Implementation Description

Blue Mountain Ranger District Fish Passage Restoration 2019

Table 1. Project information

Category: 1 – Fish passage restoration; 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 and legacy structure removal (log weirs); 6 – Streambank restoration; 14 – Riparian vegetation planting	Lead Preparer: Dan Armichardy and Rosalinda Gonzalez
Applicant: Blue Mountain Aquatics	NEPA Reference: DN For Aquatic Restoration EA website*
Location: See Table 2	Lease/ /Case File/ Serial #: N/A (Reference #): N/A
Begin Date: 01/15/2019	Due Date: 05/15/2019

*Please see http://www.fs.usda.gov/detailfull/malheur/landmanagement/?cid=STELPRD3817723&width=full

Purpose and Need

The purpose for replacing the 10 culverts identified in this checklist (Table 2, Figure 1) is to restore threatened juvenile Middle Columbia River steelhead access to essential rearing habitat. As well as restore access to essential habitat for threatened bull trout on Deadwood Creek. Additional access would be provided for regionally sensitive species westslope cutthroat trout habitat on East Fork Beech Creek and East Fork Deer Creek.

Currently the culvert on East Fork Beech Creek has been identified as a juvenile fish passage barrier and has legacy structures (log weirs) downstream and upstream of the culvert (Figure 2, Figure 3). Aquatic restoration work completed on East Fork Beech Creek in 2017 downstream of the culvert is anticipated to improve juvenile rearing habitat in proximity of existing adult spawning areas and potentially improve water storage within this area. Providing connectivity for these juvenile steelhead to move is critical for increasing survival within this area. Work at this site would entail removing the log weirs and setting the appropriate grade. Any trees removed as part of the replacement would be utilized onsite. Trees immediately adjacent to the culvert replacement area and within the riparian habitat conservation area may be tipped and utilized as part of grade reconstruction for new culvert. Existing boulders onsite would also be utilized. Existing riparian hardwoods would be salvaged and utilized on site for planting.

The purpose of the Tinker Creek culvert replacement is to provide adult and juvenile Middle Columbia River steelhead passage during high flows. Currently the culvert is undersized and during high flows likely becomes a velocity barrier (Figure 5). The culvert is also misaligned with the valley floor (Figure 6) and this has altered sediment transport processes downstream. It is anticipated that aquatic restoration work completed on East Fork Beech Creek downstream from the confluence of Tinker Creek would capture any bedload movement facilitating reconnection of abandoned floodplains within these areas and depositing spawning gravels. Overall, within East Fork Beech Creek and its tributaries there is a need to improve Middle Columbia River steelhead juvenile rearing habitat along with connectivity to late summer rearing habitat. Additionally, there is an overall need to improve water storage and bedload deposition/conveyance across the watershed. Work at this site would entail removing a large amount of

fill and the blacktop. A log weir would be removed below the culvert out flow. Lodgepole pine adjacent to the site within the riparian habitat conservation area would be tipped and utilized to reestablish the appropriate grade. Additional aquatic restoration work is scheduled from the culvert replacement site 1.5 miles upstream and includes wood placement, legacy structure removal (concrete gauging station dam), and legacy road fill berm removal and culvert (decommissioned road).

The culvert on Cottonwood Creek with a log weir located just downstream of the culvert (Figure 7, Figure 8) is a concern for juvenile and adult steelhead and redband trout. The channel has been manipulated in the past and the current channel has a berm at what appears to be an old road crossing (Figure 10). The berm is composed of large substrate similar to what is in the channel in this area (Figure 9). This may be due to stream substrate previously being used to create the berm or the substrate being a part of a crossing that may have been in place. Upstream of the berm area the stream gradient changes more gradually and the channel is more complex with instream large wood (Figure 12). The berm is also located where two braids of the stream join and the berm may have been placed to slow stream power that increases when the forked channels came back together (Figure 11). Large wood will be added to 1 mile of this stream to assist with habitat complexity and enhance fish restoration. Wood will also help create connectivity between then the stream and its floodplain. Work entails wood placement for 1 mile of stream up from its confluence with Camp Creek. The confluence of Cottonwood Creek has been modified from past logging and would be graded and log weir removed to reduce steepness approaching culvert allowing juvenile fish passage. Streambank restoration would occur from the culvert replacement site down to the confluence with Camp Creek.

