1. Large Wood, Boulder, and Gravel Placement and Tree Removal for Large Wood Projects

Description- To place large wood (LW) and or boulders 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. In areas where natural gravel supplies are low (immediately below reservoirs, for instance), gravel placement may be used to improve spawning habitat. Full channel-spanning porous boulder weirs (boulder weirs) will only be installed in streams with a legacy of splash damming, stream cleaning, or other activities that have resulted in highly uniform, incised, bedrock-dominated channels with few boulders or woody debris. Live and dead trees may be removed from riparian areas to provide LW for restoration projects, under special conditions described below. LW, boulder, boulder weirs and gravel projects will involve the use of log trucks and dump trucks for transport and excavator-type machinery, spyders, cable yarders, draft horses, or helicopters for placement.

Design Criteria

Large Wood, Boulder, and Gravel Placement:

1. Place LW and boulders only in those areas where they would naturally occur and in patterns that closely mimic that which would naturally occur for that particular stream type.

2. LW includes whole conifer and hardwood trees, logs, and root wads. LW 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 x bankfull channel width, while logs without rootwads should be a minimum of 2.0 x bankfull width. Place wood in a manner that most closely mimics natural accumulations of LW for that particular stream type. Structures may partially or completely span stream channels or be positioned along stream banks.

3. No conifers should be felled in the riparian area for in-channel large wood placement unless conifers are fully stocked and are consistent with project design criteria in vegetation treatment categories. Felled hazard trees can be used for in-channel wood placement.

4. Key boulders (footings) or LW may be buried into the stream bank or channel but shall not constitute the dominant placement method of boulders and LW.

5. Anchoring large wood with cable should only occur after first reviewing feasibility of the following, in preferential order, avoid cabling except as a last resort:

a). The size and weight of the wood sufficient for stability, no anchoring is required.

b). The wood is oriented in such a way that movement is unlikely (sharp bends in the stream, naturally narrow reaches, placed within a functional riparian zone.

c). Ballasting (gravel and/or rock) is used to increase the mass of the structure to resist movement (the height of the structure generally must be above design flow elevations) (this works well in systems with intact floodplains).

d). Large boulders are used as anchor points for the large wood.

e). Wood is pinned with rebar to large rock to increase its weight (the wood/rock combinations are still independent in the overall structure).

6. Gravel augmentation should only occur in areas where the natural supply has been eliminated or significantly reduced through anthropogenic means. 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. After gravel placement, allow the stream to naturally sort and distribute the material.

Boulder Weirs:

1. Full channel-spanning boulder weirs 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.

2. Install boulder weirs low in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 1.5-year flow event). If larger boulders are needed to withstand bankfull flows, boulder size should be determined through a site-specific analysis - such as a shear stress analysis - and should not promote bank scouring and channel routing around the structure.

3. Place boulder weirs diagonally across the channel or in more traditional upstream pointing "V" or “U” configurations with the apex oriented upstream. Structures installed perpendicular to the streamflow are not covered in this consultation.

4. Boulder weirs are to be constructed to allow upstream and downstream passage of all native listed fish species and life stages that occur in the stream. This can be accomplished by providing plunges no greater than 6” in height, allowing for juvenile fish passage at all flows.

5. The use of gabions, cable or other means to prevent the movement of individual boulders in a boulder weir is not allowed.

6. Rock for boulder weirs shall be durable and of suitable quality to ensure permanence in the climate in which it is to be used. Rock sizing depends on the size of the stream, maximum depth of flow, plan form, entrenchment, and ice and debris loading

7. The project designer or an inspector experienced in these structures should be present during installation.

8. Full spanning boulder weir placement should be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of LW.

Tree Removal for LW Projects:
1. Tree felling in suitable nesting or dispersal habitat for Northern Spotted owls(NSO), and murrelets will not occur during their nesting periods (Apr 1 - Sept 15 for murrelets, or Mar 1 - July 15 for NSOs).

2. A wildlife biologist must be fully involved in all "Individual Tree Removal" planning efforts, and involved in making decisions on whether individual trees are suitable for nesting or have other important listed bird habitat value.

3. Trees may be removed by cable, groundbased equipment, horses or helicopters, or felled directly into the stream. Felled trees may be stock-piled for later use in instream restoration projects.

4. Individual trees or small groups of trees (<5) should come from the periphery of permanent openings (roads etc) or from the periphery of non-permanent openings (*e.g.* plantations, along recent clear-cuts etc).

