projects impacting any of these species is low because:

- They are uncommon,
- Projects are most likely to occur in previously impacted areas that are not suitable habitat,
- Project design features would minimize impacts to features like coarse woody debris and soils,
- Projects would be less than one acre and well-distributed across the landscape, and

Therefore, negative effects to these species are extremely unlikely to occur, and would not contribute to the need to list them under the Endangered Species Act. Projects could benefit these species in the long term by maintaining or promoting the development of late-seral habitat and improving riparian function.

Western Pond Turtle
Most suitable pond turtle habitat on the District occurs at low elevation on privately-owned lands. However, some suitable stream reaches do occur on BLM-administered lands and privately-owned lands that could be part of the proposed action. Projects could impact pond turtles by modifying vegetation or soil conditions in nesting or overwintering habitat, or by disrupting normal behaviors like basking through noise or visual disturbance. Projects would be less than one acre and size and widely distributed across the landscape. These factors, combined with the relative scarcity of pond turtles in potential project areas, would ensure that any negative effects to the species would be insignificant and not contribute to the need to list pond turtles under the ESA. Projects could ultimately benefit pond turtles by expanding/connecting aquatic habitat and adding suitable in-stream features like logs and boulders.

Birds: American Peregrine Falcon, Bald Eagle, Northern Goshawk, Harlequin Duck and Purple Martin

Habitat
Projects are most likely to occur in previously impacted areas that are not suitable habitat for these species, and would be designed to retain or promote late-seral conditions where they occur. The extent of individual projects would typically be less than one acre and well-distributed across the landscape. Additionally, known nest trees would not be removed under any action alternative and projects would be designed to maintain or improve habitat function. Consequently, the action alternatives would not negatively impact these species through habitat modification. Restoration activities would ultimately improve riparian habitats and contribute to increased nesting opportunities and prey availability.

Disruption
These species are susceptible to disruption during courtship and nesting, but all project activities would occur outside of the appropriate disruption distance from known nest sites or roosting areas during the breeding season. Therefore, noise, smoke, or visual disturbance from projects would not negatively impact peregrine falcon, bald eagle, northern goshawk, harlequin duck, or purple martin breeding, feeding, sheltering, or rearing behavior.

Bats: Fringed Myotis, Pallid Bat, and Townsend’s Big-Eared Bat

Habitat
Potential impacts to these bat species could occur from the replacement of bridges used as roosts or the removal of large hollow roost snags posing dangers to humans. However, projects would be relocated away from danger snags whenever possible, and any suitable snags that must be felled would be felled when unoccupied. Therefore, any impact would be insignificant these bat species at the population scale. Projects could indirectly benefit bats by accelerating the development of late-seral habitat conditions and increasing insect prey populations by stimulating growth of riparian vegetation.

Disruption
Disruption from noise, smoke, or visual disturbance would be minimized by restricting project activities within disruption distances of known hibernacula or roosts for these species. These

restrictions would ensure that proposed actions would not affect breeding, feeding, sheltering, or dispersal behaviors for these bat species.

CHAPTER FIVE – TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONSULTED

Agencies, Organizations, and Persons Consulted

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

The Endangered Species Act of 1973 (ESA) requires consultation to ensure that any action that an Agency authorizes, funds or carries out is not likely to jeopardize the existence of any listed species or destroy or adversely modify critical habitat.

U.S. Fish & Wildlife Service

Consultation on effects to listed species from proposed activities was completed on June 14, 2006 with a Letter of Concurrence / Biological Opinion (LOC/BO) from the US Fish and Wildlife Service (CITE), which was later clarified on May 23, 2008 (CITE). This Environmental Assessment does not address any actions that are not covered by the LOC/BO, and all Project Design Criteria, Conservation Measures, Reasonable and Prudent Measures, and Conservation Recommendations described in the LOC/BO are incorporated into this document by reference.

Some provisions of the LOC/BO have or will become outdated over its effective lifespan: calendar years 2007-2012. For example, disturbance/disruption distances for the spotted owl and marbled murrelet have been modified by the Service since the LOC/BO was released. Any action undertaken under this EA would also meet the standards found in the most current Biological Opinion for the appropriate geographic area (North Coast or Willamette Planning Provinces) in addition to those found in the LOC/BO.

National Marine Fisheries Service

Programmatic consultation with the National Marine Fisheries Service for aquatic and riparian habitat restoration was completed in 2007. This consultation covers all of the proposed actions within this EA, and provides extensive project design features to be used in aquatic restoration projects.

Cultural Resources Section 106 Compliance

The BLM would conduct pre-project inventories and implement necessary mitigation measures to ensure compliance with Section 106 of the National Historic Preservation Act under the guidance of the 1997 National Programmatic Agreement and the 1998 Oregon Protocol. Compliance with Section 106 would be documented on a project by project basis and discussed as needed in project-specific decisions.

Public Notification

Eugene District Planning Updates

The general public was notified that the BLM was beginning preparation of this EA in the September 2009 Eugene District Project Planning Update, which was published on the Eugene District BLM Internet website and mailed to interested parties. The Eugene District Project Planning Update provided information about this proposed action and invited the public to submit issues, concerns, or opportunities relative to this project. An electronic project notification letter was also sent to several agencies and members of the public. These addressees consist of members of the public that have expressed interest in Eugene District BLM projects.

A detailed scoping letter was sent in summer 2009 to the following watershed councils: McKenzie, Coast Fork Willamette, Middle Fork Willamette, Calapooia, Long Tom, and Siuslaw. No written scoping responses were received.

State, County, and Local Government Agencies

This EA, and its associated documents, will be provided to certain State, County and local government offices including: U.S. Fish & Wildlife Service, NOAA Fisheries Service, Oregon Department of Environmental Quality, and the Oregon Department of Fish and Wildlife. If a decision(s) is made to implement the proposed action(s), it will be sent to the aforementioned State, County, and local government offices.

Public Comment Period

A 30-day public comment period will be provided for this EA.

CHAPTER SIX – LIST OF PREPARERS

Name	***Title***	***Team Role***
Richard Hardt	District Forest Ecologist	Interdisciplinary Team Lead
Nikki Moore	District Fisheries Biologist/Hydrologist	EA Writer, Fisheries, Hydrology
Nancy Sawtelle	District Botanist	Invasive Plants
Eric Greenquist	District Wildlife Biologist	Wildlife
Chris Langdon	Upper Willamette Wildlife Biologist	Wildlife
Jay Ruegger	District GIS Specialist	GIS
Dale Gough	Upper Willamette GIS Specialist	GIS
Heather Ulrich	District Archeologist	Cultural Resources

CHAPTER SEVEN – REFERENCES

INVASIVE PLANTS

Bennett, Max. 2004. Restoration of Himalayan blackberry-dominated riparian zones in interior southwest Oregon: A thorny issue. Oregon State University Extension Service. 16th Int'l Conference, Society for Ecological Restoration, August 24 – 26, Victoria Canada. 9 pp.

Bennett, Max. 2007. Managing Himalayan Blackberry in western Oregon riparian areas. Oregon State University Extension Service. 16 pp.

Blakely-Smith, Matt and Thomas N. Kaye 2007. Mowing Mulching and Seeding to Control False-brome on the Eugene District, BLM, Oregon. December 2007 Status Report. 12.

Bureau of Land Management. 2009. Draft Vegetation Treatments Using Herbicides on BLM Lands in Oregon, Environmental Impact Statement (EIS). 548 pp.

Chan, Sam and Kathy Maas-Hebner. 2006. Himalayan Blackberry: an invader of degraded riparian areas. Watershed Connections, Oregon State University Sea Grant Program. Volume 3, Issue 3 Fall/Winter 2006. 3 pp.

Department of Natural Resources, King County, 2008. Best Management Practices Scotch Broom, Scot's Broom *Cytisus scoparius*, Fabaceae. Available: http://your.kingcounty.gov/dnrp/library/water-and-land/weeds/BMPs/Scotch-Broom-Control.pdf. 9pp.

Fitzpatrick, Greg and Tom Kaye. 2006. False brome Working Group Notes. April 12, 2006. Available: http://www.google.com/search?q=Fitzpatrick+and+kaye+2006+false+brome&rls=com.microsoft:*:IE-SearchBox&ie=UTF-8&oe=UTF-8&sourceid=ie7&rlz=1I7SUNA_en. 4pp.

Getty, Jenny (2009) Middle Fork Willamette Watershed False-brome Implementation Plan 2009 – 2013. The Middle Fork Willamette Watershed Council. 41 pp.

Johnson, Deborah. 2009. Treating False Brome: Lessons Learned. False brome Working Group Notes. March 12, 2009. Available: http://www.google.com/search?q=Debra+Johnson+False+Brome+Working+Group&rls=com.microsoft:*:IE-SearchBox&ie=UTF-8&oe=UTF-8&sourceid=ie7&rlz=1I7SUNA_en 4 pp.

Kaye, T. 2001. *Brachypodium sylvaticum* (Poaceae) in the Pacific Northwest. Botanical Electronic News. Available: http:www.ou.edu/ca/botany/micro/ben/ben277.html (February 1, 2005).

Hoshovsky, Marc. 1986. Element Stewardship Abstract for *Cytisus scoparius* and *Genista monspessulanus* (Scotch Broom, French Broom). The Nature Conservancy. 19 pp.

Hoshovsky, Marc. 1989. Element Stewardship Abstract for *Rubus discolor,* (*Rubus procerus*) Himalayan Blackberry. The Nature Conservancy. 12 pp.

Huckins E. and Jonathan Sol. 2004. Controlling Scotch (Scot's) Broom (*Cytisus scoparius*) in the Pacific Northwest. Lincoln County Soil and Water Conservation District and The Nature Conservancy, Oregon Field Office. Available: http://www.invasive.org/gist/moredocs/cytsco01.pdf. 13pp.

Hulting A., K.Neff, E.Coombs, R. Parker, G.Miller and L.C. Burrill, 2008. Scotch Broom Biology and Management in the Pacific Northwest Cytisus scoparius (L.) Link. A Pacific Northwest Extension publication. Oregon State University, University of Idaho, Washington State University. PNW 103 Revised July 2008 8pp.

Oregon Department of Agriculture. 2001. Oregon Noxious Weed Strategic Plan 60 pp.

Oregon State University Extension Service. 2008. Invasive Weeds in Forest Land. English Ivy *Hedera helix*. EC195-E. September 2008. 2 pp.

Plant Conservation Alliance. (n.d). Plant Conservation Alliance's Alien Plant Working Group Least Wanted. English Ivy. Retrieved August 2009. Available: http://www.nps.gov/plants/ALIEN/fact/hehe1.htm

Tu, M. 2002. *Brachypodium sylvaticum* (Huds.) P. Beauv. (Slender false-brome, falsebrome). TNC The Gloval Invasive Species Team. Available: http://www.invasive.org/gist/alert/alrtbrac.html [January 1, 2005].

Urgenson, Lauren S., Sarah H. Reichard and Charles B. Halpern 2009. Community and ecosystem consequences of giant knotweed (*Polygonum sachalinense*) invasion into riparian forests of western Washington, USA. Biological Conservation 142 (2009). pp. 1536-1541.

Washington Department of Natural Resources, King County. 2008. Best Management Practices. Invasive Knotweeds Bohemian Knotweed, Japanese Knotweed, Giant Knotweed, Himalayan Knotweed *Polygonum bohemicum*, *P. cuspidatum*, *P. sachalinense*, *P. polystachyum*. January 2008. Available: http://your.kingcounty.gov/dnrp/library/water-and-land/weeds/BMPs/Knotweed-Control.pdf. 10 pp.

Washington State Noxious Weed Control Board. 2001. Draft written findings of the Washington State Noxious Weed Control Board. Available: http://www.nwcb.wa.gov/weed_info/Hedera.htm.

Watterson, Nicholas A. and Julia A. Jones. 2006. Flood and debris flow interactions with roads promote the invasion of exotic plants along steep mountain streams, western Oregon. Department of Geosciences, Oregon State University. Geomorphology 78 (2006) 107 – 123 pp.

WeedMapper (n.d.). Armenian/Himalayan Blackberry Noxious Weed Control Program, Oregon Department of Agriculture. Retrieved August 2009. Available: http://www.weedmapper.org/index.html.

WeedMapper (n.d.); English Ivy, Noxious Weed Control Program, Oregon Department of Agriculture. Retrieved August 2009. Available: http://www.weedmapper.org/index.html.

WeedMapper (n.d.). False Brome. Noxious Weed Control Program, Oregon Department of Agriculture. Retrieved August 2009. Available: http://www.weedmapper.org/index.html.

WeedMapper (n.d.). Japanese and Giant Knotweed, Noxious Weed Control Program, Oregon Department of Agriculture. Retrieved August 2009. Available: http://www.weedmapper.org/index.html.

WeedMapper (n.d.). Scotch broom, Noxious Weed Control Program, Oregon Department of Agriculture. Retrieved August 2009. Available: http://www.weedmapper.org/index.html.

Zouhar, Kris. 2005. *Cytisus scoparius, C. striatus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2009, September 18].

WILDLIFE

Applegarth, J. S. 1995. Invertebrates of Special Status or Special Concern in the Eugene District (Oregon). Bureau of Land Management, Eugene, Oregon, USA.

Black, S., L. Lauvray, and S. Jepsen. 2007. Species Fact Sheet: Siuslaw Sand Tiger Beetle. Bureau of Land Management, Portland, Oregon, USA. 7pp.

Black, S. H., M. Vaughan, and L. Lauvray. 2005. Species Fact Sheet: Taylor’s checkerspot. Bureau of Land Management, Portland, Oregon, USA. 16pp.

Brenner, G. 2005a. Species Fact Sheet: Haddock’s Rhyacophilan Caddisfly. Bureau of Land Management, Portland, Oregon, USA. 17pp.

Brenner, G. 2005b. Species Fact Sheet: Roth’s blind ground beetle. Bureau of Land Management, Portland, Oregon, USA. 21pp.

Brenner, G. 2006. Species Fact Sheet: Siskiyou Short-Horned Grasshopper. Bureau of Land Management, Portland, Oregon, USA. 18pp.

Bromley, Robert G.; Rothe, Thomas C. 2003. Conservation assessment for the dusky Canada goose (*Branta canadensis occidentalis* Baird). Gen. Tech. Rep. PNW-GTR-591. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 79 pp.

Burger, A. E. 2002. Conservation assessment of marbled murrelets in British Columbia, a review of biology, populations, habitat associations and conservation. Pacific and Yukon Region, Canadian Wildlife Service. 168 pages.

Burke, T. E. and N. Duncan. Conservation Assessment for *Deroceras hesperium,* Evening fieldslug. 2005. Bureau of Land Management, Portland, Oregon, USA. 16pp.

Bury, R. B. 1995. Painted Turtle (*Chrysemys picta*). Pages 30-33 *in* Storm and Leonard, eds. The Reptiles of Washington and Oregon. Seattle Audubon Society, Seattle, Washington. 176pp.

Corkran, C. C. and C. Thoms. 1996. Amphibians of Oregon, Washington and British Columbia. A field identification guide. Lone Pine Publishing, Vancouver, BC. 175 pp.

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

Cross, S. P., H. Lauchstedt and C. Harmes. 1996. Characterizing forest roost sites of some bats of special concern occurring in Roseburg and Medford BLM Districts. 47 pp., 2 appendices. Unpublished.

Duncan, N. 2008. Species Account for Gliabates oregonius (Salamander slug). Bureau of Land Management, Portland, Oregon, USA. 3pp.

Duncan, N. 2009. Species Account for Hesperarion mariae, Tillamook westernslug. Bureau of Land Management, Portland, Oregon, USA. 3pp.

Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey Protocol for Survey and Manage Terrestrial Mollusk Species From the Northwest Forest Plan. Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service. Portland, Oregon, USA. 70pp.

Dunk, J. R. 1995. White-tailed kite (*Elanus leucurus*): In A. Poole and F. Gill, Eds. The birds of North America, No. 178. The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

Fellers G. M. and E. D. Pierson. 2002. Habitat use and foraging behavior of Townsend's Big-Eared Bat in coastal California. Journal of Mammalogy 83: 167–177

Frest, T.J. and E.J. Johanes. 2000. A baseline mollusc survey of southwestern Oregon, with emphasis on the Rogue and Umpqua River Drainages. Deixis Consultants, Seattle, Washington. 403 pp.

Horvath, E. 2003. Purple Martin. Pages 428-430 *in* D. B. Marshall, M. G. Hunter, and A L. Contreras, eds. Birds of Oregon: A General Reference. Oregon State University Press. Corvallis, Oregon, USA. 768 pp.

Jones, S. L., and J. E. Cornely. 2002, Vesper Sparrow (*Pooecetes gramineus*): In A. Poole and F. Gill, Eds. The birds of North America, No. 624. The Birds of North America, Inc., Philadelphia, PA.
Kerwin, A. E. and R. Huff. 2007. Conservation Assessment for the Mardon Skipper. Bureau of Land Management, Portland, Oregon, USA. 43pp.

Lewis, S. E. 1994. Night roosting ecology of pallid bats (*Antrozous pallidus*) in Oregon. American Midland Naturalist 132:219-226.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 21, 2008).

