



# Crane Prairie Stage Zero Restoration

## Aquatic Restoration Checklist

### USDA Forest Service

#### Prairie City Ranger District, Malheur National Forest

#### Grant County, Oregon

## Implementation Description

### Project Information

**Project Information** (select the **+** on right of selection to add additional categories)

Category 1: Fish Passage Restoration

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

Category 3: Dam and Legacy Structure Removal

Category 4: Channel Reconstruction/Relocation

Category 5: Off- and Side-Channel Habitat Restoration

Category 6: Streambank Restoration

Category 9: Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering

Category 13: Riparian Vegetation Treatment (Controlled Burning)

Category 14: Riparian Vegetative Planting

Category 17: Fisheries, Hydrology, Geomorphology Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration

Lead Preparer(s): Sam Spengler & Allen Taylor

Location: T16S R35E Section 30,

HUC6- Middle Snake-Boise (170501)

HUC10- Upper North Fork Malheur River-1705011611

HUC12- Crane Creek- 170501161103

Lease/ Case File/ Serial number: 0401-2024

Begin Date: 11/20/2023

Due Date: 1/22/2024

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

### Purpose and Need

Crane Creek is a perennial fish-bearing stream within the Upper North Fork Malheur watershed and Crane Creek sub-watershed (Figure 1 and Figure 2). From its confluence with the North Fork Malheur River up to the intersection with Little Crane Creek (Figure 3), Crane Creek is also critical habitat for Bull Trout (*Salvelinus confluentus*), listed as Threatened under the Endangered Species Act. Above this confluence Crane Creek is considered a temperature barrier for Bull Trout, in part due to degraded conditions within its headwater reaches. Within Crane Prairie (Figure 4-8), a broad depositional reach with abundant groundwater dependent ecosystems and recent beaver activity, Crane Creek is incised up to 3 feet and has been deemed impaired by Prairie City Ranger District aquatics specialists on the ground.

Riparian habitat within Crane Creek has been degraded through human caused activities, principally beaver removal, timber harvest, road construction (Figure 9 and Figure 10), fire suppression, and livestock grazing. Cumulatively these activities led to channel incision which reduced the floodplain inundation frequency and connectivity of the creek to its once-extensive side-channel network. Loss of root strength provided by riparian vegetation combined with excessive trampling from non-native ungulates facilitated streambank erosion, channel capture, and increased stream power in what has become the “primary” stream channel of Crane Creek.

Though many of these land use practices have been discontinued or amended, their legacy effects continue to limit recovery within Crane Creek. Decades of downcutting has exhausted what was likely a perennially high water table throughout the valley bottom, allowing upland vegetation to establish within former riparian areas and replace the hardwoods which once provided valuable shade and forage within Crane Prairie. In recent years intensive cattle grazing, including unauthorized use within the target reach, has resulted in denuded streambanks, increased fine sediment delivery, and severe impacts to riparian vegetation (Figure 10). Though beaver have recently occupied this stretch of Crane Creek, their dams have been abandoned and the remaining forage is likely not adequate to support new populations currently.

Long-term data collected on Crane Creek over the past two decades (Figure 12 and Figure 13) indicates that 7-Day Average Daily Max (7DADM) water temperatures consistently exceed the 12 °C (53.6 °F) Oregon Department of Environmental Quality threshold for bull trout spawning and rearing life history stages (key period for spawning is August 15 through the month of October). Where Crane Creek enters the North Fork Malheur River approximately 6 miles below the project reach, 7DADM temperatures also regularly exceed Inland Fish Strategy (INFISH) requirements for Bull Trout adult holding (15 °C) for the better portion of the summer. Further upstream, approximately 1.7 stream-miles below the project area, 7DADM temperatures frequently exceed the 20 °C Malheur Forest Plan habitat requirement for redband trout (*Oncorhynchus mykiss*), a management indicator species for the Malheur National Forest and designated sensitive species under Oregon’s Endangered Species Act. These elevated temperatures have not only deterred native fish from utilizing available rearing and spawning zones, but they may eventually lead to a rise in non-native, less temperature-sensitive species such as brook trout (*Salvelinus fontinalis*) outcompeting and dominating historic habitat on Crane Creek.

