Big Creek Exclosure and Floodplain Restoration
Aquatic Restoration Checklist
USDA Forest Service
Blue Mountain Ranger District, Malheur National Forest
Grant County, Oregon

Implementation Description

Project Information

Project Information (select the + on right of selection to add additional categories)
Category 2: Large Wood, Boulder, and Gravel Placement; including tree removal for large wood placement Category 5: Off- and Side-Channel Habitat Restoration Category 6: Streambank Restoration Category 9: Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering Category 14: Riparian Vegetative Planting Category 16: Beaver Habitat Restoration
Lead Preparer: Cody Lund
Location: Township 09 South, Range 33 East, Section 19 HUC 170702030302 USGS Quad: Sharp Ridge
Lease/ Case File/ Serial number: 01032022
Begin Date: 12/15/2021
Due Date: 5/2/2022

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

Purpose and Need

The purpose of this project is to improve riparian floodplain and aquatic habitat along a surface-mined section of Big Creek. This area includes critical habitat for threatened bull trout and Middle Columbia River steelhead. Juvenile rearing and spawning habitat for these species is currently limited within Big Creek. This project would increase productivity for rearing Middle Columbia River steelhead, bull trout, and culturally important Chinook salmon, and would restore riparian plant communities within the mined area.

Portions of Big Creek reach 4's floodplain and side channels lack riparian vegetation and large wood (see Figure 7-8 and Figure 11-13). Riparian vegetation provides streambank shading to help maintain cool water temperatures, while root reinforcement provides bank stability. Currently, riparian vegetation is limited due to ungulate grazing and browsing, which also limits terrestrial insect and nutrient production. Large wood is important for sediment catchment, which is important for creating fish habitat and storing spawning gravel. Instream large wood also serves as cover for fish and influences water temperature and floodplain connectivity. The amount of large wood is currently inadequate to dissipate the stream's energy for side channels and floodplains, causing side channel incision. Water temperature and instream large

wood are important aquatic habitat features (riparian management objectives) identified in the Malheur Forest Plan (USDA Forest Service 1990) as amended by PACFISH.

Past restoration efforts implemented in Big Creek reach 4 have provided more access to rearing and spawning habitat for Endangered Species Act listed fish and restored its historical floodplain and braided channel network that had been cut off due to mining-related waste rock piles and levees. Riparian hardwoods were planted and fenced off during these efforts, but hardwoods and other riparian vegetation are unable to establish outside these small exclosures due to ungulate browsing and grazing (see Figure 9 and Figure 10).

This project proposes to continue these efforts by planting hardwoods and fencing portions of newly activated floodplain to enhance and protect hardwood growth and restoration efforts. Fencing would include both portions of buck and pole and areas with a 7-strand tension cable fence to exclude both cattle and game in order to protect new plantings from browse (Figure 6). The bottom of the cable fence would be approximately 18 inches above the ground to allow for passage of calves and fawns, though the intent is to exclude big game until plantings can establish. Large wood would also be strategically placed on the floodplain and in side channels to help slow streamflow across the area, facilitate depositional processes, and increase side channel habitat complexity.

The desired conditions for Big Creek fence and floodplain project area are:

- Improved and well-established riparian vegetation;
- Cooler water temperatures;
- Increased water storage within floodplain;
- Reduced streamflow energy within floodplain and reduced channel incision in side channels;
- Multi-thread side channels that are maintained; and
- Improved juvenile rearing habitat for Middle Columbia River steelhead, bull trout, and Chinook salmon.

Reaching the desired condition for Big Creek requires improvements of riparian vegetation and hardwoods to enhance stream shade, riparian vegetation composition and vigor, adequate spawning and rearing gravels, and streambank stability. Adding wood to the floodplain and side channels through this project would help reduce streamflow energy, preventing channel incision, catchment of fine sediment and gravels, and increasing water storage within the floodplain.

Land Use Plan Conformance

The project falls within management areas 3B “Anadromous Riparian Areas” and 4 “Big Game Winter Range” of the Malheur National Forest Land and Resource Management Plan (Malheur Forest Plan; USDA forest Service 1990).

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 provide the necessary habitat to maintain or increase populations of management indicator species; manage the composition and productivity of key riparian vegetation to protect or enhance riparian-dependent resources; plan, design, and implement riparian habitat improvement activities to upgrade riparian areas that are not in a condition to meet management

objectives or the desired future condition; improve the rate of recovery in riparian areas that are not in a condition to meet management objectives by eliminating or reducing the impacts of management activities that may slow riparian recovery; maintain or enhance water quality or 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, 8, 9, 10, 11, and 12, page IV-63).

The following Malheur Forest Plan goals and standards apply for management area 4A "Big Game Winter Range:"

- Forest-wide standard 88: "Design and implement structural and nonstructural range improvements to maintain productivity and range condition in addition to benefiting both wildlife and livestock. Locate range structural and nonstructural improvements to encourage livestock movement away from riparian areas," (USDA Forest Service 1990, page IV-34). This project is consistent with this standard because fences are proposed to protect riparian resources and critical fish habitat. Restoration in the long term would also improve wildlife habitat through increased forage and riparian vegetation.
- Management area 4A, standard 7: "Restrict activities that disturb wintering big game in a significant and prolonged manner from December 1 to April 1," (USDA Forest Service 1990, page IV-70). This project is consistent with this standard because it would be implemented in summer.

Big Creek reach 4 is within a category 1 riparian habitat consevation area (fish bearing stream) as designated by PACFISH/INFISH[1], and contains critical habitat for Middle Columbia River steelhead as designated by the National Marine Fisheries Service and bull trout by the United States Fish and Wildlife Services. Juvenile Chinook salmon also use the reach for rearing habitat.

Proposed Action and Implementation Plan

The following project activities would occur in Big Creek reach 4 as part of this proposal (see Figure 1). Implementation actions are scheduled to begin in 2022 and may continue into 2023 depending on weather, contractor pace, and planting efforts. In-channel restoration would occur during the in-water work window from July 15 to August 15, unless an instream work variance is granted.

The specific actions proposed within this project are to:

- Construct two exclosures which would be combination of tensioned cable and buck and pole, (see Figure 5-6) totaling 12.1 acres and enclosing approximately 0.38 miles of Middle Columbia River steelhead and bull trout critical habitat on Big Creek (0.3 miles) and Deadwood Creek (0.08 miles) (see Figure 2).
- Fence exclosure design would include 8 foot tall segments consisting of 7 strands of tension cable and 6 foot high segments of buck and pole. There would also be two sections of barbed wire fence above and below National Forest System road 4560000 that would parallel the road. These sections could be let down in the winter and spring for spring high flows. Tensioned cable fence may replace barbed wire fence in future once a decision is in place on the relocation of National Forest System road 4560000. For tension cable fencing, the lowest strand should be approximately 18 inches above the ground to allow for wildlife passage underneath. See Figure 5 for fence type locations and Figure 6 for a diagram of tensioned cable fence.

[1] PACFISH refers to USDA Forest Service 1995a, and INFISH refers to USDA Forest Service 1995b.

- Tip trees within two units in the Big Mosquito Project area along National Forest System road 2090000 (see Figure 4). The tipping unit upstream of the Big Creek Exclosure and Floodplain Restoration project area is the preferred unit since it is closer to the project area.
- Hand fell lodgepole from identified lodgepole thinning unit in the Big Mosquito project area to be used as post material to help lock in floodplain wood (see Figure 2).
- Place wood on the floodplain and in side channels to slow streamflow across to facilitate sediment deposition and prevent side channel incision (see Figure 3).
- Plant willows and cottonwood cuttings within constructed exclosures.

Detailed Action Description

General Actions and Project Timeline

Pre-Project Work (March to June 15)

- Identify and flag botany avoidance areas and invasive weed treatment areas;
- Identify and flag heritage avoidance areas;
- Meet with permittees to discuss project prior to turn out;
- Arrange field trip with interdisciplinary team to identify final fence configuration that would best reduce impacts within sensitive areas from wildlife and livestock movement and fence construction;
- Identify and flag trees within tipping units and develop guidelines with silviculture; and
- Work with the Public Affairs Office to create informational signs to be placed in the project area and put out a press release notifying the public of implementation in 2022 and 2023 if necessary.

Phase I (June 15 to July 15)

Work within Big Creek would entail tipping trees with an excavator or similar heavy equipment from identified tipping units starting June 15, 2022. These trees would be used within Big Creek reach 4 to augment 2018 restoration efforts and would be used within the newly restored floodplain and side channels. An excavator or grapple skidder would be used to move trees to desired locations adjacent to National Forest System Road 2090000, and a flatbed log truck or off-road dump truck would likely be needed to move these trees to staging areas along Big Creek reach 4 (see Figure 2). A grapple skidder would also be used to move trees from staging areas to locations along the creek to be placed during the in-water work period. Lodgepole identified in the lodgepole thinning unit along National Forest System Road 4560000 would be hand-felled. Lodgepole between 6 and 10 inches diameter at breast height would be felled, limbed, cut to 8-foot lengths, and hauled to Big Creek reach 4. Buck and pole material and tensioned cable fencing material would be delivered and staged along National Forest System roads 2090000 and 4560000 where exclosures are being built.

