



**Camp Lick Riparian Restoration
Aquatic Restoration Proposal and Checklist
USDA Forest Service
Blue Mountain Ranger District, Malheur National Forest
Grant County, Oregon**

Implementation Description

Table 1. Project information

2. Large wood, boulder, and gravel placement; 9 – Livestock fencing, stream crossings, and off channel livestock watering facilities (a,b); 13 Riparian Vegetation Treatment (b); 14 –Riparian vegetative planting; 16- Beaver habitat restoration (b)	Lead Preparer: Dan Armichardy
Applicant: Blue Mountain Aquatics	NEPA Reference: DN For Aquatic Restoration EA website*
Location: T10S, R32E, sec. 25 T11S, R32E, sec. 10, 28, 33, 34, 35 USGS Quad: Cougar Rock, Susanville	Lease/ /Case File/ Serial #: N/A (Reference #): N/A
Begin Date: 1/15/20	Due Date: 5/15/20

*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 and aquatic habitat along Camp Creek, including high priority riparian habitat for Endangered Species Act listed Middle Columbia River steelhead. The need for this project is to decrease or maintain cool water temperatures for rearing juvenile Middle Columbia River steelhead and recover riparian plant communities for beaver restoration within this tributary to the Middle Fork John Day River.

Camp Creek has significant portions of stream channel that are over-widened, lack abundant shade, and have high water temperatures. However, these areas have the potential to provide for high levels of juvenile rearing abundance, providing water temperatures that are survivable within steelhead lethal limits.

Restoration efforts implemented over the last 10 years have provided more rearing habitat, stored water on the landscape, and revegetated streams. This project proposes to continue these efforts, by planting hardwoods and fencing portions of the Camp Creek watershed to enhance and protect hardwood growth and protect restoration efforts. Floodplain constraints would also be removed, increasing connectivity of historical side channels and wetlands, which would put these streams on a trajectory to self-adjust over the long term. Proposed planting would increase cottonwood, willow, and water birch cover, increasing



seed production benefits over time to self-maintain the rest of the reach. This would also increase beaver habitat, which would improve the ecohydrologic¹ functions of this particular landscape.

Background

Effective stream shade and water temperature are the two major limiting factors for juvenile rearing capacity on Camp Creek. Riparian vegetation and its processes of streambank shading, root reinforcement, and terrestrial insect production are limited due to constraining legacy features like railroad grade levees, lowered water tables, ungulate browsing, and loss of overbank flooding. The lack of these processes in core habitat areas of Camp Creek negatively impacts ecosystem functions such as maintaining cold water for cool water fisheries in and downstream of these reaches.

Alder vegetation was established following livestock management changes in the early 1980s. Willow and cottonwood communities are present in isolated numbers; however, they lack multiple age classes and distribution to maintain riparian resilience, provide shade and habitat, and provide for beaver life cycle histories that will self-maintain Camp Creek long into the future. Flood flows that have overtopped the railroad grade have developed multiple headcuts due to a lack of riparian plant communities with root masses that can withstand overbank flooding processes. As a result, upland plant species occur on the dry side of the floodplain. Where the creek runs through the floodplain, single threaded, long riffles with large substrate sizes are abundant where beaver likely maintained multithreaded channels and willow/cottonwood communities over centuries.

This project would include the planting of approximately 11,000 rooted willow, 11,000 rooted cottonwood, and 2,500 rooted water birch within critical thermal loading areas, fenced areas, and newly restored areas on Camp Creek. Protection of the planting investments would include use of encroaching lodgepole for buck and pole fencing, and wildlife enclosure fencing. The particular fencing type prescribed is based on shrub utilization type and primary browsers (elk or deer). Studies have shown that in the absence of grazing by domestic livestock, browsing pressure from deer and elk may limit the potential to restore native riparian forests. The Middle Fork Intensively Monitored Watershed team observed that browsing by deer and elk suppressed the growth of most hardwoods and can prevent riparian plants from growing tall enough to shade the river in some areas (MFIMW 2017).

Water temperatures in most years negatively influence juvenile over-summer habitats for steelhead within Camp Creek. The Middle Fork Intensively Monitored Watershed team found that the primary cooling mechanism of the Middle Fork John Day River occurred at the confluence of the mainstem and its tributaries, where tributaries supplied cooler, groundwater-rich water into the main channel. These tributaries can provide miles of potential thermal refugia from warm Middle Fork John Day River water temperatures and mediate downstream warming, potentially expanding suitable thermal rearing habitat downstream. These areas have been identified through thermograph temperature monitoring over multiple years and the modelling of solar radiation. They have also been modelled using the Beaver Restoration analysis tool (BRAT) developed by Utah State University and were identified as high potential for beaver restoration, with the main limiting factor being vegetation (Macfarlane et al. 2019). Lack of shade from riparian plants limits Middle Columbia River steelhead productivity for some of these tributaries and the Middle Fork John Day River due to elevated water temperatures, particularly during drought years. Stress induced by high water temperatures can result in mortality particularly for juvenile salmonids.

¹ Ecohydrology: an interdisciplinary field studying the interactions between water and ecosystems. These interactions may take place within waterbodies, such as rivers and lakes, or on land in forests, deserts, and other terrestrial ecosystems. Areas of research in ecohydrology include influence of vegetation on stream flow, and function and feedbacks between ecological processes and the hydrological cycle.



Middle Columbia River steelhead numbers in the John Day River Basin are considerably lower than historical levels. To address this decline, the state of Oregon, National Marine Fisheries Service, and Northwest Power and Conservation Council have developed largescale recovery plans. The Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan (NMFS 2009) rated the Camp Creek watershed as a high priority for habitat protection and restoration within the Middle Fork John Day River subbasin. Key watershed issues in these subwatersheds are fish passage barriers; altered hydrology and sediment routing; and degraded floodplains, riparian communities, stream channels (habitat diversity and quantity), and water quality (stream temperature).

This project directly addresses stream temperature and, combined with actions from previous aquatic restoration work, facilitates the inundation of the valley. This would increase organic matter deposition and improve riparian productivity of newly planted or protected cottonwoods, willows, and water birch in critical shade areas (riparian communities).

The actions proposed by this project are part of the remaining essential actions for the Camp Creek Watershed Restoration Action Plan. The exception is the lowermost 1 mile of Camp Creek which is scheduled for implementation in 2021 or 2022.