The purpose of this project is to improve ecological function and biological productivity for Endangered Species Act-listed Bull Trout, as well as other native species, while restoring valley bottom connectivity and complexity within Crane Creek. By raising the stream bed back to historic elevation, stage zero restoration would return the stream network to an anastomosing, naturally aggrading state where it could remain hydrologically dynamic in perpetuity and retain water, sediment, and nutrients for longer periods of time. Once fully reconnected to its historic floodplain and roughened with large wood, Crane Creek would again be able to inundate the valley bottom from toe-slope to toe-slope year-round, maximizing potential rearing and spawning habitat, improving groundwater storage and water temperatures, and creating additional area for riparian and wetland obligate vegetation to recolonize.

Within portions of the project area where conifers, primarily lodgepole pine (*Pinus contorta*), have invaded the meadow ecosystem and replaced riparian species, hand-thinning and pile burning will help to restore plant species composition and regenerate deciduous trees and shrubs. Planned livestock enclosure fencing will ensure that hardwoods within the project reach have time to recover and reestablish, eventually providing the necessary shade and seasonal nutrient input to support riparian food webs. With the recovery of hardwood communities, beaver will eventually have the forage needed to return to this

reach of Crane Creek, providing additional cold-water refuge for native fish and continuing the positive feedback loop of riparian regrowth and aggradation.

There are currently no monitoring sites on Crane Creek that could provide data on groundwater levels or stream discharge prior to project implementation. Ground-and-surface water monitoring has been used on many other stream restoration projects throughout the region, including another ongoing stage zero project on Summit Creek (Figure 14 and Figure 15). The desired outcome of piezometer and stream gauge monitoring is to amass continuous before-and-after data to demonstrate the impacts of stage zero restoration on ground-and-surface-water storage. Post-implementation data is expected to show significant increases in groundwater elevations throughout the valley bottom as well as improved flood attenuation and baseflow conditions below the treatment reach. Coupled with new and existing stream temperature data gathered on Crane Creek above and below the project area, these monitoring sites would provide empirical evidence to support future stage zero projects on the forest.

## Land Use Plan Conformance

This project falls under Management Area (MA) 3A “Non-Anadromous Riparian Areas” of the Malheur National Forest Land and Resource Management Plan (USDA Forest Service, 1990). This project is also within the riparian habitat conservation area as designated by PACFISH/INFISH. The riparian habitat conservation area for this reach of Crane Creek is Category 1, with 300-foot slope-distance buffers extending from both sides of the active channel. The valley bottom restoration and associated monitoring as outlined in this implementation plan will support the MA3A objective to “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 conditions”. It will also serve to “promote the long-term ecological integrity of ecosystems” and “conserve the genetic integrity of native species” as laid out in PACFISH/INFISH.

Additional management areas within the project area are General Forest- Rangeland (MA1\_2) and Foreground Visual Corridor (MA14F) land. With regards to the General Forest- Rangeland Management Areas, (MA1 and MA2), this restoration is management that will directly “provide for other multiple uses and resources” through the improvement of areas within and adjacent to riparian habitat. Resources that would benefit from this management will include improved habitat for fish and wildlife and improved ecosystem services. With regards to the MA14F objectives, this project will “design and implement fish and wildlife improvement/maintenance projects to meet visual quality objectives” by restoring this degraded meadow reach to a properly functioning, more “natural” condition with long-term improvements in wetland vegetation.

Prairie City Ranger District aquatics staff consulted with the Forest Realty Specialist, Stacia Kimbell, and determined that there are no special use impacts within or adjacent to the project area at this time.