Nelson, K. and A. Wilson. 2002. Marbled murrelet habitat characteristics on state lands in western Oregon. Corvallis, OR: Oregon Cooperative Fish and Wildlife Research Unit, OSU, Department of Fisheries and Wildlife. 151 pages.

Pearson, S. F., and B. Altman. 2005. Range-wide streaked horned lark (*Eremophila alpestris strigata*) assessment and preliminary conservation strategy. Washington Department of Fish and Wildlife, Olympia, WA. 25 pp

Pierson, E.D, M.C. Wackenhut, J.S. Altenbach, P. Bradley, P. Call, D.L. Genter, C.E. Harris, B.L. Keller, B. Lengus, L. Lewis, B. Luce, K.W. Navo, J.M. Perkins, S. Smith, and L. Welch. 1999. Species conservation assessment and strategy for Townsend's big-eared bat (Corynorhinus townsendii townsendii and Corhynorhinus Townsendii pallescens). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.

Ross, D., S. H. Black, and L. Lauvray. 2005. Species Fact Sheet: Seaside Hoary Elfin. of Land Management, Portland, Oregon, USA. 12pp.

Scheurering, E. 2006. Species Fact Sheet: Oregon Plant Bug. Bureau of Land Management, Portland, Oregon, USA. 2pp.

Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon and J. Verner. 1990. A conservation strategy for the northern spotted owl: Report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, National park Service. 427 pp.

Tobalske, B. W. 1997, Lewis' Woodpecker (*Melanerpes lewis*): In A. Poole and F. Gill Eds., The birds of North America, No. 284. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington DC.

Truex, R.L., W. J. Zielinski, R. T. Golightly, R. L. Barrett, and S. M. Wisely. 1998. A meta-analysis of regional variation in fisher morphology, demography, and habitat ecology in California. Draft report submitted to California Department of Fish and Game. USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Lab, Arcata, California.

USDI Fish and Wildlife Service. 1991. Aleutian Canada goose (*Branta canadensis leucopareia*) recovery plan. Prepared by the Aleutian Canada goose recovery team. U.S. Dept. Interior, Fish and Wildlife Service, Anchorage, AK. 55 pp.

USDI Fish and Wildlife Service. 1997. Recovery plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon and California. 203 pp.

USDI Fish and Wildlife Service. 2009. Memorandum #13420-2009-I-0152, "Informal programmatic consultation for activities with potential to disturb…" Oregon Fish and Wildlife Office, Fish and Wildlife Service, Portland, Oregon. 19pp.

USDI Fish and Wildlife Service, USDI Bureau of Land Management & USDA Forest Service. 2008. Methodology for estimating the number of northern spotted owls affected by proposed federal actions. Ver. 2.0. Oregon Fish and Wildlife Office, Fish and Wildlife Service, Portland, Oregon. 34 pp.

Verts, B. J. and L. N. Carraway. 1998. Land Mammals of Oregon. University of California Press. Berkeley, California, USA.

Weller, T. J. and C. J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. Journal of Wildlife Management 66:489-497.

FISHERIES

Bash, J., Berman C., and Bolton S. 2001. Effects of Turbidity and Suspended Solids on Salmonids. Center for Streamside Studies, University of Washington.

Bisson, P.A. and R.E. Bilby. 1982. Avoidance of suspended sediment by juvenile coho salmon. North American Journal of Fisheries Management 2: 371-374.

Bureau of Land Management. Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts. October 2008.

Burnett, K.M.2001.Relationships among juvenile anadromous salmonids, their freshwater habitat, and landscape characteristics over multiple years and spatial scales in Elk River, Oregon. Ph. D. Dissertation. Oregon State University, Corvallis, OR.

Burnett, Kelly M., Gordon H. Reeves, Daniel J. Miller, Sharon Clarke, Ken Vance-Borland, and Kelly Christiansen. 2003.A first step toward broad-scale identification of freshwater protected areas for Pacific salmon and trout in Oregon, USA.In: Aquatic protected areas: What works best and how do we know? J.P. Beumer, A. Grant and D.C. Smith, editors. Proceedings of the world congress on aquatic protected areas, Cairns, Australia and North Beach, WA. Australian Society for Fish Biology.

Burnett, Kelly M., Gordon H. Reeves, Daniel J. Miller, Sharon Clarke, Ken Vance-Borland and Kelly Christiansen. 2007. Distribution of salmon-habitat potential relative to landscape characteristics and implications for conservation. Pacific Northwest Research Station, U.S. Department of Agriculture, U.S. Forest Service. Corvallis, OR.

Greig, S.M., D.A. Sear, and P.A. Carling. 2005. The impact of fine sediment accumulation on the survival of incubating salmon progeny: Implications for sediment management. Science of the Total Environment 344: 241-258.

Healy, M.C.1991.Life history of chinook salmon (*Oncorhynchus tshawytscha*).Pages 311–394 in C. Groot and L. Margolis, editors. Pacific salmon life histories.UBC Press, Vancouver, BC, Canada.

Keppeler E.T., P.H. Cafferata, and W.T. Baxter. 2007. State Forest Road 600: A Riparian Road Decommissioning Case Study in Jackson Demonstration State Forest. California Forestry Note No. 120.

Lisle, T. E., and J. Lewis. 1992. Effects of sediment transport on survival of salmonid embryos in a natural stream: a simulation approach. Can. J. Fish. Aquat. Sci. 49: 2337-2344.

McLeay et al 1981 in Bash, J., Berman C., and Bolton S. 2001. Effects of Turbidity and Suspended Solids on Salmonids. Center for Streamside Studies, University of Washington.

Montgomery, D.R., E.M. Beamer, G.R. Pess, and T.P. Quinn. 1999.Channel Type and Salmonid Spawning Distribution and Abundance. Canadian Journal of Fisheries and Aquatic Sciences 56(3):377-387

Naiman R.J., R.E. Bilby and P.A. Bisson. 2000. Riparian ecology and management in the Pacific Coastal rain forest. BioScience 50:996–1011.

National Marine Fisheries Service. 2008. Biological Opinion #2008/03506 for Fish Habitat Restoration Activities in Oregon and Washington. Portland, OR.

Newcombe, C. P., and J. O. T. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management. 16: 693-727. Schematic adapted from "Turbidity: A Water Quality Measure", Water Action Volunteers, Monitoring Factsheet Series, UW-Extension, Environmental Resources Center.

ODEQ.2004b.Water Quality Assessment. Section 305(b) Report.

Oregon Department of Fish and Wildlife. 1999-2009. Aquatic Habitat Inventories for Eugene District BLM.

Sigler, J.W., T.C. Bjornn, and F.H. Everest. 1984. Effects of chronic turbidity on density and growth of steelheads and coho salmon. Transactions of the American Fisheries Society 113: 142-150.

Suttle, K.B., M.E.Power, J.M Levine and C.McNeely.2004.How fine sediment in riverbeds impairs growth and survival of juvenile salmonids.Ecological Applications, 14(4): 969–974 by the Ecological Society of America.

URS Corporation. 2000. Erosion Control Pilot Study Report. Erosion and Sediment Control BMP's Installed Costs and Effectiveness.

USDA, U.S. Forest Service and USDI, BLM. February 1994b. 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. Washington, D.C.

USDA, U.S. Forest Service. 2006. Tongass Monitoring and Evaluation Report. Appendix C – Turbidity Monitoring of Fubar Creek Restoration. Tongass National Forest.

USDA, U.S. Forest Service and USDI, BLM. 1994. Final Supplemental Environmental Impact Statement. Proposal to Amend Wording About the Aquatic Conservation Strategy. Portland, Oregon.

USDI, BLM. 1995. Eugene District Record of Decision and Resource Management Plan. Eugene, Oregon.

APPENDIX A. AQUATIC CONSERVATION STRATEGY

One element of the Northwest Forest Plan is the Aquatic Conservation Strategy (ACS); developed to restore and maintain the ecological health of watersheds and associated riparian-dependant species over broad landscapes of public lands. The ACS contains four components:

1. *Riparian Reserves*
2. *Key Watersheds*
3. *Watershed Analysis*
4. *Watershed Restoration*

The ACS also contains nine objectives. All proposed management actions must be consistent with each of these objectives.

On March 30, 2007, the District Court, Western District of Washington, ruled against the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA-Fisheries) and USFS and BLM (Agencies) in *Pacific Coast Fed. of Fishermen's Assn. et al v. Natl. Marine Fisheries Service, et al and American Forest Resource Council,* Civ. No. 04-1299RSM (W.D. Wash)((PCFFA IV); based on violations of the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA). As a result, the Court set aside:

- the USFWS Biological Opinion (March 18, 2004),
- the NOAA-Fisheries Biological Opinion for the ACS Amendment (March 19, 2004),
- the ACS Amendment Final Supplemental Environmental Impact Statement (FSEIS) (October 2003), and
- the ACS Amendment adopted by the Record of Decision dated March 22, 2004.

Consistent with PCFFA IV, the following project consistency assessment is included for each objective for all spatial and temporal scales.

<u>Aquatic Conservation Strategy Objectives</u>

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

Site Scale / Watershed Scale
Under all alternatives, the proposed actions would restore the distribution, diversity, and complexity of aquatic and riparian habitat under all alternatives at all temporal and spatial scales. Within the next ten years, instream restoration activities would restore stream complexity in approximately 305 miles of stream habitat under the No Action Alternative, and 495 miles under the action alternatives. Additionally, approximately 53 fish passage barriers would be removed under the No Action; and 59 under the action alternatives. As a result, between 53-59 additional stream miles would become accessible to fish species (distribution).

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

Site Scale / Watershed Scale

Under all alternatives, the proposed actions would restore the spatial and temporal connectivity within and between watersheds at all temporal and spatial scales. Approximately 53 fish passage barriers would be removed under the No Action; and 59 under the action alternatives. As a result, between 53-59 additional stream miles would become accessible to fish species (connectivity).

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

Site Scale / Watershed Scale

Under all alternatives, the proposed restoration activities would restore the physical integrity of the stream channel including streambanks and stream beds. Over the next ten years, instream restoration activities would restore stream complexity in approximately 305 miles of stream habitat under the No Action Alternative, and 495 miles under the action alternatives. As a result, the accumulation of large wood and boulders would increase sediment (e.g. gravels) storage and pool depth within stream channels (BLM, 2008) in all watersheds within the Eugene District over time.

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

Site Scale / Watershed Scale

A short term increase in turbidity would occur under all alternatives from instream disturbance. Fish species have the ability to cope with some level of turbidity at various life stages, and increases in turbidity can have both beneficial and detrimental effects to salmon and other fish species (BLM, 2008). At certain levels, elevated turbidity can increase cover, reduce predation rates, and improve survival (NMFS, 2008). Many studies have shown that fish can tolerate sediment exposure for short periods (McLeay et al. 1983); typically 3-5 days (Sigler et al, 1984) before adverse effects occur. However, chronic exposure and increases greater than 25 nephelometric turbidity units can cause physiological stress responses that cause temporary avoidance, reduce feeding, and gill stress (BLM, 2008). Under all alternatives, if Best Management Practices such as sediment traps are utilized, the increases in turbidity would be below the threshold that would cause direct mortality of fish. Adverse effects to fish species would include temporary avoidance, reduced feeding, and gill stress (Suttle et al, 2004, Bash et al, 2001, Newcomb et al. 1996) since the duration of the increase would occur beyond 3-5 days and at concentrations above 25 nephelometric turbidity units.

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

The natural sediment regimes of watersheds in the Eugene District, are highly variable from year to year. For example, in the Coast Range, annual sediment yields vary from 59 tons per square mile per year to 1,237 tons per square mile per year. Various studies show that the average annual sediment yield in the Coast Range are typically between 200 to 800 tons per square mile per year; and 100 to 500 tons per square mile per year in the Cascades (Swanson et al. 1982, Grant et al. 1991, Stallman et al. 2005).

Site Scale / Watershed Scale
Under all alternatives, the proposed actions would reduce the overall amount of sediment delivered to stream channels in the long term (<1 year), but would have a short term (less than 1 year) increase of fine sediment to stream channels. Under all alternatives, the increase in fine sediment delivery to stream channels would be less than 0.011 cubic yards per mile per year. When combined to the cumulative input of sediment delivered to streams, approximately 0.10 cubic yards per mil per year would be delivered. It is assumed that this amount would be equivalent to approximately 0.025 tons per square mile per year; which would be within range of the natural sediment yield. Therefore, water quality would remain within the range that would maintain the biological, physical and chemical integrity of the aquatic system.

In the long term (>1 year), the amount of sediment delivered to stream channels would decrease under the No Action Alternative by 12,000 cubic yards from the current rate. Under the action alternatives, the amount of sediment delivered to stream channels would decrease by 67,600 cubic yards from the current rate.

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

There are no proposed actions that would alter the timing, magnitude, duration, or spatial distribution of peak, high, or low stream flows.

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

There are no proposed actions that would alter the timing, variability, or duration of floodplain inundation within meadows and wetlands.

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

Site Scale / Watershed Scale

Under all Alternatives, the proposed actions would restore the species composition and structural diversity of plant communities in riparian areas since invasive plants would be removed from riparian areas and replaced with native plant species. Under the No Action Alternative, approximately 265 riparian acres would be treated. Under the action alternatives, approximately 940 riparian acres would be treated.

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

Site Scale / Watershed Scale
Under all alternatives, the proposed actions would restore habitat for native plant, invertebrate and vertebrate riparian-dependant species. For fish species, the greatest benefit would occur under Alternative 1, since 15 of the watersheds (or indicators) that would be restored would occur in stronghold watershed for threatened and endangered fish species; and 13 of the watersheds (or indicators) would occur in stronghold watersheds for native resident fish species. In other words, implementing the restoration priority strategy under Alternative 1, would restore the highest amount of watersheds overall, and the highest number that are considered stronghold watersheds for both threatened and endangered and native, resident fish species. The amount of habitat restored in stronghold watersheds for fish species would also increase under Alternative 2, Alternative 3, and the No Action Alternative; but to a lesser degree than under Alternative 1.

APPENDIX B. FISHERIES ANALYTICAL METHODOLOGY

Analytical Question #1: How would the proposed aquatic and riparian restoration activities improve fish habitat and fish productivity?

In order to evaluate the effectiveness multiple large-scale multispecies management strategies, a scenario-based analysis was used to evaluate watershed-scale restoration strategies for multiple species. The analysis organized predictions of physical and biological outcomes for each restoration strategy. Restoration actions and levels of treatments were estimated to determine the effect on fish habitat and fish productivity. A reference analysis was also used to determine the maximum restoration potential for each watershed and how each strategy compares to this maximum potential. The level of restoration was estimated annually and for one decade. This spatially explicit approach would provide an analysis of the trade-offs between improvements in different locations (i.e. watersheds).

Analytical Assumptions

High Intrinsic Potential Model

Calculating the high intrinsic potential of a stream is a topographically-based modeling approach developed by Burnett (2003) for coho salmon, chinook salmon and steelhead trout for all lands in Western Oregon.

- The intrinsic potential of a stream is its inherent ability to provide high quality rearing habitat for salmonids.
- Intrinsic potential, reflects species-specific associations between fish use and persistent stream attributes; stream flow, valley constraint, and stream gradient.
- The intrinsic potential score can range from zero to one; larger values indicate a greater potential for providing high-quality rearing habitat. Stream reaches are classified with a high intrinsic potential when the calculated value is >0.75.
- The species specific relationship between habitat value and mean annual discharge reflects that coho salmon are thought to rear primarily small to mid-size streams (Sandercock 1991 and Rosenfeld et al. 2000 in Burnett et al, 2007); that juvenile steelhead generally use a somewhat broader range of stream sizes (Meehan and Bjornn 1991 and Benke 1992 in Burnett et al, 2007); and that juvenile chinook rear in medium to larger rivers (Healy 1991).
- Species specific relationships between value of juvenile rearing habitat and channel gradient reflect that: 1) coho and chinook salmon predominate in the lowest gradient reaches while steelhead predominate in reaches of 2-3%; and 2) fish density decreases with increasing channel gradient beyond the optimum up to a maximum of 7% for coho salmon and 10% for steelhead (Burnett et al. 2007) and up to a maximum of 5% for chinook salmon (Burnett 2001), which also encompasses gradients where adult chinook salmon spawn (Montgomery et al. 1999).

- Species specific relationships between habitat value and channel constraint reflect that densities of chinook salmon and coho salmon tend to be greater in unconstrained than in constrained reaches (Burnett 2001) but that juvenile steelhead may avoid unconstrained reaches (Burnett 2001).

<u>*Restoration Strategies*</u>

- Aquatic and restoration actions would have the greatest benefit to the recovery of fish habitat and fish productivity in watersheds with the greatest density of streams with threatened and endangered fish species.

- Aquatic and restoration actions would have the greatest benefit to the recovery of fish habitat and fish productivity in watersheds with the greatest density of streams with threatened and endangered fish species.

- Aquatic and restoration actions would have the greatest benefit to the recovery of fish habitat and fish productivity in watersheds with the greatest density of streams with native, resident fish species.