5. Single trees may only be removed from the first two lines of trees.

6. Trees selected for LW restoration projects must be spaced at least one site potential tree height apart and at least one crown width from any trees with potential nesting structure for ESA-listed bird species.

7. No suitable nesting trees greater the 36" dbh are to be removed. Trees greater than 36" may be felled if a wildlife biologist determines those trees do not provide suitable nesting habitat.

8. No conifers should be felled in the riparian area for in-channel LW placement unless conifers are fully stocked and are consistent with PDCs in vegetation treatment categories. Felled hazard trees can be used for in-channel wood placement.

9. When removing L W from blow-down or an area burned by a wildfire, consult a wildlife biologist to determine which trees can be removed without adversely affecting wildlife habitat.

Excluded Activities- The following activities are not included in this permit:
1. An individual structure, such as a log jam, longer than 7 bankfull channel widths.
2. In non-bedrock dominated systems, boulder weirs greater than Y2 the channel width.
3. Full spanning boulder weir structures installed perpendicular to the streamflow in bed-rock dominated streams.
4. Full spanning, downstream pointed U or V style weirs.

2. Reconnection of Existing Side Channels and Alcoves

Description - To reconnect and/or restore existing side channels and alcoves to increase rearing habitat for juvenile fish and high flow refuge areas for all life stages of fish. Functioning side channels have inlet and outlet connections to the main channel and often contain flow only during flood events-bankfull or greater. Functioning alcoves are back-water channels that typically contain water during both low and high flows. This action includes the removal of plugs which block water movement through side channels and alcoves. Further, side channel and alcove improvements include fill removal within channels and alcoves, L W and/or boulder placement, riparian planting, etc. Boulder placement may be used in the main river to stabilize the channel and bring the entrance of the side channel into alignment (vertically and horizontally). Construction would involve use of heavy equipment, such as excavators, spyders, backhoes, and dump trucks.

Design Criteria

1. Excavated material removed from side-channels or alcoves shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.

2. Design and construct side-channels in such a manner as to prevent the capture and relocation of the main channel.

3. Design project to naturally maintain inlet and outlet connections with the main stream channel (i.e., placement of LW to increase local scour).

4. Should fish rescue occur, use fish handling criteria listed under activity #7.

5. If other aquatic restoration activities included in this BO are used as complementary actions, follow the associated PDCs and CMs.

Excluded Activities - The following activities are not included in this BO:
1. Creation of new side channels;
2. Excavation of severely aggraded (completely filled in) side channels and alcoves.

3. Bank Restoration

Description The Action Agencies propose to restore eroding stream banks to reduce chronic bank erosion, improve water quality, restore natural channel cross-section, allow for natural channel adjustments, expand floodplain area, promote growth of riparian vegetation, and where appropriate (*e.g.*, outside meander bends) create undercut banks for adult and juvenile fish hiding cover. Projects will not significantly restrict the channel migration zone or ability of the channel to form and maintain habitat. Construction will involve use of heavy equipment, such as excavators, spyders, backhoes, dump trucks.

Design Criteria

1. Bank restoration work will focus on eroding stream banks, primarily the outside edge of meander bends.

2. Limit bank restoration projects to those sites where existing channel conditions are at or near reference channel conditions—width:depth ratio, radius of curvature, etc. To the extent possible, use bank stabilizing materials that would naturally occur at that site (such as LW, woody and herbaceous plantings, native sedge and rush mats, or native rock).

3. Banks may be reshaped and slopes graded where the objective is to reduce blank slope angle without changing the location of the bank toe and to provide more favorable planting surfaces.

4. Jute matting or other biodegradable material can be used in conjunction with plantings to help prevent erosion of affected banks.

5. If other aquatic restoration activities included in this BA are used as complementary actions, follow the associated design criteria and conservation measures.

Excluded Activities - Use of dikes, groins, buried groins, drop structures, porous weirs, weirs, riprap, rock toes, and similar structures to stabilize streambanks are not covered by this permit.

4. Head-cut Stabilization and Associated Fish Passage

Description - To stabilize active or potentially active head-cuts to prevent further channel degradation (upstream migration of head-cut) and promote downstream aggradations. In streams currently or historically occupied by fish, fish passage will be provided over the stabilized headcut through a series of rock/boulder or log step-pool structures, to be in compliance with relevant fish passage criteria for jump height, and pool depth, among other things.