### **Land and Resources Management Plan Goals (USDA 1990):**

#### *MA1- General Forest*

*Emphasize timber production on a sustained yield basis while providing for other resources and values. Develop equal distribution of age classes to optimize sustained timber production. Manage at levels and intensities consistent with the schedules described in this Plan to provide for other multiple uses and resources.*

*MA2- Rangeland*

*Emphasize forage production on non-forested areas on a sustained yield basis while providing for other resources and values.*

*MA3A- Non-Anadromous Riparian Areas (RHCA)*

*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. Manage timber, grazing, and recreation to give preferential consideration to non-anadromous fish on that portion of the management area “suitable” for timber management, grazing, or recreation.*

*MA14- Visual Corridors*

*Manage viewshed corridors with primary consideration given to their scenic quality and the growth of large diameter trees. Visual quality objectives of retention, partial retention, and modification will be applied while providing for other uses and resources.*

**National Forest Boundary Line Policy**

The National Forest boundary within Secs. 25 & 30 T. 16 S., R. 35 E. was maintained in 2014, according to the Northeast Oregon Land Zone land surveyor, Robert Moyers.

The western portion of this project borders private land. Prairie City Ranger District aquatics staff will confirm that the fence line accurately reflects the National Forest System and private land boundary.

**Proposed Action and Implementation Plan**

Prior to in-stream work livestock enclosure fencing will be constructed along the north end of the project within what is currently the Flag Prairie Allotment’s Crane Prairie Holding pasture (see Figure 6). This 4-wire snow fence will be constructed according to wildlife specifications and will permanently exclude the portion of Crane Prairie closest to Crane Creek.

Between Crane Creek and the National Forest System Road 1663669 where vegetation treatment is deemed necessary (see Figure 7) conifer encroachment thinning and prescribed burning would occur as specified under Category 13. After consulting with district silviculture and fuels staff it was determined that a “species cut” for lodgepole pine (*Pinus contorta*) followed by hand piling and pile burning is the preferred method for reducing conifer encroachment and restoring hardwood communities within this area. Prairie City Ranger District aquatics will continue to work with district specialists to refine the vegetation treatment within this area. No heavy equipment will be used during this thinning.

This project will follow stage zero restoration design principles to achieve maximum valley bottom connectivity and restore historic bed elevation where feasible. The in-channel restoration will occur during the in-stream work window from July 1 to August 31. Off-channel work may begin as early as snow has melted and last until snow flies the following fiscal year, pending necessary surveys.

Using a relative elevation model, which models historic valley slope, District aquatics specialists have identified sections of incised channel that require fill as well as potential fill sources. The relative elevation model informs specialists where the natural “zero,” or pre-disturbance base elevation, sits within the valley bottom and the elevation to which incised channels need to be filled. Adequate ground

cover such as slash, straw, or grass from seed will be placed on fill sources to control erosion from these sites. The adjacent landowner with an inholding on Crane Prairie just to the west of the treatment reach will be notified of project work in advance to avoid any potential conflict.

Large woody material within the valley bottom and on adjacent toe slopes will also be identified prior to implementation, for use as added roughness within the stream network. Since most of the valley bottom is devoid of conifers, most of the large wood will likely be sourced from upland areas along National Forest System roads 1663 and 1663669 and transported closer to the stream channel. Large woody material reduces energy and shear stress across the entire valley bottom and acts as a surrogate for riparian graminoid and shrub communities until vegetation re-establishes. Aquatics personnel will consult with other resources, including botany and heritage, to identify avoidance areas and develop mitigation strategies.

Fill material will be sourced from abandoned constructed features, as well as natural areas of deposition and adjacent hillslopes, and staged adjacent to fill sites using heavy machinery. Large woody material required for roughness may be similarly staged as needed. Prior to in-stream work, block nets will be installed and fish within the treatment reaches will be salvaged to minimize adverse effects. Other native aquatic organisms, such as mussels, will be similarly collected and relocated.

Once fill material and large wood are staged appropriately, the sections of channel identified for fill will be filled with the staged material to as close to “zero,” or historical valley elevation, as possible. The filled channel will be compacted through heavy machinery traffic across the surface and large woody material added as needed to prevent future erosion. Sections of relic side channel incised below “zero” may be similarly filled and roughened or left to serve as future pools when the valley bottom is inundated. Large woody material will also be placed strategically across the valley bottom in areas where future flow is expected to prevent erosion and capture sediment. Heavy machinery will be used to move fill material and large wood. In-stream work will occur upstream to downstream, to protect machinery and avoid the effects of surface water pooling upstream of the fill sites.