Three culverts are proposed for removal on Summit Creek. The culvert on National Forest System Road 1940 is a fish passage barrier the culvert is perched (Figure 14). Perched culverts can trap juvenile fish downstream of culverts. The perched culvert is also a potential adult passage barrier due to the lack of a deep pool downstream of the culvert. A legacy berm is located approximately 150 feet upstream of the culvert which acts as a pond capturing most of summit creek. Work would entail removal of this berm and placement of wood (lodgepole pine) as well as removal of a log weir 120 feet downstream from the culvert.

The culvert on Summit Creek at National Forest System Road 1940281 is not aligned with the channel and has been identified as a fish passage barrier (Figure 15, Figure 16). Work entails modification of large boulders placed upstream to protect the existing culvert and removal of a legacy berm 160 feet below the culvert that spans 90 percent of the valley. Trees (lodgepole pine) located within the project footprint 300 feet upstream and downstream would be utilized for grade and streambank stabilization.

The culvert on Summit Creek at National Forest System Road 2622 is undersized and negatively effecting sediment transport and stream channel energy dissipation. Undersized culverts concentrating high flows through the culvert can cause down cutting of the channel.

Two culverts are proposed for removal on Idaho Creek. Both culverts are identified as fish passage barriers. The culvert on National Forest System Road 2622 would entail removal of three legacy berms that block three stream channels and a log weir downstream from the culvert work site. The culvert on National Forest System Road 2622172 has a log weir that may also be removed at the time of culvert work downstream and a legacy berm above that would be modified (Figure 21).

The culvert on Deadwood Creek is perched and a barrier to steelhead and bull trout passage (Figure 23, Figure 24). Deadwood Creek has been impacted by mining in this area. Downstream of this culvert stream restoration has been implemented that is anticipated to improve juvenile rearing habitat in proximity of existing adult spawning areas.

The East Fork Deer Creek culvert has also been identified as a juvenile and adult fish passage barrier. The culvert is perched and has a double log weir at the outlet (Figure 25). The influence of the culvert upstream has caused a less than 1 percent slope and altered the channel from a B to more of an E Rosgen channel. Engineers designing the new aquatic organism passage culvert are looking at a longitudinal profile of the stream to find a place to tie in the slope up and downstream of the culvert. Out of the influence of the stream the channel up and downstream appears to be a Rosgen B channel. During the field trip with the engineers designing the new culvert it was mentioned that we would like to retain access to the stream for fire to draft water if needed in this area.

These 10 culverts do not meet the current guidance for properly designed stream crossings; these culverts are barriers to fish passage and/or are unable to dissipate excess stream energy. The desired condition is to replace these culverts with structures of a proper size and alignment to increase natural movement of fish, bed load, and wood and decrease the need for road maintenance. The desired condition is a state that would provide ecological resiliency in the face of a changing climate. Replacing these culverts would primarily benefit threatened juvenile Middle Columbia River steelhead, stream channel function, and increase aquatic habitat connectivity. By allowing high flows and material to pass through these crossings, the integrity of both the stream channel and the road would be protected.

Land Use Plan Conformance

The project falls under Management Area 3B “Anadromous Riparian Areas” of the Malheur National Forest Land and Resource Management Plan (Malheur Forest Plan). The goal of Management Area 3B is to “Manage riparian areas to protect and enhance their value for wildlife, anadromous fish habitat and water quality… Design and conduct management in all riparian areas to maintain or improve water quality and beneficial uses” (USDA Forest Service 1990). The project is consistent with Management Area 3B standards to maintain roads to protect fisheries values and riparian habitat, maintain fish passage on fish-bearing streams, provide the necessary habitat to maintain or increase populations of management indicator species, implement riparian habitat improvement activities to upgrade riparian areas that are not in a condition to meet management objectives, enhance fish habitat through instream or riparian improvements, and provide for input of large woody debris into all classes of streams (USDA Forest Service 1990, Management Area 3B standards 5, 9, 11, 12, 42, and 46, pages IV-63 and IV-67).