- The BLM's ability to influence fish habitat depends on the location of ownership and/or actions in relation to high intrinsic potential habitat and the density of streams with threatened, endangered or native, resident fish species.

- The level and location of aquatic and riparian treatment would continue at a similar rate and location over the next decade if a restoration strategy was not implemented (No Action Alternative).

STEP 1: Develop restoration strategies.

1. For this analysis, the restoration strategies for each Alternative were based on the following watershed criteria:

	Criterion 1	**Criterion 2**	**Criterion 3**
No Action	Rate/Location Similar to Previous Decade		
Alt 1	Density of HIP streams per watershed – all ownerships	Density of stream miles with threatened or endangered fish species.	
Alt 2	Density of HIP streams on BLM-administered lands.	Density of stream miles with threatened or endangered fish species on BLM-administered lands.	
Alt 3	Density of HIP streams on BLM-administered lands.	Density of stream miles with threatened or endangered fish species on BLM-administered lands.	Density of streams with native, resident fish species on BLM-administered lands.

2. Use GIS and criterion to identify priority watersheds for each Alternative.

STEP 2: Develop Ten-Year Aquatic and Riparian Restoration Treatment Scenario

1. Group the proposed actions into the following categories for analysis:

Instream
Large wood, boulder, and gravel placement
Reconnection of existing side channels and alcoves
Streambank Restoration

Sediment/Roads
Road Treatments
Reduction of Recreational Impacts

Fish Passage
Fish Passage Culvert and Bridge Replacements
Head Cut Stabilization and Associated Fish Passage

Riparian
Riparian Exclusion Fencing
Riparian Vegetative Treatments

Riparian Invasive
Riparian Area Invasive Plant Treatment

2. Determine levels of treatment in watersheds without priorities (No Action Alternative).

Apply the following levels of treatment for each watershed (BLM-administered and non-BLM-administered lands combined, treatment/watershed/decade):

	INSTREAM		SEDIMENT ROADS		FISH PASSAGE		RIPARIAN		RIPARIAN INVASIVE	
HU_10_NAME	Miles	Acres Canopy Removed	Miles	Acres Canopy Removed	#	Acres Canopy Removed	Acres	Acres Canopy Removed	Acres	Acres Canopy Removed
Upper Siuslaw River	100	20	20	0	5	5	50	5	50	0
Wildcat Creek	10	5	20	0	5	5	10	3	10	0
Wolf Creek	10	5	20	0	5	5	10	3	10	0
Lake Creek	10	5	10	0	5	5	10	3	10	0
Lower Coast Fork Willamette River	10	5	10	0	1	1	10	3	10	0
Mosby Creek	10	5	10	0	1	1	10	3	10	0
Indian Creek	5	5	10	0	1	1	10	3	10	0

North Fork Siuslaw River	5	5	10	0	1	1	10	3	10	0
Yachats River	5	5	10	0	1	1	5	1	5	0
Deadwood Creek	5	5	10	0	1	1	5	1	5	0
Five Rivers	5	5	10	0	1	1	5	1	5	0
Tenmile Creek-Frontal Pacific Ocean	5	5	10	0	1	1	5	1	5	0
Lower Siuslaw River	5	5	10	0	1	1	5	1	5	0
Wiley Creek	5	5	10	0	1	1	5	1	5	0
Muddy Creek-Willamette River	5	5	10	0	1	1	5	1	5	0
Upper Calapooia River	5	5	10	0	1	1	5	1	5	0
Pudding Creek-Middle Fork Willamette River	5	5	10	0	1	1	5	1	5	0
Little Fall Creek	5	5	10	0	1	1	5	1	5	0
Quartz Creek-McKenzie River	5	5	10	0	1	1	5	1	5	0
Mohawk River	5	5	10	0	1	1	5	1	5	0
South Santiam River	5	5	10	0	1	1	5	1	5	0
South Santiam River-Foster Reservoir	5	5	10	0	1	1	5	1	5	0
McKenzie River	5	5	10	0	1	1	5	1	5	0
Long Tom River	5	5	10	0	1	1	5	1	5	0
Lookout Point Reservoir-Middle Fork Willamette River	5	5	10	0	1	1	5	1	5	0
Headwaters McKenzie River	5	5	10	0	1	1	5	1	5	0
Horse Creek	5	5	10	0	1	1	5	1	5	0
Upper Coast Fork Willamette River	5	5	10	0	1	1	5	1	5	0
Fall Creek	5	5	10	0	1	1	5	1	5	0
South Fork McKenzie River	5	5	10	0	1	1	5	1	5	0
Row River	5	5	10	0	1	1	5	1	5	0
Hills Creek Reservoir-Middle Fork Willamette River	5	5	10	0	1	1	5	1	5	0
Salt Creek	5	5	10	0	1	1	5	1	5	0
North Fork Middle Fork Willamette River	5	5	10	0	1	1	5	1	5	0
Hills Creek	5	5	10	0	1	1	5	1	5	0
Salmon Creek	5	5	10	0	1	1	5	1	5	0
Blue River	5	5	10	0	1	1	5	1	5	0

3. Determine levels of treatment in priority and all other watersheds, under each strategy.

Apply the following levels of treatment for priority watersheds (BLM-administered and non-BLM-administered lands combined, treatment/watershed/decade):

		Instream	Sediment/ Roads	Fish Passage	Riparian	Riparian Invasive
Priority Watershed #1	Miles/Acres Treated	100 Miles	50 Miles	6 Miles	100 Acres	200 Acres
	Acres Canopy Removed/Disturbed	20	0	5	5	0
Priority Watershed #2	Miles/Acres Treated	60	40	5	50	100
	Acres Canopy Removed/Disturbed	20	0	5	5	0
Priority Watershed #3	Miles/Acres Treated	40	30	4	10	100
	Acres Canopy Removed/Disturbed	20	0	5	5	0
Priority Watersheds #4-8	Miles/Acres Treated	30	30	3	10	50
	Acres Canopy Removed/Disturbed	10	0	3	3	0
All Other Watersheds	Miles/Acres Treated	5	10	1	5	10
	Acres Canopy Removed/Disturbed	7	0	1	1	0

4. In all other watersheds apply the following level of treatment (treatment/watershed/decade):

		Category				
		Instream	Sediment/ Roads	Fish Passage	Riparian	Riparian Invasive
10-Year Total	Miles/Acres Disturbed	5 Miles	10 Miles	1 Site	5 acres	10 Acres

STEP 3: Develop Reference Analysis

1. The following criteria would be used to determine the maximum restoration potential for each watershed.

Category	Unit/Indicator	Assumptions to Determine Maximum Potential
Instream	HIP Streams	Assume 50% need restoration (e.g. large wood, boulders).
Sediment/Roads	# Roads	Assume all crossings above fish bearing streams block or limit debris flows to fish bearing stream channels.
	# Road/Stream Crossings	Assume all roads within 200’ of stream channels contribute sediment
Fish Passage	# Major Dam Barriers	Assume all major dam barriers block 50 miles of fish habitat.
	# Culvert Barriers	Assume 50% of all culverts are barriers on

		perennial fish bearing streams. Assume each culvert barrier blocks one mile of fish habitat.
Riparian	Acres of stand establishment within Riparian Reserves	Assume 50% of stands could be treated.
Riparian Invasives	Acres of invasives in Riparian Reserves	Assume all acres could be treated.

2. Use GIS and criterion to calculate the level of treatment per watershed under the reference analysis.

STEP 4: Calculate Watershed Scores

1. For each Alternative, assign each watershed a score.
2. Use the following thresholds to assign the score:

Score	Definition	Threshold
HIGH	High Potential to Restore Watershed	60%-100% of Reference Analysis
MED	Medium Potential to Restore Watershed	20%-59% of Reference Analysis
LOW	Low Potential to Restore Watershed	0%-19% of Reference Analysis

3. Determine the number of watersheds, for each category (Instream, Sediment, Fish Passage, Riparian), in each score category (HIGH, MED, LOW) and report in a table.

4. Calculate the overall average (number of watersheds) for the instream, sediment and fish passage categories combined. The riparian category is not included in the average since it does not change between alternatives.

Example:

	Instream			Sediment/Roads			Fish Passage			Riparian[3]			Overall (Avg)		
	High	Med	Low	High	Med	Low	High	Med	Low	High	Med	Low	High	Med	Low
No Action	5	12	18	2	16	17	3	9	25	0	0	37	**9%**	32%	54%
Alt 1	10	10	17	7	12	18	7	5	25	0	0	37	**21%**	24%	55%
Alt 2	10	9	18	5	16	16	5	8	24	0	0	37	**19%**	28%	53%
Alt 3	10	10	17	4	18	15	5	8	24	0	0	37	**16%**	34%	50%

[3] The number of watersheds in the Riparian category were not included in the overall average.

STEP 5: Determine Fish Productivity Score

In order to determine how each outcome effects fish productivity, a fish productivity index and scoring approach was developed and used for this analysis. This model provides the best information to evaluate the effects of fish habitat restoration on fish productivity in the absence of watershed and species-specific population models. The index is not a prediction of absolute productivity numbers or outcomes, but allows for a comparative analysis of the effects of each alternative.

1. Use a watershed rating system to determine if each watershed is a "stronghold watershed" for threatened and endangered fish species, and for native resident fish species.

2. Use the following thresholds to assign the score:

Category	Criterion	Criterion
Threatened and Endangered Fish Stronghold Watershed	>0.0013 mi/sq/mi HIP	No significant dams
Native Resident Fish	>1.15 mi/sq/mi native resident fish	No significant dams

3. Total the number of watersheds with a HIGH potential of restoration (from previous score) in stronghold watersheds for the threatened and endangered category and the native resident category. If more than one category (e.g. fish passage and instream) have a HIGH rating, the watershed is counted once for each category.

4. Calculate the index score by dividing the number of watersheds by the total number under the reference analysis (111) for each category (T&E, native resident) and report in a table.

Example:

	# Watersheds - Contribution to Fish Productivity		
	Threatened and Endangered Fish	**Native, Resident Fish**	**Index Score (% of Reference Analysis)**
No Action	4	2	**5**
Alt 1	18	13	**28**
Alt 2	10	9	**17**
Alt 3	8	9	**15**
Reference Analysis	37	37	111

APPENDIX C. INVASIVE PLANTS

Data Sources - WeedMapper

No single unified source exists for compiling invasive plant infestation information within Oregon. The best tool available in the State is called, WeedMapper (http://www.weedmapper.org/), hosted by the Oregon Department of Agriculture. It is a "virtual weed mapping program". Federal, State, and local agencies voluntarily submit weed locations on an annual basis to WeedMapper. Because WeedMapper displays invasive plant locations regardless of ownership, it will be used in this analysis. Because it is unlikely that all known invasive plant infestations have been submitted, it can serve only as a characterization and is not intended to capture information about all invasive plant species and/or distributions that could occur in the planning area. Application on a site-specific level is limited. WeedMapper identifies 39 species occurring in the project area. See Table C-1 (*Current invasive plant species within Eugene District*) for the current invasive plant species recorded in WeedMapper for the Eugene District in 2009.

FIGURE C-1. CURRENT INVASIVE PLANT SPECIES WITHIN EUGENE DISTRICT.

Species Name	Common Name
Brachypodium sylvaticum	**false brome**
Centaurea maculos	**spotted knapweed**
Cirsium arvense	**Canada thistle**
Cirsium vulgare	**bull thistle**
Buddleja davidii	**butterfly bush**
Carduus nutans	**musk thistle**
Centaurea diffusa	**diffuse knapweed**
Centaurea solstitialis	**yellow star thistle**
Chondrilla juncea	**rush skeletonweed**
Convolvulus arvense	**field bindweed**
Cortaderia spp.	**Jubata grass**
Cynoglossum officinale	**houndstongue**
Cytisus striatus	**Portuguese broom**
Cytisus scoparius	**Scotch broom**
Centaurea pratensis	**meadow knapweed**
Centaurea maculosa	**spotted knapweed**
Daphne laureola	**spurge laurel**
Hypericum perforatum	**St. Johnwort**
Lathyrus latifolius	**perennial peavine**
Lythrum salicaria	**purple loosestrife**
Hedera helix	**English Ivy**
Silylbum marianum	**milk thistle**
Polygonum cuspidatum	**Japanese knotweed**
Hieracium pratense	**meadow hawkweed**
Heracleum mantegazzianum	**giant hogweed**
Genista monspessulanas	**French broom**
Echium plantagineum	**Paterson's curse**
Iris pseudacorus	**yellow flag iris**
Linaria dalmatica	**dalmatian toadflax**
Linaria vulgaris	**yellow toadflax**
Myriophyllum aquaticum	**parrot feather**

Myriophyllum spicatum	**Eurasian watermilfoil**
Nymphoides peltata	**yellow floating heart**
Potentilla recta	**sulfur cinquefoil**
Polygonum sachalinense	**giant knotweed**
Senecio jacobaea	**tansy ragwort**
Ranunculus ficaria	**lesser celandine**
Rubus discolor (armeniacus)	**Armenian blackberry**
Ulex europaeus	**gorse**

Five invasive plant species will be used for this analysis because of the species known ability to spread along riparian habitats and/or to alter native plant communities:

- *Brachypodium sylvaticum* (False brome)
- *Cytisus scoparius* (Scotch broom)
- *Hedera helix* (English Ivy); Infestations mapped may also be *Hedera hibernica* (Irish ivy)
- *Polygonum* spp. (*Polygonum cuspidatum* – Japanese knotweed and *Polygonum sachalinense* – giant knotweed)
- *Rubus armeniacus (*Armenian blackberry*)* (Formally *Rubus discolor* - Himalayan Blackberry); Infestations mapped may also be *Rubus vistitus* (European blackberry)

Although only these five species are used for analytical purposes, several other species that also occur in the planning area also have the potential to impact riparian habitats. These include *Centaurea pratensis* (meadow knapweed), *Clematis vitalba* (old man's beard), *Iris pseudacorus* (yellow flag iris), *Ranunculus ficaria* (fig buttercup), *Phalaris arundinacea* (reed canary grass), and *Cirsium arvense* (Canada thistle).

2009 Invasive Plant Watch List – Eugene District

Table C-2 (*2009 Invasive Plant Watch List)* shows the current invasive plant species watch list for the Eugene District.

TABLE C-2. 2009 INVASIVE PLANT WATCH LIST.

Common Name	Code	Scientific Name
Russian Knapweed	**ACRE3**	*Acroptilon repens*
Bentgrasses (introduced)	**AGCA5**	*Agrostis capillaris, stolonifera, alba, tenuis*
Tree of Brooklyn/Heaven	**AIAL**	*Ailanthus altissima*
Garlic Mustard	**ALPE4**	*Alliaria petiolata*
European beachgrass	**AMAR4**	*Ammophila arenaria*
Common bugloss	**ANOF**	*Anchusa officinalis*
False brome	**BRSY**	*Brachypodium sylvaticum*
Butterfly bush	**BUDA2**	*Buddleja davidii (=B. variabilis)*
Butterfly bush	**BUGL6**	*Buddleja globosa*
Flowering Rush	**BUUM**	*Butomus umbellatus*
Italian thistle	**CAPY2**	*Carduus pycnocephalus*

Slender-flowered thistle	**CATE2**	*Carduus tenuiflorus*
Smooth distaff thistle	**CABA5**	*Carthamus baeticus*
Wooly distaff thistle	**CALA20**	*Carthamus lanatus*
Diffuse knapweed	**CEDI3**	*Centaurea diffusa*
Iberian Starthistle	**CEIB**	*Centaurea iberica*
Meadow knapweed	**CEPR2**	*Centaurea pratensis*
Yellow Starthistle	**CESO3**	*Centaurea solstitialis*
Spotted Knapweed	**CEST8**	*Centaurea stoebe (=C. maculosa)*
Rush skeleton weed	**CHJU**	*Chondrilla juncea*
Canada thistle	**CIAR4**	*Cirsium arvense*
Bull thistle	**CIVU**	*Cirsium vulgare*
Old man's beard	**CLVI6**	*Clematis vitalba*
Poison hemlock	**COMA2**	*Conium maculatum*
Field bindweed	**COAR4**	*Convolvulus arvensis*
Pampas or jubata grass	**COJU2**	*Cortaderia jubata*
Pampas grass	**COSE4**	*Cortaderia selloana*
English/single seed hawthorn	**CRMO3**	*Crataegus monogyna*
Houndstongue	**CYOF**	*Cynoglossum officinale*
Scotch broom	**CYSC4**	*Cytisus scoparius*
Portuguese Broom	**CYST7**	*Cytisus striatus*
Spurge Laurel	**DALA11**	*Daphne laureola*
Wild carrot	**DACA6**	*Daucus carota*
Foxglove	**DIPU**	*Digitalis purpurea*
Cutleaf teasel	**DILA4**	*Dipsacus laciniatus*
Patterson's curse	**ECPL**	*Echium plantagineum*
South American waterweed	**EGDE**	*Egeria densa (=Elodea densa)*
Weeping lovegrass	**ERCU2**	*Eragrostis curvula*
Spanish Heath	**ERLU6**	*Erica lusitanica*
Oblong spurge	**EUOB4**	*Euphorbia oblongata*
Japanese knotweed	**FAJA2**	*Fallopia japonica (=Polygonum cuspidatum)*
Himalayan knotweed	**FAPO2**	*Fallopia polystachyum*
Giant knotweed	**FASA3**	*Fallopia sachalinensis*
Hybrid knotweed	**FABO**	*Fallopia x bohemicum (japonica x sachalinense)*
Common fennel	**FOVU**	*Foeniculum vulgare*
French broom	**GEMO2**	*Genista monspessulana*
Shining cranesbill	**GELU**	*Geranium lucidum*