During emergency headcut stabilization events, (high flow events, where no prior knowledge of headcut exists and stabilization action must immediately occur), short term headcut stabilization may occur without associated fish passage measures. However, fish passage must be incorporated into the final head cut stabilization action, to be completed during the first subsequent in-water work period. This subsequent action may include complete or partial removal of all materials placed at the headcut during emergency stabilization efforts, and replacement with carefully designed, long term, fish passage friendly, headcut stabilization options (see below for options). Construction may involve use of heavy equipment, such as excavators, spyders, backhoes, dump trucks.

Design Criteria

1. In an emergency head-cut event, armor the head-cut with sufficient appropriately sized material to prevent continued up-stream movement. Materials can include both rock and organic materials which are native to the area. The FS will focus stabilization efforts in the plunge pool, the head cut, and a short distance above the headcut. Minimize lateral migration of channel around the head cut (“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. In streams with current or historic fish presence, provide fish passage over stabilized head-cut through a series of log or rock weir structures. Emergency stabilization projects may occur without associated fish passage measures. However, fish passage must be incorporated into the final head cut stabilization action and be completed during the first subsequent in-water work period. In streams without current or historic fish presence, it is recommended to construct a series of downstream log or rock weirs to expedite channel aggradation.

2. For non-emergency head cut stabilization actions, the following three grade control treatments are acceptable alternatives to stabilize a head cut and re-establish fish passage. These alternatives are also acceptable to complete channel stabilization and fish passage activities during the first in-water work period, for previously-treated emergency headcut sites. These alternatives may also include complete or partial removal of all materials placed at headcut during emergency stabilization efforts, and replacement with carefully designed, long term, fish passage friendly, headcut stabilization options. The choice of treatment should be based on site characteristics and limitations (*i.e.*, channel slope, bed material type), but may also be based on material availability, economics, land use, design competence or familiarity, and/or regulatory restrictions (*i.e.*, jump heights for fish).

a). Large Roughness Elements: In many Pacific Northwest streams, large wood and boulders provide natural grade control in the form of channel spanning log jams or debris flow deposits. Hence, the designed rock and wood structure should mimic natural colluvial features, such as debris flow or landslide deposits, that provide this base level control or grade stabilization in areas where the risk of headcut migration exists. This technique is applicable to a wide range of stream types, from low gradient meandering streams (less than 1 percent) to high gradient cascade channels (greater than 8 percent). The goal of using large roughness elements is not to completely halt the incision process, but rather to slow it down and spread the elevation change over a greater length of channel. Since log jams are porous structures, not all of the sediment will be held in place; however, sediment inputs will be spread out over time rather than introduced to the stream as one large pulse. A log jam is also self-maintaining as long as more large wood is available in the stream system. Rock and wood should be sized so that it is not mobile during the design flood. Buoyancy calculations to determine appropriate ballast requirements should be completed for structures that will be completely inundated.

b). Rock and Log Weirs: Rock and log weirs are very low channel spanning structures that are often used to stabilize streambeds and halt channel incision. These weirs are used in low gradient (generally less than 2 percent) streams. The weirs are ‘V’ shaped, oriented with the apex upstream, and are lower in the center to direct flows to the middle of channel. A series of V weirs will help to stabilize stream gradient, dissipate energy, provide some level of bank protection, and will maintain fish passage. Weirs should be keyed into the stream bed by a minimum of 2.5 x their exposure height to minimize structure undermining due to scour. The weir should also be keyed into both banks a minimum of 8 feet. If several structures will be used in series, weir spacing should be no closer than the net drop divided by the channel slope (for example, a one-foot-high weir in a stream with a two percent gradient will have a minimum spacing of 50 feet. Weirs can fail if flow goes subsurface flow below weir material. If placed material is coarse and unconsolidated, it is possible that upstream flows will go subsurface and reemerge at the downstream end of the structure, effectively causing a complete passage barrier. Careful consideration of subsurface flow is therefore required before weir construction. The

inclusion of fine material in the sediment mix and construction techniques that include washing material into place to seal the weir to the channel bed is highly recommended.

Excluded Activities - The following activities are not included in this BO:
1. Any structures that include the use of gabion baskets, sheet pile, concrete, articulated concrete block, and/or cable anchors.
2. Straight weirs, which disperse flows and can cause channel widening and thus structure "flanking" (erosion around the ends of the structure).

5. Estuary Restoration

Description - To restore estuary functions through removal of dikes, berms, levees, culverts and tiles, drainage systems, or portions thereof, including tide gates, which block tidal waters from flooding historic estuaries. Such functions include storage of overland flow during high-tide and flood events, dissipation of flood energy, sediment and debris deposition, growth of riparian vegetation, nutrient cycling, development of side channels and alcoves, and rearing habitat for juvenile salmonids. Construction would involve use of heavy equipment, such as excavators, backhoes, front-end loaders, dump trucks, and bulldozers.