Project areas on Cottonwood Creek, Deadwood Creek, East Fork Beech Creek, Idaho Creek, Summit Creek and Tinker Creek are within a category 1 riparian habitat conservation area (fish-bearing stream) as designated by PACFISH/INFISH, and contain designated critical habitat for Middle Columbia River steelhead by the National Marine Fisheries Service. The project is consistent with standard RF-5 by providing fish passage at road crossings of existing fish-bearing streams (USDA Forest Service 1995, page C-12).

Proposed Action and Implementation Plan

All culvert have or will have designs completed by January 2019. Thus, culverts can start being replaced as soon as 2019. At least 2 culverts will be built each summer until all 10 culverts are replaced (meaning that implementation may take up to 5 years). In-channel work would occur during the in-stream work window from July 15 to August 31 each year. Fish will be salvaged from the area prior to aquatic organism passage work. Minor changes in road elevation or alignment near the crossings would also be necessary.

Legacy structures including log weirs and berms may be partially or fully removed during culvert and restoration work. Large wood will be placed along 1 mile of Cottonwood Creek as described above. There is a potential for hardwood planting at all culvert replacement sites.

Table 2. Location of culverts and proposed work

Stream name	National Forest System Road	Decimal degrees	Location	Fish species present
East Fork Beech Creek	3600052	-118.932, 44.513	T12S, R31E, sec. 12 Quad: Magone Lake	Middle Columbia River steelhead, redband trout, westslope cutthroat trout
Tinker Creek	3620000	-118.896, 44.55	T12S, R32E, sec. 5 Quad: Magone Lake	Middle Columbia River steelhead, redband trout
Cottonwood Creek	3600000	-118.828, 44.653	T10S, R23E, sec. 35 Quad: Susanville	Middle Columbia River steelhead, redband trout
Summit Creek	2622000	-118.397, 44.58	T11S, R35½E, sec. 27 Quad: Austin	Middle Columbia River steelhead, redband trout
Summit Creek	1940000	-118.368, 44.576	T11S, R36E, sec. 36 Quad: Pogue Point	Middle Columbia River steelhead, redband trout
Summit Creek	1940281	-118.36, 44.582	T11S, R35½E, sec. 25 Quad: Pogue Point	Middle Columbia River steelhead, redband trout
Idaho Creek	2622000	-118.401, 44.583	T11S, R35½E, sec. 27 Quad: Austin	Middle Columbia River steelhead, redband trout
Idaho Creek	2622172	-118.388, 44.595	T11S, R35½E, sec. 23 Quad: Austin	Middle Columbia River steelhead, redband trout
Deadwood Creek	4560000	-118.77, 44.767	T9S, R33E, sec. 20 Quad: Sharp Ridge	Middle Columbia River steelhead, redband trout, Columbia River bull trout
East Fork Deer Creek	4020000	-118.281, 44.714	T10S, R29E, sec. 7 Quad: Hamilton	Middle Columbia River steelhead, redband trout, westslope cutthroat trout

