USDA

United States Department of Agriculture

Aquatic Restoration

Environmental Assessment

Malheur National Forest
August 2014

for the greatest good

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Table of Contents

Introduction

We prepared this draft environmental assessment to determine whether effects of the proposed activities may be significant enough to prepare an environmental impact statement. By preparing this environmental assessment, we are fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. For more details of the proposed action, see Chapter 2 Proposed Action and Alternatives.

This Aquatic Restoration Environmental Assessment includes a number of individual actions that, when grouped together, represent an overall watershed and fish habitat restoration program that may occur at many individual sites across the Malheur National Forest. The specific restoration actions can occur on a routine basis or sporadically and over an extended period, starting in 2014. A general plan for implementation would tier to the national priority subwatersheds and regional focus watersheds that have been identified on the Malheur National Forest utilizing the Regional Aquatic Restoration Strategy (USDA 2007) and the Watershed Condition Framework (USDA 2011) as well as the schedule listed on the Malheur National Forest Accelerated Vegetation Restoration Priority Watershed Map (see Figure 10)

On January 28, 2013 the U.S. Forest Service, Pacific Northwest Region, Bureau of Land Management (Oregon State Office) and the Bureau of Indian Affairs, submitted the *Fish Habitat Restoration Activities Affecting ESA-Listed Animal and Plant Species and their Designated or Proposed Critical Habitat and Designated Essential Fish Habitat under MSA found in Oregon, Washington and parts of California, Idaho and Nevada* (ARBA II) to the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service on the effects of funding or carrying out restoration activities in Oregon and Washington.

The 2013 Aquatic Restoration Biological Assessment is based on the Aquatic Restoration Biological Assessment (USDA et al. 2006), and the Biological Opinions (NMFS 2007 and USFWS 2007). The 2007 Biological Opinions expired in 2012 and triggered re-initiation. Some examples of projects completed on the Forest under the former biological assessment and biological opinion include riparian planting, stream restoration augmenting with large wood, culvert replacement for fish passage, livestock exclosures, juniper removal, and installation of fish screens on diversion ditches.

National Marine Fisheries Service issued the *Endangered Species Act – Section 7 Programmatic Consultation Conference and Biological Opinion And Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Reinitiation of Aquatic Restoration Activities in States of Oregon and Washington (ARBO II)* on April 25, 2013 and the US Fish and Wildlife Service issued the *Endangered Species Act – Section 7 Consultation Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon, Washington and portions of California, Idaho and Nevada (ARBO II)* on July 1, 2013.

When projects are implemented on the Malheur National Forest within the categories of activities described in the Aquatic Restoration Biological Assessment II, and the standards of the biological assessment and the terms and conditions of these biological opinions are followed, further consultation for threatened endangered and sensitive species is not required.

The categories of activities and their site-specific project design criteria approach are the basis of this Environmental Assessment which provides each Malheur National Forest administrative unit with a consistent methodology to design, implement, monitor, and document watershed and aquatic restoration activities.

Location of the Proposed Action

This analysis covers aquatic restoration projects that would occur within the administrative boundaries of the Forest and adjacent lands where restoration activities would aid in the recovery of threatened and endangered species and impaired water bodies, and achieve Forest Service aquatic restoration goals. Contained within the geographic area, site-specific action areas are located in fish and non-fish bearing streams, riparian areas, and uplands that have a direct link to restoration of aquatic habitat and watershed function. The project area includes all areas to be affected directly or indirectly by the aquatic restoration activities and not merely the immediate project area.

The 1,459,422-acre Malheur National Forest (Forest or Malheur) and 240,000 acres of the Ochoco National Forest that are managed by the Malheur National Forest, Emigrant Creek Ranger District, for a total of nearly 1.7 million acres in eastern Oregon comprise the project area (see Figure **1**). These 1.7 million acres are the acreage considered as the Malheur National Forest for purposes of this Environmental Assessment.

Between the inception of the project and the release of the preliminary environmental assessment, approximately 13,080 acres of private lands were acquired by the Malheur National Forest in the headwaters of the John Day River. These acquired lands automatically become part of the management areas within which they are located (36 CFR 254.3 (f)) which includes portions of general forest (MA 1); rangeland (MA 2); riparian areas (MA 3); big game winter range (MA 4A); semi-primitive motorized recreation (MA 11); visual corridor (MA (14); and wildlife emphasis area (MA 15). At this time this area will be managed as the surrounding lands, with the exception of adjacent wilderness.

The

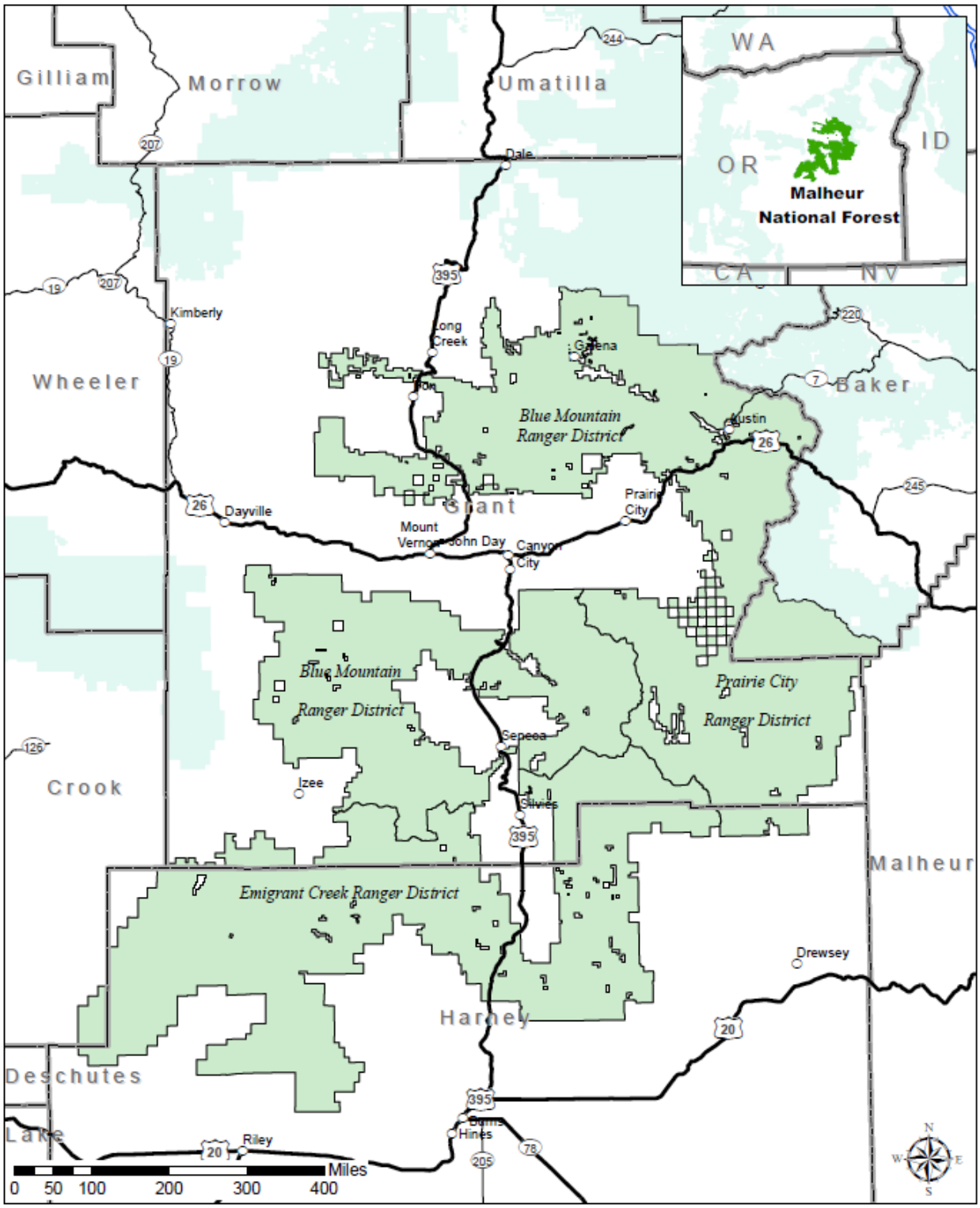


Figure 1 **Aquatic Restoration Project Area – Malheur National Forest**

Chapter 1 Purpose and Need for the Proposal

The purpose of this project is to maintain or enhance watershed health, species recovery and diversity as required by the Land and Resource Management Plans (Forest Plans) for the Malheur and Ochoco National Forests (1990 and 1989 respectively).

The proposed project categories and activities, with their specific project design criteria (appendix A), as defined in ARBA II and ARBO II, are predictable as to their effects to Endangered Species Act and Magnuson Stevens Act listed aquatic species. This incorporation by reference to ARBA II and ARBO II, includes program administration and general aquatic conservation measures, in addition to the project design criteria. Seventeen project categories are covered by this environmental assessment, with the omission of 'nutrient enhancement', 'invasive plant treatments', and 'sudden oak death treatments', which are not applicable to the Malheur National Forest. ARBA II and ARBO II provide the basis for consistent implementation and effects analysis for the project categories and activities at the forest and site specific scale, and the agreement between the Forest Service and the US Fish and Wildlife Service and National Marine Fisheries Service on their effects provides an efficient approach to environmental analysis and future implementation for those projects that meet the design criteria on the Malheur National Forest and on adjacent private lands with willing partners that benefit public lands. The need of this forest wide project is based on providing a more efficient process to increase implementation of projects that would aid in the recovery of threatened and sensitive fish species located on the forest, their associated habitats, watershed health, and water quality.

- The Watershed Condition Framework (USDA Forest Service 2011) identified 63 percent of the subwatersheds across the Forest as impaired or functioning at risk. Impaired or functioning at risk subwatersheds receive ratings based on reduced conditions for water quality, aquatic habitat, riparian vegetation, and roads and trails indicators.
- The Environmental Baseline for Matrix of Pathways and Indicators (National Marine Fisheries Service Environmental and Technical Services Division Habitat Conservation Branch August 1996) further reinforced these condition assessments showing diminished fish habitat conditions for steelhead, bull trout, and redband trout – the majority of fish habitat indicators evaluated were found to be functioning at risk or functioning at unacceptable risk for aquatic habitats and water quality (see Figure 18).
- The State of Oregon, National Marine Fisheries Service, and Northwest Power and Conservation Council developed large-scale recovery plans that include areas of the Forest. These plans identified elements that are impeding the recovery of watershed function, water quality, species and or their designated critical habitats to help guide restoration actions in identified watersheds. (See Table 3)
    - The Middle Columbia River Steelhead Recovery Plan (Carmichael 2007) identified limiting factors for steelhead in the John Day Subbasin. Examples included altered hydrology and sediment routing, along with degraded floodplains, riparian communities, stream channel structure, and water quality (temperature).
    - The Columbia River Bull Trout Recovery Plan (U.S. Fish and Wildlife Service. 2002), identified limiting factors for bull trout in both the John Day and Malheur Subbasins. Examples include altered hydrology and sediment routing, aquatic passage, degraded floodplains, riparian communities, stream channel structure, water quality (temperature), and introduction of non-native species.
- The Malheur River Subbasin Assessment and Management Plan for Fish and Wildlife Mitigation (Malheur Watershed Council and Burns Paiute Tribe 2004) identified aquatic focal species (Chinook salmon, redband trout, and bull trout). The Malheur Subbasin Coalition selected these species based on their cultural, biological, and esthetic value. The primary

limiting habitat attributes are channel conditions, riparian conditions, flow conditions (emphasis on low flows), and obstructions (habitat connectivity, aquatic passage).

- The John Day Subbasin Plan (Columbia-Blue Mountain Resource Conservation and Development Area and Northwest Power and Conservation Council 2005) identified aquatic focal species (summer steelhead, Chinook salmon, bull trout, westslope cutthroat trout and redband trout) and identified limiting factors that were having effects to those species. Those limiting factors include habitat diversity, sediment load, aquatic passage, stream temperatures, and key habitat quality and quantity. Flow was an additional limiting factor specifically identified for spring Chinook salmon, primarily in the mainstem Middle Fork John Day River.

The previous plans listed aid in directing the need for action and help prioritize restoration projects on the Forest and on adjacent lands that benefit public values.

Proposed aquatic restoration activities would be consistent with the Forest Plans. Restoration actions would be implemented through the use of project specific design criteria using a consistent methodology to design, implement, monitor, and provide documentation as outlined in the Aquatic Restoration Biological Opinion (ARBO II 2013).

Public Involvement

The proposal was listed in the Malheur National Forest Schedule of Proposed Actions (SOPA) in January, 2014. On January 17, 2014, a summary of the project proposal was mailed to 131 individuals and groups. This included Federal, State and local agencies, Grant County Court, Tribes, nearby property owners, advocacy groups and the general public. Considerations of comments brought up during public involvement are included in the project record.

The proposed action and summary of environmental consequences was mailed to 127 individuals and groups for review during the 30-day comment period. The information was also posted on the forest web site. A legal notice for this comment period was published in Grant County, Oregon's Blue Mountain Eagle on June 25, 2014.

The Forest received 4 comment letters during the 30 day comment period. During the 30 day comment period the Forest staff met with various individuals and groups to discuss the project and answer questions. All comments received related to this project were reviewed, discussed by the interdisciplinary team and the line officer, and responses to each of these comments were recorded. The response to these comments is available upon request and will remain in the project record.

This analysis and a draft decision notice are now made available for review, objection, resolution meetings, and pre-decisional administrative review pursuant to 36 CFR 218 subparts A and B.

Issues

Issues for the Aquatic Restoration Project were identified through public scoping and internal input from project resource specialists. Similar items were combined into one statement where appropriate.

Key issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects cannot be reduced by normal best management practices or project design criteria. Usually an alternative is developed to address key issues.

Analysis issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects could be reduced with the design of the proposed action. These analysis issues will be tracked in the relevant resource area effects analysis in chapter 3.

Issues Eliminated from Detailed Study are identified as those:

- Outside the scope of the proposed action;
- Already decided by law, regulation, Forest Plans, or other higher level decision;
- Irrelevant to the decision to be made; or
- Conjectural and not supported by scientific or factual evidence.

Potential issues were identified by the interdisciplinary team (IDT) and approved by the Responsible Official. These issues were addressed by either modifying the proposed action, or by incorporating design criteria as integral components of the project design. A summary of public comments can be found in the project record.

Key Issues

After reviewing the public and resource specialists comments received during scoping, no key issues were identified by the Responsible Official.

Analysis Issues

Other issues that did not result in alternative development were considered during the analysis process and are discussed in chapter 3. These issues are generally less focused on the elements of the purpose and need than are the key issues and reflect the discussions of the effects of the proposed action. These issues are important for providing the Responsible Official with complete information about the effects of the project, lists the analysis issues considered for this analysis generated from public comments and/or the project interdisciplinary team.

Table 1 Analysis Issues

Issue Topic	Analysis Issues
Recreational Opportunities and Experience	Potential periods of increase or loss of recreational opportunities
Wildlife	Projects and activities may alter habitat or disturb various wildlife species
Effects to water quality	Activities may impact water quality during or after implementation
Fisheries	Potential of the proposed activities to impact fisheries and fish habitat
Soils Quality	Equipment used to implement projects may impact soil
Botany	Proposed activities would be assessed for potential effects to Threatened, Endangered and Sensitive plant species.
Invasive Plants	Proposed activities would be assessed for the potential to introduce or spread existing populations of invasive plants
Fuels	Potential effects of the proposed activities on fuel loading and air quality
Cultural Resources	Proposed activities would be assessed for potential effects to cultural resources
Range Resources	Proposed activities would be assessed for potential effects to range resources and grazing activities

Issues Eliminated from Detailed Study

After reviewing the public comments received during scoping and the 30 day comment period, two issues were received but were eliminated from detailed study by the Responsible Official.

Table 2 Issues eliminated from further analysis.

Issue Topic	Issue Statement and Issue Indicator(s)
Eliminating the use of heavy equipment in Inventoried Roadless Areas and within riparian areas	The use of heavy equipment is addressed in the project design criteria, the Inventoried Roadless Rule, and Land and Resource Management Plans. Compliance with the LRMPs and the Inventoried Roadless rule are addressed in the analysis of effects and compliance verification of the environmental assessment. Effects of the project to riparian areas is addressed in the analysis issues under Fish and Aquatic Habitat.
Smoke from prescribed fire and the impacts to bicyclists using the Oregon Scenic Bikeway route and the Trans America Trail route.	The majority of bicycle use on these two routes occurs between May 1 and September 30 (2014 Waldner) with the heaviest use on the Oregon Scenic Bikeway route occurring in June and September when the weather is cooler (2014 Jacobs). In order to inform the public of prescribed burn areas and activity, the Forest posts information on the public web page as well as provide a news release to the local papers and radio stations. All prescribed burns are coordinated with the State of Oregon to comply with the Clean Air Act (see analysis page 173).

Applicable Laws

Shown below is a partial list of federal laws pertaining to project-specific planning and environmental analysis on federal lands. Disclosures and findings required by these laws and orders are contained in chapter 3 for this environmental assessment.

- National Environmental Policy Act (NEPA) of 1969 (as amended)
- Clean Air Act of 1977 (as amended)
- Magnuson-Stevens, Fishery Conservation and Management Act, Public Law 94-265 (as amended through October 11, 1966)
- American Indian Religious Freedom Act of 1978
- National Historic Preservation Act of 1966 (as amended)
- Archeological Resource Protection Act of 1980

Project Record Availability

This environmental assessment hereby incorporates by reference the Project Record. The Project Record contains Specialist Reports, Biological Evaluations and other technical documentation used to support the analysis and conclusions in this environmental assessment. These are for the Wildlife, Soils, Hydrology/Fisheries, Range, Botany, Recreation, and Heritage resource areas. Relying on specialist reports and the Project Record help implement the Council on Environmental Quality (CEQ) Regulations' provision that agencies should reduce NEPA paperwork (40 CFR 1500.4). The objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the Proposed Action and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere.

The Project Record is available for review at the Malheur National Forest Supervisors Office, John Day, Oregon.

This document is posted on the Malheur National Forest webpage at the following location: http://www.fs.usda.gov/detail/malheur/landmanagement/?cid=fsbdev3_033818

Malheur/Ochoco Forest Plan Consistency

Management direction is found within the resource prescriptions of the Land and Resource Management Plans for the Malheur and Ochoco National Forests (USDA 1990, 1989). Chapter 4

in both the Malheur and Ochoco Forest Plans each contains a detailed description of each management area. This analysis was developed in consideration of the best available science and is consistent with both the Forest Plans, as amended.

The Land and Resource Management Plans can be viewed on the web at the following locations:

Malheur National Forest: http://www.fs.usda.gov/main/malheur/landmanagement/planning

Ochoco National Forest:
http://www.fs.usda.gov/detail/centraloregon/landmanagement/planning/?cid=fsbdev3_035906

Figures 2 and 3 are color-coded maps which display the various Forest Plan Management Areas for the Malheur National Forest and Ochoco National Forest.

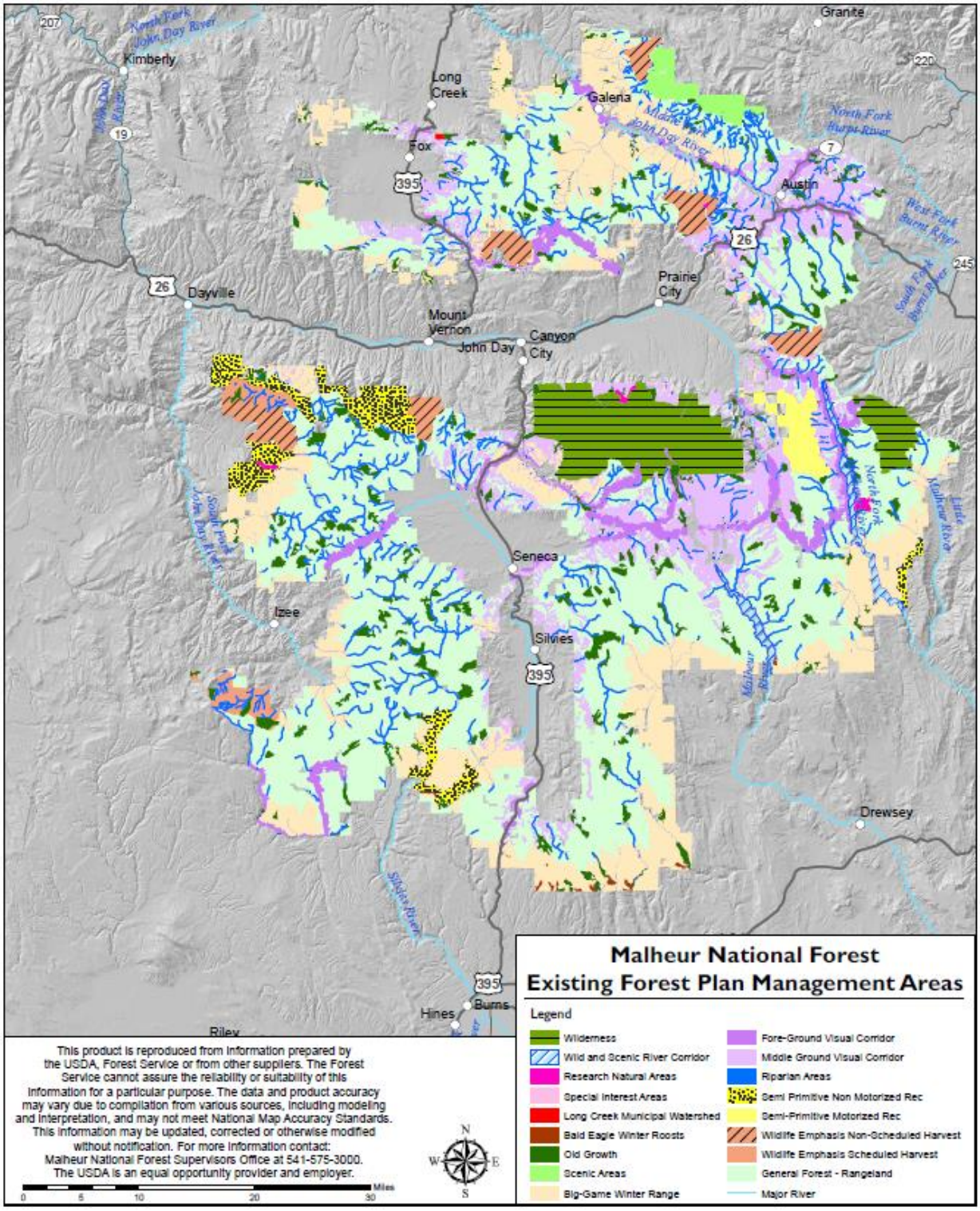


Figure 2 Existing Forest Plan Management Areas for the Malheur National Forest.

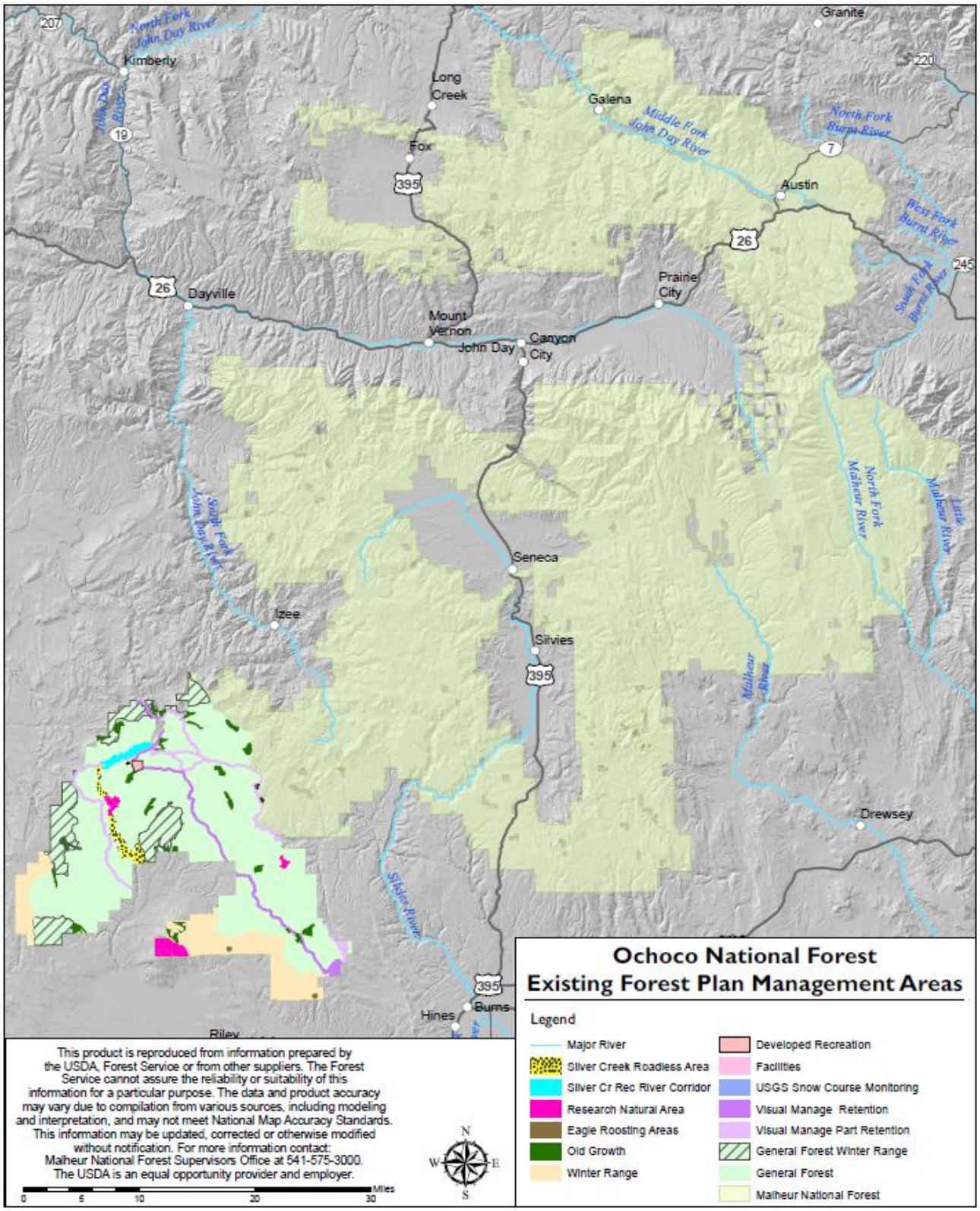


Figure 3 Existing Forest Plan Management Areas for the Ochoco National Forest.

Chapter 2 Proposed Action and Alternatives

Alternative 1 – No Action

The Forest would likely continue to plan and implement aquatic restoration projects at the current rate of three per year. Districts would independently identify projects and complete analysis on an individual basis, reproducing multiple biological evaluations/assessments, design criteria, and NEPA documents for actions in previously identified locations. The Forest would not be prepared to take advantage of the funding opportunities currently available to implement essential projects that would aid in the recovery of threatened and sensitive fish species located on the forest, their associated habitats, and overall water quality.

Alternative 2 – Proposed Action

The Malheur National Forest proposes aquatic restoration on those private and public lands within the boundary of the Malheur National Forest and/or adjacent lands where restoration activities would aid in the recovery of aquatic species and impaired water bodies. Aquatic restoration activities would be accomplished through the use of project specific design criteria using a consistent methodology to design, implement, monitor, and document watershed and aquatic restoration activities. Regional aquatic restoration goals and objectives (USDA Forest Service, Pacific Northwest Region, 2007) would be achieved when administered by following guidelines within the following aquatic restoration categories:

1. Fish Passage Restoration (Stream Simulation Culvert and Bridge Projects; Headcut and Grade Stabilization; Fish Ladders; Irrigation Diversion Replacement/Relocation and Screen Installation/Replacement)
2. Large Wood, Boulder, and Gravel Placement (Large Wood and Boulder Projects; Engineered Logjams; Porous Boulder Weirs and Vanes, Gravel Augmentation; Tree Removal for Large Wood Projects)
3. Dam, Tide gate, and Legacy Structure Removal
4. Channel Reconstruction/Relocation
5. Off- and Side-Channel Habitat Restoration
6. Streambank Restoration
7. Set-back or Removal of Existing Berms, Dikes, and Levees
8. Reduction/Relocation of Recreation Impacts
9. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering
10. Piling and other Structure Removal
11. Road and Trail Erosion Control
12. Juniper Removal
13. Riparian Vegetation Treatment (controlled burning)
14. Riparian Vegetative Planting
15. Bull Trout Protection
16. Beaver Habitat Restoration
17. Fisheries, Hydrology, Geomorphology, Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration

Table 3 Limiting factors linked with proposed restoration actions.

Limiting Factor	Restoration Activities
Fish Passage Barriers	Remove or replace priority barriers; provide screens on diversions, etc.
Altered Hydrology and Sediment Routing	Road and trail erosion control – improve road drainage, decommission roads, disconnect road drainage from streams; streambank restoration; juniper removal
Degraded Floodplains, Riparian Communities, and/or Stream Channels (habitat diversity/quantity)	Riparian vegetation protection (livestock fencing); riparian vegetation planting; channel reconstruction/relocation; remove legacy log-weir structures; remove existing berms/railroad grade; large wood, boulder and gravel placement; riparian vegetation treatments; Reduction/relocation of recreation impacts; streambank restoration; off-and-side channel habitat restoration; beaver habitat restoration
Water Quality (summertime cold-water refugia)	Riparian vegetation protection and planting, channel reconstruction/relocation, large wood placement, beaver habitat restoration, etc.
Flow	Protect instream flow
Non-native aquatic species	Bull trout protection

Implementation Locations

On the following pages, Figures 4 through 8 display where actions would occur by project category. Some categories are grouped as the actions would occur in the same locations.

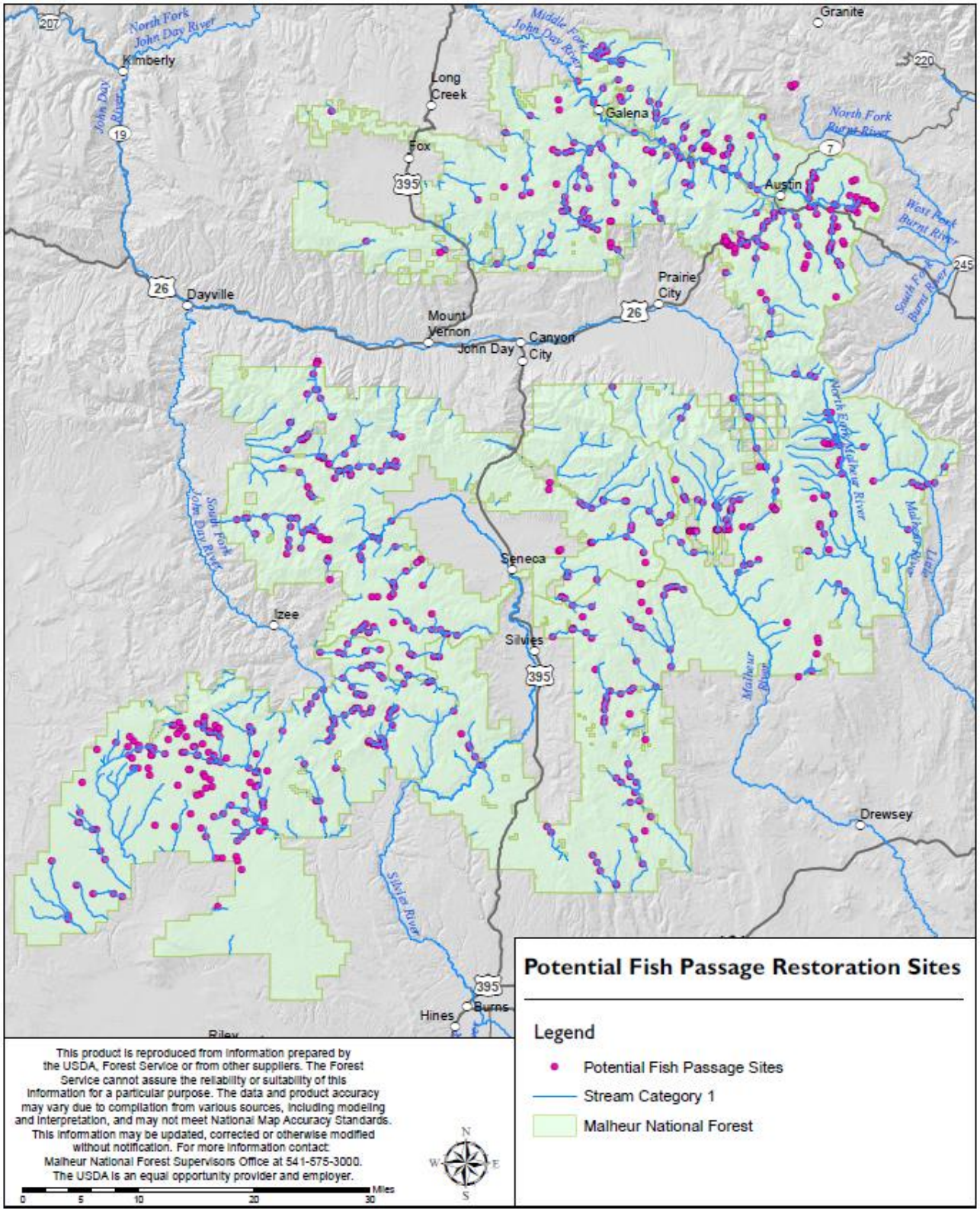


Figure 4 Existing Culverts in the project area that provide potential Fish Passage Restoration Projects.

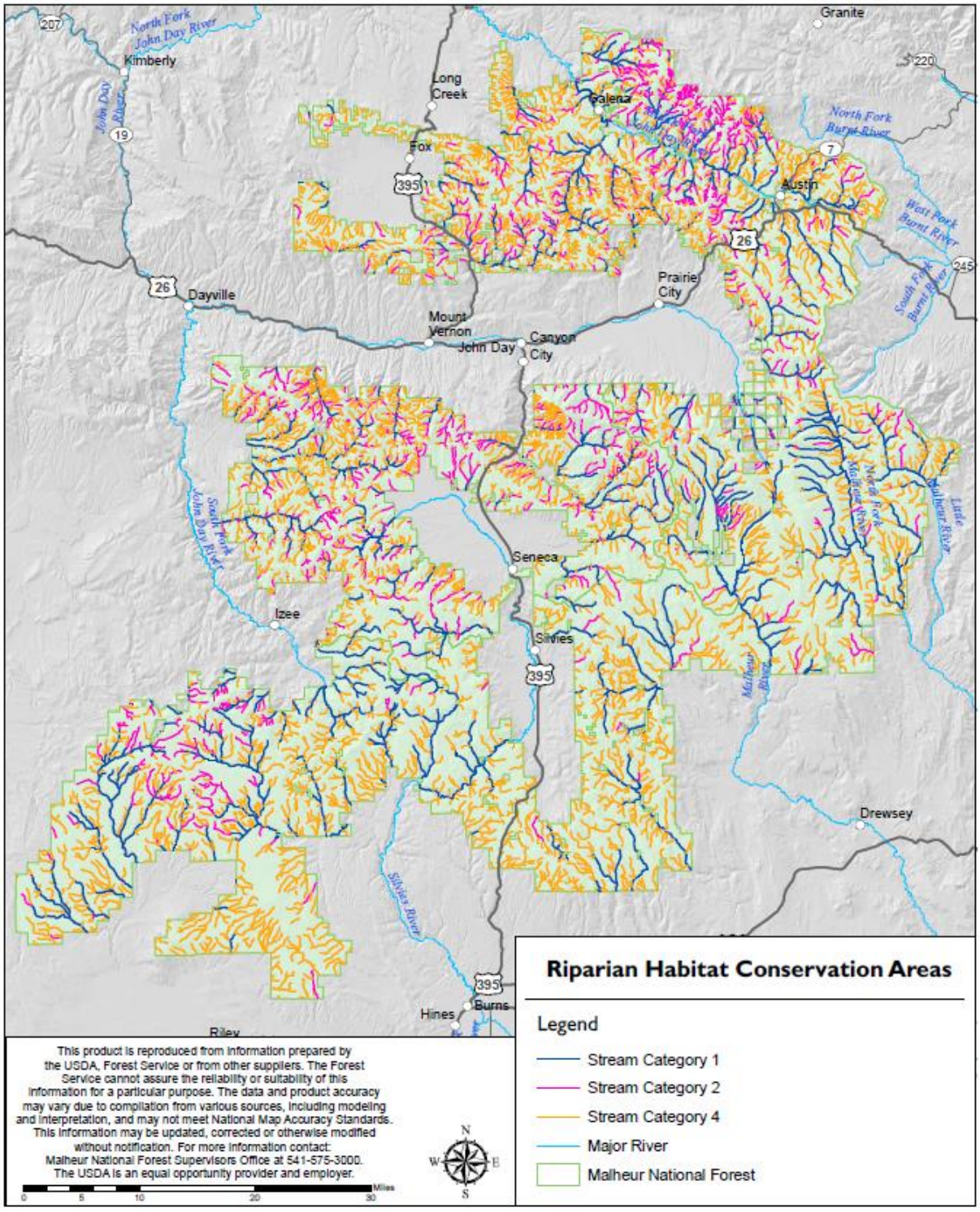


Figure 5 Riparian Habitat Conservation Areas where various aquatic restoration activities and improvements would occur for large wood, boulder and gravel replacement; legacy structure removal; channel reconstruction/relocation; off- and side- channel habitat restoration; streambank restoration; set-back or removal of existing berms, dikes and levees; reduction/relocation of recreation impacts; livestock fencing, stream crossings and off-channel livestock watering; piling and other structure removal; riparian vegetation treatment (controlled burning); riparian vegetative planting; beaver habitat restoration.

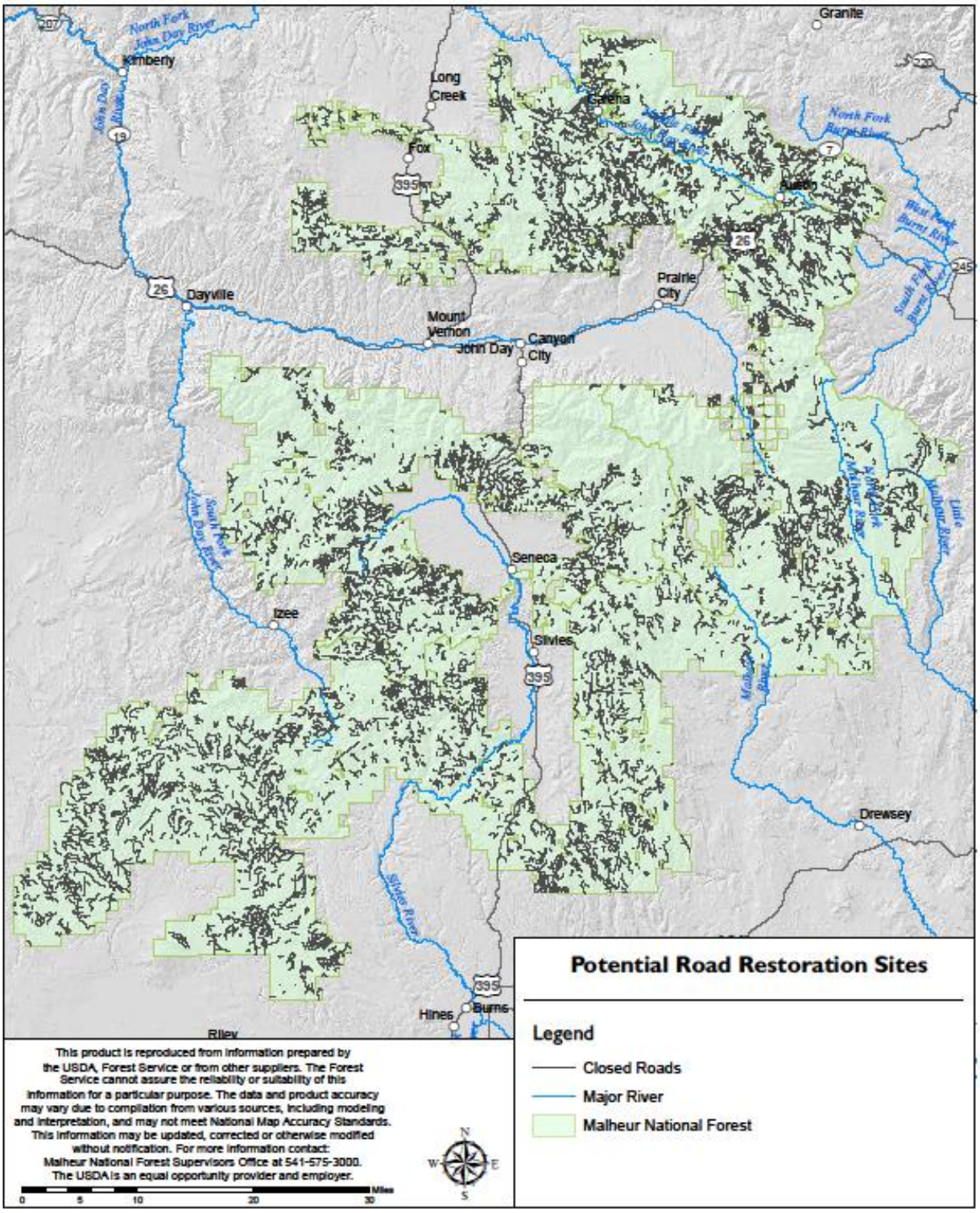


Figure 6. Potential Road Restoration Sites

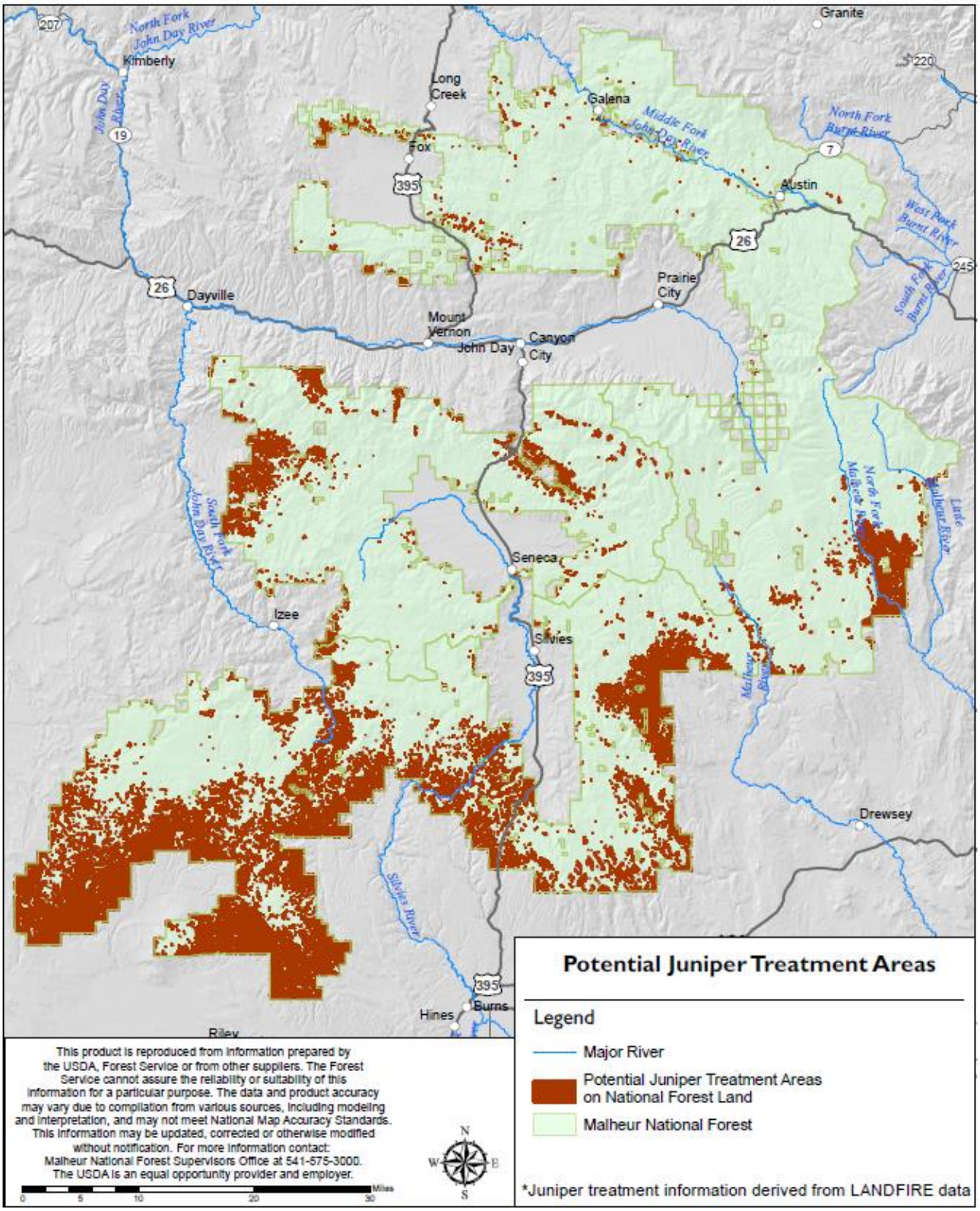


Figure 7 Potential Juniper Removal Treatments

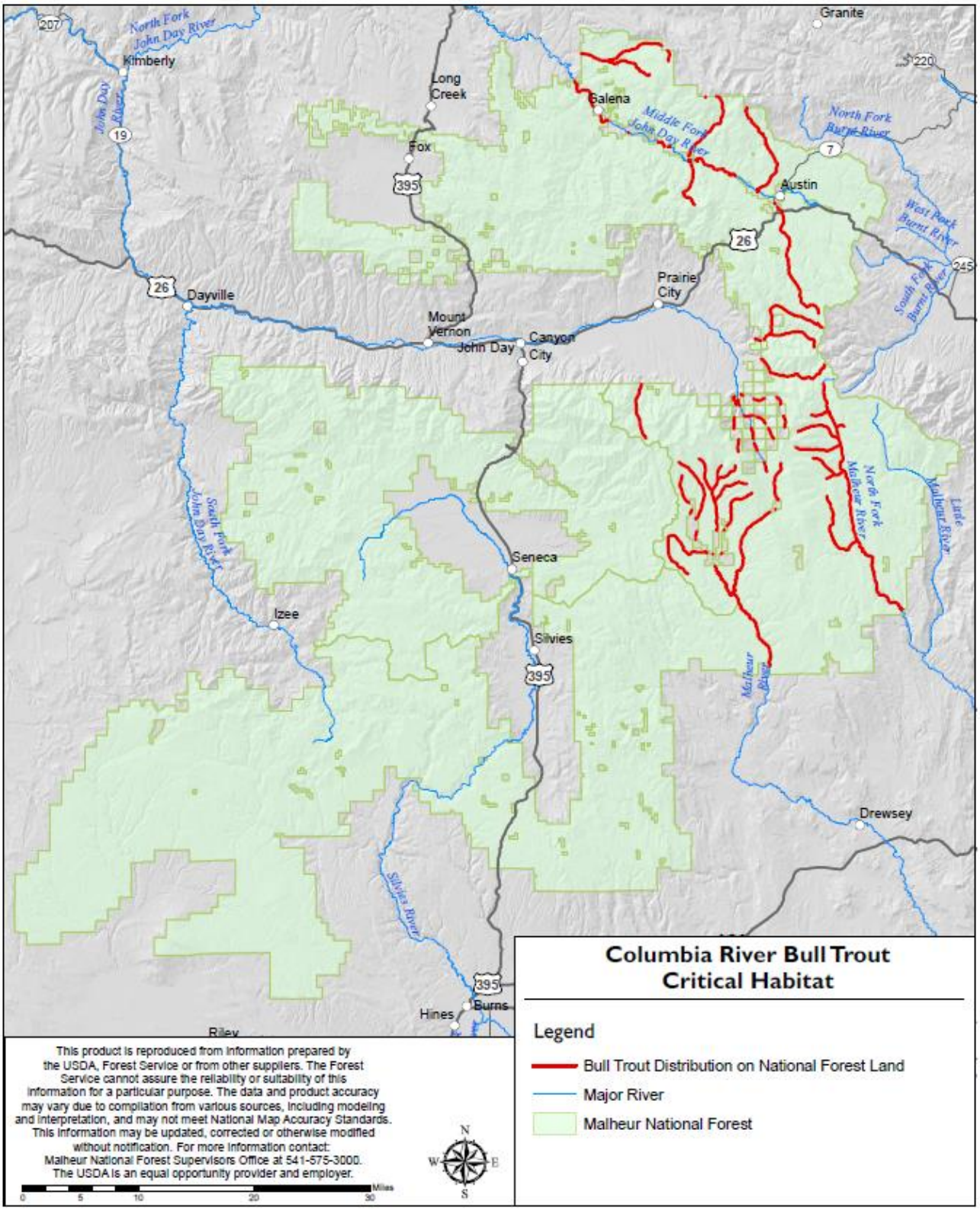


Figure 8 Bull Trout Protection Areas

Design:

- Activities will be developed and prioritized at the District level.
- Activities will include written specific action descriptions and design criteria as identified in appendix A of the EA.
- Activities would be finalized and approved on an annual basis.

Collaboration and Validation Period:

- The Project Implementation Checklist (appendix B) will be used to ensure each activity is consistent with the analysis and within the criteria of the decision.
- Pre-project notification will be posted on the Forest's web site and reported to all required regulatory agencies at least 60 days prior to implementation of any activity.
- Activities may be discussed with collaborative groups, working groups, local and state governments, and private stake holders based on potential interest as determined by District Rangers or Forest Supervisor.

Consultation and Implementation:

- Pre-implementation surveys will be conducted for Endangered Species Act and sensitive species, invasive species, and cultural resources. If threatened or sensitive species or cultural sites are found during pre-implementation surveys or during activity implementation the appropriate mitigation will be incorporated into the activity design. Any cultural resource findings will be coordinated with the State Historical Preservation Office. Each activity will have an invasive species plan.

Four strategies will be used to prioritize locations and timing of implementation: watershed condition, corresponding accelerated vegetation restoration projects, Collaborative Forest Landscape Restoration projects, and an opportunistic approach as needed (EA – page18-22).

1) Watershed Condition - The 2011 Watershed Condition Framework is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands. The Watershed Condition Framework was implemented across all National Forests to improve the Forest Service approach to watershed restoration by establishing a consistent methodology for condition assessment, and targeting the implementation of integrated collections of enhancement activities on those watersheds identified as priorities for restoration (USDA 2011).

Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect soil and hydrologic functions supporting aquatic ecosystems. The national priority subwatersheds and regional focus watersheds have been identified on the Forest utilizing the Regional Aquatic Restoration Strategy (2007) and the national Watershed Condition Framework (USDA FS-977 2011). (http://www.fs.fed.us/publications/watershed/Watershed_Condition_Framework.pdf). The 10-digit watershed scale is considered a strategic scale for analysis and long term restoration planning, whereas the 12-digit subwatershed scale is considered an operational scale for near term (3-5 year) investment in completion of essential projects. The National Forests reviewed existing priorities and selected subwatersheds for near-term (3-5 year) focused investment, and identified 'essential projects' to maintain or improve watershed conditions detailed in 'Watershed Restoration Action Plans' (see Table 4). Essential projects are defined as actions and treatments that are implemented as an integrated suite of on-the-ground management activities focused primarily on restoring watershed function and thereby improving watershed condition class.

Table 4 Watershed Restoration Action Plans for Priority Subwatersheds on the Malheur National Forest

Priority Subwatershed (6th field HUC)	12-digit Hydrologic Unit Code	Watershed Restoration Action Plan Developed
Lick Creek	170702030206	2012
Lower Camp Creek	170702030207	2012
Upper Camp Creek	170702030205	2012

Implementation of essential projects would occur within these three sixth field watersheds over the next 10+ years. These identified essential projects would be considered the highest priority for aquatic restoration actions. The Malheur is currently in the process of developing additional Watershed Action Plans within the Upper Middle Fork John Day and Upper Mainstem John Day watersheds.

Figure 9 below displays restoration priority areas identified by the US Forest Service, Pacific Northwest Region, in the State of Oregon showing high, moderate and low priority river basins, focus watersheds, and priority sub-watersheds. It also identifies the high priority river basin within the project area, and its focal watersheds.

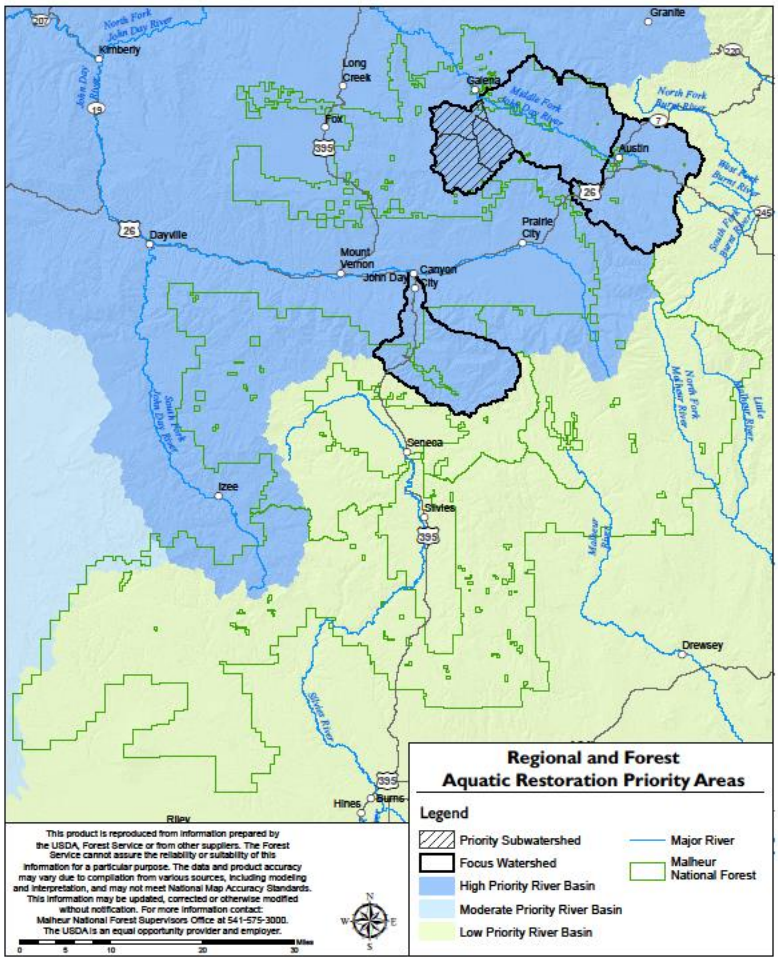


Figure 9 Forest Aquatic Restoration Priority Areas based on National, Regional, and local analysis.

2) **Accelerated Vegetative Restoration -** The vision of this approach is that, as data is being collected to support the Malheur National Forest Accelerated Vegetation Program, specialists would be identifying aquatic restoration essential projects. The implementation of essential projects identified within this approach would generally follow the implementation schedule as outlined in Figure 10.

3) **Priority Watersheds Associated with Collaborative Forest Landscape Restoration Program -** In addition to terrestrial restoration projects, the Forest, in concert with, the Blue Mountain Forest Partners and Harney County Restoration Collaborative, proposed a long term (10 year) invasive aquatic control project to eliminate common carp on the upper part of the Silvies River, located in the middle of the southern Blues, as well as brook trout control on the east side of the southern Blues landscape. Other aquatic restoration treatments on the Forest may include, but would not be limited to, riparian fencing, native species replanting, road removal and decommissioning, and juniper control. The implementation of essential projects identified within this approach would generally follow the implementation schedule as outlined in Figure 10 and within the collaborative forest restoration program area.

Figure 10 is a color coded map which displays the watersheds prioritized for vegetative restoration, which would include aquatic restoration activities. Different colors designate which year restoration activities are expected to occur. The timeframe spans from 2014 to 2023 and beyond.