Design Criteria

1. Project implementation shall be conducted in a sequence that will not preclude repairing or restoring estuary functions once dikes/levies are breached and the project area is flooded.

2. An experienced hydrologist, fisheries biologist, botanist, ecologist, and wildlife biologist shall be involved in designing restoration treatments.

3. Culverts and tide gates will be removed using the design criteria and conservation measures, where appropriate, as described in Activity #7 Fish Passage Culvert and Bridge Projects.

4. Roads within the project area should be removed to allow free flow of water. Material either will be placed in a stable area above the ordinary high water line or highest measured tide or be used to restore topographic variation in wetlands.

5. Some or all concrete, segmented drain tiles placed to drain wetlands should be removed. Fill generated by drain tile removal will be compacted back into the ditch created by removal of the drain tile.

6. Channel construction may be done to recreate channel morphology based on aerial photograph interpretation, literature, topographic surveys, and nearby undisturbed channels. Channel dimensions (width and depth) are based on measurements of similar types of channels and the drainage area. In some instances, channel construction is simply breaching the levee. For these sites, further channel development will occur through natural processes.

7. Ditches constructed and maintained to drain wetlands will be filled. Some points in an open ditch may be over-filled, while other points may be left as low spots to enhance topography and encourage sinuosity of the developing channel.

8. If other aquatic restoration activities are used as complementary actions, follow the associated design criteria and conservation measures.

Excluded Activities – This activity does not include replacements of tide gates.

6. **Irrigation Screen Installation and Replacement**

Description - For existing water diversions only, irrigation screen installation and replacement includes installing, replacing, or upgrading off-channel screens to improve fish passage or prevent fish entrapment in irrigation canals. This action also includes the removal of diversion structures that are less than six feet high, or that impound less than 15 acre-feet of water. Construction would involve use of heavy equipment, such as excavators, backhoes, front-end loaders, dump trucks, and bulldozers.

Design Criteria

1. All fish screens must be sized to match the landowner's documented or estimated historic water use or legal water right, whichever is less.

2. Irrigation 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 irrigation system.

3. Screens, including screens installed in temporary and permanent pump intakes, must meet NMFS fish screen criteria.

4. Bypass structures should be big enough to pass kelt steelhead.

5. Abandoned ditches and other similar structures will be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them.

6. When making improvements to pressurized irrigation systems, 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.

7. Diversion Removal
   a). Construction Actions – Remove diversion dam and water routing equipment. Heavy machinery operating from the bank or within the channel may be used to aid in removal of diversion structures. Re-watering the construction site occurs at such a rate as to prevent loss of surface water downstream as the construction site streambed absorbs water.
   b). Construction Impacts – Stream channel substrate will be minimally disturbed with the removal of the diversion dam. Restored stream flow will flush out substrate fines within the formerly dewatered area, resulting in increased but short-lived stream turbidity (usually less than 2 hours).

8. If other aquatic restoration activities are used as complementary actions, follow the associated

design criteria and conservation measures.

Conservation Measures - For diversion removal, follow the appropriate conservation measures described in Activity #7 for work area isolation, re-watering, and fish removal.

Excluded Activities - The removal of large diversions/structures which have substantial accumulations of sediment that may be released and adversely affect downstream fish, critical habitat and or EFH. Furthermore, consolidation, improvement, and modification of diversions are not covered by this permit.

7. Fish Passage Culvert and Bridge Projects

Description - to remove or replace existing road-stream crossing structures (culverts and bridges) that restrict fish passage and natural flows with stream simulation structures to restore up- and downstream fish passage for all life stages of native fish. Replacements of existing road-stream crossing structures that do not restrict fish passage are permissible. Construction would involve use of heavy equipment, such as excavators, cranes, backhoes, front-end loaders, dump trucks, bull dozers, and on occasion pile-drivers and helicopters.

Design Criteria

1. Fish passage projects will be designed by an experienced engineer with design input from an experienced fish biologist and hydrologist. Such personnel shall oversee or review the project during construction to ensure that project designs and conservation measures are being properly implemented.

2. Forest Service Design Assistance Teams or the BLM and Coquille Tribe equivalent will provide design review for projects that exceed $100,000 or will result in structures that are greater than 20 feet wide.

3. Assess sites for a potential to headcut below the natural stream gradient. Projects that lead to headcutting below the natural stream gradient are excluded from this permit.