Figures

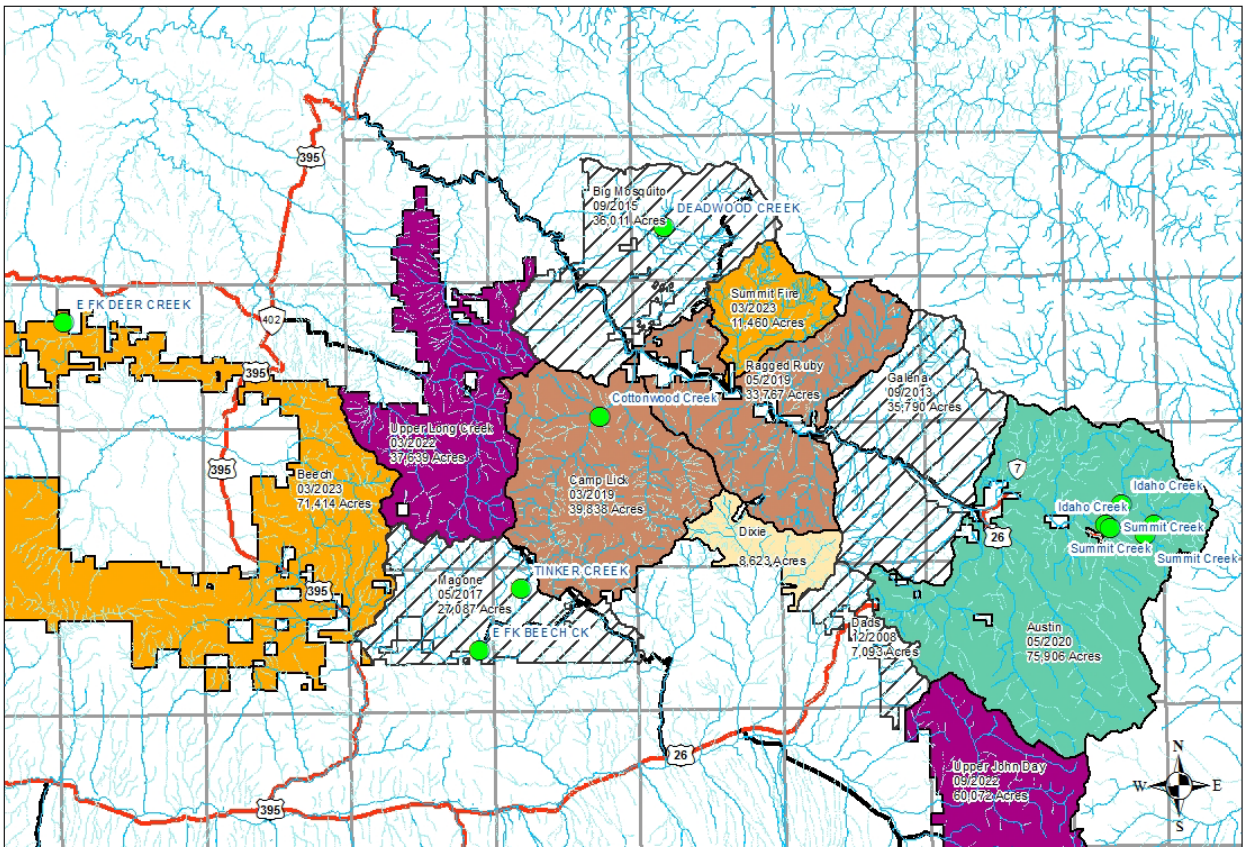

Figure 1. Culverts proposed for replacement (green dots)

Figure 2. National Forest System Road 3600052 East Fork Beech Creek culvert inlet and upstream of the inlet

Figure 3. National Forest System Road 3600052 East Fork Beech Creek culvert outlet and downstream of outlet

Figure 4. National Forest System Road 3620 that culvert will be replaced on

Figure 5. Existing Tinker Creek culvert outlet, perched and undersized

Figure 6. Existing Tinker Creek culvert inlet, alignment and culvert size

Figure 7. National Forest System Road 36 culvert on Cottonwood Creek (left photo: inlet, right photo: outlet)

Figure 8. National Forest System Road 36 log weir in downstream of culvert on Cottonwood Creek (right photo: taken 5/17/2016)

Figure 9. Berm next to Cottonwood Creek, approximately 0.3 miles upstream of existing culvert

Figure 10. Remnants of old road or skid trail which ends at the berm across stream depicted above

Figure 11. Cottonwood Creek just upstream of what looks like an old road crossing and berm. The stream is forked here. The berm is located where the stream comes back to one channel and thus where stream power is increased.