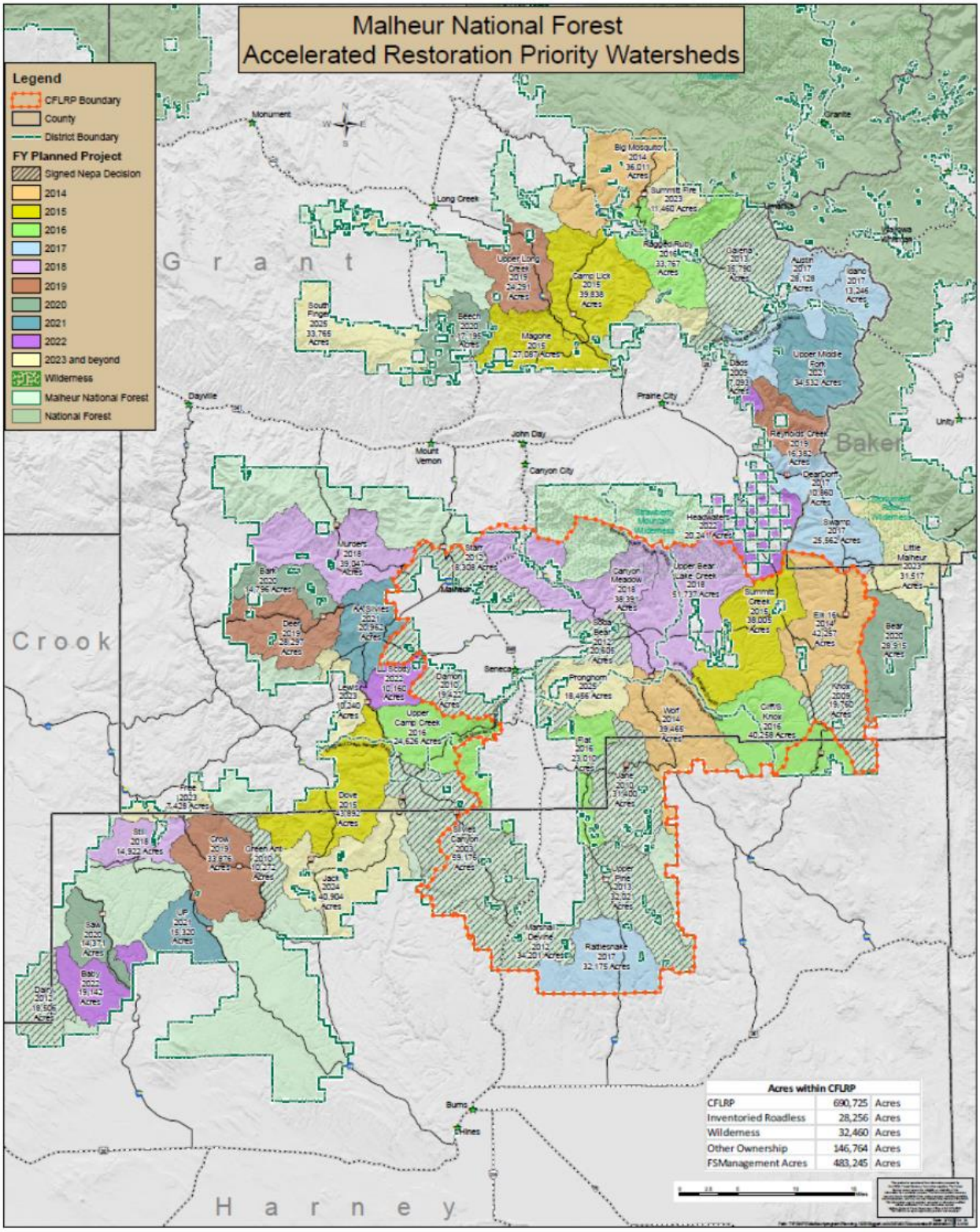


Figure 10 The Malheur National Forest Accelerated Vegetation Restoration Schedule and Collaborative Forest Landscape Restoration Project Area

4) **Opportunistic Approach:** This approach is designed to account for projects associated with natural events such as fire or flood where resource damage is occurring or has the potential to occur. Timing of implementation would occur based on need. Currently there no projects identified utilizing this approach.

Monitoring

Monitoring would be conducted as appropriate for a specific action, both during and after a project, to track effects and compliance with this analysis.

During Project Implementation:

- Visually monitor to ensure effects are not greater (amount, extent) than anticipated and to contact Level 1 representatives1 if problems arise.
- Fix any problems that arise during project implementation.
- Coordinate as needed to ensure a biologist or hydrologist is always present on site during activities to ensure a contractor is following all stipulations of a contract.
- Coordinate as needed to ensure a biologist or hydrologist is present or informed during activities performed by Forest Service personnel under the scope of this analysis.
- To minimize short-term degradation to water quality during project implementation, follow current 401 Certification provisions of the Federal Clean Water Act for maintenance or water quality standards as described by the Oregon Department of Environmental Quality.

After Project Implementation:

- A post-project review shall be conducted after winter and spring high flows.
- For each project, conduct a walk through/visual observation to determine if there are post-project affects that were not considered during consultation.
- For fish passage and re-vegetation projects, monitor in the following manner:
  - Fish Passage Projects – Note any problems with channel scour or bedload deposition, substrate, discontinuous flow, vegetation establishment, or invasive plant infestation.
  - Revegetation – For all plant treatment projects, including site restoration, monitor for and remove invasive plants until native plants become established.

In cases where remedial action is required, such actions are permitted without additional consultation if they use relevant project design criteria and aquatic conservation measures and the effects of the action categories are not exceeded.

Documentation

Post-project notification would be posted on the Forest's web site and reported to all required regulatory agencies.

Alternatives Considered but Eliminated From Detailed Study

An alternative to the proposed action included the removal of forest products for commercial or industrial use that resulted as a by-product of the restoration treatments.

This alternative was not further developed or analyzed because all activities within this analysis are falling within the scope of the Aquatic Restoration Biological Opinion, 2013. The

1 Level 1 Representative: A member of a multi-agency team of highly experienced field staff involved with threatened and endangered species consultation. The members meet as needed, and the purpose of their role is to both streamline the consultation process and improve efficiency.

Responsible Official prioritized the completion of this NEPA process as designed in order to allow for project implemention. Additional NEPA could be completed under a categorical exclusion process if commercial removal of a by-product is desired.

Another alternative to the proposed action included altering range management practices.

This alternative was not further developed under this project description because it would be analyzed under a separate project. Range management NEPA documentation for allotments across the forest is currently in various stages including three separate current range analysis projects. The stakeholders have the opportunity to be involved in these projects during scoping, notice and comment periods, and objection periods as well as various other times throughout the NEPA process.

A diameter limit for thinning projects was also requested as an alternative.

This alternative was not further developed because setting a diameter limit would create unnecessary sideboards to completing the projects to reach the desired condition. In general it is expected that most trees thinned would be less than 10 inches diameter but it is expected under certain situations a stand or area may benefit from removal of a specific tree species that would be over 14 inches diameter: riparian areas, juniper stands, and aspen stands. In all cases, trees cut would not be sold under this decision.

Table 5 USDA Forest Service minimum diameter limits for wood classification in streams (USDA FS 2013).

Eastside Forests (east of the High Cascades)	
Large Wood - Small	Minimum Diameter > 6 in, at a length of 20 ft. from the large end (Forest option)
Large Wood - Medium	Minimum Diameter > 12 in, at a length of 35 ft. from the large end (Mandatory)
Large Wood - Large	Minimum Diameter > 20 in, at a length of 35 ft. from the large end (Mandatory)

Table 6 Oregon Department of Fish and Wildlife minimum diameter limits for instream projects based on stream width (ODFS 1995/2010).

Bankfull Width (feet)	Minimum Diameter (inches)
0 to 10	10
10 to 20	16
20 to 30	18
Over 30	22

Old juniper would be protected from thinning based on physical age characteristics as described in the design criteria (appendix A), not based on diameter limits alone. Data derived from Forest Inventory and Analysis on both forest land and timber land juniper trees in Oregon are dominated by the smaller diameter classes. Of the 242.1 million juniper trees on forest land 10.5 million are over 17 inches, but when timberland is considered, the majority of the riparian area where restoration treatment would occur, the total number of juniper trees is 61.3 million and the number of juniper over 17 inches is 1.67 million (2014 USDA FACTS). Three to four percent of the juniper are within the larger diameter class of 17 inches and greater.

Chapter 3 Affected Environment and Environmental Consequences

Fisheries and Hydrology

Fish species of special conservation concern (e.g., federally listed, Forest Service sensitive, Forest Service management indicator species) within the aquatic environment analyzed in this report include Columbia River bull trout, Middle Columbia River steelhead, Middle Columbia River Chinook salmon (including essential fish habitat), redband (rainbow) trout, and westslope cutthroat trout (see Table 7 below). In addition, Forest Service sensitive aquatic macroinvertebrates and one amphibian species are addressed.

Note: Detailed analyses of federally listed fish species are provided in the Aquatic Restoration Biological Assessment II (ARBA II).

Table 7 Aquatic species of special conservation concern for the Malheur National Forest

Species	Status	Occurrence	Note
Middle Columbia River steelhead* *Oncorhynchus mykiss*	Federally threatened, designated critical habitat	Documented occurrence	Middle Columbia River distinct population segment
Bull trout* *Salvelinus confluentus*	Federally threatened, designated critical habitat	Documented occurrence	John Day and Malheur species management units
Redband trout* *Oncorhynchus mykiss gairdneri*	Forest Service sensitive**	Documented occurrence	Forest Wide Distribution
Westslope cutthroat trout* *Oncorhynchus clarkia lewisi*	Forest Service sensitive**	Documented occurrence	Present in John Day River and tributaries
Middle Columbia River Chinook salmon *Oncorhynchus tshawytscha*	Designated Essential Fish Habitat	Documented occurrence	Essential Fish Habitat
Columbia spotted frog *Rana luteiventris*	Forest Service sensitive**	Documented occurrence	Known to occur on Emigrant Creek Ranger District
Shortface lanx *Fisherola nuttalli*	Forest Service sensitive**	Suspected occurrence	Very little available species information
Harney Basin duskysnail *Colligyrus depressus*	Forest Service sensitive**	Suspected to occur	Endemic to Harney Basin area only
Columbia clubtail *Gomphus lynnae*	Forest Service sensitive**	Suspected occurrence	Very little available species information
Western ridged mussel *Gonidea angulata*	Forest Service sensitive**	Documented occurrence	Only known in Middle Fork John Day River

* Species: Malheur National Forest Management Indicator Species

** Status: From 2011 Region 6 Sensitive Species list

Table 8 Aquatic species of special conservation concern for the Ochoco National Forest on lands managed by the Malheur National Forest.

Species	Status	Occurrence	Note
Middle Columbia River steelhead* *Oncorhynchus mykiss*	Federally threatened, designated critical habitat	Documented occurrence	Does not occur on the portion of the Ochoco managed by the Malheur National Forest
Bull trout *Salvelinus confluentus*	Federally threatened, designated critical habitat	Documented occurrence	Does not occur on the portion of the Ochoco managed by the Malheur National Forest
Redband trout* *Oncorhynchus mykiss gairdneri*	Forest Service sensitive**	Documented occurrence	Forest Wide Distribution
Brook Trout*	MIS	Documented occurrence	Known to occur on Emigrant Creek Ranger District
Westslope cutthroat trout *Oncorhynchus clarkia lewisi*	Forest Service sensitive**	Documented occurrence	Does not occur on the portion of the Ochoco managed by the Malheur National Forest
Shortface lanx *Fisherola nuttalli*	Forest Service sensitive**	Suspected occurrence	Very little available species information
Western ridged mussel *Gonidea angulata*	Forest Service sensitive**	Suspected occurrence	Does not occur on the portion of the Ochoco managed by the Malheur National Forest
Harney Basin duskysnail *Colligyrus depressus*	Forest Service sensitive**	Suspected occurrence	Endemic to Harney Basin area only
Columbia clubtail *Gomphus lynnae*	Forest Service sensitive**	Suspected occurrence	Very little available species information
Columbia spotted frog *Rana luteiventris*	Forest Service sensitive**	Documented occurrence	Known to occur on Emigrant Creek Ranger District

* Species: Ochoco National Forest Management Indicator Species
** Status: From 2011 Region 6 Sensitive Species list

Methodologies and Assumptions

Analysis Method

- Determine distribution of Threatened and Endangered and Sensitive, Region 6 sensitive, and Management Indicator aquatic species within the analysis area.
- Determine potential effects to aquatic species by implementation category and associated project design criteria.
- Determine potential effects to impaired water bodies as defined by the 2012 Oregon Department of Environmental Quality 303(d) list, by implementation category and associated project design criteria.

The basis of these effects analyses are the observations and professional judgment of the project fisheries biologist and hydrologist and the best available science.

Information Sources

Information used for this analysis comes from:

- State Of Oregon, Department of Environmental Quality , Oregon Department of Fish and Wildlife
- Internal information (geographical information systems, surveys, professional judgment)
- National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS)

Resource Indicators

Table 9 Resource Indicators and Measure for Assessing Effects on Aquatic Species

Resource Element	Resource Indicator	Used to address: P/N, or key issue?	Source
Water quality	Turbidity Temperature Chemical Contaminates	yes	Matrix of Pathways and Indicators (USFWS and NMFS 1999)
Habitat Access	Physical Barriers	yes	Matrix of Pathways and Indicators (USFWS and NMFS 1999)
Habitat Elements	Substrate/Sediment Large Wood Pool Frequency Poll Quality Off-Channel Habitat Refugia	yes	Matrix of Pathways and Indicators (USFWS and NMFS 1999)
Channel Condition and Dynamics	Width/Depth Ratio Streambank Condition Floodplain Connectivity	yes	Matrix of Pathways and Indicators (USFWS and NMFS 1999)
Flow/Hydrology	Changes in Peak/Base Flows; Increase in Drainage Network	yes	Matrix of Pathways and Indicators (USFWS and NMFS 1999)
Watershed Condition	Road Density and Location; Riparian Reserves; Disturbance History	yes	Matrix of Pathways and Indicators (USFWS and NMFS 1999)

Incomplete and Unavailable Information

The precise distribution of the aquatic organisms is not well known throughout the entire analysis area. Because of these imprecisions, the analysis will rely heavily on the implementation of the Aquatic Restoration Biological Opinion (ARBO II 2013) to support conclusions and lay the framework for implementation. Currently there are no significant data gaps that would impede this analysis and or the implementation of the proposed project.

Affected Environment

Existing Condition

Aquatic Species

Steelhead

Middle Columbia River steelhead, a distinct population segment, was listed by the National Marine Fisheries Service as threatened under the federal Endangered Species Act on March 25, 1999 (64 FR 15417). Middle Columbia River steelhead is also a Forest management indicator

species. Critical habitat for Middle Columbia River steelhead was designated on September 2, 2005 (70 FR 52630).

John Day River status: the John Day River Major Population Group covers Oregon's John Day River drainage. The Major Population Group contains five extant populations (Lower Mainstem John Day, North Fork John Day, Middle Fork John Day, South Fork John Day and Upper Mainstem John Day). Steelhead in these populations are exclusively summer steelhead. The Major Population Group is one of the few remaining summer steelhead groups in the Interior Columbia basin that has had no intentional influence from introduced hatchery steelhead and which has recently been classified as strong or healthy. Spawning is widely distributed across tributary and mainstem habitats (ODFW 2009).

- The Lower Mainstem John Day River population includes tributaries to the John Day River downstream of the South Fork John Day River. This widespread population is the most differentiated ecologically from other populations, occupying the lower, drier, Columbia Plateau ecoregion.
- The North Fork John Day River population occupies the highest elevation, wettest area in the John Day basin. Population boundaries include the main stem and tributaries of the North Fork John Day River. The population was defined based on habitat characteristics, basin topography, and demographic patterns.
- The Middle Fork John Day River population resides in the Middle Fork John Day and all its tributaries. Spawning areas in the Middle Fork John Day River are separated substantially from all other spawning areas; except for those in the North Fork John Day, which exhibit different habitat characteristics.

Analysis Area Status (John Day Basin Major Population Group) (ODFW 2009)

The population within the North Fork John Day River is considered 'highly viable' with low or very low risk ratings. In comparison, the upper and lower mainstem John Day River, Middle Fork John Day River, and South Fork John Day River have medium risk ratings.

Table 10 John Day Major Population Group status

Population Current Risk Status	Population Current Risk Status
North Fork John Day	Highly viable
Upper Mainstem John Day	Moderate risk
Lower Mainstem John Day	Moderate risk
Middle Fork John Day	Moderate risk
South Fork John Day	Moderate risk

Major limiting factors and threats for the John Day River major population group include degraded tributary habitat, mainstem passage, hatchery related effects, and predation/competition/disease in mainstem and estuary.

Within the analysis area, there are approximately 409 miles of designated critical habitat for Mid-Columbia River Steelhead

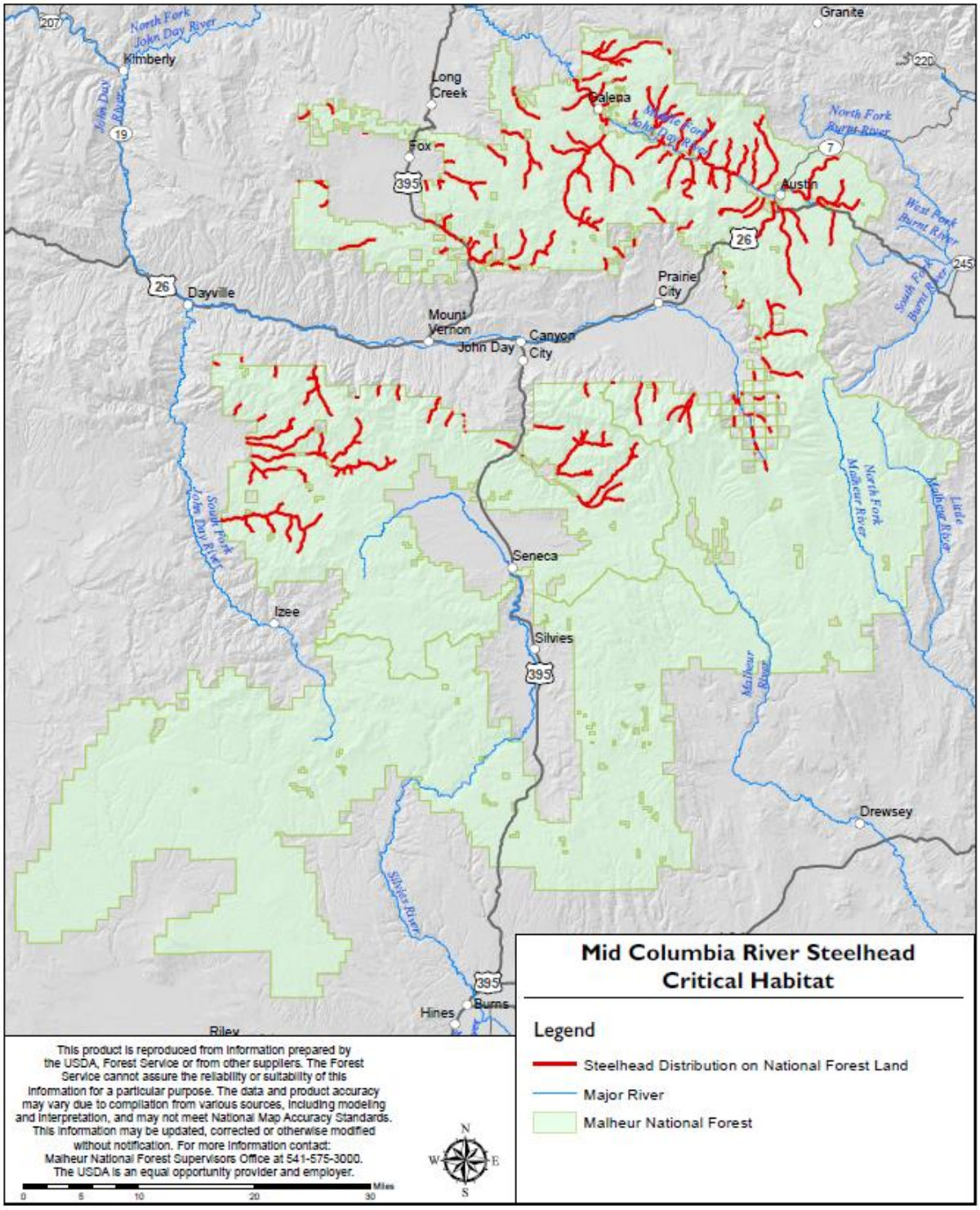


Figure 11 Mid-Columbia River Steelhead on Malheur National Forest Lands

Bull trout

Bull trout were listed by the US Fish and Wildlife Service as threatened under the federal Endangered Species Act on June 10, 1998 (63 FR 31647). The Service published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (70 FR 63898); the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on our website (http://www.fws.gov/pacific/bulltrout). Bull trout are also a Forest management indicator species. The analysis area includes portions of both the John Day and Malheur bull trout species management units.

See Aquatic Restoration Biological Assessment (2013) for species life history.

Declines in bull trout distribution and abundance are the results of combined effects of the following: habitat degradation and fragmentation, the blockage of migratory corridors, poor water quality, angler harvest and poaching, entrainment (process by which aquatic organisms are pulled through a diversion structure or other device) into diversion channels and dams, and introduced nonnative species. Specific land and water management activities that continue to depress bull trout populations and degrade habitat include dams and other diversion structures, forest management practices, livestock grazing, agriculture, road construction and maintenance, mining, and urban and rural development. Some threats to bull trout are the continuing effects of past land management activities.

Presently, bull trout distribution is limited primarily to headwaters of the North Fork John Day River, Middle Fork John Day River, and upper mainstem John Day River and tributaries, with seasonal use of the Mainstem River downstream to the vicinity of the town of John Day. The John Day River Recovery Unit Team has identified 12 extant local populations in the recovery unit.

Within the analysis area, bull trout currently occupy streams within both the John Day and Malheur River systems (USDI 2002). There are approximately 202 miles of designated critical habitat for Columbia River Bull Trout in the analysis area.

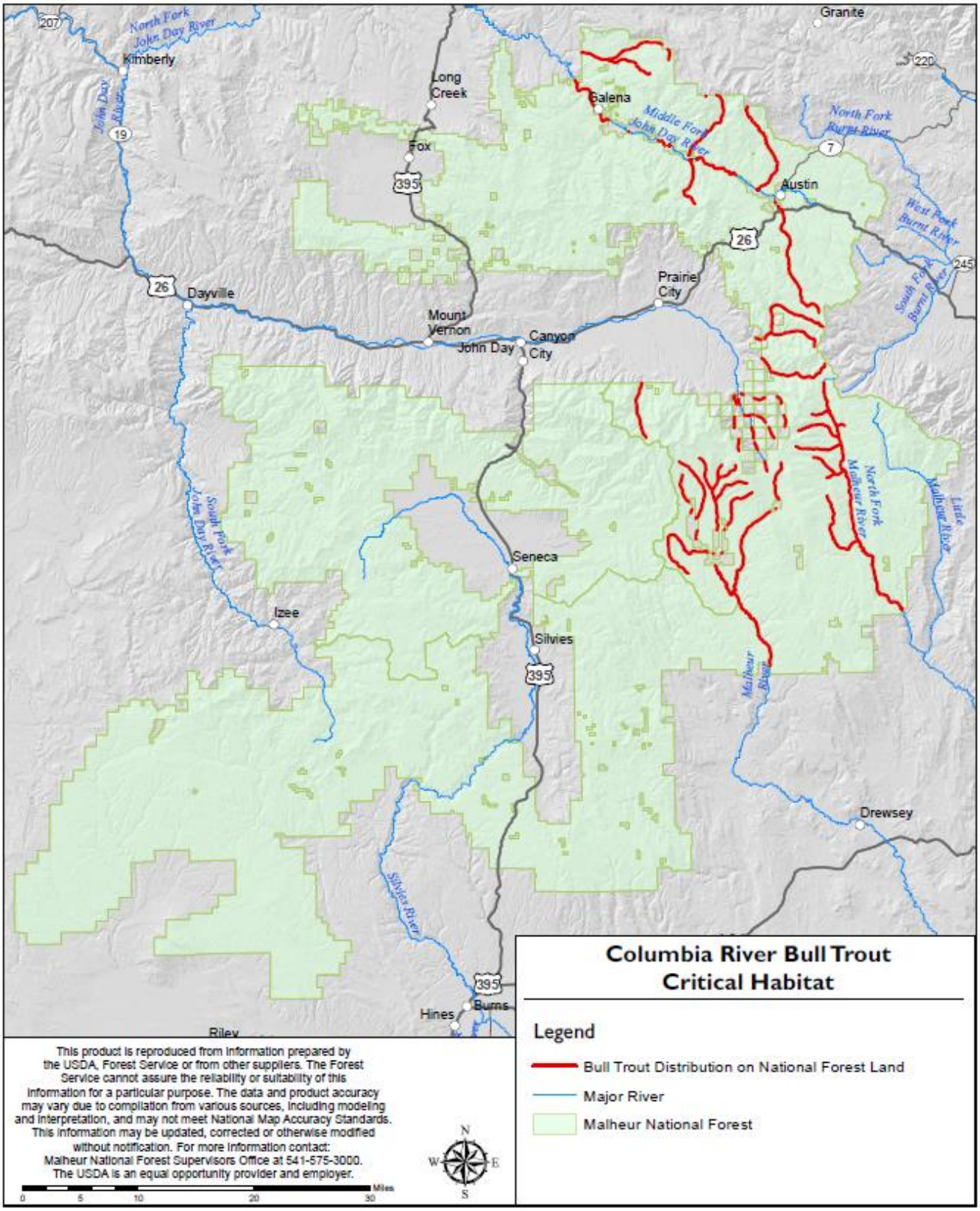


Figure 12 Columbia River Bull Trout Critical Habitat on the Malheur National Forest.

Redband trout

Redband trout are currently on the Region 6 sensitive species list, and are also considered a management indicator species on the Forest.

Life History: This is a resident form of rainbow trout, and exhibits habitat preferences similar to those for steelhead. Redband trout may migrate within river systems, but do not migrate to the ocean.

Redband trout populations are widely distributed in all/most major stream drainages (and tributaries) within the Forest, including the John Day River, Malheur River, and Silvies River.

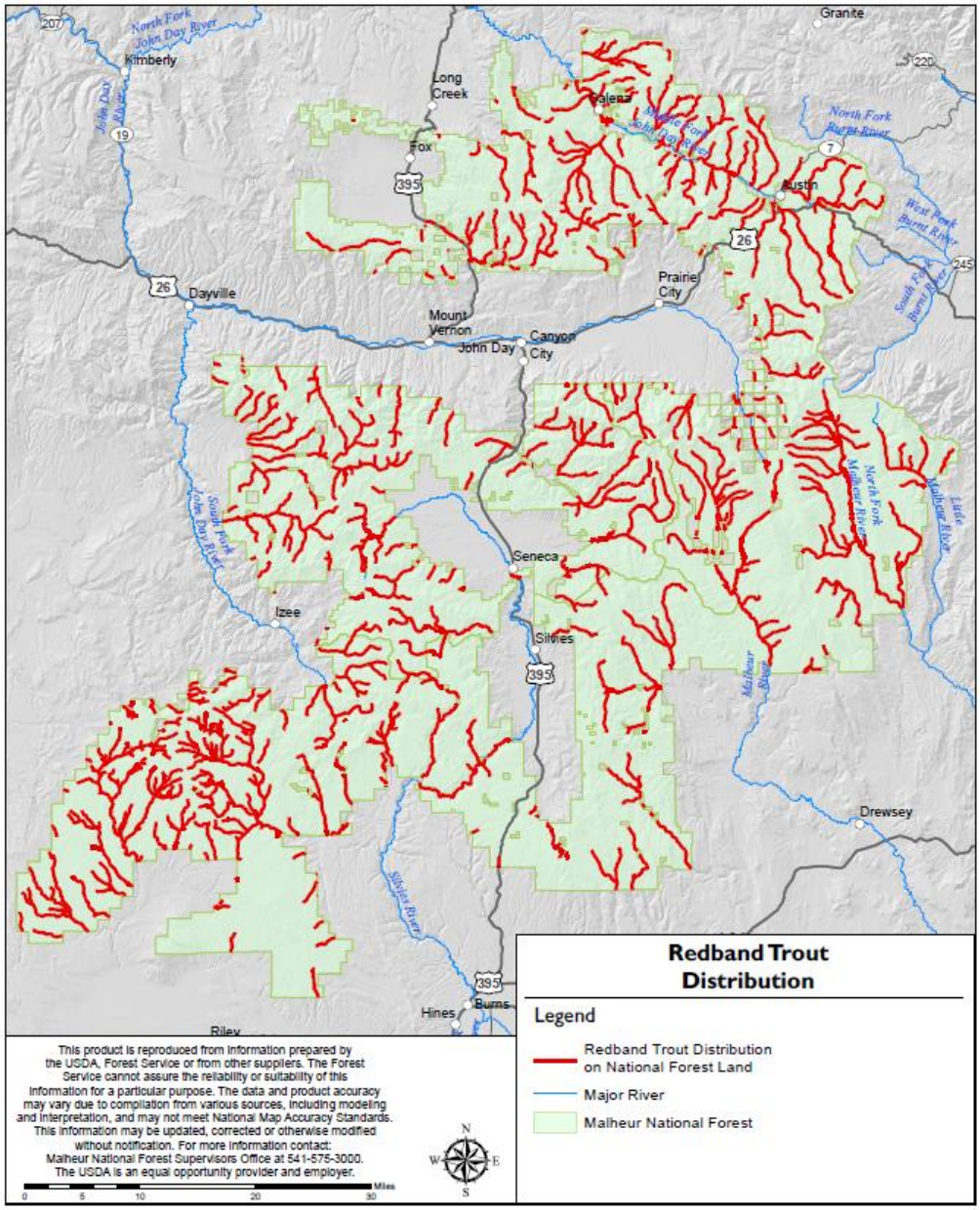


Figure 13 Redband Trout Distribution on the Malheur National Forest

Westslope cutthroat trout

Westslope cutthroat trout are currently on the Region 6 sensitive species list, and are also considered a management indicator species on the Forest.

Potential westslope cutthroat trout distribution is adequately characterized by the steelhead distribution described previously, within the John Day River and tributaries.

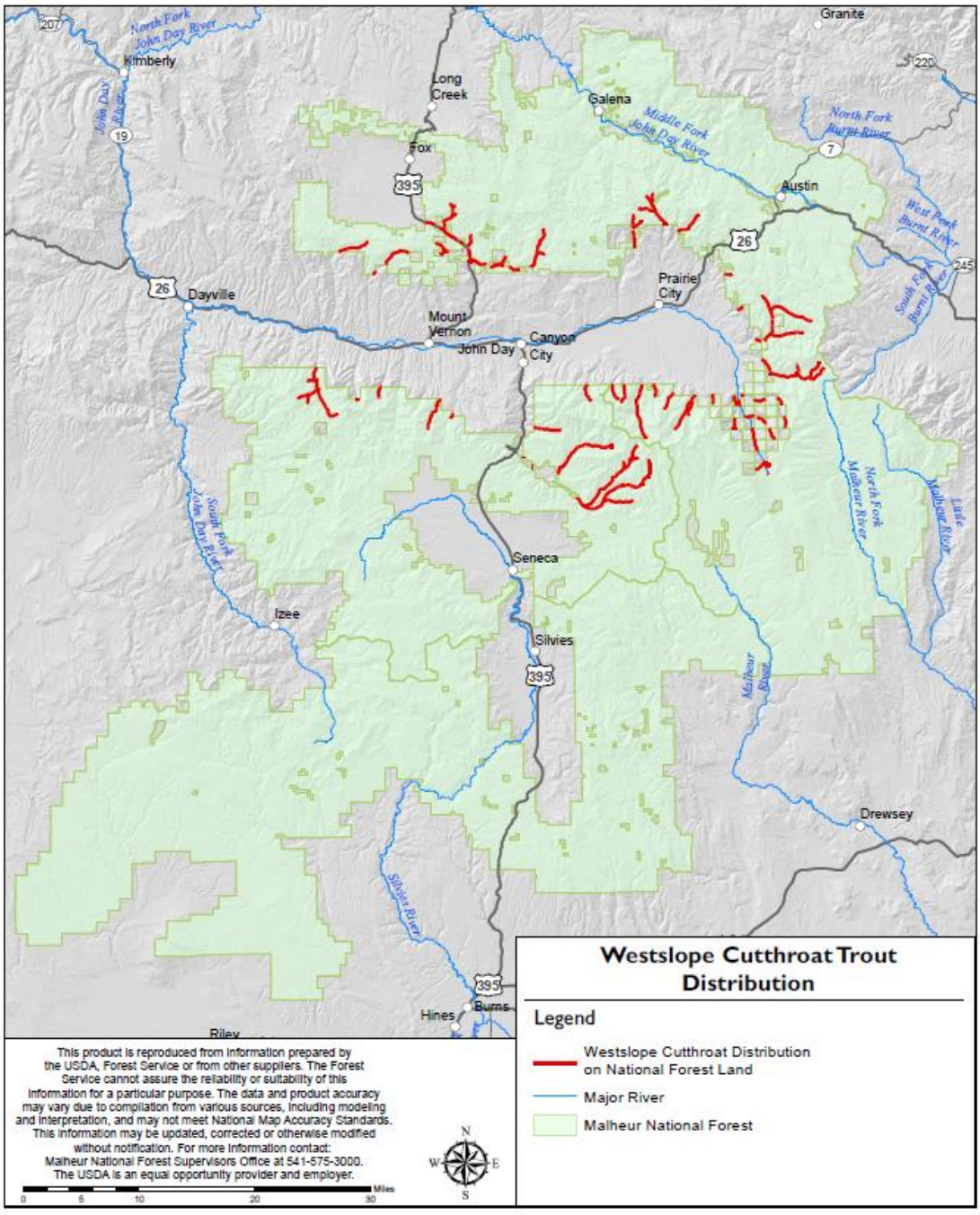


Figure 14 Westslope Cutthroat Trout Distribution on the Malheur National Forest

Chinook salmon

Spring Chinook salmon are a Region 6 sensitive species. Essential fish habitat for spring Chinook salmon has been designated by the National Marine Fisheries Service in the analysis area.

Adult spring Chinook salmon return to the main stem John Day River and Middle Fork John Day River during the spring. Spawning occurs within both drainages, with the majority in the Middle Fork John Day.

For this analysis, essential fish habitat for Chinook salmon is approximated by the distribution of steelhead, which includes most perennial streams within the John Day River drainage. Consultation with the National Marine Fisheries Service for essential fish habitat has been completed.

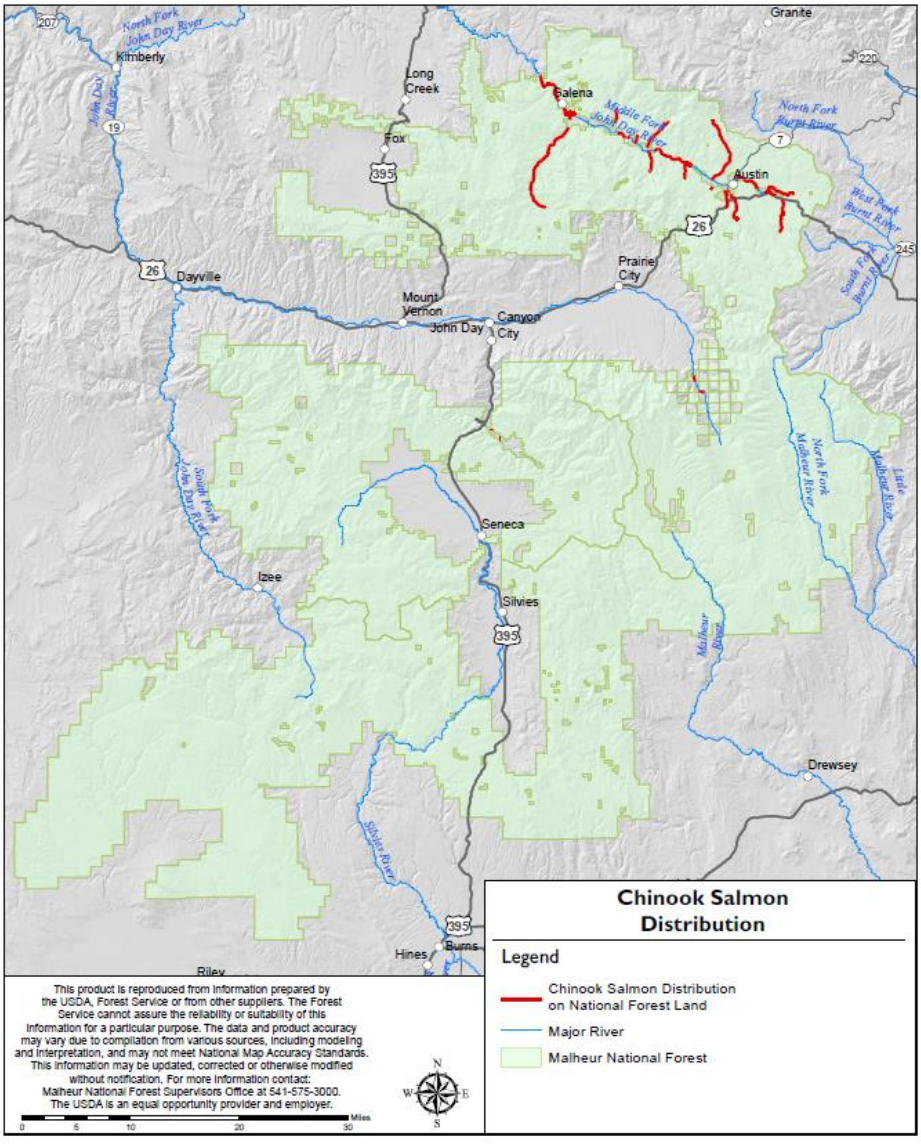


Figure 15 Chinook Salmon Distribution on the Malheur National Forest

Columbia spotted frog (*Rana luteiventris*)

Columbia spotted frogs are on the Region 6 sensitive species list. This species is known to occur in multiple streams within the Emigrant Creek District of the Forest, including: lower Sawmill Creek, Dairy Creek, Claw Creek, and Crowsfoot Creek. Over the project timeframe, this analysis assumes that this species could be present in any suitable habitat, such as ponds/lakes, springs, and slow-moving streams and rivers.

Aquatic macroinvertebrates

Shortface lanx (*Fisherola nuttalli*)
A small pulmonate (lunged) snail in the family Lymnaeidae. This species is threatened by habitat alteration and reduced water quality due to dams, impoundments, and siltation and pollution from agriculture, development, industry, and grazing. Shortface lanx have not been documented on the Forest, but are suspected to, or could occur within the project boundary and are therefore considered in this analysis.

Harney Basin Duskysnail (*Colligyrus depressus*)
A rare snail found at only two sites in a single creek drainage tributary (unnamed springs, and Cricket Creek, Silvies River drainage, Harney County, Oregon) to an Oregon Interior Basin stream. Harney Basin duskysnail have not been documented on the Forest, but are suspected to, or could occur within the project boundary and are therefore considered in this analysis.

Columbia Clubtail (*Gomphus lynnae*)
The Columbia clubtail is a member of the Anisoptera sub-order, which includes all North American dragonflies. The streams that provide suitable habitat for Columbia clubtail are threatened by continued water drainage and diversion for irrigation and development purposes, as well as stormwater run-off containing pesticides. Oregon sightings of Columbia clubtail include locations along the John Day River and Owyhee River in Grant, Malheur and Wheeler Counties. Columbia clubtail have not been documented on the Forest, but are suspected to, or could occur within the project boundary and are therefore considered in this analysis.

Western Ridged Mussel (*Gonidea angulata*)
The western ridged mussel is widely distributed and inhabits cold creeks and streams from low to mid-elevations. Little is known about the fish species that serve as hosts for this mussel throughout other parts of its range. Western ridged mussels have been documented in the Middle Fork John Day River drainage.

Note: Conclusions from the analysis for fishes will be used to qualitatively estimate effects on invertebrates since the aquatic species utilize the same habitat, and detailed distribution and habitat requirements are not well known for the invertebrates.

Watershed Condition

Watershed restoration action plans for priority subwatersheds (Lick Creek, Lower Camp Creek, and Upper Camp Creek) were developed in 2012.

The 2011 Watershed Condition Framework is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands (Figure 16). The Watershed Condition Framework was implemented across all National Forests to improve the Forest Service approach to watershed restoration by establishing a consistent methodology for condition assessment, and targeting the implementation of integrated collections of enhancement activities on those watersheds identified as priorities for restoration (USDA 2011).

Six Steps of the Watershed Condition Framework Process

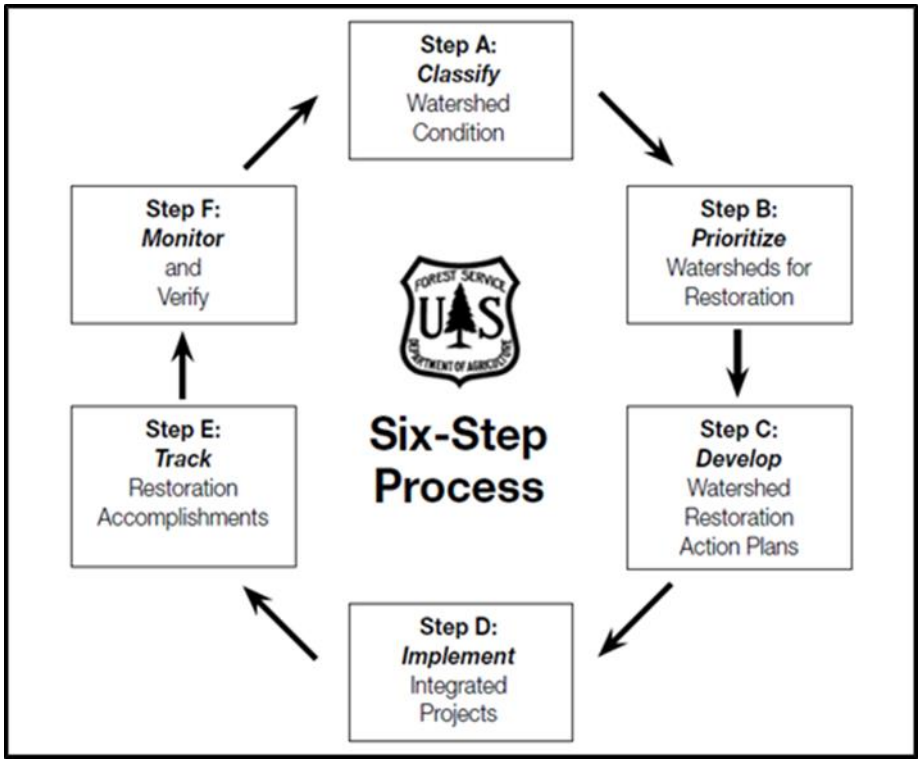


Figure 16 Diagram of the Six Steps of the Watershed Condition Framework

Watershed condition classification is the process of describing watershed condition in terms of discrete categories (or classes) that reflect the level of watershed health or integrity. The Watershed Condition Framework classifies watershed condition using a comprehensive set of 12 indicators that are surrogate variables representing the underlying ecological, hydrological, and geomorphic functions and processes that affect watershed condition.

The indicators are grouped according to four major process categories: (1) aquatic physical, (2) aquatic biological, (3) terrestrial physical, and (4) terrestrial biological. These categories represent terrestrial, riparian, and aquatic ecosystem processes or mechanisms by which management actions can affect the condition of watersheds and associated resources. The four 'process categories' are then weighted to reflect their relative contribution toward watershed condition from a national perspective. The aquatic physical and aquatic biological categories are weighted at 30% each because of their direct impact to aquatic systems (endpoint indicators). The terrestrial physical category was weighted at 30% because roads are one of the greatest sources of impact to watershed condition. The terrestrial biological category is weighted at 10% because these indicators have less direct impact on watershed condition.

Prior to the Watershed Condition Framework each national forest classified watershed condition (typically at the watershed, or HU5, scale) using local methods that were not consistent between forests. The Watershed Condition Framework provides a framework for consistent assessments at the subwatershed, or HU6 scale, and for prioritizing watersheds for restoration.

The Watershed Condition Framework (USDA 2011) places primary emphasis on aquatic and terrestrial processes and conditions that Forest Service management activities can influence. The approach is designed to 1) promote integrated watershed assessments; 2) target programs of work in watersheds that have been identified for restoration; 3) enhance communication and coordination with external agencies and partners; and 4) improve reporting and monitoring of program accomplishments.

On the Malheur, there were 152 subwatersheds included in the assessment. National Forest managed lands within subwatersheds ranged from 5-100 percent (watersheds with less than 5 percent national forest lands were not rated). Assessment data came from the national forests, so ratings apply only to national forest managed lands in the watershed.

Table 11 Overall watershed condition ratings on the Malheur National Forest by HU4 Subbasin - number of HU6 Subwatersheds by condition class (2010 baseline year)

Rating	Upper John Day River HU#17070201	NF John Day River HU#17070202	MF John Day River HU#17070203	Upper Malheur River HU#17050116	Silvies River HU#17120002	Silver Creek HU#17120004	Harney/ Malheur Lakes HU#17120001	Totals
Functioning Properly	29	2	10	1	7	5	2	56
Functioning at Risk	19	4	15	21	24	8	4	95
Impaired Function	0	0	0	1	0	0	0	1
Totals	**48**	**6**	**25**	**23**	**31**	**13**	**6**	**152**

Overall Watershed Condition

Overall watershed condition on the Malheur NF was rated good in 56 watersheds (37%) and fair in 95 watersheds (63%). Only one of the evaluated watersheds rated in poor condition.

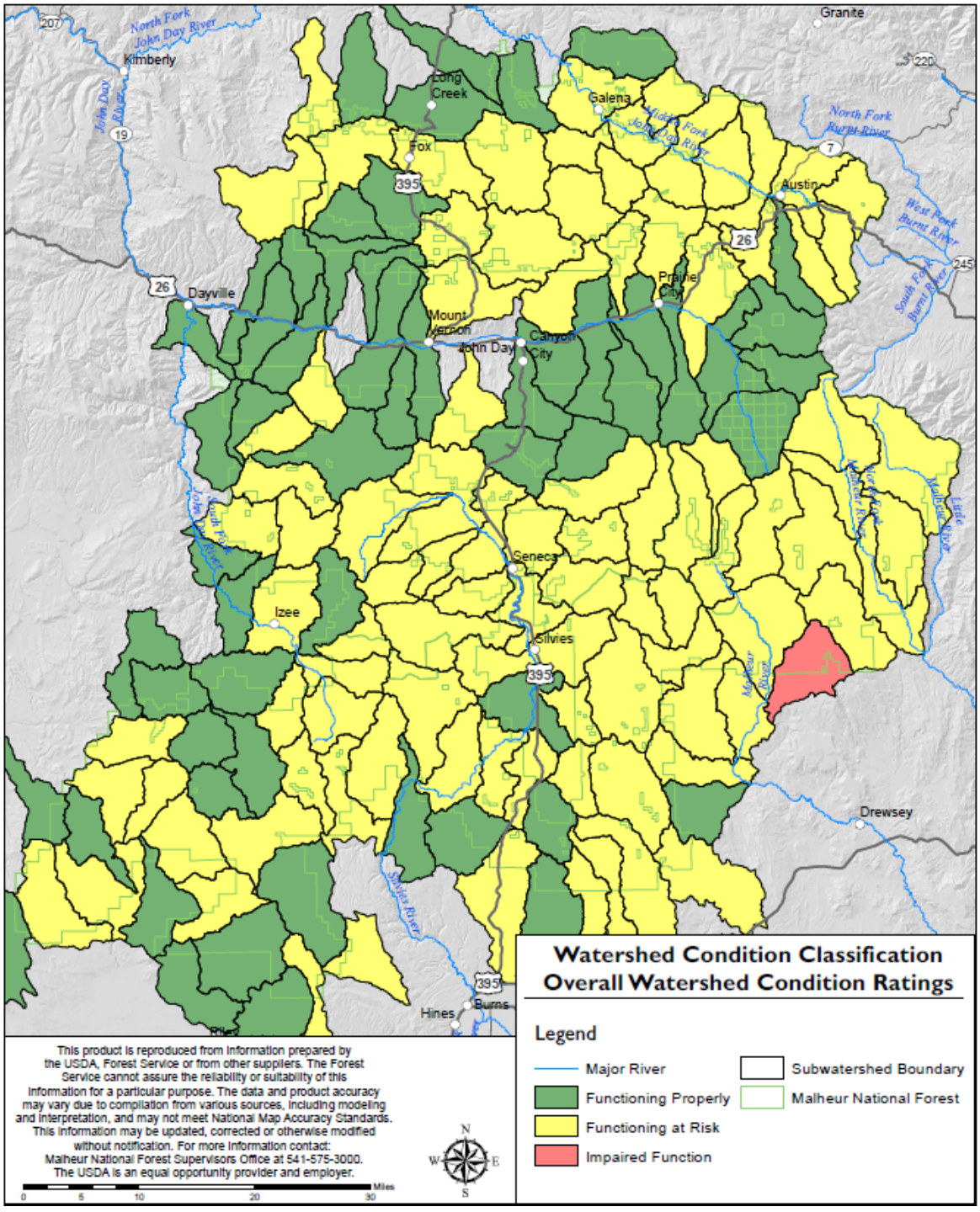


Figure 17 Overall Watershed Condition Classes for Malheur National Forest Subwatersheds

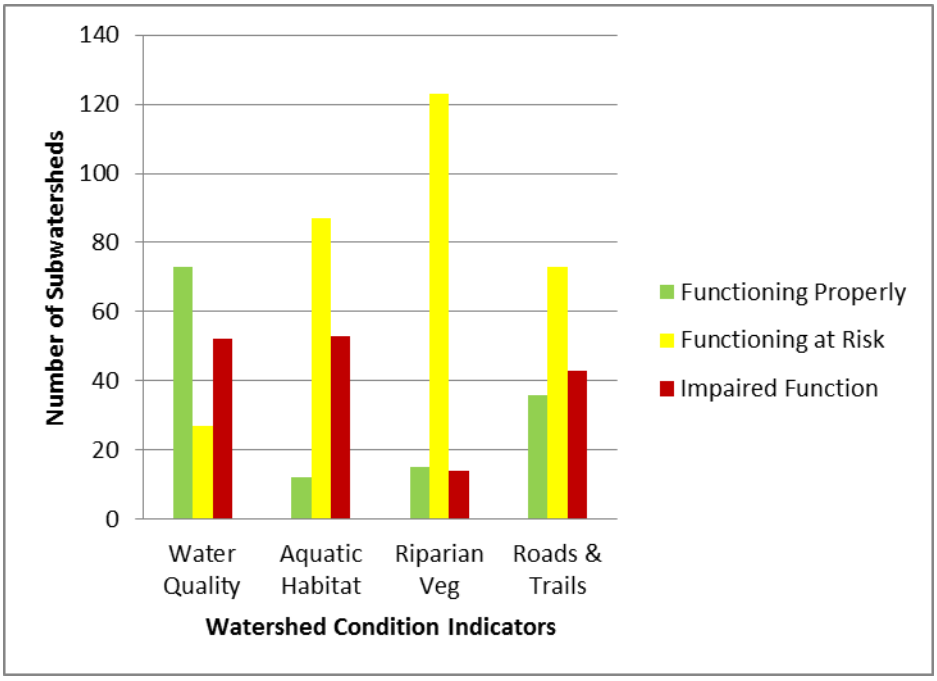


Figure 18 Number of subwatersheds by condition class for selected indicators

Ratings for most indicators show varying distributions of functioning properly, functioning at risk, and impaired function. Four indicators most relevant to water quality and fisheries are discussed in more detail: water quality, aquatic habitat, riparian/wetland vegetation, and roads and trails.

Water Quality

For water quality, 73 subwatersheds were rated good condition, 27 fair condition, and 52 rated in poor condition. This attribute rating is based on 303(d) status (percent of miles listed) and other known water quality impairments, and largely reflects the status of 303(d) listings for the 2010 assessment year (which addressed the 2004/2006 303(d) list) and was prior to total maximum daily load approval. When water quality ratings are updated, there will be fewer 'poor' ratings just based on fewer miles of streams listed 303(d).

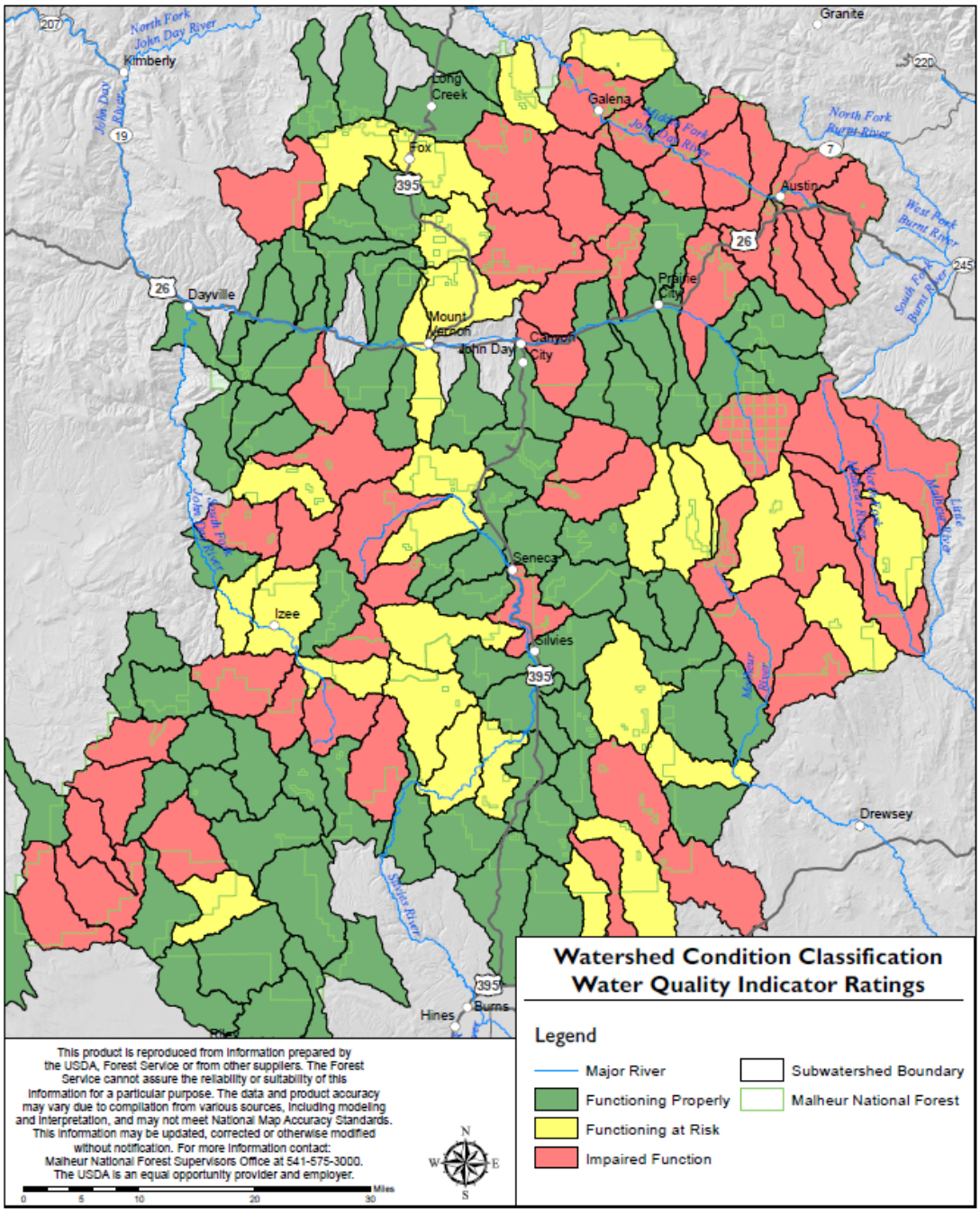


Figure 19 Water Quality Indicator Ratings for Malheur National Forest Subwatersheds

Aquatic Habitat

For aquatic habitat, 12 subwatersheds were rated in good condition, 87 in fair condition and 53 watersheds rated in poor condition based on habitat quality, fragmentation and stream channel condition. Watersheds in 'poor condition' for aquatic habitat largely reflect past land uses (i.e. grazing, mining, logging), including fragmentation by roads, lack of large wood in channels, and altered channel morphology. Many of these conditions continue to persist long after the original impact.

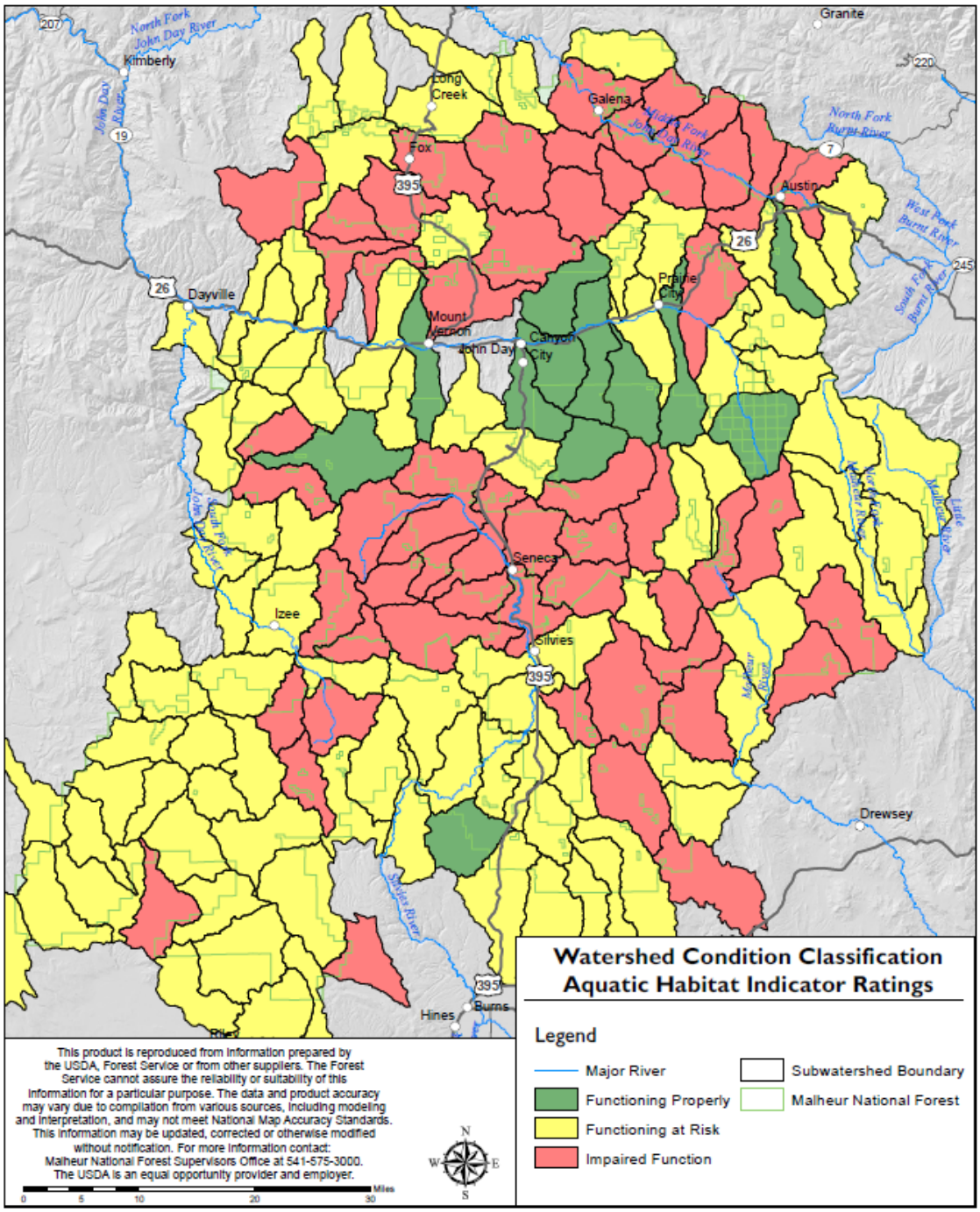


Figure 20 Aquatic Habitat Indicator Ratings for Malheur National Forest Subwatersheds

Riparian Vegetation

For the riparian vegetation indicator, 15 subwatersheds were rated in good condition, 123 rated in fair condition, and 14 rated in poor condition based on relative condition and departure from potential. As with aquatic habitat, riparian conditions also reflect past land uses that are no longer active or allowed (such as streamside logging).