In sections where channel fill is not feasible or necessary, beaver dam analogues or large wood may be installed to seasonally activate side channels and floodplain surfaces, reducing stream-energy through these areas. These structures will involve the mechanical installation of untreated wood vertically in the channel, across the floodplain and stream. Spacing between posts will be about 1.5- 2.5 feet with each post buried approximately 30 percent into the soil. Spacing between structures will vary. They will then be woven with willows and plastered with mud and rock on the upstream side. They will be semi-permanent structures and may need maintenance in the future.

After mechanical work has been completed on Crane Creek, riparian hardwoods and/or graminoid plugs will be planted by hand within the valley bottom and protected to reduce pressure from wild ungulates and trespass livestock. Felled conifers and slash material will be used as a natural barrier, where appropriate, to reduce access by ungulates. Wildlife exclosure fencing will be installed if felled trees provide insufficient protection. Wildlife fencing may use a variety of fencing material and be installed around large clumps of plants or as cages around individual plants as appropriate. Seeding of native grasses will also take place in any location where ground disturbance leaves newly exposed ground. Channel fill and culvert replacement sites, as well as fill extraction sites, will likely require seeding. Seeding needs will be determined by aquatics or botany resource specialists.

Prior to implementation, four-to-six shallow groundwater-monitoring wells will be installed at various points along the Crane Creek floodplain, including relic flow paths and areas currently above bankfull. Exact locations of the wells within the treatment reach have not yet been determined. Stream gauge sites

will also be established at two points within the Crane Creek streambed, one above and one below the project area.

Wells will be installed by driving two-inch sand point well heads to a depth of approximately two meters. Equipment including, or similar to, a skid steer with a mounted auger may be used along with hand tools (for example, sharpshooter shovels) to install the wells. The extent of disturbance at each well is relatively small (less than 9 square feet). Stream gauges will be installed by driving a five-to-six-inch U-post approximately two-to-three feet into the streambed by hand using a fence post-pounder. A utility terrain vehicle or other means of relatively low-impact ground transport may also be used to shuttle supplies to the monitoring sites. Ground-disturbing impacts will be isolated to the well and stream gauges.

**Project Objectives:** This project will move Crane Creek towards desired conditions in the following ways:

- Restored stream connectivity will create a valley bottom with maximum capacity to store water for slow release through the dry season. Water table elevations will approach the ground surface elevation of the valley bottom throughout the dry season, except at naturally occurring high spots, mounds, and abandoned terraces. Stream channels will have connectivity at base flow to allow inundation of the floodplain for sediment and nutrient deposition and energy dissipation.
- A riparian area with vigorous and abundant hardwood communities (including a diversity of willows, dogwoods, aspen, cottonwood, and/or alder) will provide forage and habitat for a variety of wildlife species, increase shade, bank stabilization, and habitat complexity within the stream, and to deliver leafy material to the stream to support aquatic food webs. The valley bottom will also contain a variety of hydric graminoids (sedges, rushes, grasses, etc.) with rooting zones that store water and stabilize the stream network during high flow events. The width of the desired vegetation corridor will extend across the valley bottom (to the toe slope or base of an abandoned terrace).
- Fish habitat to support all life stages of native fish species, particularly bull trout (threatened under the ESA), will increase the competitive advantage of bull trout and other native species over invasives. Crane Creek will return to a complex series of anastomosing channels and wetlands with both cold-water refuge and gravels present for spawning, as well as areas of high primary productivity (e.g., algae growth) ideal for juvenile rearing.
- Water quality will be high; the channel will be shaded by shrubs, stream temperatures within and adjacent to the treatment reach will move towards those suitable for bull trout spawning and rearing (12° C), and fine sediment will be stored on the channel margin and outside of sensitive spawning areas. The relative abundance of spawning gravels will increase, and channels will have low width /depth ratios (below 10; USDA Forest Service, 1990).
- Habitat to support the natural expansion and reintroduction of beaver throughout the Crane Creek subwatershed will return. The recovery of active beaver colonies within this stream will provide long term maintenance of these depositional environments to support hardwood riparian communities, fish and wildlife diversity, and store cool water in the valley bottom.
- Groundwater, discharge, photo point, and temperature data will be collected before and after implementation to provide a better understanding of restoration impacts. Data will be organized and shared to support future Stage Zero projects on the Prairie City Range District.