Herb robert	**GERO**	*Geranium robertianum*
English and Irish ivy	**HEHE**	*Hedera helix (and H. hibernica)*
Giant hogweed	**HEMA17**	*Heracleum mantegazzianum*
Orange hawkweed	**HIAU**	*Hieracium aurantiacum*
Yellow hawkweed	**HIFL3**	*Hieracium x floribundum*
Creeping velvet grass	**HOMO**	*Holcus mollis*
Hydrilla	**HYVE3**	*Hydrilla verticillata*
St. Johnswort	**HYPE**	*Hypericum perforatum*
English holly	**ILAQ80**	*Ilex aquifolium*
Policeman's helmet	**IMGL**	*Impatiens glandulifera*
Yellow flag iris	**IRPS**	*Iris pseudacorus*
Perennial peavine	**LALA4**	*Lathyrus latifolius*
Thin-leaved pea	**LASY**	*Lathyrus sylvestris*
Hoary cress	**LEDR**	*Lepidium draba*
Perennial pepperweed	**LELA2**	*Lepidium latifolium*
Oxeye daisy	**LEVU**	*Leucanthemum vulgare*
Dalmatian Toadflax	**LIDA**	*Linaria dalmatica*
Yellow Toadflax	**LIVU2**	*Linaria vulgaris*
Water primrose willow	**LUPE5**	*Ludwigia peploides*
Purple loosestrife	**LYSA2**	*Lythrum salicaria*
White sweet clover	**MEAL2**	*Melilotus albus*
Parrot's feather	**MYAQ2**	*Myriophyllum aquaticum*
Eurasian water milfoil	**MYSP2**	*Myriophyllum spicatum*
Fragant water lily	**NYOD**	*Nymphaea odorata*
Yellow floating heart	**NYPE**	*Nymphoides peltata*
Scotch Thistle	**ONAC**	*Onopordum acanthium*
Harding grass	**PHAQ**	*Phalaris aquatica*
Reed canary grass	**PHAR3**	*Phalaris arundinacea*
Bristly ox tongue	**PIEC**	*Picris echioides*
Sulfur cinquefoil	**PORE5**	*Potentilla recta*
English laurel	**PRLA5**	*Prunus laurocerasus*
Kudzu	**PULO**	*Pueraria lobata*
Feral pear	**PYCO**	*Pyrus communis*
Fig buttercup	**RAFI**	*Ranunculus ficaria = (Ficaria avena)*
Creeping buttercup	**RARE3**	*Ranunculus repens*
Multiflora rose	**ROMU**	*Rosa multiflora*

Armenian (Himalayan) blackberry	**RUAR9**	*Rubus armeniacus (= R. discolor)*
Evergreen blackberry	**RULA**	*Rubus laciniatus*
European blackberry	**RUVE**	*Rubus vestitus*
Bamboo	**SAPA31**	*Sasa palmata*
Tansy ragwort	**SEJA**	*Senecio jacobaea*
Milk thistle	**SIMA3**	*Silybum marianum*
Spanish broom	**SPJU2**	*Spartium junceum*
Medusahead rye	**TACA8**	*Taeniatherum caput-medusae*
Purple oyster plant	**TRPO**	*Tragopogon porrifolius*
Gorse	**ULEU**	*Ulex europaeus*

Data Sources - Road-side Inventories

From 2003 to 2006, a roadside inventory of 21 species of concern was completed on more than 5500 acres (1529 miles) of BLM-controlled roads. Population densities ranged from "low" to "high" depending on the species and location. Many species such as *Cytisus scoparius* (Scotch broom) were largely underestimated because areas outside of the road prism were not inventoried.

Data Sources - Botany Inventory Reports

Botanical inventory reports contain information about invasive plants, but site locations are coarsely mapped and are not well quantified. A new botanical inventory contract starting in FY2010 will provide better location information on BLM lands on a project by project basis.

INVASIVE PLANTS PLANNING CRITERIA

Analytical Question #1: How would the proposed aquatic and riparian restoration activities contribute to the spread of invasive plants?

In order to evaluate how the proposed actions under each alternative would contribute to the spread of invasive plants, this analysis uses a fifth-field watershed risk rating approach to determine the effects of aquatic restoration actions on the introduction and spread of invasive plant species. In order to calculate a risk rating for each fifth-field watershed, species distribution and abundance is generated for each fifth-field watershed and assigned to an associated **Invasive Species Distribution Category;** derived from the spatially explicit data base Weed Mapper. The Invasive Species Distribution Category is weighted against the number of acres of ground disturbance and canopy modification (increases in light) from restoration actions, which is termed the **Susceptibility Value**. The resulting **Invasive Species Distribution**

Category and the **Susceptibility Value** is used to assign a **Risk Rating** for each watershed. This **Risk Rating** can be defined as the potential for invasive species introduction into the project area within the first 10 years.

The following general assumptions were made in order to quantify the risk of potential spread:

<u>Analytical Assumptions</u>

- Not all populations are recorded in WeedMapper (2009).
- Some populations that have been recorded have likely been treated and may/may not be extant.
- More than five noxious/invasive species have the potential to invade project areas and more than five species currently occur within the riparian zone.
- Pathways for spread are often complex and varied and not easily modeled or assessed.
- Flooding is the primary mechanism for transporting noxious/invasive species longitudinally within the fluvial system and has not been assessed.
- Road systems play a key role in introducing species into the fluvial system and has not been assessed.
- Some level of background Invasion is occurring within the riparian zone that is not under management control such as roads, trails, recreation, animal movement, etc., all which introduce invasive plant species into the riparian, regardless of management activities.
- Distribution Categories are reflective of the entire watershed and not focused solely on populations found within the riparian alone.
- Species such as Blackberry, Ivy or Knotweed that are mapped in WeedMapper (2009) may be more than one species. Ex. *Rubus discolor* may actually be *Rubus aremeniacus* and was erroneously mapped/recorded as *Rubus discolor*. This should not affect the analysis as all species in any of these groups are considered invasive.

Step 1: Determine Invasive Species Distribution Categories (Low, Limited, Abundant) For Each Watershed.

Two levels of analysis were conducted to determine whether invasive plants were present within watersheds using a regional database and mapping system call WeedMapper. Each method followed the same protocol where all watersheds in the planning area were over laid with a one-mile grid. Values were assigned to each watershed based the abundance of invasive/noxious species mapped using WeedMapper.

> **Low** – The representative invasive species chosen (5 species combined) were reported in no more than 1% of the square miles in the 5^{th} field watershed.
>
> **Limited** – The representative invasive species chosen (5 species combined) were reported from between less than 25% and more than 1% of the square miles within the 5^{th} field watershed.
>
> **Abundant** - The representative invasive species chosen (5 species combined) were reported from more than 25% of the square miles within the 5^{th} field watershed.

Two distribution categories/maps were derived:

1. A composite map of five species was developed/evaluated and used as the primary tool for this analysis. The five species that were used to build the composite map for the analysis are: *Brachypodium sylvaticum* (false brome); *Polygonum* spp. (*Polygonumcuspidatum* - Japanese knotweed and *Polygonumsachalinense* - giant knotweed); *Rubus discolor* (Himalayan/Armenian blackberry); *Hedera helix* (English ivy*)*; and, *Cystisus scoparius (*Scotch broom). The composite map will be used to derive the Risk Rating. The five species were chosen because of the species presence in riparian areas as mapped by WeedMapper in conjunction with the habitat altering capabilities that these species have.

2. Individual maps of the above five species was developed/evaluated.

Step 2: Determine Susceptibility Value (SV)

A Susceptibility Value (Low, Medium, High) was generated for each of the five riparian restoration actions that are purposed for this project. The three riparian restoration actions were evaluated as to the level of acres of ground disturbance/increased light that would occur as a result of restoration activities over a 10 year period.

The five actions are categorized as followed:

Category #1: Instream
Large wood, boulder, and gravel placement
Reconnection of existing side channels and alcoves
Streambank Restoration

Category #2: Fish Passage
Fish Passage Culvert and Bridge Replacements
Head Cut Stabilization and Associated Fish Passage

Category #3: Riparian
Riparian Exclusion Fencing
Riparian Vegetative Treatments

The following table shows the Susceptibility Value (SV) that was assigned to the sum of the total acres that could be disturbed/watershed cumulatively within 10 years. See Table C-3 (*Susceptibility Values Based on Probably Total 10-Year Disturbance Levels in Selected Watersheds*). Total Acres disturbed, 30, 16, 13, 9 and 7 were assigned to different watersheds in different alternatives. Values of 1, 5 and 10 were assigned to these categories, which were used for developing the risk rating.

TABLE C-3. SUSCEPTIBILITY VALUES BASED ON PROBABLE TOTAL 10-YEAR DISTURBANCE LEVELS IN SELECTED WATERSHEDS

SUSCEPTABILITY VALUE (SV)	Instream Projects/Acres	Fish Passage/Acres	Riparian Treatments/ Acres	Total Acres of Disturbance/Canopy Removal in 10 years
HIGH (10)	**20**	**5**	**5**	**30**
MEDIUM (5)	**10**	**3**	**3**	**16**
MEDIUM (5)	**5**	**5**	**3**	**13**
LOW (1)	**5**	**1**	**3**	**9**
LOW (1)	**5**	**1**	**1**	**7**

0 – 10 ACRES = LOW; 10 – 20 = ACRES MEDIUM; 20 – 30 = ACRES HIGH

Step 3: Develop Risk Rating

Use the following matrix to combine the Invasive Species Distribution Categories derived from Step 1 with Susceptibility Values in Step 2 to develop the Risk Rating for each watershed. See Table C-4 (*Matrix to Determine the Relative Risk for the Introduction of Invasive Plant Species That are Associated with Riparian Restoration Activities over the next 10 Year*s)

TABLE C-4. MATRIX TO DETERMINE THE RELATIVE RISK FOR THE INTRODUCTION OF INVASIVE PLANT SPECIES THAT ARE ASSOCIATED WITH RIPARIAN RESTORATION ACTIVITIES OVER THE NEXT 10 YEARS.

Species Distribution Categories	Susceptibility Categories for Introduction of Invasive Plant Species From Riparian Restoration Activities		
	LOW (1)	**MEDIUM (5)**	**HIGH (10)**
LOW (1)	**LOW (1)**	**MODERATELY LOW (5)**	**MODERATE (10)**
LIMITED (5)	**MODERATELY LOW (5)**	**MODERATELY HIGH (25)**	**HIGH (50)**
ABUNDANT (10)	**MODERATE (10)**	**HIGH (50)**	**HIGHEST (100)**

Step 4: Determine Reduction From Invasive Plant Species Control Activities

Invasive plant control activities were evaluated against the total disturbance planned as a result of aquatic restoration activities. This assessment looked at all acres disturbed (and assumed they would be infested) against the amount of treatment available in each alternative. See Table C-5 (*Potential Net Gains/Losses in Invasive Plant Spread as a result of Purposed Treatment Acres/Acres of Disturbance Planned*).

TABLE C-5. POTENTIAL NET GAINS/LOSSES IN INVASIVE PLANT SPREAD AS A RESULT OF PURPOSED TREATMENT ACRES/ACRES OF DISTURBANCE PLANNED.

	Acres Disturbed as a result of Restoration Activities/10 years	Acres Treated for Invasive spp./10 years	Potential Net gain in invasive plant spread /acres (increase in invasive plant populations)	Potential Net loss/acres in invasive plant spread (reduction in invasive plant populations)
No Action	312	265	47	
Alternative 1	413	940		527
Alternative 2	413	940		527
Alternative 3	413	940		527

Invasive Plants – Modeling Results by Alternative and Watershed

The results of the analysis were summarized in Chapter 4. Detailed results for each Alternative and watershed are included below.

The following tables show the Invasive Plant Distribution Categories derived for each Alternative and watershed for both the combined five invasive species and for the five selected invasive plant species individually. See Table C-6 (*Invasive Plant Distribution Categories by Alternative and Watershed*).

TABLE C-6. INVASIVE PLANT DISTRIBUTION CATEGORIES BY ALTERNATIVE AND WATERSHED (*light gray cells are priority watersheds*)

NO ACTION ALTERNATIVE						
Watershed	Invasive Plant Distribution Category (5 species Combined)	English Ivy (HEHE)	False Brome (BRSY)	Knotweed spp. (POSP)	Armenian Blackberry (RUDI2)	Scotch Broom (CYSC)
Upper Siuslaw River	Abundant 74.37%	Null 0	Limited 9.54%	Null 0	Abundant 65.3%	Abundant 74.37%

Wildcat Creek	**Abundant 64.29%**	**Null 0**	**Null 0**	**Limited 1.79%**	**Abundant 46.4%**	**Abundant 64.29%**
Wolf Creek	**Abundant 93.1%**	**Null 0**	**Limited 8.62%**	**Null 0**	**Abundant 81.0%**	**Abundant 93.1%**
Lake Creek	**Abundant 63.79%**	**Null 0**	**Limited 7.75%**	**Limited 9.48**	**Abundant 52.5%**	**Abundant 63.79%**
Lower Coast Fork Willamette	**Limited 20.0%**	**Null 0**	**Limited 3.57%**	**Null 0**	**Limited 13.5%**	**Limited 20.0%**
Mosby	**Abundant 54.17%**	**Null 0**	**Limited 7.29%**	**Null 0**	**Abundant 53.1%**	**Abundant 54.17%**
Indian Creek	**Abundant 72.0%**	**Null 0**	**Null 0**	**Limited 10.0%**	**Abundant 50.0%**	**Abundant 72.0%**
North Fork Siuslaw River	**Abundant 54.55%**	**Limited 4.54%**	**Null 0**	**Limited 6.06%**	**Abundant 31.8%**	**Abundant 54.55%**
Total	**496.27**	**4.54**	**36.77**	**27.33**	**393.6**	**496.27**
Yachats River	**Limited 2.17%**	**Null 0**	**Null 0**	**Null 0**	**Null 0**	**Limited 2.15%**
Deadwood Creek	**Abundant 64.91%**	**Null 0**	**Null 0**	**Limited 14.04%**	**Abundant 43.8%**	**Abundant 64.91%**
Five Rivers	**Abundant 25.21%**	**Null 0**	**Low .84**	**Null 0**	**Limited 13.4%**	**Abundant 25.21%**
Tenmile Creek Front	**Abundant 30.48%**	**Null 0**	**Low .95**	**Limited 10.48%**	**Limited 7.61%**	**Abundant 30.48%**
Lower Siuslaw River	**Abundant 29.41%**	**Limited 1.17%**	**Null 0**	**Limited 6.47%**	**Limited 8.23%**	**Abundant 29.41%**
Wiley Creek	**Abundant 28.33%**	**Null 0**	**Limited 25**	**Limited 3.33%**	**Null 0**	**Abundant 28.33%**
Muddy Creek – Will.	**Limited 7.45%**	**Null 0**	**Limited 4.04%**	**Low .85%**	**Limited 2.24%**	**Limited 7.45**
Upper Calapooia Riv.	**Limited 13.84%**	**Low .34%**	**Limited 5.53%**	**Low .35%**	**Limited 10.7%**	**Limited 13.84%**
Pudding Creek – MF	**Abundant 43.64%**	**Null 0**	**Abundant 38.1**	**Limited 10.91%**	**Limited 20%**	**Abundant 43.64%**
Little Fall Creek	**Abundant 25.42%**	**Limited 1.69%**	**Limited 23.7%**	**Limited 1.69%**	**Limited 13.5%**	**Abundant 25.42%**
Quartz Creek – McK.	**Abundant 44.87%**	**Null 0**	**Limited 20.5%**	**Limited 1.28%**	**Limited 8.97%**	**Abundant 44.87%**
Mohawk River	**Abundant 49.72%**	**Null 0**	**Limited 18.4%**	**Limited 3.35%**	**Abundant 46.3%**	**Abundant 44.72%**
South Santiam	**Abundant 50.94%**	**Null 0**	**Abundant 27%**	**Limited 1.26%**	**Abundant 35.8%**	**Abundant 50.94%**
South Santiam-Fost	**Limited 12.28%**	**Null 0**	**Limited 7.01%**	**Limited 3.51%**	**Limited 3.5%**	**Limited 12.28%**
McKenzie River	**Abundant 28.63%**	**Limited 1.14%**	**Limited 11.8%**	**Low .38%**	**Limited 22.5%**	**Abundant 28.63%**
Long Tom River	**Limited 17.11%**	**Low .24%**	**Low .72%**	**Low .72%**	**Limited 12.2%**	**Limited 17.11%**
Lookout Point Res.	**Abundant 41.46%**	**Limited 1.21%**	**Limited 17.6%**	**Limited 7.93%**	**Abundant 26.8%**	**Abundant 41.46%**
Headwaters McKen.	**Abundant 27.04%**	**Low .28%**	**Limited 8.16%**	**Null 0**	**Limited 2.81%**	**Abundant 27.04%**
Horse Creek	**Limited 17.9%**	**Null 0**	**Limited 12.3%**	**Null 0**	**Limited 1.23%**	**Limited 17.9%**