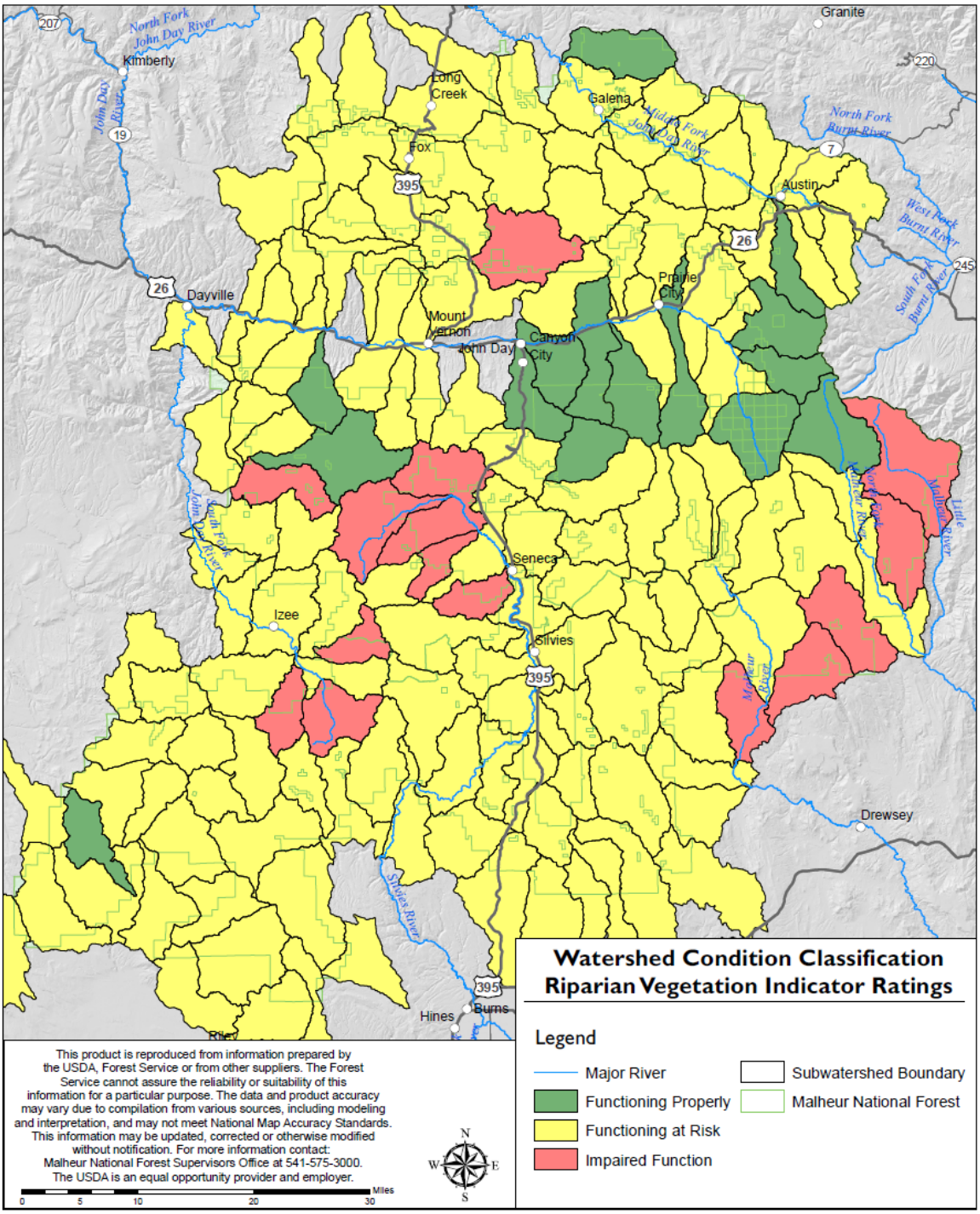


Figure 21 Riparian Vegetation Indicator Ratings for Malheur National Forest Subwatersheds

Roads and Trails

Watershed function and health, as they relate to roads and trails, were rated based on factors that include open road density, maintenance investment, and proximity to water. 36 were rated in good condition, 73 rated in fair condition, and 43 watersheds rated poor condition. Road management is an ongoing agency emphasis, with national direction for transportation analysis to identify a 'sustainable' (economic, social, and ecological) road system, and develop a plan to reduce road impacts. Ongoing challenges include desire for public access for various purposes, needs for access for resource management and protection, and diminished funding for maintenance and storage or decommissioning of unneeded roads.

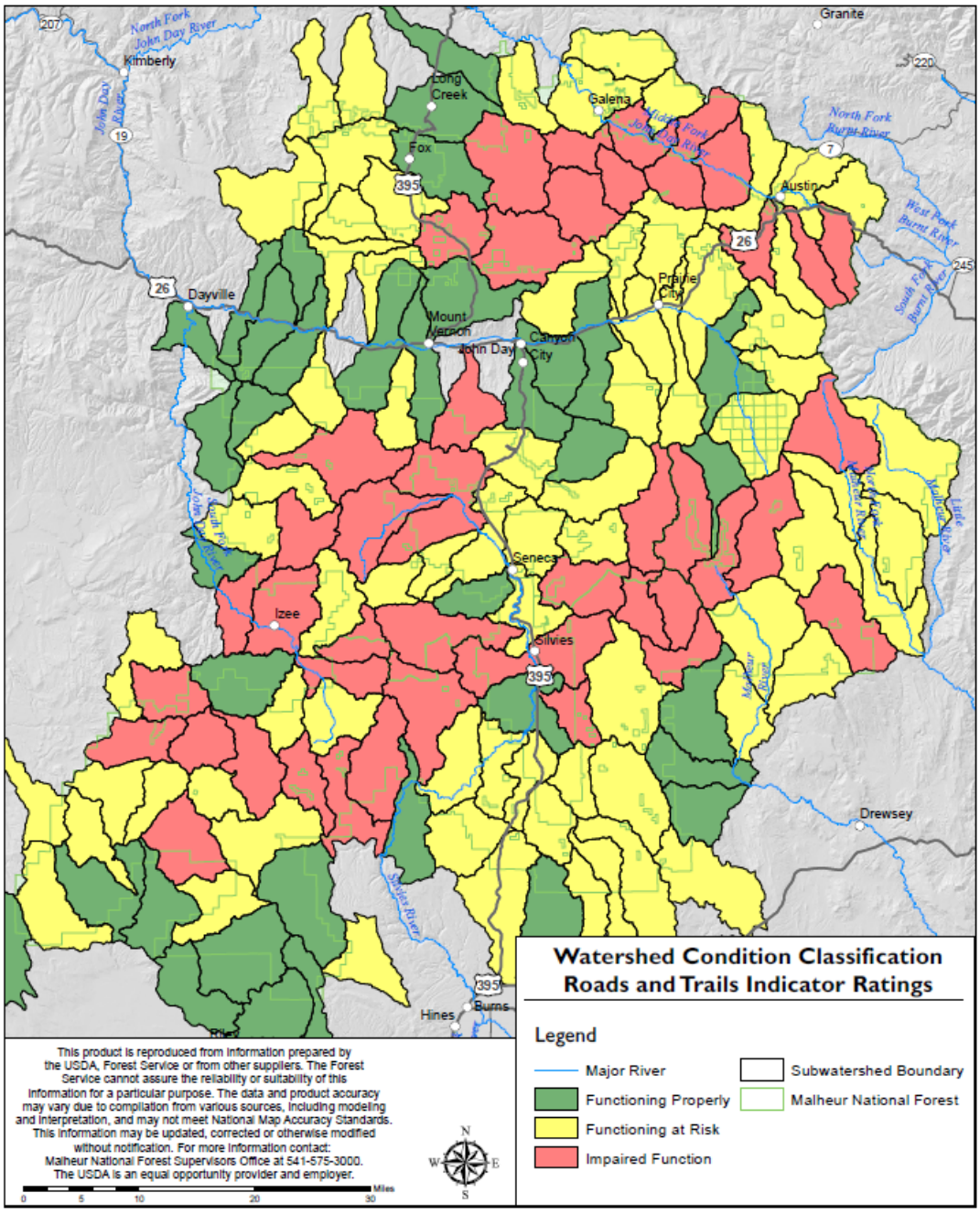


Figure 22 Roads and Trails Indicator Ratings for Malheur National Forest Subwatersheds

Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect soil and hydrologic functions supporting aquatic ecosystems.

Lick Creek, Lower Camp Creek, and Upper Camp Creek are the National priority subwatersheds and regional focus watersheds located on the Malheur. These were identified utilizing the Regional Aquatic Restoration Strategy (2007) and the national Watershed Condition Framework (USDA, FS-977, 2011). Watershed Restoration Action Plans for each stream were developed in 2012.

Human-induced Habitat Degradation

Forestry, farming, grazing, road construction, hydropower system development, mining, and housing/urban development have radically changed the historical habitat conditions within the Pacific Northwest. Water quality problems in the region are caused by a variety of activities such as urban development, forestry, farming, livestock grazing, riparian/channel alteration, road systems, and dams and other types of water management. The quality and quantity of fresh water habitat in much of Eastern Oregon has declined dramatically in the last 150 years.

Many water bodies on the Malheur are on the 303(d) list and do not meet water quality standards for temperature. High water temperatures adversely affect salmonid metabolism, growth rate, and disease resistance, as well as the timing of adult migrations, fry emergence, and smoltification. Many factors can cause high stream temperatures, but they are primarily related to land-use practices rather than point-source discharges. Some common actions that cause high stream temperatures are the removal of trees or shrubs that directly shade streams, water withdrawals for irrigation or other purposes, and warm irrigation return flows. Loss of wetlands and increases in groundwater withdrawals contribute to lower base-stream flows that, in turn, contribute to temperature increases. Activities that create shallower streams (e.g., channel widening) also cause temperature increases.

Chemical use in state, federal, and private forest lands in the Pacific Northwest has resulted in the introduction of pollutants to headwater stream segments. The three major categories of forest chemical used are pesticides, fertilizers, and fire retardants. While pesticide use in all forest ownership types was extensive during the 1970's and 1980's, application rates on National Forest System lands peaked in the mid 1980's, and have decreased considerably since. Very little pesticide or fertilizer use takes place on the Malheur, and fire retardants used during emergency firefighting must follow national NEPA and Endangered Species Act consultation.

Water quantity problems are also a significant cause of habitat degradation and reduced fish production. Numerous acres in eastern Oregon are irrigated. Although some of the water withdrawn from streams eventually returns as agricultural runoff or groundwater recharge, crops consume a large proportion of it. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May through September) and restoring it to surface streams and groundwater in ways that are difficult to measure. Withdrawing water for irrigation, and other uses increases temperatures, smolt travel time, and sedimentation. Return water from irrigated fields can introduce nutrients and pesticides into streams and rivers. Water withdrawals (primarily for irrigation) have lowered summer flows in nearly every stream in the basin and thereby profoundly decreased the amount and quality of rearing habitat. The Malheur and John Day sub-basin plans identify flow and temperature as limiting factors of which water withdrawals are a significant contributor.

On the landscape scale, human activities have affected the timing and amount of peak water runoff from rain and snowmelt. Forest and range management practices have changed vegetation types and density that, in turn, affect runoff timing and duration. Many riparian areas,

floodplains, and wetlands that once stored water during periods of high runoff have been impacted by soil compaction and vegetation, potentially altering natural hydrograph patterns in portions of the John Day and Malheur basins.

Land ownership has also played its part in the area's habitat and land-use changes. Federal lands are generally forested and situated in upstream portions of the watersheds. While there has been substantial habitat degradation across all land ownerships, including federal lands, in general, habitat in many headwater stream segments is in better condition than in the largely non-federal lower portions of tributaries. In the past, valley bottoms were among the most productive fish habitats in the basin. Today, agricultural and suburban land development and water withdrawals have significantly altered the habitat for fish and wildlife in valleys and lower elevation areas of the Pacific Northwest. Streams in these areas typically have high water temperatures, sedimentation problems, low flows, simplified stream channels, and reduced riparian vegetation, which has occurred on the Malheur National Forest.

Water Quality

Water produced within the analysis area is generally of high quality. Monitoring programs include a network of stream temperature sensor sites and sediment sampling in selected streams as part of project and/or long-term effectiveness monitoring, and measurements of other water quality parameters. The most persistent and widespread water quality concern is high stream temperatures during low stream flows in summer. High summer air temperatures, changes in stream surface shading caused by Forest Service management activities, and low flows are important factors contributing to warmer water. Sediment levels in streams vary significantly with stream flows, with the highest levels during winter and spring runoff. Some stream reaches show evidence of sediment accumulation from varying sources, such as local stream bank erosion or contributing watershed conditions (e.g., high sediment-producing geology and roads close to streams). Sediment accumulation is a natural function in lower gradient streams, but some areas show evidence of sediment accumulation from past and ongoing management activities. Other water quality concerns that have been observed include nutrient and bacteria sources from livestock, wildlife, and recreation uses. Impacts generally occur during times of concentrated use (at concentrated use areas).

Water quality has improved in recent years as a result of changes in management motivated by direction in PACFISH and INFISH, implementation of water quality best management practices, direction in the Regional Aquatic Restoration Strategy, fish recovery plans, and through partner investments. Examples include increased emphasis on protecting streamside areas to reduce impacts to shade producing vegetation, and repairing and removing unstable roads. At the project level, Forest Service staff design and implement a wide variety of best management practices as part of land management activities. Monitoring occurs on a sample of practices to determine best management practices implementation and effectiveness and need for adjustment. For example, Forest personnel have monitored logging best management practices and reported adequate riparian areas, roads practices, and water quality protection. Monitoring of road decommissioning and stabilization conducted by the Rocky Mountain Research Station since 2008 has assessed treatment effectiveness in reducing impacts to aquatic ecosystems. Monitoring results indicated treatments reduced erosion and sediment delivery and lowered risk to aquatic ecosystems.

Impaired Waters

Water quality is assessed in terms of designated beneficial uses as defined by the Oregon Department of Environmental Quality. Section 303(d) of the 1972 Federal Clean Water Act requires the identification of water bodies that violate water quality standards and thereby fail to fully protect beneficial uses. Streams that do not meet water quality standards and thereby do not

protect designated beneficial uses are referred to as impaired and are included on state 303d lists. The law requires that states develop total maximum daily load plans for those waters that address the sources of pollution and identify actions needed to improve water quality. A total maximum daily load is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. Total maximum daily load plans establish load allocations that are expected to provide conditions that meet state water quality standards over time.

Oregon Department of Environmental Quality's 2004/2006 water quality assessment is used to compile the list of impaired waters for Oregon for use in this analysis. The maintenance of the 303(d) list is an ongoing process and is updated periodically based on new information. Oregon Department of Environmental Quality prepared and submitted Oregon's 2010 303(d) list for Environmental Protection Agency review, and the Environmental Protection Agency partially approved and partially disapproved the submitted list in 2012. The Environmental Protection Agency added new listings to Oregon's 303(d) list, with scattered sites across the analysis area (the list of the Environmental Protection Agency's additions and documentation of its decision process are available on Environmental Protection Agency's website). The Department of Environmental Quality will supplement information on Oregon's 2010 Integrated Report Assessment Database website with the list of added 303(d) segments. Identified in Table 9 below is a list of all current 303(d) impaired water bodies on the Malheur.

Table 12 List of water quality impaired streams within the analysis area on the Malheur National Forest

Watershed (USGS 4th Field Name)	USGS 4th Field HUC	Water Body (Stream)	River Miles*	Parameter
Upper John Day	17070201	Canyon Creek	0 to 23.9	Biological Criteria
Upper John Day	17070201	East Fork Beech Creek	0 to 12.4	Biological Criteria
Upper John Day	17070201	North Fork Deer Creek	0 to 4.2	Biological Criteria
Upper John Day	17070201	South Fork John Day River	0 to 57.3	Biological Criteria
Upper John Day	17070201	John Day River	182 to 243.7	Dissolved Oxygen
Upper John Day	17070201	John Day River	265 to 278.3	Dissolved Oxygen
Upper John Day	17070201	Jackass Creek	0 to 4.8	Sedimentation
Upper John Day	17070201	Murderers Creek	0 to 24.7	Sedimentation
Upper John Day	17070201	Tributary to Strawberry Creek	0 to 1.6	Sedimentation
Lower John Day; Upper John Day	17070204; 17070201	John Day River	0 to 278.3	Biological Criteria
Middle Fork John Day	17070203	Bridge Creek	0 to 7.8	Biological Criteria
Middle Fork John Day	17070203	Deadwood Creek	0 to 4.5	Biological Criteria
Middle Fork John Day	17070203	Long Creek	0 to 36.7	Biological Criteria
Middle Fork John Day	17070203	Vinegar Creek	0 to 9.4	Biological Criteria
Middle Fork John Day	17070203	Long Creek	0 to 36.7	Sedimentation
Middle Fork John Day	17070203	Summit Creek	0 to 8.6	Sedimentation
North Fork John Day	17070202	Fox Creek	0 to 19.7	Biological Criteria
Silvies	17120002	Antelope Creek	0 to 9.6	Biological Criteria
Silvies	17120002	Bear Canyon Creek	0 to 6.4	Biological Criteria
Silvies	17120002	Camp Creek	0 to 16.7	Biological Criteria
Silvies	17120002	Van Aspen Creek	0 to 7.8	Biological Criteria
Silvies	17120002	Hay Creek	0 to 12.3	Temperature
Silvies	17120002	Silvies River	0 to 104.8	Dissolved Oxygen

Watershed (USGS 4th Field Name)	USGS 4th Field HUC	Water Body (Stream)	River Miles*	Parameter
Silvies	17120002	Scotty Creek	0 to 9.5	Temperature
Silvies	17120002	Little Bear Creek	0 to 5.8	Temperature
Silvies	17120002	Myrtle Creek	0 to 12.3	Temperature
Silver	17120004	Dodson Creek	0 to 8.4	Biological Criteria
Silver	17120004	Nicoll Creek	0 to 14.1	Biological Criteria
Silver	17120004	Rough Creek	0 to 10.6	Biological Criteria
Silver	17120004	Silver Creek	0 to 63.6	Biological Criteria
Silver	17120004	Sawmill Creek	0 to 10.7	Temperature
Silver	17120004	Wickiup Creek	0 to 9.0	Temperature
Silver	17120004	Salt Canyon Creek	0 to 1.2	Temperature
Silver	17120004	Claw Creek	0 to 15.1	Temperature
Silver	17120004	Egypt Creek	0 to 8.9	Temperature
Lower Malheur; Upper Malheur	17050116, 17050115	Malheur River	67.1 to 190.3	Dissolved Oxygen
Upper Malheur	17050116	Bear Creek	0 to 14.7	Biological Criteria
Upper Malheur	17050116	Crane Creek	0 to 10.2	Biological Criteria
Upper Malheur	17050116	Little Malheur River	0 to 23.2	Biological Criteria
Upper Malheur	17050116	North Fork Malheur River	0 to 51.4	Biological Criteria
Upper Malheur	17050116	Summit Creek	0 to 14.2	Biological Criteria
Upper Malheur	17050116	North Fork Malheur River	0 to 32.1	Dissolved Oxygen (Spawning)
Upper Malheur	17050116	North Fork Malheur River	0 to 32.1	Dissolved Oxygen (Cold Water)
Upper Malheur	17050116	North Fork Malheur River	18 to 59.3	E.Coli
Harney/Malheur Lakes	17120001	Rattlesnake Creek	0 to	Temperature
Harney/Malheur Lakes	17120001	Coffeepot Creek	0 to 10.3	Temperature
Harney/Malheur Lakes	17120001	Mill Creek	0 to 7.1	Temperature

* 'River miles' shown for listed stream segments include sections off National Forest System lands

The most common water quality impairment within the analysis area is stream temperature and biological criteria.

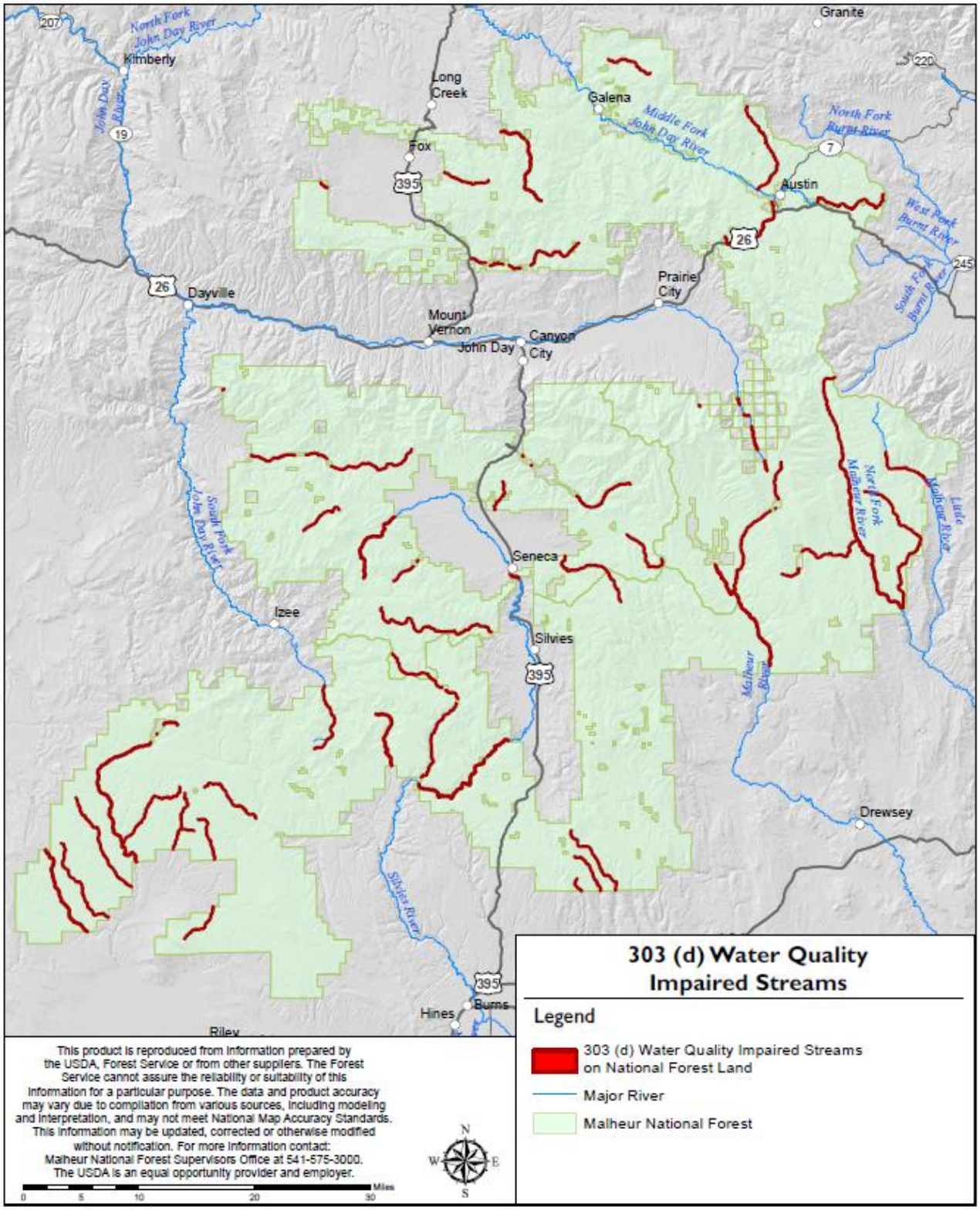


Figure 23 303(d) Water Quality Impaired Streams on Lands Managed by the Malheur National Forest

Other parameters for listing streams include sedimentation, dissolved oxygen, and nutrient, bacteria. Because the concentration of dissolved oxygen in water is temperature dependent, streams with high water temperatures often have correspondingly low dissolved oxygen levels, which is detrimental to beneficial uses (cold water fish species). Sources of temperature impairment identified in total maximum daily loads by Oregon Department of Environmental Quality include loss of stream shade, changes in channel morphology, loss of floodplain and shallow groundwater connection, and changes in streamflow. Oregon Department of Environmental Quality recognizes that stream shade provided by riparian vegetation has the most widespread achievable effect on reducing stream temperatures by reducing direct solar radiation. This emphasis on shade shows the importance of restoring healthy communities of riparian vegetation. The agencies recognize that changes in channel morphology are often more costly and take longer to achieve results. Oregon Department of Environmental Quality has administrative procedures for transferring water rights from out-of-stream uses to instream flows for benefit of water quality, aquatic species, and recreation uses.

As of 2010, Oregon Department of Environmental Quality has completed analysis of total maximum daily load and water quality implementation plans for the John Day and Malheur River basins .

Table 13 Status of Total Maximum Daily Loads (TMDL) and Water Quality Restoration Plans (WQRP).

National Forest	Subbasin/ Watershed	Water Quality Concern Addressed	TMDL Parameters	TMDL Date	WQRP Date	Oregon Department of Environmental Quality Response/Approval
Malheur NF Umatilla NF Wallowa-Whiteman NF	John Day Basin	Temperature, Bacteria, Dissolved Oxygen, and Excessive Amounts Of Fine-Grained Streambed Sediment.	Temperature, Bacteria, and Dissolved Oxygen	2010	In progress	Total Maximum Daily Loads completed, Water Quality Restoration Plans in development.
MAL	Malheur River Basin	Temperature, Bacteria, Chlorophyll-a, toxics, DDT, Dieldrin, and Dissolved Oxygen	Temperature, Bacteria, and Chlorophyll a (Controls on total phosphorus).	2010	In progress	Total Maximum Daily Loads completed, Water Quality Restoration Plans in development.

The total maximum daily load process was has not yet been started for Silver Creek, Silvies River, or Harney/Malheur Lakes subbasins. Completed total maximum daily load plans identify the sources of water quality impairment and the measures needed to restore water quality in each basin. The Forest Service has contributed to the development of total maximum daily load plans since 1998 by providing relevant data and technical assistance for streams within the Forest and has participated in technical and stakeholder groups. As the designated management agency, the Forest Service is responsible for developing water quality restoration plans that outline the best management practices and restoration strategies needed to restore water quality in impaired waters and reduce pollution to surface waters within National Forest System lands. Watershed quality restoration plans are currently being developed in the John Day and Malheur River Subbasins.

The majority of water bodies within the Forest support designated beneficial uses, which include domestic and agricultural, cold-water fisheries, recreation, domestic livestock, and wildlife uses.

Maintaining the quality of these waters is becoming increasingly important as the demand for clean water resources increases and the timing and volume of surface runoff changes in responses to climate change.

The ability to maintain existing high quality habitats and to restore degraded habitats will be influenced by climate change over the next several decades with projected higher average air temperatures, more winter precipitation falling as rain versus snow, and diminishing winter snow packs resulting in earlier snowmelt. Changes in runoff volume and lower summer base flows, higher surface water temperatures, and likely greater year-to-year variability in precipitation could also result in extended drought periods and more severe floods than have occurred in recent history. Changes in timing and amount of runoff associated with climate change affect every resource, including terrestrial vegetation, wildlife, riparian and aquatic species, and water availability for human use. The effects of climate change to water resources are further described in the discussion of cumulative effects.

Associated State Antidegradation Policy as it relates to the Proposed Action

Oregon's Antidegradation policy is consistent with Environmental Protection Agency recommendations and was most recently approved by the Agency in 2004. Oregon's Antidegradation rule includes a purpose statement and a growth policy.

Antidegradation

- Purpose. The purpose of the Antidegradation Policy is to guide decisions that affect water quality such that unnecessary further degradation from new or increased point and nonpoint sources of pollution is prevented, and to protect, maintain, and enhance existing surface water quality to ensure the full protection of all existing beneficial uses. [OAR 340-041-0004(1)] The standards and policies set forth in OAR 340-041-0007 through 340-041-0350 are intended to supplement the Antidegradation Policy.
- Nondegradation Discharges. The following new or increased discharges are subject to this Division. However, because they are not considered degradation of water quality, they are not required to undergo an antidegradation review under this rule:
  - (c) Temperature. Insignificant temperature increases authorized under OAR 340-041-0028(11) and (12) are not considered a reduction in water quality.
- Exemptions to the Antidegradation Requirement. Some activities may, on a short term basis, cause temporary water quality degradation. However, these same activities may also have substantial and desirable environmental benefits. The following activities and situations fall into this category. Such activities and situations remain subject to water quality standards, and must demonstrate that they have minimized adverse affects to threatened and endangered species in order to be exempt from the antidegradation review under this rule:
  - Riparian Restoration Activities. Activities that are intended to restore the geomorphology or riparian vegetation of a water body, or control invasive species need not undergo an antidegradation review so long as the Department determines that there is a net ecological benefit to the restoration activity. Reasonable measures that are consistent with the restoration objectives for the water body must be used to minimize the degradation.

Management Direction

Background

During the early to mid-1990's, the Forest Service took assertive steps to better protect fish habitat and address dwindling salmon, trout, and other native fish stocks in Oregon and Washington. In doing so, the Forest Service amended National Forest Land and Resource Management Plans, including the Malheur and Ochoco Forest Plans, with the following conservation strategy: INFISH (USDA and USDI 1995a), and PACFISH (USDA and USDI 1995b).

Desired Future Condition

Maintain or restore the habitat conditions which result in compliance with Oregon Water Quality Standards and ensure viable populations of aquatic and riparian-dependent species. The habitat elements (features) of sediment/substrate, water quality, channel morphology and riparian vegetation will be managed within their natural ranges of variability. The balance of these elements within these ranges of variability is to be considered the quantitative expression of achieving desired condition.

Resource Element

Fish, Water, Quality, and Wildlife

Standard 5. Manage riparian areas to achieve the following desired conditions by habitat element, sub-element and numeric value. These values are to be measured on a subwatershed basis, and to the degree the individual riparian area contains these specific habitat elements.

Table 14 Desired Future Condition for Habitat Elements

Element	Sub-Element	Numeric Values1
A. Sediment/Substrate	1) Cobble embeddedness	< 20% embedded
B. Water Quality	1) Water Temperature	
	a. Forest wide, existing temperature < 68 F	No increase
	b. Forest wide, existing temperature > 68 F	Reduce to 68 F
	c. Bull trout spawning and rearing habitat	< 55 F
	d. Cutthroat trout spawning and rearing habitat	< 55 F
C. Channel Morphology	1) Large woody debris	
	a. Ponderosa pine ecosystems	Maintain 20 to 70 pieces/mile; at least 12 inches in diameter and 20% > 20 inches in diameter; and at least 35 feet long or 1 ½ times the bankfull width of stream
	b. Mixed conifer ecosystems	Maintain 80 to 120 pieces/mile; at least 12 inches in diameter and 20% > 20 inches in diameter; and at least 35 feet long or 1 ½ times the bankfull width of stream
	c. Lodgepole pine ecosystems	Maintain 100 to 350 pieces/mile; at least 6 inches in diameter and 20% > 12 inches in diameter; and at least 35 feet long or 1 ½ times the bankfull width of stream
	2) Pool frequency	Based upon range expected for

Element	Sub-Element	Numeric Values1
		Rosgen type B and C streams, with upper limits adjusted for streams > 75 to be consistent with 'PACFISH' values.
	3) Bank stability (forested ecosystem)	90% stable, no decrease if above 90% stable
	4) Lower bank angle with stream gradients < 2% (non-forested ecosystems)	50-70% of banks with 90 degree angle or greater (undercut)
	5) Width:Depth Ratio	<10, mean wetted width divided by mean depth (all systems)
D. Riparian Vegetation	1) Potential large woody debris (forested ecosystem)	To provide a rate of input to maintain large woody debris standard C.1
	2) Ground cover	90% of site potential, covered by herbaceous species, litter, rock, moss, of lichens
	3) % of stream bank vegetated	90% of site potential
	4) Shade/canopy closure	
	a) Ponderosa pine series	40-55% canopy closure
	b) Mixed conifer species	50-65% canopy closure
	c) Lodgepole pine	60-75% canopy closure
	d) Hardwood/meadow complex	80% shaded

Environmental Consequences

Alternative 1 – No Action

The No Action alternative is required by NEPA (36 CFR 220) to provide a baseline for comparison of effects of action alternatives. If no action were selected for this project, federal and non-federal actions are likely to continue affecting water quality, water quantity and listed fish habitat and individual aquatic species. Existing watershed degradation and associated loss of habitat would continue to maintain degraded baseline conditions that would continue to stress fish populations in most subbasins.

This alternative would continue current management, which includes a mix of protection strategies and ongoing watershed and vegetation management. Watershed and aquatic restoration would proceed at current levels, though watershed restoration is not the primary focus of forest plan direction as amended by PACFISH and INFISH. Current management direction includes forest and regional strategies for watershed protection and passive restoration. The emphasis on watershed protection and restoration would be less than it would be for the action alternative.

Under the No Action alternative, watershed conditions would be maintained or improved at current rates; however, at slower rates (fewer watersheds in improving condition) compared to the action alternative and its accelerated restoration levels (amount and intensity of projects would be more). Furthermore, not only would the Forest continue to implement a small aquatic restoration program, it would miss out on opportunities for the Aquatic Restoration Program to be integrated into the Forest's Accelerated Vegetation Restoration program as it moves across the landscape. Also, the Forest would not be prepared to take advantage of many of the funding opportunities currently available to implement essential watershed restoration projects that would aid in the recovery of threatened, endangered, and sensitive species and habitat and put watersheds back on an improving trajectory.

The level of risk associated with watershed conditions, species and habitats would be higher with this alternative since the amount and intensity of aquatic restoration would be less. Furthermore,

bull trout would also be at a higher risk of extirpation (climate change, low viability, degraded baseline conditions, threats from brook trout hybridization and competitions) as it is assumed that less aquatic restoration would occur with the No Action alternative.

Forest Management of Vegetation and Roads (in relation to stream function and flow)

Not implementing any management activities addressed in the proposed action (non-commercial thinning in conjunction with juniper removal and prescribed burning) the current conditions within these subwatersheds could potentially degrade. This is due to increasing high canopy densities; juniper encroachment; and lack of fire, which results in decreased shrub and grass density decreasing soil cover and infiltration rates. Because of decreased soil cover and infiltration rates, increased overland flow and soil erosion often occur. Therefore, there is a potential loss of water available for stream flow during dry summer months due to unusually high amounts of water that are lost to overland flow and/or evapotranspiration due to high canopy densities and encroaching juniper. If current conditions degrade in reference to uplands, then habitat for aquatic species could also degrade, not meeting the need of protection and improvement of aquatic and terrestrial habitat. Furthermore, by perpetuating unusually high stand densities the probability for catastrophic fire increases. A catastrophic fire has the potential to decimate aquatic resources by leaving no shade adjacent to the streams (increased stream temps), and denuding subwatersheds of vegetation thereby leaving exposed soils (increased sediment in streams).

By not decomisioning closed roads, the drainage network of a stream significantly increases. Roads directly affect the channel morphology of streams by accelerating erosion and sediment delivery and by increasing the magnitude of peak flow. Indirectly, if current conditions degrade then habitat for aquatic species will also degrade. The more roads and stream crossings there are, the higher the probability of sediments delivery to streams, negatively affecting the hydrologic function. In addition, roads affect the hydrograph and drainage density, increasing peak flows and decreasing low flows. This alternative does not meet the need for protection and improvement of aquatic habitat.

By not implementing any management activities addressed in the proposed action there is potential for the current conditions to degrade. Riparian vegetation, bank stability and therefore stream type could degrade because of high tree and road densities. Increasing magnitude of peak flows could cause the stream channel to incise thus creating unstable banks, altering riparian vegetation, and changing the functioning stream type to one that does not function appropriately. Riparian vegetation would reflect conditions that are suited towards a dryer climate such as grasses and sage. Grass and sage species have less root mass than riparian species and therefore do not have the ability to stabilize the incised streambanks. Consequently, the No Action alternative would be detrimental to the aquatic habitat and aquatic species. If current conditions degrade, then habitat for aquatic species will also degrade.

Alternative 2 – Proposed Action

The Forest proposes aquatic restoration on those private and public lands within the boundary of the Malheur National Forest and or adjacent lands where restoration activities would benefit or help achieve Forest Service aquatic restoration goals.

Direct and Indirect Effects

The majority of the effects and indicator descriptions that follow were taken directly from the Aquatic Restoration Biological Assessment (2013). The effects of restoration activities are

described in context of the Matrix of Pathways and Indicators (MPI) developed by FWS and NOAA Fisheries (1999).

Each of the aquatic restoration categories listed within the proposed action may have varying degrees of direct and indirect effects to aquatic Endangered Species Act-listed species and their critical habitat and essential fish habitat as well as to Forest sensitive and management indicator species. Direct effects cause an immediate impact. Indirect effects are those effects that occur later in time. Effects of most concern under this analysis are those resulting from short-term habitat removal or degradation or impacts that cause changes to species' growth, reproduction, and survival. The aquatic conservation measures and project design criteria are intended to minimize potential adverse direct and indirect project effects to Endangered Species Act/Magnuson-Stevens Act listed species, critical habitat, and essential fish habitat, sensitive species and management indicator species.

Effects of the Proposed Action on the Resource Indicators

The following discussion presents the effects of the proposed activities on individual indicators. The proposed action activities are intended to 'Enhance' conditions at the site scale and move a 5th field watershed baseline towards a 'Restore' rating over the long-term. All of these actions may result in some degree of short-term adverse effects to fish or their habitat.

1. **Water Quality Pathway**
   a. **Indicator Description –** The description of the following three pathway indicators provides the ways in which they serve as essential ecological functions necessary for the overall viability of fish stocks: Water Temperature, Sediment/Turbidity, and Chemical Contamination/Nutrients.
      i. **Water Temperature –** Water temperatures affect the survival and production of fish throughout all life stages. For instance, a study of Chinook salmon survival from fertilization to hatching demonstrated that those eggs incubated at 15.0˚C had a 23% survival rate while those incubated at 9.9 and 11.4˚C had a 49 and 50% survival rate, respectively (Garling and Masterson 1985). In Chum salmon, embryo survival was demonstrated to be highest at 11˚C (Murry and McPhail 1988), hatching success of rainbow trout reaches its maximum at 10-12˚C (McCullough 1999), and preferred temperatures for bull trout ranges are 2-4˚C (McPhail and Murray 1979). Next, changing water temperatures affect juvenile fish. Cairns et al. (2005) documented that increased temperatures in an Oregon stream resulted in higher neacus-type trematode infestations of juvenile salmonids. Further, juvenile (fry, fingerling, parr) Chinook demonstrate optimum growth between 10.0-15.6˚C (Armour 1990), while growth drastically declines or ceases at 19.1˚C (Armour 1990) and is accompanied by decreased feeding, increased stress, and warm water diseases. Juvenile bull trout are usually found in water temperatures below 12˚C (Goetz 1994). Finally, at a certain point, temperatures become lethal for all fish. McCullough (1999), citing numerous studies, stated that temperatures above 21˚C equal or exceed incipient lethal temperatures for Columbia River Chinook stocks and steelhead stocks migrating during the summer season. The best bull trout habitat in Oregon streams seldom exceeded 15˚C (Buckman et al. 1992; Ratliff 1992; Ziller 1992). Modoc suckers are typically found in streams with relatively cool (59-72° F) summer temperatures (Moyle 2002), and the Warner sucker spawns most frequently when stream temperatures range between 14-20˚C (USDI 1998c).
      ii. **Turbidity –** Increased levels of sedimentation often have adverse effects on fish habitats and riparian ecosystems. Fine sediment deposited in spawning gravels

can reduce egg survival and developing alevins (Everest et al. 1987; Hicks et al. 1991) by reducing the availability of dissolved oxygen in the gravel. Primary production, benthic invertebrate abundance, and thus, food availability for fish may be reduced as sediment levels increase (Cordone and Kelley 1961; Loyd et al. 1987) due to reductions in photosynthesis within murky waters. Social (Berg and Northcoate 1985) and feeding behavior (Noggle 1978) can be disrupted by increased levels of suspended sediment. Pools, which are an essential habitat type, can be filled by sediment and degraded or lost (Kelsey et al. 1981; Megahan 1982). Robichaud et al. (2010) documented that sediment influxes into streams, which create turbidity, were lower in natural (undisturbed) forests relative to disturbed sites created by land management activities. Reeves et al. (1995) describe that sediment influxes and resulting turbidity occurs through naturally occurring landslides in western Oregon.

iii. **Chemical Contamination/Nutrients –** Aquatic ecosystem perturbations related to chemical contamination include thermal pollution, toxicity due to organic compounds and heavy metals, organic wastes and resulting changes in dissolved oxygen, acidification, and increased eutrophication. Sources of these chemical inputs commonly result from industry, urban development and agriculture. It is clear from the growing body of literature that salmon may influence the food webs, trophic structure, nutrient budgets, and possibly the productivity of freshwater and terrestrial systems, although the effect varies widely between systems and is contingent upon timing, scale, retention mechanisms, alternative nutrient sources, and baseline limiting factors (Gende et al. 2002). Reduced inputs of salmon-derived organic matter and nutrients (SDN) may limit freshwater production and thus establish a negative feedback loop affecting future generations of fish. Restoration efforts use the rationale of declining SDN to justify artificial nutrient additions, with the goal of reversing salmon decline. Biological responses to this method have also been documented (Roni et al. 2002). Elevated primary production and density of invertebrates have been associated with carcass additions (Wipfli et al. 1999). Kohler et al. (2012) documented that invertebrate productivity and fish growth increased after a carcass analog treatments in several Columbia River Basin streams. While evidence suggests that fish and wildlife may benefit from increases in food availability as a result of carcass additions, stream ecosystems vary in their ability to use nutrients to benefit salmon. Moreover, the practice may introduce excess nutrients, disease, and toxic substances to streams that may already exceed proposed water quality standards (Compton 2006).

b. Long-term Benefits of the Proposed Action to the Water Quality Pathway – The ARBA II Team (BLM, FS, BIA, FWS, NMFS) determined that numerous ARBA II activity categories will provide immediate and long-term benefits to Water Quality conditions: Large Wood, Boulder, and Gravel Placement; Dam, Tidegate, and Legacy Structure Removal; Channel Reconstruction/Relocation; Off- and Side-Channel Habitat Restoration; Streambank Restoration; Set-back or Removal of Existing Berms, Dikes, and Levees; Reduction/Relocation of Recreation Impacts; Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering; Piling and other Structure Removal; Road and Trail Erosion Control and Decommissioning. Other ARBA II activity categories may not provide immediate benefits but will provide long-term benefits to Water Quality conditions: Juniper Removal; Riparian Vegetation Treatment (controlled burning); Riparian Vegetative Planting; Beaver Habitat Restoration.

In general, the aquatic restoration categories listed above will improve or restore one or more of the following: stream structure/complexity, stream sinuosity and length, bank stability, floodplain connectivity, and riparian vegetation structure and diversity. Such results will promote conditions that maintain or decrease stream temperature (via increased shading and hyporheic flow), reduce turbidity (via stable banks, improved sediment retention through increased channel structure, riparian areas, and floodplains), and improved nutrient input (via increased riparian allocthonous sources) and retention (via increased channel structure, sinuosity, and floodplain areas).

Short-term Negative Impacts of the proposed activities to the Water Quality Pathway – As described above, ARBA II activity categories are expected to benefit the Water Quality Pathway. In acquiring these benefits, short-term negative impacts are expected. Such effects will be minimized by incorporating Aquatic Conservation Measures (ACM) and Project Design Criteria (PDC) described above and can also be found in the Aquatic Restoration Biological Assessment II (January 28, 2013) in Chapter II; project design, implementation, and monitoring.

The ARBA II Team determined that all activity categories (except Fisheries and Hydrology, Geomorphology Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration categories) are known to increase short-term sediment loads into a stream channel during project implementation. Increased sediment loads would result from the use of large equipment within or near a stream channel and soil exposure through controlled burning, causing soil disturbance and transport within the stream system. The ARBA II Team also concluded that these activities are unlikely to have negative impacts to stream temperatures because only minimal amounts of vegetation will be removed. For instance, Riparian and Upland Juniper Treatment (non-commercial), and Riparian Vegetation Treatment (controlled burning) will result in reduced shade on a limited basis and in such a manner as to have discountable impacts to water temperature; these impacts will be ameliorated through growth of desired riparian vegetation. Further, the ARBA II team determined that the General Aquatic Conservation Measures will minimize or prevent chemical contamination to action area waters. Therefore the following analysis will focus on activity impacts to the Turbidity Indicator.

Short-term inputs of sediment could result from instream structure placement, opening of side channels, road treatments, and other projects that occur inside the bankfull channel. Other sources of sediment will arise from disturbed and exposed ground adjacent to stream channels created by heavy equipment use and moderate-severity controlled burns. The sediment plume will be most concentrated in the immediate project vicinity and should dissipate within a few hours. The amount, extent, and duration of fine sediment inputs and turbidity are related to the following: type and duration of heavy machinery used in or near a bankfull channel; soil type; the amount of soil disturbance; the sensitivity of the channel banks to erosion and other disturbances; the amount of time it takes for disturbed areas to re-vegetate and stabilize; and the probability of precipitation events before disturbed areas are re-vegetated or stabilized.

The increased stream turbidity may deposit fine coats of sediment on channel substrate a short distance downstream, encourage fish to move downstream, and alter fish behavior patterns for a short time. Because the work will be conducted during the in-water work periods (a time when spawning is not expected and after

emergence of fry), the project should not interfere with spawning, egg development, and the sac fry life stage. In cases of fall-spawning fish, the fine layer of sediment deposited on channel substrate will be cleared away as the fish construct redds. It is anticipated that all project related sediment will be flushed out during the first fall/winter/spring high flows after project completion, and site restoration conservation measures are expected to prevent future project related sediment inputs into the stream. Therefore, long-term impacts to turbidity and spawning gravels are not expected.

2. Habitat Access Pathway

a. Indicator Description – The description of the following pathway indicator provides the ways in which it serves as an essential ecological function necessary for the overall viability of fish stocks: Physical Barrier.

i. **Physical Barriers –** Human constructed physical barriers within the stream channel, such as culverts, headcuts, irrigation weirs, and dams can impair sediment and debris transport, migration routes, life history patterns, and population viability. First and second order streams, which generally include permanently flowing non-fish bearing streams and seasonally flowing or intermittent streams, often comprise over 70 percent of the cumulative channel length in mountain watersheds in the Pacific Northwest (Benda et al. 1992). These streams are the sources of water, nutrients, wood, and other vegetative material for streams inhabited by fish and other aquatic organisms (Swanson et al. 1982; Benda and Zhanag 1990). Decoupling the stream network (through physical barriers) can result in the disruption and loss of functions and processes necessary for creating and maintaining fish habitat. Further, physical barriers prevent the movement of fish in their fulfillment of life history functions. Culverts, for instance, prevent juvenile fish from reaching rearing habitats (Furniss et al. 1991) and have blocked significant amounts of historical anadromous salmonid habitat (Roni et al. 2002; Sheer and Steel 2006). Even more, barriers restrict the expression of various life history forms within a species. Migratory movements of fluvial or adfluvial forms of bull trout, for example, can be restricted or prevented, and such a loss of life history forms restricts the full potential of fish production. Finally, strong populations rely on unimpeded access between watershed reserves, those areas of high quality habitat occupied by viable subpopulations, for dispersion and genetic interchange (Noss et al. 1997).

b. **Long-term Benefits of ARBA II Activities to the Habitat Access Pathway –** Two ARBA II activity categories, both of which contain subcategories, will restore fish passage into previously occupied habitat for all life stages of native fish. The Fish Passage Restoration category contains four sub-categories: Fish Passage Culvert and Bridge Projects; Headcut Stabilization and Associated Fish Passage; Fish Ladders; Irrigation Diversion Replacement/Relocation and Screen Installation/Replacement. The Dam, Tidegate, and Legacy Structure Removal category contains two subcategories that will target fish passage restoration: Dam and Tidegate removal. The resulting benefits include uninhibited stream access for migrating and rearing fish, restored or improved continuous paths for wood, nutrients, sediments, and other vegetative material essential for quality fish habitat.

Short-term Negative Impacts of ARBA II Activities to the Habitat Access Pathway – As described above, ARBA II activity categories are expected to benefit Habitat Access. In acquiring this benefit, short-term negative impacts are expected. Such effects will be minimized by incorporating Aquatic Conservation Measures

(ACM) and Project Design Criteria (PDC) described above and can also be found in the Aquatic Restoration Biological Assessment II (January 28, 2013) in Chapter II; project design, implementation, and monitoring.

The ARBA II Team determined that the aforementioned activities described above may temporarily restrict habitat access during project implementation. Coffer dams and water bypass systems associated with these activities may temporarily block (few weeks) fish movement up and/or downstream through the construction area. Up and downstream fish movement will be permitted with ditch bypass systems, downstream fish movement is provided with plastic-culvert bypass structures, and no fish movement is provided with pump bypass systems. Because road crossings, dams, irrigation diversions, tidegates, and headcuts to be repaired serve as existing fish-passage barriers, coffer dams and diversion structures may not be any more of a barrier than the pre-restoration baseline. The remaining activity types are not expected to result in barriers to fish movement during any life stages and will therefore have no negative impacts to this indicator.

3. Habitat Elements Pathway

a. **Indicator Description –** Descriptions of the following five indicators provide the ways in which each indicator serves as an essential ecological function necessary for the overall viability of fish stocks: Substrate/Sediment; Large Wood; Pool Frequency and Quality; Off-channel Habitat; Refugia.

i. **Substrate/Sediment** (excerpts from Rieman and McIntyre 1993) – This indicator is similar to "Sediment" in that it addresses fines and their effects on fish habitat. Unlike "Sediment," which addresses spawning and incubation, the substrate indicator assesses fines and their effects on rearing habitat within channel substrate. The NMFS (1996) notes that rearing capacity of salmon habitat decreases as cobble embeddedness levels increase, resulting from increased sedimentation. Furthermore, over wintering rearing habitat within substrate may be a limiting factor to fish production and survival, and the loss of this over wintering habitat may result in increased levels of mortality during rearing life stages. Likewise, when the percent of fine sediments in the substrate was relatively high, rearing bull trout were also less abundant.

ii. **Large Wood (LW) –** Large wood in streams is an important roughness element influencing channel morphology, sediment distribution, and water routing (Swanson and Lienkaemper 1978; Bisson et al. 1987). Common sources of large wood include falling of dead trees, wind-throw and breakage, and landslides (Johnston et al. 2011). Latterell and Naiman (2007) observed that the primary source of in-stream wood on the Queets River in Washington was from channel meandering and bank erosion through riparian areas. Large wood influences channel gradient by creating step pools and dissipating energy (Heede 1985), lengthens streams by increasing sinuosity (Swanston 1991), and serves as an important agent in pool formation (Montgomery et al.1995; Reeves et al. 2011). In low order streams, in particular, LW collects sediment and larger substrates during high flow events (Keller et al. 1985) and can account for 50% of the sediment/substrate storage sites (Megahan 1982). Further, LW is instrumental in nutrient retention by capturing and storing salmon carcasses (Cederholm and Peterson 1985; Strobel et al. 2009) and allochthonous materials, a primary energy source for smaller rivers and streams (Gregory et al. 1991). The resulting effect of LW on fish habitat is significant. Crispin et al. (1993) noted increased salmon spawning activity in an area where gravels accumulated behind LW. Bjornn and

Reiser (1991) cited several studies that documented an increase in fish densities with higher levels of LW, and Fausch and Northcote (1992) documented that Coho salmon and cutthroat trout production was greater in LW-dominated streams, where pools, sinuosity, and overhead cover were greatest. The role of LW decreases as streams become larger, because greater currents will carry LW out of the active channel and onto the banks (Murphy and Meehan 1991).

iii. **Pool Frequency and Quality –** Pools are considered to be one of the most important habitat elements and are the preferred habitat type by most fish (Bestcha and Platts 1986), offering low velocity refuges, cooler stream temperatures during summer months, and overwintering habitat (Reeves et al. 1991). Salmonid density is positively correlated to pool volume and frequency; pool loss reduces the production capability of salmonid habitat (Everest et al. 1985; Sedell and Everest 1990; MacDonald et al. 1991; Nickelson et al. 1992a; Fausch and Northcote 1992; Reeves et al. 2011).

Availability of pools during summer low flow periods can be a limiting factor in survival and production of salmonids (Reeves et al., 1990). In reference to spawning, pool tailouts, where gravel is deposited, are important areas for redd construction, and the pool bodies provide rearing habitat for juveniles and holding habitat for adults (Bjornn and Reiser 1991). Further, Sedell et al. (1990) describes pools as being important refuges from drought, fire, winter icing, and other disturbances. When pool numbers, volume, depth, and complexity increase, the stream's capacity to support a diversity of species and life stages increases (Bisson et al. 1992; Bjornn and Reiser 1991). In general, pool quality is directly related to decreased surface area and increased depth, overhead cover (Fausch and Northcote 1992), presence of LW, and undercut banks, especially in lower gradient streams. Further, pools of all shapes and sizes are needed to accommodate the various life history stages of fish, thereby allowing for juveniles to occupy pools absent of larger predatory fish (Bestcha and Platts 1986).

iv. **Off-channel Habitat –** Off-channel habitats—comprised of alcoves, side channels, freshwater sloughs, wetlands or other seasonally or permanently flooded areas—are important rearing sites for juvenile fish (Roni et al. 2002). Roni et al. (2002) noted that most off channel habitat research focused on coho salmon, noting that juveniles are much more reliant on this habitat type for over-winter rearing and growth than other salmonids, such as cutthroat trout and Chinook salmon. In an Oregon coastal stream, Reeves et al. (2011) noted that side channels comprised 5% of the total habitat but contained 20-60% of the coho fry in the study area.

v. **Refugia –** Refugia, or designated areas providing high quality habitat, either currently or in the future, are a cornerstone of most species conservation strategies. Although fragmented areas of suitable habitat may be important, Moyle and Sato (1991) argue that to recover aquatic species, refugia should be focused at a watershed scale. Naiman et al. (1992) and Sheldon (1998) noted that past attempts to recover fish populations were unsuccessful because the problem was not approached from a watershed perspective. Noss et al. (1997) provides additional information, listing several principals that should be considered when evaluating reserves (refugia). First, refugia should be well distributed across a landscape, the idea being that widely distributed subpopulations will not experience catastrophic or adverse impacts across its entire range. Some subpopulations will escape the impact, eventually re-colonize the affected area, and sustain the population as a whole. Second, large reserves are better than

small ones, because there is a greater opportunity for habitat diversity and larger population size. As a result, genetic variability within a population will be optimized, promoting increased adaptability to environmental change. Thirdly, refugia that are closer together are better than those farther apart. A short distance between refugia promotes dispersion and genetic interchange. If enough interchange occurs between refugia, fish are functionally united into a larger population that can better avoid extinction.

b. Long-term Benefits of ARBA II Activities to the Habitat Elements Pathway – The following activity categories will provide immediate and long-term benefits to one or more of the Habitat Element indicators: Fish Passage Restoration; Large Wood, Boulder, and Gravel Placement; Dam, Tidegate, and Legacy Structure Removal; Channel Reconstruction/Relocation; Streambank Restoration; Set-back or Removal of Existing Berms, Dikes, and Levees; Reduction/Relocation of Recreation Impacts; Piling and other Structure Removal; Road and Trail Erosion Control and Decommissioning. Other ARBA II activity categories may not provide immediate benefits but will provide long-term benefits: Juniper Removal; Riparian Vegetation Treatment (controlled burning); Riparian Vegetative Planting; Beaver Habitat Restoration.

For instance, large wood and boulder placement will enhance habitat elements described in the Large Wood indicator, while Reconnection of Existing Side Channels and Alcoves will increase adult and juvenile rearing habitat as described in the Off-channel Habitat indicator above. Headcut stabilization, bank restoration, and road treatment projects will decrease direct sediment inputs into the stream channel, thereby enhancing conditions for juvenile rearing within channel substrate. Fish Passage Restoration projects will provide access to refugia while all restoration actions within the proposed action will enhance the quality of such refugia.