Phase II (July 15 to August 15)

Instream work would involve an excavator or similar heavy equipment building secondary wood structures and placing single pieces of wood on the floodplain and in side channels to add roughness and help dissipate stream energy resulting in deposition of fine sediment and gravels. Lodgepole posts would also be placed to help anchor secondary structures and single pieces of wood on the floodplain and in side channels.

Construction of exclosures for which material has been staged (both buck and pole and tensioned cable) would begin. Any part of the exclosures can be constructed during this phase as long as it does not interfere with access for equipment placing instream wood on the floodplain and side channels. All sections of fence that cross the stream must be completed during this phase within the in-water work period. Once the instream wood placement is complete and the heavy equipment is out, the exclosure can be completed in the wood placement areas.

Phase III (August 15 to November 15)

Construction of exclosures may continue as long as there is no instream equipment work associated. Planting of approximately 3,000 willow and cottonwood cuttings would begin in fall once hardwoods enter dormancy. Between October 15 and November 15 in normal years, rainfall returns and ideal conditions for planting occur. Willow and cottonwood cuttings would be harvested in close proximity to the project area where sources for cuttings are abundant. Planting focus areas include activated floodplain and side channels from 2018 work and within newly constructed exclosures. Planting strategy would focus on maximizing stream shade, streambank stability, and floodplain complexity.

Project-Specific Design Criteria

The following project-specific design criteria apply to this proposal:

- District archaeologist shall be included in the field trip designating the path of the fence line so that any cultural resources are avoided during fence construction.
- District archaeologist shall be notified 30 days before implementation and once work has been completed so a post implementation inspection can occur.
- Project lead shall coordinate with District archaeologist for a heritage monitor to be present during large wood placement near cultural features and artifact concentrations.
- Avoid heavy machinery travel on slopes steeper than 35 percent where feasible.
- No heavy equipment shall be allowed on highly erodible soil. “Highly erodible soil” generally means areas larger than 50 feet in diameter, and either: (1) steeper than 30 percent with less than 75 percent ground cover, (2) 20 to 30 percent slope with less than 50 percent ground cover, (3) 10 to 19 percent slope with less than 25 percent ground cover, or (4) with signs of current erosion, such as pedestaling or rilling.
- For tree-tipping or removal for large woody debris projects – On areas where existing skid trails spaced 100 to 140 feet apart can be reused, reuse the old skid trails. Otherwise, space heavy machinery travel ways approximately 120 feet apart where practical, using existing skid trails where possible and appropriate. Travel ways (“trails”) should average less than 14 feet wide.
- Low ground pressure equipment (less than 8.5 pounds per square inch) can be allowed off trails on dry, snow-covered, or frozen soil. For soil protection practices, “dry” means July through September, or obviously dry in 6 of the top 10 inches of the soil profile.
- Tree tipping trails shall be covered with slash to reduce runoff and erosion.
- Work with public affairs to notify the public of any road closures that will limit access to areas of the forest, and, as possible, avoid closures during high-visitation seasons (hunting, mushrooming) - especially if established dispersed camping locations will be impacted.
- Ensure full compliance with the National Forest Boundary Line Policy and Direction.

- Ensure adjacent landowners are adequately notified (Big Mosquito tree tipping western unit).
- Inform mine claimant of activities and timeline.
- To protect debris jams at culverts and bridges during high flows, use laydown fence and ensure fence is rolled up and removed from floodplain when cattle are not grazing in the area.
- Do not install fence within 50 feet of the toe slope of existing National Forest System road 4560000.
- There is a design contract operational at this site to develop new Big Creek crossing alternatives for National Forest System road 4560000. Survey and survey monuments will be completed in the floodplain and construction will need to use these monuments to match the design. This calls for the below requirements:
    - Do not install large woody debris in ways that could alter existing stream braids or channels.
    - GPS photos of where new large woody debris is installed in the floodplain shall be provided to the contract design engineer for the Big Creek Crossing after installation is complete.
    - Do not install fence within 50 feet of "Upstream Alternative 2" location (map has been provided to aquatics).
    - Existing survey monuments shall be protected and marked. Heavily flag and paint 20 feet from monuments and brief contractors of their locations to ensure they are protected. If they are accidentally altered, moved, or damaged, contact engineering immediately. A map of these monuments has been provided to aquatics.
    - For all pieces of placed large woody debris within 500 feet upstream of a culvert or bridge, the length of each piece with a rootwad should be less than 50 percent of the effective culvert or bridge opening width, and the length of each piece without a rootwad should be less than 75 percent of the effective culvert or bridge opening width. Use the existing structure opening widths for meeting these sizing and placement criteria within 500 feet upstream of the crossing.
- If any raptor or eagle nest is discovered within a half a mile of project site, consult with wildlife biologist for necessary mitigations to protect active nest during breeding and nesting period.
- Fences protecting critical fish habitat can also create hazards and barriers for wildlife, from big game to birds. By tailoring fence design and placement, injuries to wildlife and damage to fence can be reduced. Fencing should allow relatively easy passage for animals to jump over or crawl under and be highly visible for both ungulates and birds. The following field-tested design recommendations have been shown to control livestock in most situations and allow for easier wildlife passage. If a modification of a fence design is needed outside of the following specifications (such as the big-game exclosure proposed to deter game from browsing on new plantings for this specific project), consult wildlife biologist to reduce impacts to wildlife.
- These design modifications shall be used for barb wire fence construction to reduce wildlife injuries and decrease damage to fences:
    - Prior to fence construction, range, wildlife, and aquatics will conduct a field visit to identify the most appropriate location and passage modification to allow for wildlife passage. Wildlife-friendly wire spacing, materials, and other specifications shall be planned for and implemented regardless of implementation mechanism.
        - Wire strand spacing: the top wire or rail should be no more than 40 inches above the ground and absolutely no more than 42 inches. This should include adjustments for slope. (Figure

15). There should be a minimum of 12 inches between the top two wires. (Figure 16). There should be at least 18 inches between the bottom wire or rail and the ground. (Figure 16)

- When possible, reduce the number of wires to three. No more than 4 wires shall be used without consulting the district wildlife biologist.
- Smooth wire (double twisted) or rail should be used for the top and smooth wire should be used for the bottom. When the top wire is barbed, the second wire from the top should be constructed with smooth wire.
- If stays are necessary, wooden, stiff plastic, or composite stays will be used. No metal stays or other material that can easily bend and cause three-dimensional hazards shall be used.
- T-posts should be placed at 16.5-foot intervals.
- Remove old fences that are in disrepair and those that are no longer in use or functioning. Bale and carry away wire and dispose of or recycle it properly.
- Wildlife-friendly spacing specifications will be maintained during maintenance over the life of the fence. (Figure 17)

♦ The following additional passage modification shall be used around riparian habitats, water holes, stream corridors, and other high-quality habitats:

- Install gates, drop downs and/or drop-down rails, adjustable wire fence, lay-down fence, elk jumps or other passages modifications preferably where wildlife concentrate and cross (i.e., trails, known migration routes, etc.). Passage modifications will be placed a minimum of every 0.25 miles. If an exclosure is less than 0.25 miles, one or more passage modifications will be used to allow wildlife passage in and out of the exclosure. Passages shall be placed directly opposite one another on each side of the exclosure.
- When adjustable wire fence or lay-down fence is used to create wildlife passage, sections will be a minimum of 33 feet in length.
- Jumps, drop downs, or other modifications should not be placed under trees or brush that would make the modification impassable by big game or antelope.
- PVC pipe modification on top and/or bottom wire for big game and pronghorn passage should also be considered.
- Modifications to increase visibility (i.e., high-vis/white ploy-coated wire, markers, etc.) should be considered in these important habitats for birds and other wildlife species.
- When possible, fence should be constructed entirely of smooth wire around riparian habitats and stream corridors.
- Fence placement will be sited on the ground outside the channel migration zone.

♦ The following passage modification shall be used around areas where wildlife are known to move or migrate, and along swales, gullies, and ridges:

- Install gates, drop downs and/or drop down rails, adjustable wire fence, or other passage modifications preferably where wildlife concentrate and cross (i.e., trails, migration routes etc.).

- If areas of wildlife use are not obvious or known, crossing will be placed at a minimum every 0.25 miles. If fence is less than 0.25 miles in length per side, one or more passage modifications will be used to allow wildlife passage in and out of the exclosure.
- Lay-down fence should be considered and let down when the pasture is not in use by cattle. (Figure 13)

♦ The following passage modifications shall be used to adjust for slopes or along ditches or road edges that increase fence height above 42 inches for more than 0.25 consecutive miles:

- On steep slopes, the top wire height should be adjusted to account for slope. (Figure 15)
- Install jumps, drop downs, or other passage modifications a minimum of every 0.25 miles, preferably where wildlife concentrate and cross.
- Where possible, lay-down fence or adjustable wire fence design should be considered on terrain with steep slopes over longer distances. This will allow for easy passage of wildlife during migration periods when livestock are not present.
- Adjustable wire design: drop the top wire to the level of the second wire, either in sections or along an entire run of fence, to allow wildlife to jump over easily. Raise the lowest wire in the same way to allow wildlife to crawl under. (Figure 14)

♦ Fence will be let-down, adjusted, and gates secured open by the permittee as part of their permit conditions when livestock are not present, and fences will be put up and gates closed each year before livestock are turned out.