Upper Coast Fork Wil.	**Abundant 60.78%**	**Null 0**	**Limited 3.92%**	**Null 0**	**Abundant 58.1%**	**Abundant 60.78%**
Fall Creek	**Abundant 32.45%**	**Low .53%**	**Abundant 27.6%**	**Limited 2.13%**	**Limited 9.57%**	**Abundant 32.45%**
South Fork McKenzie	**Limited 20.83%**	**Null 0**	**Limited 8.33%**	**Low .46%**	**Limited 4.16%**	**Limited 20.83%**
Row River	**Limited 23.74%**	**Null 0**	**Limited 2.51%**	**Low .72%**	**Limited 21.2%**	**Limited 23.74%**
Hills Creek Reserv.	**Limited 8.77%**	**Null 0**	**Limited 1.16%**	**Limited 4.09**	**Limited 3.5%**	**Limited 8.77%**
Salt Creek	**Limited 10.53%**	**Null 0**	**Limited 3.5%**	**Low .88%**	**Limited 4.38%**	**Limited 10.53%**
North Fork Middle F.	**Limited 6.48%**	**Null 0**	**Low .4%**	**Limited 2.02%**	**Limited 1.61%**	**Limited 6.48%**
Hills Creek	**Limited 6.45%**	**Null 0**	**Null 0**	**Null 0**	**Limited 1.61%**	**Limited 6.45%**
Salmon Creek	**Limited 11.2%**	**Low .8%**	**Limited 2.4%**	**Limited 3.2%**	**Limited 2.4%**	**Limited 11.2%**
Blue River	**Abundant 60.22%**	**Null 0**	**Limited 20.4%**	**Limited 1.08%**	**Limited 16.1%**	**Abundant 60.22%**

ALTERNATIVE 1						
Watershed	**Invasive Plant Distribution Category (5 species Combined)**	**English Ivy (HEHE)**	**False Brome (BRSY)**	**Knotweed spp. (POSP)**	**Armenian Blackberry (RUDI2)**	**Scotch Broom (CYSC)**
Indian Creek	**Abundant 72.0%**	**Null 0**	**Null 0**	**Limited 10.0%**	**Abundant 50.0%**	**Abundant 72.0%**
North Fork Siuslaw River	**Abundant 54.55%**	**Limited 4.54%**	**Null 0**	**Limited 6.06%**	**Abundant 31.8%**	**Abundant 54.55%**
Yachats River	**Limited 2.17%**	**Null 0**	**Null 0**	**Null 0**	**Null 0**	**Limited 2.17%**
Deadwood Creek	**Abundant 64.91%**	**Null 0**	**Null 0**	**Limited 14.04%**	**Abundant 43.8%**	**Abundant 64.91%**
Wolf Creek	**Abundant 93.1%**	**Null 0**	**Limited 8.62%**	**Null 0**	**Abundant 81.0%**	**Abundant 93.1%**
Upper Siuslaw River	**Abundant 74.37%**	**Null 0**	**Limited 9.54%**	**Null 0**	**Abundant 65.3%**	**Abundant 74.37%**
Wildcat Creek	**Abundant 64.29%**	**Null 0**	**Null 0**	**Limited 1.79%**	**Abundant 46.4%**	**Abundant 64.29%**
Lake Creek	**Abundant 63.79%**	**Null 0**	**Limited 7.75%**	**Limited 9.48%**	**Abundant 52.5%**	**Abundant 63.79%**
Total	**489.13**	**4.54**	**25.91**	**41.37**	**370.8**	**489.29**
Five Rivers	**Abundant 25.21%**	**Null 0**	**Low .84**	**Null 0**	**Limited 13.4%**	**Abundant 25.21%**
Tenmile Creek Front.	**Abundant 30.48%**	**Null 0**	**Low .95**	**Limited 10.48%**	**Limited 7.61%**	**Abundant 30.48%**
Lower Siuslaw River	**Abundant 29.41%**	**Limited 1.17%**	**Null 0**	**Limited 6.47%**	**Limited 8.23%**	**Abundant 29.41%**
Wiley Creek	**Abundant 28.33%**	**Null 0**	**Limited 25**	**Limited 3.33%**	**Null 0**	**Abundant 28.33%**
Muddy Creek –	**Limited**	**Null**	**Limited**	**Low**	**Limited**	**Limited**

Will.	7.45%	0	4.04%	.85%	2.24%	7.45
Upper Calapooia Riv.	Limited 13.84%	Low .34%	Limited 5.53%	Low .35%	Limited 10.7%	Limited 13.84%
Pudding Creek-MF	Abundant 43.64%	Null 0	Abundant 38.1	Limited 10.91%	Limited 20%	Abundant 43.64%
Little Fall Creek	Abundant 25.42%	Limited 1.69%	Limited 23.7%	Limited 1.69%	Limited 13.5%	Abundant 25.42%
Quartz Creek – McK.	Abundant 44.87%	Null 0	Limited 20.5%	Limited 1.28%	Limited 8.97%	Abundant 44.87%
Mohawk River	Abundant 49.72%	Null 0	Limited 18.4%	Limited 3.35%	Abundant 46.3%	Abundant 44.72%
Mosby Creek	Abundant 54.17%	Null 0	Limited 7.29%	Null 0	Abundant 53.1%	Abundant 54.17%
South Santiam River	Abundant 50.94%	Null 0	Abundant 27%	Limited 1.26%	Abundant 35.8%	Abundant 50.94%
South Santiam-Fost.	Limited 12.28%	Null 0	Limited 7.01%	Limited 3.51%	Limited 3.5%	Limited 12.28%
Lower Coast Fork Wil.	Limited 20.0%	Null 0	Limited 3.57%	Null 0	Limited 13.5%	Limited 20.0%
McKenzie River	Abundant 28.63%	Limited 1.14%	Limited 11.8%	Low .38%	Limited 22.5%	Abundant 28.63%
Long Tom River	Limited 17.11%	Low .24%	Low .72%	Low .72%	Limited 12.2%	Limited 17.11%
Lookout Point Res.	Abundant 41.46%	Limited 1.21%	Limited 17.6%	Limited 7.93%	Abundant 26.8%	Abundant 41.46%
Headwaters McKen.	Abundant 27.04%	Low .28%	Limited 8.16%	Null 0	Limited 2.81%	Abundant 27.04%
Horse Creek	Limited 17.9%	Null 0	Limited 12.3%	Null 0	Limited 1.23%	Limited 17.9%
Upper Coast Fork Wil.	Abundant 60.78%	Null 0	Limited 3.92%	Null 0	Abundant 58.1%	Abundant 60.78%
Fall Creek	Abundant 32.45%	Low .53%	Abundant 27.6%	Limited 2.13%	Limited 9.57%	Abundant 32.45%
South Fork McKenzie	Limited 20.83%	Null 0	Limited 8.33%	Low .46%	Limited 4.16%	Limited 20.83%
Row River	Limited 23.74%	Null 0	Limited 2.51%	Low .72%	Limited 21.2%	Limited 23.74%
Hills Creek Reserv.	Limited 6.45%	Null 0	Limited 1.16%	Limited 4.09	Limited 3.5%	Limited 8.77%
Salt Creek	Limited 10.53%	Null 0	Limited 3.5%	Low .88%	Limited 4.38%	Limited 10.53%
North Fork Middle F.	Limited 6.48%	Null 0	Low .4%	Limited 2.02%	Limited 1.61%	Limited 6.48%
Hills Creek	Limited 8.77%	Null 0	Limited 1.16%	Limited 4.09	Limited 3.5%	Limited 8.77%
Salmon Creek	Limited 11.2%	Low .8%	Limited 2.4%	Limited 3.2%	Limited 2.4%	Limited 11.2%
Blue River	Abundant 60.22%	Null 0	Limited 20.4%	Limited 1.08%	Limited 16.1%	Abundant 60.22%

ALTERNATIVE 2						
	Invasive Plant Distribution Category	English Ivy (HEHE)	False Brome (BRSY)	Knotweed spp. (POSP)	Armenian blackberry (RUDI2)	Scotch broom (CYSC)

	5 species Combined					
Wolf Creek	**Abundant 93.1%**	**Null 0**	**Limited 8.62 %**	**Null 0**	**Abundant 81.0%**	**Abundant 93.1%**
Upper Siuslaw River	**Abundant 74.37%**	**Null 0**	**Limited 9.54%**	**Null 0**	**Abundant 65.3%**	**Abundant 74.37%**
Wildcat Creek	**Abundant 64.29%**	**Null 0**	**Null 0**	**Limited 1.79%**	**Abundant 46.4%**	**Abundant 64.29%**
Deadwood Creek	**Abundant 64.91%**	**Null 0**	**Null 0**	**Abundant 14.04%**	**Abundant 43.8%**	**Abundant 64.91%**
Lake Creek	**Abundant 63.79%**	**Null 0**	**Limited 7.75%**	**Abundant 9.48%**	**Abundant 52.5%**	**Abundant 63.79%**
Mohawk River	**Abundant 49.72%**	**Null 0**	**Limited 18.4%**	**Abundant 3.35%**	**Abundant 46.3%**	**Abundant 49.72%**
McKenzie River	**Abundant 28.63%**	**Limited 1.14%**	**Limited 11.8%**	**Low .38%**	**Limited 22.5%**	**Abundant 28.63%**
Little Fall Creek	**Abundant 25.42%**	**Limited 1.69%**	**Limited 23.7%**	**Limited 1.69%**	**Limited 13.5%**	**Abundant 25.42%**
Total	**464.23**	**2.83**	**79.81**	**30.73**	**371.30**	**464.23**
Five Rivers	**Abundant 25.21%**	**Null 0**	**Low .84**	**Null 0**	**Limited 13.4%**	**Abundant 25.21%**
Lower Siuslaw River	**Abundant 29.41%**	**Limited 1.17%**	**Null 0**	**Limited 6.47%**	**Limited 8.23%**	**Abundant 29.41%**
Mosby Creek	**Abundant 54.17%**	**Null 0**	**Limited 7.29%**	**Null 0**	**Abundant 53.1%**	**Abundant 54.17%**
Pudding Creek-MF	**Abundant 43.64%**	**Null 0**	**Abundant 38.1**	**Limited 10.91%**	**Limited 20%**	**Abundant 43.64%**
Lookout Point Res.	**Abundant 41.46%**	**Limited 1.21%**	**Limited 17.6%**	**Limited 7.93%**	**Abundant 26.8%**	**Abundant 41.46%**
Upper Calapooia Riv.	**Limited 13.84%**	**Low .34%**	**Limited 5.53%**	**Low .35%**	**Limited 10.7%**	**Limited 13.84%**
Row River	**Limited 23.74%**	**Null 0**	**Limited 2.51%**	**Low .72%**	**Limited 21.2%**	**Limited 23.74%**
Upper Coast Fork Wil.	**Abundant 60.78%**	**Null 0**	**Limited 3.92%**	**Null 0**	**Abundant 58.1%**	**Abundant 60.78%**
Muddy Creek – Will.	**Limited 7.45%**	**Null 0**	**Limited 4.04%**	**Low .85%**	**Limited 2.24%**	**Limited 7.45**
Fall Creek	**Abundant 32.45%**	**Low .53%**	**Abundant 27.6%**	**Limited 2.13%**	**Limited 9.57%**	**Abundant 32.45%**
Long Tom River	**Limited 17.11%**	**Low .24%**	**Low .72%**	**Low .72%**	**Limited 12.2%**	**Limited 17.11%**
Lower Coast Fork Wil.	**Limited 20.0%**	**Null 0**	**Limited 3.57%**	**Null 0**	**Limited 13.5%**	**Limited 20.0%**
Indian Creek	**Abundant 72.0%**	**Null 0**	**Null 0**	**Limited 10.0%**	**Abundant 50.0%**	**Abundant 72.0%**
North Fork Siuslaw River	**Abundant 54.55%**	**Limited 4.54%**	**Null 0**	**Limited 6.06%**	**Abundant 31.8%**	**Abundant 54.55%**
Yachats River	**Limited 2.17%**	**Null 0**	**Null 0**	**Null 0**	**Null 0**	**Limited 2.17%**
South Santiam-Fost.	**Limited 12.28%**	**Null 0**	**Limited 7.01%**	**Limited 3.51%**	**Limited 3.5%**	**Limited 12.28%**
Wiley Creek	**Abundant 28.33%**	**Null 0**	**Limited 25**	**Limited 3.33%**	**Null 0**	**Abundant 28.33%**
Tenmile Creek Front.	**Abundant 30.48%**	**Null 0**	**Low .95**	**Limited 10.48%**	**Limited 7.61%**	**Abundant 30.48%**

Quartz Creek – McK.	**Abundant 44.87%**	**Null 0**	**Limited 20.5%**	**Limited 1.28%**	**Limited 8.97%**	**Abundant 44.87%**
South Santiam River	**Abundant 50.94%**	**Null 0**	**Abundant 27%**	**Limited 1.26%**	**Abundant 35.8%**	**Abundant 50.94%**
South Fork McKenzie	**Limited 20.83%**	**Null 0**	**Limited 8.33%**	**Low .46%**	**Limited 4.16%**	**Limited 20.83%**
Horse Creek	**Limited 17.9%**	**Null 0**	**Limited 12.3%**	**Null 0**	**Limited 1.23%**	**Limited 17.9%**
Hills Creek Reserv.	**Limited 6.45%**	**Null 0**	**Limited 1.16%**	**Limited 4.09**	**Limited 3.5%**	**Limited 8.77%**
Headwaters McKen.	**Abundant 27.04%**	**Low .28%**	**Limited 8.16%**	**Null 0**	**Limited 2.81%**	**Abundant 27.04%**
Salt Creek	**Limited 10.53%**	**Null 0**	**Limited 3.5%**	**Low .88%**	**Limited 4.38%**	**Limited 10.53%**
Hills Creek Res.	**Limited 8.77%**	**Null 0**	**Limited 1.16%**	**Limited 4.09**	**Limited 3.5%**	**Limited 8.77%**
Blue River	**Abundant 60.22%**	**Null 0**	**Limited 20.4%**	**Limited 1.08%**	**Limited 16.1%**	**Abundant 60.22%**
North Fork Middle F.	**Limited 6.48%**	**Null 0**	**Low .4%**	**Limited 2.02%**	**Limited 1.61%**	**Limited 6.48%**
Salmon Creek	**Limited 11.2%**	**Low .8%**	**Limited 2.4%**	**Limited 3.2%**	**Limited 2.4%**	**Limited 11.2%**

ALTERNATIVE 3						
	Invasive Plant Distribution Category (5 species Combined)	**English Ivy (HEHE)**	**False Brome (BRSY)**	**Knotweed spp. (POSP)**	**Armenian blackberry (RUDI2)**	**Scotch broom (CYSC)**
Wolf Creek	**Abundant 93.1%**	**Null 0**	**Limited 8.62%**	**Null 0**	**Abundant 81.0%**	**Abundant 93.1%**
Upper Siuslaw River	**Abundant 74.37%**	**Null 0**	**Limited 9.54%**	**Null 0**	**Abundant 65.3%**	**Abundant 74.37%**
Lake Creek	**Abundant 63.79%**	**Null 0**	**Limited 7.75%**	**Limited 9.48%**	**Abundant 52.5%**	**Abundant 63.79%**
Deadwood Creek	**Abundant 64.91%**	**Null 0**	**Null 0**	**Limited 14.04%**	**Abundant 43.8%**	**Abundant 64.91%**
Mohawk River	**Abundant 49.72%**	**Null 0**	**Limited 18.4%**	**Limited 3.35%**	**Abundant 46.3%**	**Abundant 49.72%**
McKenzie River	**Abundant 28.63%**	**Limited 1.14%**	**Limited 11.8%**	**Low .38%**	**Limited 22.5%**	**Abundant 28.63%**
Lookout Point Res.	**Abundant 41.46%**	**Limited 1.21%**	**Limited 17.6%**	**Limited 7.93%**	**Abundant 26.8%**	**Abundant 41.46%**
Pudding Creek-MF	**Abundant 43.64%**	**Null 0**	**Abundant 38.1%**	**Limited 10.91%**	**Limited 20.0%**	**Abundant 43.64%**
Total	**459.62**	**2.35**	**111.81**	**46.09**	**311.90**	**459.62**
Five Rivers	**Abundant 25.21%**	**Null 0**	**Low .84**	**Null 0**	**Limited 13.4%**	**Abundant 25.21%**
Mosby Creek	**Abundant 54.17%**	**Null 0**	**Limited 7.29%**	**Null 0**	**Abundant 53.1%**	**Abundant 54.17%**
Lower Siuslaw River	**Abundant 29.41%**	**Limited 1.17%**	**Null 0**	**Limited 6.47%**	**Limited 8.23%**	**Abundant 29.41%**
Upper Calapooia Riv.	**Limited 13.84%**	**Low .34%**	**Limited 5.53%**	**Low .35%**	**Limited 10.7%**	**Limited 13.84%**