4. Design Standards

a). Structure Type – Structure types include closed-bottomed culverts, open-bottomed arch culverts, and bridges. Structure material must be concrete or metal.

b). Structure Width – The structure width shall never be less than the bankfull channel width. (The stream width inside the culvert or between bridge footings shall be equal to or greater than the bankfull width.) The minimum structure width and height for a closed bottom culvert shall be 6 feet to allow manual placement of stream simulation material. Structures must accommodate a 100-year flood flow while maintaining sediment continuity (similar particle size distribution) within the culvert as compared to the upstream and downstream reaches. To meet this requirement, unconfined channel types may require structures wider than bankfull and/or the addition of flood relief culverts or other comparable flood relief methods.

c). When possible, flood relief culverts will be designed to restore and maintain access to off-channel rearing and high flow areas for juvenile and adult fish. Therefore, existing floodplain

channels should be the first priority for location of flood relief culverts which should be installed in a manner that matches floodplain gradient and does not lead to scour at the outlet.

d). Channel Slope – The structure slope shall approximate the average channel gradient of the natural stream up- and downstream of the structure. The maximum slope for closed-bottomed culverts shall not exceed 6 percent because of difficulties in retaining substrate in the culvert at higher gradients. Open-bottom arches can be placed in channel gradients that exceed 6 percent.

e). Embedded Culvert – If a closed culvert is used, the bottom of the culvert shall be buried into the streambed not less than 30 percent and not more than 50 percent of the culvert height. For open-bottomed arches and bridges, the footings or foundation shall be designed to be stable at the largest anticipated scour depth. Substrate and habitat patterns within the culvert should mimic stream patterns that naturally occur above and below the culvert. Coarser material may be incorporated to create velocity breaks during high flows, thereby improving fish passage, and to provide substrate stability.

f). Riprap – The use of riprap is permissible above bankfull height to protect the inlet or outlet of new culverts or open-bottomed arches. If the use of riprap is required for culvert stability, then an additional analysis may be required to ensure that the structure is not undersized. Riprap may only be placed below bankfull height when necessary for protection of abutments and pilings for bridges. However, the amount and placement of riprap around the abutments and/or pilings should not constrict the bankfull flow.

g). Grade Control Structures – Grade control structures are permitted to prevent headcutting above or below the culvert or bridge. Grade control typically consists of boulder structures that are keyed into the banks, span the channel, and are buried in the substrate.

h). Where applicable, incorporate road dips into crossing designs, to ensure catastrophic flood events will transport overflow back into the downstream channel instead of the road bed.

i). Structures containing concrete must be sufficiently cured or dried before they come into contact with stream flow.

j). In cases of structure removal or when removing an existing structure and replacing it with a bridge, consideration should be given to restoring the stream channel and reconnecting the floodplain at the site.

k). When removing woody debris from the road-crossing inlet, place the debris downstream of the road crossing.

l). Monitor structures after high flow events, which occur during the first fall/winter/spring after project completion. Assess the following parameters: headcutting below natural stream gradient, substrate embeddedness in the culvert, scour at the culvert outlet, and erosion from sites associated with project construction. Apply remedial actions (using project design criteria and conservation measures) if projects do not meet the intended goals.

m). If other aquatic restoration activities are used as complementary actions, follow the associated design criteria and conservation measures.

Conservation Measures - The following conservation measures will be used to minimize sediment and turbidity and the effects of fish handling/transport:

1. Isolate construction area and remove fish from project area. Fish shall be removed from project area (see fish capture guidelines below).

2. Dewater Construction Site – Upstream of the isolated construction area, coffer dams

(diversions) constructed with non-erosive materials are typically used to divert stream flow with pumps or a by-pass culvert. Diversions constructed with material mined from the streambed or floodplain are not permitted. Pumps must have fish screens and be operated in accordance with NMFS fish screen criteria. Dissipate flow energy at the bypass outflow to prevent damage to riparian vegetation or stream channel. If diversion allows for downstream fish passage, (*i.e.*, is not screened), place diversion outlet in a location to promote safe reentry of fish into the stream channel, preferably into pool habitat with cover. When necessary, 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.