Short-term Negative Impacts of ARBA II Activities to the Habitat Element Pathway – As described above, restoration activity categories are expected to benefit Habitat Element indicators. In acquiring these benefits, short-term negative impacts are expected. Such effects will be minimized by incorporating Aquatic Conservation Measures (ACM) and Project Design Criteria (PDC) described above and can also be found in the Aquatic Restoration Biological Assessment II (January 28, 2013) in Chapter II; project design, implementation, and monitoring.

The ARBA II Team determined that negative impacts would occur to Substrate/Sediment. Further, the Team determined that all activity categories are known to increase short-term sediment loads into a stream channel during project implementation. Increased sediment loads would result from the use of large equipment within or adjacent to a stream channel, causing soil disturbance and transport within the stream system. The ARBA II Team also concluded that these activities are unlikely to have negative impacts to the remaining indicators of this pathway as ARBA II projects are intended to enhance such indicators. Therefore the following analysis will focus on activity affects to the Substrate/Sediment indicator.

Short-term inputs of sediment could result from instream structure placement, opening of side channels, road treatments, and other projects that occur inside or near the bankfull channel. The sediment plume from activities will be most concentrated in the immediate project vicinity and should dissipate throughout a stream channel within a few hours. The amount, extent, and duration of fine sediment inputs and

turbidity are related to the following: the type and duration of heavy machinery used within or near a bankfull channel; soil type; the amount of soil disturbance; whether restoration is in or out of the wetted channel; the sensitivity of the channel banks to erosion and other disturbances; the amount of time it takes for disturbed areas to re-vegetate and stabilize; and the probability of precipitation events before disturbed areas are re-vegetated or stabilized.

The increased stream turbidity may deposit fine coats of sediment on channel substrate a short distance downstream, encourage fish to move downstream, and alter behavior patterns for a short time. Because the work will be conducted during the in-water work periods (a time when spawning is not expected and after emergence of fry), the project should not interfere with spawning, egg development, and the sac fry life stage. In cases of fall-spawning fish, the fine layer of sediment deposited on channel substrate will be cleared away as the fish construct their redds. It is anticipated that all project related sediment will be flushed out during the first fall/winter/spring high flows after project completion, and site restoration conservation measures are expected to prevent future project related sediment inputs into the stream. Therefore, long-term negative impacts to Substrate/Sediment are not expected.

4. Channel Conditions and Dynamics Pathway

a. **Indicator Description –** The descriptions of the following three pathway indicators provide the ways in which each indicator serves as an essential ecological function necessary for the overall viability of fish stocks: Width/Depth Ratio; Streambank Condition; Floodplain Connectivity.

i. **Width/Depth Ratios –** The width to depth ratio is an index value that helps describe the shape of a stream channel, and is the ratio of bankfull width to mean bankfull depth (Rosgen 1996). Both measurements are based on bankfull flow or its indicators. In short, bankfull flow is the channel forming flow that transports the bulk of available sediment over time. In another way, bankfull flows are those that transport sediment from upstream reaches, forming and removing channel bars, doing the work that forms the morphological characteristics of a channel (Dunne and Leopold 1978). Relatively small width/ depth values are indicative of stream stability, and Rosgen (1996) suggests that width to depth ratios can be used as a surrogate to stream stability. Finally, Bestcha and Platts (1986) state that as width to depth ratios increase, the stream becomes shallower and may result in a loss of pools.

ii. **Streambank Condition –** Streambank condition is related to its ability to dissipate stream power. For many stream channels, riparian vegetation with woody root masses, along with instream debris, serve as physical barriers to erosive and downcutting forces of stream power (Bestcha and Platts 1986). Further, the stems of herbaceous and woody plants, residing on the stream bank, provide additional roughness to dissipate stream power and capture suspended sediments (Elmore and Bestcha 1987). When these roughness elements are removed, however, a streambanks ability to withstand stream power is decreased, resulting in bank erosion, relatively higher width to depth ratios, and possible channel incision. Even if streambanks are in good condition, increased peak flows can damage banks and cause channel incision. Finally, streambanks that are in good condition can provide quality fish habitat through undercut banks and overhanging vegetation (Bestcha and Platts 1986; USDI 1998c).

iii. **Floodplain Connectivity –** Leopold (1994) defines a floodplain as a level area near a river channel, constructed by the river in the present climate and overland

flow during moderate flow events. When a stream can readily access its floodplain during high flow events, the stream will overflow its banks and spread across the floodplain, dissipating stream energy, depositing sediments, accessing side channels. Bestcha and Platts (1986) suggest that for a floodplain to be effective in sorting and capturing flood-born sediment it must have roughness elements, such as trees and other debris. Floodplains or riparian areas adjacent to stream channels serve as water storage sites—water collected from flooding and precipitation—which can increase subsurface flow to the stream channel (Elmore and Bestcha 1987), especially important to augmentation of low stream flows during summer months. Likewise, Tonina and Buffington (2009) note that floodplains that are connected to stream channels result in hyporheic exchange of water, resulting in increased nutrient distribution and increased inundation of floodplain habitats, such as side channels, a habitat type offering refuge to juvenile salmonids during high flow events (Roni et al. 2002).

b. Long-term Benefits of ARBA II Activities to the Channel Condition and Dynamics Pathway – All projects will enhance one or more of the indicators under the Channel Condition and Dynamics Pathway. Each of these projects will occur within the bankfull channel and/or immediate floodplain area and are intended to restore channel, bank, and floodplain areas to more natural conditions. As a result, ARBA II projects are expected to decrease width/depth ratios, improve streambank condition, and/or increase floodplain connectivity.

c. Short-term Negative Impacts of ARBA II Activities to the Channel Condition and Dynamics Pathway – As described above, restoration activity categories are expected to benefit Channel Conditions and Dynamics. In acquiring these benefits, the ARBA II Team determined that activity categories will not result in negative impacts to any of the three pathway indicators as no projects will increase width/depth ratios, decrease streambank condition, and disconnect floodplains.

5. Flow Hydrology Pathway

a. **Indicator Descriptions –** The descriptions of the following two pathway indicators provide the ways in which each indicator serves as an essential ecological function necessary for the overall viability of fish stocks: Changes in Peak/Base Flows and Increase in Drainage Network.

i. **Changes in Peak/Base Flows** – Many riparian wetlands, such as wet meadows, have been damaged by grazing, mining, road construction, and logging in the project area as consistently indicated by field reviews (Beschta et al., 1991). This loss of wetland function has probably contributed to a reduction in summer low flows relative to historic conditions. Although data are sparse, peakflows may occur a week or two earlier in the year in some managed watersheds year than in unmanaged watersheds. McIntosh (1992) found that the annual peakflows currently occur about 2 weeks earlier in the Grande Ronde than historically. Some heavily logged drainages may have increased summer low flows; summer low flow has increased in the some parts of the Grande Ronde over the past 50 years (McIntosh, 1992). However, the increases in low flows do not appear to have improved salmonid survival because the water quality is so poor and stream habitats have been heavily degraded due to upstream logging, grazing, and road construction (Anderson et al., 1993; McIntosh et al., 1994).

ii. **Increase in Drainage Network –** Wemple et al. (1996) documented that 57% of a road system within a watershed, located in the western Cascades of Oregon, was hydrologically connected to the stream network by roadside ditches draining directly into streams and roadside ditches draining into relief culverts with gullies below their outlets. Thus, an increase in road densities led to an associated

increase in drainage density by up to 50%. High-density road systems have been linked to changes in the hydrograph or magnitude and timing of flow events. For instance, in an Oregon Coast Range watershed, Harr et al. (1975) showed that peak flows increased significantly after road building converted at least 12% of the area to road prisms. The causal effects were attributed to increased surface compaction, which reduces water infiltration, resulting in excess water being carried down the road, drainage ditches, and relief culverts into the stream network. Jones and Grant (1996) documented that peak flows increased by 50% in a watershed within a five year period following road construction and logging. The longevity of the hydrologic changes are as permanent as the roads, and until a road is removed and natural drainage patterns are restored, the road will continue to affect the routing of water through a watershed.

b. Long-term Benefits of ARBA II Activities to the Flow/Hydrology Pathway – Numerous ARBA II activity categories will provide immediate benefits to the Flow/Hydrology Pathway: Large Wood, Boulder, and Gravel Placement; Channel Reconstruction/Relocation; Off- and Side-Channel Habitat Restoration; Set-back or Removal of Existing Berms, Dikes, and Levees. Each of these projects will enhance floodplain connectivity, thereby addressing wetland functions described under Peak/base Flows above. Road and Trail Erosion Control and Decommissioning will provide additional benefits in that they will reduce the drainage network, thus addressing issues discussed in the Drainage Network category above.

c. Short-term Negative Impacts of ARBA II Activities to the Flow Hydrology Pathway – As described above, restoration activity categories are expected to benefit Peak/base Flows and Drainage Network categories. In acquiring these benefits, the ARBA II Team determined that activity categories will not result in negative impacts to any of the two pathway indicators as no projects will not disrupt natural peak/base flow patterns or increase the drainage network.

6. Watershed Condition Pathway

a. **Indicator Description** – The descriptions of the following three MPI Indicators provide the ways in which each indicator serves as an essential ecological function necessary for the overall viability of fish stocks: Road Density and Location, Riparian Reserves, and Disturbance History.

i. **Road Density and Location –** Available information consistently indicates that roads are one of the greatest sources of habitat degradation in managed watersheds, especially when they are within riparian zones (Geppert et al., 1984; Furniss et al., 1991). Roads significantly elevate on-site erosion and sediment delivery for the life of the road (Geppert et al. 1984). Studies consistently indicate that roads increase the frequency of mass failures in mountainous terrain (Dunne and Leopold, 1978; Geppert et al., 1984; Furniss et al. 1991). Mass failure volumes from roads are orders of magnitude greater than from undisturbed areas on a per unit area basis (Dunne and Leopold, 1978; Geppert et al., 1984; Furniss et al., 1991). Road crossings cause extreme increases in sediment delivery (Fowler et al., 1987). Roads also disrupt subsurface flows (Megahan, 1972). Roads increase peakflows (King and Tennyson 1984). Roads within riparian zones reduce shading and disrupt LWD sources for the life of the road. These effects of roads degrade habitat by increasing fine sediment levels, reducing pool volumes, increasing channel width and exacerbating seasonal temperature extremes.

ii. **Riparian Areas –** The following discussion was adapted from FEMAT (1993). Riparian areas are those portions of watersheds that are directly coupled to streams and rivers, the portions of watersheds required for maintaining

hydrologic, geomorphic, and ecological processes that directly affect streams, stream processes, and fish habitats. The network of Riparian Reserves—comprised of all stream orders both intermittent and perennial—allow for connectivity of the aquatic ecosystem within a watershed. Riparian areas are shaped by disturbances characteristic of upland ecosystems, such as fire and windthrow, as well as disturbance processes unique to stream systems, such as lateral channel erosion, peakflows, deposition by floods and debris flows. The near-stream riparian areas—floodplains—may contain an increased diversity of plant species and extensive hydrologic nutrient cycling interactions between groundwater and riparian vegetation. This vegetation, ranging from conifers to deciduous hardwoods, provides allochthonous (organic debris) to stream channels and associated aquatic invertebrate communities. Further, riparian vegetation moderates light levels and stream temperature, helps armor stream banks with extensive root systems, and contributes large wood into the stream channel.

iii. **Disturbance History –** Information for this section was acquired from Reeves et al. (1995). Even though the article was directed at anadromous salmonids, the discussion can readily apply to most PNW fish stocks. Riverine-riparian ecosystems within the PNW used by anadromous salmonids naturally experience periodic catastrophic disturbances, which then moved through a series of recovery states over a period of decades to centuries, resulting in a landscape that varies in suitability for salmonids. Disturbance can be categorized as being pulse or press disturbances. A pulse disturbance is one that allows an ecosystem to recover to pre-disturbance conditions, and a press disturbance is one that prohibits an ecosystem from rebounding to pre-disturbance conditions. The dominant pulse disturbances in which the PNW salmonids are adapted to include natural fire regimes, fire related landslides, and floods, all working in concert in a manner that produce habitat patches, varying in quality and quantity. In short, fires would burn through an area, landslides would then transport wood and sediment into the streams, and floods would distribute the sediment and debris throughout stream networks. In the Oregon coast range, the amount of sediment and large wood found in streams could be correlated to occurrence of the last stand replacement fire. This pulse disturbance regime, or varying forms thereof, was altered with the onset of fire suppression and extensive timber harvest. The resulting effects are different from the natural pulse regime in that sediment is transported in the system without wood, the interval between disturbances has been drastically reduced in most cases, and harvest and road construction is widely distributed, resulting in chronic sedimentation across a larger landscape.

b. Long-term Benefits of Restoration Activities to the Watershed Condition Pathway – Several activity categories are expected to provide immediate and long-term benefits to the Watershed Condition Pathway: Dam, Tidegate, and Legacy Structure Removal; Channel Reconstruction/Relocation; Off- and Side-Channel Habitat Restoration; Streambank Restoration; Set-back or Removal of Existing Berms, Dikes, and Levees; Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering; Road and Trail Erosion Control and Decommissioning. Other ARBA II activity categories may not provide immediate benefits but will provide long-term benefits: Juniper Removal; Riparian Vegetation Treatment (controlled burning); Riparian Vegetative Planting; Beaver Habitat Restoration.

All of these activities will promote growth of riparian vegetation, thus improving riparian conditions as described under the Riparian Area category. Road treatment projects will reduce the potential for negative impacts as described in the Road

Density and Location category as well as restoring processes that would occur under a more natural disturbance regime. Riparian Vegetation Treatment (controlled burning) is intended to mimic and promote the recovery of fire-based natural disturbance regimes, while Road and Trail Erosion Control and Decommissioning projects will help transform disturbance regimes from a press to a pulse regime.

c. **Short-term Negative Impacts of ARBA II Activities to the Watershed Conditions Pathway** – proposed action activity categories are expected to benefit Watershed Condition indicators. It is anticipated that no adverse effects are expected to occur to the three indicators as no projects will increase road density, increase press disturbance regime processes, or degrade riparian conditions.

Cumulative Effects

Cumulative Effects (No Action)

By selecting the no action Alternative there is a potential to have negative impacts to aquatic resources (See Environmental Consequences; No Action) however, there are no considerable direct or indirect effects expected and therefore no cumulative effects to Watershed and Fisheries resource indicators.

Cumulative Effects of All Action Alternatives

Cumulative effects are the result of incremental impacts of the proposed actions/alternative when added to other past, present, and reasonably foreseeable actions, both on National Forest System lands and adjacent federal, state, or private lands (40 CFR 1508.7). The baseline for cumulative effects analysis is the current condition as described previously in the affected environment section.

All restoration activity categories (except for fisheries, hydrology, geomorphology wildlife, botany, and cultural surveys in support of aquatic restoration activity categories) would result in short-term negative impacts to the turbidity and substrate/sediment indicators in proximity to sensitive species, management indicator species, listed fish species and within designated critical habitat.

Table 15 Resource indicators most likely to contribute to cumulative effects

Resource pathway	Resource indicator	Project-related categories that have short term negative effects (less than 1 years)	Examples of Anthropogenic Disruptions	Activity Category to address Disruptions	Direction in addressing Ecological Processes Long-term Benefits and Goals (USDA and USDI 1994)
Water Quality/ Habitat Elements	Sediment	#'s 1-16	Road Networks; Dams; Altered Fire Regime (juniper expansion); Past Silvicultural Practices; Livestock Grazing	1,2,3,4,5, 11,14, 16	Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

A long list of forest wide projects are scheduled to occur in 2014 and beyond that would be concurrent with the proposed action. These projects include but are not limited to: prescribed burning, plantation thinning, replacing road culverts, road decommissioning, snow park

relocation, aspen release, juniper thinning, toilet replacement, commercial timber harvest, parking lot paving, gate replacement, and demolition of a structure by explosion, fencing and other various and related activities.

Based on this analysis and professional judgment, potential project effects would represent a very small percentage of the total (cumulative) from all actions combined. Natural background seasonal fluctuation along with sediment/turbidity effects from other actions (e.g., roads, timber harvest, grazing) exceed any potential production from the proposed restoration activities. Sediment production from project actions could add to sources derived from other actions on National Forest System lands, tribal lands, state and county lands, private forestry lands, rangelands, utility corridors, road rights-of-way, and private property.

Within specific 6th field sub-watersheds where project-related sediment/turbidity effects could potentially exceed the 'discountable' threshold, effects are low magnitude and short term. Streams listed (303(d)) (see Affected Environment, this section) for sediment/bio criteria within the project area are not expected to incur any detectable long-term sediment additions from project activities; spatially isolated short-term sediment effects would be limited to low-magnitude turbidity increases. The short-term effects of this project would generally occur during the instream work-window, and are also not to the extent that would combine with ongoing human activities or foreseeable projects on the Forest and produce long-term, cumulative impacts.

Overall, it is assumed that the temporary and short-term effects from restoration activities would not compromise the benefits of restoration, and thus, water quality (sediment and temperature) across the Forest is expected to improve as projects are implemented to restore healthy, functioning watersheds and their associated aquatic ecosystems.

Regulatory Framework

- Land and Resource Management Plans
  - All proposed activity categories comply with the Forest Plans as amended by the Record of Decision and Standards and Guidelines of the INFISH (USDA and USDI 1995a), PACFISH (USDA and USDI 1995b).
- National Forest Management Act
  - Use of water quality and other resource protection best management practices in National Forests are required by the National Forest Management Act, and prescribed in the Forest Plans. Consequently, all land management activities, must be implemented using best management practices for control of non-point source water pollution (USDA 2011).

Federal Law, Consultation

- Endangered Species Act of 1973
  - All proposed activity categories are consistent and comply with the Endangered Species Act of 1973, and Endangered Species Act consultation on this project was completed in 2013. (Aquatic Restoration Biological Opinion, 2013).
- Anti-degradation Environmental Protection Agency policy 40 C.F. R. Section 131.12
  - This policy states that existing water quality, even when it exceeds required levels for stated beneficial uses, will be maintained.
- Clean Water Act and the Water Quality Act
  - This project is also consistent and compliant with the Clean Water Act, 1977 and the Water Quality Act of 1987. Potential effects of the proposed action do not constitute a significant degradation of quality or impair existing beneficial uses, either through

surface runoff of sediment and chemicals or chemicals entering water bodies through groundwater sources.

State and Local Law

- Regional Water Quality Control Board Requirements
- Federal Permits, Licenses, or Other Entitlements (Army Corps of Engineers and Oregon Division of State Lands)

Summary

Federally Listed Fishes and their Designated Critical Habitat

For federally listed species (steelhead, bull trout) and essential fish habitat (Chinook salmon), the potential for adverse effects was determined to exist, specifically for the resource indicator - Sediment. Although effects (sediment/turbidity) from these activities are expected to be minor and short term, they could exceed the 'discountable' threshold, and are therefore likely to adversely affect fish and their designated habitat. Consultation was completed with U.S. Fish and Wildlife Service and the National Marine Fisheries Service in 2013 for all of the proposed restoration project categories.

Forest Service Sensitive Species

A biological evaluation was completed for forest service sensitive species. Forest Service Sensitive species (redband trout and mussel) exhibit largely overlapping ranges and similar vulnerability to effects with the federally listed fishes; therefore, the following determination applies: 'May impact individuals, but is not likely to cause a trend toward federal listing or loss of viability' within the planning area.

Forest Service Management Indicator Species

Forest Service management indicator species overlap the distribution of federally listed fishes, and exhibit similar vulnerability to effects. In summary, there would be no reduction in quantity (miles) of stream habitat due to project actions. Habitat quality may be slightly reduced in the short-term due to post-implementation sediment input resulting from restoration activities. This potential effect would occur within a fraction of available habitat; therefore, the following determination applies: 'May impact individuals, but is not likely to cause a trend toward federal listing or loss of viability within the planning area.' In the long term, near-stream conditions would be improved as restoration actions are completed.

Table 13 displays proposed, endangered, threatened, and sensitive species, their status, their occurrence in the analysis area, and the effects determination.

Table 16 Determination of Effects on Aquatic Species for the Malheur and Ochoco National Forests

Species / Scientific Name	Status	Occurrence	Effects Determination
Columbia River Bull Trout *Salvelinus confluentus*	Threatened	Species documented in general vicinity of project activities	May Effect, Likely to Adversely Affect
Columbia River Bull Trout Salvelinus confluentus	Designated Critical Habitat	Habitat documented or suspected within the analysis area or near enough to be impacted by project activities	May Effect, Likely to Adversely Affect
Mid-Columbia River Steelhead	Threatened	Species documented in general vicinity of project	May Effect, Likely to Adversely Affect

Species / Scientific Name	Status	Occurrence	Effects Determination
Oncorhynchus mykiss ssp		activities	
Mid-Columbia Summer Steelhead Oncorhynchus mykiss	Designated Critical Habitat	Habitat documented or suspected within the analysis area or near enough to be impacted by project activities	May Effect, Likely to Adversely Affect
Interior Redband Trout Oncorhynchus mykiss ssp.	Sensitive	Species documented in general vicinity of project activities; Habitat documented or suspected within the analysis area or near enough to be impacted by project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species
Westslope cutthroat trout Oncorhynchus clarkia lewisi	Sensitive	Species documented in general vicinity of project activities; Habitat documented or suspected within the analysis area or near enough to be impacted by project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species
Brook Trout Salvelinus fontinalis	Sensitive	Species documented in general vicinity of project activities; Habitat documented or suspected within the analysis area or near enough to be impacted by project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species
Western Ridged Mussel Gonidea angulata	Sensitive	Species documented in general vicinity of project activities; Habitat documented or suspected within the analysis area or near enough to be impacted by project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species
Shortface Lanx Fisherola nuttalli	Sensitive	Species suspected in general vicinity of project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species
Harney Basin duskysnail Colligyrus depressus	Sensitive	Species suspected in general vicinity of project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species
Columbia clubtail Gomphus lynnae	Sensitive	Species suspected in general vicinity of project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species
Columbia spotted frog Rana luteiventris	Sensitive	Species documented in general vicinity of project activities	May Impact Individuals or Habitat, but will not likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the

Species / Scientific Name	Status	Occurrence	Effects Determination
			Population or Species
Chinook Salmon Oncorhynchus tshawytscha	Magnuson-Stevens Act Designated Critical Habitat	Species documented in general vicinity of project activities; Habitat documented or suspected within the analysis area or near enough to be impacted by project activities	Adverse Effects on Essential Fish Habitat

Wildlife

The U.S. Department of Interior Fish and Wildlife Service provides a list of threatened, endangered, proposed, and sensitive species that have the potential to occur in Grant and Harney Counties for consideration in analysis (USFWS 2012). Some projects may be carried out in designated or proposed critical habitat for Threatened or Endangered species in the affected subwatersheds. No proposed species or proposed critical habitat occurs in the analysis area at this time.

The management direction in the Forest Plans for the analysis area includes General Forest (1), and Riparian Habitat Conservation Areas.

- *General Forest* – Manage for timber production and other multiple uses on a sustained yield basis.
- *Riparian Habitat Conservation Areas* – Manage riparian areas to protect and enhance their value for wildlife, resident fish habitat, and water quality. Manage timber, grazing, and recreation to give preferential consideration to riparian-dependent species on that portion of the management area deemed suitable for those management activities. Design and conduct management in all riparian areas to maintain or improve water quality and beneficial uses.

Species Considered and Evaluated

There are 20 species on the 2011 Regional Forester's Sensitive Species list that occur on the Malheur National Forest (see foot note below). However, only seven species have potential habitat in the proposed project area and warrant further analysis. These include the Gray Wolf (*Canis lupus*), California Wolverine (*Gulo gulo luscus*), Lewis's Woodpecker (*Melanerpes lewis*), White-headed Woodpecker (*Picoides alborarvatus*), Fringed Myotis (*Myotis thysanodes*), Johnson's Hairstreak (*Callophrys johnsoni*), and Townsend's Big-Eared Bat (*Corynorhinus townsendii*). The Fisheries and Hydrology section addresses the Columbia Spotted Frog and therefore will not be discussed further here.

Table 14 below describes threatened, endangered, and sensitive species considered in the analysis of the Aquatics restoration project.

Table 17 Species Occurrence for Threatened, Endangered, Proposed and Regional Forester's Sensitive Species

Common Name *Scientific Name*	Status	Occurrence
Gray Wolf (outside NRM) *Canis lupus*	Endangered/Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Gray Wolf (NRM) *Canis lupus*	Sensitive, Federally Delisted	**Habitat Documented** or suspected within the analysis area or near enough to be impacted by project activities, Species **Not documented** and not suspected in in general vicinity of project activities
North American Wolverine *Gulo gulo luscus*	Sensitive, Proposed for Federal Listing	**Habitat Documented** or suspected within the analysis area or near enough to be impacted by project activities, Species **Not documented** and not suspected in in general vicinity of project activities
White-headed Woodpecker *Picoides albolarvatus*	Sensitive	**Habitat Documented** or suspected within the analysis area or near enough to be impacted by project activities, Species **Suspected** in general vicinity of project activities

Common Name ***Scientific Name***	**Status**	**Occurrence**
Lewis's Woodpecker *Melanerpes lewis*	Sensitive	**Habitat Documented** or suspected within the analysis area or near enough to be impacted by project activities, Species **Suspected** in general vicinity of project activities
Bufflehead *Bucephala albeola*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Bobolink *Dolichonyx oryzivorus*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Silver-bordered Fritillary *Boloria selene*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Canada Lynx[2] *Lynx canadensis*	Federally Threatened	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Pygmy Rabbit *Brachylagus idahoensis*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Greater Sage Grouse *Centrocercus urophasianus*	Sensitive, Candidate species under Endangered Species Act	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Upland Sandpiper *Bartramia longicauda*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Grasshopper Sparrow *Ammodramus savannarum*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Wallowa Rosy Finch *Leucosticte tephrocotis wallowa*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities
Fringed Myotis *Myotis thysanodes*	Sensitive	**Habitat Documented** or suspected within the analysis area or near enough to be impacted by project activities, Species **Suspected** in general vicinity of project activities
Johnson's Hairstreak *Callophrys johnsoni*	Sensitive	**Habitat Documented** or suspected within the analysis area or near enough to be impacted by project activities, Species **Not documented** and not suspected in in general vicinity of project activities
Pallid Bat *Antrozous pallidus*	Sensitive	**Habitat not** within the analysis area or affected by its activities/Species **Not documented** and not suspected in general vicinity of project activities

[2] There is no designated or proposed critical habitat for threatened or endangered terrestrial species in the affected subwatersheds. Based on the National Lynx Survey, the Malheur National Forest falls under the designation of 'Unoccupied Mapped Lynx Habitat' (USFWS Memo 2006).

Common Name *Scientific Name*	Status	Occurrence
Townsends Big-Eared Bat *Corynorhinus townsendii*	Sensitive	**Habitat Documented** or suspected within the analysis area or near enough to be impacted by project activities, Species **Suspected** in general vicinity of project activities

Regulatory Framework

The three principle laws relevant to wildlife management are the National Forest Management Act of 1976, the Endangered Species Act of 1973, and the Migratory Bird Treaty Act of 1918. The following lists direction relative to wildlife:

- The National Forest Management Act requires the Forest Service to manage fish and wildlife habitat to maintain viable populations of all native and desirable non-native wildlife species and conserve all listed threatened or endangered species populations (36CFR219.19).
- The Endangered Species Act requires the Forest Service to manage for the recovery of threatened and endangered species and the ecosystems upon which they depend. Forests are required to consult with the US Fish and Wildlife Service if a proposed activity may affect the population or habitat of a listed species.
- The Migratory Bird Treaty Act established an international framework for the protection and conservation of migratory birds. This act makes it illegal, unless permitted by regulations, to 'pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird.'

Forest Service Manual Direction provides additional guidance: identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (FSM2670.31 (6)). This manual directs the Regional Forester to identify sensitive species for each national forest where species viability may be a concern.

Amendment # 2 established interim wildlife standards for old growth, old growth connectivity, snags, large down logs, and northern goshawks. The Regional Forester has periodically distributed letters clarifying direction in Amendment #2 (Regional Forester, October 2, 1997; October 23, 1997; June 11, 2003).

Additional management direction is provided for conservation of migratory landbirds. This direction is consolidated in the Forest Service Landbird Strategic Plan and further developed through the Partners in Flight Program. The Oregon-Washington Partners in Flight Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000) identifies priority bird species and habitats for the Blue Mountains in Oregon.

Regional Forester's Sensitive Species List (Update): In December 2011, Regional Forester Kent Connaughton released the current Sensitive Species list that includes federally listed, federally proposed, and sensitive species lists.

Methodologies/Assumptions

This section analyzes the potential effects to wildlife species from proposed aquatic restoration activities. A Biological Evaluation was prepared for this analysis (filed in the project file) to satisfy the requirements of Forest Service Manual 2672.4 which requires the Forest Service to

review all planned, funded, executed or permitted programs and activities for possible effects on threatened, endangered, proposed, or sensitive species.

The following sources of information were reviewed to determine which threatened, endangered and sensitive species, or their habitats, occur in the analysis area:

- Regional Forester's Sensitive Species List (2011)
- Forest or District sensitive species databases(s) and the GIS mapping layer(s)
- Oregon Natural Heritage Program, Rare, Threatened, and Endangered Plants and Animals of Oregon
- Analysis area maps and aerial photos

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, observations made during reconnaissance, and non-Forest Service databases and literature. There is a high confidence level that species discussed here in this section are currently present or were present in the recent past.

Data Source

Current management direction for desired conditions for threatened, endangered, proposed and sensitive species on the Forest can be found in the following documents:

- Forest Service Manual and Handbooks (FSM/H 2670/2609)
- National Forest Management Act
- Endangered Species Act
- National Environmental Policy Act
- Malheur and Ochoco National Forest Land and Resource Management Plans (USDA 1990, 1989)
- Recovery Plans (species specific)
- Regional Forester policy and management direction
- The principle policy documents relevant to wildlife management are the Forest Plans (1990, 1989).

Affected Environment

Gray Wolf (*Canis lupus*)

Status - Federal: Delisted east of Highway 395, Endangered west of Highway 395; State: Endangered; Forest Service Region 6: Sensitive

Gray wolves are highly adaptable and use a variety of habitats with a preference for remote areas, which provides refuge from humans and support ungulate prey such as Rocky Mountain elk and mule deer, which Gray wolves feed extensively upon. In unexploited populations, survival of young and population growth are dependent upon availability of food during the rearing season (Jordan et al. 1967, Verts and Carraway 1998). Currently, the major limiting factor to gray wolf populations is human caused mortality and disturbance.

Oregon: In July of 2008, a biologist confirmed the presence of Oregon's first reproducing pack of wolves on the Umatilla National Forest. Oregon Department of Fish and Wildlife confirms a minimum of 64 wolves in 8 packs including 4 breeding pairs for 2013 with individuals dispersed throughout the northeastern portion of Oregon. This is compared with 46 wolves in 6 packs and 6 breeding pairs in 2012.

Malheur National Forest: In 1999, a collared wolf from the experimental, non-essential Idaho population was confirmed near the Middle Fork John Day River, but was captured and returned to Idaho. In 2011 a male wolf, OR 7, crossed the Forest when it left the Imnaha pack located in northeastern Oregon while en route to an area near the Oregon/California border. High road densities and human disturbance are most likely the primary limiting factors affecting wolf viability on the Forest.

Existing Condition
There are 1.7 million acres of available habitat for the gray wolf on the Forest. While wolves may pass through the forest area, there have been no verified sightings or confirmed gray wolf denning or rendezvous sites.

California Wolverine (*Gulo gulo luscus*)

Status - Federal: Proposed for listing; State: Threatened: Region 6: Sensitive

Wolverines are strongly associated with remote mountainous wilderness habitats (Beauvais et. al 2004). Open areas are avoided and the most critical habitat component is the absence of human activity or development. Wolverines prefer higher elevation alpine and mature coniferous forest. The presence of avalanche chutes, boulder fields, and/or large piles of down logs are also important habitat features. In Oregon, the wolverine's diet consists mainly of elk and deer carrion. Wolverines are extremely mobile travelling great distances within large home ranges. The major limiting factor to California wolverine populations is human caused mortality and disturbance.

Oregon: The California wolverine is found in higher elevations of Oregon, including the northern Blue Mountains and the Cascade Mountains. Confirmed sightings have occurred in Oregon, in the Wallowa and Cascade mountains.

Malheur National Forest*:* Presence of wolverine was confirmed with a partial skeleton and tufts of fur found near Canyon Mountain in 1992. Tracks and a possible denning site were found in the Strawberry Mountain Wilderness in 1997. This was seen from aerial observation but never confirmed on the ground. Numerous other unconfirmed sightings have occurred, which indicate portions of the Forest are suitable habitat for wolverine. Suitable habitat consists of areas with low human impacts, low human disturbance, and high deer and elk concentrations such as the Strawberry and Monument Rock wilderness areas, Vinegar Hill-Indian Rock Scenic Area, Dixie Butte and Dry Cabin Wildlife Emphasis Areas, and Shaketable, McClellan Mountain, and Aldrich Mountain Roadless Areas.

Existing Condition
With the proposed aquatic restoration activity proximity to open roads reduces the potential to be occupied habitat. Although source habitat, where local reproduction exceeds mortality, does not exist in the analysis area, suitable dispersal and winter foraging habitat that would serve as connectivity for wolverines may exist.

Lewis's Woodpecker (*Melanerpes lewis*)

Status - Federal (USFWS): Species of Concern; State: Sensitive - Imperiled; Region 6: Sensitive; Management Indicator Species[3, 4]

[3] Management Indicator Species – Primary Cavity Nester
[4] Management Indicator Species – Snags and Down Wood

Lewis's woodpecker inhabits primarily open forest and woodlands; it is distinguished from other woodpecker species by its unique flycatching behavior and distinctive plumage (Marshall et al. 2003). Nesting habitat consists of three distinct types in eastern Oregon: riparian areas with large cottonwoods, open canopied old forest in ponderosa pine, or burned old forest in ponderosa pine (Wisdom et al. 2000). Lewis's woodpecker generally avoids dense forest (Blue Mountains Forest Plan Revision Draft EIS 2011).

Woodpecker abundance is generally higher in post-fire habitat (Blue Mountains Forest Plan Revision Draft EIS 2011). Lewis's woodpecker sightings increased dramatically after the Summit Fire which burned in 1996 along the Middle Fork of the John Day River.

The species is considered a weak excavator and seldom excavates its own nest cavity; instead it relies on cavities created by other woodpeckers (Bock 1970). Lewis's woodpeckers also use natural cavities, or would excavate their own in very soft snags (Blue Mountains Forest Plan Revision Draft EIS 2011). Home ranges are 2.5 acres to 15 acres in size (Johnson and O'Neil 2001). In burned areas, ponderosa pine snags greater than 16 inches diameter at breast height are chosen for nesting. Similar diameter cottonwood snags in riparian areas are selected (Galen 1989).

Oregon: Lewis's woodpecker breeds from southwestern Canada and Montana, south to central California, Colorado, Arizona, and New Mexico. It winters from northern Oregon south to northern Mexico and west Texas. In Oregon, Lewis's woodpecker breeds along the east slope of the Cascades, within the Blue Mountains, and within riparian areas across eastern Oregon (Marshall et al. 2003)

Lewis's woodpecker was added to the Regional Forester's Sensitive Species list in 2008.

Existing Condition
Post-fire habitats for species such as the Lewis's woodpecker occur periodically in random fashion across the Forest. Very little salvage logging occurs on the forest with the latest occurring after the 6,000 acre Parish Cabin fire in 2012. The Parish Cabin salvage only accounted for the removal of 4% of the dead timber within the burn. The 230 acre Cabin Fire burned in 1994; approximately 50 acres of this fire was salvage logged in 1995. Although a few remaining snags still stand, most snags from this fire are currently on the ground. Suitable post fire habitat exists in the Flagtail Fire which burned in 2002. Other large burns within the Strawberry Wilderness have provided post fire habitat for almost 20 years. Lewis's Woodpeckers were found still occupying these sites in 2012. In 2010, Lewis's woodpeckers were also observed within the Soda Bear project area along the border with Antelope Valley. This area was burned as part of the Antelope I and II prescribed burning projects. Some mortality of ponderosa pine occurred as a result of these burns, which may be providing suitable snag habitat.

White-headed Woodpecker (*Picoides alborarvatus*)

Status – Federal: Species of Concern; State: Sensitive - Critical; Region 6[5] : Sensitive

White-headed woodpeckers are associated with Old Forest Single Stratum, i.e., open canopy stands of large mature and over mature ponderosa pine, and less frequently mixed ponderosa and Douglas-fir stands (Burleigh 1972, Ligon 1973, Cannings, 1995, Buchanan et al. 2003). The white-headed woodpecker differs from many of the other primary cavity excavators in its near exclusive selection of mature single stratum ponderosa pine dominated habitats. On the Forest this species relies almost exclusively upon the seeds from large ponderosa pine cones for foraging

[5] Management Indicator Species of Dead and Defective Wood Habitat and Old Growth Habitat

and eats insects gleaned off ponderosa pine trees. White-headed woodpeckers prefer large ponderosa pine snags for nesting; however other tree species used include grand fir, Douglas-fir and aspen. Because of its more limited need and use of snags for foraging, the species snag requirements are less than those required by other primary cavity excavators such as the pileated, downy, and hairy woodpeckers.

Oregon: White-headed woodpeckers are found in the Blue, Ochoco, and Wallowa mountains, as well as the east side of the Cascades. Loss of mature ponderosa pine habitat has resulted in a severe decline of this species in the Blue Mountains of Oregon (Csuti et al. 2001).

Malheur National Forest*:* As with the rest of Oregon, habitat abundance and distribution for white-headed woodpeckers has been reduced or eliminated in the warm dry and hot dry forest types. Past harvest activities have concentrated on removing the large overstory ponderosa pine, western larch and Douglas-fir trees and snags, setting many stands back to younger structural stages. Significant reduction in numbers of large, mature ponderosa pine reduces trees available for nesting and cones for winter food supplies. Fire suppression has increased stocking of understory trees, shifting stand structure from old forest single structure to old forest multi structure. White-headed woodpecker was chosen by the Blue Mountain Land Management Plan Revision Team (the team, Wales et al. 2011 draft) as a focal species to represent the Medium-large trees/Dry forest group. The team determined the current condition viability outcome call for the white-headed woodpecker on the Malheur National Forest and the Blue Mountain Land Management Plan revision planning area is low likelihood of viability. During the summers of 2010 through 2013, formal white-headed woodpecker monitoring conducted on the Forest verified localized breeding in ponderosa pine-dominated habitats on the Blue Mountain Ranger District. However, survey information and population data for the white-headed woodpecker is incomplete.

Existing Condition
On the forest, preferred habitat currently occurs on less than 1% of the landscape. Potential habitat for white-headed woodpeckers is most often associated with the warm dry and hot dry forest types. Historically, 15-55% of warm dry forest types and 20-70% of the hot dry forest types were in stands of Old Forest Single Stratum (OFSS). Old Forest Multiple Stratum (OFMS) stands provide habitat for OFSS associated species to a degree, as long as canopy cover is not too great, and appropriate tree species composition exists, i.e., predominantly ponderosa pine, Douglas-fir and western larch. However, habitat suitability may be low. The areas being considered for aquatic restoration in the warm dry biophysical environments may have the appropriate tree species and composition to be utilized by white-headed woodpecker, although these riparian sites are not likely as preferred as upland OFSS sites.

Fringed Myotis (*Myotis thysanodes*)

Status- Federal: Species of Concern; State: Sensitive–Vulnerable; Region 6: Sensitive

The fringed myotis is well adapted for foraging within the forest as well as forest edge habitats. Its diet consists mainly of beetles and moths but also may prey on non-flying insects, suggesting it gleans prey from vegetation in addition to capturing its prey on the wing. Roosts occur in buildings, underground mines, rocks, cliff faces, and bridges although in the western U.S. and Canada large decadent trees and snags are used as well. Fringed myotis have been documented roosting in a wide variety of tree species and it is likely that structural characteristics (e.g. height, decay stage) rather than tree species play a greater role in selection of a snag or tree as a roost. In general, the long term persistence of North American bat species is threatened by the loss of clean, open water, modification or destruction of roosting and foraging habitat and, for hibernating species, disturbance or destruction of hibernacula (Western Bat Working Group

2012). Current conservation concerns include White-Nose Syndrome, a cold-loving fungus recently identified as *Geomyces destructans*, which is considered the primary causal agent associated with mass mortality rates of bat populations in the eastern United States.

Oregon: In Oregon, this species is rare, with most records of fringed myotis occurring west of the Cascade Mountains in southwestern Oregon and the northeastern corner of the state. (Csuti et al 2001).

Malheur National Forest: Forest Service survey information and population data for the fringed myotis is incomplete and no records exist. Verts and Carraway (1998) report one museum specimen of the fringed myotis from Grant County Oregon on public lands near Keeney Meadows.

Existing Condition
The analysis areas for aquatic restoration provide suitable foraging habitat for the fringed myotis and potential roosting trees occur in those areas.

Johnson's Hairstreak (*Callophrys johnsoni*)

Status - Federal: Sensitive; State: None; Region 6: Sensitive

Johnson's hairstreak habitat is almost entirely restricted to cool, moist, old-growth conifer forests of the Pacific Northwest (Miller and Hammond 2007). Caterpillars feed on dwarf mistletoes that grow on various conifers while adults feed on nectar from various flowering plants (Miller and Hammond 2007). Loss of mature to old-growth forests have contributed to this species decline.

Oregon: This species is found in conifer forests throughout the Pacific Northwest west of the Cascade Mountains and in the Sierra Nevada Mountains in California. However, there is a disjunct population of Johnson's hairstreak in the Hell's Canyon region of northeast Oregon and adjacent Idaho (Miller and Hammond 2007).

Malheur National Forest: In 2010 the Interagency Special Status/Sensitive Species Program conducted field surveys in Oregon and Washington to document presence of Johnson's hairstreak butterfly where species presence is currently unknown but likely based on habitat modeling (Davis and Weaver 2011). Survey efforts focused on high probability of occurrence areas, excluding the Malheur National Forest, which has a moderate probability of occurrence. The current known geographic distribution of Johnson's hairstreak occurs on the neighboring Wallowa-Whitman National Forest and the species is suspected to occur on the Malheur as well.

Existing Condition
The analysis area for the proposed action is suitable habitat for the Johnson's hairstreak.

Townsend's Big-Eared Bat (*Corynorhinus townsendii*)

Status – Federal: Species of Concern; State: Sensitive - Critical; Region 6: Sensitive

The Townsend's big-eared bat occurs in a wide variety of habitat types ranging from sea level to 3,300 meters. Habitat associations include: coniferous forests, mixed meso-phytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Distribution is strongly correlated with the availability of caves and cave-like roosting habitat, including abandoned mines. The Townsend's big-eared bat is a moth specialist, foraging within wooded areas, along edge habitats and near streams. The primary threat to the Townsend's big-eared bat is related to disturbance and/or destruction of roost sites. Timber harvest and loss of riparian habitat further threatens the persistence of this bat.

Distribution
Oregon: The Townsend's big-eared bat has been collected throughout most of the state except in parts of the Blue Mountain Province and in the western part of the Basin and Range Province (Verts and Carraway 1998).

Malheur National Forest: Although bat presence and population data on the Forest is incomplete, Townsend's big-eared bats were detected at three mine sites during surveys in 2009 and 2010.

Existing Condition
The analysis area for the proposed action provides suitable foraging habitat for Townsend's big-eared bat and potential roosting trees occur at these locations.

Environmental Consequences

Potential Effects to Threatened, Endangered, Proposed and Sensitive Species

Threatened, Endangered, Proposed and Sensitive species could be affected by removing danger trees at specific work sites; however, there are expected to be an insignificant number of snags felled. One of the goals of restoration is to maintain trees and snags in riparian zones as these provide shade and future wood inputs to the stream. Some of the proposed actions may occur in designated old growth or replacement old growth timber stands.

Wildlife and invertebrate species that depend on down wood, snags, dwarf mistletoe brooms, dense forest with abundant saplings and small poles, and closed canopy forests for survival and reproduction, would not be detrimentally affected by these projects. In-stream projects would not fragment or decrease connectivity for old growth dependent species.

Direct and Indirect Effects of the Proposed Action for Threatened, Endangered, Proposed and Sensitive Species

The proposed action would largely involve activities within the stream channel, riparian zone and some upland juniper removal. Actions would involve culvert replacement, bridge construction, headcut and grade stabilization, irrigation diversion replacement, Screen relocation or replacement, large wood, boulder and gravel placement, engineered logjams, boulder weirs and vanes, and gravel augmentation.

Gray Wolf
Wolves feed primarily on big-game animals and occasionally on other species. Therefore, actions that affect big game populations could affect wolf survival or productivity. Any wolf inclined to travel in the analysis area would be temporarily displaced by activities associated with that particular site. However, since wolves have not been documented within the analysis area and due to the wide-ranging nature of wolves it is assumed that these chance encounters are remote.

Determination for Wolves is **No Impact (NI)** for the following reasons:

- No populations currently occupy the Forest.
- No denning or rendezvous sites have been identified.
- There is an abundance of prey; that is not a limiting factor

California Wolverine
Any proposed activity areas could be used by wolverines as dispersal habitat for animals dispersing from the Strawberry Wilderness or Canyon Mountain areas (unroaded). The greatest

impacts on wolverines would be increased habitat fragmentation and human presence associated with activities in the analysis area. Additionally, wolverines do not tolerate land-use activities that permanently alter their habitat. Elk and deer distribution, an important food source, would not be altered.

Determination for Wolverines is **No Impact (NI)** for the following reasons:

- No populations currently occupy the forest.
- Project activities would not occur in any roadless areas (suitable habitat)
- While highly unlikely, any wolverines potentially encountered will likely be dispersing individuals and would not remain in the area.

White-headed Woodpecker
The activities associated with this project would not impact preferred White-headed woodpecker habitat. White-headed woodpecker typically prefer dry upland pine sites but are likely to visit riparian habitats briefly for water.

Determination for the White-headed Woodpecker is **No Impact (NI)** for the following reasons:

- The amount of area impacted is inconsequential compared to the total habitat area.
- The majority of proposed activities are outside of White-headed Woodpecker habitat

Lewis's Woodpecker
The activities associated with this project would not impact preferred Lewis's woodpecker habitat. Lewis's woodpecker typically prefer open woodland sites but are likely to visit riparian habitats briefly for water.

Determination for the Lewis's Woodpecker is **No Impact (NI)** for the following reasons:

- The amount of area impacted is inconsequential compared to the total habitat area.

The majority of proposed activities are outside of Lewis's Woodpecker habitat

Fringed Myotis and Townsend's Big-eared Bat
The activities associated with the proposed action would not effect potential roosting habitat for the fringed myotis and Townsend's big-eared bat. Unless classified as a safety hazard, any snags within the riparian area would be preserved. Some trees may be moved from upland sites in order to introduce large wood to any project streams. However, the amount of area altered as a result of removing a few upland trees is inconsequential. Important roosting habitat in the form of caves, rocks, abandoned mines, and buildings would not be altered.

Determination for the Fringed Myotis and Townsend's Big-eared Bat is **May Impact individuals or habitat, but will not likely contribute to a trend in Federal listing or loss of viability to the population or species (MIIH)** for the following reasons:

- The potential exists for the possible removal of snags if deemed a hazard.
- Removal of upland trees for stream placement could possibly impact individuals.

Johnson's Hairstreak
Habitat important for Johnson's hairstreak would not be reduced due to any aquatic restoration projects. Unlike wildfire, aquatic restoration activities would not cause reductions in timber or any dwarf mistletoe present. The amount of area altered by this aquatic proposed action is inconsequential related to levels of mature, old growth forest. Some designated old growth or replacement old growth stands may be located in some potential project locations, or there may be very little large old structure stands in the activity area. Restoration would include activities to re-establish appropriate vegetation at each site. Implementation of the proposed action **May Impact individuals or habitat, but will not likely contribute to a trend in Federal listing or loss of viability to the population or species (MIIH)** for the following reasons:

- Timber harvest is not a planned activity with these projects.
- This project does not include the removal of any potential dwarf mistletoe habitat.

Cumulative Effects

There are no direct or indirect impacts expected to the Gray wolf or its associated habitat from the proposed project. Therefore, there would be no cumulative impact to this species.

All of the activities considered in this project have been considered for their cumulative effects on California wolverine, white-headed woodpecker, fringed myotis, big-eared bat, and Johnson's hairstreak. Past activities including, but not limited to, timber harvest, grazing, recent timber sales, thinning and fuels reduction projects, and plantation maintenance, have impacted the quantity, quality, and distribution of habitat. There has been an extensive level of habitat fragmentation within the analysis area as a result of past activities and the small area that may be impacted as a result of aquatic restoration activities would not likely have cumulative effects to these species. Long term impacts would be positive for these species as the goal of this project to restore and improve aquatic habitats and stream hydrology. The effects of this project on all wildlife species listed in this section when added to all other past, present, and reasonably foreseeable future activities, are not expected to contribute to cumulative effects due to the small area impacted and the restorative results expected.

Terrestrial Wildlife Species Report

Based on habitat assessment and possible presence/absence, additional species that are not threatened, endangered, proposed, or sensitive were considered in the analysis of the aquatic restoration project. These species are included in the following wildlife categories:

- Management Indicator Species (see Table 18)
- Featured Species (see Table 19)
- Landbirds - including Neotropical migratory birds

Direct, indirect, and cumulative effects to Forest Plan management indicator species and landbirds were considered. District wildlife records were reviewed for presence/absence determinations and habitat was assessed. However, any presence/absence data was collected pre-project and may no longer be accurate due to the passage of time.

This project is consistent with the Forest Plans, and the Regional Forester's Eastside Forest Plans Amendment 2. The effects to management indicator species and the rationale for effects determinations follow.

Management Indicator Species

Table 18 Management Indicator Species on the Malheur National Forest

Management Indicator Species	Representing	Habitat Requirements	Habitat Present in Analysis Area
Rocky Mountain Elk	Big Game	Forests, meadows, mountain valleys, and foothills	Yes
Mule Deer	Big Game	Forests, meadows, mountain valleys and foothills	Yes
American Marten	Old Growth	Mature, mesic coniferous forests with high structural diversity in the understory	Yes
Pileated Woodpecker	Old Growth, Primary Cavity Excavator, Snags and Down Wood	Extensive areas of dense coniferous forests with tall closed canopy, high basal area and large diameter snags	Yes
Three-toed Woodpecker	Old Growth, Primary Cavity Excavator, Snags and Down Wood	Higher elevation (above 4,500ft) lodgepole pine and mixed conifer forests with a lodgepole component	Yes
Black-backed Woodpecker	Primary Cavity Excavator, Snags and Down Wood	Forests with dead, insect-infested trees associated with large-scale disturbances such as fire or wind throw	Yes
Downy Woodpecker	Primary Cavity Excavator, Snags and Down Wood	Associated with riparian habitats consisting of a mixture of grasses shrubs and hard woods	Yes
Hairy Woodpecker	Primary Cavity Excavator, Snags and Down Wood	Habitat generalists that prefer large trees in open park like stands along ridges	Yes
Lewis's Woodpecker	Primary Cavity Excavator, Snags and Down Wood	Open forests and nests in large snags in cavities created by other cavity nesters or in very soft snags	Yes
Northern Flicker	Primary Cavity Excavator, Snags and Down Wood	Habitat generalists that prefer large trees in open park like stands near meadows	Yes
Red-naped Sapsucker	Primary Cavity Excavator, Snags and Down Wood	Associated with riparian habitats consisting of a mixture of grasses shrubs and hard woods	Yes, but limited due to lack of hardwoods within the riparian areas
Williamson's Sapsucker	Primary Cavity Excavator, Snags and Down Wood	Mature higher-elevation coniferous forests for nesting and feeding	Yes
Golden Eagle	Cliff, talus, or cave habitats	Nesting habitat includes ledges along rims and cliffs	Yes
Bald Eagle	Sensitive Species	Associated with large bodies of water and nests in forested areas near water	Yes
Prairie Falcon	Cliff, talus, or cave habitat	Nesting habitat includes ledges along rims and cliffs	Yes

Management Indicator Species – Big Game

Existing Condition

Rocky Mountain elk (*Cervus elaphus*) were selected as a management indicator species on the Forest due to their economic and social value, and their response to changes in forest cover, forage quality, and road densities.

The proposed action would occur in summer and winter range in the Forest. Big game management on the Forest is a cooperative effort between the Forest Service and the Oregon Department of Fish and Wildlife with the Forest Service managing habitat and Oregon Department of Fish and Wildlife managing populations and public use. The agencies cooperate by managing big game according to pre-established management objectives for each Big Game Management Unit. Currently Management objectives are being met on several units of the Malheur.

Potential Effects to Management Indicator Species – Big Game

In general, elk could be temporarily impacted by the proposed activities of this project, which would include assorted scattered streambed projects throughout the forest. Projects could occur both in summer or winter range. In either case elk would likely move from the area during the active period and return during night time hours and upon project completion.

Winter Range
The potential exists to cause disturbance to big game (elk, deer, sheep, antelope) during the vulnerable winter season if restoration activities are conducted (ie. Juniper removal) when big game occupies the winter range. As a general rule, aquatic restoration activities don't take place during the winter, however juniper removal activities and/or burning could occur during the winter months. In order to minimize big game disturbance, winter range activities would not take place during periods of big game occupation. Winter range work activities should be flexible and based on the severity of the winter. During severe winters, refrain from working in winter range areas until snow levels have receded enough to allow big game to move to higher elevations. During mild winters, work could be done earlier and continue later in the season without disturbance to big game populations.

Juniper removal over time would improve winter range by allowing increased production of forage and provide for higher ground water flows due to less draw on groundwater from juniper trees.

Direct and Indirect Effects for Management Indicator Species – Big Game

Since aquatic restoration activities would generally take place in close proximity to both streams and roads, the amount of elk habitat affected is negligible. Forest wide elk population trends would not be impacted by the proposed project for the following reasons:

1. The small size of the activity areas.
2. Due to activity proximity to existing roads big game security would not decrease.
3. Activities in big game winter range would only be scheduled during periods when big game is dispersed and not present on the winter range (see in appendix A).
4. There would be no increased disturbance to big game.

Management Indicator Species – Old Growth

Existing Condition

The Forest Plans identify three management indicator species for old growth: pileated woodpecker, pine marten and three-toed woodpecker. In addition, the white-headed woodpecker is a good indicator of the health of old growth. By providing old growth habitat for these species, it is assumed that habitat for other old growth obligate species will be provided as well.

Old Growth Dependent Species

Pileated Woodpecker (*Dryocopus pileatus*)
Pileated woodpeckers prefer late successional stages of coniferous or deciduous forest, but also use younger forests that have scattered, large, dead trees (Bull et al. 2007). In northeastern Oregon, pileated woodpeckers selected unlogged stands of old-growth grand fir (Abies grandis) with closed canopies (Bull and Holthausen 1993) and in some cases open stands with high densities of large snags and logs (Bull et al. 2007). These woodpeckers are rarely found in stands of pure ponderosa pine (Bull and Holthausen 1993). In western Oregon, densities are greater in forests greater than 80 years old than in younger ones (Nelson 1988). Their association with late seral stages stems from their use of large-diameter snags or living trees with decay for nest and roost sites, large-diameter trees and logs for foraging on ants and other arthropods, and a dense canopy to provide cover from predators (Marshall et al. 2003).

Pileated woodpecker was chosen as a focal species by the Blue Mountain Land Management Plan Revision Team (the team, Wales et al. 2011 draft) to represent species of conservation concern associated with Medium-large trees/Cool/Moist forests Group. The team determined the current condition viability outcome call for the pileated woodpecker on the Forest is adequate distribution and/or abundance leading to a higher likelihood of viability, and is based on the following: under historical conditions, pileated woodpeckers were likely well-distributed throughout the Blue Mountain Forest Plan Revision planning area; currently, they are likely not as well distributed, and source habitat is less abundant.

The forest fish and wildlife database includes about 400 recorded sightings of pileated woodpeckers. Currently there are 186,027 acres of source habitat for pileated woodpecker on the Forest.

American Marten (*Martes americana*)
In Oregon and Washington, American marten are found in montane forests of the southern Oregon Coast Range, Siskiyou Mountains, Cascade Mountains, Blue Mountains, Olympic Peninsula, and northeast Washington (Aubry et al. 2003). American marten are typically associated with late-seral coniferous forests with closed canopies, large trees, and abundant snags and down wood (Zielinski et al. 2001).

For the purposes of land management plan revision viability analysis, the American marten was chosen as focal species by the Blue Mountain Land Management Plan Revision Team (the team, Wales et al. 2011 draft) to represent landscape characteristics of the Cool/Moist Forests Group in the Medium/Large Trees Family. The team determined the current condition viability outcome call for the American marten on the Forest is low likelihood of viability based on the following: Marten habitat historically was not abundant on this forest which led to a poorer viability projected historically as compared to the other forests within the Blue Mountain Forest Plan Revision planning area. Loss of historic habitat is the primary cause of poorer viability on this forest currently. The loss of habitat has led to poorer abundance and distribution overall.

The Forest fish and wildlife database includes about 20 recorded sightings of American marten. Currently there are 25,664 acres of source habitat for American marten on the Forest.