Desired Condition

The desired conditions of the Camp Lick Riparian Restoration project area are:

- Improved riparian vegetation (increased algae mats; brook grasses; spike rushes; sedges; bulrushes; young and middle age class groups of cottonwood, willow, and dogwood species; and composition of wetland obligate plant communities);
- Reduced stream temperature (reduced width-to-depth ratio of the stream and increased effective shade);
- Reduced ungulate browsing;
- Restored side channels and wetlands (increased length of side channels and the areas connected to peak flows that store water longer);
- Improved floodplain condition (increased area of the floodplain that can be inundated frequently);
- Improved bed and channel form (decreased average riffle length);
- Restored altered flow timing (increased residence time of water on Camp Creek's floodplain through reconnected side channels and slowed water flow through wetlands and beaver dams);
- Increased juvenile rearing habitat in proximity of threatened Middle Columbia River steelhead spawning habitat overall; and
- Increased juvenile rearing capacity for Chinook salmon which currently enter Camp Creek and its main tributary (Lick Creek) from the Middle Fork John Day River.

Land Use Plan Conformance

The project falls under Management Areas 3B "Anadromous Riparian Areas," 4A "Big Game Winter Range," and 13 "Old Growth," 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 and/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 Areas 4A "Big Game Winter Range" and 13 "Old Growth:"

- 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 habitat.
- 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 of 2020 or 2021.
- Management Area 13, goal: "Manage old growth for wildlife and plant habitat, ecosystem diversity, and aesthetic quality," (USDA Forest Service 1990, page IV-47). This project is consistent with this goal because it would enhance and protect riparian habitat within and adjacent to old growth. In addition, the removal of lodgepole along National Forest System road 3640000 would enhance old growth characteristics and remove ladder fuels.

Camp Creek Reaches 3, 4, 5, 7, 8, and 9 are within a category 1 riparian habitat conservation area (fish-bearing stream) as designated by PACFISH/INFISH², and contain critical habitat for Middle Columbia River steelhead as designated by the National Marine Fisheries Service. This project is consistent with PACFISH by design and implements watershed restoration projects in a manner that promotes the long-term integrity of ecosystems, and fish habitat restoration and enhancement actions in a manner that contributes to attainment of the Riparian Management Objectives (USDA Forest Service 1995, standards WR-1 and FW-1, page C-18).

Proposed Action and Implementation Plan

The following project activities would occur in Camp Creek Reaches 3, 4, 5, 7, 8, and 9 as part of this proposal (see Figure 1). Implementation actions are scheduled to begin in 2020 and may continue until October 2021 depending on weather and contractor pace.

The specific actions proposed within this project are to:

- Construct eight exclosures (combination of wildlife and buck and pole) totaling 57 acres and enclosing 2.4 miles of Middle Columbia River steelhead designated critical habitat on Camp Creek within areas highly sensitive to solar radiation and sites of recent aquatic restoration work (Table 3).
- Thin lodgepole along approximately 4.2 miles of closed and open road within the outer 100 feet of riparian habitat conservation area along wide valley meadows adjacent to National Forest System roads of upper Camp Creek. Lodgepole between 4 and 12 inches diameter at breast height would be selected for removal to release larch, ponderosa pine, Douglas-fir, and riparian hardwoods.

² PACFISH refers to USDA Forest Service 1995a, and INFISH refers to USDA Forest Service 1995b.



- Remove lodgepole within one aspen stand.
- Tip trees in riparian habitat conservation areas.
- Plant 11,000 rooted cottonwood, 11,000 rooted willow, and 2,500 rooted water birch. Planting would occur in clusters within exclosures to maximize shade and protect investments.
- Provide posts and small woody material for the Camp Valley Restoration Project (Phase II) in lower Camp Creek.

Detailed Action Description

Lodgepole ranging from 4 inches to 12 inches diameter at breast height would be felled or tipped along the National Forest System roads listed below for an approximate total distance of 4.2 miles. Selection would focus on areas where stands are overstocked and lodgepole is competing with larch, ponderosa pine, Douglas-fir, and riparian hardwoods.

Table 2. National Forest System roads with proposed lodgepole felling or tipping

National Forest System Road	Road Status (Open or Closed)	Distance
1800867	Closed	0.46 miles
3600000 / 3640000	Open	2.65 miles
3600930	Open	0.10 miles (which includes aspen stand)
3645273	Closed	1.00 mile

The following actions and guidance would be part of the lodgepole thinning actions along the identified National Forest System roads, and for exclosure construction.

Lodgepole Thinning

- Equipment would operate adjacent to the road prism when feasible to minimize impacts to the road surface. Equipment would include a feller buncher and loader.
- The majority of the work would be within the outer riparian habitat conservation area. Chainsaws would be used to fell and would be followed by equipment operating within approximately 200 feet of the road prism that would cut the felled trees to length, then limb and pile them for haul to exclosure areas and the Camp Valley Phase II project areas.
 - All lodgepole less than 10 inches diameter at breast height and within double the drip line of ponderosa pine, western larch, Douglas-fir, and hardwoods would be removed.
 - All lodgepole between 4 and 6 inches diameter at breast height would be cut in 8 to 10 foot lengths, hauled, and staged at buck and pole exclosure areas for use in construction of buck and pole exclosures.
 - Lodgepole between 6 and 10 inches diameter at breast height would be harvested and cut into 8 to 12 foot lengths and hauled on National Forest System Road 3600000 to Camp Valley Phase II project area to be utilized for approximately 6 to 8 miles of aquatic restoration. All trees would be limbed and cut to length. They would be staged at areas identified for whole trees as part of Camp Valley Phase II restoration (see Camp Valley Restoration Project (Phase II), aquatic restoration checklist for staging areas).
 - Lodgepole greater than 10 inches diameter at breast height may be tipped where feasible or hauled as whole trees to areas identified for whole trees as part of Camp Valley Phase



II restoration (see Camp Valley Restoration Project (Phase II), aquatic restoration checklist for staging areas).

- All slash from harvest would be piled along the roadside and hauled 6 to 8 miles to Camp Valley Phase II project area where it would be staged at areas identified for whole trees as part of Camp Valley Phase II restoration (see Camp Valley Restoration Project (Phase II), aquatic restoration checklist for staging areas), then used for aquatic restoration activities.

Exclosure Configuration and Construction

- All exclosures would follow wildlife guidelines and recommendations for design and material.
- All exclosures would have, at a minimum, an entry and an exit point.
- Exclosures would follow rangeland management guidelines.
- 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.
- Exclosure maintenance will be the responsibility of the Forest Service aquatics staff.



Table 3. Enclosures proposed in Camp Creek watershed to be implemented between 2020 and 2021 using multiple funding sources. The enclosures would protect approximately 2.43 stream miles and 57.6 acres. The estimated total cost would be \$221,681.