Little Fall Creek	**Abundant 25.42%**	**Limited 1.69%**	**Limited 23.7%**	**Limited 1.69%**	**Limited 13.5%**	**Abundant 25.42%**
Upper Coast Fork Wil.	**Abundant 60.78%**	**Null 0**	**Limited 3.92%**	**Null 0**	**Abundant 58.1%**	**Abundant 60.78%**
Row River	**Limited 23.74%**	**Null 0**	**Limited 2.51%**	**Low .72%**	**Limited 21.2%**	**Limited 23.74%**
Fall Creek	**Abundant 32.45%**	**Low .53%**	**Abundant 27.6%**	**Limited 2.13%**	**Limited 9.57%**	**Abundant 32.45%**
Long Tom River	**Limited 17.11%**	**Low .24%**	**Low .72%**	**Low .72%**	**Limited 12.2%**	**Limited 17.11%**
Wildcat Creek	**Abundant 64.29%**	**Null 0**	**Null 0**	**Limited 1.79%**	**Abundant 46.4%**	**Abundant 64.29%**
South Santiam-Fost.	**Limited 12.28%**	**Null 0**	**Limited 7.01%**	**Limited 3.51%**	**Limited 3.5%**	**Limited 12.28%**
Wiley Creek	**Abundant 28.33%**	**Null 0**	**Limited 25**	**Limited 3.33%**	**Null 0**	**Abundant 28.33%**
Lower Coast Fork Wil.	**Limited 20.0%**	**Null 0**	**Limited 3.57%**	**Null 0**	**Limited 13.5%**	**Limited 20.0%**
Indian Creek	**Abundant 70%**	**Null 0**	**Null 0**	**Limited 10%**	**Abundant 50%**	**Abundant 72%**
North Fork Siuslaw River	**Abundant 54.55%**	**Limited 4.54%**	**Null 0**	**Limited 6.06%**	**Abundant 31.8%**	**Abundant 54.55%**
Muddy Creek – Will.	**Limited 7.45%**	**Null 0**	**Limited 4.04%**	**Low .85%**	**Limited 2.24%**	**Limited 7.45**
Yachats River	**Limited 2.17%**	**Null 0**	**Null 0**	**Null 0**	**Null 0**	**Limited 2.17%**
Tenmile Creek Front.	**Abundant 30.48%**	**Null 0**	**Low .95**	**Limited 10.48%**	**Limited 7.61%**	**Abundant 30.48%**
Quartz Creek – McK.	**Abundant 44.87%**	**Null 0**	**Limited 20.5%**	**Limited 1.28%**	**Limited 8.97%**	**Abundant 44.87%**
South Santiam River	**Abundant 50.94%**	**Null 0**	**Abundant 27%**	**Limited 1.26%**	**Abundant 35.8%**	**Abundant 50.94%**
South Fork McKenzie	**Limited 20.83%**	**Null 0**	**Limited 8.33%**	**Low .46%**	**Limited 4.16%**	**Limited 20.83%**
Horse Creek	**Limited 17.9%**	**Null 0**	**Limited 12.3%**	**Null 0**	**Limited 1.23%**	**Limited 17.9%**
Hills Creek	**Limited 8.77%**	**Null 0**	**Limited 1.16%**	**Limited 4.09**	**Limited 3.5%**	**Limited 8.77%**
Headwaters McKen.	**Abundant 27.04%**	**Low .28%**	**Limited 8.16%**	**Null 0**	**Limited 2.81%**	**Abundant 27.04%**
Salt Creek	**Limited 10.53%**	**Null 0**	**Limited 3.5%**	**Low .88%**	**Limited 4.38%**	**Limited 10.53%**
Hills Creek Reserv.	**Limited 6.45%**	**Null 0**	**Limited 1.16%**	**Limited 4.09**	**Limited 3.5%**	**Limited 8.77%**
Blue River	**Abundant 60.22%**	**Null 0**	**Limited 20.4%**	**Limited 1.08%**	**Limited 16.1%**	**Abundant 60.22%**
North Fork Middle F.	**Limited 6.48%**	**Null 0**	**Low .4%**	**Limited 2.02%**	**Limited 1.61%**	**Limited 6.48%**
Salmon Creek	**Limited 11.2%**	**Low .8%**	**Limited 2.4%**	**Limited 3.2%**	**Limited 2.4%**	**Limited 11.2%**

The following tables outline the proposed acres of disturbance/canopy removal over a 10 year period by watershed in the No Action and Action Alternatives 1, 2 and 3 and the Relative Susceptibility of each. See Table C-7 (*Susceptibility Values by Alternative and Watershed*).

TABLE C-7. SUSCEPTIBILITY VALUES BY ALTERNATIVE AND WATERSHED.

NO ACTION ALTERNATIVE					
Watershed	**Instream Projects/Acres**	**Fish Passage/Acres**	**Riparian Treatments/ Acres**	**Total Acres of Canopy Removed in 10 years**	**Relative Susceptibility**
Upper Siuslaw River	**20**	**5**	**5**	**30**	**HIGH**
Wildcat Creek	**5**	**5**	**3**	**13**	**MEDIUM**
Wolf Creek	**5**	**5**	**3**	**13**	**MEDIUM**
Lake Creek	**5**	**5**	**3**	**13**	**MEDIUM**
Lower CF Willamette	**5**	**5**	**3**	**13**	**MEDIUM**
Mosby Creek	**5**	**1**	**3**	**9**	**LOW**
Indian Creek	**5**	**1**	**3**	**9**	**LOW**
North Fork Siuslaw River	**5**	**1**	**3**	**9**	**LOW**
Yachats	**5**	**1**	**1**	**7**	**LOW**
Deadwood Creek	**5**	**1**	**1**	**7**	**LOW**
Five Rivers	**5**	**1**	**1**	**7**	**LOW**
Tenmile Creek Front	**5**	**1**	**1**	**7**	**LOW**
Lower Siuslaw River	**5**	**1**	**1**	**7**	**LOW**
Wiley Creek	**5**	**1**	**1**	**7**	**LOW**
Muddy Creek –Will.	**5**	**1**	**1**	**7**	**LOW**
Upper Calapooia Riv.	**5**	**1**	**1**	**7**	**LOW**
Pudding Creek – MF	**5**	**1**	**1**	**7**	**LOW**
Little Fall Creek	**5**	**1**	**1**	**7**	**LOW**
Quartz Creek – McK.	**5**	**1**	**1**	**7**	**LOW**
Mohawk River	**5**	**1**	**1**	**7**	**LOW**
South Santiam	**5**	**1**	**1**	**7**	**LOW**
South Santiam-Fost	**5**	**1**	**1**	**7**	**LOW**
McKenzie River	**5**	**1**	**1**	**7**	**LOW**
Long Tom River	**5**	**1**	**1**	**7**	**LOW**
Lookout Point Res.	**5**	**1**	**1**	**7**	**LOW**
Headwaters McKen.	**5**	**1**	**1**	**7**	**LOW**
Horse Creek	**5**	**1**	**1**	**7**	**LOW**
Upper Coast Fork Wil.	**5**	**1**	**1**	**7**	**LOW**
Fall Creek	**5**	**1**	**1**	**7**	**LOW**
South Fork McKenzie	**5**	**1**	**1**	**7**	**LOW**
Row River	**5**	**1**	**1**	**7**	**LOW**
Hills Creek Reserv.	**5**	**1**	**1**	**7**	**LOW**
Salt Creek	**5**	**1**	**1**	**7**	**LOW**
North Fork Middle F.	**5**	**1**	**1**	**7**	**LOW**
Hills Creek	**5**	**1**	**1**	**7**	**LOW**
Salmon Creek	**5**	**1**	**1**	**7**	**LOW**
Blue River	**5**	**1**	**1**	**7**	**LOW**

ALTERNATIVE 1					
Watershed	**Instream Projects/Acres**	**Fish Passage/Acres**	**Riparian Treatments/ Acres**	**Total Acres of Canopy Removed in 10 years**	**Relative Susceptibility**
Indian Creek	**20**	**5**	**5**	**30**	**HIGH**
North Fork Siuslaw	**20**	**5**	**5**	**30**	**HIGH**
Yachats River	**20**	**5**	**5**	**30**	**HIGH**
Deadwood Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Wolf Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Upper Siuslaw River	**10**	**3**	**3**	**16**	**MEDIUM**
Wildcat Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Lake Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Five Rivers	**7**	**1**	**1**	**9**	**LOW**
Tenmile Creek Front.	**7**	**1**	**1**	**9**	**LOW**
Lower Siuslaw River	**7**	**1**	**1**	**9**	**LOW**
Wiley Creek	**7**	**1**	**1**	**9**	**LOW**
Muddy Creek – Will.	**7**	**1**	**1**	**9**	**LOW**
Upper Calapooia Riv.	**7**	**1**	**1**	**9**	**LOW**
Pudding Creek-MF	**7**	**1**	**1**	**9**	**LOW**
Little Fall Creek	**7**	**1**	**1**	**9**	**LOW**
Quartz Creek – McK.	**7**	**1**	**1**	**9**	**LOW**
Mohawk River	**7**	**1**	**1**	**9**	**LOW**
Mosby Creek	**7**	**1**	**1**	**9**	**LOW**
South Santiam River	**7**	**1**	**1**	**9**	**LOW**
South Santiam- Fost.	**7**	**1**	**1**	**9**	**LOW**
Lower Coast Fork Wil.	**7**	**1**	**1**	**9**	**LOW**
McKenzie River	**7**	**1**	**1**	**9**	**LOW**
Long Tom River	**7**	**1**	**1**	**9**	**LOW**
Lookout Point Res.	**7**	**1**	**1**	**9**	**LOW**
Headwaters McKen.	**7**	**1**	**1**	**9**	**LOW**
Horse Creek	**7**	**1**	**1**	**9**	**LOW**
Upper Coast Fork Wil.	**7**	**1**	**1**	**9**	**LOW**
Fall Creek	**7**	**1**	**1**	**9**	**LOW**
South Fork McKenzie	**7**	**1**	**1**	**9**	**LOW**
Row River	**7**	**1**	**1**	**9**	**LOW**
Hills Creek Reserv.	**7**	**1**	**1**	**9**	**LOW**
Salt Creek	**7**	**1**	**1**	**9**	**LOW**
North Fork Middle F.	**7**	**1**	**1**	**9**	**LOW**
Hills Creek	**7**	**1**	**1**	**9**	**LOW**
Salmon Creek	**7**	**1**	**1**	**9**	**LOW**
Blue River	**7**	**1**	**1**	**9**	**LOW**

ALTERNATIVE 2					
Watershed	**Instream Projects/Acres**	**Fish Passage/Acres**	**Riparian Treatments/ Acres**	**Total Acres of Canopy Removed in 10 years**	**Relative Susceptibility**
Wolf Creek	**20**	**5**	**5**	**30**	**HIGH**
Upper Siuslaw River	**20**	**5**	**5**	**30**	**HIGH**
Wildcat Creek	**20**	**5**	**5**	**30**	**HIGH**
Deadwood Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Lake Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Mohawk River	**10**	**3**	**3**	**16**	**MEDIUM**
McKenzie River	**10**	**3**	**3**	**16**	**MEDIUM**
Little Fall Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Five Rivers	**7**	**1**	**1**	**9**	**LOW**
Lower Siuslaw River	**7**	**1**	**1**	**9**	**LOW**
Mosby Creek	**7**	**1**	**1**	**9**	**LOW**
Pudding Creek-MF	**7**	**1**	**1**	**9**	**LOW**
Lookout Point Res.	**7**	**1**	**1**	**9**	**LOW**
Upper Calapooia Riv.	**7**	**1**	**1**	**9**	**LOW**
Row River	**7**	**1**	**1**	**9**	**LOW**
Upper Coast Fork Wil.	**7**	**1**	**1**	**9**	**LOW**
Muddy Creek – Will.	**7**	**1**	**1**	**9**	**LOW**
Fall Creek	**7**	**1**	**1**	**9**	**LOW**
Long Tom River	**7**	**1**	**1**	**9**	**LOW**
Lower Coast Fork Wil.	**7**	**1**	**1**	**9**	**LOW**
Indian Creek	**7**	**1**	**1**	**9**	**LOW**
North Fork Siuslaw River	**7**	**1**	**1**	**9**	**LOW**
Yachats River	**7**	**1**	**1**	**9**	**LOW**
South Santiam- Fost.	**7**	**1**	**1**	**9**	**LOW**
Wiley Creek	**7**	**1**	**1**	**9**	**LOW**
Tenmile Creek Front.	**7**	**1**	**1**	**9**	**LOW**
Quartz Creek – McK.	**7**	**1**	**1**	**9**	**LOW**
South Santiam River	**7**	**1**	**1**	**9**	**LOW**
South Fork McKenzie	**7**	**1**	**1**	**9**	**LOW**
Horse Creek	**7**	**1**	**1**	**9**	**LOW**
Hills Creek Reserv.	**7**	**1**	**1**	**9**	**LOW**
Headwaters McKen.	**7**	**1**	**1**	**9**	**LOW**
Salt Creek	**7**	**1**	**1**	**9**	**LOW**
Hills Creek Res.	**7**	**1**	**1**	**9**	**LOW**
Blue River	**7**	**1**	**1**	**9**	**LOW**
North Fork Middle F.	**7**	**1**	**1**	**9**	**LOW**
Salmon Creek	**7**	**1**	**1**	**9**	**LOW**

ALTERNATIVE 3					
Watershed	**Instream Projects/Acres**	**Fish Passage/Acres**	**Riparian Treatments/ Acres**	**Total Acres of Canopy Removed in 10 years**	**Relative Susceptibility**
Wolf Creek	**20**	**5**	**5**	**30**	**HIGH**
Upper Siuslaw River	**20**	**5**	**5**	**30**	**HIGH**
Lake Creek	**20**	**5**	**5**	**30**	**HIGH**
Deadwood Creek	**10**	**3**	**3**	**16**	**MEDIUM**
Mohawk River	**10**	**3**	**3**	**16**	**MEDIUM**
McKenzie River	**10**	**3**	**3**	**16**	**MEDIUM**
Lookout Point Reser.	**10**	**3**	**3**	**16**	**MEDIUM**
Pudding Creek – Mid. Fork	**10**	**3**	**3**	**16**	**MEDIUM**
Five Rivers	**7**	**1**	**1**	**9**	**LOW**
Mosby Creek	**7**	**1**	**1**	**9**	**LOW**
Lower Siuslaw River	**7**	**1**	**1**	**9**	**LOW**
Upper Calapooia Riv.	**7**	**1**	**1**	**9**	**LOW**
Little Fall Creek	**7**	**1**	**1**	**9**	**LOW**
Upper Coast Fork Wil.	**7**	**1**	**1**	**9**	**LOW**
Row River	**7**	**1**	**1**	**9**	**LOW**
Fall Creek	**7**	**1**	**1**	**9**	**LOW**
Long Tom River	**7**	**1**	**1**	**9**	**LOW**
Wildcat Creek	**7**	**1**	**1**	**9**	**LOW**
South Santiam- Fost.	**7**	**1**	**1**	**9**	**LOW**
Wiley Creek	**7**	**1**	**1**	**9**	**LOW**
Lower Coast Fork Wil.	**7**	**1**	**1**	**9**	**LOW**
Indian Creek	**7**	**1**	**1**	**9**	**LOW**
North Fork Siuslaw River	**7**	**1**	**1**	**9**	**LOW**
Muddy Creek – Will.	**7**	**1**	**1**	**9**	**LOW**
Yachats River	**7**	**1**	**1**	**9**	**LOW**
Tenmile Creek Front.	**7**	**1**	**1**	**9**	**LOW**
Quartz Creek – McK.	**7**	**1**	**1**	**9**	**LOW**
South Santiam River	**7**	**1**	**1**	**9**	**LOW**
South Fork McKenzie	**7**	**1**	**1**	**9**	**LOW**
Horse Creek	**7**	**1**	**1**	**9**	**LOW**
Hills Creek	**7**	**1**	**1**	**9**	**LOW**
Headwaters McKen.	**7**	**1**	**1**	**9**	**LOW**
Salt Creek	**7**	**1**	**1**	**9**	**LOW**
Hills Creek Reserv.	**7**	**1**	**1**	**9**	**LOW**
Blue River	**7**	**1**	**1**	**9**	**LOW**
North Fork Middle F.	**7**	**1**	**1**	**9**	**LOW**
Salmon Creek	**7**	**1**	**1**	**9**	**LOW**

The following table shows the risk rating, the baseline risk rating, and the cumulative historic disturbance for each Alternative and watershed. See Table C-8 (*Risk Rating By Alternative And Watershed*)

TABLE C-8. RISK RATING BY ALTERNATIVE AND WATERSHED.