Figure 12. Cottonwood Creek further upstream of berm the existing channel has large wood and debris jams

Summit Creek / National Forest System Road 1940 Culvert Replacement

Figure 13. National Forest System Road 1940 culvert on Summit Creek (culvert inlet and the road the culvert is on)

Figure 14. National Forest System Road 1940 culvert outlet on Summit Creek

Figure 15. National Forest System Road 1940281 culvert on Summit Creek and general creek area

Figure 16. National Forest System Road 1940281 Culvert on Summit Creek

Summit Creek / National Forest System Road 2622 Culvert Replacement

Figure 17. National Forest System Road 2622 culvert on Summit Creek

Figure 18. National Forest System Road 2622 culvert on Summit Creek and a view of the road

Idaho Creek / National Forest System Road 2622 Culvert Replacement

Figure 19. National Forest System Road 2622 culvert on Idaho Creek


Figure 20. National Forest System Road 2622 in the area where the culvert would be replaced and Idaho Creek

Idaho Creek / National Forest System Road 2622172 Culvert Replacement


Figure 21. National Forest System Road 2622172 culvert on Idaho Creek and log weir downstream in channel near culvert



Figure 22. National Forest System Road 262172 culvert on Idaho Creek and road that culvert is being replaced on

Figure 23. National Forest System Road 4560 culvert on Deadwood Creek (culvert inlet and standing above culvert looking upstream)

Figure 24. National Forest System Road 4560 culvert on Deadwood Creek (outlet)

Figure 25. East Fork Deer Creek National Forest System Road 4020 culvert outlet and downstream of the outlet farther from the influence of the culvert

Figure 26. East Fork Deer Creek National Forest System Road 4020 culvert Inlet and directly upstream of the inlet (gradient change upstream and downstream of culvert is evident)

Figure 27. East Fork Deer Creek (left photo: farther upstream of culvert, right photo: farther downstream of weir)

Figure 28. National Forest System Road 4020 that crosses East Fork Deer Creek

Figure 29. Example of what aquatic organism passage culvert construction can look like (footer placement on Big Creek in 2018)

Appendix to the Aquatic Restoration EA

Implementation Description

Project Title: Blue Mountain Ranger District Fish Passage Restoration 2019

Project Number: 01022019

Category: 1 – Fish passage restoration; 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 and legacy structure removal (log weirs); 6 – Streambank restoration; 14 – Riparian vegetation planting

The following information will guide actions for this project that is taking place within the bounds of the Decision Notice for the 2014 Malheur National Forest Aquatic Restoration Environmental Analysis to maintain that all conservation measures, guidelines, and project design criteria are met under this guiding document.

Much of the information below is reproduced from the Decision Notice for Aquatic Restoration Project Appendix A (pages 7 through 44), and may cite project design criteria numbers, literature, or other documents not referenced further in this proposal document. Please refer to the Decision Notice for more information.

Program Administration

1. Integration of project design criteria and conservation measures and terms and conditions into project design and contract language

a. This document is to outline the conservation measures and project design criteria that will be used during project implementation to remain compliant with the aquatic restoration biological assessment as well as ARBO II.