ID	Stream and Reach	Stream miles	Past Restoration	Acres	Type of Enclosure	Fence Perimeter (feet)	Fence Perimeter (miles)	Estimated Cost	Match to Cover Estimated Cost and Funding Obtained	Implementation
2 ^c	Camp Creek Reach 8	0.3	2016	6.93	Wildlife	2,834	0.54	\$14,171	\$105,000 Bring Back the Natives Grant	Fall 2020
3 ^c	Camp Creek Reach 8	0.35	2016	6.29	Wildlife	3,638	0.69	\$18,188	\$105,000 Bring Back the Natives Grant	Fall 2020
4 ^d	Camp Creek Reach 5	0.13	2011 and 2019	2.21	Wildlife	1,552	0.29	\$7,758	\$113,000 Collaborative Forest Landscape Restoration Program, USDA Forest Service (electric fencing, Camp Valley restoration phase I)	Fall 2020 ^e
5 ^d	Camp Creek Reach 4	0.22	2011	7.70	Wildlife	2,743	0.52	\$13,713	\$167,000 Oregon Watershed Enhancement Board (electric fencing, Camp Valley restoration phase II)	Fall 2020 ^e
6 ^d	Camp Creek Reaches 4 and 5	0.48	2011 and 2019	9.57	Wildlife	5,298	1.00	\$26,490	\$167,000 Oregon Watershed Enhancement Board (electric fencing, Camp Valley restoration phase II)	Fall 2020 ^e
11 ^f	Camp Creek Reach 9	0.09	2014	1.47	Buck and pole	1,300	0.25	\$15,600	\$200,000 Camp Creek Revegetation Oregon Watershed Enhancement Board, Focused Investment Partnership (planting / buck and pole fence)	Fall 2020

^c These are fences that are included in Bring Back the Natives Grant. They would likely provide the greatest benefit to water temperature. The fences also overlap with the Oregon Watershed Enhancement Board Focused Investment Partnership (OWEB FIP) Camp Creek headwaters revegetation planting proposal which would come online 2020 to 2021.

^d These enclosures are within the Camp Valley Restoration Phase I to Phase II areas and would effectively protect the investments made (planting and revegetation of newly reconnected side channels and aquatic restoration). Electric fencing materials were included as part of funding.

^e Includes electric fencing and wildlife enclosure rebuilding.

^f Enclosures partially within the Camp Creek Headwaters Project (2016) and the Camp Creek Large Woody Debris Project (2014) and where water temperature increases of up to 8 °C have been documented. Funding for these enclosures is included within the Camp Creek revegetation OWEB FIP.



ID	Stream and Reach	Stream miles	Past Restoration	Acres	Type of Enclosure	Fence Perimeter (feet)	Fence Perimeter (miles)	Estimated Cost	Match to Cover Estimated Cost and Funding Obtained	Implementation
12 ^f	Camp Creek Reach 9	0.12	2016	1.76	Buck and pole	1,418	0.27	\$17,012	\$200,000 Camp Creek Revegetation Oregon Watershed Enhancement Board, Focused Investment Partnership (planting / buck and pole fence)	Fall 2020
13 ^f	Camp Creek Reaches 8 and 9	0.14	2016	3.87	Buck and Pole	1,813	0.34	\$21,751	\$200,000 Camp Creek Revegetation Oregon Watershed Enhancement Board, Focused Investment Partnership (planting / buck and pole fence)	Fall 2020
14 ^c	Camp Creek Reach 7	0.33	2016	5.50	Buck and Pole	3,430	0.65	\$41,156	\$105,000 Bring Back the Natives Grant	Fall 2020
19 ^d	Camp Creek Reach 3	0.27	2011	12.27	Buck and Pole	3,820	0.72	\$45,842	\$113,000 Collaborative Forest Landscape Restoration Program, USDA Forest Service (electric fencing, Camp Valley restoration phase II)	Fall 2020 ^e



Project Timeline

Pre-Project Work (March to June 15)

Pre-project work would include:

- Identifying and flagging botany avoidance areas and invasive weed treatment areas;
- Identifying and flagging heritage avoidance areas;
- Meeting with permittees to discuss the project prior to turn out;
- Working with the Public Affairs Office to place informational signs in the project area and submit an article to the Blue Mountain Eagle describing the project to notify the public of implementation in 2020 or 2021; and
- Purchasing material for buck and pole fencing (nails); wire fencing and posts for wildlife enclosures; and other construction materials.

Phase I (May 15 to July 15)

Work within Camp Creek would entail thinning lodgepole and stacking material along National Forest System roads identified for haul. All lodgepole would be hand-felled with a chainsaw, then followed by a loader and feller buncher that would cut poles to length and pile limbs. The loader would tip lodgepole larger than 10 inches diameter at breast height to utilize as large wood for Camp Valley Phase II Project and transport felled trees for processing. All limb and top material would be piled and hauled to the Camp Valley Phase II project areas. Lodgepole post material would be hauled to Camp Lick buck and pole enclosure areas and Camp Valley Phase II project areas along National Forest System Road 3600000. In addition to lodgepole buck and pole fence material, purchased material for wire fence would be hauled in and staged at wildlife enclosure locations.

Phase II (July 15 to August 15)

Construction of enclosures for which material has been staged (both buck and pole and wildlife) would begin, starting with upper Camp Creek areas and ending with enclosures within Camp Valley Phase II (upper Camp Creek reaches 7, 8, and 9 and lower Camp Creek reaches 3, 4, and 5). This work would occur as soon as aquatic restoration in those areas is completed.

Phase III (October 15 to November 12)

Construction of enclosures would continue. Planting of rooted riparian hardwoods would begin.

A mixture of wetland plant and riparian hardwood planting would include planting approximately 3,000 willows initially, within upper enclosures. Planting would occur in the fall once hardwoods enter dormancy. Between October 15 and November 10 in normal years, rainfall returns and a 3-week window ideal for planting occurs. Seeding of native seed on bare soil areas would also occur during this time. A mini or small-tracked excavator or equivalent (skidsteer) would be used for planting, with the capability to dig holes and trenches for planting rooted willows, cottonwood, and water birch. Approximately 8,000 additional rooted willows, 11,000 rooted cottonwood, and 2,500 water birch would be planted following the initial planting. Enclosures and disturbed areas within Camp Creek reaches 3, 4, and 5 within the Camp Valley Phase II project areas are included in this planting.