NO ACTION ALTERNATIVE				
Watershed	**Distribution x Susceptibility (5 species combined) with Aquatic Restoration Activities**	**Risk Rating**	**Distribution x Susceptibility (5 species combined) without Aquatic Restoration Activities – assumes low level natural disturbance from flood events, etc., in a 10 year period**	**Baseline Risk Rating**
Upper Siuslaw River	**Abundant (10) X High (10)**	**HIGHEST (100)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Wildcat Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Wolf Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Lake Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Lower Coast Fork Willamette	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Mosby	**Abundant(10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Indian Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
North Fork Siuslaw River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Yachats River	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Deadwood Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Five Rivers	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Tenmile Creek Front	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Lower Siuslaw River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Wiley Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Muddy Creek – Will.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Upper Calapooia Riv.	**Limited(5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Pudding Creek – MF	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Little Fall Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Quartz Creek – McK.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**

Mohawk River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
South Santiam	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATELY LOW (5)**
South Santiam-Fost	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
McKenzie River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Long Tom River	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Lookout Point Res.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Headwaters McKen.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Horse Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Upper Coast Fork Wil.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
Fall Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**
South Fork McKenzie	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Row River	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Hills Creek Reserv.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Salt Creek	**Limited(5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
North Fork Middle F.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Hills Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Salmon Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Blue River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant(10) X Low (1)**	**MODERATE (10)**

ALTERNATIVE 1				
Watershed	**Distribution X Susceptibility (5 species Combined)**	**Risk Rating**	**Distribution X Susceptibility (5 species combined) without Aquatic Restoration Activities – assumes low level natural disturbance from flood events, etc., in a 10 year period**	**Baseline Risk Rating**
Indian Creek	**Abundant (10) X High (10)**	**HIGHEST (100)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
North Fork Siuslaw River	**Abundant (10) X High (10)**	**HIGHEST (100)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Yachats River	**Limited (5) X High (10)**	**HIGH (50)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Deadwood	**Abundant (10)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**

Creek	**X Medium (5)**			
Wolf Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Upper Siuslaw River	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Wildcat Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Lake Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Five Rivers	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Tenmile Creek Front.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Lower Siuslaw River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Wiley Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Muddy Creek – Will.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Upper Calapooia Riv.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Pudding Creek-MF	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Little Fall Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Quartz Creek – McK.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Mohawk River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Mosby Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
South Santiam River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
South Santiam-Fost.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Lower Coast Fork Wil.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
McKenzie River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Long Tom River	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Lookout Point Res.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Headwaters McKen.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Horse Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Upper Coast Fork Wil.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Fall Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
South Fork McKenzie	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Row River	**Limited (5) X**	**MODERATELY**	**Limited (5) X Low (1)**	**MODERATELY**

	Low (1)	LOW (5)		LOW (5)
Hills Creek Reserv.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Salt Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
North Fork Middle F.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Hills Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Salmon Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Blue River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**

ALTERNATIVE 2				
Watershed	**Distribution X Susceptibility (5 species Combined)**	**Risk Rating**	**Distribution X Susceptibility (5 species combined) without Aquatic Restoration Activities – assumes low level natural disturbance from flood events, etc., in a 10 year period**	**Baseline Risk Rating**
Wolf Creek	**Abundant (10) X High (10)**	**HIGHEST (100)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Upper Siuslaw River	**Abundant (10) X High (10)**	**HIGHEST (100)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Wildcat Creek	**Abundant (10) X High (10)**	**HIGHEST (100)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Deadwood Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Lake Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Mohawk River	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
McKenzie River	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Little Fall Creek	**Abundant (10) X Medium (5)**	**HIGH (50)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Five Rivers	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Lower Siuslaw River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Mosby Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Pudding Creek-MF	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Lookout Point Res.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Upper Calapooia Riv.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Row River	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**

Upper Coast Fork Wil.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Muddy Creek – Will.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Fall Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Long Tom River	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Lower Coast Fork Wil.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Indian Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
North Fork Siuslaw River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Yachats River	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
South Santiam-Fost.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Wiley Creek	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Tenmile Creek Front.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Quartz Creek – McK.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
South Santiam River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
South Fork McKenzie	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Horse Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Hills Creek Reserv.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Headwaters McKen.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Salt Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Hills Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Blue River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
North Fork Middle F.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Salmon Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**

ALTERNATIVE 3				
Watershed	**Distribution X Susceptibility (5 species Combined)**	**Risk Rating**	**Distribution X Susceptibility (5 species combined) without Aquatic Restoration Activities – assumes low level natural disturbance from flood events, etc., in a 10 year period**	**Baseline Risk Rating**
Wolf Creek	**Abundant (10)**	**HIGHEST (100)**	**Abundant (10) X Low (1)**	**MODERATE (10)**

	X High (10)			
Upper Siuslaw River	Abundant (10) X High (10)	HIGHEST (100)	Abundant (10) X Low (1)	MODERATE (10)
Lake Creek	Abundant (10) X High (10)	HIGHEST (100)	Abundant (10) X Low (1)	MODERATE (10)
Deadwood Creek	Abundant (10) X Medium (5)	HIGH (50)	Abundant (10) X Low (1)	MODERATE (10)
Mohawk River	Abundant (10) X Medium (5)	HIGH (50)	Abundant (10) X Low (1)	MODERATE (10)
McKenzie River	Abundant (10) X Medium (5)	HIGH (50)	Abundant (10) X Low (1)	MODERATE (10)
Lookout Point Res.	Abundant (10) X Medium (5)	HIGH (50)	Abundant (10) X Low (1)	MODERATE (10)
Pudding Creek-MF	Abundant (10) X Medium (5)	HIGH (50)	Abundant (10) X Low (1)	MODERATE (10)
Five Rivers	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Mosby Creek	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Lower Siuslaw River	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Upper Calapooia Riv.	Limited (5) X Low (1)	MODERATELY LOW (5)	Limited (5) X Low (1)	MODERATELY LOW (5)
Little Fall Creek	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Upper Coast Fork Wil.	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Row River	Limited (5) X Low (1)	MODERATELY LOW (5)	Limited (5) X Low (1)	MODERATELY LOW (5)
Fall Creek	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Long Tom River	Limited (5) X Low (1)	MODERATELY LOW (5)	Limited (5) X Low (1)	MODERATELY LOW (5)
Wildcat Creek	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
South Santiam-Fost.	Limited (5) X Low (1)	MODERATELY LOW (5)	Limited (5) X Low (1)	MODERATELY LOW (5)
Wiley Creek	Abundant (5) X Low (1)	MODERATE (10)	Limited (5) X Low (1)	MODERATELY LOW (5)
Lower Coast Fork Wil.	Limited (5) X Low (1)	MODERATELY LOW (5)	Limited (5) X Low (1)	MODERATELY LOW (5)
Indian Creek	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
North Fork Siuslaw River	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Muddy Creek – Will.	Limited (5) X Low (1)	MODERATELY LOW (5)	Limited (5) X Low (1)	MODERATELY LOW (5)
Yachats River	Limited (5) X Low (1)	MODERATELY LOW (5)	Limited (5) X Low (1)	MODERATELY LOW (5)
Tenmile Creek Front.	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
Quartz Creek – McK.	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)
South Santiam River	Abundant (10) X Low (1)	MODERATE (10)	Abundant (10) X Low (1)	MODERATE (10)

South Fork McKenzie	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Horse Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Hills Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Headwaters McKen.	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
Salt Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Hills Creek Reserv.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Blue River	**Abundant (10) X Low (1)**	**MODERATE (10)**	**Abundant (10) X Low (1)**	**MODERATE (10)**
North Fork Middle F.	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**
Salmon Creek	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**	**Limited (5) X Low (1)**	**MODERATELY LOW (5)**

The following table shows the Risk Rating for cumulative disturbance levels from timber harvest and wildfire between 1995 and 2004. See Table C-9 (*Risk Rating for Cumulative Disturbance Levels from Timber Harvest and Wildfire, 1995 – 2004*)

TABLE C-9. RISK RATING FOR CUMULATIVE DISTURBANCE LEVELS FROM TIMBER HARVEST AND WILDFIRE, 1995 – 2004.

Watershed	1995 – 2004 Disturbance Acres (Timber Harvest/Wildfire)	Distribution X Susceptibility (5 species Combined)	Risk Rating – Historical Level for 9 year period
Indian Creek	**491**	**Abundant (10) X High (10)**	**HIGHEST (100)**
North Fork Siuslaw River	**522**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Yachats River	**790**	**Limited (5) X High (10)**	**HIGH (50)**
Deadwood Creek	**215**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Wolf Creek	**4,684**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Upper Siuslaw River	**13,418**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Wildcat Creek	**4,026**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Lake Creek	**4,598**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Five Rivers	**1,177**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Tenmile Creek Front.	**567**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Lower Siuslaw River	**5,768**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Wiley Creek	**3,409**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Muddy Creek – Will.	**1,449**	**Limited (5) X High (10)**	**HIGH (50)**
Upper Calapooia Riv.	**10,214**	**Limited (5) X High (10)**	**HIGH (50)**
Pudding Creek-MF	**1,949**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Little Fall Creek	**4,832**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Quartz Creek – McK.	**3,762**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Mohawk River	**14,581**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Mosby Creek	**1,933**	**Abundant (10) X High (10)**	**HIGHEST (100)**
South Santiam River	**1,126**	**Abundant (10) X High (10)**	**HIGHEST (100)**
South Santiam- Fost.	**4,941**	**Limited (5) X High (10)**	**HIGH (50)**
Lower Coast Fork	**3,622**	**Limited (5) X High (10)**	**HIGH (50)**

Wil.			
McKenzie River	**12,550**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Long Tom River	**15,959**	**Limited (5) X High (10)**	**HIGH (50)**
Lookout Point Res.	**3,471**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Headwaters McKen.	**5,352**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Horse Creek	**123**	**Limited (5) X High (10)**	**HIGH (50)**
Upper Coast Fork Wil.	**6,291**	**Abundant (10) X High (10)**	**HIGHEST (100)**
Fall Creek	**5,128**	**Abundant (10) X High (10)**	**HIGHEST (100)**
South Fork McKenzie	**813**	**Limited (5) X High (10)**	**HIGH (50)**
Row River	**7,842**	**Limited (5) X High (10)**	**HIGH (50)**
Hills Creek Reserv.	**1,040**	**Limited (5) X High (10)**	**HIGH (50)**
Salt Creek	**229**	**Limited (5) X High (10)**	**HIGH (50)**
North Fork Middle F.	**10,262**	**Limited (5) X High (10)**	**HIGH (50)**
Hills Creek	**491**	**Limited (5) X High (10)**	**HIGH (50)**
Salmon Creek	**428**	**Limited (5) X High (10)**	**HIGH (50)**
Blue River	**317**	**Abundant (10) X High (10)**	**HIGHEST(100)**

APPENDIX D. WILDLIFE

There are over 45 special status and birds of conservation concern species that are known or suspected to occur in the Eugene District. See Table D-1 (*Special Status Species And Birds Of Conservation Concern That Are Known Or Suspected To Occur In The Eugene District).*

TABLE D-1. SPECIAL STATUS SPECIES AND BIRDS OF CONSERVATION CONCERN THAT ARE KNOWN OR SUSPECTED TO OCCUR IN THE EUGENE DISTRICT.

Name	Presence in the Eugene District — Habitat Associations	Carried forward for evaluation?
Federally-listed Threatened, Endangered and Proposed Species		
Marbled murrelet *Brachyramphus marmoratus*	**Present** – Nests only in structurally-complex conifer forest stands; nesting structure occurs within 50 miles of the coast and below 2,925 ft. in elevation, is one of four species (Western hemlock, Douglas-fir, Sitka spruce or western red cedar), is ≥ 19.1 in. (dbh) in diameter, > 107 ft. in height, has at least one platform ≥ 5.9 in. in diameter, nesting substrate (*e.g.,* moss, epiphytes, duff) on that platform, and an access route through the canopy that a murrelet could use to approach and land on the platform, and it has a tree branch or foliage, either on the tree with potential structure or on a surrounding tree, that provides protective cover over the platform	Yes; possible effects from habitat modification and disturbance
Northern spotted owl *Strix occidentalis caurina*	**Present** – Occupies young, mature or structurally-complex conifer forest stands with snags and/or downed wood; occupied stands generally have a mean tree diameter of ≥ 11in. and a canopy cover ≥ 40 percent; lives in forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags and live trees with broken tops; although known to nest, roost and feed in a wide variety of habitat types, prefers older forest stands with variety: multi-layered canopies of several tree species of varying size and age, both standing and fallen dead trees, and open space among the lower branches to allow flight under the canopy; typically, forests do not attain these characteristics until they are at least 150 to 200 years old	Yes; possible effects from habitat modification and disturbance
California brown pelican *Pelecanus occidentalis californicus*	**Possible** – Coastal; inhabits coastal salt water, beaches, bays, marshes and the open ocean, most numerously within a few kilometers of the ocean throughout the year, also occupies large inland water bodies with fish; a warm-weather species that thrives near coasts and on islands; generally uses the rocky islands along the California coast for its group or "colonial" nest sites; roosting and resting, or "loafing," sites where pelicans can dry their feathers and rest without disturbance are also important	No; unlikely to occur in project areas or to be affected by proposed activities
Fenders' blue butterfly *Plebejus icarioides fenderi*	**Present** – Inhabits moist grasslands and sub-irrigated meadows with Kincaid's lupine in the Willamette Valley; occurs in native prairie habitats; most typically found in native upland prairies, dominated by red fescue and/or Idaho fescue; uses lupine species as larval food plants	No; does not inhabit project areas
Sensitive Species		
Evening fieldslug *Deroceras hesperium*	**Possible** – Associated with low to mid elevations in the western Cascade Range to the Pacific Ocean and from northwestern Oregon through western Washington and onto Vancouver Island, B.C.; no currently extant known sites are known; habitat is largely unknown but, based on limited information, includes varied low vegetation, litter, and debris; rocks may also be used; the last report of living *Deroceras hesperium* was in 1969; it has been known from a few scattered sites within a fairly broad range; based on what is currently known, its status is not at all secure; while it may logically be expected to still occur in the Columbia Gorge east of Portland, on the north slope of the Olympic Peninsula, and at other sites in western Washington and Oregon, that is merely speculation, since there are no recent records	No; unlikely to occur in project areas or to be affected by proposed activities
Salamander slug *Gliabates oregonius*	**Possible** – One record (1959) from Lane County; leaf litter under bushes in mature conifer forest on east side of Long Tom River at 600 feet elevation	No; unlikely to occur in project areas or to be affected by proposed activities
Tillamook westernslug *Hesperarion mariae*	**Present** – Inhabits moist, mature forest with deciduous tree/shrub layer; coastal fog forest	Yes; possible effects from habitat modification
Crater Lake tightcoil *Pristiloma arcticum crateris*	**Possible** – May be found sparsely distributed throughout the Oregon Cascades, at moderate to high elevations, roughly 600 to 2000 meters (2000 to 7000 feet); it has been found from south of Crater Lake in southern Oregon to the Bull Run Watershed in northern Oregon. They are currently known from about 8 sites within 3 localities in this range, 6 of those sites being in the Crater Lake locality; this species may be found on logs and other woody debris, or among litter in moist to wet forests, or in well vegetated meadows in forested settings; expected microhabitats include moist to wet sites such as riparian areas, and near springs, seeps, wetlands, and mountain meadows; essential habitat components include uncompacted soil, litter, logs, and other woody debris in a site where the ground is shaded or otherwise protected from excessive fluctuations in temperature and humidity.	No; unlikely to occur in project areas or to be affected by proposed activities