Three-Toed Woodpecker (*Picoides tridactylus*)
To ensure species viability for three-toed woodpecker, a management indicator species, Malheur Forest Plan standard 59 gives direction to identify potential or existing old growth lodgepole pine forests. Minimum management requirements suggest establishing habitat areas of 75 acres for every 2,000 to 2,500 acres (USDA 1986). Cold dry forest types, consisting mostly of lodgepole pine, and moist forest types represent the highest quality habitat for three-toed woodpeckers.

The three-toed woodpecker prefers stands where lodgepole pine is either dominant or co-dominant, and uses mostly trees 9" diameter at breast height and greater for both nesting and foraging (Bull et al. 1980, Goggans et al. 1987). Suitable habitat is tied to existing levels of diseased and decaying trees with heart rot for nesting and roosting, as well as decaying substrate to provide a prey base for wood-boring insects (Goggans et al. 1987). In particular, three-toed woodpeckers are attracted to areas with high concentrations of beetles, such as habitats created by stand replacing burns or blowdown.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 70% of the watersheds in the Blue Mountains showed an increasing trend in three-toed woodpecker habitat and 30% showed a decreasing trend. Breeding Bird Survey data is insufficient to determine population trends in the Interior Columbia Basin, but data summarized across the West indicates a 0.7% annual decline in populations from 1966 through 1994 (Wisdom et al. 2000). Breeding Bird Survey data for 1980–1998 indicates a significant annual decrease in three-toed woodpecker populations of 15.0% (n = 12 survey routes) and 13.4% (n = 18) in the U.S. and across the species' range in North America, respectively (Sauer et al. 1997). However, this data should be viewed with caution given the low number of routes and low abundance of three-toed woodpeckers per route (Leonard 2001).

Approximately 117,599 acres of recent (post 2005) post fire habitat occurs on the Forest.

White-headed Woodpecker (*Picoides albolarvatus*)
The white-headed woodpecker is a Region 6 Sensitive Species and has been analyzed in the *Threatened, Endangered, Proposed, and Sensitive Species* portion of this section.

Potential Effects to Management Indicator Species – Old Growth

The resource concern is to determine if old growth habitat would be impacted as a result of the proposed action, thus impacting habitat and population trends forest-wide for pileated woodpecker, marten, and three-toed woodpecker.

Direct and Indirect Effects of Proposed Action for Management Indicator Species – Old Growth

Dedicated Old Growth and Replacement Old Growth

The proposed action would not result in any changes or additions to the designated old growth/replacement old growth network to meet MA-13 standards. There may be some existing designated old growth or replacement old growth habitat adjacent to some project sites.

While some trees may be felled in the riparian area for use for large wood placements in the streambed, the goal is to maintain healthy stands of riparian trees for stream shading and future wood inputs to the stream. If additional large wood is needed for the streambed, it would be moved down from upland sites as approved by a wildlife biologist.

Old Growth Dependent Species

Wildlife and invertebrate species that depend on down wood, snags, dwarf mistletoe brooms, dense forest with abundant saplings and small poles, and closed canopy forests for survival and reproduction, would not be detrimentally affected by the Proposed Action. Habitat types would not be fragmented or connectivity would not be decreased for old growth dependent species. Therefore, old growth dependent species would not be adversely affected as a result of aquatic restoration activities. The proposed activities would not contribute to a negative trend in viability on the Forest for American marten, pileated woodpecker, or three-toed woodpecker.

Management Indicator Species – Primary Cavity Excavator, Snag and Down Wood

Existing Condition of the Affected Environment

Ten (10) management indicator species represent primary cavity excavators, snags and down wood on the Forest. Regional Forester's Eastside Forests Plan Amendment #2 requires the retention of snag and dead and down material at the 100% potential population level, i.e., 2.39 snags per acres 21" diameter at breast height or greater or '*whatever is the best representative diameter at breast height of the overstory layer.*' Three of the ten species, pileated woodpecker, three-toed woodpecker, and white-headed woodpecker have been analyzed previously in this report (*see Threatened, Endangered, Proposed, and Sensitive Species and Management Indicator Species – Old Growth sections*). Four of the remaining 10 species; downy woodpecker, hairy woodpecker, northern flicker, and Williamson's sapsucker may occur in the analysis area.

Direct and Indirect Effects of Proposed Action to Management Indicator Species – Primary Cavity Excavator, Snag and Down Wood

Primary cavity nesters depend heavily on disturbance agents (insects, disease, and fire) that result in dead or hollow trees (Bull and Wales, 2001). Most of these species require some degree of decay in the wood to enable them to excavate for nest and roost cavities (Bull et al. 1997). Aquatic Restoration Activities would not reduce snag densities or habitat as a result of implementation. However, any snag in the immediate work site may be removed for safety reasons. Snags that don't present a safety hazard would remain.

The proposed action would not result in any changes and/or additions to the designated old growth/replacement old growth network. Standards and guidelines are met on the Malheur for MA-13 and on the Ochoco for MA-F6.

Management Indicator Species – Cliff, talus, or cave habitats

Existing Condition of the Affected Environment

The Golden eagle and Prairie falcon are dependent on cliff, talus or cave habitats for nesting success. Current populations are stable and there are numerous nests throughout the forest.

Potential Effects to Management Indicator Species – Cliff, talus or cave habitats.

Aquatic restoration activities will not reduce or damage cliff, talus or cave habitat as a result of implementation. The proposed activities will not contribute to a negative trend in viability on the forest for Golden eagles and Prairie falcons.

Nest protections are in place in the event that nesting activity is detected in the vicinity of an aquatic restoration project. Human activities should be controlled during the critical nesting period. The critical period is the time between arrival of adults at the nest site and three weeks

after the fledging of any young. The critical period will usually fall between March 1 and August 15.

Management Indicator Species – Large bodies of water with forested areas near water.

Existing Condition of the Affected Environment

The Bald eagle's habitat requirements consist of large bodies of water for feeding and timbered areas near water for nesting. Bald eagle populations have recovered to the point of being delisted from the Endangered Species list. They will no longer be classified as sensitive after this year.

Although the Malheur National Forest has very few large bodies of water, Bald eagles are regularly sighted along the many perennial streams in the area and traditional roost areas are located along the southern edge of the forest. These eagles make use of the Harney basin with its large water bodies and abundant waterfowl and fish.

Potential Effects to Management Indicator Species – Large bodies of water with forested areas near water.

Nesting sites and roosting sites used in conjunction with nesting sites, will be protected under the "Act for Protection of Bald and Golden Eagles" ref. title 50 CFR, USC 668-668d. Nest protections are in place in the event that nesting activity is detected in the vicinity of an aquatic restoration project. Human activities should be controlled during the critical nesting period. The critical period is the time between arrival of adults at the nest site and three weeks after the fledging of any young. The critical period will usually fall between March 1 and August 15. The proposed activities will not contribute to a negative trend in viability on the Forest for Bald eagles.

Cumulative Effects to MIS

There are no direct or indirect impacts expected to MIS species or their associated habitats from the proposed project. Therefore, there would be no cumulative impact to these species.

All of the activities considered in the Aquatic Restoration environmental assessment have been considered for their cumulative effects on Rocky Mountain Elk, American Marten or any Primary cavity excavators or birds of prey. Past activities including, but not limited to, timber harvest, grazing, recent timber sales, thinning and fuels reduction projects, and plantation maintenance, have impacted the quantity, quality, and distribution of habitat. The analysis area has experienced an extensive level of habitat fragmentation as a result of past activities and the small area impacted as a result of aquatic restoration activities would not likely have cumulative effects to these species. Long term impacts would be positive for these species as the goal of this project to restore and improve aquatic habitats and stream hydrology. The effects of this project on all wildlife species listed here, when added to all other past, present, and reasonably foreseeable future activities, are not expected to contribute to cumulative effects due to the small area impacted and the restorative results expected.

Featured Species

Featured species are identified in the Forest Plans as species that require special protections. The Plan (IV-30, 31) provides direction (standards 50-55) for the protection of habitat for these species. Table 19 lists the seven (7) featured species currently on the Forest. The table also

includes their habitat requirements and whether habitat exists in the analysis area. Only species with habitat in the analysis area are discussed in detail.

Table 19 Featured Species on the Malheur National Forest

Featured Species	Habitat Requirements	Habitat Present in Analysis Area
Hawks and Owls	A mosaic of mature, mixed conifer stands, with closed canopies and interspersed openings suitable of supporting a wide array of prey	Yes
Blue Grouse	Clumps of mistletoe infected Douglas-fir on ridge tops or upper slopes of ridges	Yes
Sage Grouse	Open sagebrush plains ranging from 4000-9000 feet elevation	Yes
Osprey	Large, dead trees suitable for nesting (30" diameter at breast height and less than60' tall) adjacent or near large rivers or lakes	Yes
Pronghorn Antelope	Open grasslands with low sagebrush as an important component	Yes
California Bighorn Sheep	Alpine-desert grasslands associated with mountains, cliffs, foothills, and river canyons	Yes
Upland Sandpiper	Native prairie grasslands and montane meadows	Yes

Northern Goshawk and Other Raptors

In the Pacific Northwest, goshawks (Accipiter gentilis) prefer to nest in mature, unlogged, or lightly managed forested habitats. These areas include sites with closed canopies (greater than 60%), northerly exposures, gentle slopes, and close proximity to water (Reynolds et al. 1992). Post-fledgling areas include the nest stand and surrounding areas used by adults and juveniles prior to natal dispersal (Reynolds et al. 1992). Post-Fledgling Areas in eastern Oregon are composed largely of structurally complex late successional mixed conifer and ponderosa pine forests (McGrath 1997).

Northern goshawks are woodland hawks and their morphology (short, rounded wings and relatively long tails) is adapted for maneuvering and hunting in moderately dense, mature forests (Beier and Drennan1997). Small openings and forest edges in mixed conifer and ponderosa pine forests, in particular, appear to be important for foraging. These foraging habitats support higher plant diversities and, in turn, support a higher number of desirable prey species such as rabbits, squirrels, and grouse. Goshawks prey on a variety of species and do not appear to select stands on the basis of prey abundance, but rather forest structure, i.e. higher canopy closure and higher tree density (Drennan and Beier 2003).

Other raptors utilize a variety of habitats, may nest within close proximity to the analysis area, and could be vulnerable to disturbance. Increased human presence during activities could displace northern goshawk, and other raptors during nesting, roosting, and foraging.

The Aquatic Restoration project would not likely impact northern goshawk or other raptors at the population level.

Blue (Dusky) Grouse

(Subspecies name is now 'dusky' grouse east of the Cascades, 'sooty' west of the Cascades)

Blue grouse (Dendragapus obscurus) is the largest forest grouse that occurs in Oregon and is a popular upland game bird. In northeast Oregon, blue grouse appear to select open park-like stands of mature ponderosa pine and Douglas-fir over more heavily forested areas, although grouse use early succession habitat for breeding and brood rearing. Blue grouse breed and nest in

a variety of forest and shrub vegetation types from foothills to timberline. For winter roost sites Blue grouse utilize large, mistletoe infected Douglas-fir trees, generally located within the upper one-third of slopes. Dense coniferous thickets of small trees, stumps, and down logs are used by blue grouse for resting, drumming and escape cover. Grouse also utilize dense deciduous areas in riparian corridors. Blue grouse home ranges are typically between 1.25 and 5 acres, and can be found at mid-elevations and in subalpine areas, usually associated with openings and rocky areas. Winter range typically includes conifer forests from sea level to subalpine, with a wide range of habitats used during spring and summer. The Malheur Forest Plan standard for the protection of grouse habitat (IV-30, standard 50) states 'maintain grouse winter roost habitat.'

The proposed action would only be taking down safety hazard trees that are found within the specific worksite. If the stand is fully stocked, some trees may be selected to be placed in the streambed to re-introduce large wood to the stream. A premium is placed on keeping most of the live trees as these are an important component in the restoration of the site. The worksites proposed for the restoration likely contain few, if any, trees with mistletoe. Due to the lack of mistletoe, sites would likely not be used throughout the year

Aquatic restoration activities would not likely impact blue grouse at the population level due to the inconsequential area impacted.

Landbirds

The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) identifies priority habitat types in the Blue Mountain of eastern Oregon important for landbird species conservation. The analysis area falls in the riparian woodland and shrub forest type, one of three priority habitats (excluding unique habitat types) identified in the plan.

Altman identifies conservation issues associated with riparian woodland and shrub including but not limited to:

- Habitat degradation from livestock overgrazing which can widen channels, raise water temperatures, reduce overstory cover, etc.
- Fragmentation and loss of large tracts necessary for area-sensitive species.

The proposed action would aid in the restoration of riparian sites due to the placement of large wood, replacement of damaged or inadequate culverts, the establishment of riparian vegetation, and the enhancement of any stands of aspen. The goal of the project is to work to allow streams to normally interact with the floodplain, allow channels to narrow and deepen, and minimize siltation. This action would not likely impact neotropical migratory birds at the population level and would improve riparian habitats over the long term.

The proposed action would contribute to the increase and enhancement of aspen stands throughout the forest. The Malheur National Forest has experienced dramatic declines in the number of aspen stands when compared to historical levels. In some instances, entire stands (clones) have completely disappeared due to ungulate grazing (wild and domestic) and competition from conifers within the stand. This has contributed to the decline in habitat diversity for neotropical migrants and the loss of nesting opportunities for multiple species of cavity excavators. A wide variety of avian species are known to use aspen stands (Debyle 1985b).

Several studies throughout the west have concluded that bird species richness may be greater in more mature aspen stands versus younger stands and in aspen stands as a habitat type versus pure or mixed conifer aspen stands (Sheppard et al. 2006).

Removal of competing conifers is considered essential for strong aspen regeneration (Jones et al. 2005). Although removal of all conifers is most beneficial to aspen, retention of some widely spaced, large conifers for other resource needs is compatible with aspen regeneration. All conifers that exhibit "old" tree characteristics will be left despite their diameter. Old will be defined as approximately 150 years based on the restoration strategies of Dr. Norman Johnson and Dr. Jerry Franklin (2009). Limiting conifer removal to only those below 21" diameter at breast height has failed to achieve the desired results in previous aspen projects. Sites that are conducive to aspen stands are relatively productive sites with good moisture content that allows more rapid growth of competing conifers. These conifers can reach 21" in diameter at breast height at a relatively young age (< 100 years). In some areas leaving all conifers 21" and above would be to the long term detriment of the aspen stand.

Juniper removal actions will be conducted in both riparian areas and uplands to provide benefits to both fish and wildlife alike. During the past 130 years, western juniper has been expanding within its geographic range at unprecedented rates compared to any other time period during the Holocene (Miller and Wigand 1994, Miller and Tausch 1991). Western juniper woodlands in eastern Oregon > 10% canopy cover have increased from 456,000 acres in 1936 (Cowlin et al. 1942) to 2.2 million acres in 1988 (Gedney et al. 1999). These trees were historically restricted to rocky hillsides, ridges and outcrops due to periodic fire. Variables such as fire exclusion, historic grazing practices and climate influences have probably all played a part in this post settlement expansion.

In areas proposed for Juniper removal, all trees exhibiting old growth (> 150 years) characteristics will be retained for birds and other wildlife benefits. Old growth characteristics include rounded tops and spreading canopies containing dead limbs or spike tops. Bark will be deeply furrowed, fibrous and reddish in color. Large basal branches will often support bright green arboreal fruticose lichens (Miller R.F. 2005).

Wildlife benefits of old-growth juniper include thermal cover and low quality forage for ungulates. Juniper is typically used for forage when nothing else is available. Western juniper berries provide an important source of food for Townsend's solitaires, American robins, mountain bluebirds, Cedar waxwings, Stellar's jays, and scrub jays (Lederer 1977, Solomonson and Balda 1977, Poddar and Lederer 1982). Cavity nesters also make use of juniper cavities. White headed woodpeckers have been documented to use junipers for nesting on the Malheur National Forest (personal observation of the Forest Wildlife Program Manager, 2014).

Botany

This section analyzes effects or impacts from the proposed action to any plant, lichen, or fungi species and/or their respective habitats, that are federally-listed as threatened, endangered, or proposed for federal listing under the Endangered Species Act of 1973 as amended, and species currently identified as sensitive (FSM 2670.5, USDA Forest Service 2011) by the Regional Forester of the Pacific Northwest Region.

A full Biological Evaluation was completed in support of this section and is part of the project file at the Malheur National Forest office. It includes environmental information and potential effects to species and their respective habitats that have culturally-significant or edible, medicinal, or other economic value (excluding commercial timber species), or that are identified as invasive or noxious, or any others that are identified as local species of concern.

Summary of Analysis and Effects

The biological evaluation process considers potential effects from the proposed project to federally listed, candidate, and proposed plant species. The process also evaluates potential impacts to Forest Service designated sensitive plants and sensitive plant habitat in the project planning area. The Forest Service and U.S. Fish and Wildlife Service records were consulted in order to determine which rare plant species and potential habitat may occur in the project planning area.

Potential direct, indirect, and cumulative effects to habitat types that support sensitive plants were analyzed. Project design criteria were incorporated into the project to reduce the chance of detrimental impacts to sensitive plants and habitats.

One candidate for federal listing occurs on the Forest. White bark pine (Pinus albicaulis) is located in the extreme northwest portion of the Glacier Mountain Roadless area. There will be no proposed activities within the habitat of this species. Therefore, this project would have No Impact (NI) to any federally listed, proposed, or candidate plant species. Consultation with the U.S. Fish and Wildlife Service is not required for this project for rare plants.

The No Action alternative does not propose any new activities. Therefore there would be no direct or indirect impacts to sensitive plants, culturally-significant plants, or invasive species. Because no management would occur, there would be no proposed action effects to add to ongoing or future actions that would contribute cumulative effects.

Several upland sensitive species habitats, such as lithosols, talus slopes, and rock outcrops will see no management actions under alternative 2. Therefore, these habitats analysis groups and their known or undiscovered sensitive species populations will be unaffected.

Project design criteria would protect all known populations of sensitive plants in the project planning area from ground disturbing activities in the action alternative. These protections are designed to prevent direct or indirect impacts from project activities to known populations of sensitive species in any special habitat.

However, activities in riparian, aquatic and juniper woodland habitats may potentially directly and indirectly impact habitat and undiscovered populations of sensitive plants. Potential detrimental direct impacts include the destruction of sensitive plants from ground disturbance associated with cutting of trees, yarding trees, piling slash, or scattering slash. Prescribed fire or slash pile burning could scorch sensitive plant individuals within the fire area, and also may kill

plants under and directly adjacent to slash piles. Fire line construction has the potential to directly kill or dislodge sensitive plants in the area that is denuded. Indirect effects could result from altering the hydrologic regime and changing light intensity. Vegetation management may also alter the interaction of herbivores and plants. By opening up the canopy of the forest, grasses, and other palatable plants may increase. This may lead to increased grazing and trampling from ungulates.

In summary, the determination of effects for riparian, aquatic and juniper woodland habitats and associated sensitive plants, for the No Action Alternative is: No Impact (NI). The determination of effects for the Action Alternative to sensitive plant species and their habitats is (depending on habitat type and proposed action): May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to populations of sensitive plant species (MIIH), No Impact (NI), or Beneficial Impact (BI).

With these potential impacts, cumulative effects may exist. There are a number of vegetation management and range management activities proposed within the Malheur National Forest in the forseeable future. Since 1990, protection and management of sensitive plant species and their habitats (in the form of project design criteria, avoidance, or other mitigation) have been included in the design of all projects. This has, and would continue to, reduce the potential of cumulative effects to sensitive plant populations and habitats. Therefore, this project, foreseeable future projects, and those that have occurred in the recent past are unlikely to contribute to adverse cumulative impacts. None of the sensitive plant species that may occur in riparian, aquatic and juniper woodland habitats on the Malheur National Forest are extremely rare on a global scale. If there are measureable cumulative effects despite the system of design criteria, there may be impacts individuals or habitat but will not likely contribute to a trend toward federal listing or cause a loss of viability to populations of sensitive plant species.

Methodologies

Habitat Analysis Groups

There are over 80 sensitive plant, lichen, and fungus species documented or suspected to occur on the Forest, and over 40 other species that are rare or of local conservation concern. Additionally, there are over 30 invasive plant and noxious weeds that are documented on the Forest and numerous culturally-significant species and economically-important special forest botanical products. Rather than evaluate effects to over 150 species individually, this analysis takes a more efficient, concise, and intuitive approach: plant species occur in 13 major habitat groups, and effects are discussed in relation to these habitat analysis groups.

While the habitat analysis group concept was developed primarily for sensitive species analyses, it can be applied to any plant or plant habitats. Thus, similar to the sensitive and rare species, the potential impacts of the proposed action to non-native invasive species, noxious weeds, and culturally-significant plants would be addressed through the habitat analysis groups.

Habitat analysis groups are primarily based on the potential vegetation hierarchy of the Blue Mountains (Powell et al. 2007) and related plant associations (Crowe and Clausnitzer 1997, Johnson 2004, Johnson and Clausnitzer 1992, Johnson and Swanson 2005, Wells 2006).

Plant associations, plant communities, and plant community types are all potential vegetation types (Powell et al. 2007). The habitat analysis groups that are presented below are roughly based on potential vegetation groups. For example, habitat analysis groups may correspond directly to a potential vegetation group (e.g. cold upland forests), that correspond to a group of potential vegetation groups. The habitat analysis groups that are presented below were developed because

they represent the best approach to assess potential impacts to plant biodiversity; they are presented in two major categories: upland habitats and riparian/aquatic habitats.

Affected Environment

The Forest contains a wide diversity of plant species and communities due to varying elevation and precipitation zones that occur within eastern Oregon. Elevations on the Forest vary from approximately 3,300 feet where the Middle Fork John Day River exits the Forest to 9,038 feet on Strawberry Mountain. The result is a diverse and productive landscape of grasslands, sage, and juniper; as well as forests of pine, fir, and other tree species, and mountain lakes and meadows. Given this combination of physiography and climate, habitats are highly variable and retain a legacy of botanical diversity.

Upland Habitats

Upland habitats include those areas classified as non-wetlands which are generally at a higher elevation than adjacent wetlands, riparian areas, and wetland/riparian zones transition zones. Upland habitats occupy the vast majority of acreage on the Forest and, in general, describe the overall biological context of a landscape.

Table 20 Upland Habitat Analysis Groups

Upland Habitat Analysis Group	General Habitat Description (Dominant and Climax Species in Parentheses)	Most Common Plant Association Groups
Upland Forests	**Cold Upland Forests -** Primarily moderate to high elevation conifer forests in the cold montane and subalpine zones (subalpine fir, whitebark pine, Engelmann spruce, lodgepole pine, grouse huckleberry, mountain juniper, pinemat manzanita, elk sedge).	cold moist UF cold dry UF cool dry UF
	Moist Upland Forests - Moist mixed conifer forests at moderate to high elevations; primarily on the north half of the Malheur NF (grand fir, subalpine fir, lodgepole pine, Douglas-fir, Engelmann spruce, Rocky Mountain maple, Pacific yew, big huckleberry, twin-flower, queens' cup bead-lily, and heartleaf arnica)	cool wet UF cool moist UF warm moist UF
	Dry Upland Forests - Primarily fire-adapted conifer forests at low to moderate elevations; this is the most common type on the south half of the Forest (ponderosa pine, Douglas-fir, grand-fir, bitterbrush, snowberry, pinegrass, elk sedge)	warm dry UF hot dry UF
Juniper Woodlands	Here, woodlands are exclusively characterized as areas where western juniper is the dominant climax species. These communities are found most extensively on the southern half of the Forest. (western juniper, mountain mahogany, sagebrush, Idaho fescue, bluebunch wheatgrass)	hot dry UW hot moist UW
Upland Shrublands	Includes upland ecosystems with little or no tree cover; primarily sagebrush steppe and related habitats, but also includes many other less common shrubland systems (big sagebrush, mountain mahogany, bitterbrush, snowberry, shrubby cinquefoil, basin wildrye, Idaho fescue, bluebunch wheatgrass, prairie junegrass)	cold moist US warm moist US hot moist US

Upland Habitat Analysis Group	General Habitat Description (Dominant and Climax Species in Parentheses)	Most Common Plant Association Groups
		warm dry US
Lithosols (Scablands)	Often referred to as scablands, lithosols are habitats with very shallow soils on poorly weathered bedrock. Lithosols are often found as small inclusions within a larger matrix of grassland, shrublands, and woodlands (stiff sagebrush, low sagebrush, Sandberg's bluegrass)	warm dry US
Grasslands and Upland Herblands	Grassland habitats are generally dominated by bunchgrasses; this group also includes dry meadows dominated by introduced perennial grasses or native forbs (Idaho fescue, bluebunch wheatgrass, needlegrasses, Great Basin wildrye, Sandberg's blugrass).	cool moist UH warm moist UH warm dry UH hot dry UH
Alpine and Subalpine Herblands (Fellfields and Parklands)	This habitat group is found in the highest elevation areas, such as mountain tops and ridges at or above timberline. Fellfields are alpine communities that are characterized by rocky soils that support sparse vegetation. Subalpine parklands are treeless plant communities at or immediately below the timberline (alpine sedges, grasses, and forbs).	cold moist UH cold dry UH
Cliffs, Rock Outcrops, and Talus	Cliffs and rock outcrops have vertical faces where very few plants are able to survive. Talus and scree are accumulated boulders, cobbles, and gravel at the base of cliffs or on steep slopes (mosses, lichens, and sparse low-growing vascular plants).	dry UH
UF = upland forest, UW = upland woodland, US = upland shrubland, UH = upland herbland		

Riparian/Aquatic Habitats

Riparian and aquatic habitats are those that are characterized by a substantial presence of water and/or soil moisture. Aquatic habitats are defined by the persistent presence of flowing or standing water. Lakes, streams, marshes and their respective substrates are types of aquatic habitats. The interface, or transition zone, between aquatic and upland systems are classified as riparian habitats.

Table 21 Riparian/Aquatic Habitat Descriptions

Riparian/Aquatic Habitat Analysis Group	General Habitat Description (Dominant and Climax Species in Parentheses)	Most Common Plant Association Groups
Riparian Forests and Shrublands	This group includes all riparian areas dominated by woody vegetation. These are usually riverine areas along perennial and intermittent streams. Cold Riparian Forests and Shrublands- Primarily moderate to high elevation riparian conifer forests in the cold montane and subalpine zones (subalpine fir, Engelmann spruce, lodgepole pine). Warm Riparian Forests and Shrublands- This is the most common riparian habitat group on the Forest; it includes the vast majority of actively-managed riparian areas at low to moderate elevations,	cold high SM RF/RS cold moderate SM RF/RS cold low SM RF warm high SM RF/RS warm moderate SM RF/RS warm low SM RF/RS hot moderate SM RF/RS

Riparian/Aquatic Habitat Analysis Group	General Habitat Description (Dominant and Climax Species in Parentheses)	Most Common Plant Association Groups
	which have the potential to be dominated by woody vegetation (willows, alder, aspen, black cottonwood, hawthorn, red-osier dogwood, pacific yew, Rocky Mountain maple, grand fir, Douglas-fir, birch, currants).	hot low SM RF/RS
Aquatic Habitats	This group includes habitats that are entirely within flowing or standing or water. This includes lakes, ponds, streams, marshes, and flarks. (pondweed, milfoil, creeping spikerush, cattail, torrent sedge, mosses).	high SM RH undescribed plant association groups
Moist Meadows and Vernal Swales	Moist meadows and vernal swales are saturated in the spring and early summer, but by late summer the water table has significantly fallen below the soil surface yet still retains enough moisture for wetland species to dominate (Nebraska sedge, Baltic rush, meadow sedge, false hellebore).	warm moderate SM RH
Groundwater-Dependent Ecosystems	Groundwater-Dependent Ecosystems are typically small, but well distributed on the Forest. They often exist as relatively small inclusions in most other habitat types or form larger complexes with other aquatic, alpine, and wet meadow habitats (many obligate and facultative wetland sedges, grasses, mosses, and shrubs). Springs- groundwater-dependent ecosystems where groundwater emerges and flows into a channel and are often developed for off-site watering of livestock. Seeps- groundwater-dependent ecosystems where groundwater emerges but does not produce perennial flow. These often do not produce enough water for effective off-site water developments. Peatlands and Fens- Peatlands are groundwater-dependent ecosystems that accumulate partially decayed plant matter (peat) over hundreds to thousands of years. Peat (histic soil) is partially decayed plant material that accumulates under saturated conditions where there is little oxygen to facilitate decomposition. Fens are the primary type of peatlands on the Forest.	high SM RF high SM RS high SM RH
Wet Meadows	Wet meadows are flooded or saturated throughout the growing season with the water table at or slightly below the soil surface. These areas are typically dominated by obligate wetland species and are characterized by wetland soil types. Often they are features of larger wetland, riparian, or groundwater-dependent ecosystem complexes (bladder sedge, aquatic sedge, tufted hairgrass, Holm's Rocky Mountain sedge). Marshes	cold high SM RH cool high SM RH warm high SM RH
Dry and Degraded Riparian Meadows and Floodplains	This group includes highly altered and degraded riparian habitats. These areas are characterized by low soil moisture due to lowered water tables and are often dominated by introduced exotic grass species or encroaching conifers (Kentucky bluegrass, meadow foxtail, orchardgrass, lodgepole pine, sagebrush, shrubby cinquefoil, sulfur cinquefoil)	cold low SM RF hot low SM RF warm low SM RS hot low SM RS warm low SM RH
SM = soil moisture, RF = riparian forest, RW = riparian woodland, RS = riparian shrubland, RH = riparian herbland		

Rare and Sensitive Species

Rare species can be described as organisms that are scarce, very uncommon, or infrequently encountered, and are important contributions to biodiversity at the local, regional, and/or global scales. While the Malheur NF does not have any federally-listed plant species or habitats, it does have numerous species that are identified through policy as sensitive.

Sensitive species are those that are designated by the Regional Forester as species for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and habitat capability that would reduce a species'

existing distribution (FSM 2670.5). Management of sensitive species 'must not result in a loss of species viability or create significant trends toward federal listing' (FSM 2670.32).

Sensitive plants and botanical species considered here include vascular plants, nonvascular plants (mosses and liverworts), lichens, and fungi. They are often collectively referred to as 'sensitive plants', even though fungi and lichens are not actually plants. There are currently 88 species of sensitive plants documented or suspected to occur on the Forest. Of these, 22 are officially documented on the Forest. These are present at 451 sites for a total of 4,396 acres.

In addition to sensitive species, other rare species are also considered. These include (1) species that may be sensitive, threatened, or endangered in Oregon or throughout their range, but for which more information is needed before status can be determined (e.g. List 3 of the Oregon Biodiversity Information Center, Forest Service strategic species), (2) species that are indicators of special habitats or sensitive species' habitats, and (3) species of local conservation concern due to their rarity in the Blue Mountains ecoregion.

Invasive Plants

Invasive plants are non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive plants have the potential to displace native plant communities, increase fire hazards, negatively affect fish and wildlife habitat, degrade rangeland forage, compete with rare and culturally-significant plants, increase soil erosion, and adversely affect scenic beauty and recreational opportunities. Because of their competitive abilities, invasive plants can spread rapidly across the landscape, unconstrained by administrative or ownership boundaries.

Often the terms 'invasive plants' and 'noxious weeds' are used interchangeably; however, there are subtle differences in meaning. Noxious weeds are invasive or otherwise undesirable plants that have been designated by the State of Oregon as being injurious to public health, agriculture, recreation, wildlife, or any public or private property. Species which are identified as invasive, and which are also designated by the state as being noxious weeds, are the target species for treatment and monitoring on the Forest. Here, the terms 'invasive plants' and 'noxious weeds' are essentially used interchangeably.

There are 18 primary target invasive plant species that infest less than 1 percent of the Forest's lands. They occupy approximately 3,070 inventoried sites coving 2,124 acres and are scattered throughout the infested areas with densities ranging from less than 10 percent to 100 percent. A total of 240 infested acres are documented in or adjacent to riparian areas on the Forest.

As mentioned before, not all invasive species are identified as target species for treatment on the Forest. However, this does not mean that non-target species for future treatment are not a concern. Indeed, many invasive annual grasses (e.g. cheatgrass, medusahead, African wiregrass) are not targets for future treatment, yet are still a concern for spreading to new un-infested areas.

Culturally-Significant Species and Special Forest Botanical Products

Culturally-significant plants include many important plants that are collected and used by Native American tribal members and/or the general public as food, medicine, or in ceremonial or traditional activities. These species occur in various habitats across the Forest, and include a variety of mushrooms, berries, roots, herbs, twigs, and leaves from species such as bitterroot, biscuitroot, camas, chokecherry, huckleberry, sedges, rushes, and willows. Specific locations where these species occur are generally not mapped or tracked by the Forest.

Special forest botanical products include all non-timber products that require a permit for commercial or personal use collecting. This includes firewood, posts and poles, Christmas trees, pine cones, burls, and commercial collecting of medicinal or food plants and mushrooms. Also included are species which require permits for collection of seeds, cuttings, or whole plants for propagation or landscaping. Permits are not required for small quantities of mushrooms (less than one gallon per day), huckleberries, and other roots and fruits. The most common special forest product collected on the Forest is firewood, followed by posts and poles. Mushroom permits are generally sold in quantity after wild fires, when morel mushrooms are in abundance. Specific locations where these species occur are not mapped or tracked by the Forest.

Environmental Consequences

Direct, indirect, and cumulative effects to plant habitats will be discussed under the following sections, where applicable. Unaffected habitats or those with negligible effects will not be disclosed in any detail [as per 40 CFR §1500.4 and 40 CFR §1500.1(b)]. However, detailed information about these habitats and the species that occupy them are available at the Supervisor's Office of the Malheur National Forest, upon request.

Effects to Upland Habitats

Unaffected Habitats

The vast majority of the Forest's 1.7 million acres would be unaffected by any of the proposed actions, this includes upland forests, upland shrublands, lithosols, grasslands and upland herblands, alpine and subalpine herblands, cliffs, rock outcrops, and talus. In general, there would be no effects to these habitats as almost all of the proposed activities would not occur in these areas. The exception is potential effects from establishing staging areas, fence construction, and relocation of recreational impacts. However, due to the insignificant footprint of these activities relative to the land base of these habitats, the effects would be unmeasurable.

While there may be some negligible yet undetectable effects to these habitats, the project design criteria assure that there would be no impacts to rare, sensitive, and local species of concern; no measurable impact to edible and culturally significant species; and no threat of spreading invasive plants into these habitats.

Juniper Woodlands

Juniper woodlands are characterized by the presence of western juniper as the dominant climax overstory species. These communities are found most extensively on the southern portion of the forest. Fire exclusion, historic overgrazing, and climate change have facilitated the growth and expansion of juniper in these areas. This habitat analysis group is comprised of any areas where juniper has the potential to dominate, including all upland areas where juniper encroachment is considered to be an issue; however, degraded floodplains where juniper are encroaching or have encroached are discussed in the dry meadow and floodplains section below.
There are many sensitive and invasive species that occupy juniper woodlands and which may be affected by the proposed action (specifically category 12, juniper removal). Potential sensitive species include Cordilleran sedge, Henderson's ricegrass, Wallowa ricegrass, bastard milkvetch, and arrowleaf thelypody. Key invasive species include the winter annual grasses medusahead rye, cheatgrass, and North Africa wiregrass. In many juniper woodlands across the Forest, these invasive grasses have a strong presence. Once these species infest an area, they can have a strong negative effect on ecosystem function, forage productivity, and fire regimes, and are almost impossible to eradicate once they gain a presence in the area. Thus, in this habitat group, the primary environmental management concern is a weed control issue.

It is assumed that any hand thinning methods of juniper would not cause any disturbance that would promote or spread invasive species or negatively affect sensitive, rare, or culturally-significant species. However, ground-disturbing activities, such as removal of juniper with heavy equipment, coupled with removal of the overstory canopy and subsequent greater light infiltration can certainly be expected to foster further increases in invasive annual grasses. For this reason, design criteria prohibit heavy equipment operation and other ground-disturbing activities in areas invasive annual grasses are present. This would assure that the proposed action would not negatively impact this habitat group. Similarly, based on the design criteria, all sensitive and rare plants and habitats would be excluded from any ground-disturbing activities. This would assure that there would be no impact to rare or sensitive plants as a result of the proposed action.

Effects to Riparian and Aquatic Habitats

Riparian and aquatic habitats are those that are characterized by the substantial presence of water, with riparian areas characterized by their location within the transition zone between aquatic and upland systems. The Forest has many types of riparian ecosystems which provide unique habitat for a large percentage of its sensitive plant species. The specific habitat types which may experience impacts from the proposed action include riparian forests and shrublands, dry and degraded meadows and floodplains, moist meadows and vernal swales, wet meadows, ground water dependent ecosystems, and aquatic habitats.

Overall effects to riparian habitats under the proposed action alternative would be beneficial in the long-term, which is consistent with the Purpose and Need. Effects to riparian habitats under the No Action alternative would likely result in long-term negative impacts and the continued degradation of unique riparian habitat. This may then negatively affect the sensitive plant species and culturally-significant species they support, as well maintain or increase the probability of weed species to invade native plant communities.

Riparian Forests and Shrublands

This habitat group includes cold and warm riparian forests and shrublands and is the most common type of riparian or aquatic habitat on the Forest. It also includes aspen stands which are addressed separately below. It is expected that the majority of proposed restoration projects (including aspen restoration) would occur in these habitat types. These types of riparian habitats would see the highest amount of disturbance from mechanical equipment during implementation of the proposed actions. Some examples of active management that would take place in these habitats are placement of woody debris, channel and streambank restoration, and prescribed burning.

Riparian forests and shrublands have some of most significant historical impacts from a combination of past management actions including logging, grazing, and recreation. The warm riparian shrublands type includes the vast majority of actively-managed riparian areas and non-native forage species including Kentucky bluegrass have successfully colonized many of these habitats.

Some acute ground disturbance will be involved in the management activities within this habitat group. However, there will be no impacts to any known populations of sensitive species. Several design criteria outline steps to survey for and protect populations and special habitats in the project area, which will eliminate any risk. Overall, the action alternative will have long-term beneficial impacts to riparian forests and shrublands and the sensitive species that rely upon their persistence, most notably because additional habitat will be created or restored as a result of the proposed action. Because of the relatively large scale of this habitat type and the amount of management action that will take place within it, there may be minimal negative short-term

impacts to undiscovered sensitive plant populations during implementation but long-term impacts will be beneficial.

The action alternative will have beneficial impacts for the issue of invasive plants, as the management actions will support recovery of the native plant communities within these ecosystems, and project design criteria outline the revegetation requirements of areas disturbed during project activities. This would assure that the proposed action would not negatively impact this habitat group.

Because there are no design criteria specifically protecting culturally-significant plant species, there may be some short-term negative impacts to their habitats from project implementation that involves machinery or ground disturbance. However, there would be long-term benefits due to the restoration of degraded habitats that have the potential to support these culturally important species. Populations of riparian species such as willows, sedges, and cherry, among others, should benefit from any restoration activities that improve stream and wetland function.

Anticipated cumulative effects of the action alternative to sensitive and cultural, and invasive species in riparian forestland and shrubland habitats are minimal. Possible effects to species from past activities are unknown and are assumed to be accounted for in the current description of existing condition of these plants. These are difficult to accurately assess as the details of the activities and existing condition of sensitive species at the time of the actions were either not known or not described. Future vegetation management or range projects overlapping in time and space will involve similar project design criteria to protect sensitive plant species and minimize or eliminate risk of disturbance and plant invasion to populations and this type of riparian habitat.

Under the No Action Alternative, there will be no impacts to sensitive, cultural or invasive species because no actions will be proposed. However, it is expected that many riparian shrublands would continue to decline in habitat quality without active restoration measures.

Aspen

Aspen communities are included within the warm riparian forest potential vegetation group, however due to their unique status on the Forest, they are treated separately here. Many aspen stands are as stringers along streams and intermittently wet draws. Fire suppression has caused a decline in populations through increased competition from coniferous species. Livestock grazing and wild ungulates have also altered the reproductive and growth cycles of aspen. In most cases, succession of aspen stands to conifers has led to diminished patch size, loss of vertical structural diversity, and loss of this species from most riparian corridors. The lack of stand regeneration has resulted in a decline of aspen acreage across the Forest and the competitive capabilities of aspen to regenerate and maintain vigor. Planned disturbances such as prescribed fire and vegetation treatments, as well as protection from browsing, are necessary to perpetuate aspen. Regeneration and restoration of aspen stand has been most successful where they have been treated with fire (natural or prescribed), had removal of over-story coniferous vegetation, and were protected to exclude or restrict browsing.

There would be no direct impacts on known or undiscovered populations of sensitive species from management activities within this habitat type. The project design criteria include the completion of botanical surveys of all of the proposed aspen treatment units before project implementation. If any sensitive species were found during these surveys, appropriate mitigations and monitoring would be implemented. Buffers for ground disturbance and the use of mechanical equipment should protect unknown populations. Indirect and long-term impacts of the proposed action would be beneficial as the restoration activities proposed in this document would increase and improve the sensitive species habitat that healthy riparian aspen communities provide.

There are several project design criteria that minimize or eliminate risk of invasive plant infestation during and after project implementation. Therefore, there will be no direct impacts in this regard. Additionally, the proposed management actions would support the recovery of the native plant communities within aspen ecosystems through careful revegetation of disturbed sites and restoration of hydrological processes. This indicates that there will be indirect and long-term benefits for the issue of invasive plant infestations in aspen stands.

It is possible that if acute ground disturbance occurs during a proposed action, there may be negative direct effects to individual culturally-significant plants. However, populations of the species that inhabit aspen meadows, such as camas, would also see a beneficial indirect and long-term impact through lasting restoration of the habitat they depend on.
Past management actions that may interact with this document and other foreseeable future actions include livestock grazing, commercial timber removal within or around aspen stands, and altered hydrology within the meadow or drainage (i.e. development of springs for livestock use within or near aspen stands). With continued use of project design criteria specific to this habitat type, cumulative effects to sensitive, cultural and invasive species are unlikely, or may be beneficial, as aspen communities are often highlighted by many resources for protection.

Under the No Action alternative, there will be no impacts to sensitive, culturally-significant, or invasive species, because no actions will be proposed. However, it is expected that many aspen stands would continue to decline without active restoration measures. Conifers would continue to encroach upon aspen stands and meadows, potentially shading out sensitive plant habitat, changing hydrological patterns, and decreasing potential for aspen recruitment. Additionally, any non-native or invasive plants within these habitats would continue to outcompete native plants. However, under this scenario there would be indirect and enduring negative impacts to this habitat type and the species it supports.

Dry and Degraded Riparian Meadows and Floodplains

This habitat group is the one that is most in need of restoration. It includes areas that have been heavily altered and degraded by a century of natural and human actions. Head-cuts, down-cuts and other changes to hydrology have lowered water tables in these areas and transformed them from wet or moist meadow habitats into dry meadows or floodplains. Because of this, these areas are often easily colonized by non-native and invasive plant species. In some cases, changes in potential vegetation to forested or woodland vegetation types have occurred due to conifer or juniper encroachment that is a result of changes to the hydrologic processes and historic management to exclude fire and other natural disturbance.

These degraded meadow types are generally no longer suitable habitat for the sensitive plant species they once may have harbored. The distribution and vigor of sensitive species in these areas before historic impacts began are unknown. Historic grazing practices have resulted in loss of potential habitat for these species through general trampling and herbivory by livestock, in addition to the accelerated erosion processes that have altered local surface hydrology.

For the proposed action, little or no direct impact to sensitive species from restoration activities would occur, because project design criteria outlines steps to avoid impacts. Additionally, it is unlikely that there are any species inhabiting degraded areas. However, a few sensitive plant species have been found to inhabit areas of historic disturbance where mineral soil was once exposed, including certain moonwort (Botrychium) species. It is therefore remotely possible that there may be negative direct impacts to individuals during implementation of the proposed restoration activities. Overall, the proposed action would restore appropriate habitat for a large

number of sensitive species by raising the water table and would therefore have a long-term beneficial impact on those species that are found in wet and moist meadow systems.

Degraded meadows and floodplains often experience weed invasions that can overtake the original plant community. Restoring degraded systems using appropriate project design criteria would both actively and passively promote the recovery of native species and would have direct and indirect beneficial impacts to native plant communities and their resilience to invasions.

Additionally, the proposed action would increase the overall amount of habitat for native culturally-significant plants such as camas, sedge, and willow species that inhabit moist and wet meadows, and provide beneficial long-term impacts for the populations of those species. It is possible that camas would be present in a degraded meadow system and individuals may experience direct impacts from implementation.

Future foreseeable activities, in combination with past actions, are unlikely to have potential cumulative effects to sensitive species and their habitats once these degraded systems are restored. Once habitat is restored it will be subject to project design criteria that will protect the habitat integrity and sensitive species populations, as well as protect the site from plant invasions. It is unlikely that cultural species would experience any cumulative impacts.

Under the No Action alternative, there would be no direct or indirect impacts to sensitive and culturally-significant species, and invasive plant invasions in this habitat type. However, potential habitat for sensitive species would continue to decrease in the absence of restoration activities. Additionally, non-native plant species would continue to out-compete many native species in these degraded communities.

Moist Meadows and Vernal Swales

Moist meadows are openings typically saturated in the spring, but transition during the mid to late summer into drier meadows once the water table has fallen below the soil surface. This habitat type is where many sensitive plant species occur on the Forest. Several sensitive species are also found in the transition zone between the meadow and the drier surrounding forest or shrubland, including the globally-rare Idaho sedge (Carex idahoa). Under the proposed action, moist meadows are an example of a habitat type that would benefit after restoration of dry and degraded meadow systems. For example, many areas that likely provided habitat for Idaho sedge in the past currently have severely down-cut streams that no longer possess the transitional habitat within the floodplain.

During implementation, there should be no direct impact to any sensitive species in the planning area, as several design criteria outline steps to survey for and protect populations. Overall there would be a long-term beneficial impact to sensitive plants that these meadow systems support as their potential habitat increases in extent and quality.

Revegetation and invasive species design criteria would work to prevent plant invasions after ground disturbance, so the proposed actions will have no impact for invasive species Additionally, the management of invasive plant species would see indirect benefits from the proposed action by actively changing the biophysical system to support the original plant communities of moist meadows. Overall, the native riparian plant community should become vigorous enough to out-compete potential noxious weeds in the future.

Culturally-significant plants that inhabit moist meadows, namely camas, rushes, and sedges, may experience acute negative impacts to individuals during implementation, but will also see

beneficial impacts from the restoration activities that would increase suitable open, moist habitat and wide floodplains.

Potential cumulative effects in this riparian type include past actions as well as those in the foreseeable future. Historical degradation of moist meadows and vernal swales has caused their overall presence to diminish over time. It is unlikely that the interaction of these actions will cause cumulative effects to sensitive, cultural, or invasive species in this habitat type. However, with an increase in extent of this habitat and its value as forage, there is potential for grazing activities to interact with restored habitat in a way that might prompt heightened range management in those areas in order to reduce risk of plant invasions and degraded plant habitat. Under the No Action alternative there would be no impacts to sensitive and culturally-significant species, and invasive plant infestations in this habitat group because no actions will be proposed. However, suitable open, moist habitat for sensitive species would continue to decrease in the absence of restoration activities. Areas where their historic habitat is currently degraded will not be restored in a way that would provide suitable habitat. Similarly, for camas and other cultural species, the total suitable habitat would continue to decrease due to issues including conifer encroachment and continued lowering of the water table. Additionally, changes over time to hydrology and plant community from ongoing issues like erosion and conifer encroachment would increase the ability of non-native plant species to compete with native species.

Wet Meadows

Wet meadows are open areas saturated throughout the growing season with the water table continuously at or slightly below the soil surface and are the most productive habitat type in terms of herbaceous biomass. This is a habitat where many sensitive plants occur, and much like moist meadows, several species are also found in the wetland ecotone and margin between the meadow and surrounding dry forest or shrubland.

Like moist meadows, there are many areas that can be restored from degraded habitats back to wet meadows. Because design criteria restricts management actions within perennially-saturated wet meadow systems to protect known populations of sensitive plants and integrity of habitat, there will be no impact to sensitive species. . Overall, restoration activities would result in an increase habitat for sensitive plant species that depend on wet meadow systems and will have long-term beneficial impacts.

The management of invasive plant species would also benefit from the proposed action by actively changing the system to support the original plant communities which should become vigorous enough to out-compete potential noxious weeds that was not possible when the meadow was in a degraded state.

Culturally-significant plants that inhabit wet meadows, such as some types of sedges, would most likely see no direct impact from project implementation but also experience beneficial impacts in the long term from the proposed action by increasing the extent of such meadows.

Potential cumulative effects in this riparian type would be similar to those of the moist meadows and vernal swale habitat type. It is unlikely that the interaction of these actions will cause cumulative effects to sensitive, cultural, or invasive species in this habitat type. However, with an increase in extent of this habitat and its value as forage, there is potential for grazing activities to interact with restored habitat in a way that might prompt heightened range management in those areas in order to reduce risk of plant invasions and degraded plant habitat. Under the No Action alternative there would be no direct or indirect impacts to sensitive and culturally-significant species, or insvasive species issues in wet meadows. However, habitat with a high water table would continue to decrease in the absence of restoration activities. Additionally, changes over time to hydrology and plant community from ongoing issues like erosion and conifer

encroachment would increase the ability of non-native plant species to compete with native and sensitive plant species.

Groundwater-Dependent Ecosystems

Seeps and Springs

Springs are points where groundwater emerges and flows. Groundwater also feeds seeps, but seeps do not produce perennial flow. Springs and seeps are typically small, but are well distributed on the Forest. Seeps are generally less well documented on the forest. Seeps and springs are often developed for cattle troughs. Many of these areas have been dewatered and/or trampled due to these developments historically. Many developed springs now have fences to protect the water source. These areas provide important habitat for several sensitive plant species, most notably several species of mosses and liverworts.
This document includes extensive project design criteria (see Appendix A Project Categories and Project Design Criteria), including cover buffers and fenced exclosures, for any projects involving spring development or restoration of previously developed springs. Therefore there should be none or beneficial impact from the proposed action to sensitive species and their unique spring and seep habitat.

There will be no impact to the issue of invasive species in spring or seep areas. Project design criteria outline the physical protection of these habitats during nearby ground disturbance as well as necessary revegetation or mitigation actions in nearby areas of disturbance.

Much like that for sensitive species, the action alternative would have no direct impact but beneficial indirect impact on culturally-significant plant species, such as cherry and willow species, which inhabit the spring and seep habitats that will be restored.
Past actions that may have influenced the existing condition of springs and seeps, and that will interact with future actions to produce cumulative effects, include spring developments where the natural spring structure was disrupted, lack of spring and seep protection from ungulate trampling, and lack of return flow systems that re-route water back into the original channel. Once these habitats are restored and protected after implementation, they will be some of the most protected systems and will need less design criteria to maintain the integrity of their habitat during future actions. This is particularly true for springs that will be developed with low-impact criteria during this project and will need only maintenance in the future (i.e. fence, pipe, or valve maintenance) to retain quality habitat for sensitive and cultural species. Thus, cumulative effects of past and forseeable future management actions will be negligible overall for the habitat, its sensitive, cultural, and invasive species.

With the absence of any management action under the No Action Alternative, these groundwater dependent ecosystems would experience no direct or indirect impacts. However, there is the potential for spring and seep habitat quality to decrease without the proposed actions if there are cases where these habitats are vulnerable to anthropogenic hydrological changes over time.

Peatlands

Peatlands are a type of wetland that is defined by the accumulation of partially decayed plant matter. Peat accumulates under saturated groundwater-fed conditions where there is little oxygen to facilitate decomposition. Peatlands form stable plant communities that are self-perpetuating in the absence of disturbance. Fens are the primary type of peatlands in the Blue Mountains. These areas are fed by groundwater or mineral-rich surface water, have neutral to alkaline pH, and support relatively rich, marsh-like vegetation. Peatlands are not common on the Forest. This is

due, in part, to a climate that does not favor their extensive development. The combination of habitat rarity, stability, and extreme conditions in peatlands supports a distinctive flora with high concentrations of rare species. Peatlands provide very specialized habitat that supports several rare mosses and sedges on the forest.

Peatlands and the sensitive species they support, would experience no impact or beneficial impact from the proposed action. This habitat type takes hundreds to thousands of years to develop and therefore cannot be restored on the timescale of this document. Only projects that mitigate current negative conditions would be proposed (example – felling large wood to correct any downcutting channels or to prevent erosion, or fencing from livestock). Any projects in or adjacent to this habitat type would avoid any ground-disturbing impacts to intact peatlands as outlined by project design criteria for groundwater-dependent ecosystems. Sensitive plant species would benefit from the maintenance of their unique resource needs within the fen habitat.

There would be no direct impact to the issue of invasive plants in peatlands because no ground disturbing activities would occur within the actual fens. Any direct disturbance adjacent to this wetland habitat would follow detailed design criteria to prevent the spread of invasive species and actively promote the native plant community.

Culturally-significant plants that inhabit peatlands, including species of willows and sedges, would either experience no impact or only beneficial impact from the proposed action by removing existing negative influences to the habitat, thus protecting their undisturbed habitat.

Past actions that may have influenced the existing condition of peatlands, and that would interact with future actions to produce cumulative effects include artificial channeling of peatlands. Fens, due to their rarity on the forest, are also likely to have protective criteria during future vegetation or range projects. Thus, cumulative effects of past and future management actions would be minimal overall for the habitat, its sensitive species,and invasive species. Cultural plant species are very unlikely to see cumulative effects because they will be well protected after implementation of restoration activities.

With the absence of any management action under the No Action alternative, groundwater-dependent ecosystems, their sensitive and cultural species, and plant invasions, would experience no direct orindirect impacts. .

Aquatic Habitats

Aquatic habitats include areas with standing water at least part of the year. These include ponds, lakes, streams and rivers. These areas support plants that are free-floating or are rooted at the bottom under the water. Some ponds only have standing water in the spring. This habitat type is very limited on the Malheur, and many ponds on the Forest are human-created stock ponds.

The action alternative will have no impact on known sensitive species populations, as project design criteria outline their protection. However, it may result in limited negative short-term impacts on aquatic sensitive plant habitat due to physical disturbance associated with any restoration activity where aquatic substrates would be moved. Projects adjacent to aquatic habitats would include mitigation measures and buffers to physically protect the habitats. Overall, the proposed action would impact known and unknown sensitive species populations beneficially in the long-term by improving and maintaining the quality of their native aquatic habitats.

The proposed action should have no impact on the spread of invasive weeds. Project design criteria describe actions necessary before and after ground-disturbing activities as well as define the use of certified weed-free materials such as gravel fill or sand in aquatic habitat restoration projects that would prevent any invasive species risks both in the water and on adjacent disturbed land.

Culturally-significant plant species inhabiting aquatic environments could see potential direct negative effects to individuals during management actions, such as removal of pilings or channel reconstruction. Overall their populations should experience a beneficial indirect impact from an improvement in their habitat quality and/or an increase in overall suitable habitat.

Past management actions within aquatic ecosystems are many, and include physical manipulations such as culverts, dams, dikes, berms, levees, pilings, and indirect degradation due to hydrological changes and erosion. Forseeable future actions may include disturbances that could impact aquatic habitats and the species they support, such as stream crossings during timber harvest, road construction, and recreation projects. For example, the greatest potential impact would likely come from grazing projects, as it is expensive and otherwise not feasible to protect all aquatic habitats with exclosure fencing as it is for springs and seeps. Therefore, detailed management plans would be necessary to prevent long-term negative cumulative effects in restored aquatic habitats.

With the absence of restoration activities under the No Action alternative, aquatic sensitive plant species and culturally-significant species habitat would see no impact. However, aquatic sensitive and cultural species habitat will continue to be vulnerable to degradation of water quality and overall aquatic function, and the lack of restoration activities would mean less suitable habitat for these important species. Similarly, there would be no impact on invasive plants with no proposed management actions, but these ecosystems may remain less resilient to weed invasions without restoration

Soils

This soils analysis focuses on erosion and other detrimental soil impacts. The intent of this section is to report if the alternatives comply with relevant laws, regulations, policies, and plans. The main proposed activity considered is heavy machinery use, although other activities that could impact soil are also considered. Soil is not directly related to the purpose and need of the project.

Desired Condition

The desired condition is for all activity areas to have less than 20% detrimental impacts on the Malheur and 10% on the Ochoco. [Forest Wide Plan Standard 126 (Malheur); MA-F15 Riparian Areas (Ochoco).] Detrimental impacts include erosion, compaction, puddling, displacement, and detrimental burning. Detrimental soil impacts are at a practical minimum.

Methodologies and Assumptions

- The basis of the effects analysis is the observations and professional judgment of the project soil scientist developed through 24 years on the Malheur National Forest.
- The analysis areas are the areas within 50 feet of streams.
- This section concerns only soil outside of stream channels. See the Hydrology and Fisheries sections for discussions of conditions within stream channels.

Resource Indicators

Table 22 Resource Indicators for Assessing Effects on Soils

Resource Element
Erosion
Other detrimental soil impacts (compaction, puddling, displacement, and detrimental burning)

Affected Environment

Erosion

Soils in riparian areas are highly variable. However some soil characteristics tend to be consistent. Most of the topography in these areas is fairly flat. Ground cover tends to be abundant, because the relatively high amounts of water supports abundant plant growth. In addition, the abundant vegetation makes riparian area soils more resilient for recovering from human activities, except roads. Often the soils were deposited on floodplains (especially soil near streams), so these soils often don't have much clay, so infiltration is high. All three of these characteristics tend to make erodibility of riparian soils low.