Project-Specific Design Criteria

The following project design criteria would apply with this project:

- If possible, use felled lodgepole and material to brush in closed roads used to harvest buck and pole material to make them effectively undrivable.
- Road drainage or general road conditions that control drainage, at locations where heavy or other equipment leave roads to enter the off-road portions of the project area, shall be inspected before the equipment leaves the project and repaired.
- Range will be involved in the design of fenced areas.
- Permittees will not be responsible for additional fences created as a result of this project.
- After five years, the fences will be assessed for need and/or removed. Buck and pole aspen fences will be maintained five years after installation and then left to deteriorate.
- Construct fences out of buck and pole material when feasible.
- Livestock use monitoring will not occur in the project area during the year(s) of project implementation.
- If possible, a soil scientist or other qualified individual should be present during railroad berm soil relocation operations to ensure damage to soil resources are kept to a practical minimum.
- Avoid heavy machinery travel (“HMT”) 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 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.
- 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 (“trails”) about 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 [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 in other months; “snow-covered” means sufficient snow strength and depth to prevent compaction; “frozen” means the soil is frozen at least through the top 4 inches.
- Operate heavy machinery on slash mats to reduce soil compaction, especially if the soil is wet.
- Tree tipping trails shall be covered with slash to reduce runoff and erosion.
- Contact the Forest Lands Special Uses Administrator for the specific location of the buried utility line located within National Forest System Road 3600000 road prism/right-of-way within the project area.
- Contact 811 prior to any excavation or ground disturbing activities within National Forest System Road 3600000 road prism/right-of-way to locate buried utility and protect the 20-foot utility right-of-way from project disturbances.
- All projects shall have legal access identified and secured prior to project implementation or contractual obligations. Project Leads shall work directly with Engineering and Forest Land Zone to verify and secure legal access.
- Ensure compliance with the National Forest Boundary Line Policy prior to project implementation and all adjacent landowners are adequately notified of project activities.
- If mineral material from Malheur National Forest rock quarries is used, minerals staff shall be notified.



- Ensure operations follow Malheur Road Rules and conform to Malheur Road Maintenance Specifications.
- Any tree tops and branches not removed for the Camp Valley Phase II aquatic restoration project should be scattered in the riparian zone to reduce the need to build handpiles.
- Fuel loading in thinning areas should not exceed 12 tons per acre.
- Follow specifications outlined in the silviculture prescription.

Figures

Camp Lick Riparian Restoration Project Area Vicinity Map

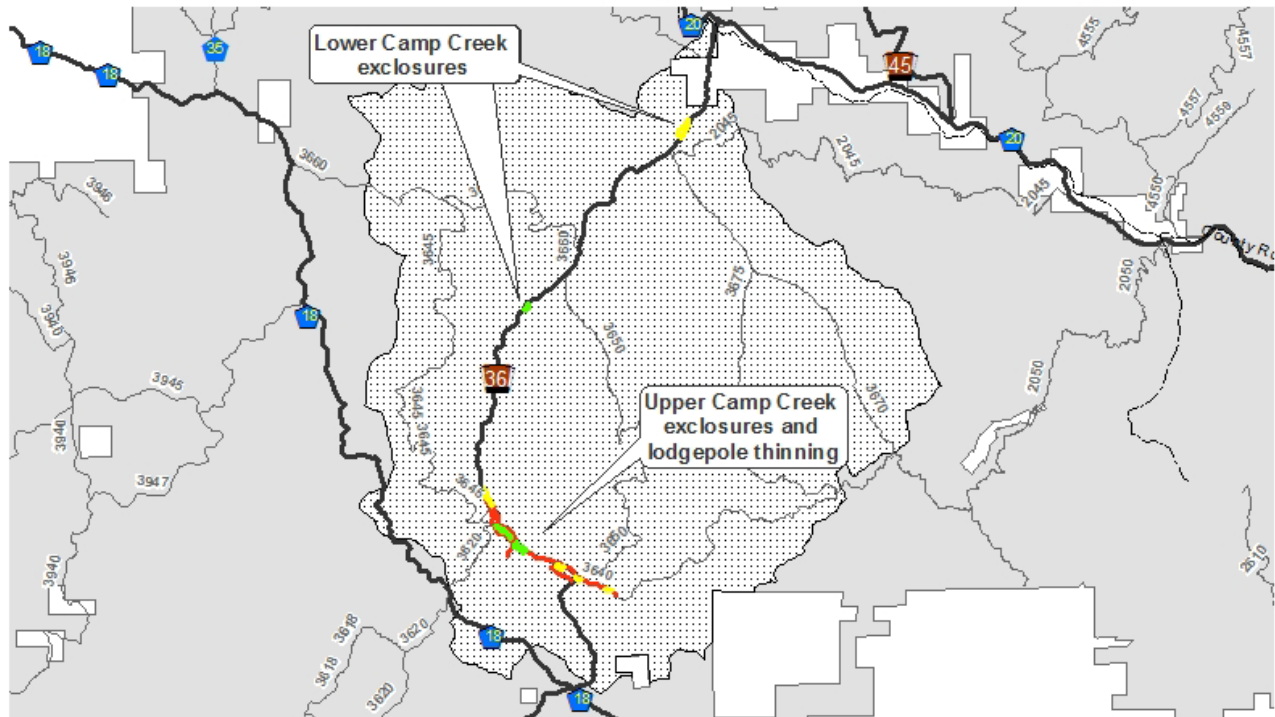
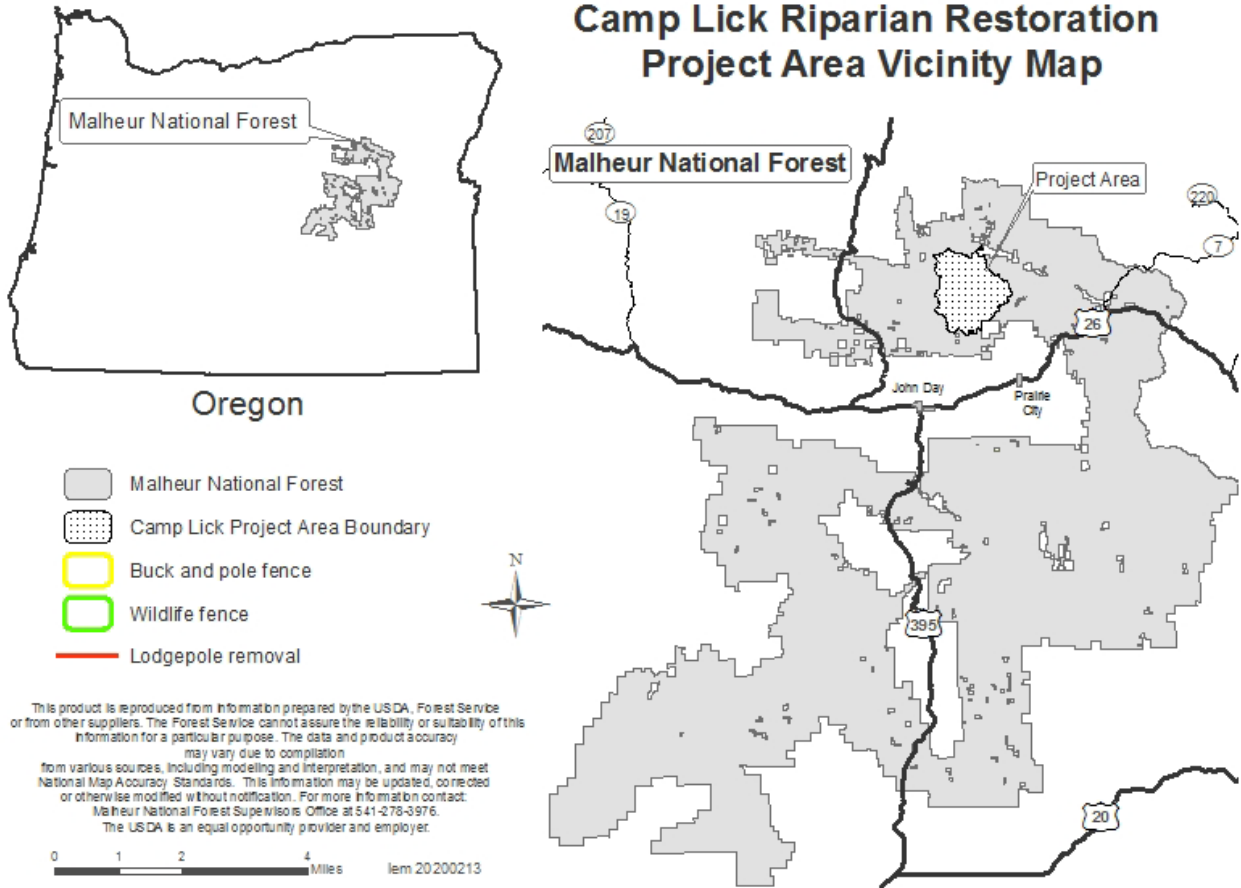