3. 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 increase in stream turbidity. Monitor downstream during re-watering to prevent stranding of aquatic organisms below the construction site

4. Fish Handling – If capture, removal, and relocation of fish are required, follow these steps:

a). All fish capture, removal, and handling activities shall be conducted by an experienced fisheries biologist or technician.

b). Isolate capture area – Install block nets at upstream and downstream locations and leave in a secured position to preclude fish from entering the project area. Leave nets secured to the stream channel bed and banks until fish capture and transport activities are complete. If block nets or traps remain in place more than one day, monitor the nets and or traps at least on a daily basis to ensure they are secured to the banks and free of organic accumulation and to minimize fish predation in the trap.

c). Fish Capture Options

1. Collect fish by hand or dip nets, as the area is slowly dewatered.
2. Seining – Use seine with mesh of such a size to ensure capture of the residing ESA-listed fish.
3. Minnow traps – Traps will be left in place overnight and in conjunction with seining
4. Electrofishing – Prior to dewatering, use electrofishing only where other means of fish capture may not be feasible or effective. The protocol for electrofishing includes the following:

a). If fish are observed spawning during the in-water work period, electrofishing shall not be conducted in the vicinity of spawning adult fish or active redds.

b). Only Direct Current (DC) or Pulsed Direct Current (PDC) shall be used.

c). Conductivity <100 use voltage ranges from 900 to 1100. Conductivity from 100 to 300 then use voltage ranges from 500 to 800. Conductivity greater than 300 then use voltage to 400.

d). 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.

e). 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 below. Dark bands on the fish indicate injury, suggesting a reduction in voltage and pulse width and longer recovery time.

5. Handling and Release –Fish must be handled with extreme care and kept in water for 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 larger fish in buckets separate from smaller prey-sized fish. Monitor water temperature in buckets and well-being of captured fish. As rapidly as possible (especially for temperature-sensitive bull trout), but after fish have recovered, release fish upstream of the isolated reach in a pool or other area that provides cover and flow refuge. Document all fish injuries or mortalities and include in annual report.

Excluded Activities The proposed action for this programmatic consultation does not include the use of treated wood in replacement bridges. When installing bridges, piers and abutments will not occur in the bankfull width. Replacing culverts using baffles or weirs (hydraulic method) is not covered by this Opinion.

8. Floodplain Overburden Removal

Description - To remove anthropogenic overburden and fill such as dredged mine tailings, railroad beds, dikes, berms, levees, and other fill types from floodplains to restore natural floodplain functions. Such functions include overland flow during high-water events, dissipation of flood energy, increased water storage to augment low flows, sediment and debris deposition, growth of riparian vegetation, nutrient cycling, and development of side channels and alcoves. Construction would involve use of heavy equipment, such as excavators, earthmovers, scrapers, backhoes, front-end loaders, dump trucks, and bulldozers.

Design Criteria

1. Create floodplain characteristics in elevation, width, gradient, length, and roughness shall closely mimic those that would naturally occur at that stream and valley type.

2. Overburden or fill comprised of native materials which originated from the project area, may be used to reshape the floodplain, placed in small mounds on the floodplain, used to fill anthropogenic holes, buried on site, or disposed into upland areas.

3. To the greatest degree practicable, non-native fill material originating from outside the project area shall be removed from the floodplain to an upland site.

4. Where it is not possible to remove all portions of dikes and berms, place culverts through or remove portions of such structures to pass high flows, bankfull or greater, into floodplain areas. The width of a breach should be equal to or greater than the bankfull width of the stream. Breaches should be located at a depositional area of the channel. Design for proper number and location of breach sites to help prevent fish stranding as high flows recede.

5. Conduct a contaminant survey for mine tailing removal projects prior to project implantation. If contaminants are found above levels set by the Environmental Protection Agency, a separate consultation is required.

6. Consider decompaction of soils once overburden material is removed. If other aquatic

restoration activities are used as complementary actions, follow the associated design criteria and conservation measures.

Excluded Activities - No excluded activities are proposed for this activity category.

9. Reduction of Recreation Impacts

Description - To close or better control recreation use along streams and within riparian areas. This includes removal of designated campgrounds, dispersed camp sites, and foot trails as well as decommissioning of off-road vehicle (ORV) trails in riparian areas. Dispersed and developed campground restoration usually includes some or all of the following: Stream bank restoration; placing rock or other barriers such as fences to block vehicle access; gravel surfacing to designate access routes and parking; ripping or sub-soiling sites to remove compaction; planting shrubs and trees to restore streamside, floodplain and meadow vegetation; clearing new sites to provide for displaced use or projected new use and relocating recreation sites outside of riparian areas; reducing or clearing noxious weeds; hardening stream access sites. Construction would involve use of heavy equipment, such as excavators, earthmovers, scrapers, backhoes, front-end loaders, dump trucks, and bulldozers.