2. Project notification: The following information will be provided to the National Marine Fisheries Service (NMFS) Level 1 aquatics members 30 days prior to implementation as a Project Notification Form 7.
    a. Action identifier – 01022019
    b. Project name – Blue Mountain Ranger District Fish Passage Restoration 2019
    c. Location – see Figure 1 and Table 1
    d. Agency contact – Dan Armichardy (Fisheries Biologist), darmichardy@fs.fed.us, 541-575-3391
    e. Timing – Work will occur during 2019 to 2024, with in-stream work happening between July 15 and August 15 on Deadwood Creek, Cottonwood Creek, Idaho Creek, and Summit Creek and between July 15 and August 31 on East Fork Beech Creek and Tinker Creek
    f. Activity category – 1 – Fish passage restoration; 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 and legacy structure removal (log weirs); 6 – Streambank restoration; 14 – Riparian vegetation planting
    g. Project description – Project description is available in the Proposed Action and Implementation Plan section above.
        i. Extent – Work will occur within 300 feet upstream and downstream from stream crossings on East Fork Beech Creek at National Forest System Road 3600052; Tinker Creek at National Forest System Road 3620; Deadwood Creek at National Forest System Road 4650; Deer Creek at National Forest System Road 4020; Summit Creek at National Forest System Road 2622, 1940, and 1940281; Idaho Creek at National Forest System Road 2622 and 2622172; and Cottonwood Creek at National Forest System Road 3600 in the Beech Creek, Big Creek, Summit Creek watersheds
    h. Species affected –
        i. Listed species: Middle Columbia River steelhead (all), Columbia River bull trout (Deadwood Creek)
        ii. Critical Habitat: Portions of Middle Columbia River steelhead critical habitat and Columbia River bull trout critical habitat (Deadwood Creek)
        iii. MIS Species: Steelhead, westslope cutthroat trout, and redband trout
    i. Date of submittal – To be completed in Spring of 2019, at least 30 day prior to implementation
    j. Site assessments – Assessment for contaminants is not required at these locations
    k. Review – NMFS fish passage review and Restoration Review Team review are not required
    l. Verification – _____
    m. SOD project notification – _____
3. Minor Variance: No variances are proposed for this project
4. NMFS Fish Passage Review and Approval: This work does not require review by the NFMS level 1 team member
5. Restoration Review Team: This work does not require review by the restoration review team.
6. Project Completion Report: To be completed after implementation
7. Annual Program Report: Reporting will occur throughout implementation of the project, which is expected to take 5 years.

Project-Specific Design Criteria

Lands and special uses recommendations:

- Contact 811 prior to ground disturbing activities and/or excavations.
- Provide advanced notification to Oregon Trail Electric Co-op (OTEC) and Oregon Telephone Corporation (OTC) on road closures/delays for Summit Creek National Forest System Road 1940, Summit Creek National Forest System Road 2622, and Idaho Creek National Forest System Road 2622.
- Provide annual advanced courtesy notification to Grant County Road Department of scheduled road closures/delays.
- Annually, notify Lands and Special Uses Program Area each spring of following instream work culvert replacements to verify any changes in special use issuance.

Range design criteria:

- Ensure the District Range program is aware of the time and year the project will be completed.
- Provide a bypass route to the permittee for the purpose of livestock and/or allotment management.

Soils design criterion:

- The areas 300 feet above and below these culverts have been modified in the past with heavy equipment (for example, log weirs, old road beds, railroad grades, rip rap, and putting in existing culverts). The soil has been heavily modified in these areas from compaction or scraped to create berms, and rock added in the case of log weirs and rip rap. In these heavily impacted areas, restrict heavy equipment to areas that have already been impacted, so the equipment does not impact areas that have not been previously impacted.

General Aquatic Conservation Measures

8. **Technical skill and planning requirements:**
    a. An appropriately qualified fisheries biologist or hydrologist will be involved in the design of this project.
    b. The scope of this project is limited in both space and context. Field evaluations and site-specific surveys will require little work. Appropriate time will be allotted for these actions, prior to implementation. Planning and design will involve appropriate expertise.
    c. The assigned fisheries biologist or hydrologist will make sure that any applicable conservation measures and project design criteria are met through the contracting process.
9. **Climate change:** due to the small scale of this work, future climate changes impacts will not have dramatic effects on this work
10. **In-water work period:** In-stream activities will occur between July 15th and August 15th.
11. **Fish passage:** Not applicable.
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 greater than 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 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 (for example, 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, 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 (for example, large wood, boulders, and 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 (for example, minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, or 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 (for example, generators and canes), and gas-powered equipment with tanks larger than 5 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 percent 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 Bureau of Land Management (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 (WDFW) 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; and 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 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 18 ºC 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 less than 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 Endangered Species Act (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 percent 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 cubic feet per second (cfs). NMFS approved fish screens have the following specifications: (1) 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 (2) 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.