Figure 1. Camp Lick Riparian Restoration vicinity map

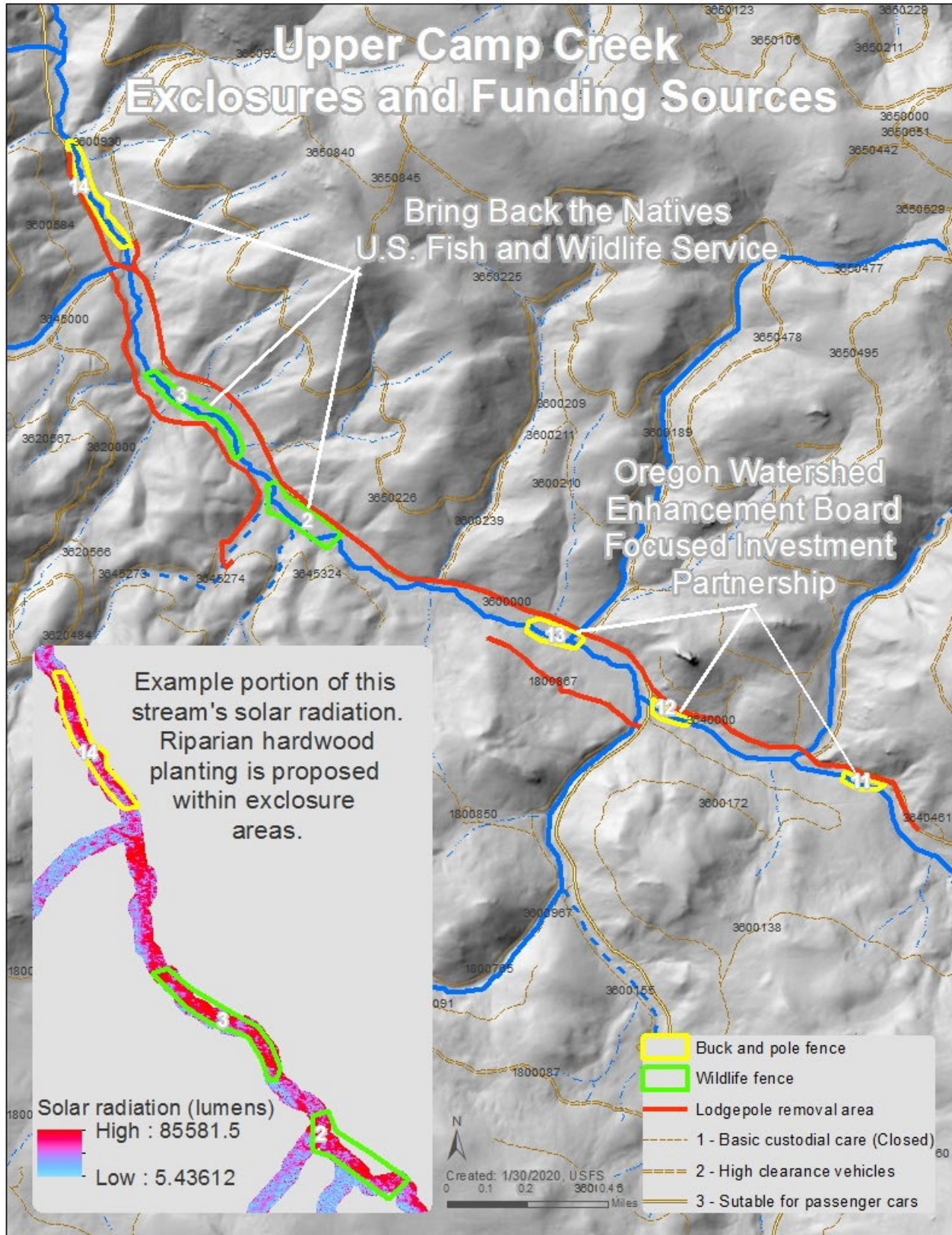


Figure 2. Upper Camp Creek exclosure, funding, lodgepole treatment, and solar radiation map