♦ Flag newly constructed fence in known wildlife migration corridors immediately after construction to protect the fence until wildlife and livestock become accustomed to the new barrier.

♦ All modifications shall have a GPS point taken which will be shared with wildlife following construction for effectiveness monitoring.

♦ If construction will occur through a Forest Service contract or agreement with a partner, a district wildlife biologist shall review the final contract specifications prior to solicitation of the bid.

♦ Fence will be constructed of high quality materials to reduce sagging and broken wires that create hazards for wildlife and livestock and to reduce time and costs associated with maintenance. The following fence materials are recommended, if modifications are necessary, consult with the wildlife biologist for review:

- Wire:
  - Will be new and consist of two twisted strands of 12.5-gauge steel wire with Class 3 galvanizing and minimum tensile strength of 170,000 PSI.
- Fasteners
  - Staples should be nine gauge or heavier galvanized or stainless steel, with a minimum length of one inch for close-grained hardwoods.
  - Staples shall be driven diagonally to the wood's grain at a slight downward angle, (or upward if the tension is upward) to avoid splitting the post and loosening the staples.
  - Space should be left between the inside crown of the staple and the post to permit free movement of high tensile barbed wire.

- Barbed staples shall be used for wooden posts. (Figure 18)
- Manufacturer's clips or 14-gauge Class 3 galvanized fasteners should be used. (Figure 19)

▪ Steel Posts

- Steel line posts shall have the standard "T" section, with nominal dimensions of 1 3/8 inches by 1 3/8 inches by 1/8 inch with an anchor plate.
- The posts shall be rolled from high carbon steel, weigh at least 1.33 pounds per foot of length and shall be hot-dip galvanized (best), enameled and baked, or painted with a weather resistant paint for steel.
- Posts should be studded to aid in wire attachment.

- An interdisciplinary team would identify the final fence configuration to reduce impacts to wildlife and livestock movement and avoid creating stream crossings and areas where cattle would congregate within sensitive areas;
- Sharp corners would be avoided;
- Exclosures would follow rangeland management recommendations;
- Exclosure maintenance shall be the responsibility of the Forest Service aquatics staff;
- Both exclosures would be in place for at least 5 years;
- After 5 years we would monitor the floodplain and side channels within the exclosures with a goal of meeting riparian management objectives for riparian vegetation in accordance with Malheur National Forest Plan, as amended. These specific objectives from Amendment 29 (PACFISH) are:
  - ♦ Ground cover: 90 percent of site potential covered by herbaceous species, litter, rock, moss, or lichens (using Merritt et al. 2017 or comparable);
  - ♦ Percent of side channel stream bank vegetated: 90 percent of site potential (using Multiple Indicator Monitoring or comparable);
  - ♦ Shade/canopy closure: 80 percent shaded for hardwood/meadow complexes (using SunEye or comparable)
- After 5 years, if all riparian management objectives are met, maintenance shall cease on sections of buck and pole fence, or sections of this fence maybe removed to allow for passage of wildlife into and out of fence. Sections of tensioned cable fence would be removed or the top several strands of the tension cable would be removed in order to allow for passage of big game in and out of exclosure.
- If riparian management objectives are not met after 5 years, an interdisciplinary team shall evaluate why riparian management objectives are not being met and what changes or strategies to take to achieve riparian management objectives.