Applicable Project Design Criteria

Project Design Criteria for Aquatic Restoration Activity Categories

1. Fish Passage Restoration

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, bulldozers, 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 U.S. Fish and Wildlife Service (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:**
    i. In streams with current or historical 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.
    ii. 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.
    iii. Focus stabilization efforts in the plunge pool, the headcut, as well as a short distance of stream above the headcut.
    iv. 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.
    v. 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.
    vi. 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 greater than 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 2.5 times 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 1 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 (such as fish counting equipment, pit tag detectors, lighting, trash racks, or 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 and 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 percent silt or clay will be disposed in uplands, outside of the active floodplain.
2. Material with more than 40 percent gravel will be deposited within the active floodplain, but not in wetlands.
3. Material with more than 50 percent gravel and less than 30 percent fines (silt or clay) may be deposited below the ordinary high water mark (HWM).

2. Large Wood, Boulder, and Gravel Placement

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 mimics 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 1.5 times bankfull channel width, while logs without rootwads should be a minimum of 2.0 times 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 (less than 12) an additional 60 percent 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 greater than 25 percent 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 (for

example, 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

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 (for example, drop structure, gabion, and 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, bulldozers, 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:

3. 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.

4. 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.

5. Sediment characterization to determine the proportion of coarse sediment (greater than 2 millimeters) in the reservoir area.

6. 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 millimeters (65 percent of the sediment by weight exceeds 2 millimeters in diameter) may be removed without excavation of stored material, if the sediment contains no contaminants; reservoirs with a d35 less than 2 millimeters (65 percent of the sediment by weight is less than 2 millimeters 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.

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. **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 (for example, large wood or 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.

6. Streambank Restoration

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, bulldozers, 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.

14. Riparian Vegetation Planting

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, rush mats, or both; and 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.

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 or felling) as part of this project for instream restoration will not be harvested from within the primary shade zone.

Table 3. Primary shade zone width slope distance (feet), based on adjacent hillslope (percent)

Hillslope less than 30 percent	Hillslope 30 to 60 percent	Hillslope greater than 30 percent
50 feet	55 feet	60 feet

The Temperature Implementation Strategies allow the distances in the above table to be less (but not less than 25 feet.) if any of the following conditions applies:

- The trees are located on a south facing slope (175 to 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 percent 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 4. Bankfull widths and minimum diameter of logs to be considered key pieces

Bankfull width* (in 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 1 1/2 times (1.5 times) the bankfull or a log without a rootwad should be twice (2 times) the length of the stream’s bankfull width. As the best fish habitat is formed around jams composed of three to seven logs, at least two 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) (see http://pubs.usgs.gov/circ/l 32 l/pdf/circ l 321.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 (Due 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 bum plan objectives for all fuel treatment activities within RHCAs.
- Use all available fuel treatments and preparation activities as necessary (for example, 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 PDC. Suppression should be used only as a last resort to achieve other PDC.

For Perennial and Fish-Bearing Stream Channels:

- Avoid removing trees along stream banks (for example, don't cause bank instability or increase erosion).
- Within primary shade zone retain 100 percent of the overstory canopy closure with the exception of hardwood treatment.
- For intermittent. non-fish-bearing stream channels:
  - Within 50 feet 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 (for example, 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 feet. 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 feet 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 Malheur 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 or mulch is not available, individual national 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, 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 (for example, 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 or not economically feasible, and (4) in permanently altered plant communities.
- Under no circumstances shall non-native invasive plant species 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 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 National Forest or moderate on the Ochoco National Forest, 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 (see section, above) 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 bums, but would be limited, and typically no heavy equipment would be used. Prescribed bums 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 (SHPO) 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 (6 feet 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 the 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.