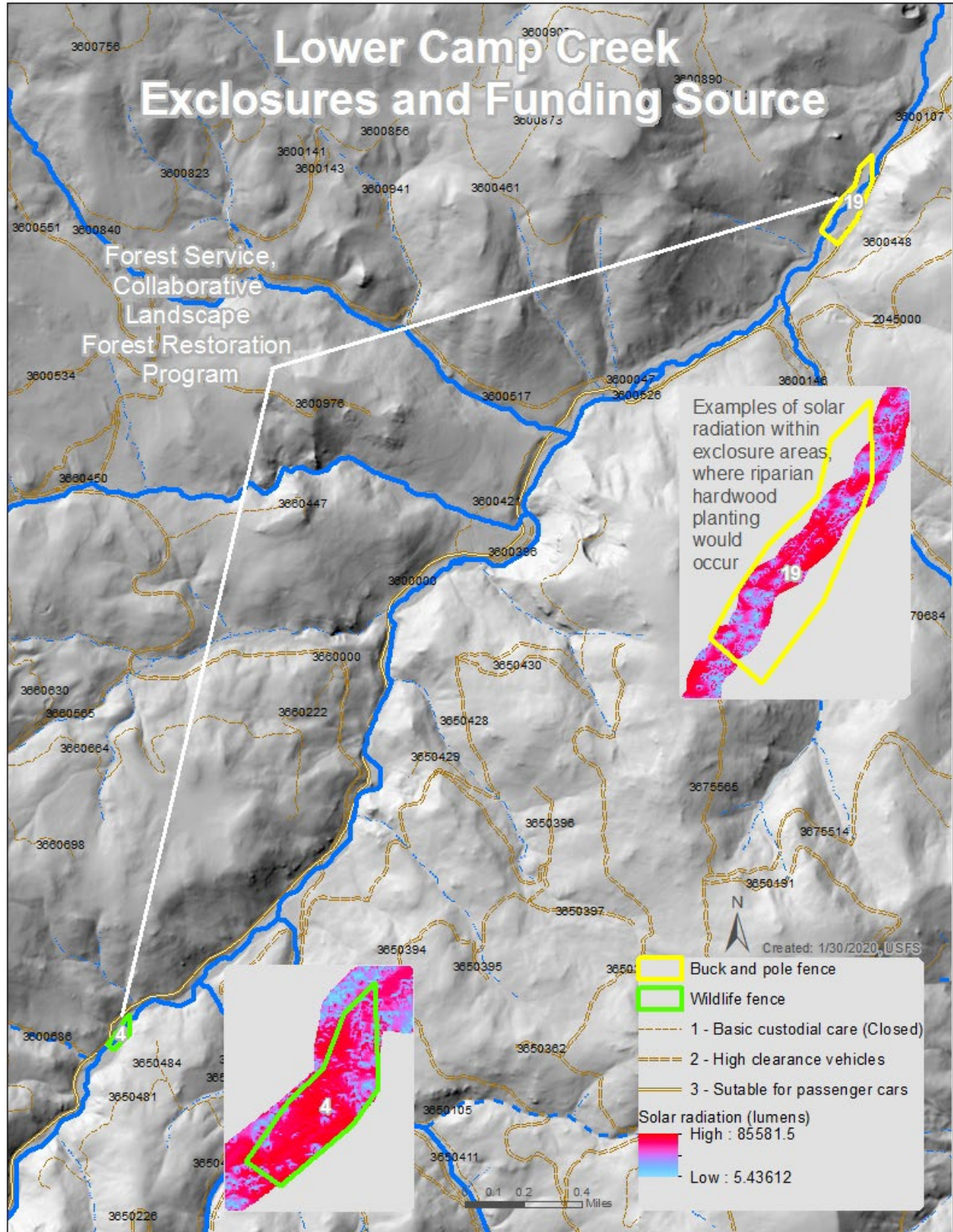


Figure 3. Lower Camp Creek exclosure, funding, and solar radiation map



Figure 4. Late 1970s exclosure placed in lower Camp Creek



Figure 5. Same area as Figure 4 within lower Camp Creek in 2019



Figure 6. Active beaver dam complex within existing wildlife exclosure on Camp Creek reach 4 (scheduled for rebuild as part of the Camp Valley Restoration Project (Phase II))



Figure 7. A 2019 photo of enclosure #14 within the Camp Creek headwaters project area from 2016 - beaver habitat restoration (funded by the Bring Back the Natives Grant)



Figure 8. A 2019 photo of enclosure #14 buck and pole fence within Camp Creek headwaters project (funded by the Bring Back the Natives Grant)



Figure 9. A 2019 photo of enclosure #2, wildlife enclosure area within Camp Creek headwaters project from 2016 (funded by the Bring Back the Natives Grant)



Figure 10. A 2019 photo of exclosure #3, wildlife exclosure area within Camp Creek headwaters project from 2016 (funded by the Bring Back the Natives Grant)



Figure 11. A 2019 photo of exclosure #19, buck and pole exclosure area within Camp Valley Phase II project area (funded by Collaborative Forest Landscape Restoration Program)



Figure 12. A 2019 photo of enclosure #4, wildlife enclosure area within Camp Valley phase I project area - wetland (funded by Collaborative Forest Landscape Restoration Program)



Figure 13. A 2019 photo of exclosure #11, buck and pole exclosure area within the Camp Creek large wood placement project from 2014 (funded by the Oregon Watershed Enhancement Board)



Figure 14. A 2019 photo of exclosure #12, buck and pole exclosure area within Camp Creek headwaters project from 2016 - wetland/spring (funded by the Oregon Watershed Enhancement Board)



Figure 15. A 2019 photo of exclosure #13, buck and pole exclosure area within Camp Creek headwaters project from 2016 - beaver habitat restoration (funded by the Oregon Watershed Enhancement Board).



References Cited

- Macfarlane, W.W., M.D. Meier, C. Hafen, M.T. Albonico, M.A. Hallerud, and J.M. Wheaton. 2019. John Day Basin Beaver Restoration Assessment Tool: Building Realistic Expectations for Partnering with Beaver in Restoration and Conservation. Prepared for the North Fork John Day Watershed Council. Logan, UT. 85 pages.
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- USDA Forest Service. 1990. Malheur National Forest Land and Resource Management Plan. John Day, OR: USDA Forest Service, Malheur National Forest. Available online: <http://www.fs.usda.gov/main/malheur/landmanagement/planning>.
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- USDA Forest Service. 1995b. Environment Assessment for the Inland Native Fish Strategy; Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada. (INFISH). Portland, OR: U.S. Department of Agriculture, Forest Service Intermountain, Northern, and Pacific Northwest Regions.



Project Review

Forest Aquatic Restoration Project NEPA Compliance and Implementation Checklist

Project Number: 01022020 **Date:** 1/23/2020 **Location:** Camp Creek watershed/ Middle Fork John Day River, T10S, R32E, sec. 25 T11S, R32E, sec. 10, 28, 33, 34, 35

Category: 2. Large wood, boulder, and gravel placement; 9 – Livestock fencing, stream crossings, and off channel livestock watering facilities (a, b); 13 Riparian Vegetation Treatment (b); 14 –Riparian vegetative planting; 16- Beaver habitat restoration (b)

Project Description: Construct eight exclosures (57 acres and 2.4 stream miles), thin lodgepole along 4.2 miles of road, remove lodgepole within one aspen stand, tree planting within exclosures, and provide posts and woody material for quartic restoration in lower Camp Creek. See Camp Lick Riparian Restoration proposal for full description.