Design Criteria

1. Design remedial actions to restore floodplain characteristics. Elevation, width, gradient, length, and roughness shall closely mimic those that would naturally occur in that stream and valley type.

2. Overburden or fill comprised of native materials which originated from the project area may be used to reshape the floodplain, placed in small mounds on the floodplain, used to fill anthropogenic holes, buried on site, and/or disposed into upland areas.

3. To the greatest degree practicable, non-native fill material originating from outside the project area shall be removed from the floodplain to an upland site.

4. Consider decompaction of soils once overburden material is removed.

5. Place barriers-boulders, fences, gates, etc-outside of the bankfull width and across traffic routes to prevent ORV access into and across streams.

Excluded Activities - No excluded activities are proposed for this activity category.

10. Road Treatments

Description - Decommissioning or obliteration of roads to restore watershed function. This activity includes road decommissioning, from simple closures to more complex road obliterations, with an overall goal of restoring hydrologic functions. This category also includes stormproofing roads intended to remain open (hydrologically disconnecting such roads from

watershed streams). Associated benefits include the following: Eliminating or reducing erosion and mass-wasting hazards associated with roads; eliminating or reducing human access and use-disturbance associated impacts to aquatic systems. Actions such as bridge and culvert removal, removal of asphalt and gravel, subsoiling or ripping of road surfaces, outsloping, waterbarring, fill removal, sidecast pullback, re-vegetating with native species and placement of large woody material and/or boulders are included. Roadway barricading to exclude vehicular traffic is covered only if the overall road remediation project substantively addresses restoration of hydrologic function. For culvert removals on closed roads, limited cutting or removal of vegetation on the closed road-bed to access the culvert site may be required. Construction would involve use of heavy equipment, such as excavators, backhoes, front-end loaders, dump trucks, and bull dozers.

Design Criteria

1. For road removal projects within riparian areas, recontour the affected area to mimic natural floodplain contours and gradient to the greatest degree possible.

2. For those road segments immediately adjacent to the stream or where the road fill is near the wetted stream, consider using sediment control barriers between the project and the stream.

3. Drainage features should be spaced to hydrologically disconnect road surface runoff from stream channels.

4. Dispose of slide and waste material in stable sites out of the flood prone area. Waste material other than hardened surface material (asphalt, concrete, etc) may be used to restore natural or near-natural contours.

5. Minimize disturbance of existing vegetation in ditches and at stream crossings to the greatest extent possible.

6. Conduct activities during dry-field conditions – low to moderate soil moisture levels.

7. When removing a culvert from a first or second order, non-fishing bearing stream, project specialists shall determine if culvert removal should follow the isolation criteria as describe in Activity #7 above. Culvert removal on fish bearing streams shall adhere to the measures describe in #7 above.

8. For culvert removal projects, restore natural drainage patterns and when possible promote passage of all fish species and life stages present in the area. Evaluate channel incision risk and construct in-channel grade control structures when necessary.

9. If other aquatic restoration activities are used as complementary actions, follow the associated design criteria and conservation measures.

Excluded Activities – This permit does not cover new road construction nor routine maintenance of existing roads.

11. Removal of Legacy Structures

Description - To remove large wood, boulders, rock gabions, and other in-channel structures that were constructed to improve fish habitat but were installed in a manner that was, and continues to be, inappropriate for the given stream type. Examples of such structures, which were installed in the 1980s and early 1990s, include boulder configurations in meadow streams, stair-step perpendicular log weirs, and rock gabions. These legacy structures typically resulted in widened stream channels, increased width/depth ratios, decreased sinuosity, and increased stream exposure to solar radiation. Removal of legacy structures would include the use of excavator-type machinery, spyders, backhoes, and dump trucks.

Design Criteria

1. If the structure being removed contains material (*i.e.*, large wood, boulders, etc) not typically found within the stream or floodplain at that site, remove material from the 100-year floodplain.

2. If the structure being removed contains material (*i.e.*, large wood, boulders, etc) that is typically found within the stream or floodplain at that site, the material can be reused to implement habitat improvements described under Large Wood, Boulder, and Gravel Placement activity category in this BA following design criteria for Large Wood, Boulder, and Gravel Placement activity category.

3. 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. Bring in clean top soil, if necessary, to improve vegetation reestablishment.

4. When removal of buried (keyed) structures may result in significant disruption to riparian vegetation and/or the floodplain, consider using a chainsaw to extract the portion of log within the channel, leaving the buried sections within the streambank.