Figures

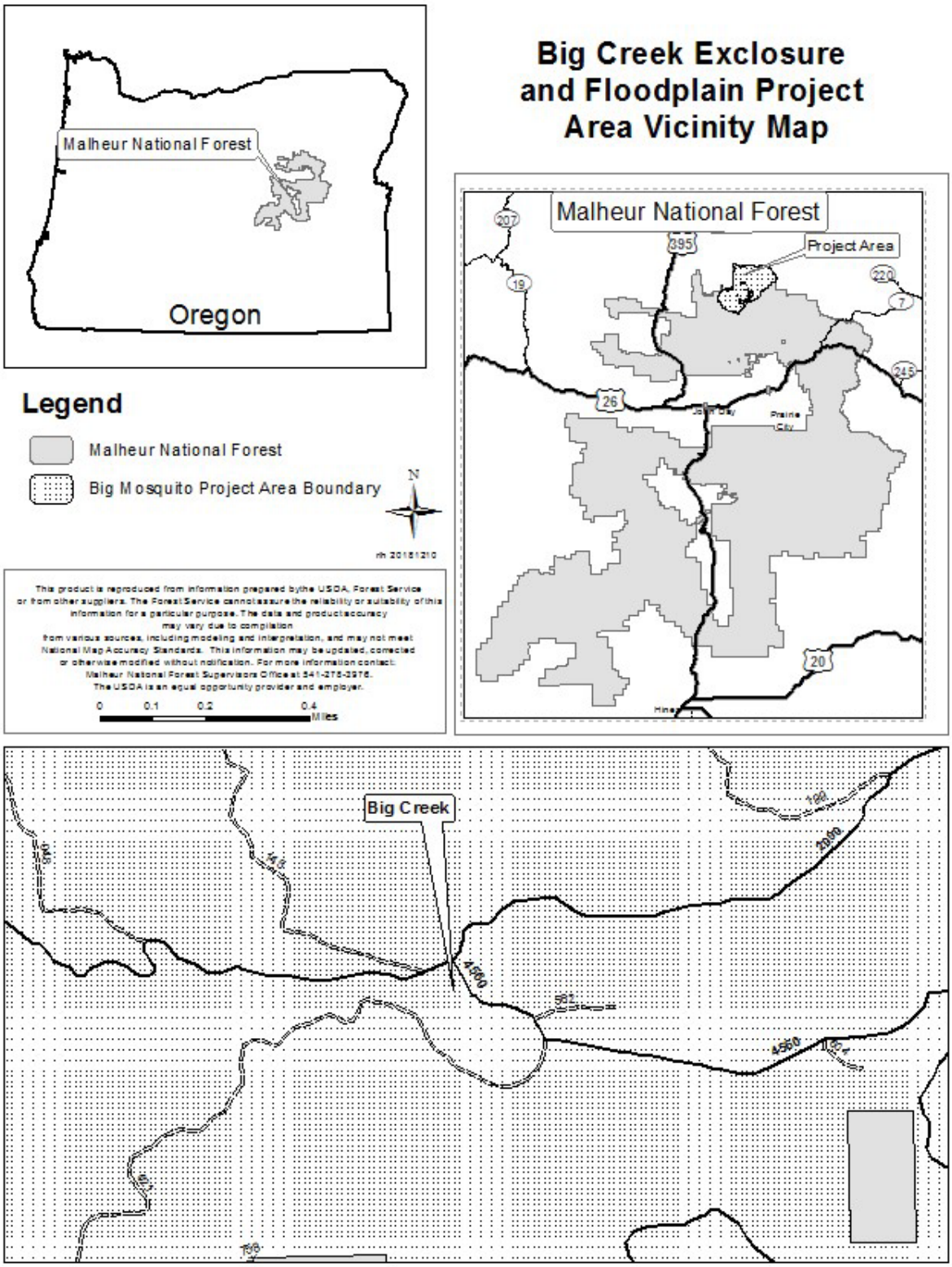

Figure 1. Big Creek Exclosure and Floodplain Restoration vicinity map

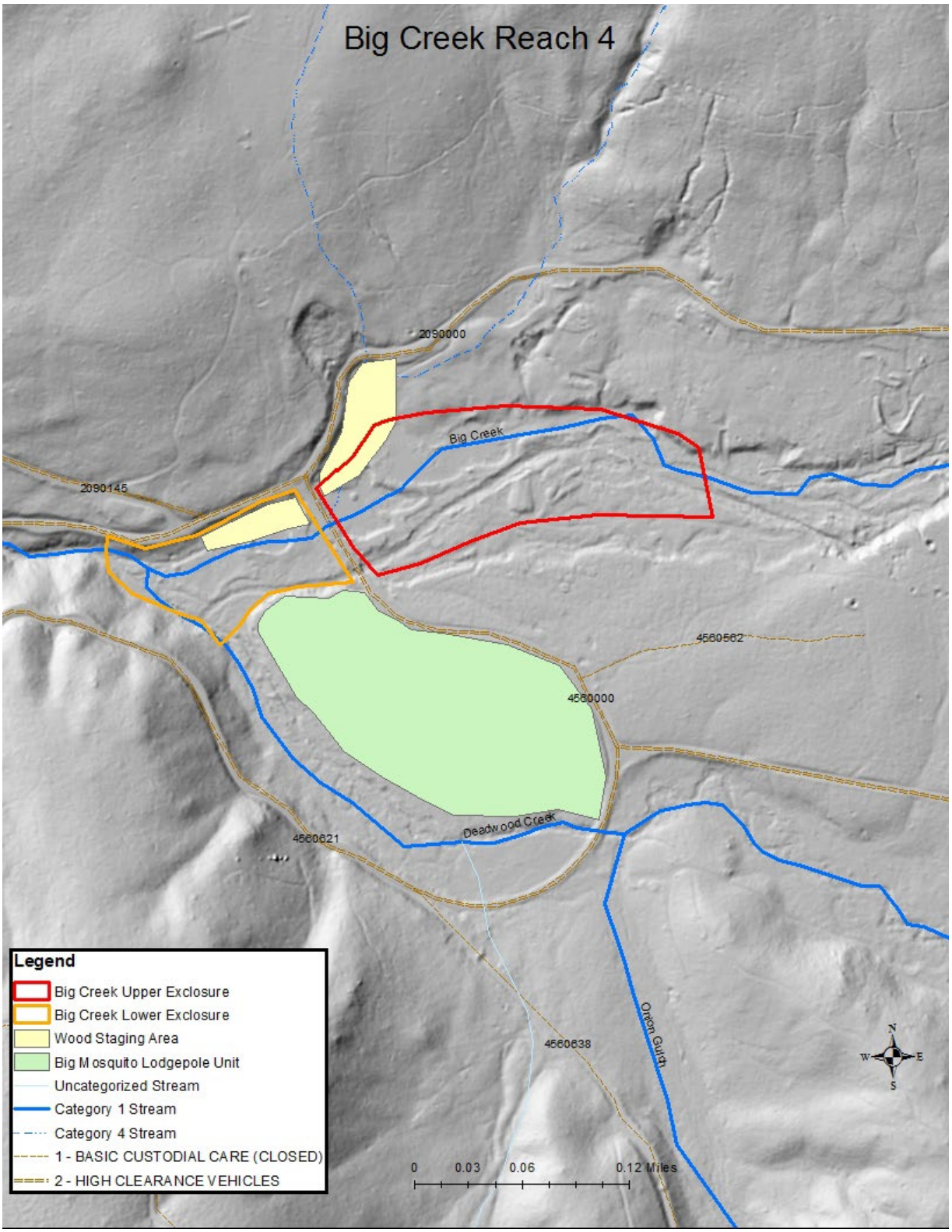

Figure 2. Big Creek Reach 4 Project Area

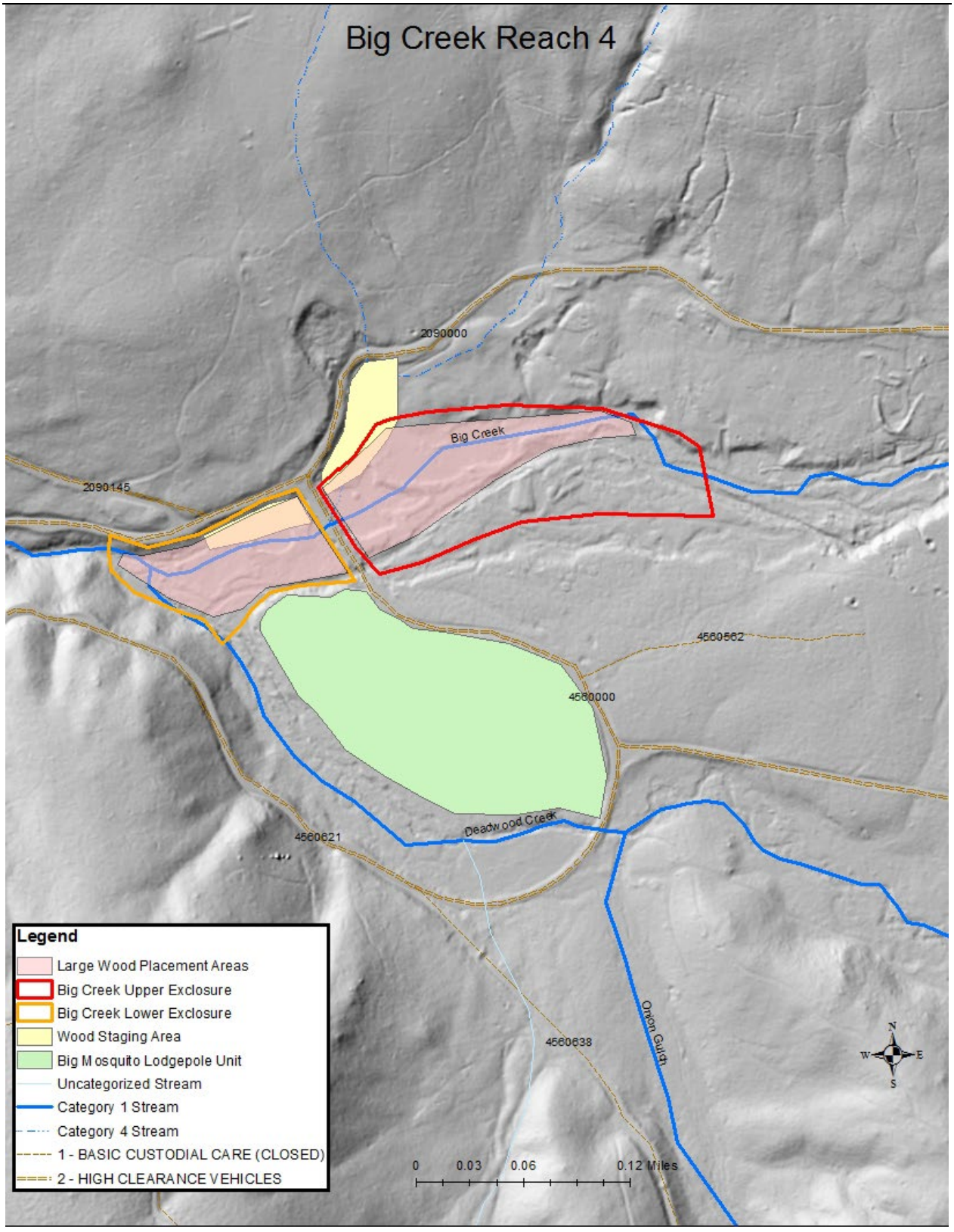

Figure 3. Big Creek Reach 4 Floodplain Wood Placement Areas

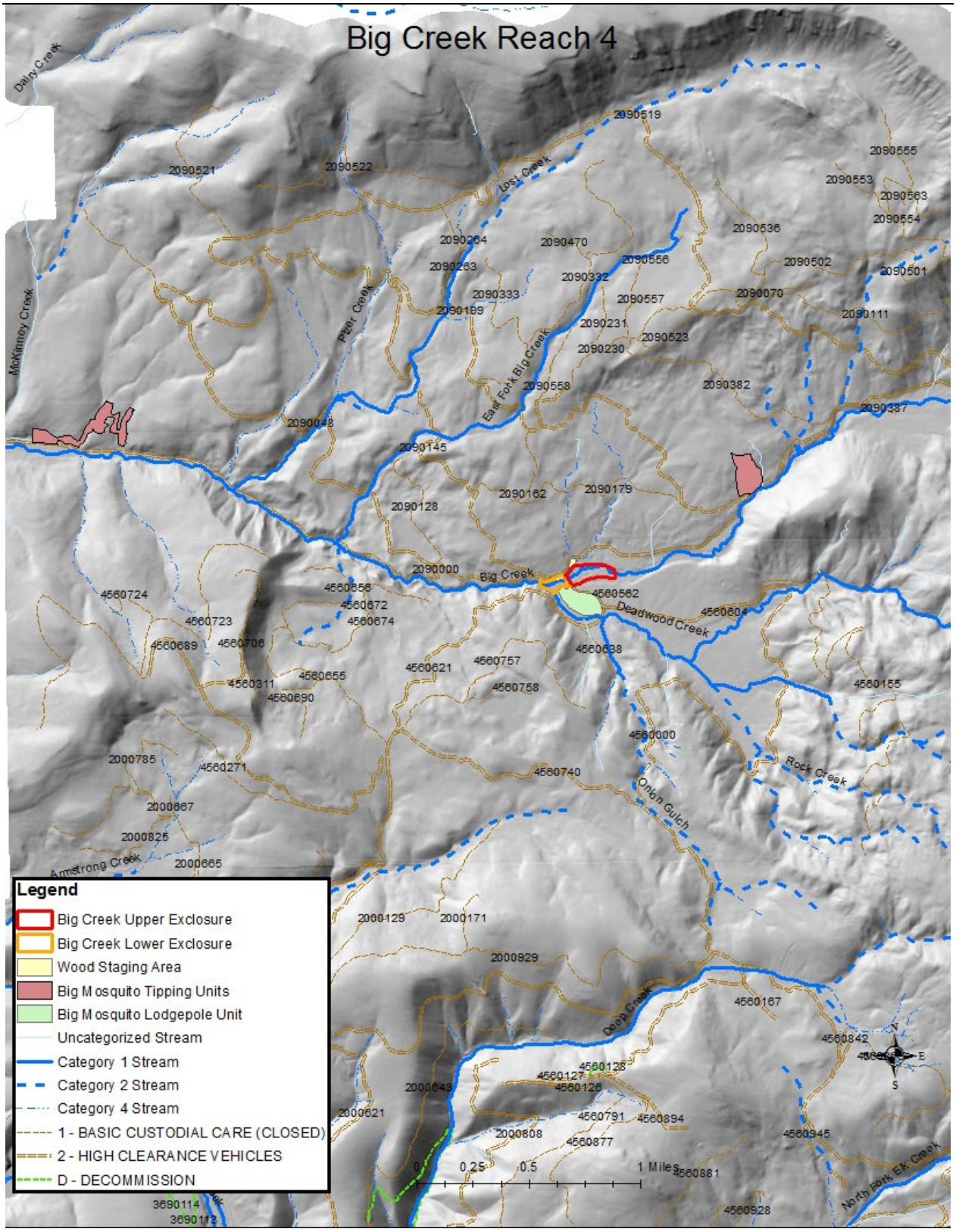

Figure 4. Big Creek Reach 4 Tree Tipping Units

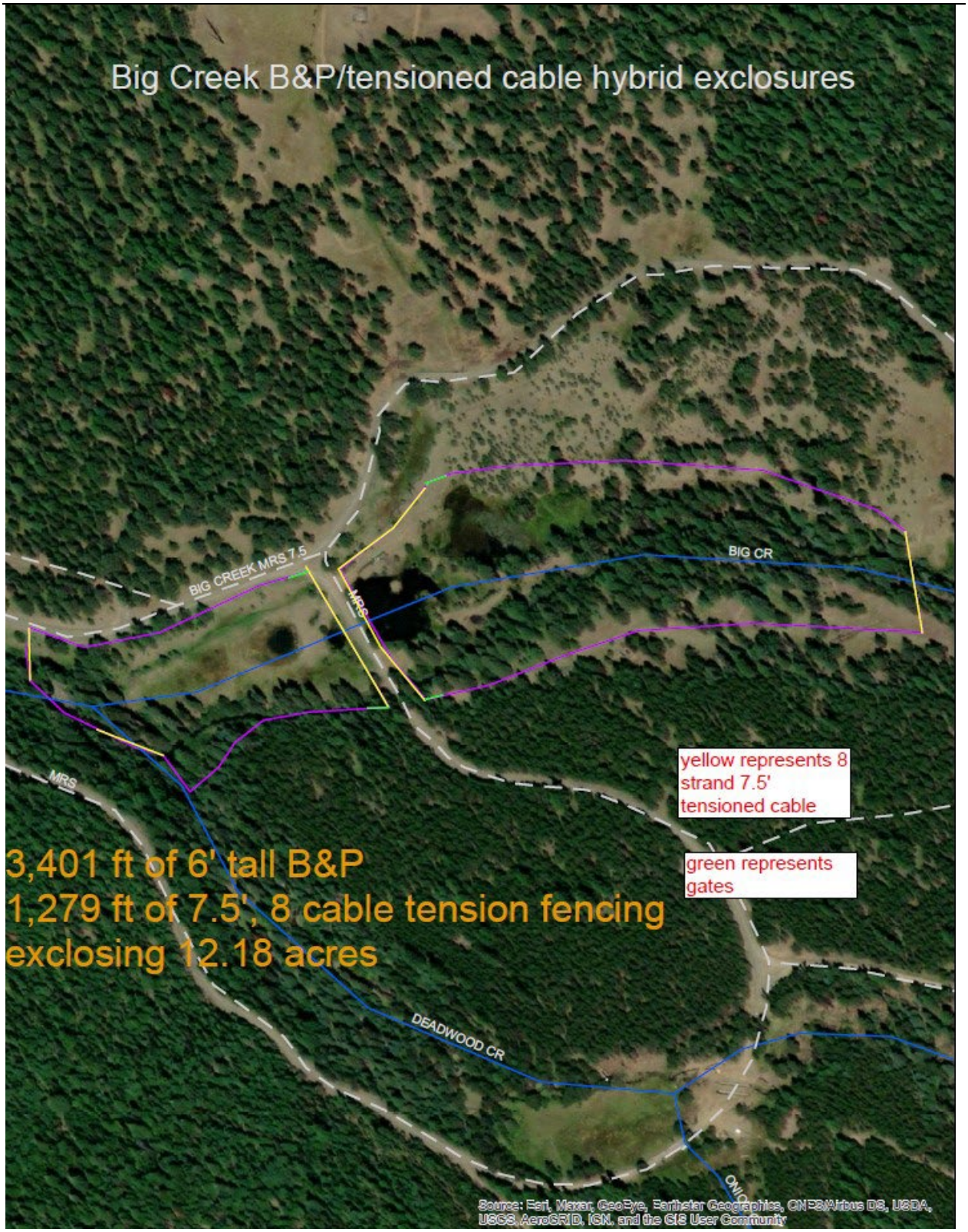

Figure 5. Big Creek exclosure, tensioned cable and buck and pole design. Purple represents buck and pole fencing.

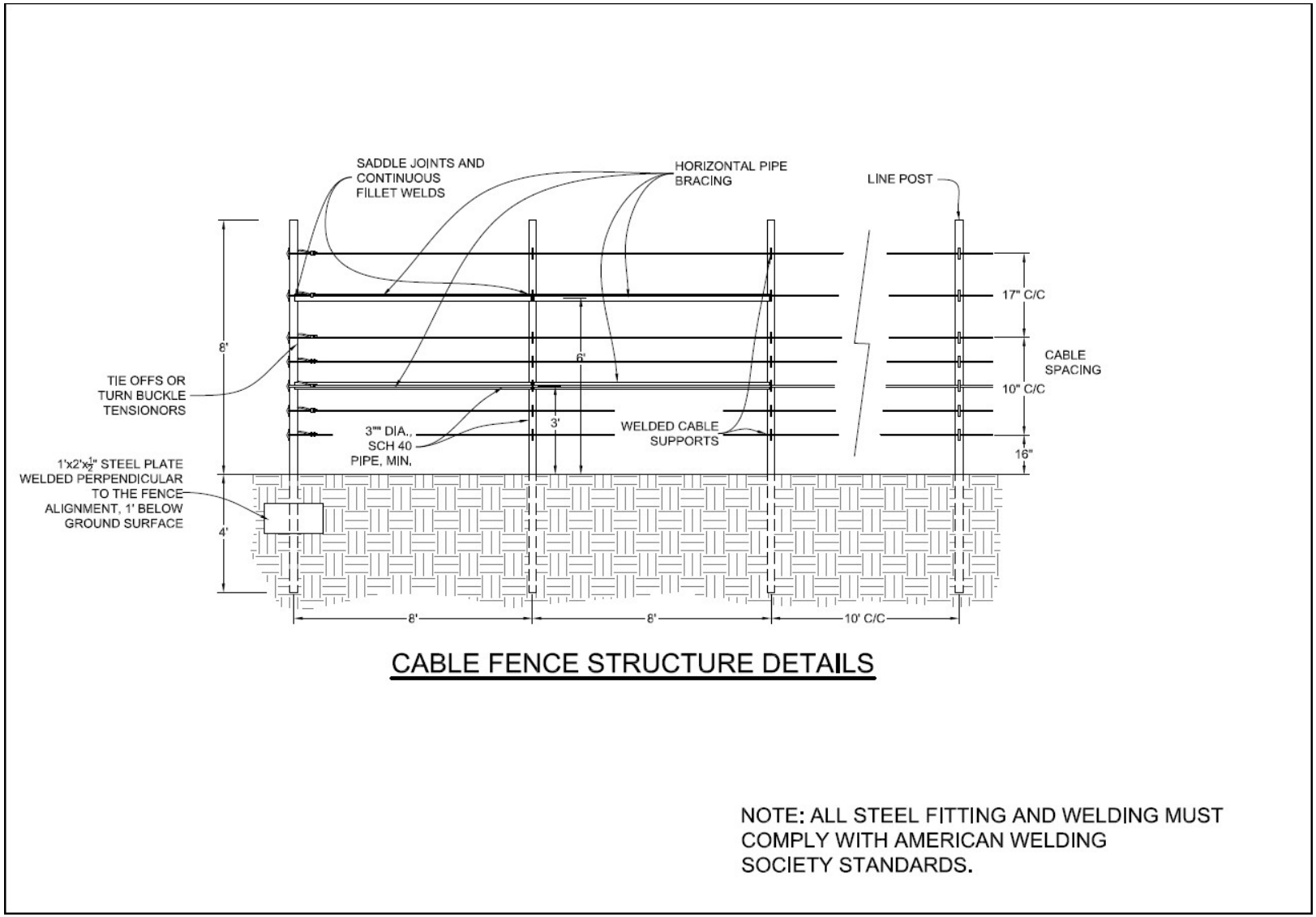

Figure 6. Fence design for the tensioned cable portions of the fence mapped above in Figure 5. Bottom strand in the above diagram shows 16" off the ground but the bottom strand will actually be 18 inches off the ground as described in Project-Specific Design Criteria.

Figure 7. Big Creek Reach 4 floodplain facing downstream of National Forest System road 4560000. Newly activated floodplain lacking riparian vegetation.

Figure 8. Big Creek Reach 4 floodplain facing upstream of National Forest System road 4560000. Newly activated floodplain lacking riparian vegetation.

Figure 9. Willows on the floodplain of Big Creek reach 4 fenced off with hog panels to protect from ungulate browsing.

Figure 10. Willows on the floodplain of Big Creek reach 4 fenced off with hog panels to protect from ungulate browsing.

Figure 11. Big Creek reach 4 headcuts and channel incision on the floodplain and side channels due to insufficient large wood to help dissipate stream energy and facilitate depositional processes.

Figure 12. Big Creek reach 4 newly activated floodplain facing downstream of National Forest System road 4560000. Insufficient large wood to dissipate stream energy and facilitate depositional processes.