Roads are the main activity causing accelerated out-of-channel erosion. Also, some accelerated erosion takes place on dry non-forest areas in riparian areas impacted by livestock, and also livestock trailing. Off highway vehicles may cause out-of-channel erosion, but no case of this erosion has been reported to the soil scientist. Accelerated erosion in the analysis area from human activity is low, except from roads. And much of the sediment from erosion is deposited on

soil before it reaches a stream channel, though some sediment does reach stream channels from roads.

Other Detrimental Impacts

The same soil moisture that produces abundant plant growth in riparian areas also makes the soils relatively susceptible to other detrimental soil impacts - compaction, puddling, and displacement. The amount of these impacts, as well as detrimental burning in riparian areas, is variable.

Some causes of high impacts near streams include past concentrated railroad logging, agricultural use prior to becoming part of the National Forest system, livestock concentration, and some dispersed camping. Off highway vehicles may cause compaction, but the only observed case of soil impacts related to them was on tracks created along fences, which likely exist for fence maintenance and may also get use by antler hunters.

About 10% of upland areas of the forest have relatively high impacts to soil. The impacts mostly result from heavy equipment use during past logging and fuels control. In regard to areas within 50 feet of streams, there are probably fewer instances of relatively heavy impacts than in upland areas (fewer than 10%) because of protective measures taken during past activities.

Environmental Consequences

Alternative 1 – No Action

No detrimental soil impacts would result from aquatic restoration activities.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Table 23 Soils Resource Indicators for Alternative 2

Resource Element	Alternative 2
Erosion	an unmeasurable increase
Other Detrimental Impacts	Variable

Erosion

Some activities are expected to *never* increase out-of-channel erosion. They are: riparian vegetative planting; bull trout protection; and surveys in support of aquatic restoration. These activities do not use heavy machinery or otherwise remove ground cover or cause water concentration.

Most of the other activities may use heavy machinery. Erosion from heavy machinery use would be minimized by General Aquatic Conservation Measures 15.f 16.c, and 18.a-e (see appendix A) and by minimizing compaction and puddling, and thus rutting.

For Livestock stream crossings and off-channel watering facilities, out-of-channel erosion would be minimized by project design criteria 9.b.ii,iv-v and 9.c.iv-vii.

For road erosion control, erosion would be minimized by project design criteria 11.a.i-vi and 11.b.i-ii
For juniper removal, erosion would be minimized by project design criteria 12.c,e-g. It is possible that juniper removal would increase ground cover within a few years, and thereby reduce erosion.
Prescribed burning (including for disposal of slash after juniper removal) can involve only low and moderate severity fire (project design criteria 13.a.iv-v. 13.b.iv), and erosion from fire lines would be minimized (project design criteria 13.a.vi), so erosion from prescribed burning would not be significant.

Erosion would be at a maximum during activities, and would decrease to zero by about two years as erosion control measures take effect.

As noted in the existing condition section, soils in analysis area tend to have low erodibility. Because erosion would be kept to a minimum, and because of the low erodibility of most soils, erosion is not expected to significantly affect soil productivity or to introduce a significant amount of sediment from outside channels into channels.

Other Detrimental Impacts

Compaction, puddling, and displacement would be caused by heavy machinery use. In addition to being detrimental impacts themselves, they can also cause rutting, which can increase erosion. Compaction, puddling, and displacement would be minimized by General Aquatic Conservation Measures 12 (soils are generally driest during the In-water Work Period), 16.a, and 17.a. They would also be minimized by project design criteria that minimize erosion (see the section that immediately precedes this section, as well as the project design criteria by resource listed in appendix A).

Upland timber sales during dry periods detrimentally impact about 6% of an area. Factors that are different for aquatic restoration are as follows:

- Soils in aquatic restoration would typically be moister, and therefore more compactable.
- Machinery in aquatic restoration is not limited to skidtrails, and therefore may affect a larger proportion of the area. On the other hand it is possible aquatic restoration machinery would affect a smaller proportion of the area, because the machinery needs to reach fewer points.
- The area impacted by aquatic restoration machinery would be impacted less, because there would be fewer passes, and the machinery may have less ground pressure than logging machinery.

Consideration of these factors suggests that aquatic restoration machinery would detrimentally impact about 4% of the activity area.

Impacts would be at a maximum immediately following the activity, and the soil would gradually recover from these impacts over the course of about 20 years.

None of the activities are likely to detrimentally burn soil, because any prescribed burning would be kept to low or moderate severity.

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects on soil are within 50 feet of the stream channel, except the boundaries would extend further when and where heavy machinery goes further from the stream channel. These boundaries were chosen because they include the area where effects (direct and indirect) may be caused by the proposed activities (FSH.1909.15, 15.2a). We would address cumulative effects after an activity is complete, since cumulative effects would be the most discernible at that time.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects

Past actions that may affect erosion and other detrimental impacts, which are not happening presently, include roading, extensive logging, and in a very few areas, agriculture. Past, present, and reasonably foreseeable activities or actions include livestock management, camping, use of off-road vehicles, and limited logging in riparian areas.

Conditions resulting from foreseeable actions are expected to be similar to current conditions. Some soil would recover from past and present actions, but this recovery would be offset by new impacts from foreseeable actions.

The effects of past and present actions were described previously under Existing Condition in this section. The effects of the proposed activities would add to the effects of the past, present, and reasonably foreseeable actions.

Erosion

The main past, present, and foreseeable source of out-of-channel erosion is roads. The expected increase in out-of-channel erosion from the proposed activities is small, and when added to erosion from roads, is not expected to be measurably greater than erosion from roads alone.

Other Detrimental Impacts

Detrimental impacts from this project add to past and present impacts. Although detrimental impacts would be kept to a minimum, it is possible that in areas with heavy existing impacts, the cumulative impact would violate Forest Plan standards. However, this possibility is averted by the project design criteria developed for the soils resource (see Appendix A Project Categories and Project Design Criteria).

Regulatory Framework

- Land and Resource Management Plans - The Forest Plans (1990, 1989) Malheur Forest-Wide Standard 126 and the Ochoco Forest-wide Standard MA-F15 Riparian Areas applies to use of heavy machinery.

Federal Law

- National Forest Management Act - If a project meets Forest Plan Standards, it would meet the requirements of the National Forest Management Act and other laws and regulations (FSM R-6 Supplement 2500-98-1).
- Compliance with the Malheur and Ochoco National Forest Land and Resource Management Plans and Other Relevant Laws, Regulations, Policies and Plans - all alternatives comply with relevant laws, regulations, policies, and the Forest Plans as disclosed in the Effects sections.

Summary

All alternatives comply with relevant laws, regulations, and policies, and the Forest Plans as disclosed in the effects section. None of the effects are significant.

Fire and Fuels

Fire and fuels treatments are tools used to achieve forest management objectives to work toward meeting desired conditions as described in the Malheur Forest Plan. These same tools would be used to achieve the desired conditions and goals as they relate to aquatic restoration activities. The actions discussed and analyzed here are not focused on the reintroduction of fire as an ecological process nor the reduction of hazardous fuels, though these may be additional benefits of the actions described.

Methodology

This effects analysis is synthesized from studies occurring on the Forest (as referenced).

For Project Design Criteria 12 (see Appendix A Project Categories and Project Design Criteria), Juniper Removal, the desired condition is to 'restore plant species composition and structure that would occur under natural fire regimes.' Juniper removal is intended to mean killing live stems, not necessarily physically removing all juniper biomass from a designated restoration site. Juniper encroachment throughout the analysis area has been well studied and defined (USDA 2003, Gedney 1999, Miller 2005). The majority of these studies use canopy cover as a measure of juniper dominance in a system, with areas of greater than 10% canopy cover categorized as a juniper woodland. Once an area has transitioned to a juniper woodland it has lost the riparian community characteristics, therefore the threshold of canopy cover of less than or equal to 10% has been used as the measure for areas to be treated (Gedney 1999).

For Project Design Criteria 13, Riparian Vegetation Treatment (see Appendix A Project Categories and Project Design Criteria), the intent is 'to help restore plant species composition and structure that would occur under natural fire regimes' through prescribed burning. A number of studies have established the links between plant species composition, stream channel structure and stability, groundwater hydrology, and nutrient cycling (USDA 2003). This vegetative composition can be characterized not only by species diversity but also structural and age class diversity that is characteristic of the biophysical setting in which it occurs and the disturbance regimes in which it developed. In the absence of fire and wake of other intensive activity (timber harvest, grazing), these compositions have deviated from the historic range of variability across our riparian zones (Powell 1998).

For the analysis for Criteria 13, we will use condition classes to describe this departure from the historic range of variability and as our metric to identify desired conditions. Condition classes, numbered from 1 to 3, are generally equivalent to low, moderate, and high departure from the historic range of variability. Condition classes also represent increasing levels of risk from uncharacteristic wildland fire behavior and effects (Hann 2004). A more intensive description of condition classes can be found in Table 24.

Table 24 Description of Condition Classes, adapted from the Malheur National Forest Fire Management Plan

Condition Class	Attributes	Example Management Options
Live Fuels Condition Class 1	Fire regimes are within or near an historical range. The risk of losing key ecosystem components is low. Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval). Vegetation attributes (species composition and structure) are intact and functioning within an historic range.	Where appropriate, these areas can be maintained within the historic fire regime by treatment such as prescribed fire or management of unplanned ignitions to meet Forest Plan objectives.

Live Fuels Condition Class 2	Fire regimes have been moderately altered from their historical range.	Where appropriate, these areas may need moderate levels of restoration treatments, such as prescribed fire, hand or mechanical treatments, or managing unplanned ignitions under the appropriate conditions to restore historic composition and structure and fire regimes (particularly fire regime I).
	The risk of losing key ecosystem components has increased to moderate.	
	Fire frequencies have departed from historic frequencies by more than one return interval. This change results in moderate changes to one or more of the following: fire size. Frequency, intensity, severity, or landscape pattern.	
	Vegetation attributes have been moderately altered from their historic ranges.	
Live Fuels Condition Class 3	Fire regimes have been considerably altered from their historical range.	Where appropriate, these areas need intensive degrees of restoration treatments, such as multiple entries of prescribed burning and hand or mechanical treatments.
	The risk of losing key ecosystem components is high.	
	Fire frequencies have departed by multiple return intervals. This change results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape pattern.	

Models

Fire regimes are the classification of the historic combined conditions for fire severity, intensity, and frequency for a particular environment (Agee 1993, Hann 2004, Sugihara 2006). They are a cornerstone for describing the natural range of variability within a system. In the broad definition, the regimes found on the Malheur are characterized as follows in Table 22:

Table 25 Fire regimes found on the Malheur National Forest

Fire Regime 1 (dry upland forest)	0-35 year frequency	Low-mixed severity (less than 75% of dominant overstory vegetation replaced)
Fire Regime 2 (dry herbland)	0-35 year frequency	High severity (greater than 75% of dominant overstory vegetation replaced)
Fire Regime 3 (moist upland forest)	35-200+ year frequency	Mixed severity (25-75% of overstory vegetation replaced
Fire Regime 4 (cold upland forest)	35-100+ year frequency	High severity (greater than 75% of dominant overstory vegetation replaced).

Seventy-two percent of the Forest is classified as Fire Regime 1 (USDA 2014). This includes the dry forest types. Because these forests had more frequent fire return intervals, with the advent of fire suppression these portions of the forest tend to be the furthest departed from the historic range of variability. As described under Resource Indicators and Measures in this section, condition class is a way to express this departure.

Resource Indicators and Measures

- Resource Indicator 1: Juniper encroachment. The allowable amount of canopy cover by juniper will be less than or equal to 10%.
- Resource Indicator 2: Where aquatic restoration activities include improving the live fuels condition class, fuels in condition class 2 or 3 will be treated with the intent of moving riparian habitat toward condition class 1.

Table 26 Resource Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source
Juniper dominance	Percent Canopy Cover	< 10%	Yes	ARBO II Project Design Criterion 12.
Plant diversity (composition and structure)	Within historic range of variability as measured in terms of Condition Class as described previously in this section	Condition Class I	No	ARBO II Project Design Criterion 13.

Affected Environment

Throughout the Forest, wildland fire processes have been altered due to fire exclusion, timber harvest, climate change, and grazing. As a result, fires are now larger and more severe than historic levels, especially in the dry forest types (Quigley 1997). Forest structure has been altered. Juniper forests in a 1936 study covered only 420,000 acres in eastern Oregon but today cover 2.2 million acres. Juniper encroachment has increased more than 500% in the Blue Mountains since the 1930s (Gedney 1999).

Studies have specifically shown hardwood tree and shrub-dominated riparian zones to have declined since the mid-1800s (Lee 1997, Wisdom 2000) throughout the Blue Mountains. Many of these areas succeeded into dense stands of fir where shade intolerant shrubs may be absent or in decline (Liquori and Jackson 2001). Ultimately, these changes have created a set of systems that are less resilient in the wake of disturbances, such as periodic native insect infestations or recurring wildfires.

Thirty percent of National Forest System lands are currently categorized as condition class 1 (USDA 2014).

Environmental Consequences

Alternative 1 – No Action, Fire Fuels and Air Quality

No juniper removal activities associated with aquatic restoration activities would be implemented in riparian areas or upland areas, allowing juniper encroachment to continue. Vegetative stands would continue to develop towards condition class 3, allowing for increased chance of severe fires and reduction in plant diversity across the Forest. Both would result in continued degradation of riparian zones.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Aquatic restoration activities utilizing fire and fuels treatments in riparian areas where appropriate actions would move the forest towards the historic range of variability and provide greater ecosystem resilience to disturbances, such as wildfires or insect invasion. For this analysis, these treatments will be described as either in restoration phase or maintenance phase.

Restoration Phase
This phase applies to both juniper reduction and riparian vegetation treatments that, under present conditions, would require mechanical treatment to ensure that any broadcast burning would be low or moderate severity. These are areas that are currently in condition class 2 or 3 or that exceed 10% Juniper canopy cover. Mechanical methods would range from chainsaw use to heavy equipment.

Maintenance Phase
This phase includes treatments where juniper canopy cover is less than or equal to 10% or within riparian areas where the system is already in condition class 1. Periodic low to moderate severity prescribed burns would be necessary to maintain the stand within the historic range of variability. Based on fire history studies by Heyerdahl and Agee (1996) in the Blue Mountains, and Olson (2000), within riparian habitats in these landscapes, mean fire return intervals were 12 years. These frequent fires burned with low severity.

There would be temporary impacts from fire crews and equipment.

Table 27 Resource indicators and measures for Alternative 2

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2
Juniper dominance	Percent Canopy Cover	< 10%	100% of the areas within riparian zones would have juniper? canopy cover at <10%
Plant diversity (composition and structure)	Within historic range of variability as measured in terms of condition class	Condition Class I	100% of the areas within riparian zones would be in condition class I

Resource Indicator and Measure 1 and 2

Riparian health would be improved in a number of ways. Stream flow would increase as the composition and structure of vegetation improves and intercepts precipitation falling on a watershed. Increases in peak flows have been observed following removal of trees, possibly due to loss of canopy interception and evapotranspiration. Several studies have reported increases in summer flows ranging from 15% to 148% (USDA 2003).

Resource Indicator and Measure 1

Overabundance of juniper leads to a number of unwanted conditions, and removal of juniper provides plant diversity and ecosystem function within the historic range of variability. Local studies that compared cut and uncut treatments reported significant increases in herbaceous cover and biomass when juniper trees were removed (Bates 2000). As described elsewhere, this shift in plant composition has a range of riparian health benefits. In a study in southeastern Oregon, Pierson et al. (2003) found that hillslopes dominated by western juniper produced more runoff on a more regular basis from thunderstorms than hillslopes that had juniper removed. During large thunderstorms, erosion on the western juniper hillslopes was over 15 times greater than on the hillslopes without western juniper (Miller 2005).

Resource Indicator and Measure 2

Restoring areas to condition class 1 would restore plant species composition and heterogeneity within the riparian zones. Plant species provide different functions for stream channels and instream habitat depending the biophysical setting. For example, meandering streams in floodplain environments are dependent upon deep-rooted plant species such as sedges (Carex spp.) and rushes (i.e., Juncus spp.). These plants provide bank stability, catch fine sediments

during flood events, increase groundwater infiltration rates, and retain coarse organic particulate matter critical in the maintenance of instream food webs. Hardwood abundance provides essential shade to properly moderate extremes and fluctuations in water temperatures as well as provide key nutrient inputs from litterfall (USDA 2003).

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The cumulative effects analysis area for this report is the proposed project area. These effects are considered for the short term, which would be the next 10 years, and the long term, which for the purposes of this report will be the next 25 years. The timeframes given reflect potential future changes in management strategies, the need to reevaluate the project periodically, and because of the uncertain effects of climate change.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Fire suppression is the principle activity which creates a cumulative impact related to this report. Other activities on the forest do not directly relate to the actions and mitigation measures described here and in the ARBO II. In the long term, with continued fire suppression and no treatments, riparian zones and other vegetation types throughout the Forest would continue to see a decrease in plant diversity, an increase in fuel loadings (both live and dead), and increased potential for uncharacteristically severe and system damaging fires.

Regulatory Framework

Land and Resource Management Plans

The Forest Plans provide standards and guidelines for fire and fuels treatments. The goals for fire management are to: 1) initiate initial management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management and 2) identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction.

Federal Law

- Clean Air Act
- Healthy Forest Restoration Act
- National Forest Management Act
- National Fire Plan
- National Cohesive Wildland Fire Management Strategy
- Interagency Prescribed Fire Implementation Guide

State and Local Law

State of Oregon Smoke Management Plan - Oregon's Smoke Management Rules (OAR 629-048-0001 through 629-048-0500) as legislated through the following: ORS 477.013, 477.562 (as amended by ch. 213, OL 2007, Enrolled HB 2973), 526.016, 526.041 Stats. Implemented: ORS 477.013, 477.515, 477.562 (as amended by ch. 213, OL 2007, Enrolled HB 2973) Hist.: DOF 4-2007, f. 12-31-07, cert. ef. 1-1-08

Compliance with the Forest Plans and Other Relevant Laws, Regulations, Policies and Plans

The project design criteria for the Fire and Fuels resource (see appendix A) comply with all with relevant laws, regulations, policies and the Malheur and Ochoco National Forest Land and Resource Management Plans (1990, 1989).

Summary

The No Action alternative would allow juniper encroachment to continue, continued reduction of diversity in plant species composition, and poor resilience to fire and other ecological disturbances in the riparian areas of the Forest. The proposed action would begin to ameliorate these unwanted effects wherever the related design criteria are implemented.

Summary of Environmental Effects

Table 28 Summary comparison of environmental effects to resources.

Resource Element	Indicator/ Measure	Alt 1 (No Action)	Alt 2 (Project Design Criteria)
Juniper Dominance	Canopy Cover	No juniper removal would be implemented, therefore juniper encroachment into riparian areas would continue.	Juniper would be removed from areas where Juniper provide greater than 10% canopy cover. This would release other native species, improving site biodiversity and restoring the plant community to historic potential natural vegetation groups.
Plant diversity (composition and structure)	Condition Class	Vegetative stands would continue to advance towards Condition Class III, allowing for increased chance at severe fires and reduction in plant diversity.	Restoration Phase: Ecosystems would begin to be more resilient to disturbance such as fire, and plant diversity would increase. Maintenance Phase: Ecosystems would be most resilient to disturbances and healthy plant communities within the historic range of variability would be contributing to healthy riparian zones.

Heritage Resources

The Malheur National Forest is located in the southern Blue Mountains at the interface of the Columbia Plateau and Great Basin. The southern Blue Mountains are the ancestral homeland of people representing the northern Great Basin and the southern Columbia Plateau cultural traditions (Burtchard 1998). Culturally important plant species, such as biscuit root, bitter root, camas, huckleberry and chokecherry, are locally abundant. A variety of wild game and fish, including deer, elk, antelope, trout and salmon, provided additional food resources. Thirteen geochemically distinct natural obsidian deposits provided tool stone which was widely traded out of the area for over 8,000 years.

The discovery of gold deposits in 1862 led to a rapid displacement of native people by Euro-American and Asian miners and settlers. The gold deposits were largely worked out by 1920, and ranching, which began in the 1860s, became the dominant economic activity. The commercial timber industry prospered as rail lines reached the Forest, as early as 1905 in the Middle Fork John Day River drainage at Austin, and as late as 1928 in Bear Valley by way of Hines.

Since 1978 the Forest has actively conducted surveys for cultural resources as mandated by Section 106 of the National Historic Preservation Act. These surveys are generally done to identify cultural resources which could be negatively affected by project activities such as logging, cattle grazing and road construction. Since then over 1,500 inventories have been conducted leading to the identification of over 5,000 archaeological sites and historic features.

In 2004 the Forest Service signed a programmatic agreement with the Oregon State Historic Preservation Office (SHPO) which allows for streamlined compliance with the National Historic Preservation Act for numerous undertaking with limited potential to negatively affect cultural resources (Oregon SHPO 2004). As displayed in Table 26, the majority of the aquatics restoration project work covered by this analysis falls under the criteria of undertakings which can receive National Historic Preservation Act clearance using the streamlined procedures.

Table 26 below, displays the approach to National Historic Preservation Act compliance which would be used for each of the project categories listed in chapter 2 and fully described in the appendix.

Table 29 Common National Historic Preservation Act compliance strategies for aquatic restoration activities. Aquatic restoration project categories are described in more detail in appendix A. National Historic Preservation Act clearance categories are taken from the Oregon SHPO 2004.

Aquatic Restoration Project Category	National Historic Preservation Act clearance categories under the 2004 Preservation Act
1. Fish Passage Restoration (Stream Simulation Culvert and Bridge Projects; Headcut and Grade Stabilization; Fish Ladders; Irrigation Diversion Replacement/Relocation and Screen Installation/Replacement)	Culverts- A-27; Bridge design- Full Inventory; Crossing design- A-20; Head cut and Grade stabilization- A-20 or B-21; Fish Ladders- Full Inventory; Irrigation diversion- A-20 or Full Inventory
2. Large Wood (LW), Boulder, and Gravel Placement (LW and Boulder Projects; Engineered Logjams; Porous Boulder Weirs and Vanes, Gravel Augmentation; Tree Removal for LW Projects)	Large wood and boulder- A-20; Engineered Logjams- A-20, B-21 or Full Inventory; Porous Bolder Structures- A-20; Gravel Augmentation- A-20; Tree removal by felling- B-16; Tree removal by pulling/pushing- Full Inventory
3. Dam, Tide gate, and Legacy Structure Removal	A-28 or Full Inventory
4. Channel Reconstruction/Relocation	Full Inventory

Aquatic Restoration Project Category	National Historic Preservation Act clearance categories under the 2004 Preservation Act
5. Off- and Side-Channel Habitat Restoration	Full Inventory
6. Stream bank Restoration	A-2, A-3, A-4, A-20, C-11, C-34, Full Inventory
7. Set-back or Removal of Existing Berms, Dikes, and Levees	Full Inventory
8. Reduction/Relocation of Recreation Impacts	B-5, B-7, B-8, B-12, B-13, Full Inventory
9. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering	Livestock fencing- A-1, C-6; Stream crossings- A-1, B-2, B-6, Full Inventory; Off-channel watering facilities- B-6 or Full Inventory
10. Piling and other Structure Removal	A-28, C-25
11. Road and Trail Erosion Control	Road decommissioning and storm proofing- A-27, B-3, B-4, B-5, B-7, B-8, C-4, C-34; Road relocation- Full Inventory
12. Juniper Removal	A-15, B-16, Full Inventory
13. Riparian Vegetation Treatment (prescribed burning)	Burning- B-17; Non-commercial thinning- A-15, B-16
14. Riparian Vegetative Planting	A-1, A-2, A-3, A-4, A-5, A-16, B-1, B-16, C-2, C-9, C-11, C-34
15. Bull Trout Protection	C-7, C-9
16. Beaver Habitat Restoration.	In-channel structures- A-20, C-7, C-9; Habitat restoration- A-2, A-3, A-4, A-8, A-15, A-16, B-1, B-16, B-17, C-6, C-7, C-9, C-11,
17. Fisheries, Hydrology, Geomorphology Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration	C-26

Affected Environment

The 5,191 cultural resource sites documented on the Forest as of 2013 include a mix of prehistoric Native American sites, historic period sites, and traditional cultural properties.

Prehistoric sites on the Forest are dominated by a variety of stone tools and tool fragments as well as the waste flakes associated with the manufacture of stone tools. These sites range from very small lithic scatters, indicative of expedient tool manufacture or reworking, to large sites with heavy lithic concentrations or stratified deposits of cultural materials, which suggest heavy and long-term use. Additional prehistoric site types include rock art, stacked rock features, cambium peeled trees, plant gathering and processing sites, and hunting camps. Human use of the area is believed to span the Late Pleistocene through the Holocene Epochs, a period of up to 14,000 years.

Most prehistoric sites are not directly associated with streams or riparian areas. They tend to be located in areas of drier ground sometimes near these locations but rarely in direct association. Most prehistoric sites would not be impacted by instream work but there can be conflicts in the adjacent drier areas if those are included in the proposed activity area.

Historic sites are primarily related to livestock grazing, timber harvest, mining, and Forest Service administration. Site types include cabins, mining camps, logging camps, refuse dumps, ditches, mine tailings, log watering troughs, lookouts, guard stations, railroad grades, bridges, wagon roads, trails and aspen carvings.

Many historic sites are not directly associated with streams or riparian areas although they may be located in areas of drier ground adjacent to these locations. Historic placer mining features including tailings, ditches, and holding ponds are a major exception and often require mitigation for aquatic restoration work. Historic railroad grades, trestles, and bridges also are sometimes in conflict with stream restoration projects.

Identified traditional cultural properties consist of plant gathering locations important to local Native American tribes. This includes significant patches of huckleberry, choke cherry, willow, biscuit root and bitter root. Cambium peeled ponderosa pine trees have been identified as of particular cultural significance to the Burns Paiute Tribe. Traditional cultural properties are rarely in conflict with aquatics restoration projects.

Environmental Consequences

By following the terms of the 2004 Programmatic Agreement with the Oregon State Historic Preservation Office cultural resources would be identified and evaluated before any ground disturbing activities are authorized which could potentially negatively impact these resources. Cultural resource sites would either be avoided or any potential impacts would be mitigated following processes developed in consultation with the Oregon State Historic Preservation Office.

Alternative 1- No Action

There would be no direct, indirect or cumulative effects to cultural resources under this alternative.

Alternative 2- Proposed Action

By complying with Section 106 of the NHPA using the processes outlined in the 2004 Programmatic Agreement with the Oregon State Historic Preservation Office there would be no significant direct, indirect or cumulative effect to cultural resources under this alternative.

- Most work conducted under the proposed project is of a nature that has very limited potential to effect cultural resources. These are exempt from case-by-case review under appendices A, B, and C of the 2004 Programmatic Agreement. Those cleared under appendix B in that document would be inspected or monitored as required under the 2004 Programmatic Agreement.
- Most aquatic restoration work to be implemented under this project would have positive effects on traditional plant and animal resources valued by Native American tribes including significant treaty resources such as salmon, steelhead, and lamprey.

Recreation

Recreation related goals of the Malheur National Forest include providing a range of high-quality recreation opportunities, settings and facilities for the public's enjoyment for a variety of both motorized and non-motorized activities. This includes providing safe, well maintained, developed facilities compatible with a forest environment, that are accessible to as many people as possible. Provide a diverse system of trails for the enjoyment of all users, and to provide interpretation, information, and educational opportunities on ecological principles, significant cultural resources, and preserve their historical, cultural, archaeological, and/or architectural values.

Methodologies

Several methods were used to identify primary recreational uses of the Malheur by the public. A nationally recognized classification system called the Recreational Opportunity Spectrum is used to describe different recreation settings, opportunities, and experiences that help guide recreation management decisions and activities on National Forest system lands (USDA Forest Service 1986).

Estimates of recreation derived from National Visitor Use Monitoring data inventories that took place on the Malheur in 2003-04 and 2009-10 were used. These inventories are conducted for all national forests on a 5-year cycle. The two National Visitor Use Monitoring surveys are the basis for estimating present recreation use and demand and for projecting the growth of recreation use on the Malheur.

National Visitor Use Monitoring inventories are not intended to specifically examine in-depth recreation activities on a national forest. However, they do provide some basic information for recreation uses on the Malheur, including vehicle travel, off highway vehicle travel, and other recreation pursuits.

The Forest's geographic information system was used to analyze the proposed activities in regard to recreation use and facilities, dispersed recreation sites, and the recreation opportunity spectrum classes within the analysis area. The recreation analysis considered the area within the proposed project area, unless otherwise noted.

Data Gaps

The National Visitor Use Monitoring inventory process has limitations that should be noted. Visitor use is measured at specific predetermined recreation sites falling into high, medium, or low use categories. Small or little used sites are not included in the inventories. However, they may represent a significant contribution to a given recreation pursuit and not be adequately represented in the data. In addition, participation is voluntary and some visitors, or activities, may better lend themselves to interviewing. For example, a party pulling a pack string may be less inclined to participate because the disruption may provide opportunity for the string of animals to experience trouble. Consequently, the data is collected from a segment that is willing or able to participate and extrapolated to represent visitor use as a whole.

Incomplete and unavailable information – Dispersed recreation sites can be dynamic as site use and forest visitors vary over time. The geographic information system dispersed recreation site locations for the northern portion of the Forest are considered to be comprehensive. However, the dispersed site inventory is relatively incomplete for the southern portion of the Forest. Additional surveys would take place the near future in conjunction with large landscape vegetation activities.

Resource Indicators

Activities associated with any proposed aquatic restoration activities that occur in riparian areas located near or adjacent to developed recreation sites or trailheads, or on or alongside/adjacent to forest roads that access those recreation sites, may cause temporary loss of access or delays of access for the recreating public. Dispersed (user-created) camp sites may be temporarily or permanently inaccessible if located in, or within close proximity to, riparian areas.

Affected Environment

The main reason visitors come to the Forest are driving for pleasure, hunting, hiking or walking, viewing wildlife, relaxing, seeking primitive camping opportunities, and viewing natural features (National Visitor Use Monitoring Data, Malheur NF, 2009-2010).

The Forest manages 42 developed recreation sites on the Forest which include campgrounds, viewpoints, picnic areas, trailheads, and horse camps. There are two wilderness areas – Strawberry Mountain (68,700 acres) and Monument Rock (12,620 acres). Developed hiking, horse, bicycle, and snowmobile trails are located throughout the Forest.

Two congressionally designated wild and scenic rivers flow through the Forest: the Malheur Wild and Scenic River, and the North Fork Malheur Wild and Scenic River. The Forest Plans, as amended by the respective Wild and Scenic River plans, prohibit motorized use off Forest system roads and trails within the wild portion and within the scenic portion, except for snowmobile use in the winter when there is 6 inches of snow within the scenic portion.

Inventoried Roadless Areas – Nineteen inventoried roadless areas are identified on the Malheur under the 2001 Roadless Area Conservation Rule. Combined, these inventoried roadless areas encompass a total of 188,353 acres.

The Forest has one designated scenic area: the Vinegar Hill-Indian Rock National Scenic Area is comprised of 17,234 acres.

Recreational Opportunity Spectrum classes represented within the analysis area are Semi-Primitive Motorized, Semi-Primitive Non-motorized, Roaded Natural and Roaded Modified

Forest GIS (geographical Information System) data shows there are 622 recorded dispersed campsites managed as Semi-primitive Non-motorized, Semi-primitive motorized, Roaded Modified, and Roaded Natural. Dispersed campsites are rustic in nature. Dispersed campsites change location over time.

Environmental Consequences

Alternative 1 – No Action

Under the No Action alternative there would be no impacts to wilderness, wild and scenic rivers, scenic areas, semi-primitive non-motorized areas, inventoried roadless areas, developed recreation sites, and dispersed recreation sites.

The current locations for developed recreation sites and developed system trails within riparian areas would remain unchanged. Over time it would be expected that soil erosion, soil compaction, increased stream sedimentation, impaired hydrologic function, dewatered wetlands, and displaced riparian wildlife may cause unwanted impacts to riparian vegetation associated with ongoing activities.

Dispersed recreation sites located adjacent to or within riparian areas and used for camping or day-use would not be impacted. Public access and use of forest system roads would not be impacted as a result of the No Action alternative.

Alternative 2 (Proposed Action)

Alternative 2 would provide NEPA for implementing aquatic restoration activities within riparian areas as prescribed in the project design criteria for the proposed restoration project. In regard to recreation resources implementing the proposed action Forest-wide has the potential to engage in aquatic restoration activities at 42 developed recreation sites (3 campgrounds and 7 trailheads), 622 dispersed recreation sites, and 75 trail segments comprising 104 miles of system trail segments located in riparian areas. Project activities would result in temporary displacement of forest recreation users if visiting an activity area during implementation.

The recreational experience may be affected in the short term by smoke caused by pile burning and underburning. People who are physically sensitive to smoke may be impacted for a short period of time when recreating in the vicinity of these activities. Other concerns would occur during implementation activities when equipment is working on and along roads. Forest standard operating procedures would include signing of activity along associated roadways.

Cumulative Effects

Activities and anticipated activities specifically centered on recreation resources include routine annual activities such as hazard tree mitigation at campgrounds, trail clearing and maintenance, operation and maintenance of developed recreation sites, and completion of the Blue Mountain Summit SnoPark project.

Also, the Malheur will implement the 2004 Travel Management Rule in the foreseeable future. Two likely effects of addressing former Forest Service Chief Dale Bosworth's four threats, one of which is 'unmanaged recreation' (http://www.fsw.fed.us/projects/four-threats/) are an increased use of some Forest System roads by off highway vehicles, and changes in cross country off highway vehicle use such as reduced cross country travel and the possible designation of special off highway vehicle use areas. Increased use of designated roads and trails could increase and concentrate the likelihood of effects within riparian areas, but this may be offset as reducing uncontrolled cross country travel is anticipated to reduce effects within riparian areas.

Table 30 lists ongoing and foreseeable projects types on the Forest, and the potential overlap of effects of aquatic restoration activities on recreation and trail resources.

Table 30 Potential overlap of effects of aquatic restoration activities on recreation resources

Project Category	Activity Implementation - Potential Overlap of Effects
Fuels Reduction and Vegetation Management	Aquatic restoration activities on the Forest may overlap in time and space with vegetation management projects. Vegetation management plans include measures to protect recreation and scenic resources, where applicable. Impacts from aquatic restoration activities to recreation and trail resources range from minor, short term visual effects to relocating or closing recreation sites and trails. The impacts of aquatic restoration activities are not likely to add to vegetation management impacts on recreation and trail resources in any discernible way.
Allotment Management Plans and Grazing	Aquatic restoration activities on the Forest overlap in time and space with livestock grazing. Impacts from aquatic restoration activities to recreation and trail resources range from minor, short term visual effects to relocating or closing recreation sites and trails. The impacts of aquatic restoration activities are not likely to add to grazing impacts on recreation and scenic resources in any discernible way.

Project Category	Activity Implementation - Potential Overlap of Effects
Recreation Projects	Aquatic restoration activities on the Forest may overlap in time and space with recreation projects. Impacts from aquatic restoration activities to recreation and trail resources range from minor, short term visual effects to relocating or closing recreation sites and trails. Aquatic restoration activities may improve the condition of recreation sites and trails over the long term, contributing to the benefit of recreation and trail projects.
Special Uses	Aquatic restoration activities on the Forest may overlap in time and space with special use projects. Special use permits include measures to protect riparian areas, trails, and recreation resources. Major Special Use projects, like pipelines and road realignments, include aquatic restoration plans. Impacts from aquatic restoration activities to recreation and trail resources range from minor, short term visual effects to relocating or closing recreation sites and trails. The impacts of Aquatic restoration activities are not likely to add to the impacts of special use projects on recreation and scenic resources in any discernible way.
Travel Management Rule Implementation	Aquatic restoration activities on the Forest will overlap in time and space with the Travel Management project. Impacts from aquatic restoration activities to recreation and trail resources range from minor, short term visual effects to relocating or closing recreation sites and trails. Aquatic restoration activities are not likely to add to the impacts of Travel Management on recreation and scenic resources in any discernible way.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Implementing the Aquatic Restoration Project would be in compliance with all applicable laws and regulations as pertaining to recreation resources. Numerous Federal laws require all Federal land management agencies including the Forest Service to consider recreation resources in land management planning, resource planning, and project design implementation and monitoring. These federal laws include the following:

- Wilderness Act of 1964
- Wild and Scenic Rivers Act of 1968
- National Trails System Act of 1968
- National Forest Management Act of 1976
- US P.L. 90-542, 1968. Wild and Scenic Rivers Act.
- US P.L. 100-577. Omnibus Oregon Wild and Scenic Rivers Act of 1988.

Forest Service policies to manage, protect, and improve recreation resources of National Forests are established in Forest Service objectives and policies outlined in Forest Service Manual (FSM) 2300, the Forest Plans, and the following USDA and Forest Service Handbooks:

- 1986 ROS Book (unnumbered)
- ROS Primer and Field Guide (R6-REC-021-90)
- ROS Users Guide 1982 (unnumbered)
- USDA FS 1993a. Malheur Wild and Scenic River Management Plan.
- USDA FS 1993b. North Fork of the Malheur Scenic River Management Plan.
- USDA PNW 2012, Aquatic Restoration Site Visit, Malheur National Forest, Prairie City Ranger District. pg. 12

Summary of Effects

Implementing the proposed action is expected to help improve negative effects of recreation use on Wilderness character, Wild and Scenic River outstandingly remarkable values, Scenic Area outstanding natural esthetics, reduced biological and botanical environmental integrity or Inventoried Roadless Areas and Semi-Primitive Roadless areas.

Implementing effective aquatic restoration activities using the appropriate project design criteria could create short term displacement to the recreating public, recreation resource and scenic quality. Recreation Opportunity Spectrum would not be altered after project implementation.

Climate Change

On January 16, 2009, the Washington Office of the Forest Service released guidance to assess the effect of proposals on the climate into project-level NEPA documents. This guidance provides that units should consider two kinds of climate change effects. First, units may, where appropriate, consider the effect of a project on climate change. Second, units may, where appropriate, consider the effect of climate change on a proposal.

Assessing the Effect of Aquatic Restoration on Climate Change

The Interdisciplinary Team considered relevant factors of how implementing restoration projects across the forest could potentially affect a change in global climate. It was determined that the relationship and contribution of exhaust emissions was likely a key factor to consider. In addition, how this project would affect forests and their role in the carbon cycle was also considered.

It was determined that the removal of vegetation was scattered and dispersed across the entire forest and that removal was a temporary reduction in vegetation with the desire to increase diversity of species within each habitat. The result of the projects would not have an effect on global climate change.

Emissions from chainsaws and other equipment used to implement projects do not completely burn fuels. The result is an increase in emissions that contain nitrogen oxides (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO) and ozone (O_3), which are also identified as 'greenhouse gasses' that contribute to warming of the atmosphere. These emissions are also what the Environmental Protection Agency identifies as criteria pollutants in which they set National Air Quality Standards. These commonly found air pollutants are found all over the United States.

Agency direction states: "[b]ecause greenhouse gases mix readily into the global pool of greenhouse gases, it is not currently possible to ascertain the indirect effects of emissions from single or multiple sources (projects). Also, because the large majority of Forest Service projects are extremely small in the global atmospheric CO_2 context, it is not presently possible to conduct quantitative analysis of actual climate change effects based on individual projects" (USDA 2009).

Under this definition, there would be no direct effect associated with any of the action alternatives. The action alternatives do not authorize the emission of greenhouse gasses; the action alternatives do not limit the emission of greenhouse gasses; and, the action alternatives are unlikely to change the emission of greenhouse gasses as compared to the No Action alternative.

Assessing the Effect of Climate Change on the Aquatic Restoration Project

Although El Niño/Southern Oscillation and the Pacific Decadal Oscillation comprise the primary factors for climate variability in the Pacific Northwest (IPCC), the influence from global climate change is a growing concern. According to the Climate Impacts Group, based out of the University of Washington, climate modeling for the Pacific Northwest predicts a future rate of warming of approximately 0.5 degrees Fahrenheit per decade for the Pacific Northwest through at least 2050, relative to the 1970 to 1999 average temperature. Temperatures are projected to increase across all seasons, although most models project the largest temperature increases in summer (June to August), and the average temperatures could increase beyond the year-to-year variability observed in the Pacific Northwest during the 20th century as early as the 2020s.

Assessing these factors on manipulation of vegetation associated with aquatic restoration projects, a warming and drying climate combined with less of a snowpack or length of snowpack season

could potentially alter the aquatic and terrestrial species mix across the landscape at various elevation levels and subsequent associated effects in the long-term if projections are accurate.

Range Management

This section focuses on potential changes in vegetation composition and/or vegetation densities by livestock herbivory as a result of implementation of proposed action in and adjacent to stream channels. This section will also analyze potential short or long term impacts to upland vegetative resource by livestock herbivory if proposed action is implemented, or not.

This report will address alternative compliance with relevant laws, regulations, policies, and Forest Plans for the Malheur and Ochoco National Forests.

Resource Indicators and Measures
Issue: Implementing the proposed actions would result in changes of forage availability to livestock, require changes in pasture rotation, alter livestock water sources, and increase maintenance cost.

Measure: available forage per acre, timing and duration of livestock in pastures, distance to available water, and management time and cost.

Table 31 Resource indicators for range management concerns or Forest Land and Resource Management Plan standards and measure for assessing effects.

Proposed Action	Grazing Management Resource Indicator
Controlled burning in Riparian	Forage availability Pasture rotation
Fencing of Stream channels	Water availability Forage availability/limit Changed use pattern
Controlled burning in uplands	Forage Availability in uplands Pasture rotation
Road decommissioning	Access to range improvements/management
Upland water development	Water availability Changed use pattern
Juniper density thinning	Forage availability

Post fire controlled burning in riparian areas would reduce forage availability in the short term, generally 1 year, but would increase available forage in the longer term. Pasture rotations are likely to change in the short term to accommodate for pre-burn fine fuel accumulation. Temporary exclusion of livestock from riparian areas would result in increased utilization of upland pasture(s).

Fencing of stream channels to exclude livestock from riparian areas would generally result in loss of available water and site specific forage. Total exclusion of livestock would require a changed rotational schedule.

Controlled burning in uplands would reduce forage availability in short term (generally 1 year) but increase available forage in the longer term. Pasture rotations are likely to change in the short term to accommodate for pre-burn fine fuel accumulation. Temporary exclusion of livestock from upland areas would result in increased utilization of other pasture(s).

In long term (usually about 1 year), the rotation schedule would not be affected.

Decommissioning of roads would likely to impede access to an allotment by the grazing permittee, and would decrease the availability of access to herds. This would likely increase labor needs and maintenance costs to the permittee.

Upland water development generally has positive effects to forage, decreasing areas of overutilization, and increasing areas of underutilization. It would result in a use pattern change, which would have effect of more even forage utilization throughout allotment.

Juniper thinning is likely to have effect of substantially increasing forage availability as perennial grasses displace areas where juniper was the dominate vegetation type.

Methodology

The basis of the effects analysis is the observations and professional judgment of Range Scientist in conjunction with best available science.

Affected Environment

Existing Condition

Native grass and forb species are predominant in the dry forest type, however some areas have been mixed with non-native species (intermediate wheatgrass and Kentucky bluegrass) introduced to stabilize soils along roads, skid trails, and landing sites. Some of these same disturbed locations now host populations of invasive plants.

The Forest administers 111 grazing permits. Active permits are reviewed annually prior to the use season. All permits contain structural improvements that are maintained by grazing permittees and Forest Service personnel. Structural improvements include allotment boundary and pasture fences, small exclosure fences, and watering troughs and ponds. Fences are maintained annually, troughs and ponds are maintained on an as needed basis but typically at least every 5 years. Management activities include herding and trailing of livestock and placing salt blocks throughout the allotments. Management activities occur throughout the grazing season using pick-ups, ATVs, horseback and on foot. Cattle, horses, and sheep are moved on and off of the forest for the grazing season via truck or trailing.

Table 32 Grazing management resource indicators and measures.

Proposed action	Grazing Management Resource Indicator	Existing Condition (Measure)
Prescribed burning in Riparian	Forage availability Pasture rotation	1500 lbs/acre Variable across forest, generally grazed every other year
Fencing of Stream channels	Water availability Forage availability/limit Changed use pattern	Currently utilizing water from stream Generally available Herding, salting used as distribution tools
Prescribed burning in uplands	Forage Availability in uplands Pasture rotation	1500 lbs/acre Variable across forest, generally grazed every year at different plant growth stages
Road decommissioning	Access to range improvements/management	Closed roads are available for access by permittees and FS

Proposed action	Grazing Management Resource Indicator	Existing Condition (Measure)
		personnel for permit compliance and improvements maintenance such as troughs and fences repair. cattle herding on road corridors
Upland water development	Water availability Changed use pattern	Limited in most areas forest wide distances to upland water limit grazing in suitable areas
Juniper density thinning	Forage availability	Forage production in lbs/acre limited due to high juniper densities.

Issue: Implementing the proposed actions would result in changes of forage availability to livestock, require changes in pasture rotation, alter livestock water sources, and increase maintenance cost.

Measure: timing and duration of livestock in pastures.

Forage availability is variable across the forest and from year to year based on climatic conditions. The forest currently uses prescribed burning and juniper thinning to reduce fuel loads that also result in overall increase in forage availability for livestock. The forest currently has adequate forage availability to support ongoing livestock operations of about 99,000 animal unit months or 49,500 tons of dry matter forage. Tremendous variation often exists among riparian areas of a stream network, and fire behavior and effects would depend on local conditions and position in the watershed (Dwire, K and Kauffman, J.B) Studies have specifically shown hardwood tree and shrub-dominated riparian zones to have declined since the mid-1800s (Lee 1997, Wisdom 2000) throughout the analysis area. Current palatable vegetation in riparian zones consists of hydric and upland grasses as well as palatable shrubs such as willow and alder. It is anticipated that prescribed burning in riparian zones would significantly alter herbaceous and browse species in long run.

Encroachment and expansion of trees in uplands has reduced herbaceous vegetation in part due to reduction in water infiltration and increased runoff as well as reduction of sunlight dependent grasses, forbs and shrubs. Local studies that compared cut and uncut treatments reported significant increases in herbaceous cover and biomass when juniper trees were removed (Bates 2000).

Measure: distance to water source

Generally, cattle will travel about 1 mile to seek water. Sheep will travel about 2.5 miles to seek water

Generally, livestock have access to aquatic (riparian) vegetation until determined utilization standards are met (Forest Plans) (Allotment Management Plan for individual pastures). Some aquatic (riparian) reaches are excluded completely from livestock grazing by fencing or natural barriers. On occasion utilization standards or other impacts are exceeded beyond acceptable levels.

After fencing, water is one of the most frequently used tools for affecting cattle distribution (Ganskopp 2001). Livestock are very habitual and will often preferentially utilize water sources that they have experience with and that they know are safe; often travelling long distances, even passing unknown water sources to use their preferred sites (Holecheck et al. 1995).

Measure: management time and cost

Cost of troughs, pipelines and fence maintenance, repair and replacement are incurred annually by grazing permittees. Costs of herding and salting are also incurred annually by grazing permittees.

Management Direction

Desired Condition

Increase rate of improvement in riparian vegetation where woody shrubs increase in abundance and reduction in utilization of grasses and shrubs where needed.

Manage uplands (including vegetative treatments) to utilize upland available forage while maintaining site productivity in coordination with management of adjacent riparian pastures.

Environmental Consequences

Alternative 1 – No Action

Desired range conditions in upland habitats would not be achieved as quickly as would under Proposed Action. Grazing Management Resource Indicators (see) would remain the same as existing condition.

Alternative 2 – Proposed Action

The Aquatic Restoration Analysis would provide a consistent methodology to design implement, monitor and document restoration activities such as re-configuring livestock fencing and off-stream water developments to influence more favorable grazing utilization patterns. Thinning and prescribed burning in uplands should enhance and increase favorable herbaceous vegetation. Although less is known and more variability occurs in riparian area burning, it is likely to positively influence herbaceous and woody browse species (Dwire and Kauffman 2003).

Project Design Criteria and Mitigation Measures
(See also Project Design Criteria by Resource in appendix A)

Grazing Schedule

Range and Fire Specialists and permittees would coordinate activities including scheduling of burning activities in grazing units.

Utilize the Forest Post-Fire Interim Grazing Guidelines (Williams 2003) to aid in determining when to resume grazing activities.

Whenever possible, units to be rested would be burned in the spring of the year to be rested or in the fall prior to the rest year.

If a rest period is required following a burn the permittee has the option to exclude cattle grazing from those portions of a pasture that were burned through the use of fencing and could continue to graze the unburned areas of a unit.

Protection of Government and Permittee Investments

All existing structural range improvements (fences, gates, spring developments, etc.) and permanent ecological plots would be contractually protected.

Protection of the structural range improvements must be maintained. If structural improvements are damaged during project operations they would be repaired to Forest Service standards prior to livestock scheduled use by the party responsible for causing the damage. Repairs would be required of the purchaser if damage was done during thinning or fuel treatment contractors or by force account where appropriate.

Fence right of ways (6 ft either side of fence), trails, other developments and access to them would be cleared of slash produced by project activities.

Aspen Restoration

New aspen exclosure fences should have gates installed in proper locations to allow for removal of stray livestock. Aspen fences should be maintained prior to the start of the grazing season each year and repaired whenever necessary. Plans for aspen exclosures would define when restoration of the protected stand has been achieved. Construction, maintenance, and removal of aspen exclosure fences would be the responsibility of the Forest Service.

If construction of new aspen exclosure fences exclude livestock from current water sources, new sources outside of exclosure would be developed by the Forest Service, if needed.

Notification

During planning stage of each individual project all potentially impacted grazing permittees would have notice of action and opportunity to provide input that may lessen impacts to their livestock operation.

Prior to implementation all potentially impacted grazing permittees would be given notice of dates when work would start.

A range specialist would be represented during planning and implementation of every project.

Direct and Indirect Effects

Table 33 Resource indicators and measures for Alternative 2.

Proposed action	Grazing Management Resource Indicator
Prescribed burning in Riparian	Forage availability Pasture rotation
Fencing of Stream channels	Water availability Forage availability/limit Changed use pattern
Prescribed burning in uplands	Forage Availability in uplands Pasture rotation
Road decommissioning	Access to range improvements/management

Proposed action	Grazing Management Resource Indicator
Upland water development	Water availability Changed use pattern
Juniper density thinning	Forage availability

Post fire prescribed burning in riparian areas would reduce forage availability in the short term, generally 1 year, but would increase available forage in the longer term. Pasture rotations are likely to change in the short term to accommodate for pre-burn fine fuel accumulation. Temporary exclusion of livestock from riparian areas would result in increased utilization of upland pasture(s).

Fencing of stream channels to exclude livestock from riparian areas would generally result in loss of available water and site specific forage. Total exclusion of livestock would require a changed rotational schedule.

Prescribed burning in uplands would reduce forage availability in short term (generally 1 year) but increase available forage in the longer term. Pasture rotations are likely to change in the short term to accommodate for pre-burn fine fuel accumulation. Temporary exclusion of livestock from upland areas would result in increased utilization of other pasture(s).
In long term (usually about 1 year), the rotation schedule would not be affected.

Decommissioning of roads would likely impede access to an allotment by the grazing permittee, and would decrease the availability of access to herds. This would likely increase labor needs and maintenance costs to the permittee.

Upland water development generally has positive effects to forage, decreasing areas of overutilization, and increasing areas of underutilization. It would result in a use pattern change, which would have effect of more even forage utilization throughout allotment.

Juniper thinning is likely to have effect of substantially increasing forage availability as perennial grasses displace areas where juniper was the dominate vegetation type.

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The cumulative effects analysis area for this report is considered to be the entire grazing allotment in which activities occur. Since a restoration activity such as fence installation has affect to change livestock distribution patters across entire grazing allotment. These effects are considered for the short term, which would be the next 10 years, and the long term, which for the purposes of this report would be the next 25 years. These timeframes are chosen because of changes in management strategies, the need to reevaluate the project periodically, and because of the uncertain effects of varying climatic patterns.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

In addition to the proposed action the Forest has other activities that effect grazing management and available forage and water.

Projects currently in the planning stages that would affect forage availability for livestock include forest wide restoration activities which includes tree thinning and removal, these activities generally have positive effects to herbaceous vegetation as the canopy opens and grass increase until the canopy closes again and the forest floor becomes shaded and grass decreases.. Other activities that would affect forage include: prescribed, naturally occurring, and human caused

fires. These projects would reduce forage availability in the short run, 1-3 years and overall increase forage as the canopy opens and grass increase until the canopy closes again and the forest floor becomes shaded and grass decreases. This generally takes 20-30 years. These other activities combined with similar types of projects in the proposed action would likely result in increased grasses and forbs.

Ongoing management and use patterns include salting, fence maintenance, driving/moving and herding and general permit management (time spent keeping cows where we want them). Although an increase in fences increases fence maintenance costs but conversely it likely to reduce labor significantly since much of time spent herding is to remove livestock from riparian areas that are not fenced. More fences means more gates, hence, gates can be left open by hunters and other recreationists. This situation can increase the time permittees and grazing managers spend monitoring livestock movement to ensure standards and plans are being met. This is standard operating procedure and should not result in any significant issues for the permittee or the resource.

Regulatory Framework

Land and Resource Management Plans

The Malheur and Ochoco National Forest Land and Resource Management Plans as amended provide standards and guidelines for Grazing Management.

Table 34 Resource indicators and measure for the existing condition.

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition (Alternative 1)
Utilization of aquatic vegetation by livestock	Prescribed fire	Percent utilization Residual stubble height (in)	Generally 35-45% 4-6 in.
Utilization of aquatic vegetation by livestock	Fencing of Stream channels	Percent utilization Residual stubble height (in)	Generally 35-45% 4-6 in.
Utilization of upland vegetation by livestock	Prescribed fire	Percent utilization	Generally 35-45%
Utilization of upland vegetation by livestock	Fencing of stream channel	Percent utilization	Generally 15-20%
Utilization of aquatic vegetation by livestock	Upland water development	Percent utilization Residual stubble height (in)	Generally 15-20%
Utilization of upland vegetation by livestock	Juniper density	Percent utilization/ pounds per acre production	Generally 35-45%

Federal Law

Where consistent with other multiple use goals and objectives, there is Congressional intent to allow grazing on suitable lands through:

- Multiple Use Sustained Yield Act of 1960
  Forest and Rangeland Renewable Resources Planning Act of 1974

Environmental Justice

Socioeconomic / Environmental Justice

As required by law and Executive Order 12898 from 1994, all Federal actions should consider potentially disproportionate effects on minority or low-income communities. Potential impact or change to low-income or minority communities within the proposed action area should be considered. Where possible, measures should be taken to avoid negative impacts to these communities or mitigate the adverse effects.

The Malheur National Forest is located within Grant, Harney, Crook, and Baker counties in eastern Oregon. These communities are mainly rural areas supported by mostly three prominent industries: Government at 18%, retail trade with 11.2% of the employment, and farm at 11.1% (Economic Profile System, 2012). Unemployment rates for Grant, Harney, and Crook counties were between 11.8 and 12.3% in 2013 (US Department of Labor).

All the communities in the study area would fall under the minority or low-income populations identified in the Executive Order. Overall, the proposed action would result in no change on low income or minority populations. There would be no change to the traditional use of the land and no change in economics. There would be no displacement of minorities, changes of land use, or increases in taxes that would constitute an economic hardship. During consultation, the tribal governments have not identified any specific traditional or sacred places within the analysis area or other concerns regarding this project. There would be no cumulative impacts since there are no direct or indirect effects to environmental justice.

USDA Civil Rights Policy

The Civil Rights Policy for the USDA, Departmental Regulation 4300-4 dated May 30, 2003, states that the following are among the civil rights strategic goals; (1) managers, supervisors, and other employees are held accountable for ensuring that USDA customers are treated fairly and equitably, with dignity and respect; and (2) equal access is assured and equal treatment is provided in the delivery of USDA programs and services for all customers. This is the standard for service to all customers regardless of race, sex, national origin, age, or disabilities.

Disparate impact, a theory of discrimination, has been applied to the planning process in order to reveal any such negative effects that may unfairly and inequitably impact beneficiaries regarding program development, administration, and delivery. The objectives of this review and analysis are to prevent disparate treatment and minimize discrimination against minorities, women and persons with disabilities and to ensure compliance with all civil rights statutes, Federal regulations, and USDA policies and procedures.

The projects, given the size of potential social and economic effects, are not likely to result in civil rights impacts to Forest Service employees or customers of its program.

Prime Farmland, Rangeland, and Forest Land

The Secretary of Agriculture issued memorandum 1827 which is intended to protect prime farm lands and rangelands. The Aquatics Restoration Project analysis area does not contain any prime farmlands or rangelands. Prime Forest Land, as defined in the memorandum, is not applicable to lands within the National Forest System.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights of-way or road.

The projects within the aquatics restoration are not considered irreversible or irretrievable commitments of any resource.

National Forest Management Act

This Project is consistent with the standards and guidelines, goals and objectives, and desired future conditions of the 1990 Malheur Land and Resource Management Plan and the 1989 Ochoco Land and Resource Management Plan as required by the National Forest Management Act.