Heritage (to be completed by heritage specialist)

Y / N Initial

N KW Specific PDC for heritage addressed (heritage surveys; avoidance areas).

Botany (to be completed by botany specialist)

Y / N Initial

Y JLB Specific PDC for botany addressed (sensitive plant surveys).

Y JLB 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 LEM 4A big game winter range

N LEM 6A and 6B wilderness

N LEM 7 scenic area

N LEM 8 special interest areas

Y / N Initial

N LEM 9 research natural areas

N LEM 10 semi-primitive non-motorized recreation areas

N LEM 22/22A wild and scenic river

N LEM inventoried roadless areas

Comments: See Land Use Plan Conformance section above for compliance.

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 4. Projects design criteria and Malheur Forest Plan compliance checklist

Resource	Signature	Date	Comments (additional PDCs may be noted if necessary) *May continue on
Heritage	<u>/s/ Katee R. Withee</u>	3/9/2020	No effects to Historic Properties
Botany	<u>/s/ Jessi Brunson</u>	2/26/2020	Follow PDCs to avoid impacts to sensitive plants.
Invasive Plants	<u>/s/ Jessi Brunson</u>	2/26/2020	Follow PDCs to avoid spreading invasive weeds.
Wildlife	<u>/s/ Dustin Hollowell</u>	4/8/2020	Follow established PDC. If possible, use felled lodgepole and material to brush in closed roads used to harvest buck and pole material to make them effectively undrivable.



Resource	Signature	Date	Comments (additional PDCs may be noted if necessary) *May continue on
Fish*	<u>/s/ Dan Armichardy</u>	2/27/2020	Project is consistent with MNF Aquatic Restoration EA and ARBO II. This includes design features within the Camp/lick project BA. Minor ground disturbance would result in an overall benefit to stream shade and water temperatures within the priority watershed of Camp creek for ESA threatened Mid-Columbia steelhead and protect previous/ongoing aquatic restoration investments.
Hydrology*	<u>/s/ Mary L. Welby</u>	5/1/2020	PDCs sent by email to B. Parker 20200508 in attachment titled "Camp....Criteria' dated 20200507 shall be incorporated. Soil disturbance would be controlled by PDCs. Project improves watershed conditions including shade and water temperature, including for Clean Water Act 303(d) listed segments, overall.
Range	<u>/s/ Nick Stiner</u>	4/22/2020	Range will be involved in the design of fenced areas. Permittees will not be responsible for additional fences created. After 5 years, the fences will be assessed for need and/or removed. Buck and pole aspen fences will be maintained five years after installation and then left to deteriorate. Effort will be made to construct the fence out of buck and pole material. Livestock use monitoring will not occur in the project area during the year of project implementation.
Soils	<u>/s/ Leslee Crawford</u>	5/4/2020	Follow established soil PDCs. Reuse existing skid trails when feasible with low tire pressure equipment, if available. Operate heavy machinery on slash mats to reduce soil compaction, especially if the soil is wet. Avoid heavy machinery travel on slopes greater than 35 percent, where feasible. No heavy equipment shall be allowed on highly erodible soil.
Recreation	<u>/s/ Kevin Green</u>	2/11/2020	No effects to recreation resources.
Special Uses	<u>/s/ Stacia Kimbell</u>	3/26/2020	Buried utility line located within NFS Road 3600 road prism/right-of-way. Contact the Forest Lands Special Uses Administrator for the specific location within the project area. Contact 811 prior to any excavation or ground disturbing activities within NFS Road 3600 right-of-way vicinity to locate buried utility and protect the 20-foot buried utility right-of-way from project disturbances.
Lands	<u>/s/ Stacia Kimbell</u>	3/26/2020	All projects shall have legal access identified and secured prior to project implementation or contractual obligations. Project Leads shall work directly with Engineering and Forest Land Zone to verify and secure. Ensure compliance with the National Forest Boundary Line Policy prior to project implementation and all adjacent landowners are adequately notified of project activities.
Mining	<u>/s/ Hannah Grist</u>	3/30/2020	No known mining claims in the project area. Report quantity and type of material used from MNF rock quarries.
Engineering	<u>/s/ Matthew Smith</u>	3/25/2020	Ensure operations follow Malheur Road Rules and conform to Malheur Road Maintenance Specifications.



Resource	Signature	Date	Comments (additional PDCs may be noted if necessary) *May continue on
Fuels / Fire	<u>/s/ Ed Clark</u>	2/10/2020	Any tops and branches not removed for Phase II should be scattered in riparian zone to reduce the need to build handpiles. Fuel loading in areas of thinning should not be over 12 tons to the acre.
Silviculture	<u>/s/ Amanda Lindsay</u>	4/7/2020	Positive effects for forest vegetation as small diameter lodgepole will be removed from the riparian area and replaced with riparian shrubs. Follow specifications outlined in the silviculture prescription.

* 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: 5/11/2020

Line Officer Signature: /s/ Robert Foxworth Date: 5/14/2020



Appendix to the Aquatic Restoration EA

Implementation Description

Project Title: Camp/Lick Riparian Restoration

Project Number: 01022020

Category: Category: 2 – Large wood and boulder placement, and tree removal for large wood projects; 9 – Livestock fencing, stream crossings, and off channel livestock watering; 13 Riparian Vegetation Treatment; 14 – Riparian vegetative planting; 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 numbers, literature, or other documents not referenced further in this proposal document. Please refer to the Decision Notice for more information.

Program Administration

1. Integration of project design criteria and conservation measures and terms and conditions into project design and contract language
 - a. This document is to outline the conservation measures and project design criteria that will be used during project implementation to remain compliant with the aquatic restoration biological assessment as well as ARBO II.
2. Project notification: The following information will be provided to the National Marine Fisheries Service (NMFS) Level 1 aquatics members 30 days prior to implementation as a Project Notification Form 7.
 - a. Action identifier – 01022020
 - b. Project name – Camp Lick Riparian Restoration
 - c. Location – Camp Creek watershed/ Middle Fork John Day River

Table 5. Project location information

Project location	Camp Lick Riparian Restoration
Stream name	Camp Creek
6th field HUC	John Day
Latitude (decimal degrees)	44.612254
Longitude (decimal degrees)	-118.65008

- d. Agency contact – Dan Armichardy, darmichardy@fs.fed.us
- e. Timing – 6/15/20 to 10/31/21, instream work July 15 to August 15 (none anticipated with exception of any stream crossings)
- f. Activity category – 2 – Large wood and boulder placement, tree removal for large wood projects; 9 – Livestock fencing, stream crossings and off channel livestock watering; 13 Riparian Vegetation Treatment; 14 – Riparian vegetative planting; 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
 - ii. Critical Habitat: Middle Columbia River steelhead critical habitat
 - iii. Management Indicator Species: Steelhead and redband trout
 - i. Date of submittal –To be completed in Spring of 2020, at least 30 day prior to implementation
 - j. Site assessments – Assessment for contaminants is not required at these locations.
 - k. Review – NMFS fish passage review and Restoration Review Team review are not required.
 - l. Verification – _____
 - m. SOD project notification – _____
3. Minor Variance: Minor variances may be requested during October 15-November 15 to allow planting of riparian hardwoods on newly activated floodplains and off channels with equipment.
 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 FY20 and FY21 before February 15th.