# Figures

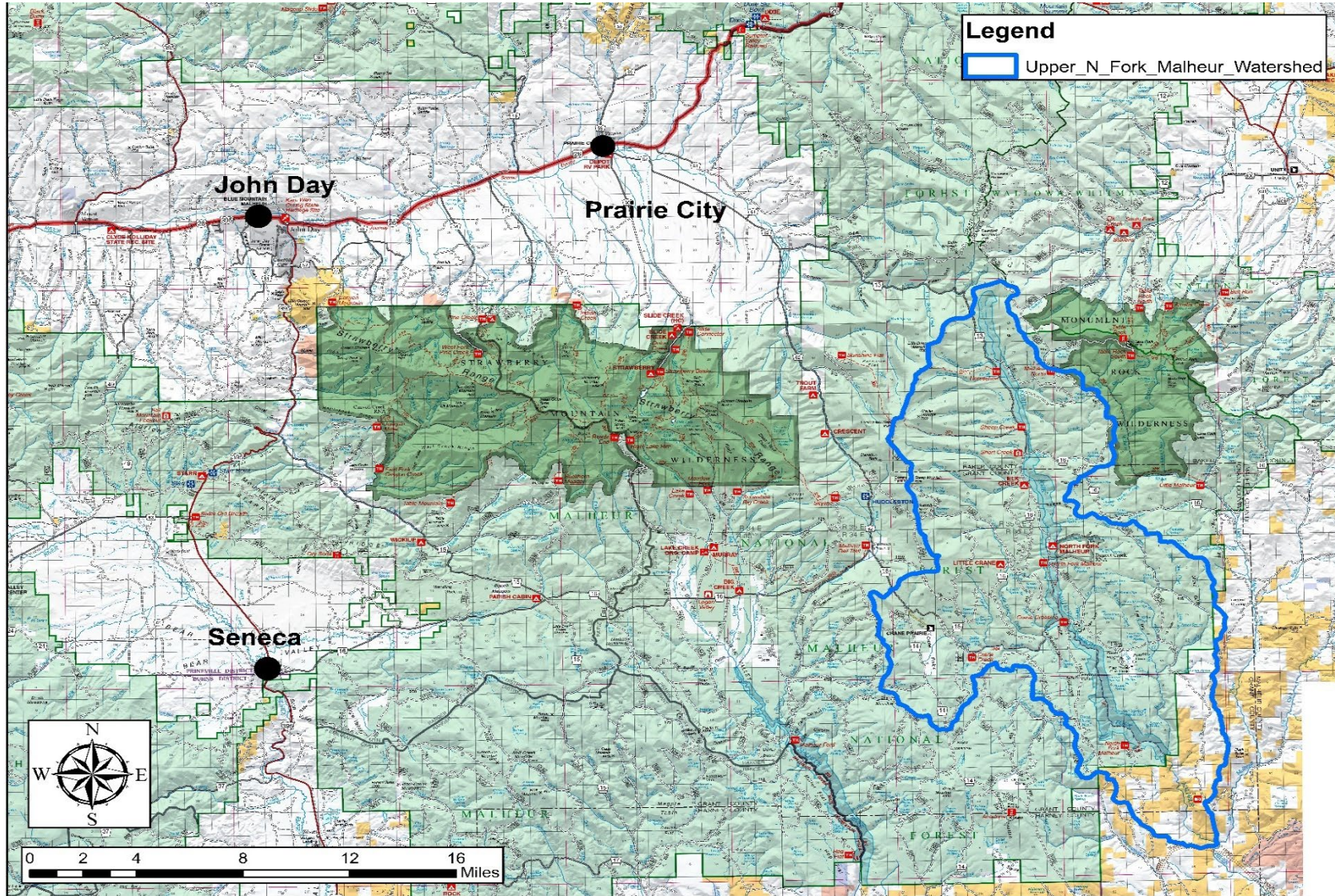


Figure 1. Upper North Fork Malheur River Watershed within the Malheur National Forest.