Finding of No Significant Impact

The responsible official is responsible for evaluating the effects of the project relative to the definition of significance established by the CEQ Regulations (40 CFR 1508.13), has reviewed and considered the Environmental Assessment and documentation included in the project record, and has determined that the proposed Aquatic Restoration Project will not have a significant effect on the quality of the human environment. As a result, no environmental impact statement will be prepared. The rationale for this finding is as follows, organized by sub-section of the CEQ definition of significance cited above.

Context

For the proposed actions the context of the environmental effects is based on the environmental analysis in this environmental assessment. The interdisciplinary team considered impacts of the proposed projects on environmental and social resources throughout the Malheur National Forest. The analysis demonstrates that the impacts of the project would be local in scope and of a short duration with long term beneficial effects. The activities of project implementation would range from a single day to one season with impacts lasting from the time of implementation to several years following completion of project activities. The local scope of impacts would vary from a section of road closed for culvert replacement to 500 or more acres closed for several weeks to implement prescribed fire during a burning season. The total analysis area includes all of the 1.7 million acres of the Malheur National Forest although project activities are very local and small in scale as are the effects.

Intensity

Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis of this environmental assessment and the references in the project record. The effects of this project have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits throughout various site locations throughout the Forest. The finding of no significant impact is based on the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b).

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

The Malheur Aquatics Restoration Project was designed around the programmatic Biological Assessment and Biological Opinion with the Fish and Wildlife Service and National Marine Fisheries Service. The analysis shows that the long term beneficial effects of these activities will include short term negative effects and also demonstrates that these short term effects are expected to be minor and would not likely adversely affect a listed species or their habitat (page 71) and would therefore not be a significant impact.

The John Day, Malheur, and Harney/Malheur Lakes basins are currently identified to have water quality issues in identified stream segments (page 49). Implementation of the activities identified in the project would have long term benefits (page 58) and short term discountable impacts (page 69) to both sediment loads and water temperatures that would not be significant.

Fringed myotis and Townsend's big-eared bats would see a benefit in overall persistence with the improvement of riparian habitat, although removal of snags for safety within activity areas and the felling and moving of large trees for placement into streams would result in negative impacts in the short term (page 88). Danger trees would be felled for implementation of all projects

resulting in minimal negative impacts to various cavity excavator species (pages 88). Big game (elk and mule deer), would be disturbed when working in activity areas or during winter use periods if they are undetected in the area (page85). No wildlife species would be permanently displaced as habitats would not be converted to a differing niche.

Pre-implementation surveys would occur before activities begin in areas where sensitive botanical species or heritage resources may occur (page 179, 183). This process would ensure that these important resources are considered and impacts would be minimized.

Overall impacts to recreation would be short term as a result of closed roads, trails, waterways, or other areas where individuals recreate. Not all areas would be closed at any given time and forest visitors would have recreational opportunities in other locations throughout the forest. Smoke and noise from prescribed burning and vegetation treatments would also be disruptive to forest visitors. These disturbances would be very local in impacts and for short duration (page 124).

Cattle allotment and special use permittees would also be notified if activities were implemented within their area of use. Project design criteria, including notification, would provide an opportunity for input before the activity occurred. Allotment permittees meet with the Forest prior to grazing season and adjustments for various activities or loss of forage availability are coordinated at that time. This is standard operating procedure and should not result in any significant issues for the permittee or the resource (page 135).

2. The degree to which the proposed action affects public health or safety.

The State of Oregon Smoke Management Plan ensures compliance with the Clean Air Act (page 117, 182). The project incorporates project design criteria to ensure compliance with the Clean Water Act (EA page 69) and overall effect of the project will improve water quality (EA page 69). Pollution and Erosion Control Measures (Page 149) would be implemented for protection of waterways. The cumulative impact of the project and other ongoing activities and reasonably future activities would not provide increased sediment due to the short-term (in-stream work window) of the majority of sediment load increase (page 182). Notification of activities will be implemented as described in project design criteria (page 126, 183) to ensure safety of forest users in activity areas (page 126).

3. Unique characteristics of the geographic area such as the proximity to historical or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

Heritage resource analysis found that the project would have no significant impact because most work conducted is limited and would be reviewed on a case by case basis under programmatic agreement with the state historical preservation office (page 121). The analysis also considered the impacts to wilderness areas and Wild and Scenic Rivers within the project area and determined that existing negative effects would improve (page 126). Culturally significant plants were determined to see a beneficial impact from project activities (page 107).

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

The project falls within the scope of the analysis for the Malheur Land and Resource Management Plan (1990). During correspondence with the public, other federal agencies, tribes, local governments, and the interdisciplinary team, there was no information presented that indicates substantial effects of the human environment or that would raise to the level of scientifically controversial as defined by the Council of Environmental Quality.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

The activities described within this project have been implemented on the forest in the past using various NEPA decisions. Implementation and expected effects are based on extensive experience with similar actions. Some of the activities completed on the Forest during 2013 include: culvert replacements, juniper removal in the uplands and within riparian zones, riparian planting, head gate installation, riparian fencing, and aspen treatments. The activities proposed are well established land management practices and the risks are well known and understood. The activities of this project fall within those categories where actions do not individually or cumulatively have a significant effect on the human environment and would be considered for categorical exclusion from documentation on an individual basis. Based on the Agency's experience and knowledge and the analysis there are no significant effects to the resources.

6. The degree to which the action may establish precedent for future actions with significant effects or represents a decision in principle about a future consideration.

This project does not lead to future actions and is not unique to those actions that have been implemented in the past. The decision will not set precedent for any future actions.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

The analysis considered this action along with past and reasonably foreseeable future actions. Actions from this project are generally small in scale, scattered across a large landscape, and over an extended time period. Each issue or analysis resource considered and documented cumulative effects of a combination of this project's activities and those other activities occurring across the forest that would overlap in space and time. Various analyses did determine cumulative effects but no resource determined cumulative effects that would be significant. (pages: 67-69, 83, 89, 93, 94, 99, 101-107, 111, 117, 121, 124, 134, 136).

8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

The proposed action complies with the National Historic Preservation Act by following the terms of the 2004 Programmatic Agreement with Oregon State Preservation Office. Cultural resources would be identified and evaluated before any ground disturbing activities are authorized (EA page 121).

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

Biological evaluations were completed for botanical, aquatic, and terrestrial species. (Botanical species, page 93) and (Terrestrial species page 75). Aquatic species were considered in the regional biological assessment and associated biological opinion (page 56, 70).

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

The project was designed to comply with federal, state and local laws. The project activities would fully comply (page 9, 75, 108, 111, 118, 125, 129). Further, this project complies with the Malheur Land and Resource Management Plan and associated standards related to law, regulation, and policy.

Chapter 4 Agencies and Persons Consulted

The Forest Service consulted the following individuals, Federal, State, tribal, and local agencies during the development of this environmental assessment:

Tribes

- Burns Paiute Tribe
- Confederated Tribes of Warm Springs
- Confederated Tribes of the Umatilla

State

- Oregon Department of Fish and Wildlife

Local Government

- Grant County Court
- Harney County Court

Groups and Individuals Who Responded to the Initial Scoping

- Sally Bird, Warm Springs Geo Visions, Confederated Tribes of Warm Springs
- Mike Higgins
- Boyd Britton, Grant County Commissioner
- Doug Heiken, Oregon Wild
- Brooks Smith, Member of Grant County Public Forest Commission and Blue Mountain Forest Partners
- Karen Coulter, Blue Mountains Biodiversity Project
- Zach Williams, King Inc.
- Susan Jane Brown
- Mark Corbet

Groups and Individuals Who Responded to the 30 day notice and comment period

- Mat Carter
- Karen Coulter, Blue Mountains Biodiversity Project
- Doug Heiken, Oregon Wild
- Jan O'Rorke

List of Preparers

Listed below are the Interdisciplinary Team specialists involved in the preparation process of this preliminary environmental assessment, including the education and experience of each member.

Name	Title	Experience Natural Resource Management
Steve Namitz	Fisheries Program Manager/Team Leader	22 years
Tom Friedrichsen	Forest Hydrologist	24 years
Joseph Rausch	Forest Botanist/Ecologist	15 years
Lisa Van Tieghem	Acting Botanist	3 years
Robert (Hersh) McNeil	Soil Scientist	24 years
Dana Skelly	Forest Fuels Specialist	19 years
Donald Hann	Forest Heritage Program Manager	25 years
Ernie Gipson	Range Program Manager	23 years
Clark Reames	Wildlife Program Manager	29 years
Robert St. John (Retired)	Recreation Program Manager	30 years
Shannon Winegar	Recreation Natural Resource Specialist	25 years
Janet Plocharsky	Forest Environmental Coordinator	20 years
Kate Goossens	Writer Editor	20 years

Appendix A Project Categories and Project Design Criteria

Aquatic Restoration Project Categories, Program Administration, General Aquatic Conservation Measures, and Project Design Criteria for Aquatic Restoration Activity Categories on the Malheur National Forest

Compiled from the Aquatic Restoration Biological Opinion (ARBO II, 2013)
by: Steve Namitz 12/2013

Project Categories

1. Fish Passage Restoration (Stream Simulation Culvert and Bridge Projects; Headcut and Grade Stabilization; Fish Ladders; Irrigation Diversion Replacement/Relocation and Screen Installation/Replacement).
2. Large Wood, Boulder, and Gravel Placement (Large Wood and Boulder Projects; Engineered Logjams; Porous Boulder Weirs and Vanes, Gravel Augmentation; Tree Removal for Large Wood Projects).
3. Dam, Tide gate, and Legacy Structure Removal.
4. Channel Reconstruction/Relocation.
5. Off- and Side-Channel Habitat Restoration.
6. Streambank Restoration.
7. Set-back or Removal of Existing Berms, Dikes, and Levees.
8. Reduction/Relocation of Recreation Impacts.
9. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering.
10. Piling and other Structure Removal.
11. Road and Trail Erosion Control
12. Juniper Removal.
13. Riparian Vegetation Treatment (controlled burning).
14. Riparian Vegetative Planting.
15. Bull Trout Protection.
16. Beaver Habitat Restoration.
17. Fisheries, Hydrology, Geomorphology Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration.

Program Administration

1. Integration of Project Design Criteria (PDC) and Conservation Measures and Terms and Conditions into Project Design and Contract Language

The Action Agencies shall incorporate appropriate aquatic and terrestrial conservation measures along with Project Design Criteria listed in the aquatic restoration BA along with any terms and conditions included in the subsequent Aquatic Restoration Biological Opinion (ARBO II, 2013) into contract language or force-account implementation plans.

2. Project Notification

Streamlining Level 1 teams will review and discuss aquatic restoration projects planned for implementation during an upcoming work season through their team-specific processes. The Action Agencies shall provide a project Notification Form7 to ARBO.nwr@noaa.gov and the NMFS Level 1 Aquatics members 30 days prior to implementation and will include the following information:

a. Action identifier – The same unique identification number is necessary for each project's Action Notification and Project Completion reports.
b. Project name – Use the same project name from notification to completion (*e.g.*, Jones Creek, Tillamook Co., Oregon, culvert replacement).
c. Location – 6th field HUC (hydraulic unit code), stream name, and latitude and longitude (decimal degrees)
d. Agency contact – Agency and project lead name
e. Timing – Project start and end dates
f. Activity category – As listed above in section 1.3.
g. Project description – Brief narrative of the project and objectives
h. Extent – Number of stream miles or acres to be treated
i. Species affected – Listed Fish and or Wildlife species, Critical Habitat, and or EFH affected by project
j. Date of submittal
k. For any action requiring a site assessment for contaminants, include a copy of the report explaining the likelihood that contaminants are present at the site.
l. For any action requiring NMFS fish passage and Restoration Review Team reviews, attach a copy of the approval correspondence.
m. Verification – Check box that verifies that all appropriate General Aquatic Conservation Measures, Wildlife Conservation Measures, Project Design Criteria for Aquatic Restoration Activity Categories, and Project Design Criteria for Terrestrial Species and Habitats have been thoroughly reviewed and will be incorporated into project design, implementation, and monitoring.
n. SOD project notification requirements (see PDC 39h-i) as an attachment to notification form

3. Minor Variance Process

Because of the wide range of proposed activities and the natural variability within and between stream systems, some projects may be appropriate for minor variations from criteria specified herein. NMFS branch chiefs will authorize variances when there is a clear conservation benefit or there are no additional adverse effects (especially incidental take) beyond that covered by the ARBO II. Minor variances may be requested as part of the above notification process and must:

a. Cite ARBO II identifying number.
b. Cite the relevant criterion by page number.
c. Define the requested variance.
d. Explain why the variance is necessary.
e. Provide a rationale why the variance will either provide a conservation benefit or,
f. at a minimum, not cause additional adverse effects.
g. Include as attachments any necessary approvals by state agencies.

4. NMFS Fish Passage Review and Approve

The NMFS Level 1 team member will coordinate NMFS fish passage review and approval for the following types of project:

a. Dewatering construction sites by pumping at a rate that exceeds 3 cubic feet per second (cfs) will require fish screen review.
b. Fish passage culverts and bridges that do not meet width standards.
c. Headcut stabilization and channel spanning non-porous rock structures that create discrete longitudinal drops > 6 inches.
d. Fish ladders.
e. Engineered log jams that occupy >25% of the bankfull area.
f. Irrigation diversion replacement/relocation & screen installation/replacement.
g. Dam removal.
h. Channel reconstruction/relocation projects.
i. Off- and side-channel reconstruction when the proposed side channel will contain >20% of the bankfull flow.

5. Restoration Review Team

The following types of project require Restoration Review Team review:

a. Dam removal.
b. Channel reconstruction/relocation projects.
c. Precedent or policy setting actions, such as the application of new technology. The Restoration Review Team will be comprised of highly skilled interagency (BLM, Forest Service, BIA, NMFS, USFWS) fisheries biologists, hydrologists, geomorphologists, soil scientists, or engineers to review and help select project designs. The Restoration Review Team will have a four member core group—one individual from each of the following agencies: Forest Service, BLM, NMFS, and USFWS. The designated Forest Service and BLM ARBO II contacts will serve as core group members. Additional technical experts from these agencies will be recruited depending on the project to be reviewed. The Restoration Review Team reviews will help ensure that projects: (1) Meet the obligations set forth in the BA and subsequent ARBO II; (2) maximize ecological benefits of restoration and recovery projects; (3) maximize efficient and effective use of limited financial resources; and (4) ensure consistent use and implementation throughout the geographic area covered by this opinion. Any Restoration Review Team concerns must be described in detail, referencing underlying scientific (based on peer-reviewed science) or policy rationale, and include recommended changes to the proposed project to address the specific concerns. When requested, Restoration Review Team will provide an estimate of the time necessary to complete the review based on the complexity of the proposed action and work load considerations at the time of the request. Approval may be delayed if a substandard design is submitted for review during the post-design or action implementation stage and significant revision is necessary. The Restoration Review Team will keep a record of each review, including any recommended clarifications, changes, or interpretations. The Restoration Review Team does not replace any existing review process, nor shall it slow down project implementation unless significant technical, policy, or program concerns with a particular restoration approach are identified.

6. Project Completion Report

Level 1 teams will discuss and review aquatic restoration projects completed during a previous season. Each BLM, Forest Service, or BIA field office that completes a project will submit a Project Completion Report to ARBO.nwr@noaa.gov and their USFWS and NMFS Level 1 Team

counterparts. Reports are due 60 days after project completion. Reports will include the following information:

a. Action identifier (same number as in notification).
b. Action name (same name as in notification).
c. Location – 6th field HUC, stream name, latitude and longitude.
d. Agency contact – Agency and project lead name.
e. Date of submittal.
f. Timing – Actual project start and end dates.
g. Activity category – As listed above in section 1.3.
h. Project description – Brief narrative of the completed project and objectives.
i. Extent – Number of stream miles or acres treated.
j. Species affected – Fish and or wildlife species, critical habitat, or EFH affected by the project.
k. Fish pursuit and capture – If fish are pursued or captured during salvage operations, the project biologist will describe removal methods, stream conditions, and the number of fish handled, injured, or killed, and reasons for the fish mortality. This report will likely be limited to fish passage, dam removal, and channel restoration/relocation projects.
l. State-specific Clean Water Act section 401 certification monitoring results. If protocol conditions were not met, describe effects and any remedial actions.
m. Post Project Assessment – Remedial actions taken, including any dates work ceased due to high flows.
n. SOD project completion requirements (see PDC 39h-ii; Table 6) as an attachment
o. to project completion form.

7. Annual Program Report

The Action Agencies will provide an annual program report to NMFS and USFWS by February 15 of each year that describes projects funded or carried out under ARBO II. The report will include the following information:

a. An assessment of overall program activity.
b. A map showing the location and category of each project carried out under ARBO II.
c. A list of any projects that were funded or carried out by the Action Agencies using the ARBO II, including the name of the Action Agency designated as the lead agency for each project for ESA purposes.
d. Data or analyses that the Action Agencies deem necessary or helpful to assess habitat trends as a result of actions carried out under the ARBO II.
e. Totals for amount of incidental take and for each extent of take indicator by recovery domain.
f. Requests for variance and their disposition and a description of Restoration Review Team activity.
g. SOD project annual report requirements (see PDC 39h-iii).

General Aquatic Conservation Measures

8. Technical Skill and Planning Requirements

a. Ensure that an experienced fisheries biologist or hydrologist is involved in the design of all projects covered by this opinion. The experience should be commensurate with technical requirements of a project.
b. Planning and design includes field evaluations and site-specific surveys, which may include reference-reach evaluations that describe the appropriate geomorphic context in

which to implement the project. Planning and design involves appropriate expertise from staff or experienced technicians (e.g., fisheries biologist, hydrologist, geomorphologist, wildlife biologist, botanist, engineer, silviculturist, fire/fuels specialists).

c. The project fisheries biologist/hydrologist will ensure that project design criteria are incorporated into implementation contracts. If a biologist or hydrologist is not the Contracting Officer Representative, then the biologist or hydrologist must regularly coordinate with the project Contracting Officer Representative to ensure the project design criteria and conservation measures are being followed.

9. Climate Change

Consider climate change information, such as predictive hydrographs for a given watershed or region, when designing projects covered by this opinion.

10. In-water Work Period

Follow the appropriate state (ODFW 2008; WDFW 2010) or most recent guidelines for timing of in-water work. If work occurs in occupied Oregon chub habitat, in-water work will not occur between June 1 and August 15. In those few instances when projects will be implemented in California, Idaho, or Nevada, follow appropriate state guidelines. The Action Agencies will request exceptions to in-water work windows through Level 1 NMFS or USFWS representatives as well as essential state agencies. [10] For National Forests in the state of Washington, the Forest Service will work with Washington Department of Fish and Wildlife (WDFW) to determine in-water work periods, using the process contained in the 2012 Memorandum of Understanding between the WDFW and USDA-Forest Service, Pacific Northwest Region regarding hydraulic projects conducted by the Forest Service (WDFW and USDA-Forest Service 2012).

11. Fish Passage

Fish passage will be provided for any adult or juvenile fish likely to be present in the action area during construction, unless passage did not exist before construction, stream isolation and dewatering is required during project implementation, or where the stream reach is naturally impassible at the time of construction. After construction, adult and juvenile passage that meets NMFS's fish passage criteria (NMFS 2011e) will be provided for the life of the structure.

12. Site Assessment for Contaminants

In developed or previously developed sites, such as areas with past dredge mines, or sites with known or suspected contamination, a site assessment for contaminants will be conducted on projects that involve excavation of >20 cubic yards of material. The action agencies will complete a site assessment to identify the type, quantity, and extent of any potential contamination. The level of detail and resources committed to such an assessment will be commensurate with the level and type of past or current development at the site. The assessment may include the following:

a. Review of readily available records, such as former site use, building plans, records of any prior contamination events.
b. Site visit to observe the areas used for various industrial processes and the condition of the property.
c. Interviews with knowledgeable people, such as site owners, operators, occupants, neighbors, local government officials, etc.
d. Report that includes an assessment of the likelihood that contaminants are present at the site.

13. Pollution and Erosion Control Measures

Implement the following pollution and erosion control measures:

a. Project Contact: Identify a project contact (name, phone number, an address) that will be responsible for implementing pollution and erosion control measures.
b. List and describe any hazardous material that would be used at the project site, including procedures for inventory, storage, handling, and monitoring; notification procedures; specific clean-up and disposal instructions for different products available on the site; proposed methods for disposal of spilled material; and employee training for spill containment.
c. Temporarily store any waste liquids generated at the staging areas under cover on an impervious surface, such as tarpaulins, until such time they can be properly transported to and treated at an approved facility for treatment of hazardous materials.
d. Procedures based on best management practices to confine, remove, and dispose of construction waste, including every type of debris, discharge water, concrete, cement, grout, washout facility, welding slag, petroleum product, or other hazardous materials generated, used, or stored on-site.
e. Procedures to contain and control a spill of any hazardous material generated, used or stored on-site, including notification of proper authorities. Ensure that materials for emergency erosion and hazardous materials control are onsite (e.g., silt fence, straw bales, oil-absorbing floating boom whenever surface water is present).
f. Best management practices to confine vegetation and soil disturbance to the minimum area, and minimum length of time, as necessary to complete the action, and otherwise prevent or minimize erosion associated with the action area.
g. No uncured concrete or form materials will be allowed to enter the active stream channel.
h. Steps to cease work under high flows, except for efforts to avoid or minimize resource damage.

14. Site Preparation

a. **Flagging sensitive areas** – Prior to construction, clearly mark critical riparian vegetation areas, wetlands, and other sensitive sites to minimize ground disturbance.
b. **Staging area** – Establish staging areas for storage of vehicles, equipment, and fuels to minimize erosion into or contamination of streams and floodplains.
    i. No Topographical Restrictions – place staging area 150 feet or more from any natural water body or wetland in areas where topography does not restrict such a distance.
    ii. Topographical Restrictions –place staging area away from any natural water body or wetland to the greatest extent possible in areas with high topographical restriction, such as constricted valley types.
c. **Temporary erosion controls** – Place sediment barriers prior to construction around sites where significant levels of erosion may enter the stream directly or through road ditches. Temporary erosion controls will be in place before any significant alteration of the action site and will be removed once the site has been stabilized following construction activities.
d. **Stockpile materials** – Minimize clearing and grubbing activities when preparing staging, project, and or stockpile areas. Any large wood, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration. Materials used for implementation of aquatic restoration categories (*e.g.,* large wood, boulders, fencing material) may be staged within the 100-year floodplain.
e. **Hazard trees** – Where appropriate, include hazard tree removal (amount and type) in project design. Fell hazard trees when they pose a safety risk. If possible, fell hazard trees

within riparian areas towards a stream. Keep felled trees on site when needed to meet coarse large wood objectives.

15. Heavy Equipment Use

a. **Choice of equipment** – Heavy equipment will be commensurate with the project and operated in a manner that minimizes adverse effects to the environment (e.g., minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).

b. Fueling and cleaning and inspection for petroleum products and invasive weeds

i. All equipment used for instream work will be cleaned for petroleum accumulations, dirt, plant material (to prevent the spread of noxious weeds), and leaks repaired prior to entering the project area. Such equipment includes large machinery, stationary power equipment (e.g., generators, canes), and gas-powered equipment with tanks larger than five gallons.

ii. Store and fuel equipment in staging areas after daily use.

iii. Inspect daily for fluid leaks before leaving the vehicle staging area for operation.

iv. Thoroughly clean equipment before operation below ordinary high water or within 50 feet of any natural water body or areas that drain directly to streams or wetlands and as often as necessary during operation to remain grease free.

c. **Temporary access roads** – Existing roadways will be used whenever possible. Minimize the number of temporary access roads and travel paths to lessen soil disturbance and compaction and impacts to vegetation. Temporary access roads will not be built on slopes where grade, soil, or other features suggest a likelihood of excessive erosion or failure. When necessary, temporary access roads will be obliterated or revegetated. Temporary roads in wet or flooded areas will be restored by the end of the applicable in-water work period. Construction of new permanent roads is not permitted.

d. **Stream crossings** – Minimize number and length of stream crossings. Such crossings will be at right angles and avoid potential spawning areas to the greatest extent possible. Stream crossings shall not increase the risk of channel re-routing at low and high water conditions. After project completion, temporary stream crossings will be abandoned and the stream channel and banks restored.

e. **Work from top of bank** – To the extent feasible, heavy equipment will work from the top of the bank, unless work instream would result in less damage to the aquatic ecosystem.

f. **Timely completion** – Minimize time in which heavy equipment is in stream channels, riparian areas, and wetlands. Complete earthwork (including drilling, excavation, dredging, filling and compacting) as quickly as possible. During excavation, stockpile native streambed materials above the bankfull elevation, where it cannot reenter the stream, for later use.

16. Site Restoration

a. **Initiate rehabilitation** – Upon project completion, rehabilitate all disturbed areas in a manner that results in similar or better than pre-work conditions through removal of project related waste, spreading of stockpiled materials (soil, large wood, trees, *etc.*) seeding, or planting with local native seed mixes or plants.
b. **Short-term stabilization** – Measures may include the use of non-native sterile seed mix (when native seeds are not available), weed-free certified straw, jute matting, and other similar techniques. Short-term stabilization measures will be maintained until permanent erosion control measures are effective. Stabilization measures will be instigated within three days of construction completion.
c. **Revegetation** – Replant each area requiring revegetation prior to or at the beginning of the first growing season following construction. Achieve reestablishment of vegetation in disturbed areas to at least 70% of pre-project levels within three years. Use an appropriate mix of species that will achieve establishment and erosion control objectives, preferably forb, grass, shrub, or tree species native to the project area or region and appropriate to the site. Barriers will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
d. **Planting manuals** – All riparian plantings shall follow Forest Service direction described in the Regional letter to Units, Use of Native and Nonnative Plants on National Forests and Grasslands May 2006 (Final Draft), and or BLM Instruction Memorandum No. OR-2001-014, Policy on the Use of Native Species Plant Material.
e. **Decompact soils** – Decompact soil by scarifying the soil surface of roads and paths, stream crossings, staging, and stockpile areas so that seeds and plantings can root.

17. Monitoring

Monitoring will be conducted by Action Agency staff, as appropriate for that project, during and after a project to track effects and compliance with this opinion.

a. Implementation
   i. Visually monitor during project implementation to ensure effects are not greater (amount, extent) than anticipated and to contact Level 1 representatives if problems arise.
   ii. Fix any problems that arise during project implementation.
   iii. Regular biologist/hydrologist coordination if biologist/hydrologist is not always on site to ensure contractor is following all stipulations.

b. **401 Certification** – To minimize short-term degradation to water quality during project implementation, follow current 401 Certification provisions of the Federal Clean Water Act for maintenance or water quality standards described by the following: Oregon Department of Environmental Quality (Oregon BLM, Forest Service, and BIA); Washington Department of Ecology (Washington BLM); and the Memorandum of Understanding between the Washington Department of Fish and Wildlife and Forest Service regarding Hydraulic Projects Conducted by Forest Service, Pacific Northwest Region (WDFW and USDA-Forest Service 2012); California, Idaho, or Nevada 401 Certification protocols (BLM and Forest Service).
c. **Post project** – A post-project review shall be conducted after winter and spring high flows.
   i. For each project, conduct a walk through/visual observation to determine if there are post-project affects that were not considered during consultation. For fish passage and revegetation projects, monitor in the following manner:
   ii. Fish Passage Projects – Note any problems with channel scour or bedload deposition, substrate, discontinuous flow, vegetation establishment, or invasive plant infestation.

iii. Revegetation – For all plant treatment projects, including site restoration, monitor for and remove invasive plants until native plants become established.
iv. In cases where remedial action is required, such actions are permitted without additional consultation if they use relevant PDC and aquatic conservation measures and the effects of the action categories are not exceeded.

18. Work Area Isolation, Surface Water Withdrawals, and Fish Capture and Release –

Isolate the construction area and remove fish from a project site for projects that include concentrated and major excavation at a single location within the stream channel. This condition will typically apply to the following aquatic restoration categories: Fish Passage Restoration; Dam, Tidegate, and Legacy Structure Removal; Channel Reconstruction/Relocation.

a. **Isolate capture area** – Install block nets at up and downstream locations outside of the construction zone to exclude fish from entering the project area. Leave nets secured to the stream channel bed and banks until construction activities within the stream channel are complete. If block nets or traps remain in place more than one day, monitor the nets and or traps at least on a daily basis to ensure they are secured to the banks and free of organic accumulation and to minimize fish predation in the trap.
b. **Capture and release** – Fish trapped within the isolated work area will be captured and released as prudent to minimize the risk of injury, then released at a safe release site, preferably upstream of the isolated reach in a pool or other area that provides cover and flow refuge. Collect fish in the best manner to minimize potential stranding and stress by seine or dip nets as the area is slowly dewatered, baited minnow traps placed overnight, or electrofishing (if other options are ineffective). Fish must be handled with extreme care and kept in water the maximum extent possible during transfer procedures. A healthy environment for the stressed fish shall be provided—large buckets (five-gallon minimum to prevent overcrowding) and minimal handling of fish. Place large fish in buckets separate from smaller prey-sized fish. Monitor water temperature in buckets and well-being of captured fish. If buckets are not being immediately transported, use aerators to maintain water quality. As rapidly as possible, but after fish have recovered, release fish. In cases where the stream is intermittent upstream, release fish in downstream areas and away from the influence of the construction. Capture and release will be supervised by a fishery biologist experienced with work area isolation and safe handling of all fish.
c. **Electrofishing** – Use electrofishing only where other means of fish capture may not be feasible or effective. If electrofishing will be used to capture fish for salvage, NMFS's electrofishing guidelines will be followed (NMFS 2000).
    i. Reasonable effort should be made to avoid handling fish in warm water temperatures, such as conducting fish evacuation first thing in the morning, when the water temperature would likely be coolest. No electrofishing should occur when water temperatures are above 18ºC or are expected to rise above this temperature prior to concluding the fish capture.
    ii. If fish are observed spawning during the in-water work period, electrofishing shall not be conducted in the vicinity of spawning fish or active redds.
    iii. Only Direct Current (DC) or Pulsed Direct Current shall be used.
    iv. Conductivity <100, use voltage ranges from 900 to 1100. Conductivity from 100 to 300, use voltage ranges from 500 to 800. Conductivity greater than 300, use voltage to 400.
    v. Begin electrofishing with minimum pulse width and recommended voltage and then gradually increase to the point where fish are immobilized and captured. Turn off current once fish are immobilized.

vi. Do not allow fish to come into contact with anode. Do not electrofish an area for an extended period of time. Remove fish immediately from water and handle as described above (PDC 20b). Dark bands on the fish indicate injury, suggesting a reduction in voltage and pulse width and longer recovery time.

vii. If mortality is occurring during salvage, immediately discontinue salvage operations (unless this would result in additional fish mortality), reevaluate the current procedures, and adjust or postpone procedures to reduce mortality.

d. **Dewater construction site** –When dewatering is necessary to protect species or critical habitat, divert flow around the construction site with a coffer dam (built with non-erosive materials), taking care to not dewater downstream channels during dewatering. Pass flow and fish downstream with a by-pass culvert or a water-proof lined diversion ditch. Diversion sandbags can be filled with material mined from the floodplain as long as such material is replaced at end of project. Small amounts of instream material can be moved to help seal and secure diversion structures. If ESA listed-fish may be present and pumps are required to dewater, the intake must have a fish screen(s) and be operated in accordance with NMFS fish screen criteria described below (in part e.iv) of this section. Dissipate flow energy at the bypass outflow to prevent damage to riparian vegetation or stream channel. If diversion allows for downstream fish passage, place diversion outlet in a location to promote safe reentry of fish into the stream channel, preferably into pool habitat with cover. Pump seepage water from the de-watered work area to a temporary storage and treatment site or into upland areas and allow water to filter through vegetation prior to reentering the stream channel.

e. Surface water withdrawals

i. Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate. Where ESA-listed fish may be present, diversions may not exceed 10% of the available flow and fish screen(s) will be installed, operated, and maintained according to NMFS's fish screen criteria (NMFS 2011e).

ii. For the dewatering of a work site to remove or install culverts, bridge abutments *etc.*, if ESA-listed fish may be present, a fish screen that meets criteria specified by NMFS (2011e) must be used on the intake to avoid juvenile fish entrainment. If ESA-listed salmon, steelhead, eulachon, or green sturgeon may be present, the Action Agencies will ensure that the fish screen design is reviewed and approved by NMFS for consistency with NMFS (2011e) criteria if the diversion (gravity or pump) is at a rate greater than 3 cfs. NMFS approved fish screens have the following specifications: a) An automated cleaning device with a minimum effective surface area of 2.5 square feet per cfs, and a nominal maximum approach velocity of 0.4 feet per second (fps), or no automated cleaning device, a minimum effective surface area of 1 square foot per cfs, and a nominal maximum approach rate of 0.2 fps; and b) a round or square screen mesh that is no larger than 2.38 mm (0.094 inches) in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069 inches) in the narrow dimension.

f. **Stream re-watering** – Upon project completion, slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden release of suspended sediment. Monitor downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

Project Design Criteria for Aquatic Restoration Activity Categories

The 17 aquatic restoration activity categories will be designed and implemented to help restore watershed processes. These projects will improve channel dimensions and stability, sediment transport and deposition, and riparian, wetland, floodplain and hydrologic functions, as well as water quality. As such, these improvements will help address limiting factors—related to spawning, rearing, migration, and more—for ESA-listed and other native fish species. Aquatic habitat restoration and enhancement projects are conducted within stream channels, adjacent riparian/floodplain areas, wetlands, and uplands. Work may be accomplished using manual labor, hand tools (chainsaws, tree planting tools, augers, shovels, and more), all-terrain vehicles, flat-bed trucks, and heavy equipment (backhoes, excavators, bulldozers, front-end loaders, dump trucks, winch machinery, cable yarding, *etc.*). Helicopters will be used for many large wood and salmon carcass placement projects.

1. Fish Passage Restoration includes the following: total removal of culverts or bridges, or replacing culverts or bridges with properly sized culverts and bridges, replacing a damaged culvert or bridge, and resetting an existing culvert that was improperly installed or damaged; stabilizing and providing passage over headcuts; removing, constructing (including relocations), repairing, or maintaining fish ladders; and constructing or replacing fish screens for irrigation diversions. Such projects will take place where fish passage has been partially or completely eliminated through road construction, stream degradation, creation of small dams and weirs, and irrigation diversions. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Stream Simulation Culvert and Bridge Projects –** All road-stream crossing structures shall simulate stream channel conditions per *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road- Stream Crossings* (USDA-Forest Service 2008), located at: http://stream.fs.fed.us/fishxing/aop_pdfs.html

i. **Culvert criteria** – Within the considerations of stream simulation, the structure shall, at a minimum, accommodate a bankfull wide channel plus constructed banks to provide for passage of all life stages of native fish species (for more information, reference Chapter 6, page 35 of the USFS Stream Simulation Guide). The following crossing-width guidance applies to specific ranges of entrenchment ratios as defined by Rosgen (1996):

1. Non-entrenched Streams: If a stream is not fully entrenched (entrenchment ratio of greater than 1.4), the minimum culvert width shall be at least 1.3 times the bankfull channel width. This is consistent with *Anadromous Salmonid Passage Facility Design* (section 7.4.2 “Stream Simulation Design”) (NMFS 2011e). However, if the appropriate structure width is determined to be less than 1.3 times the bankfull channel width, processes for variances are listed in “iv” and “v” below.
2. Entrenched Streams: If a stream is entrenched (entrenchment ratio of less than 1.4), the culvert width must be greater than bankfull channel width, allow sufficient vertical clearance to allow ease of construction and maintenance activities, and provide adequate room for the construction of natural channel banks. Consideration should be given to accommodate the floodprone width. Floodprone width is the width measured at twice the maximum bankfull depth (Rosgen 1996).

ii. **Bridge Design**

1. Bridges with vertical abutments, including concrete box culverts, which are constructed as bridges, shall have channel widths that are designed using the culvert

criteria (PDC 21a-i above). This opinion does not cover bridges that require pile driving within a wetted stream channels.
2. Primary structural elements must be concrete, metal, fiberglass, or untreated timber. Concrete must be sufficiently cured or dried before coming into contact with stream flow.
3. Riprap must not be placed within the bankfull width of the stream. Riprap may only be placed below bankfull height when necessary for protection of abutments and pilings. However, the amount and placement of riprap should not constrict the bankfull flow.

iii. **Crossing Design**

1. Crossings shall be designed using an interdisciplinary design team consisting of an experienced Engineer, Fisheries Biologist, and Hydrologist/Geomorphologist. 2. Forest Service crossing structures wider than 20 feet or with costs that exceed $100,000 shall be reviewed by the USDA-Forest Service, Region 6, Aquatic Organism Passage Design Assistance Team.
3. At least one member of the design team shall be trained in a weeklong Aquatic Organism Passage course based *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings* (USDA-Forest Service 2008).
4. Bankfull width shall be based on the upper end of the distribution of bankfull width measurements as measured in the reference reach to account for channel variability and dynamics.

iv. **NMFS fish passage review and approve** – If the structure width is determined to be less than the established width criteria as defined above, a variance must be requested from NMFS for consistency with criteria in NMFS (2011e).
v. **Opportunity for individual consultation** – The Action Agencies have a legal duty under the ESA to consult with NMFS and USFWS on a project specific basis if they prefer to operate outside the conditions in this opinion. The standards provided in this document are conservative for the purpose of this programmatic and may or may not be applicable to projects that undergo individual Level 1 Consultation. The standards in ARBO II are not new defaults to be used universally outside the programmatic arena.
vi. **Headcut and grade stabilization –** Headcuts often occur in meadow areas, typically on Rosgen "C" and "E" channel types. Headcuts develop and migrate during bankfull and larger floods, when the sinuous path of Rosgen E type streams may become unstable in erosive, alluvial sediments, causing avulsions, meander cut-offs, bank failure, and development of an entrenched Rosgen G gully channel (Rosgen 1994).

1. **Stabilize Headcuts**
   a. In streams with current or historic fish presence, provide fish passage over stabilized headcut through constructed riffles for pool/riffle streams or a series of log or rock structures for step/pool channels as described in part ii below.
   b. Armor headcut with sufficiently sized and amounts of material to prevent continued up-stream migration of the headcut. Materials can include both rock and organic materials which are native to the area. Material shall not contain gabion baskets, sheet pile, concrete, articulated concrete block, and cable anchors.
   c. Focus stabilization efforts in the plunge pool, the headcut, as well as a short distance of stream above the headcut.
   d. Minimize lateral migration of channel around headcut ("flanking") by placing rocks and organic material at a lower elevation in the center of the channel cross section to direct flows to the middle of channel.

e. Short-term headcut stabilization (including emergency stabilization projects) may occur without associated fish passage measures. However, fish passage must be incorporated into the final headcut stabilization action and be completed during the first subsequent in-water work period.
f. In streams without current or historic fish presence, it is recommended to construct a series of downstream log or rock structures as described in part ii below to expedite channel aggradation.

vii. **Grade stabilization to promote fish passage associated with headcut stabilization**

1. **NMFS fish passage review and approve –** If a grade stabilization structure spans the channel and creates one or more discrete longitudinal drops > 6 inches, the Action Agencies will ensure that the action is individually reviewed and approved by the NMFS for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011e).
2. Provide fish passage over stabilized headcut through constructed riffles for pool/riffle streams or a series of log or rock structures for step/pool channels. If large wood and boulder placement will be used for headcut stabilization, refer to Large Wood, Boulder, and Gravel Placement (PDC 22) below.
3. Construct structures in a 'V' or 'U' shape, oriented with the apex upstream, and lower in the center to direct flows to the middle of channel.
4. Key structures into the stream bed to minimize structure undermining due to scour, preferably at least 2.5x their exposure height. The structures should also be keyed into both banks—if feasible greater than 8 feet.
5. If several structures will be used in series, space them at the appropriate distances to promote fish passage of all life stages of native fish. Incorporate NMFS fish passage criteria (jump height, pool depth, *etc.*) in the design of step structures. Recommended spacing should be no closer than the net drop divided by the channel slope (for example, a one-foot high step structure in a stream with a two-percent gradient will have a minimum spacing of 50-feet [1/0.02]).
6. Include gradated (cobble to fine) material in the rock structure material mix to help seal the structure/channel bed, thereby preventing subsurface flow and ensuring fish passage immediately following construction if natural flows are sufficient.
7. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

b. **Fish Ladders**

i. **NMFS fish passage review and approve –** The Action Agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011e).
ii. Design preference is based on project type, level of maintenance, and required monitoring essential for reliable fish passage. Typical fishway designs include:

1. roughened channels/boulder step structures
2. channel spanning concrete sills
3. pool and chute, and
4. pool and weir fishways.

Roughened channel and boulder step structure fishways consist of a graded mix of rock and sediment in an open channel that creates enough roughness and diversity to facilitate fish passage. NMFS's review will include any appurtenant facilities (*i.e.*, fish counting equipment, pit tag detectors, lighting, trash racks, attraction water) that may be included with the fish ladder design. See: the most recent version of *Anadromous Salmonid Passage Facility Design* (NMFS 2011e)

for guidelines and design criteria. Through the NMFS Level 1 team member, collaborate with NMFS engineering staff prior to the conceptual design process of fishway projects to solicit NMFS's preferred design type.

iii. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

c. **Irrigation Diversion Replacement/Relocation & Screen Installation/Replacement**

i. **NMFS fish passage review and approve** – The Action Agencies will ensure that the action is individually reviewed and approved by National Marine Fisheries Service (NMFS) for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011e).

ii. Diversion structures—associated with points of diversion and future fish screens—must pass all life stages of threatened and endangered aquatic species that historically used the affected aquatic habitat.

iii. Water diversion intake and return points must be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the diversion.

iv. NMFS fish screen criteria (NMFS 2011e) applies to federally listed salmonid species under their jurisdiction. This includes screens in temporary and permanent pump intakes.

v. All fish screens will be sized to match the irrigator's state water right or estimated historic water use, whichever is less.

vi. Size of bypass structure should be big enough to pass steelhead kelt into the stream.

vii. Abandoned ditches and other similar structures will be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them.

viii. When making improvements to pressurized diversions, install a totalizing flow meter capable of measuring rate and duty of water use. For non-pressurized systems, install a staff gage or other measuring device capable of measuring instantaneous rate of water flow.

ix. Conversion of instream diversions to groundwater wells will only be used in circumstances where there is an agreement to ensure that any surface water made available for instream flows is protected from surface withdrawal by another water-user.

x. For the removal of diversion structures constructed of local rock and dirt, the project sponsor will dispose of the removed material in the following manner:

1. Material more than 60% silt or clay will be disposed in uplands, outside of the active floodplain.
2. Material with more than 40% gravel will be deposited within the active floodplain, but not in wetlands.
3. Material with more than 50% gravel and less than 30% fines (silt or clay) may be deposited below the ordinary high water mark (HWM).

2. Large Wood, Boulder, and Gravel Placement includes large wood and boulder placement, engineered log jams, porous boulder structures and vanes, gravel placement, and tree removal for large wood projects. Such activities will occur in areas where channel structure is lacking due to past stream cleaning (large wood removal), riparian timber harvest, and in areas where natural gravel supplies are low due to anthropogenic disruptions. These projects will occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Equipment such as helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, and similar equipment may be used to implement projects.

a. **Large Wood and Boulder Projects**

i. Place large wood and boulders in areas where they would naturally occur and in a manner that closely mimic natural accumulations for that particular stream type. For example, boulder placement may not be appropriate in low gradient meadow streams.
ii. Structure types shall simulate disturbance events to the greatest degree possible and include, but are not limited to, log jams, debris flows, windthrow, and tree breakage.
iii. No limits are to be placed on the size or shape of structures as long as such structures are within the range of natural variability of a given location and do not block fish passage.
iv. Projects can include grade control and bank stabilization structures, while size and configuration of such structures will be commensurate with scale of project site and hydraulic forces.
v. The partial burial of large wood and boulders is permitted and may constitute the dominant means of placement. This applies to all stream systems but more so for larger stream systems where use of adjacent riparian trees or channel features is not feasible or does not provide the full stability desired.
vi. large wood includes whole conifer and hardwood trees, logs, and rootwads. large wood size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5x bankfull channel width, while logs without rootwads should be a minimum of 2.0x bankfull width.
vii. Structures may partially or completely span stream channels or be positioned along stream banks.
viii. Stabilizing or key pieces of large wood must be intact, hard, with little decay, and if possible have root wads (untrimmed) to provide functional refugia habitat for fish. Consider orienting key pieces such that the hydraulic forces upon the large wood increases stability
ix. Anchoring large wood – Anchoring alternatives may be used in preferential order:

1. Use of adequate sized wood sufficient for stability
2. Orient and place wood in such a way that movement is limited
3. Ballast (gravel or rock) to increase the mass of the structure to resist movement
4. Use of large boulders as anchor points for the large wood
5. Pin large wood with rebar to large rock to increase its weight. For streams that are entrenched (Rosgen F, G, A, and potentially B) or for other streams with very low width to depth ratios (<12) an additional
60% ballast weight may be necessary due to greater flow depths and higher velocities.

b. **Engineered Logjams** are structures designed to redirect flow and change scour and deposition patterns. To the extent practical, they are patterned after stable natural log jams and can be either unanchored or anchored in place using rebar, rock, or piles (driven into a dewatered area or the streambank, but not in water). Engineered log jams create a hydraulic shadow, a low-velocity zone downstream that allows sediment to settle out. Scour holes develop adjacent to the log jam. While providing valuable fish and wildlife habitat they also redirect flow and can provide stability to a streambank or downstream gravel bar.

i. **NMFS fish passage review and approve** – For engineered log jams that occupy >25% of the bankfull area, the Action Agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with criteria in Anadromous Salmonid Passage Facility Design (NMFS 2011e).
ii. Engineered log jams will be patterned, to the greatest degree possible, after stable natural log jams.

iii. Grade control engineered log jams are designed to arrest channel down-cutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks.
iv. Stabilizing or key pieces of large wood that will be relied on to provide streambank stability or redirect flows must be intact, solid (little decay). If possible, acquire large wood with untrimmed rootwads to provide functional refugia habitat for fish.
v. When available, trees with rootwads attached should be a minimum length of 1.5 times the bankfull channel width, while logs without rootwads should be a minimum of 2.0 times the bankfull width.
vi. The partial burial of large wood and boulders may constitute the dominant means of placement, and key boulders (footings) or large wood can be buried into the stream bank or channel
vii. Angle and Offset – The large wood portions of engineered log jam structures should be oriented such that the force of water upon the large wood increases stability. If a rootwad is left exposed to the flow, the bole placed into the streambank should be oriented downstream parallel to the flow direction so the pressure on the rootwad pushes the bole into the streambank and bed. Wood members that are oriented parallel to flow are more stable than members oriented at 45 or 90 degrees to the flow.
viii. If large wood anchoring is required, a variety of methods may be used. These include buttressing the wood between riparian trees, the use of manila, sisal or other biodegradable ropes for lashing connections. If hydraulic conditions warrant use of structural connections, such as rebar pinning or bolted connections, may be used. Rock may be used for ballast but is limited to that needed to anchor the large wood.

c. Porous Boulder Structures and Vanes

i. Full channel spanning boulder structures are to be installed only in highly uniform, incised, bedrock-dominated channels to enhance or provide fish habitat in stream reaches where log placements are not practicable due to channel conditions (not feasible to place logs of sufficient length, bedrock dominated channels, deeply incised channels, artificially constrained reaches, etc.), where damage to infrastructure on public or private lands is of concern, or where private landowners will not allow log placements due to concerns about damage to their streambanks or property.
ii. Install boulder structures low in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 1.5-year flow event).
iii. Boulder step structures are to be placed diagonally across the channel or in more traditional upstream pointing “V” or “U” configurations with the apex oriented upstream.
iv. Boulder step structures are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. Plunges shall be kept less than 6 inches in height.
v. The use of gabions, cable, or other means to prevent the movement of individual boulders in a boulder step structure is not allowed.
vi. Rock for boulder step structures shall be durable and of suitable quality to assure long-term stability in the climate in which it is to be used. Rock sizing depends on the size of the stream, maximum depth of flow, planform, entrenchment, and ice and debris loading.
vii. The project designer or an inspector experienced in these structures should be present during installation.
viii. Full spanning boulder step structure placement should be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of large wood.

d. Gravel Augmentation

i. Gravel can be placed directly into the stream channel, at tributary junctions, or other areas in a manner that mimics natural debris flows and erosion.
ii. Augmentation will only occur in areas where the natural supply has been eliminated, significantly reduced through anthropogenic disruptions, or used to initiate gravel accumulations in conjunction with other projects, such as simulated log jams and debris flows.
iii. Gravel to be placed in streams shall be a properly sized gradation for that stream, clean, and non-angular. When possible use gravel of the same lithology as found in the watershed. Reference the Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USDA-Forest Service 2008) to determine gravel sizes appropriate for the stream.
iv. Gravel can be mined from the floodplain at elevations above bankfull, but not in a manner that would cause stranding during future flood events. Crushed rock is not permitted.
v. After gravel placement in areas accessible to higher stream flow, allow the stream to naturally sort and distribute the material.
vi. Do not place gravel directly on bars and riffles that are known spawning areas, which may cause fish to spawn on the unsorted and unstable gravel, thus potentially resulting in redd destruction
vii. Imported gravel must be free of invasive species and non-native seeds. If necessary, wash gravel prior to placement.

e. Tree Removal for Large Wood Projects

i. Live conifers and other trees can be felled or pulled/pushed over in a Northwest Forest Plan (USDA and USDI 1994a) Riparian Reserve or PACFISH/INFISH (USDA-Forest Service 1995 ; USDA and USDI 1994b) riparian habitat conservation areas (RHCA), and upland areas (e.g., late successional reserves or adaptive management areas for northern spotted owl and marbled murrelet critical habitat) for in-channel large wood placement only when conifers and trees are fully stocked. Tree felling shall not create excessive stream bank erosion or increase the likelihood of channel avulsion during high flows.
ii. Danger trees and trees killed through fire, insects, disease, blow-down and other means can be felled and used for in-channel placement regardless of live-tree stocking levels.
iii. Trees may be removed by cable, ground-based equipment, horses or helicopters.
iv. Trees may be felled or pushed/pulled directly into a stream or floodplain.
v. Trees may be stock piled for future instream restoration projects.
vi. The project manager for an aquatic restoration action will coordinate with an action-agency wildlife biologist in tree-removal planning efforts.

3. Dam, Tidegate and Legacy Structure Removal includes removal of dams, tidegates, channel-spanning weirs, legacy habitat structures, earthen embankments, subsurface drainage features, spillway systems, outfalls, pipes, instream flow redirection structures (e.g., drop structure, gabion, groin), or similar devices used to control, discharge, or maintain water levels. Projects will be implemented to reconnect stream corridors, floodplains, and estuaries, reestablish wetlands, improve aquatic organism passage, and restore more natural channel and flow conditions. Any instream water control structures that impound substantial amounts of contaminated sediment are not proposed. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. Dam Removal

i. Design review

1. **NMFS fish passage review and approve** – The Action Agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with criteria in NMFS (2011e).
2. **Restoration Review Team** – The Action Agencies will ensure that the action is individually reviewed by the Restoration Review Team.

ii. Dams greater than 10-feet in height require a long-term monitoring and adaptive management plan that will be developed between the Services and the action agency.

iii. At a minimum, the following information will be necessary for review:
1. A longitudinal profile of the stream channel for 20 channel widths downstream of the structure and 20 channel widths upstream of the reservoir area (outside of the influence of the structure) shall be used to determine the potential for channel degradation.
2. A minimum of three cross-sections – one downstream of the structure, one through the reservoir area upstream of the structure, and one upstream of the reservoir area (outside of the influence of the structure) to characterize the channel morphology and quantify the stored sediment.
3. Sediment characterization to determine the proportion of coarse sediment (>2mm) in the reservoir area.
4. A survey of any downstream spawning areas that may be affected by sediment released by removal of the water control structure or dam. Reservoirs with a d35 greater than 2 mm (i.e., 65% of the sediment by weight exceeds 2 mm in diameter) may be removed without excavation of stored material, if the sediment contains no contaminants; reservoirs with a d35 less than 2 mm (i.e., 65% of the sediment by weight is less than 2 mm in diameter) will require partial removal of the fine sediment to create a pilot channel, in
conjunction with stabilization of the newly exposed streambanks
with native vegetation.
5. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

b**. Tide Gate Removal** – This action includes the removal of tide gates.

i**. NMFS fish passage review and approve** – For projects that constrain tidal exchange, the Action Agencies will ensure that the action is individually reviewed and approved by the NMFS for consistency with criteria in NMFS (2011e).

ii. Follow Work Area Isolation, Surface Water Withdrawals, and Fish Capture and Release (PDC 20). If a culvert or bridge will be constructed at the location of a removed tide gate, then the structure should be large enough to allow for a full tidal exchange.

c. **Removal of legacy structures** – This action includes the removal of past projects, such as large wood, boulder, rock gabions, and other in-channel and floodplain structures.

d. If the structure being removed contains material (large wood, boulders, concrete, etc.) not typically found within the stream or floodplain at that site, remove material from the 100-year floodplain.

e. If the structure being removed contains material (e.g., large wood, boulders) that is typically found within the stream or floodplain at that site, the material can be reused to implement habitat improvements described under the Large Wood, Boulder, and Gravel Placement activity category in this opinion.

f. If the structure being removed is keyed into the bank, fill in "key" holes with native materials to restore contours of stream bank and floodplain. Compact the fill material adequately to prevent washing out of the soil during over-bank flooding. Do not mine material from the stream channel to fill in "key" holes.

g. When removal of buried log structures may result in significant disruption to riparian vegetation or the floodplain, consider using a chainsaw to extract the portion of log within the channel and leaving the buried sections within the streambank.

h. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible. i. If the legacy structures (log, rock, or gabion weirs) were placed to provide grade control, evaluate the site for potential headcutting and incision due to structure removal. If headcutting and channel incision are likely to occur due to structure removal, additional measures must be taken to reduce these impacts.

j. If the structure is being removed because it has caused an over-widening of the channel, consider implementing other ARBO II restoration categories to decrease the width to depth ratio of the stream to a level commensurate with the geomorphic setting.

4. Channel Reconstruction/Relocation projects include reconstruction of existing stream channels through excavation and structure placement (large wood and boulders) or relocation (rerouting of flow) into historic or newly constructed channels that are typically more sinuous and complex. This proposed action applies to stream systems that have been straightened, channelized, dredged, or otherwise modified for the purpose of flood control, increasing arable land, realignment, or other land use management goals or for streams that are incised or otherwise disconnected from their floodplains resulting from watershed disturbances. This activity type will be implemented to improve aquatic and riparian habitat diversity and complexity, reconnect stream channels to floodplains, reduce bed and bank erosion, increase hyporheic exchange, provide long-term nutrient storage, provide substrate for macroinvertebrates, moderate flow disturbance, increase retention of organic material, and provide refuge for fish and other aquatic species. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **General Project Design Criteria**

i. ***Design Review***

1. **NMFS fish passage review and** approve – The Action Agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with NMFS (2011e).
2. **Restoration Review Team** – The Action Agencies will ensure that the action is individually reviewed by the Restoration Review Team.

ii. ***Design Guidance***

1. Construct geomorphically appropriate stream channels and floodplains within a watershed and reach context.
2. Design actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.
3. To the greatest degree possible, remove nonnative fill material from the channel and floodplain to an upland site.
4. When necessary, loosen compacted soils once overburden material is removed. Overburden or fill comprised of native materials, which originated from the project

area, may be used within the floodplain where appropriate to support the project goals and objectives.

5. Structural elements shall fit within the geomorphic context of the stream system. For bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in poolriffle stream types, while roughened channels and boulder step structures shall be preferentially used in step-pool and cascade stream types.