Figure 13. Big Creek reach 4 newly activated floodplain facing downstream towards National Forest System road 4560000. Insufficient large wood to dissipate stream energy and facilitate depositional processes.

Passage Modifications

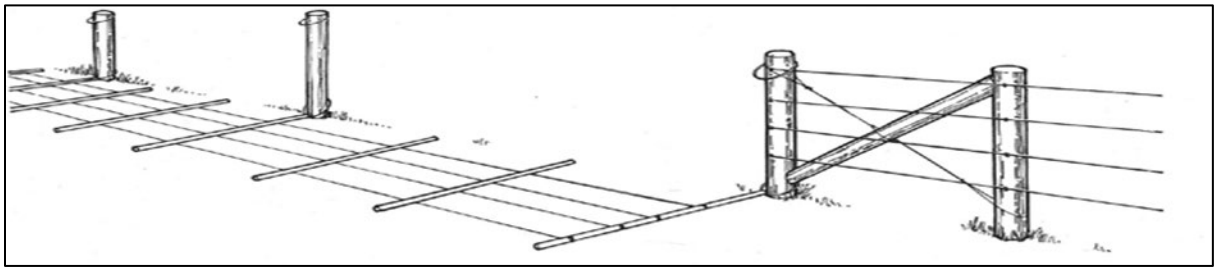

Figure 14. Lay-down modification allowing passage for wildlife where and when livestock are not present (Hanophy 2009).

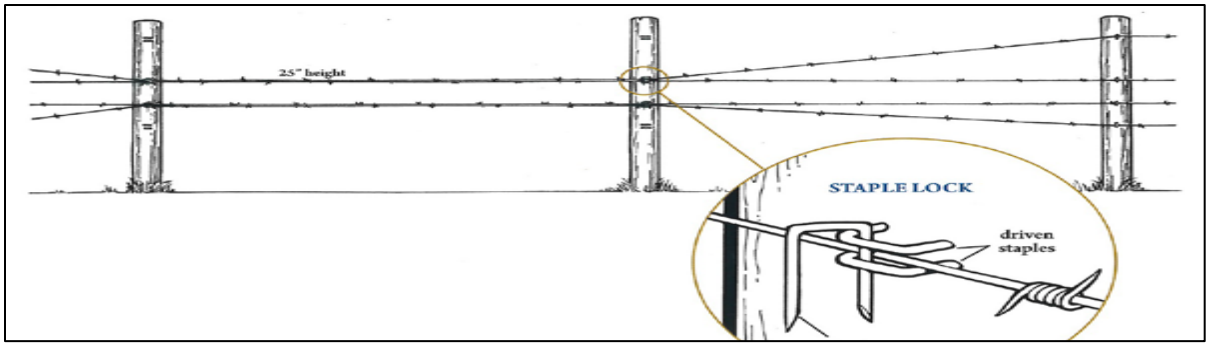

Figure 15. Adjustable fence to allow for wildlife passage around high quality habitats, on steep slopes, swales, gullies, ridges and/or when livestock are not present (Hanophy 2009).

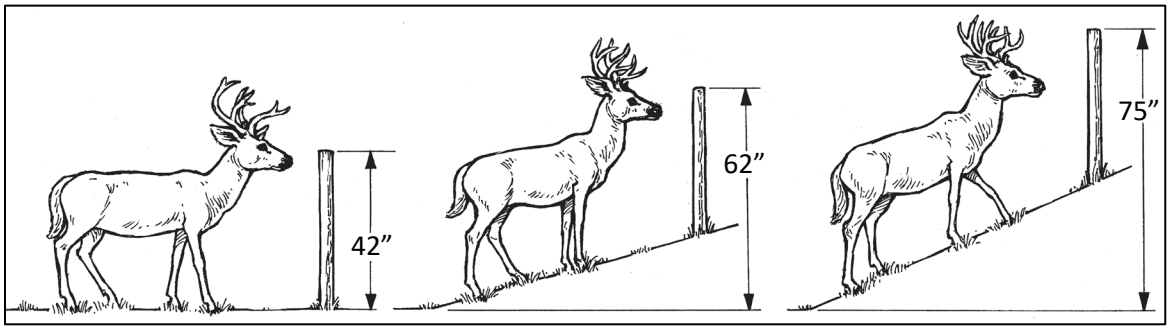

Figure 16. Influence of slope on fence height (Hanophy 2009).

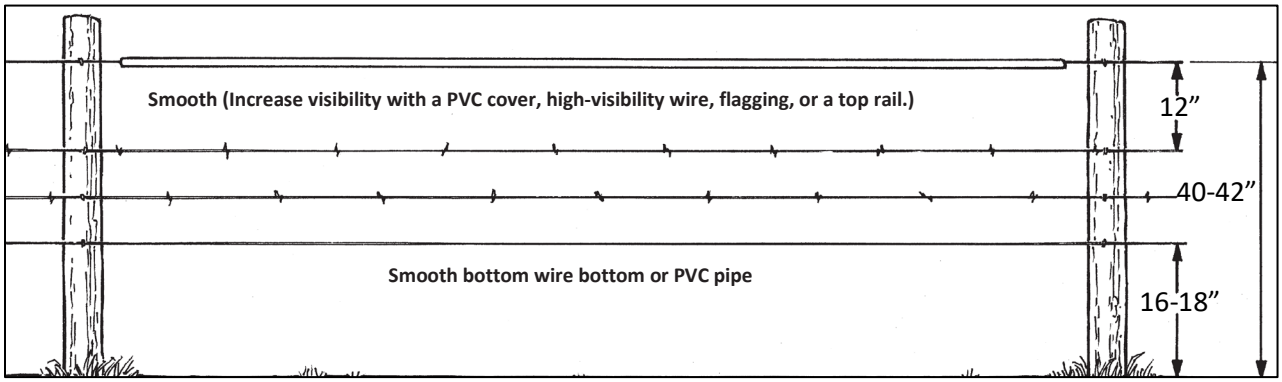

Figure 17. Wire fence with wildlife friendly fencing specifications (flat ground) (Hanophy 2009).

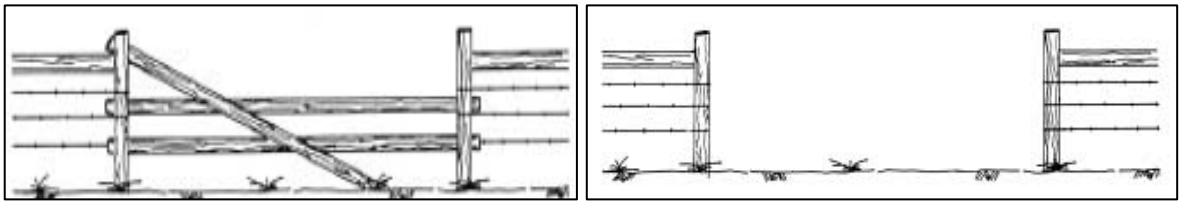

Figure 18. Wildlife jumps or gates made of corral poles stacked parallel to the ground. Vertical poles should not be less than 12 feet apart. One or more poles can be removed to allow for easy passage (Hanophy 2009).

Fastening Mechanisms for Adjustable Wire Fence

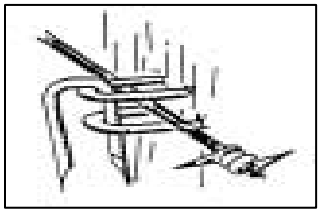

Figure 19. Staple lock. Simple and effective on wood posts. Holds wire tight if standard fence staples are used.

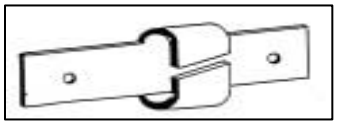

Figure 20. Metal Clip. Excellent on either wood or steel posts. Easy to install, no maintenance and allows fastest wire adjustment. Existing fences easy to modify with this clip. Variations of clip available for both adjustable and lay-down.

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Project Review

Malheur National Forest Aquatic Restoration Project
NEPA Compliance and Implementation Checklist

Project Number: 01032022 **Date:** 12/15/2021 **Location:** Big Creek Watershed
Category: 2. Large wood, boulder, and gravel placement; 5. Off – and side-channel habitat restoration; 6. Streambank restoration; 9. Livestock fencing, stream crossings and off-channel livestock watering; 14. Riparian vegetative planting; 16. Beaver habitat restoration
Project Description: Construct two exclosures (12.1 acres and 0.38 stream miles) and plant riparian hardwood cuttings within constructed exclosures. Tip trees within two tree tipping units and hand fell lodgepole for post material from lodgepole thinning unit. All identified units are from the Big Mosquito Project area. Tipped trees will be placed on the floodplain and in side channels and locked in place with lodgepole post. See project proposal for full description

Heritage (to be completed by heritage specialist)

Y / N	Initial	
Y	*EM*	Specific PDC for heritage addressed (heritage surveys; avoidance areas).

Botany (to be completed by botany specialist)

Y / N	Initial	
Y	*AH*	Specific PDC for botany addressed (sensitive plant surveys).
Y	*AH*	Specific PDC for noxious weeds addressed.

Land Management Consistency (is the proposed project within the management area? Check yes or no. If yes, comments should indicate whether proposed actions are consistent with the standards for the management area.)