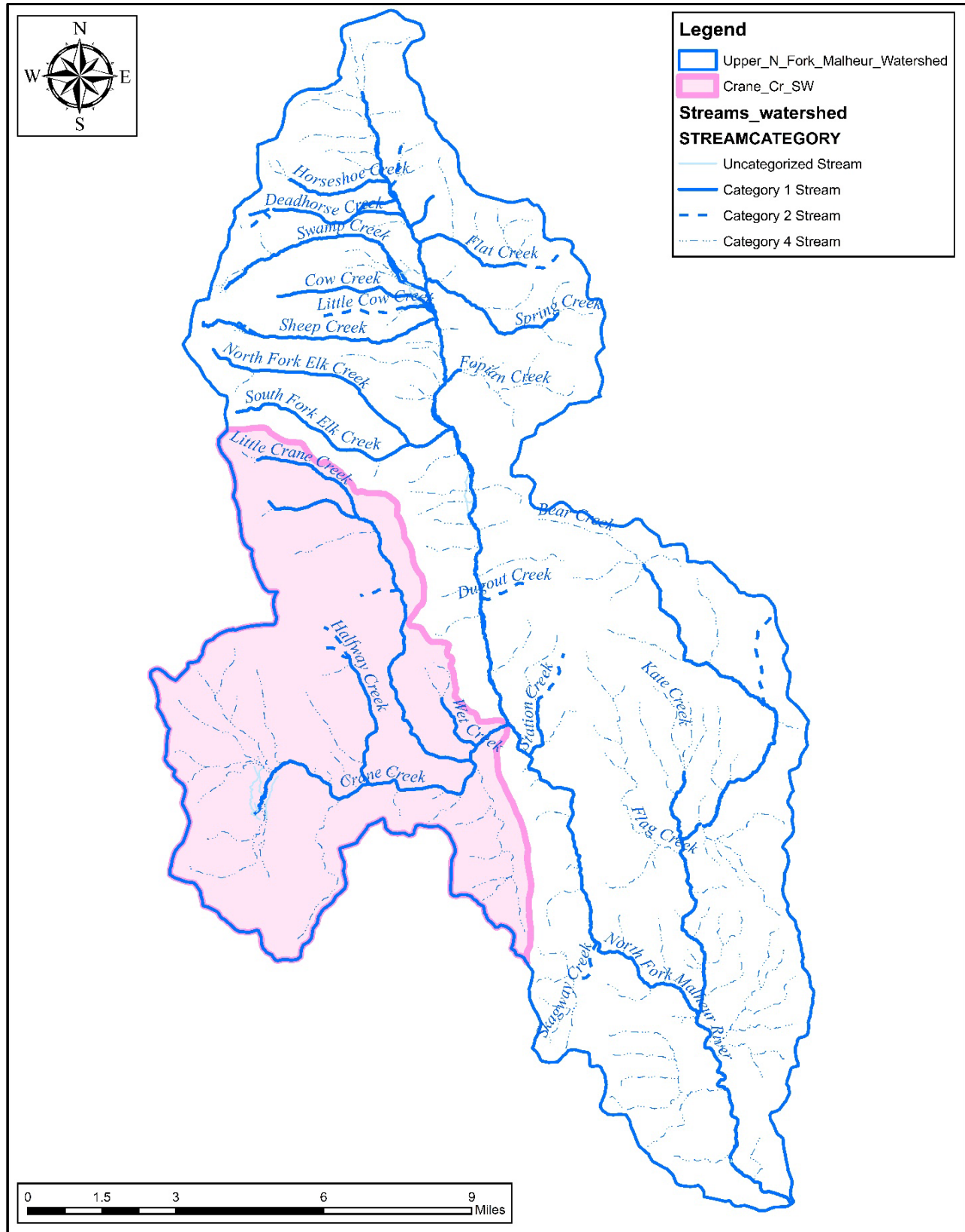


Figure 2. Crane Creek sub-watershed location within the Upper North Fork Malheur Watershed.