6. Material selection (large wood, rock, gravel) shall also mimic natural stream system materials.

7. Construction of the streambed should be based on Stream Simulation Design principles as described in section 6.2 of Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings or other appropriate design guidance documents (USDA-Forest Service 2008).

iii. ***Project documentation*** – Prior to the Design Review, the project contact will provide NMFS and the Restoration Review Team with the following documentation:

1. Background and Problem Statement
   a. Site history.
   b. Environmental baseline.
   c. Problem Description.
   d. Cause of problem.
2. Project Description
   a. Goals/objectives.
   b. Project elements.
   c. Sequencing, implementation.
   d. Recovery trajectory –how does it develop and evolve?
3. Design Analysis
   a. Technical analyses.
   b. Computations relating design to analysis.
   c. References.
4. River Restoration Analysis Tool – The River Restoration Analysis Tool (restorationreview.com) was created to assist with design and monitoring of aquatic restoration projects. The following questions taken from the tool must be addressed in the project documentation:

   a. Problem Identification
      i. Is the problem identified?
      ii. Are causes identified at appropriate scales?
   b. Project Context
      i. Is the project identified as part of a plan, such as a watershed action plan or recovery plan?
      ii. Does the project consider ecological, geomorphic, and socioeconomic context?
   c. Goals & Objectives
      i. Do goals and objectives address problem, causes, and context?
      ii. Are objectives measurable?
   d. Alternatives/Options Evaluation
      i. Were alternatives/options considered?
      ii. Are uncertainties and risk associated with selected alternative acceptable?
   e. Project Design
      i. Do project elements collectively support project objectives?
      ii. Are design criteria defined for all project elements?
      iii. Do project elements work with stream processes to create and maintain habitat?

iv. Is the technical basis of design sound for each project element?

f. Implementation

i. Are plans and specifications sufficient in scope and detail to execute the project?

ii. Does plan address potential implementation impacts and risks?

g. Monitoring & Management

i. Does monitoring plan address project compliance?

ii. Does monitoring plan directly measure project effectiveness?

h. Monitoring – Develop a monitoring and adaptive plan that has been reviewed and approved by the Restoration Review Team and the Services. The plan will include the following:

i. Introduction

ii. Existing Monitoring Protocols

iii. Project Effectiveness Monitoring Plan

iv. Project Review Team Triggers

v. Monitoring Frequency, Timing, and Duration

vi. Monitoring Technique Protocols

vii. Data Storage and Analysis

viii. Monitoring Quality Assurance Plan

ix. Literature cited

5. Off- and Side-Channel Habitat Restoration projects will be implemented to reconnect historic side-channels with floodplains by removing off-channel fill and plugs. Furthermore, new side-channels and alcoves can be constructed in geomorphic settings that will accommodate such features. This activity category typically applies to areas where side channels, alcoves, and other backwater habitats have been filled or blocked from the main channel, disconnecting them from most if not all flow events. These project types will increase habitat diversity and complexity, improve flow heterogeneity, provide long-term nutrient storage and substrate for aquatic macroinvertebrates, moderate flow disturbances, increase retention of leaf litter, and provide refuge for fish during high flows. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Review and approve** – When a proposed side channel will contain >20% of the bankfull flow,16 the Action Agencies will ensure that the action is reviewed by the Restoration Review Team and reviewed and approved by NMFS for consistency with criteria in NMFS (2011e).

b. **Data requirements** – Data requirements and analysis for off- and side-channel habitat restoration include evidence of historical channel location, such as land use surveys, historical photographs, topographic maps, remote sensing information, or personal observation.

c. **Allowable excavation** – Off- and side-channel improvements can include minor excavation (< 10% of volume) of naturally accumulated sediment within historical channels. There is no limit as to the amount of excavation of anthropogenic fill within historic side channels as long as such channels can be clearly identified through field or aerial photographs. Excavation depth will not exceed the maximum thalweg depth in the main channel. Excavated material removed from off- or side-channels shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.

6. Streambank Restoration will be implemented through bank shaping and installation of coir logs or other soil reinforcements as necessary to support riparian vegetation; planting or installing large wood, trees, shrubs, and herbaceous cover as necessary to restore ecological

function in riparian and floodplain habitats; or a combination of the above methods. Such actions are intended to restore banks that have been altered through road construction, improper grazing, invasive plants, and more. Benefits include increased amounts of riparian vegetation and associated shading, bank stability, and reduced sedimentation into stream channels and spawning gravels. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. Without changing the location of the bank toe, restore damaged streambanks to a natural slope and profile suitable for establishment of riparian vegetation. This may include sloping of unconsolidated bank material to a stable angle of repose or the use of benches in consolidated, cohesive soils.

b. Complete all soil reinforcement earthwork and excavation in the dry. When necessary, use soil layers or lifts that are strengthened with biodegradable fabrics and penetrable by plant roots.

c. Include large wood to the extent it would naturally occur. If possible, large wood should have untrimmed root wads to provide functional refugia habitat for fish. Wood that is already within the stream or suspended over the stream may be repositioned to allow for greater interaction with the stream.

d. Rock will not be used for streambank restoration, except as ballast to stabilize large wood.

e. Use a diverse assemblage of vegetation species native to the action area or region, including trees, shrubs, and herbaceous species. Vegetation, such as willow, sedge and rush mats, may be gathered from abandoned floodplains, stream channels, etc.

f. Do not apply surface fertilizer within 50 feet of any stream channel.

g. Install fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

h. Conduct post-construction monitoring and treatment or removal of invasive plants until native plant species are well established.

7. Set-back or Removal of Existing Berms, Dikes, and Levees will be conducted to reconnect historic fresh-water deltas to inundation, stream channels with floodplains, and historic estuaries to tidal influence as a means to increase habitat diversity and complexity, moderate flow disturbances, and provide refuge for fish during high flows. Other restored ecological functions include overland flow during flood events, dissipation of flood energy, increased water storage to augment low flows, sediment and debris deposition, growth of riparian vegetation, nutrient cycling, and development of side channels and alcoves. Such projects will take place where estuaries and floodplains have been disconnected from adjacent rivers through drain pipes and anthropogenic fill. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a**. Floodplains and Freshwater Deltas**

i. Design actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.
ii. Remove drain pipes, fences, and other capital projects to the extent possible.
iii. To the extent possible, remove nonnative fill material from the floodplain to an upland site.
iv. Where it is not possible to remove or set-back all portions of dikes and berms, or in areas where existing berms, dikes, and levees support abundant riparian vegetation,

openings will be created with breaches. Breaches shall be equal to or greater than the active channel width to reduce the potential for channel avulsion during flood events. In addition to other breaches, the berm, dike, or levee shall always be breached at the downstream end of the project or at the lowest elevation of the floodplain to ensure the flows will naturally recede back into the main channel thus minimizing fish entrapment.
v. Elevations of dike/levee setbacks shall not exceed the elevation of removed structures
vi. When necessary, loosen compacted soils once overburden material is removed. Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain to create set-back dikes and fill anthropogenic holes provided that floodplain function is not impeded.

b. **Estuary Restoration**

i. Project implementation shall be conducted in a sequence that will not preclude repairing or restoring estuary functions once dikes/levees are breached and the project area is flooded.
ii. Culverts and tide gates will be removed using the design criteria and conservation measures, where appropriate, as described in Work Area Isolation, Surface Water Withdrawals, & Fish Capture and Release (PDC 20) and Fish Passage Restoration (PDC 21) above.
iii. Roads within the project area should be removed to allow free flow of water. Material either will be placed in a stable area above the ordinary high water line or highest measured tide or be used to restore topographic variation in wetlands.
iv. To the extent possible, remove segmented drain tiles placed to drain wetlands. Fill generated by drain tile removal will be compacted back into the ditch created by removal of the drain tile.
v. Channel construction may be done to recreate channel morphology based on aerial photograph interpretation, literature, topographic surveys, and nearby undisturbed channels. Channel dimensions (width and depth) are based on measurements of similar types of channels and the drainage area. In some instances, channel construction is simply breaching the levee. For these sites, further channel development will occur through natural processes. When required, use PDC in Channel Reconstruction/Relocation (PDC 24).
vi. Fill ditches constructed and maintained to drain wetlands. Some points in an open ditch may be over-filled, while other points may be left as low spots to enhance topography and encourage sinuosity of the developing channel.

8. Reduction/Relocation of Recreation Impacts is intended to close, better control, or relocate recreation infrastructure and use along streams and within riparian areas. This includes removal, improvement, or relocation of infrastructure associated with designated campgrounds, dispersed camp sites, day-use sites, foot trails, and off-road vehicle roads/trails in riparian areas. The primary purpose is to eliminate or reduce recreational impacts to restore riparian areas and vegetation, improve bank stability, and reduce sedimentation into adjacent streams. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. Design remedial actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.

b. To the extent possible, non-native fill material shall be removed from the floodplain to an upland site.

c. Overburden or fill comprised of native materials, which originated from the project area, can be used to reshape the floodplain, placed in small mounds on the floodplain, used to fill anthropogenic holes, buried on site, or disposed into upland areas.

d. For recreation relocation projects—such as campgrounds, horse corrals, off-road vehicle trails—move current facilities out of the riparian area or as far away from the stream as possible.

e. Consider de-compaction of soils and vegetation planting once overburden material is removed.

f. Place barriers—boulders, fences, gates, etc.—outside of the bankfull width and across traffic routes to prevent off-road vehicle access into and across streams.

g. For work conducted on off-road vehicle roads and trails, follow relevant PDC in Road and Trail Erosion Control and Decommissioning (PDC 32) below.

9. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering Facilities projects will be implemented by constructing fences to exclude riparian grazing, providing controlled access for walkways that livestock use to transit across streams and through riparian areas, and reducing livestock use in riparian areas and stream channels by providing upslope water facilities. Such projects promote a balanced approach to livestock use in riparian areas, reducing livestock impacts to riparian soils and vegetation, streambanks, channel substrates, and water quality. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Livestock Fencing**

i. Fence placement must allow for lateral movement of a stream and to allow establishment of riparian plant species. To the extent possible, fences will be placed outside the channel migration zone.
ii. Minimize vegetation removal, especially potential large wood recruitment sources, when constructing fence lines.
iii. Where appropriate, construct fences at water gaps in a manner that allows passage of large wood and other debris.

b. **Livestock Stream Crossings**

i. The number of crossings will be minimized.
ii. Locate crossings or water gaps where streambanks are naturally low. Livestock crossings or water gaps must not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (e.g., wetlands) due to congregating livestock.
iii. To the extent possible, crossings will not be placed in areas where ESA listed species spawn or are suspected of spawning (e.g., pool tailouts where spawning may occur), or within 300-feet upstream of such areas.
iv. Existing access roads and stream crossings will be used whenever possible, unless new construction would result in less habitat disturbance and the old trail or crossing is retired.
v. Access roads or trails will be provided with a vegetative buffer that is adequate to avoid or minimize runoff of sediment and other pollutants to surface waters.
vi. Essential crossings will be designed and constructed or improved to handle reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the trail if the crossing fails.
vii. If necessary, the streambank and approach lanes can be stabilized with native vegetation or angular rock to reduce chronic sedimentation. The stream crossing or water

gap should be armored with sufficient sized rock (e.g., cobble-size rock) and use angular rock if natural substrate is not of adequate size.
viii. Livestock crossings will not create barriers to the passage of adult and juvenile fish. Whenever a culvert or bridge—including bridges constructed from flatbed railroad cars, boxcars, or truck flatbeds—is used to create the crossing, the structure width will tier to project design criteria listed for Stream Simulation Culvert and Bridge Projects under Fish Passage Restoration (PDC 21).
ix. Stream crossings and water gaps will be designed and constructed to a width of 10 to 15 feet in the upstream-downstream direction to minimize the time livestock will spend in the crossing or riparian area.
x. When using pressure treated lumber for fence posts, complete all cutting/drilling offsite (to the extent possible) so that treated wood chips and debris do not enter water or flood prone areas.
xi. Riparian fencing is not to be used to create livestock handling facilities or riparian pastures.

c. **Off-channel Livestock Watering Facilities**

i. The development of a spring is not allowed if the spring is occupied by ESA-listed species.
ii. Water withdrawals must not dewater habitats or cause low stream flow conditions that could affect ESA-listed fish. Withdrawals may not exceed 10% of the available flow.
iii. Troughs or tanks fed from a stream or river must have an existing valid water right. Surface water intakes must be screened to meet the most recent version of NMFS fish screen criteria (NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e), be self-cleaning, or regularly maintained by removing debris buildup. A responsible party will be designated to conduct regular inspection and as-needed maintenance to ensure pumps and screens are properly functioning.
iv. Place troughs far enough from a stream or surround with a protective surface to prevent mud and sediment delivery to the stream. Avoid steep slopes and areas where compaction or damage could occur to sensitive soils, slopes, or vegetation due to congregating livestock.
v. Ensure that each livestock water development has a float valve or similar device, a return flow system, a fenced overflow area, or similar means to minimize water withdrawal and potential runoff and erosion.
vi. Minimize removal of vegetation around springs, wet areas.
vii. When necessary, construct a fence around the spring development to prevent livestock damage.

10. Piling and other Structure Removal includes the removal of untreated and chemically treated wood pilings, piers, boat docks as well as similar structures comprised of plastic, concrete, and other material. Piling and other structure removal from waterways will improve water quality by eliminating chronic sources of toxic contamination and associated impacts to riparian dependent species. Pilings and other structures occur in estuaries, lakes, and rivers and are typically used in association with boat docks and other facilities. Equipment such as boats, barges, excavators, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **When removing an intact pile:**

i. Install a floating surface boom to capture floating surface debris.

ii. To the extent possible, keep all equipment (e.g., bucket, steel cable, vibratory hammer) out of the water, grip piles above the waterline, and complete all work during low water and low current conditions.
iii. Dislodge the piling with a vibratory hammer, whenever feasible. Never intentionally break a pile by twisting or bending.
iv. Slowly lift piles from the sediment and through the water column.
v. Place chemically-treated piles in a containment basin on a barge deck, pier, or shoreline without attempting to clean or remove any adhering sediment. A containment basin for the removed piles and any adhering sediment may be constructed of durable plastic sheeting with sidewalls supported by hay bales or another support structure to contain all sediment.
vi. Fill the holes left by each piling with clean, native sediments located from the project area.
vii. Dispose of all removed piles, floating surface debris, any sediment spilled on work surfaces, and all containment supplies at a permitted upland disposal site.

b. **When removing a broken pile:**

i. If a pile breaks above the surface of uncontaminated sediment, or less than 2 feet below the surface, every attempt short of excavation will be made to remove it entirely. If the pile cannot be removed without excavation, excavate sediments and saw the stump off at least 3 feet below the surface of the sediment.
ii. If a pile breaks above contaminated sediment, saw the stump off at the sediment line; if a pile breaks within contaminated sediment, make no further effort to remove it and cover the hole with a cap of clean substrate appropriate for the site.
iii. If dredging is likely in the area of piling removal, use a global positioning device (GPS) to note the location of all broken piles for future use in site debris characterization.

11. Road and Trail Erosion Control includes hydrologically closing or decommissioning roads and trails, including culvert removal in perennial and intermittent streams; removing, installing or upgrading cross-drainage culverts; upgrading culverts on non-fish-bearing steams; constructing water bars and dips; reshaping road prisms; vegetating fill and cut slopes; removing and stabilizing of sidecast materials; grading or resurfacing roads that have been improved for aquatic restoration with gravel, bark chips, or other permeable materials; contour shaping of the road or trail base; removing road fill to native soils; soil stabilization and tilling compacted surfaces to reestablish native vegetation. Roads closed under Forest Service and BLM/BIA-equivalent Travel and Access Management Plans will be subject to these PDC and may be addressed under this opinion. However, such “plans” for road management will require separate consultations. Such actions will target priority roads that contribute sediment to streams, block fish passage, or disrupt floodplain and riparian functions. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Road Decommissioning and Stormproofing**

i. For road decommissioning and hydrologic closure projects within riparian areas, recontour the affected area to mimic natural floodplain contours and gradient to the extent possible.
ii. When obliterating or removing road segments adjacent to a stream, use sediment control barriers between the road and stream if space is available.
iii. Dispose of slide and waste material in stable sites out of the flood-prone area. Native material may be used to restore natural or near-natural contours.

iv. Drainage features used for stormproofing and treatment projects should be spaced as to hydrologically disconnect road surface runoff from stream channels. If grading and resurfacing is required, use gravel, bark, or other permeable materials for resurfacing.
v. Minimize disturbance of existing vegetation in ditches and at stream crossings.
vi. Conduct activities during dry-field conditions (generally May 15 to October 15) when the soil is more resistant to compaction and soil moisture is low.
vii. When removing a culvert from a first or second order, non-fishing bearing stream, project specialists shall determine if culvert removal should include stream isolation and rerouting in project design. Culvert removal on fish bearing streams shall adhere to the measures described in Fish
Passage Restoration (PDC 21).
viii. For culvert removal projects, restore natural drainage patterns and channel morphology. Evaluate channel incision risk and construct in-channel grade control structures when necessary.

b. **Road Relocation**

i. When a road is decommissioned in a floodplain and future vehicle access through the area is still required, relocate the road as far as practical away from the stream.
ii. The relocation will not increase the drainage network and will be constructed to hydrologically disconnect it from the stream network to the extent practical. New cross drains shall discharge to stable areas where the outflow will quickly infiltrate the soil and not develop a channel to a stream.
iii. This consultation does not cover new road construction (not associated with road relocation) or routine maintenance within riparian areas.

12. Juniper Tree Removal will be conducted in riparian areas and adjoining uplands to help restore plant species composition and structure that would occur under natural fire regimes. Juniper removal will occur in those areas where juniper have encroached into riparian areas as a result of fire exclusion, thereby replacing more desired riparian plant species such as willow, cottonwood, aspen, alder, sedge, and rush. This action will help restore composition and structure of desired riparian species, thereby improving ground cover and water infiltration into soils. Equipment may include chainsaws, pruning shears, winch machinery, feller-bunchers, and slash-busters. The following measures will apply:

a. Remove juniper to natural stocking levels where BLM and Forest Service determines that juniper trees are expanding into neighboring plant communities to the detriment of other native riparian vegetation, soils, or streamflow.
b. Do not cut old-growth juniper, which typically has several of the following features: sparse limbs, dead limbed or spiked-tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of cambium layer at base of tree, and limited terminal leader growth in upper branches (Miller et al. 2005).
c. Felled trees may be left in place, lower limbs may be cut and scattered, or all or part of the trees may be used for streambank or wetland restoration (e.g., manipulated as necessary to protect riparian or wetland shrubs from grazing by livestock or wildlife or otherwise restore ecological function in floodplain, riparian, and wetland habitats).
d. Where appropriate, cut juniper may be placed into stream channels and floodplains to provide aquatic benefits. Juniper can be felled or placed into the stream to promote channel aggradation as long as such actions do not obstruct fish movement and use of spawning gravels or increase width to depth ratios.
e. On steep or south-facing slopes, where ground vegetation is sparse, leave felled juniper in sufficient quantities to promote reestablishment of vegetation and prevent erosion.

f. If seeding is a part of the action, consider whether seeding would be most appropriate before or after juniper treatment.
g. When using feller-buncher and slash-buster equipment, operate equipment in a manner that minimizes soil compaction and disturbance to soils and native vegetation to the extent possible. Equipment exclusion areas (buffer area along stream channels) should be as wide as the feller-buncher or slash-buster arm.

13. Riparian Vegetation Treatment (controlled burning) includes reintroduction of low and moderate-severity fire into riparian areas to help restore plant species composition and structure that would occur under natural fire regimes in dry forest types east of the Cascade mountains and in southwestern Oregon. Additionally, controlled burns may be implemented in localized lowland areas in western Oregon, i.e., oak woodlands. Conifer thinning may be required to adjust fuel loads for moderate-severity burns to regenerate deciduous trees and shrubs. Equipment would include drip torches and chainsaws, along with fire suppression vehicles and equipment.

a. **Low and Moderate Severity Burns**

i. Experienced fuels specialists, silviculturists, fisheries biologist, and hydrologists shall be involved in designing prescribed burn treatments.
ii. Prescriptions will focus on restoring the plant species composition and structure that would occur under natural fire regimes.
iii. Burn plans are required for each action and shall include, but not be limited to the following: a description of existing and desired future fire classifications, existing and target stand structure and species composition (including basis for target conditions); other ecological objectives, type, severity, area, and timing of proposed burn; and measures to prevent destruction of vegetation providing shade and other ecological functions important to fish habitat.
iv. Low-severity burns will be used except where the objective is to restore deciduous trees, as describe below under part “v.”, with a goal of creating a mosaic pattern of burned and unburned landscape. Low severity burns are characterized by the following: Low soil heating or light ground char occurs where litter is scorched, charred, or consumed, but the duff is left largely intact. large wood accumulation is partially consumed or charred. Mineral soil is not changed. Minimal numbers of trees, typically pole/saplings, will be killed.
v. Moderate-severity burns are permitted only where needed to invigorate decadent aspen stands, willows, and other native deciduous species and may be targeted in no more than 20% of the area within RHCAs or Riparian Reserves/6th field HUC/year. Such burns shall be contained within the observable historical boundaries of the aspen stand, willow site, other deciduous species, and associated meadows; additional area outside of the “historical boundaries” may be added to create controllable burn boundaries. Moderate severity are characterized by the following: Moderate soil heating or moderate ground char occurs where the litter on forest sites is consumed and the duff is deeply charred or consumed, but the underlying mineral soil surface is not visibly altered. Light colored ash is present. large wood is mostly consumed, except for logs, which are deeply charred.
vi. Fire lines will be limited to five feet in width, constructed with erosion control structures, such as water bars, and restored to pre-project conditions before the winter following the controlled fire. To the extent possible, do not remove vegetation providing stream shade or other ecological functions that are important to streams.
vii. Ignition can occur anywhere within the Riparian Reserve and RHCAs area as long as project design criteria are met.

viii. Avoid water withdrawals from fish bearing streams whenever possible. Water drafting must take no more than 10% of the stream flow and must not dewater the channel to the point of isolating fish. Pump intakes shall have fish screens consistent with NMFS fish screening criteria (NMFS 2011e).

b. **Non-commercial Thinning Associated with Moderate-severity Burns**

i. Non-commercial tree thinning and slash removal is allowed only as required to adjust fuel loads to implement a moderate-severity burn to promote growth of deciduous trees and shrubs, such as aspen, cottonwood, willow, other deciduous species, and associated meadows.
ii. Thinning is allowed only in dry forest types, i.e., east of the Cascade mountains and southwestern Oregon, and in localized lowland areas in western Oregon, i.e., oak woodlands.
iii. To protect legacy trees, thinning from below is allowed. If conifers are even-aged pole, sapling, or mid-seral with no legacy trees, thin existing trees to the degree necessary to promote a moderate-severity burn.
iv. No slash burning is allowed within 30-feet of any stream. To the extent possible, avoid creating hydrophobic soils when burning slash. Slash piles should be far enough away from the stream channel so any sediment resulting from this action will be unlikely to reach any stream.
v. Apply PDC in National Fire Plan salmonid criteria (USDI-Bureau of Land Management 2005) for limits on mortality to residual overstory vegetation.
vi. Only hand equipment—chain saws, axes, Pulaski's, etc.—may be used for felling.
vii. Where livestock or wildlife grazing could be a threat to restoration of aspen, cottonwood, willow, alder, and other deciduous vegetation and an immediate moderate-severity burn would consume large amounts of felled trees, consider delaying the burn and leaving felled trees in place to create grazing barriers to help assure plant growth.
viii. If in an existing grazing allotment, projects in this category shall be accompanied by livestock grazing practices that promote the attainment of moderate-severity burn objectives.

14. Riparian Vegetation Planting includes the planting of native riparian species that would occur under natural disturbance regimes. Activities may include the following: planting conifers, deciduous trees and shrubs; placement of sedge and or rush mats; gathering and planting willow cuttings. The resulting benefits to the aquatic system can include desired levels of stream shade, bank stability, stream nutrients, large wood inputs, increased grasses, forbs, and shrubs, and reduced soil erosion. Equipment may include excavators, backhoes, dump trucks, power augers, chainsaws, and manual tools.

a. Experienced silviculturists, botanists, ecologists, or associated technicians shall be involved in designing vegetation treatments.
b. Species to be planted will be of the same species that naturally occur in the project area. Acquire native seed or plant sources as close to the watershed as possible.
c. Tree and shrub species, willow cuttings, as well as sedge and rush mats to be used as transplant material shall come from outside the bankfull width, typically in terraces (abandoned flood plains), or where such plants are abundant.
d. Sedge and rush mats should be sized to prevent their movement during high flow events.
e. Concentrate plantings above the bankfull elevation.
f. Removal of native and non-native vegetation that will compete with plantings is permitted.
g. Exclosure fencing to prevent utilization of plantings by deer, elk, and livestock is permitted.

15. Bull Trout Protection includes the removal of brook trout or other non-native fish species via electrofishing or other manual means to protect bull trout from competition or hybridization.

a. For brook trout or other non-native fish species removal, staff experienced in the specific removal method shall be involved in project design and implementation.

b. When using electrofishing for removal of brook trout or other non-native fish species, use the following guidelines:

i. Electrofishing shall be conducted using the methods outlined in the NMFS's guidelines (NMFS 2000).

ii. Electrofishing equipment shall be operated at the lowest possible effective settings to minimize injury or mortality to bull trout.

iii. To reduce adverse effects to bull trout, electrofishing shall only occur from May 1 (or after emergence occurs) to July 31 in known bull trout spawning areas. No electrofishing will occur in any bull trout habitat after August 15.

iv. Electrofishing shall not be conducted when the water conditions are turbid and visibility is poor. This condition may be experienced when the sampler cannot see the stream bottom in 1 foot of water.

v. Electrofishing will not be conducted within core areas that contain 100 or fewer adult bull trout.

vi. Other removal methods, such as dip netting, spearing, and other means can be used.

16. Beaver Habitat Restoration includes installation of in-channel structures to encourage beavers to build dams in incised channels and across potential floodplain surfaces. The dams are expected to entrain substrate, aggrade the bottom, and reconnect the stream to the floodplain.

a. **In-channel Structures**

i. Consist of porous channel-spanning structures comprised of biodegradable vertical posts (beaver dam support structures) approximately 0.5 to 1 meter apart and at a height intended to act as the crest elevation of an active beaver dam. Variation of this restoration treatment may include post lines only, post lines with wicker weaves, construction of starter dams, reinforcement of existing active beaver dams, and reinforcement of abandoned beaver dams (Pollock et al. 2012).

ii. Place beaver dam support structures in areas conducive to dam construction as determined by stream gradient or historical beaver use.

iii. Place in areas with sufficient deciduous shrub and trees to promote sustained beaver occupancy.

b. **Habitat Restoration**

i. Beaver Restoration activities may include planting riparian hardwoods (species such as willow, red osier dogwood, and alder) and building exclosures (such as temporary fences) to protect and enhance existing or planted riparian hardwoods until they are established (Malheur National Forest and the Keystone Project 2007).

ii. Maintain or develop grazing plans that will ensure the success of beaver habitat restoration objectives.

iii. As a means to restore desired vegetation (e.g., aspen, willow, alder, and cottonwood) associated with quality beaver habitat, follow project design criteria in the *Riparian Vegetation Treatment (controlled burning) b. Noncommercial thinning associated with Moderate-severity burns* category.

17. Fisheries, Hydrology, Geomorphology, Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration include assessments and monitoring projects that could or are associated with planning, implementation, and monitoring of aquatic restoration projects covered by this opinion. Such support projects may include surveys to document the following aquatic and riparian attributes: fish habitat, hydrology, channel geomorphology, water quality, fish spawning, fish presence19, macro invertebrates, riparian vegetation, wildlife, and cultural resources (including excavating test pits <1 m2 in size). This also includes effectiveness monitoring associated with projects implemented under ARBO II, provided the effectiveness monitoring is limited to the same survey techniques described in this section.

a. Train personnel in survey methods to prevent or minimize disturbance of fish. Contract specifications should include these methods where appropriate.
b. Avoid impacts to fish redds. When possible, avoid sampling during spawning periods.
c. Coordinate with other local agencies to prevent redundant surveys.
d. Locate excavated material from cultural resource test pits away from stream channels. Replace all material in test pits when survey is completed and stabilize the surface.
e. Does not include research projects that have or should obtain a permit pursuant to section 10(a) of the ESA.

Project Design Criteria by Resource

Fisheries and Hydrology

Fisheries and Hydrology resources will follow all mitigation measures and project design criteria for aquatic restoration activities as shown in the 'Aquatic Restoration Project Categories, Program Administration, General Aquatic Conservation Measures, and Project Design Criteria for Aquatic Restoration Activity Categories on the Malheur National Forest.'

Additional Aquatic project design criteria were developed for the following elements: Tree Tipping and Felling, Juniper Treatments, Tree Hauling, and Prescribed Burning.

General For Inside Riparian Habitat Conservation Areas

- All snags will be maintained within the RHCA unless deemed a hazard to the restoration activity.

Tree Tipping and Tree Felling for Large Wood Projects

- Source trees being extracted (either by tipping and or falling) as part of this project for instream restoration will not be harvested from within the primary shade zone.

Table 35 Primary shade zone width, based on adjacent hill slope.

	Hill Slope less than 30%	Hill Slope 30% to 60%	Hill Slope greater than 30%
Primary Shade Zone Width (slope distance	50 ft.	55 ft.	60 ft.

The Temperature Implementation Strategies allow the distances in the above table to be less (but not less than 25 ft.) if any of the following conditions applies:

- The trees are located on a south facing slope (175-185 degree azimuth) and therefore do not provide stream shade;
- An appropriate level of analysis is completed and documented, such as shade modeling, using site-specific characteristics to determine the primary shade tree width; and or
- Field monitoring or measurements are completed to determine the width where optimum Angular Canopy Density (65% or greater) is achieved (see TMDL Implementation Strategies).
- If trees are being felled for safety reasons they can be felled towards the stream.
- Source trees should come from but are not limited to: over or fully stocked upland and riparian stands, hazard trees, trees generated from administrative sites (maintenance, expansion, or new construction), and hardwood restoration.

There is no DBH (diameter at breast height) restriction for large wood, but consider the following before removing and placing trees:

Diameter

The key to establishing a logjam is utilizing larger diameter wood that resists decay. These pieces of wood are often called "key pieces," and serve as the anchors for the logjam structure. Wood can improve fish habitat only if the wood is large enough to stay, influence flow patterns, and sediment sorting. Larger diameter wood retains its size longer as abrasion and decay occurs over the years. Larger diameter wood is more effective in creating pools and complex channels that

improve fish populations. The minimum diameter required for a key piece of wood depends on the bankfull width of the stream is found in the following table.

Table 36 Bankfull widths and minimum diameter of logs to be considered key pieces.

Bankfull Width* - Feet	Minimum Diameter* - Inches
0 to 10	10
10 to 20	16
20 to 30	18
Over 30	22
*This table was taken from '1995 A Guide to Placement of Large Wood in Streams.	

Length

- The length of the wood is also important to stability. To be considered a key piece a log with a rootwad still attached should be at least one and one-half times (1.5X) the bankfull or a log without a rootwad should be twice (2X) the length of the stream's bankfull width. As the best fish habitat is formed around jams composed of 3 to7 logs, at least 2 key pieces should be used at each structure.
- Mimic natural accumulations of large woody debris based on stream type, valley setting, and community type and ensure future large woody debris recruitment
- Tailholds as part of tree tipping operations are permitted across perennial, intermittent and ephemeral streams but the use of protective straps will be required to prevent tree damage.

Juniper Treatments

The majority of the juniper treatment areas would be within the riparian habitat conservation areas and adjoining uplands. For each area evaluated for juniper treatments, interdisciplinary teams would discuss the following questions in order to identify the attributes of an area and select the appropriate treatments:

- What kind of site (potential natural vegetation, soils)?
- Successional state of site?
- Components that need to be restored?
- How units may fit into the overall landscape mosaic?
- Long-term goals and objectives?
- Utilize the "Western Juniper Field Guide: Asking the Right Questions to Select the Appropriate Management Actions. (Bates et al. 2007, Circular 1321) http://pubs.usgs.gov/circ/1321/pdf/circ1321.pdf

Tree and Boulder Hauling

- Apply mitigation and best management practices for dust abatement (water, lignosulfonate, Calcium and Magnesium Chlorides) dry conditions, and erosion control as directed by physical scientist or road engineer (See Road Maintenance project design criteria #6 for application).
    - ♦ Haul on gravel and native-surface roads will be limited to dry conditions.

Haul Restrictions to Prevent Fine Sediment Delivery to Streams

Haul or maintenance is permitted on roads under the following conditions:

- During haul, weather conditions are monitored daily for the chance of precipitation by the Hydrologist or Fish Biologist.
- No rutting of the road surface is occurring, indicating the subsurface is wet.
- Frozen ground conditions.
- Haul will cease at any time when the travelway of the road is wet and turbid water or fines are observed moving off the road surface to ditchlines that deliver to stream channels regardless of time of year.

Roads Exempt from Haul Restrictions include (Do to no mechanism for sediment delivery):

- Paved roads
- Surfaced Ridge top roads
- Surfaced outsloped roads with no ditch or stream crossings

Prescribed Burning and Related Activities

- Mechanical piling and burning of large piles will be restricted to existing roads and landings.
- Include all relevant PDC in Silviculture prescriptions and burn plan objectives for all fuel treatment activities within RHCA's.
- Use all available fuel treatments and preparation activities as necessary (e.g. multiple entries, slash pull-back; modified ignition methods, locations, timing, and sequence; thinning of small green trees; pruning of green trees and snags, prescribed fire, fire suppression, jack pot burning, etc.) to achieve the specific project design criteria. Suppression should be used only as a last resort to achieve other project design criteria.

For perennial and fish-bearing stream channels:

- Avoid removing trees along stream banks (e.g. don't cause bank instability or increase erosion)
- Within 100' of the stream channel backing fire is preferred.
- Within primary shade zone retain 100% of the over-story canopy closure with the exception of hardwood treatment.

For intermittent, non-fish-bearing stream channels:

- Within 50' of the stream channel backing fire is preferred.

For the maintenance and use of water sources and draft sites:

- Minimize disturbance of existing riparian vegetation to the greatest extent practical; in particular, maintain shade, bank stability, and large woody material recruitment potential.
- Use sediment control measures such as straw bales, filter cloth, or sediment fences when conditions warrant.
- Maximize maintenance activities during late summer and early fall to best avoid wet conditions.
- Do not pump from streams that do not have continuous surface flow. When pumping water in all situations from streams, ensure that at least one-half of the original streamflow remains below the pump site.
- Refuel power equipment, or use absorbent pads for immobile equipment, and prepare concrete at least 150 feet (or as far as possible from the water body where local site

conditions do not allow a 150 foot setback) from water bodies to prevent direct delivery of contaminants into associated water bodies.
- Fisheries, hydrology or other qualified personnel must work with engineering/fire personnel to review proposed activities to minimize potential effects to fish, stream channel conditions, and water quality.
- Use and develop off-channel ponds outside of stream channels were feasible and appropriate. Work with fire folks to prioritize and decommission unnecessary in-stream drafting sites.
- Water withdrawal equipment must have a fish screen installed, operated and maintained in accordance to NOAA Fisheries guidelines.

Wildlife

Threatened, Endangered or Sensitive Species

- If wolves become established (denning) while project implementation is occurring, measures will be taken to avoid activity in that vicinity
- If any evidence of wolverines is discovered during project implementation, measures will be taken to provide protection. If a den is found we would protect it from human disturbance.

Raptors

- No activities will occur within currently known goshawk or other raptor nest stands. To conserve nesting habitat and to minimize disturbance to nesting individuals, restrictions would be executed according to the requirements of the species involved.
- With all newly discovered raptor nests, a buffer zone would be established by the wildlife biologist to restrict activities near the nest area during occupancy.
- Where possible, retain trees with inactive nests that may be important to secondary nesters (e.g. Great Gray Owl).
- Any snags in riparian areas or uplands will be protected from disturbance, removal, or use in stream restoration activities unless deemed a safety hazard at a specific work site.
- Big Game
- Within big game winter range a wildlife biologist will be consulted between December 1 and April 1 to determine if activities should be restricted for big game needs.

Botany

Note: Pre-implementation planning project design criteria are identified.

Rare and Sensitive Plants and Habitats

- ***Pre-Implementation:*** Proposed restoration projects shall be completely surveyed early in the implementation planning process by a qualified botanist or rare plant technician, to identify and assess any sensitive or rare plant populations or habitats.
- ***Pre-Implementation:*** Proposed restoration projects shall develop restoration plans for degraded sensitive species habitats and/or mitigation plans in areas where sensitive plant populations are documented. This shall be accomplished by a journey-level Forest Service botanist in collaboration with the interdisciplinary team and other stakeholders.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, recreation sites, prescribed fires, fire lines, and other operational activities shall not be allowed in any documented sensitive plant sites unless it is for the demonstrated benefit or protection of the site. All sensitive plant populations should be

buffered 100 ft. from all operational activities where topography does not restrict such a distance. Sensitive plant sites and associated buffers shall be identified as Areas to Protect.

Sensitive and Unique Habitats

- The integrity of unique habitats shall be maintained. Unique habitats [may] include meadows, rimrock, talus slopes, cliffs, animal dens, wallows, bogs [fens], seeps and springs. This shall be accomplished by incorporating cover buffers approximately 100 feet in width.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, recreation sites, prescribed fires, fire lines, and other operational activities shall not occur within, or at the interface of lithosols (scablands).
- Cutting of old-growth juniper shall be prohibited. Old-growth characteristics include: sparse limbs, dead limbed or spiked-tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of cambium layer at base of tree, and limited terminal leader growth in upper branches.

Groundwater-Dependent Ecosystems

- The integrity of groundwater-dependent ecosystems shall be maintained. Spring developments shall not dewater Groundwater dependent ecosystems. Spring developments shall not be allowed if the spring is occupied by rare or sensitive plant species, or in peatlands, fens, or where histic soils are present. These sites should be buffered 100 ft. from all operational activities where topography does not restrict such a distance, and be identified as Areas to Protect.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, fire lines, and other operational activities shall not be allowed in springs, seeps, or any other groundwater dependent ecosystem, unless it is for the benefit or protection of the groundwater dependent ecosystems or development of the spring.
- Spring developments should not disturb the spring orifice (point where water emerges). Spring head boxes should be placed in a location that will cause the least amount of disturbance to the soils and vegetation of the groundwater dependent ecosystems. Preferable locations for spring head boxes should be in an established channel downstream from the orifice or a location where flowing water becomes subsurface.
- When necessary, construct fenced exclosures around spring developments to prevent damage from wild ungulates and livestock.
- Spring developments shall have a return flow system to minimize the diversion of surface and subsurface water from the catchment area. Consider using a float valve or similar device to reduce the amount of water withdrawn from the groundwater dependent ecosystems.
- When developing springs, place troughs far enough away from Groundwater dependent ecosystems, wetlands, and other sensitive or unique habitats to prevent erosion, compaction, or degradation to sensitive soils and vegetation due to livestock congregation.

Invasive Plant Species

- ***Pre-Implementation:*** Proposed restoration projects shall be surveyed for invasive plants early in the implementation planning process by a qualified invasive plant specialist /technician, to identify and assess any undocumented invasive plant infestation.
- ***Pre-Implementation:*** For project areas that overlap or are adjacent to invasive plant infestations, assure that there is sufficient time prior to develop a long-term site strategy for control, eradication, and revegetation of the site. This shall be accomplished by a qualified invasive plant specialist in collaboration with the interdisciplinary team and other stakeholders.

- All activities shall be conducted in a manner as to minimize or prevent the potential spread or establishment of invasive species.
- Actions conducted on National Forest System Lands that will operate outside the limits of the road prism, require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering the National Forest. Cleaning will be inspected and approved by the forest officer in charge of administering the project.
- Assure that all materials are weed-free. Use weed-free straw and mulch for all projects conducted or authorized by the Forest Service on National Forest System Lands. If State certified straw and/or mulch is not available, individual Forests should require sources certified to be weed-free using the North American Weed Free Forage Program standards or a similar certification process.
- Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and/or rock that are judged to be weed free by District or Forest weed specialists.
- Prohibit heavy equipment operation, vehicle travel, staging areas, fire-control lines, and any other operational activities in invasive plant infestations, unless the activities are for the express purpose of eradicating the infestation or INV1 and INV2 have been completed.
- Conduct post-implementation monitoring for invasive plants. Continue monitoring, treating, and removing invasive plants until all infestations are eradicated and native plant species are well established.

Native Plant Materials and Revegetation

- ***Pre-Implementation:*** Where the need for native plant materials is anticipated, assure that there is sufficient time for the plant materials specialist to develop a native plant materials plan and/or prescription prior to implementation of planned revegetation, rehabilitation, and restoration projects. This may include allowing for enough time to harvest and store hardwood cuttings, produce suitable quantities of native seed, and/or grow-out container stock.
- Locally adapted, genetically appropriate native plant materials are the first choice for use in revegetation, restoration and rehabilitation, where timely natural regeneration of the native plant community is not likely to occur. Use a diverse assemblage of species that have the potential to naturally occur in the project area. Acquire native seed or plant sources as close to the watershed as possible. Examples of areas that may need treatment include: habitat restoration efforts, log decks, staging areas, landing zones, temporary roads, slash piles, culvert replacements, severely burned areas, skid trails, decommissioned roads, invasive species treatments, and other disturbances.
- Non-native, non-invasive plant species may be used in the following situations: (1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality, and to help prevent the establishment of invasive species), (2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, (3) if native plant materials are not available and/or are not economically feasible, and (4) in permanently altered plant communities.
- Under no circumstances shall non-native invasive plant species and/or noxious weeds be used for revegetation.
- Development, review and/or approval of revegetation, rehabilitation, and restoration prescriptions, including species selection, genetic heritage, growth stage, seed mixes, sowing guidelines, and any needed site preparation, shall be accomplished by a plant materials specialist who is knowledgeable and trained or certified in the plant community type where the revegetation will occur.

- Concentrate plantings above the bank-full elevation. Sedge and rush mats should be placed and sized to prevent their movement during high flow events.
- Newly planted and/or seeded areas should be protected from animals and activities that may prevent, retard, or slow the establishment and recovery of native vegetation. Site-specific measures may include building fences, piling slash, jackstrawing, closing areas to vehicles, and/or temporarily changing grazing regimes until the desired condition is sufficiently achieved.

Soils

- For projects involving heavy machinery off roads, the project proponents shall inspect the site for existing impacts to the soil. If existing impacts appear to be heavy on the Malheur or moderate on the Ochoco, they shall contact a soil scientist, who shall determine what site specific project design criteria are necessary to meet Forest Plan and Forest Service Manual standards and guidelines. (If a soil scientist is not available, a silviculturist or hydrologist can do the work.) If standards and guidelines cannot be met, heavy machinery shall not be used.
- Erosion would be minimized by following General Aquatic Conservation Measures and by implementing the appropriate project design criteria based on the type of activity (see appendix A).
- Erosion from heavy machinery use would be minimized; by minimizing compaction and puddling, rutting would be minimized.
- For Livestock Stream Crossings and Off-Channel Watering Facilities, out-of-channel erosion would be minimized.
- For Road Erosion Control, erosion would be minimized.
- For Juniper Removal, erosion would be minimized. It is possible that Juniper Removal would increase ground cover within a few years, and thereby reduce erosion.
- Prescribed Fire (including for disposal of slash after Juniper removal) can involve only low and moderate severity fire, and erosion from fire lines would be minimized, so erosion from prescribed fire would not be significant.

Fire and Fuels

- Mechanical tools may be necessary to prepare fire control lines for these burns, but would be limited, and typically no heavy equipment would be used. Prescribed burns or wildfires could temporarily affect air quality.
- The project design criteria for both Juniper Removal and Riparian Vegetation Treatment (controlled burning) would be followed. National, state, and local policies regarding prescribed fire implementation will be met.
- Activities that are expected to create smoke emissions would follow the State of Oregon Smoke Management Plan. Prior to burning, approval will be obtained from the Oregon Department of Forestry, who determines compliance with the Clean Air Act. State smoke forecasts, which predict wind direction and smoke mixing height, will be obtained prior to all burning to ensure smoke intrusions will not occur in the local smoke sensitive receptor areas.
- Burning will follow the guidance provided by the Oregon Smoke Management Plan (Directive 1-4-1-601, Operational Guidance for the Oregon Smoke Management Program), which is an agreement between federal land management agencies in northeast Oregon and Oregon Department of Forestry limiting smoke emission amounts. Oregon Department of Forestry monitors activity, and if a limit is reached it will shut down prescribed fire activity.

Heritage Resources

- Compliance with Section 106 of the National Historic Preservation Act for activities authorized under this analysis will be completed and concurred with by the Oregon State Historic Preservation Office before any ground disturbing action takes place. For each potential activity the District or Zone archaeologist will determine which of the criteria in the 2004 Programmatic Agreement with the Oregon State Historic Preservation Office best fit the particular project. This will vary somewhat project to project based on the scale of the particular activity, the location on the landscape, and the nature of associated cultural resources, if any.
- The District or Zone archaeologist will document their findings on a Programmatic Agreement form with a project description, rationale and location map which will be attached to the Forest Service Heritage Event database. The Forest archaeologist will review and sign off on the Programmatic Review form if concurred with. For appendices A, B and C projects as defined in the 2004 Programmatic Agreement, the Forest will retain the documentation and provide the Oregon State Historic Preservation Office with the annual summary of projects as described in the Preservation Act.
- For full inventories the District or Zone archaeologist will complete an inventory report meeting current Oregon State Historic Preservation Office standards which will be reviewed by the Forest archaeologist. The Forest archaeologist will forward the completed inventory report to the Oregon State Historic Preservation Office for review and concurrence signature or further discussion as appropriate.
- Consultation with Native American tribes is conducted under the terms of the Memorandums of Understanding the Forest has with each individual tribe. The Forest regularly consults with the Burns Paiute Tribe, the Confederated Tribes of the Umatilla Indian Reservation and the Confederated Tribes of Warm Springs Reservation.
- For work requiring a full inventory under the terms of the 2004 Programmatic Agreement any identified cultural resources sites will generally be avoided. For cases where site avoidance is impractical mitigation procedures will be developed in consultation with the Oregon SHPO before project work begins.
- If any previously unidentified cultural resources are located during project implementation, ground disturbing work will be halted until the resources are evaluated by the District or Zone archaeologist. If the cultural resources are determined to be potentially eligible for listing on the National Register of Historic Places work will either be permanently halted or a mitigation plan will be developed in consultation with the Oregon SHPO before work continues.

Recreation

- Motorized aquatic restoration methods would not be used within Wilderness, Wild portions of Wild and Scenic Rivers, and Inventoried Roadless Areas.
- Mechanized aquatic restoration methods would not be used within Wilderness or Wild portions of Wild and Scenic Rivers.

Grazing

General

- Range and Fire Specialists and permittees would coordinate activities including scheduling of burning activities in grazing units.
- Utilize the Forest Post-Fire Interim Grazing Guidelines to aid in determining when to resume grazing activities.

- Whenever possible, units to be rested would be burned in the spring of the year to be rested or in the fall prior to the rest year.
- If a rest period is required following a burn the permittee has the option to exclude cattle grazing from those portions of a pasture that were burned through the use of fencing and could continue to graze the unburned areas of a unit.

Protection of Government and Permittee Investments

- All existing structural range improvements (fences, gates, spring developments, etc) and permanent ecological plots would be contractually protected.
- Maintain structural integrity of range improvements.
- If structural improvements are damaged during project operations they would be repaired to Forest Service standards prior to livestock scheduled use by the party responsible for causing the damage. Repairs would be required of the purchaser if damage were done during thinning or fuel treatment contractors or by force account where appropriate.
- Three or more splices to a single wire within a distance of 20 feet will be replaced with a single splice.
- Fence right of ways (6ft either side of fence), trails, other developments and access to them would be cleared of slash produced by project activities.

Aspen Restoration

- New aspen exclosure fences would have gates installed in proper locations to allow for removal of stray livestock. Aspen fences would be maintained each year and repaired whenever necessary. Plans for aspen exclosures will define when restoration of the protected stand has been achieved and who has responsibility for maintenance of the structure. When fences are no longer needed, aspen fences should be removed.
- Alternate livestock water sources to those being used in aspen stands would be developed off-site before fencing aspen or re-evaluate fencing of the aspen site. Coordinate with range specialist and permittee.

Notification

- During planning stage of each individual project all potentially impacted grazing permittees will have notice of action and opportunity to provide input that may lessen impacts to their livestock operation well in advance of implementation.
- Prior to implementation all potentially impacted grazing permittees will be given notice of dates when work will start.

Appendix B – Examples

Implementation Checklist - Examples

Example - Forest Aquatic Restoration Project
NEPA Compliance and Implementation Checklist (Blank)

Project #	Project Name	District	Contact	CFLRP Area / Part of the 10 year stewardship contract? (Y/N)	Land Mgt. Area	Sixth Field Watershed Number, Stream Name and County	Latitude/ Longitude	Timing (Start and End dates xx/xx/xxxx)	Primary Activity Category Type	Project Description	Miles Treated or Acres Treated
1											
2											
3											
4											
5											

Completed Example:
Forest Aquatic Restoration Project
NEPA Compliance and Implementation Checklist

Project #	Project Name	District	Contact	CFLRP Area / Part of the 10 year stewardship contract? (Y/N)	Land Mgt. Area	Sixth Field Watershed Number, Stream Name and County	Latitude/ Longitude	Timing (Start and End dates)	Primary Activity Category Type	Project Description	Miles Treated or Acres Treated
1	West Fork Lick Culvert Replacement	BMRD	Holly Bentz, hbentz@fs.fed.us, 541-575-3012	N / N	3B	170702030207, West Fork Lick Ck, Grant	N44.6236 W-118.7878	7/15/2010-8/15/2010	(1) Fish Passage	Replaced existing 8 ft. bottomless arch with a 12 ft. bottomless arch, removed log weir immediately downstream which had a 30" perch.	2.8 miles
2	Cougar Creek Culvert Replacement	BMRD	Holly Bentz, hbentz@fs.fed.us, 541-575-3012	N / N	3B	170702030206, Cougar Ck, Grant	N44.6239 W-118.8381	7/15/2010-8/15/2010	(1) Fish Passage	Remove existing 8 ft. pipe arch and associated log weir and replace with a 12 ft. span bottomless arch.	2.4 miles
3	Camp Creek Log Weir Removal Project (Phase 2)	BMRD	Allen Taylor, allentaylor@fs.fed.us, (541) 575-3394	N / N	3B	170702030206, Lick Creek, 170702030207, Camp Creek, 170702030205, Camp Creek, Grant County	Lick Cr R1/Camp Cr R4 Start N44.663 W118.810, Lick Cr R1 End N44.636 W118.785, Camp Cr R5 End N44.619	7/15/2011-	3	Camp Creek Log Weir Removal Project (Phase 2)	BMRD

Project #	Project Name	District	Contact	CFLRP Area / Part of the 10 year stewardship contract? (Y/N)	Land Mgt. Area	Sixth Field Watershed Number, Stream Name and County	Latitude/ Longitude	Timing (Start and End dates)	Primary Activity Category Type	Project Description	Miles Treated or Acres Treated
							W118.864				
4	Lower Camp Creek Exclosure Fence 2011	BMRD	Kelly Ware, kware@fs.fed.us, (541)-575-3432,	4	Lower Camp Creek Exclosure Fence 2011	BMRD	Kelly Ware, kware@fs.fed.us, (541)-575-3432,	4	Lower Camp Creek Exclosure Fence 2011	BMRD	Kelly Ware, kware@fs.fed.us, (541)-575-3432,
5	Lower Camp Creek Riparian Planting	BMRD	Allen Taylor, allentaylor@fs.fed.us, (541) 575-3394	N /N	3B	170702030208 Lower Camp Creek,	5	Lower Camp Creek Riparian Planting	BMRD	Allen Taylor, allentaylor@fs.fed.us, (541) 575-3394	N /N

Specific Resource Project Design Criteria for Resource Protection and Forest Plan Compliance.

Project Number: 5 (Lower Camp Creek Riparian Planting) **Date: 4/1/2011**

Heritage

☒ - Specific PDC for Heritage addressed (Heritage Surveys; Avoidance areas).

Botany

☒ - Specific PDC for Botany addressed (Sensitive Plant Surveys).

☒ - Specific PDC for Nox. Weeds addressed.

Land Management Consistency

☐4A	Big Game Winter range	☒9	Research Natural Areas
☒6A and 6B	Wilderness	☒10	Semi-Primitive Non-Motorized Recreation Areas
☒7	Scenic Area	☒22	Wild and Scenic River
☒8	Special Interest Areas	☒	Inventoried Roadless Areas

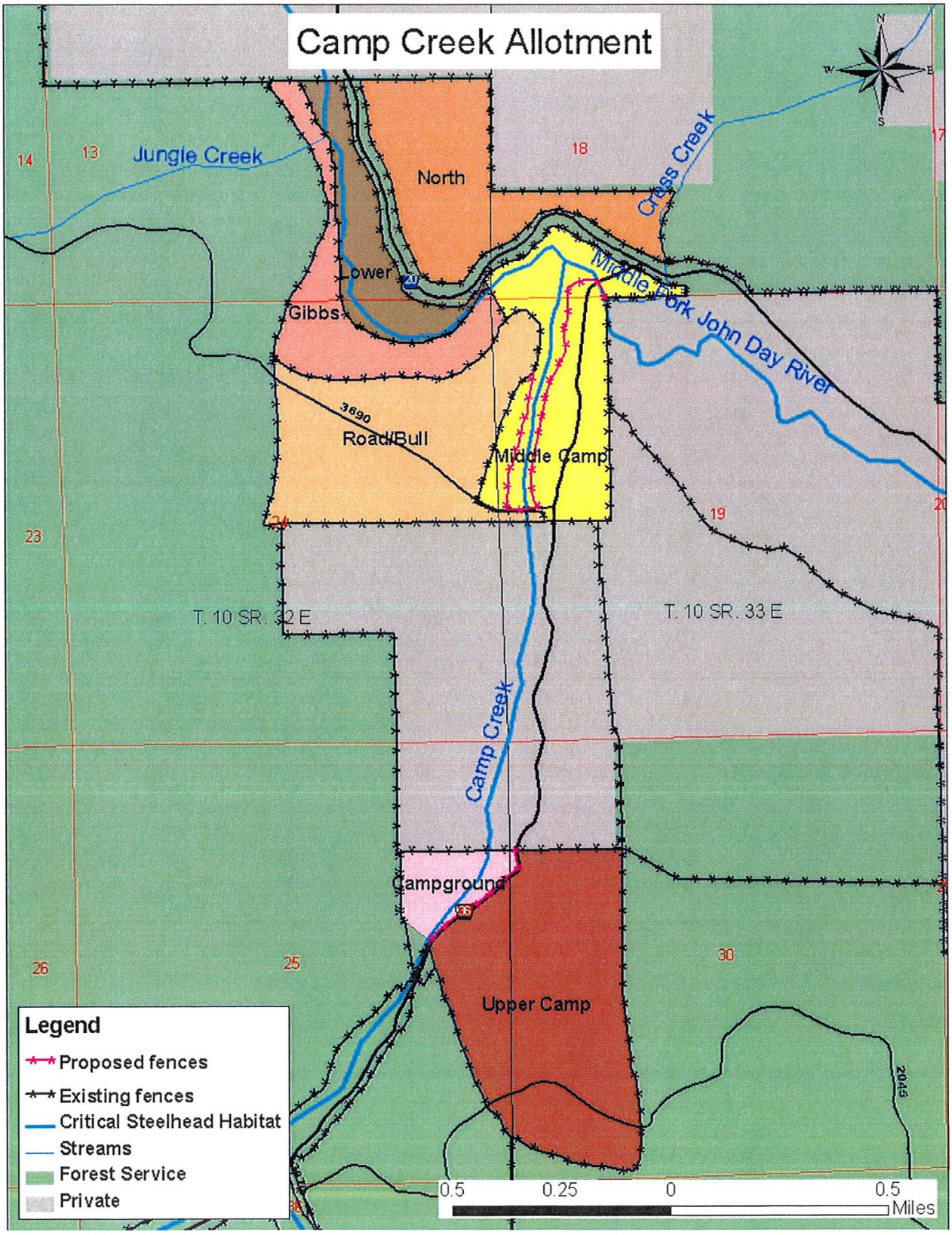
Comments: Project was reviewed and is consistent with the goals, objectives and standards and guidelines of the Malheur NF Land and Resource Management Plan. The project does not fall within any of the above checked land management areas. The project does occur within Big Game winter range but will be implemented outside of the seasonal restrictions.

Table 2. Projects Design Criteria and Forest Plan compliance checklist.

I have reviewed this project and have determined it is within the Project Design Criteria identified for my resource.			
Resource	Signature	Date	Comments
Heritage	/s/ Don Hann	(4/1/2011)	Site was reviewed on 3/9/2011, Heritage clearance has occurred, there are no avoidance areas within the project area.
Botany	/s/ Joe Rausch	(4/1/2011)	Botany surveys occurred on 3/12/2011, no sensitive plans were documented within the project area. Native plants were collected within the project eco-zone and propagated at Clarno nursery in 2009. native material is being utilized within the project. Project is consistent with Noxious weeds PDC's.
Wildlife	/s/ Clark Reams	(4/1/2011)	No concerns, outside the raptor breeding season and does not impact winter range.
Fish*	/s/ Steve Namitz	(4/1/2011)	Project is consistent with Aquatic Objectives and is consistent with ARBO II PDC's.
Hydrology*	/s/ Tom Friedrichsen	(4/1/2011)	Project is consistent with meeting Water Quality objectives, and is expected to restore hydrologic functions and watershed/riparian processes.
Range	/s/ Ernie Gipson	(4/1/2011)	No comments
Soils	/s/ Hersh McNeil	(4/1/2011)	No Comments
Recreation	/s/ Rob St. John	(4/1/2011)	No Comments
Lands and Special Uses	/s/ Stacia Kimbell	(4/1/2011)	Project does not impact lands and special uses.
Engineering	/s/ Holly Bentz	(4/1/2011)	No Comments
Fuels / Fire	/s/ Dana Skelly	(4/1/2011)	No Comments
Silviculture	/s/ Larry Amell	(4/1/2011)	No Comments

* Ensure that an experienced fisheries biologist or hydrologist is involved in the design of all projects covered by Aquatic Restoration Biological Opinion II. The experience should be commensurate with technical requirements of a project.

Line Officer Signature: */s/ John Gubel; District Ranger BMRD* Date: 4/1/2011


Camp Creek Allotment
N
W
E
S
Jungle Creek
Cress Creek
North
Lower
Gibbs
Middle Fork John Day River
3690
Road/Bull
Middle Camp
T. 10 SR. 32 E
T. 10 SR. 33 E
Camp Creek
Campground
Upper Camp
2045
13
14
18
19
23
25
26
30
Legend
Proposed fences
Existing fences
Critical Steelhead Habitat
Streams
Forest Service
Private
0.5
0.25
0
0.5
Miles

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