5. 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 (see grade control options described under Headcut Stabilization activity category).

6. If the structure is being removed because it has caused an over-widening of the channel, restoration measures (LW, Boulder, and Gravel Placement activity category) may be implemented to decrease the width to depth ratio of the stream at that location to a level commensurate with upstream and downstream (within the same channel type).

7. Protect riparian vegetation that has grown around legacy structures to the greatest degree possible.

8. If other aquatic restoration activities included in this BA are used as complementary actions, follow the associated design criteria and conservation measures.

Excluded Activities - No excluded activities are proposed for this activity category.

12. Riparian Exclusion Fencing

Description - To construct and replace fences around riparian areas to restrict or eliminate human and livestock use to maintain or restore stream channel, riparian vegetation, and floodplain functions. Fence types can include the following: Permanent barbed-wire, high-tension, smooth-wire, let-down, electric, buck and pole, and other similar types. Fence construction may involve use of all-terrain vehicles, flatbed trucks, and manual and power tools. Water gap or stream crossing construction may involve dump trucks and excavator-type equipment.

Design Criteria

1. Fence placement should allow for lateral movement of stream.

2. Minimize vegetation removal, especially potential large wood recruitment sources, when constructing fence lines.

3. When constructing livestock crossings and water gaps, use the following design criteria:
   a). Locate crossings or water gaps where stream banks are naturally low.
   b). When possible, crossings and gaps should not be constructed within known or suspected spawning areas (*e.g.* pool tailouts where spawning may occur).
   c). Fences at stream crossings and water gaps should not inhibit upstream or downstream movement of fish or significantly impede bedload movement. Where appropriate, construct fences at water gaps as to allow passage of large wood and other debris.
   d). If necessary, the stream bank and approach lanes can be stabilized with native vegetation and angular rock to reduce chronic sedimentation. The stream crossing or water gap should be armored with cobble-size rock, and use angular rock if natural substrate is not of adequate size.
   e). Livestock crossings or water gaps must not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (*e.g.*, wetlands) due to congregating livestock.
   f). The maximum width of a water gap or stream crossings should be no less than 10 feet and no more than 20 feet in the upstream-downstream direction
   g). When using pressure treated lumber for fence posts only, complete all cutting/drilling offsite so that treated wood chips and debris do not enter water or flood prone areas.

4. If other aquatic restoration activities are used as complementary actions, follow the associated design criteria and conservation measures.

Excluded Activities - Riparian fencing is not to be use to create livestock handling facilities or riparian pastures

13. Riparian Juniper Treatment

Description - The Action Agencies propose to fell juniper trees occurring in riparian and associated uplands to help restore natural plant species composition and structure that would occur under natural fire regimes. The associated benefits to aquatic and riparian environments include the following: Reduction of soil erosion into stream channels; increased frequencies and diversity of herbaceous, shrub, and tree species; increased bank stability and stream nutrients. Associated uplands include those areas where juniper stands are creating or will create conditions that result in lost ground cover and increased sedimentation into stream channels; upland treatments would only be covered if those treatments directly benefit the aquatic environment. Treatments will emphasize the removal of junipers above natural stocking levels. Equipment may include the use of feller-buncher type equipment, slash-buster, chainsaws, winch machinery, or prescribed fire.

Design Criteria

1. Do not cut old-growth juniper, which typically has several of the following features: sparse limbs, dead limbed or spiked tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of cambium layer at base of tree, and limited terminal leader growth in upper branches (Miller *et al*. 2005).

2. On steep or south-facing slopes, where ground vegetation is sparse, leave felled juniper in sufficient quantities to promote reestablishment of vegetation and prevent erosion.

3. If seeding is a part of the action, consider whether seeding would be most appropriate before or after juniper treatment.

4. Where appropriate, move cut juniper stems into the stream channel and floodplain to provide aquatic benefits. Juniper can be felled or placed into the stream to promote channel aggradations as long as such actions do not obstruct fish movement, cover spawning gravels of ESA-listed fish or increase width to depth ratios.

5. When using feller-buncher and slash-buster equipment, operate equipment in a manner that minimizes soil compaction and disturbance to soils and desired native vegetation to the greatest degree possible. Equipment exclusion areas (buffer area along stream channels) should be as wide as the feller-buncher or slash-buster arm.

6. If other aquatic restoration activities are used as complementary actions, follow the associated design criteria and conservation measures.

Excluded Activities - The placement of juniper in streams where the action will preclude the channel from properly functioning or limiting the ability of stream to reach its natural sinuosity is not covered in this consultation.