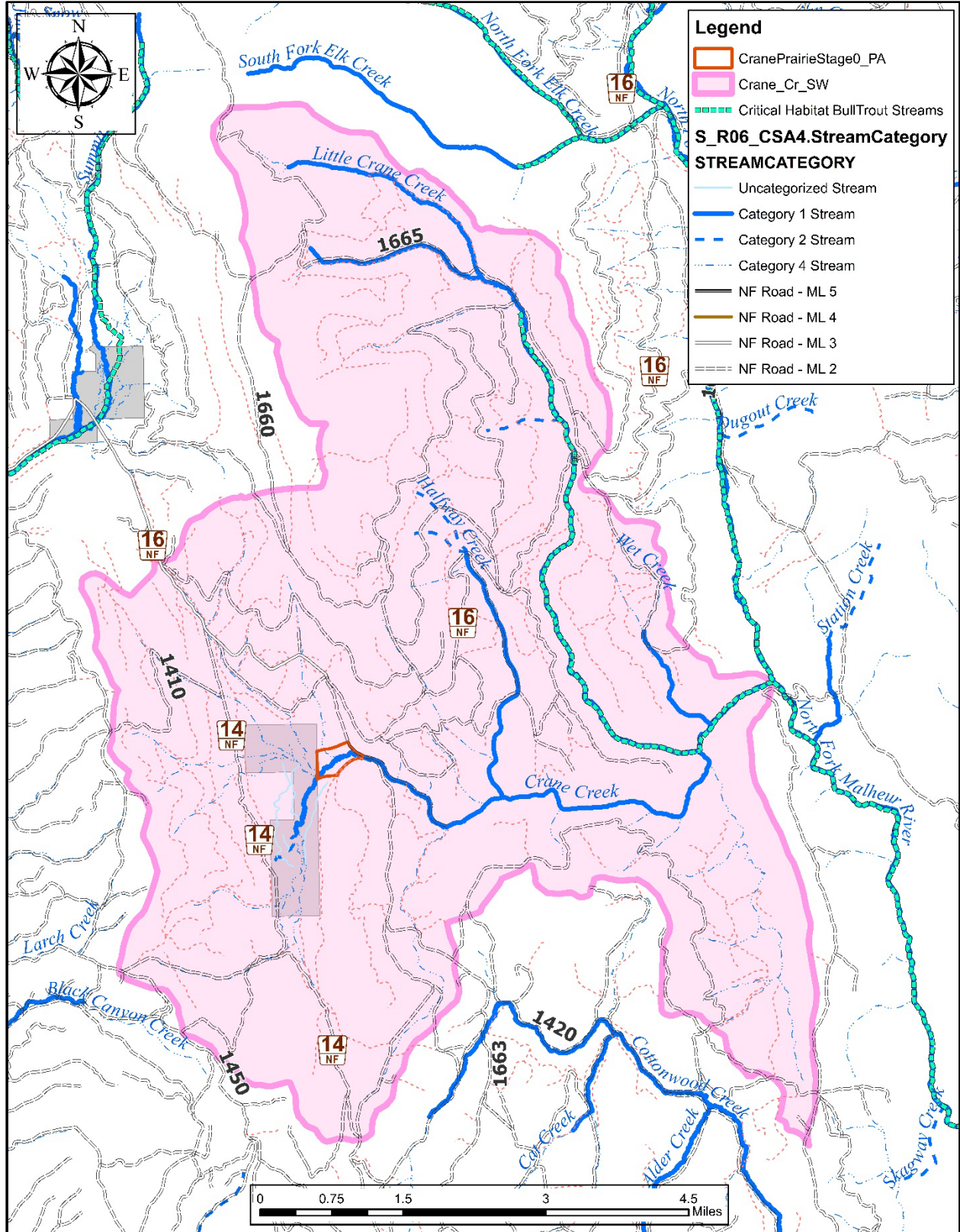


Figure 3. Project area within the Crane Creek sub-watershed and in relation to Bull Trout Critical Habitat stream reaches.