Spotted tail-dropper *Prophysaon vanattae pardalis*	**Possible** – Inhabits mature forest with deciduous layer in the coastal zone; sensitive to logging activities; little know of habitat associations	No; unlikely to occur in project areas or to be affected by proposed activities
Siuslaw sand tiger-beetle *Cicindela hirticollis siuslawensis*	**Present** – Inhabits sand dunes and bars associated with river mouths; not found in Lane County since 1957; disrupted by OHV uses	No; unlikely to occur in project areas or to be affected by proposed activities
Roth's blind ground beetle *Pterostichus rothi*	**Possible** – Restricted to cool, moist, closed-canopy conifer forests with well-drained, deep, coarse-crumb structure soils; not found on alluvial soils on floodplains; prefers ground covered by duff; found throughout year under embedded rocks and logs; not found in disturbed sites, meadows or ecotones associated with grassy areas	No; unlikely to occur in project areas or to be affected by proposed activities
Oregon plant bug *Lygus oregonae*	**Possible** – Confined to sand dunes near the beach, usually just back of the foremost dune where host plant grows	No; unlikely to occur in project areas or to be affected by proposed activities
Hoary elfin (butterfly) *Incisalia polia maritima*	**Possible** – Coastal; kinnikinnick associate (host plant); known from Lincoln and Curry Counties in Oregon and Del Norte County in California; there are no known populations on Forest Service or BLM lands; the site farthest north is near Waldport; colonies are on the interface of "public beach lands" and private lands, in addition to the State Park land of Driftwood State Wayside where the elfin has been found in the past	No; unlikely to occur in project areas or to be affected by proposed activities
Taylor's checkerspot (butterfly) *Euphydryas editha taylori*	**Possible** – Inhabits coastal bluffs and chaparral, grassland and native prairie on valley floor; once found throughout grasslands in the lowlands west of the Cascade Range from Oregon's Willamette Valley; extirpated from British Columbia and restricted to twelve sites in Washington and two in Oregon; open grasslands and grass/oak woodland sites where food plants for larvae and nectar sources for adults are available; these sites include coastal and inland prairies on post-glacial, gravelly outwash and balds	No; unlikely to occur in project areas or to be affected by proposed activities
Mardon skipper (butterfly) *Polites mardon*	**Possible** – Alpine, grassland/herbaceous, conifer woodlands; grass openings in Idaho fescue and serpentine; occurrence in Eugene District not considered "reasonable possibility" (Applegarth 1995:88)	No; unlikely to occur in project areas or to be affected by proposed activities
Siskiyou short-horned grasshopper *Chloealtis aspasma*	**Possible** – Grasslands and herbaceous habitats, associated with elderberry plants, open stands of hemlock and grassy areas near the summit of a ridge; not found in Lane County; not found in Jackson and Benton counties since 1919	No; unlikely to occur in project areas or to be affected by proposed activities
Haddock's rhyacophilan caddisfly *Rhyacophila haddock*	**Possible** – Known habitat does not exist in Lane County (Applegarth 1995:90)	No; unlikely to occur in project areas or to be affected by proposed activities
Grasshopper sparrow *Ammodramus savannarum*	**Present** – Associated with grasslands, hayfields and prairies; verified in West Eugene Wetlands; occupy open grasslands and prairies with patches of bare ground; prairie and cultivated grasslands, weedy fallow fields and alfalfa fields; avoid significant shrub cover; occupy intermediate grassland habitat, preferring drier sparse sites in tallgrass prairies with open or bare ground for feeding; with few exceptions, nests are built on the ground, near a clump of grass or base of a shrub, "domed" with overhanging vegetation	No; unlikely to occur in project areas or to be affected by proposed activities
Dusky Canada goose *Branta canadensis occidentalis*	**Present** – Winter resident only; associated with open grasslands, wet meadows; nest is usually located in an elevated area near water such as streams, lakes, ponds and sometimes on a beaver lodge	No; unlikely to occur in project areas or to be affected by proposed activities
Aleutian Canada goose (winter) *Branta canadensis leucopareia*	**Possible** – Winter resident only; in Oregon inhabit coastal grasslands	No; unlikely to occur in project areas or to be affected by proposed activities
White-tailed kite *Elanus leucurus*	**Present** – Associated with grasslands, typically with deciduous trees for nesting and perching; also frequent agricultural lands; typically occur on valley floor	No; unlikely to occur in project areas or to be affected by proposed activities
Streaked horned lark *Eremophila alpestris strigata*	**Possible** – Associated with grasslands, pastures and agricultural fields; prefer short vegetation; documented in prairie portions of Fern Ridge Reservoir; probably occur in West Eugene Wetlands; nesting in Willamette Valley associated with large expanses of herbaceous dominated habitat (cultivated grass fields, moderate to heavily grazed pasture, fallow fields, roadside shoulders), Christmas tree farms and wetland mudflats; dominated by short grasses (0-6 inches), relatively high percent of bare ground (17%) for territories, a higher percent cover of bare ground (31%) for nest sites; wintering habitat Willamette Valley associated with high percent of bare ground (sites with flocks > 20 birds averaged greater than 85% bare ground) and large expanse of treeless area; most birds use agricultural fields, particularly rye grass fields with sparse ground cover	No; unlikely to occur in project areas or to be affected by proposed activities
American peregrine falcon *Falco peregrinus anatum*	**Present** – Nest on cliffs; forages along river corridors and over wetlands where bird prey reside and feed; only a single eyrie know in the Eugene District but others are likely; nests unlikely to be directly affected by proposed activities	Yes; possible effects from disturbance
Bald eagle *Haliaeetus leucocephalus*	**Present** – Nest and roost in large trees, late-seral forest stands within 1 mile of lakes, rivers and large streams; nest site selection varies widely from deciduous, coniferous and mixed-forest stands; nest trees are usually large diameter trees characterized by open branching and stout limbs; nests are in dominant or co-dominant trees often located near a break in the forest such as a burn, clearcut, field edge (including agricultural fields), or water; the majority of nest sites are within 1/2 mile of a body of water such as coastal shorelines, bays,	Yes; possible effects from habitat modification and disturbance

	rivers, lakes, farm ponds, dammed up rivers (i.e., beaver dams, log jams, etc.) and have an unobstructed view of the water; habitation occurs primarily in undeveloped areas with little human activity; winter foraging areas are usually located near open water on rivers, lakes, reservoirs, and bays where fish and waterfowl are abundant, or in areas with little or no water (i.e., rangelands, barren land, tundra, suburban areas, etc.) where other prey species (e.g., rabbit, rodents, deer, carrion) are abundant; communal roost sites contain large trees (standing snags and utility poles have also been used) with stout lower horizontal branches for perching and may be used at night by three to greater than one hundred bald eagles, as well as during the day, especially during inclement weather; perch trees used during the day possess the same characteristics as roost trees but are located closer to foraging areas; conspicuous birds and most use areas in the Eugene District are known	
Harlequin duck *Histrionicus histrionicus*	**Present** – In the District known to breed only in the Cascades: McKenzie River and Middle Fork of the Willamette River; not know to occur on the valley floor or in the Coast Range; inhabits forests generally within 50 m of 1^{st}- 5^{th}order streams from March to August; winters in the ocean	Yes; possible effects from habitat modification and disturbance
Lewis'woodpecker *Melanerpes lewis*	**Present** – Associated with open woodlands including Oregon white oak woodlands, Ponderosa pine woodlands and mixed oak/pine woodlands; more common in woodlands near grassland-shrub communities; winter resident in West Eugene Wetlands	No; unlikely to occur in project areas or to be affected by proposed activities
Oregon vesper sparrow *Pooecetes gramineus affinis*	**Present** – Associated with grasslands, fields, prairies and roadsides; not associated with forests	No; unlikely to occur in project areas or to be affected by proposed activities
Purple martin *Progne subis*	**Present** – Snags in early-seral stands, openings and burns; commonly associated with rivers, marshes and open water, especially when snags are present, both for nesting and foraging	Yes; possible effects from habitat modification and disturbance
Oregon slender salamander *Batrachoseps wrighti*	**Present** – Fully terrestrial, not obligated to riparian habitats; strong affinity for cool, moist conifer stands with large amounts of large down logs in advance decay and large snags; nests associated with stumps, downed logs and talus	No; unlikely to occur in project areas or to be affected by proposed activities
Foothill yellow-legged frog *Rana boylii*	**Present** – Perennial, low-gradient, medium-sized streams (4^{th} – 6^{th} order) or side channels of larger creeks or rivers with rock, gravel or sand substrate	Yes; possible effects from habitat modification
Northwestern pond turtle *Clemmys marmorata marmorata*	**Present** – Associated with both terrestrial and aquatic habitats from sea level to 5000 ft.; lentic water (ponds, slow reaches of rivers); nests in open areas within 150 m of water; overwinter within 500 m of live/open water.	Yes; possible effects from habitat modification
Painted turtle *Chrysemys picta*	**Possible** – Inhabitat freshwater that is quiet, shallow, and has a thick layer of mud; slow-moving shallow waters of ponds, marshes, creeks and lakes with soft, muddy bottoms, with suitable basking sites and ample aquatic vegetation. There are no known sightings of this species in the Eugene District and this species has no known historical population here. The District is at the southern edge of this species' range and it is unlikely that there are any populations of these turtles on the Eugene District. Given the habitat associated with this species, any populations of this species on the District would likely be found within the West Eugene Wetlands area.	No; unlikely to occur in project areas or to be affected by proposed activities
Pallid bat *Antrozous pallidus*	**Possible** – Associated with desert areas in Oregon; west of Cascades restricted to drier interior valleys of southern portion of state, including Lane County, where it occurs at low elevations and along the valley floor; usually found in brushy and rocky terrain but has been observed along edges of coniferous and deciduous woods and open farmlands; crevice dweller associated with rock crevices, snags, large hollow trees and human structures used for day roosting	No; due to valley floor restriction, unlikely to occur in project areas or to be affected by proposed activities
Townsend's big-eared bat *Corynorhinus townsendii*	**Present** – Cave obligate; day roosts in mines, caves, tree cavities and attics of buildings	No; unlikely to occur in project areas or to be affected by proposed activities
Fisher *Martes pennanti*	**Present** – Late-seral forest stands, both conifer and conifer-hardwood mix, with dense canopy; large down logs, live trees and snags for denning; in Oregon fishers occurred historically throughout the Coastal and Cascade mountains; currently the range is severely reduced; despite extensive surveys conducted in forested regions of Oregon, records dating from 1954 to 2001 show that the remaining populations of fishers are restricted to two separate and genetically isolated populations in southwestern Oregon; one in the northern Siskiyou Mountains and one in the southern Cascade Range; Fishers select forests with high canopy closure, large trees, and a high percentage of conifers; the physical structure of this type of forest provides the fisher with reduced vulnerability to predation and an abundance of prey; distribution likely limited by elevation and snow depth	Yes; possible effects from habitat modification
Fringed myotis *Myotis thysanodes*	**Possible** – Crevice dweller associated with large snags and live trees, abandoned buildings, mines and caves, some bridges; forage in openings, and late- and mid-seral forests	Yes; possible effects from habitat modification
Birds of Conservation Concern (not already listed above)		
Northern goshawk *Accipiter gentilis*	**Present** – Inhabits a wide variety of forest ages, structural conditions and successional stages; for hunting habitat, the northern goshawk prefers the transitional zones from bog to forest and forest to shrubland; riparian zones and mosaics of forested and open areas are also important hunting habitats; uses stands of old-growth forest as nesting sites; nests in both live trees and snags.	No; proposed activities unlikely to affect a local or regional population (see IM OR-2009-018)

Black swift *Cypseloides niger*	**Present** – Breeding swifts are restricted to two main habitat features – sea caves and cliffs along the Pacific coast, and adjacent to or near wet cliff sites in montane canyons; inland nests are usually located near dripping water sources, waterfalls, or turbulent water sprays; foraging habitat is poorly known; during warm, clear weather, foraging is presumed to occur at high altitudes where blooms of aerial insects are available, from 1000 to 2000 feet above ground during the day to within 100 feet of the ground during the late afternoon	No; proposed activities unlikely to affect a local or regional population (see IM OR-2009-018)
Rufous hummingbird *Selasphorus rufus*	**Present** – Inhabits forest edges near riparian thickets, meadows and other openings; found in forests, on seed-tree harvest units, riparian shrub, and spruce-fir habitats; during the winter it lives wherever flowers are present	No; proposed activities unlikely to affect a local or regional population (see IM OR-2009-018)
Olive-sided flycatcher *Contopus borealis*	**Present** – Inhabits mixed conifer and hardwood-conifer forests; abundant in landscapes containing fragmented late-seral forests with pronounced ecotones; frequent coniferous forests, especially with tall standing dead trees. They prefer spruce, fir, balsam, pine, or mixed woodlands near edges and clearings, wooded streams, swamps, bogs, edges of lakes or rivers	No; proposed activities unlikely to affect a local or regional population (see IM OR-2009-018)
Streaked horned lark *Eremophila alpestris strigata*	**Present** – Inhabits open fields with short, herb-dominated ground cover with patches of bare ground; In the Willamette Valley inhabits large expanses of herbaceous dominated habitat (cultivated grass fields, moderate to heavily grazed pasture, fallow fields, roadside shoulders), Christmas tree farms and wetland mudflats, dominated by short grasses (0-6 inches), relatively high percent of bare ground (17%) for territories, a higher percent cover of bare ground (31%) for nest sites	No; proposed activities unlikely to affect a local or regional population (see IM OR-2009-018)
Purple finch *Carpodacus purpureus*	**Present** – Inhabits coniferous and mixed forests, as well as park-like areas, breeding throughout western Oregon; nests are most often found far out on horizontal branches in conifers and are made of concealing material; food consists mostly of seeds, buds, blossoms, and fruit, usually taken from the outer branches of trees and occasionally from the ground; purple finches display strong site fidelity to breeding areas, but in winter, flocks may range widely depending on local food supplies and a wider variety of habitats are used	No; proposed activities unlikely to affect a local or regional population (see IM OR-2009-018)

Table D-2 lists the special status wildlife species and migratory bird species that were not included in the analysis (*Special Status Wildlife Species And Migratory Birds Not Included)*

TABLE D-2. SPECIAL STATUS WILDLIFE SPECIES AND MIGRATORY BIRDS NOT INCLUDED.

Common Name	Scientific Name	Status [1]	Occurrence [2]	Reason Eliminated	Habitat/Range	Citations
SPECIAL STATUS SPECIES						
FENDER'S BLUE BUTTERFLY	PLEBEJUS ICARIOIDES FENDERI	FE	D	No Habitat	Associated strongly with Kincaid's Lupine. Meadow/prairie habitat	Applegarth 1995
CALIFORNIA BROWN PELICAN	PELECANUS OCCIDENTALIS CALIFORNICUS	FE	S	No Habitat	Coastal and estuarine habitats.	NatureServe 2008.
HADDOCK'S RHYACOPHILAN CADDISFLY	RHYACOPHILA HADDOCKI	SEN	S	No Habitat	Spring-fed subalpine streams and adjacent riparian areas.	Brenner 2005a
HOARY ELFIN	CALLOPHRYS POLIOS MARITIMA	SEN	S	No Habitat	Ocean bluffs and dunes.	Ross et al. 2005
MARDON SKIPPER	POLITES MARDON	SEN	S	No Habitat	Grassland, prairie.	Kerwin and Huff 2007
OREGON PLANT BUG	LYGUS OREGONAE	SEN	S	No Habitat	Ocean dunes.	Scheurering 2006
SISKIYOU SHORT-HORNED GRASSHOPPER	CHLOEALTIS ASPASMA	SEN	S	No Habitat	Grassland, meadow, open areas. Associated with blue elderberry.	Brenner 2006
SIUSLAW SAND TIGER BEETLE	CICINDELA HIRTICOLLIS SIUSLAWENSIS	SEN	D	No Habitat	Sandy riverbanks and river mouths adjacent to the Pacific Ocean.	Black et al. 2007
TAYLOR'S CHECKERSPOT	EUPHYDRYAS EDITHA TAYLORI	SEN	S	No Habitat	Grassland, prairie.	Black et al. 2005

PAINTED TURTLE	CHRYSEMYS PICTA	SEN	S	No Habitat	Slow water; rivers, marshes, ponds with abundant vegetation and basking sites	Bury 1995.
ALEUTIAN CANADA GOOSE	BRANTA HUTCHINSII LEUCOPAREIA	SEN	S	No Habitat	Pasture, harvested agricultural fields, marshes.	U.S. Fish and Wildlife Service 1991
DUSKY CANADA GOOSE	BRANTA CANADENSIS OCCIDENTALIS	SEN, GBBDC	D	No Habitat	Willamette Valley agricultural fields and wetlands.	Bromley and Rothe 2003
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SEN	D	No Habitat	Grassland, prairie.	NaureServe 2008
LEWIS' WOODPECKER	MELANERPES LEWIS	SEN	D	No Habitat	Open woodlands with ground cover and snags	Tobalske 1997
OREGON VESPER SPARROW	POOECETES GRAMINEUS AFFINIS	SEN, BCC	D	No Habitat	Grassland, farmland, sage. Dry, open habitat with moderate herb and shrub cover	Jones and Cornely 2002
STREAKED HORNED LARK	EREMOPHILA ALPESTRIS STRIGATA	SEN, BCC	S	No Habitat	Prairies, dunes, beaches, pastures; areas with low grassy vegetation.	Pearson and Altman 2005
WHITE-TAILED KITE	ELANUS LEUCURUS	SEN	D	No Habitat	Low-elevation grassland, farmland or savannah and nearby riparian areas	Dunk 1995
FISHER	MARTES PENNANTI	SEN	D	No Habitat	Large contiguous blocks of mature forest with structural complexity	Verts and Carraway 1998
MIGRATORY BIRDS						
BLACK SWIFT	CYPSELOIDES NIGER	BCC	S	Proposed activities unlikely to affect a local or regional population (see IM OR-2009-018)	Nest near waterfalls.	
OLIVE-SIDED FLYCATCHER	CONTOPUS COOPERI	BCC	D		Edge habitats, tall snags and trees important	
PURPLE FINCH	CARPODACUS PURPUREUS	BCC	D		Moist conifer forest, conifer woodlands	
RUFOUS HUMMINGBIRD	SELASPHORUS RUFUS	BCC	D		Shrubby, early-successional habitat. Nectar-producing plants important	
WILLOW FLYCATCHER	EMPIDONAX TRAILLI	BCC	D		Brushy or forested habitat in riparian areas	
BAND-TAILED PIGEON	COLUMBA FASCIATA	GBBDC	D		Nests in mature forest	
MOURNING DOVE	ZENAIDA MACROURA	GBBDC	D		Forest, woodland, shrub habitats.	
WOOD DUCK	AIX SPONSA	GBBDC	D			

1: FE = Federal Endangered, FT = Federal Threatened, SEN = BLM Sensitive Species, BCC = Bird of Conservation Concern, GBBDC = Game Bird Below Desired Condition
2: D = Detected on District, S = Suspected on District