Y / N	Initial		Y / N	Initial	
Y	*BSP*	4A big game winter range	**N**	*BSP*	9 research natural areas
N	*BSP*	6A and 6B wilderness	**N**	*BSP*	10 semi-primitive non-motorized recreation areas
N	*BSP*	7 scenic area	**N**	*BSP*	22/22A wild and scenic river
N	*BSP*	8 special interest areas	**N**	*BSP*	inventoried roadless areas

Comments: *Click here to enter additional comments.*

I have reviewed this project and have determined it is compliant with the Malheur Forest Plan and Aquatic Restoration environmental assessment project design criteria identified for my resource.

Table 1. Projects design criteria and Malheur Forest Plan compliance checklist

Resource	Signature	Date	**Comments** (additional PDCs may be noted if necessary) *May continue on next page
Heritage	*/s/ Emily Modelski*	4/13/2022	In addition to the PDC's listed in the Appendix, the District Archaeologist will be included in the fieldtrip designating the path of the fence line so that any cultural resources are avoided during fence construction. The District archaeologist will be notified 30 days before implementation and once work has been completed so a post implementation inspection can occur. The project lead will coordinate with the District archaeologist for a heritage monitor to be present during LWD placement near cultural features and artifact concentrations. There are no anticipated effects to cultural resources.
Botany	*/s/ Amanda Hardman*	4/5/2022	No concerns
Invasive Plants	*/s/ Amanda Hardman*	4/5/2022	No concerns
Wildlife	*/s/ Lauren Romstad*	4/19/2022	Project is consistent with Aquatic EA and final determination for wildlife species: no adverse impacts or effects expected to any sensitive, threatened, or endangered wildlife species. No records of active nests within ½ mile of this project at time of analysis, however, surveying this site for new nests was not possible this early in the year. Therefore, if any new nests are discovered, mitigation measures would be established to protect nest. Note: some PDCs listed are applicable to barbed wire cattle fencing and not applicable to the game-exclosure designed for this project. PDCs specific to this project include: for bottom strand of fence, maintaining 18" above ground to improve passage of calves and fawns; avoid sharp corners; monitor and remove top strands after establishment of riparian vegetation to allow for big-game passage into exclosures; use PVC or flagging on top strand of fence to increase visibility. If modifications to the design of the fence are needed after this checklist is signed, reference the complete PDC list for design specifications to meet wildlife friendly design and consult with wildlife biologist.
Fish*	*/s/ Cody Lund*	4/12/2022	Project is consistent with MNF Aquatic Restoration EA and ARBO II. Minor ground disturbance would result in an overall benefit to riparian vegetation, floodplain water storage, floodplain channel complexity, rearing and spawning habitat for ESA threatened bull trout and Mid-Columbia steelhead and protect previous/ongoing aquatic restoration investments.

Hydrology*	*/s/ Denine Schmitz*	4/22/2022	Follow MNF Aquatic EA and ARBO2 PDCs. This project may have short term impacts to water quality, but long-term benefits to floodplain development, channel form, and riparian function will improve shade and floodplain storage leading to movement toward meeting temperature standards.
Range	*/s/ Ardin Hoyt*	4/1/2022	No Range concerns identified.
Soils	*/s/ Leslee Crawford*	4/6/2022	In addition to the Soil PDCs listed in the Appendix to the Aquatic Restoration EA below, the following PDCs required as listed in the "Soil Protection Guidance for Aquatic Restoration Projects Using Heavy Equipment Off Roads" document. A copy of this document is available from the project Soil Scientist, upon request. These soil protection practices typically used to minimize adverse effects to the soil environment, in order to meet desired soil conditions (including the Forest Plan standards). • Avoid heavy machinery travel ("HMT") on slopes steeper than 35%, where feasible. • No heavy equipment shall be allowed on highly erodible soil. "Highly erodible soil" generally means areas larger than 50 feet in diameter, and either: (1) steeper than 30% with <75% ground cover, (2) 20-30% slope with <50% ground cover, (3) 10-19% slope with <25% ground cover, or (4) with signs of current erosion, such as pedestaling or rilling. • For tree-tipping or removal for LWD projects – On areas where existing skid trails spaced 100-140 feet apart can be reused, reuse the old skid trails. Otherwise, space HMT travel ways about 120 feet apart, where practical, using existing skid trails, where possible and appropriate. Travel ways ("trails") should average <14 feet wide. • Low ground pressure equipment (< 8.5 psi) can be allowed off trails on dry, snow-covered, or frozen soil. For soil protection practices "dry" means July through September, or obviously dry in 6 of the top 10 inches of the soil profile. • Tree tipping trails shall be covered with slash to reduce runoff and erosion.
Recreation	*/s/ Jared Bowman*	3/22/2022	No developed recreation resources are within, adjacent, or otherwise impacted by this project's location and actions. Work with PAO to notify the public of any road closures that will limit access to areas of the forest, and as possible avoid closures during high-visitation seasons (hunting, mushrooming) - especially if established dispersed camping locations will be impacted.
Special Uses	*/s/ Stacia Kimbell*	3/21/2022	No Lands Special Uses identified.
Lands	*/s/ Stacia Kimbell*	3/21/2022	Ensure full compliance with the National Forest Boundary Line Policy & Direction and adjacent landowners are adequately notified (Big Mosquito Tree Tipping western unit).
Mining	*/s/ Hannah Grist*	4/21/2022	Inform mine claimant of activities and timeline.

Engineering	*/s/ Matthew Smith*	5/2/2022	• To protect debris jams at culverts and bridges during high flows, use laydown fence and ensure fence is rolled up and removed from floodplain when cattle are not grazing in the area. • Do not install fence within 50 feet of the toe slope of the existing 4560 road. There is an A&E design contract operational at this site to develop new Big Creek crossing alternatives for the 4560-000 road. The USFS has already paid for survey and survey monuments in the floodplain and construction will need to use these monuments to match the design. This calls for the below requirements: • Do not install large woody debris in ways that could alter existing stream braids/channels. • The contract design engineer for the Big Creek Crossing requests GPS photos of where new Large Woody Debris is installed in the floodplain. Must provide these photos after installation is complete. • Do not install fence within 50 feet of "Upstream Alternative 2" location (map has been provided to aquatics). • Existing survey monuments must be protected and marked off. Heavily flag and paint 20 feet from the monuments and brief contractors of their locations to ensure they are protected. If they are accidentally altered, moved, or damaged, contact engineering immediately. A map of these monuments has been provided to aquatics. • The designer may choose a new 4560/Big Creek crossing location. Fence location may be altered or need to be removed because of this. • The fence may need to be moved for construction activities. For all pieces of placed large woody debris within 500 feet upstream of a culvert or bridge, the length of each piece of LWD with a rootwad should be less than 50% of the effective culvert or bridge opening width, and the length of each piece of LWD without a rootwad should be less than 75% of the effective culvert or bridge opening width. Use the existing structure opening widths for meeting LWD sizing and placement within 500 feet upstream of the crossing. This guidance comes from: https://wsdot.wa.gov/publications/manuals/fulltext/M23-03/Chapter10.pdf

Fuels / Fire	*/s/ Ed Clark*	3/30/2022	No fire and fuels concern
Silviculture	*/s/ Zane Murray*	4/25/2022	The project has a positive impact to silviculture. No concerns.
Visuals	*/s/ Kevin Green*	3/24/2022	Visual Quality Objectives for the project area is Maximum Modification. No PDCs required for Forest Plan compliance.

* Ensure that an experienced fisheries biologist or hydrologist is involved in the design of all projects covered by Aquatic Restoration Biological Opinion II. The experience should be commensurate with technical requirements of a project.

District Environmental Coordinator: */s/ Bethany Parker* Date: 5/10/2022

Line Officer Signature: */s/ Lisa Galbreath* Date: 5/5/2022

Appendix to the Aquatic Restoration EA

Implementation Description

Project name: Big Creek Exclosure and Floodplain Restoration
Project number: 01032022
Category 2: Large Wood, Boulder, and Gravel Placement; including tree removal for large wood placement
Category 5: Off- and Side-Channel Habitat Restoration
Category 6: Streambank Restoration
Category 9: Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering
Category 14: Riparian Vegetative Planting
Category 16: Beaver Habitat Restoration

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 (PDC) 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 PDCs 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 – 01032022
    b. Project name – Big Creek Exclosure and Floodplain Restoration
    c. Location – Township 09 South, Range 33 East, Section 19

Table 2. Project location information

Project Location	Big Creek Exclosure and Floodplain Restoration	
Stream name	Big Creek	
6th field HUC	170702030302	
Location	Latitude (decimal degrees)	Longitude (decimal degrees)
Big Creek Reach 4 (Top)	44.769	-118.786
Big Creek Reach 4 (Bottom)	44.768	-118.793

    d. Agency contact – Cody Lund, cody.a.lund@usda.gov
    e. Timing – Start date: 6/15/2022 End date: 10/31/2023
    f. Activity category –

Category 2: Large Wood, Boulder, and Gravel Placement; including tree removal for large wood placement

Category 5: Off- and Side-Channel Habitat Restoration

Category 6: Streambank Restoration

Category 9: Livestock Fencinig, Stream Corssings and Off-Channel Livestock Watering

Category 14: Riparian Vegetative Planting

Category 16: Beaver Habitat Restoration

g. Project description – Project description is available in the Proposed Action and Implementation Plan section above.
h. Species affected –
    i. Listed species: Middle Columbia River Steelhead, Bull Trout
    ii. Critical Habitat: Yes
    iii. MIS Species: Yes
i. Date of submittal – To be completed in Spring of 2022, at least 30 days 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 – Click here to enter text.
m. SOD project notification – Click here to enter text.