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 °C 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.

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.
When necessary, construct a fence around the spring development to prevent livestock damage.

13. Riparian Vegetation Treatment (controlled burning)

Riparian vegetation treatment (controlled burning) includes reintroduction of low and moderate-severity fire into riparian areas to help restore plant species composition and structure that would occur under natural fire regimes in dry forest types east of the Cascade mountains and in southwestern Oregon. Additionally, controlled burns may be implemented in localized lowland areas in western Oregon (oak woodlands). Conifer thinning may be required to adjust fuel loads for moderate-severity burns to regenerate deciduous trees and shrubs. Equipment would include drip torches and chainsaws, along with fire suppression vehicles and equipment.

a. Low and moderate severity burns:

- i. Experienced fuels specialists, silviculturists, fisheries biologist, and hydrologists shall be involved in designing prescribed burn treatments.
- ii. Prescriptions will focus on restoring the plant species composition and structure that would occur under natural fire regimes.
- iii. Burn plans are required for each action and shall include, but not be limited to the following: a description of existing and desired future fire classifications, existing and target stand structure and species composition (including basis for target conditions); other ecological objectives, type, severity, area, and timing of proposed burn; and measures to prevent destruction of vegetation providing shade and other ecological functions important to fish habitat.
- iv. Low-severity burns will be used except where the objective is to restore deciduous trees, as describe below under part “v.”, with a goal of creating a mosaic pattern of burned and unburned landscape. Low-severity burns are characterized by the following: Low soil heating or light ground char occurs where litter is scorched, charred, or consumed, but the duff is left largely intact. Large wood accumulation is partially consumed or charred. Mineral soil is not changed. Minimal numbers of trees, typically pole or saplings, will be killed.
- v. Moderate-severity burns are permitted only where needed to invigorate decadent aspen stands, willows, and other native deciduous species and may be targeted in no more than 20 percent of the area within RHCAs or Riparian Reserves/6th field HUC/year. Such burns shall be contained within the observable historical boundaries of the aspen stand, willow site, other deciduous species, and associated meadows; additional area outside of the “historical boundaries” may be added to create controllable burn boundaries. Moderate severity are characterized by the following: Moderate soil heating or moderate ground char occurs where the litter on forest sites is consumed and the duff is deeply charred or consumed, but the underlying mineral soil surface is not visibly altered. Light colored ash is present. Large wood is mostly consumed, except for logs, which are deeply charred.
- vi. Fire lines will be limited to 5 feet in width, constructed with erosion control structures, such as water bars, and restored to pre-project conditions before the winter following the controlled fire. To the extent possible, do not remove vegetation providing stream shade or other ecological functions that are important to streams.
- vii. Ignition can occur anywhere within the riparian reserve and riparian habitat conservation areas (RHCAs) as long as project design criteria are met.
- viii. Avoid water withdrawals from fish bearing streams whenever possible. Water drafting must take no more than 10 percent of the stream flow and must not dewater the channel to the point of isolating fish. Pump intakes shall have fish screens consistent with NMFS fish screening criteria (NMFS 2011e).

b. Non-commercial thinning associated with moderate-severity burns:

- i. Non-commercial tree thinning and slash removal is allowed only as required to adjust fuel loads to implement a moderate-severity burn to promote growth of deciduous trees and shrubs, such as aspen, cottonwood, willow, other deciduous species, and associated meadows.
- ii. Thinning is allowed only in dry forest types, such as east of the Cascade mountains and southwestern Oregon, and in localized lowland areas in western Oregon, (oak woodlands).
- iii. To protect legacy trees, thinning from below is allowed. If conifers are even-aged pole, sapling, or mid-seral with no legacy trees, thin existing trees to the degree necessary to promote a moderate-severity burn.
- iv. No slash burning is allowed within 30 feet of any stream. To the extent possible, avoid creating hydrophobic soils when burning slash. Slash piles should be far enough away from the stream channel so any sediment resulting from this action will be unlikely to reach any stream.
- v. Apply PDC in National Fire Plan salmonid criteria (USDI-Bureau of Land Management 2005) for limits on mortality to residual overstory vegetation.
- vi. Only hand equipment—chain saws, axes, Pulaski's, etc.—may be used for felling.
- vii. Where livestock or wildlife grazing could be a threat to restoration of aspen, cottonwood, willow, alder, and other deciduous vegetation and an immediate moderate-severity burn would consume large amounts of felled trees, consider delaying the burn and leaving felled trees in place to create grazing barriers to help assure plant growth.
- viii. If in an existing grazing allotment, projects in this category shall be accompanied by livestock grazing practices that promote the attainment of moderate-severity burn objectives.

14. Riparian Vegetation Planting

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 6. 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 60 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 7. 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/1321/pdf/circ1321.pdf>).

Tree and Boulder Hauling

- Apply mitigation and best management practices for dust abatement (water, lignosulfonate, calcium, and magnesium chlorides) dry conditions, and erosion control as directed by physical scientist or road engineer (see road maintenance project design criteria #6 for application).
 - ◆ Haul on gravel and native-surface roads will be limited to dry conditions.

Haul Restrictions to Prevent Fine Sediment Delivery to Streams

- Haul or maintenance is permitted on roads under the following conditions:
 - ◆ During haul, weather conditions are monitored daily for the chance of precipitation by the hydrologist or fish biologist.
 - ◆ No rutting of the road surface is occurring, indicating the subsurface is wet.
 - ◆ Frozen ground conditions.
 - ◆ Haul will cease at any time when the travelway of the road is wet and turbid water or fines are observed moving off the road surface to ditchlines that deliver to stream channels regardless of time of year.

Roads Exempt from Haul Restrictions Include (Due to No Mechanism for Sediment Delivery):

- Paved roads
- Surfaced Ridge top roads
- Surfaced out-sloped 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 enclosure 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 enclosures 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.



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