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: This project will be completed within 2 years, completion and annual reporting will occur in the winter of FY24 before February 28th.

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

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.

5. Off- and Side-Channel Habitat Restoration

Off- and side-channel habitat restoration projects will be implemented to reconnect historic side-channels with floodplains by removing off-channel fill and plugs. Furthermore, new side-channels and alcoves can be constructed in geomorphic settings that will accommodate such features. This activity category

typically applies to areas where side channels, alcoves, and other backwater habitats have been filled or blocked from the main channel, disconnecting them from most if not all flow events. These project types will increase habitat diversity and complexity, improve flow heterogeneity, provide long-term nutrient storage and substrate for aquatic macroinvertebrates, moderate flow disturbances, increase retention of leaf litter, and provide refuge for fish during high flows. Equipment such as excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Review and approve:** When a proposed side channel will contain greater than 20 percent of the bankfull flow, 16 the action agencies will ensure that the action is reviewed by the restoration review team and reviewed and approved by NMFS for consistency with criteria in NMFS (2011e).
b. **Data requirements:** Data requirements and analysis for off- and side-channel habitat restoration include evidence of historical channel location, such as land use surveys, historical photographs, topographic maps, remote sensing information, or personal observation.
c. **Allowable excavation:** Off- and side-channel improvements can include minor excavation (less than 10 percent of volume) of naturally accumulated sediment within historical channels. There is no limit as to the amount of excavation of anthropogenic fill within historic side channels as long as such channels can be clearly identified through field or aerial photographs. Excavation depth will not exceed the maximum thalweg depth in the main channel. Excavated material removed from off- or side-channels shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.

6. Streambank Restoration

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.

9. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering Facilities

Livestock fencing, stream crossings and off-channel livestock watering facilities projects will be implemented by constructing fences to exclude riparian grazing, providing controlled access for walkways that livestock use to transit across streams and through riparian areas, and reducing livestock use in riparian areas and stream channels by providing upslope water facilities. Such projects promote a balanced approach to livestock use in riparian areas, reducing livestock impacts to riparian soils and vegetation, streambanks, channel substrates, and water quality. Equipment such as excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Livestock fencing:**

i. Fence placement must allow for lateral movement of a stream and to allow establishment of riparian plant species. To the extent possible, fences will be placed outside the channel migration zone.

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

iii. Where appropriate, construct fences at water gaps in a manner that allows passage of large wood and other debris.

b. **Livestock stream crossings:**

i. The number of crossings will be minimized.

ii. Locate crossings or water gaps where streambanks are naturally low. Livestock crossings or water gaps must not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (for example, wetlands) due to congregating livestock.

iii. To the extent possible, crossings will not be placed in areas where ESA-listed species spawn or are suspected of spawning (for example, pool tailouts where spawning may occur), or within 300 feet upstream of such areas.

iv. Existing access roads and stream crossings will be used whenever possible, unless new construction would result in less habitat disturbance and the old trail or crossing is retired.

v. Access roads or trails will be provided with a vegetative buffer that is adequate to avoid or minimize runoff of sediment and other pollutants to surface waters.

vi. Essential crossings will be designed and constructed or improved to handle reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the trail if the crossing fails.

vii. If necessary, the streambank and approach lanes can be stabilized with native vegetation or angular rock to reduce chronic sedimentation. The stream crossing or water gap should be armored with sufficient-sized rock (for example, cobble-size rock) and use angular rock if natural substrate is not of adequate size.

viii. Livestock crossings will not create barriers to the passage of adult and juvenile fish. Whenever a culvert or bridge—including bridges constructed from flatbed railroad cars, boxcars, or truck flatbeds—is used to create the crossing, the structure width will tier to project design criteria listed for Stream Simulation Culvert and Bridge Projects under Fish Passage Restoration (PDC 21).

ix. Stream crossings and water gaps will be designed and constructed to a width of 10 to 15 feet in the upstream-downstream direction to minimize the time livestock will spend in the crossing or riparian area.

x. When using pressure-treated lumber for fence posts, complete all cutting or drilling offsite (to the extent possible) so that treated wood chips and debris do not enter water or flood-prone areas.

xi. Riparian fencing is not to be used to create livestock handling facilities or riparian pastures.

c. **Off-channel livestock watering facilities:**

i. The development of a spring is not allowed if the spring is occupied by ESA-listed species.

ii. Water withdrawals must not dewater habitats or cause low stream flow conditions that could affect ESA-listed fish. Withdrawals may not exceed 10 percent of the available flow.
iii. Troughs or tanks fed from a stream or river must have an existing valid water right. Surface water intakes must be screened to meet the most recent version of NMFS fish screen criteria (NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e), be self-cleaning, or regularly maintained by removing debris buildup. A responsible party will be designated to conduct regular inspection and as-needed maintenance to ensure pumps and screens are properly functioning.
iv. Place troughs far enough from a stream or surround with a protective surface to prevent mud and sediment delivery to the stream. Avoid steep slopes and areas where compaction or damage could occur to sensitive soils, slopes, or vegetation due to congregating livestock.
v. Ensure that each livestock water development has a float valve or similar device, a return flow system, a fenced overflow area, or similar means to minimize water withdrawal and potential runoff and erosion.
vi. Minimize removal of vegetation around springs, wet areas.
vii. When necessary, construct a fence around the spring development to prevent livestock damage.

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.

16. Beaver Habitat Restoration

Beaver habitat restoration includes installation of in-channel structures to encourage beavers to build dams in incised channels and across potential floodplain surfaces. The dams are expected to entrain substrate, aggrade the bottom, and reconnect the stream to the floodplain.

a. **In-channel structures:**
i. Consist of porous channel-spanning structures comprised of biodegradable vertical posts (beaver dam support structures) approximately 0.5 to 1 meter apart and at a height intended to act as the crest elevation of an active beaver dam. Variation of this restoration treatment may include post lines only, post lines with wicker weaves, construction of starter dams, reinforcement of existing active beaver dams, and reinforcement of abandoned beaver dams (Pollock et al. 2012).

ii. Place beaver dam support structures in areas conducive to dam construction as determined by stream gradient or historical beaver use.
iii. Place in areas with sufficient deciduous shrub and trees to promote sustained beaver occupancy.

b. **Habitat restoration:**

i. Beaver restoration activities may include planting riparian hardwoods (species such as willow, red osier dogwood, and alder) and building exclosures (such as temporary fences) to protect and enhance existing or planted riparian hardwoods until they are established (Malheur National Forest and the Keystone Project 2007).
ii. Maintain or develop grazing plans that will ensure the success of beaver habitat restoration objectives.
iii. As a means to restore desired vegetation (for example, aspen, willow, alder, and cottonwood) associated with quality beaver habitat, follow project design criteria in the *Riparian Vegetation Treatment (controlled burning) b. Noncommercial thinning associated with Moderate-severity burns* category.

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 burn 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 burns, but would be limited, and typically no heavy equipment would be used. Prescribed burns or wildfires could temporarily affect air quality.
- The project design criteria for both Juniper Removal and Riparian Vegetation Treatment (controlled burning) would be followed. National, state, and local policies regarding prescribed fire implementation will be met.
- Activities that are expected to create smoke emissions would follow the State of Oregon Smoke Management Plan. Prior to burning, approval will be obtained from the Oregon Department of Forestry, who determines compliance with the Clean Air Act. State smoke forecasts, which predict wind direction and smoke mixing height, will be obtained prior to all burning to ensure smoke intrusions will not occur in the local smoke sensitive receptor areas.
- Burning will follow the guidance provided by the Oregon Smoke Management Plan (Directive 1-4-1-601, Operational Guidance for the Oregon Smoke Management Program), which is an agreement between federal land management agencies in northeast Oregon and Oregon Department of Forestry limiting smoke emission amounts. Oregon Department of Forestry monitors activity, and if a limit is reached it will shut down prescribed fire activity.

Heritage Resources

- Compliance with section 106 of the National Historic Preservation Act for activities authorized under this analysis will be completed and concurred with by the Oregon State Historic Preservation Office before any ground disturbing action takes place. For each potential activity the district or zone archaeologist will determine which of the criteria in the 2004 Programmatic Agreement with the Oregon State Historic Preservation Office best fit the particular project. This will vary somewhat project to project based on the scale of the particular activity, the location on the landscape, and the nature of associated cultural resources, if any.
- The district or zone archaeologist will document their findings on a programmatic agreement form with a project description, rationale and location map which will be attached to the Forest Service Heritage Event database. The forest archaeologist will review and sign off on the programmatic review form if concurred with. For appendices A, B and C projects as defined in the 2004 Programmatic Agreement, the Forest will retain the documentation and provide the Oregon State Historic Preservation Office with the annual summary of projects as described in the Preservation Act.
- For full inventories the district or zone archaeologist will complete an inventory report meeting current Oregon State Historic Preservation Office (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.