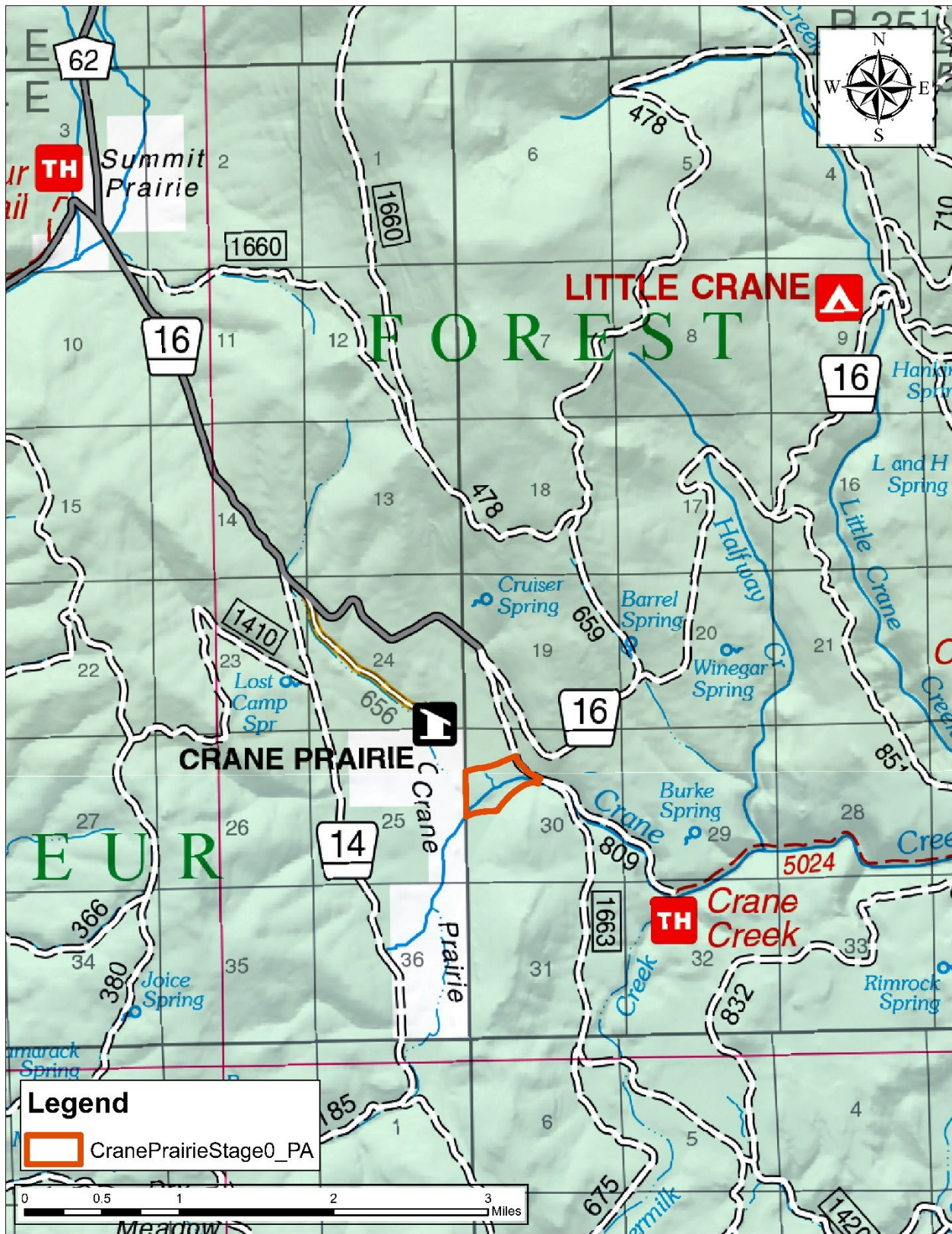


Figure 4. Project area in relation to private portion of Crane Prairie, Crane Prairie Guard Station, and other significant features on the Malheur National Forest.

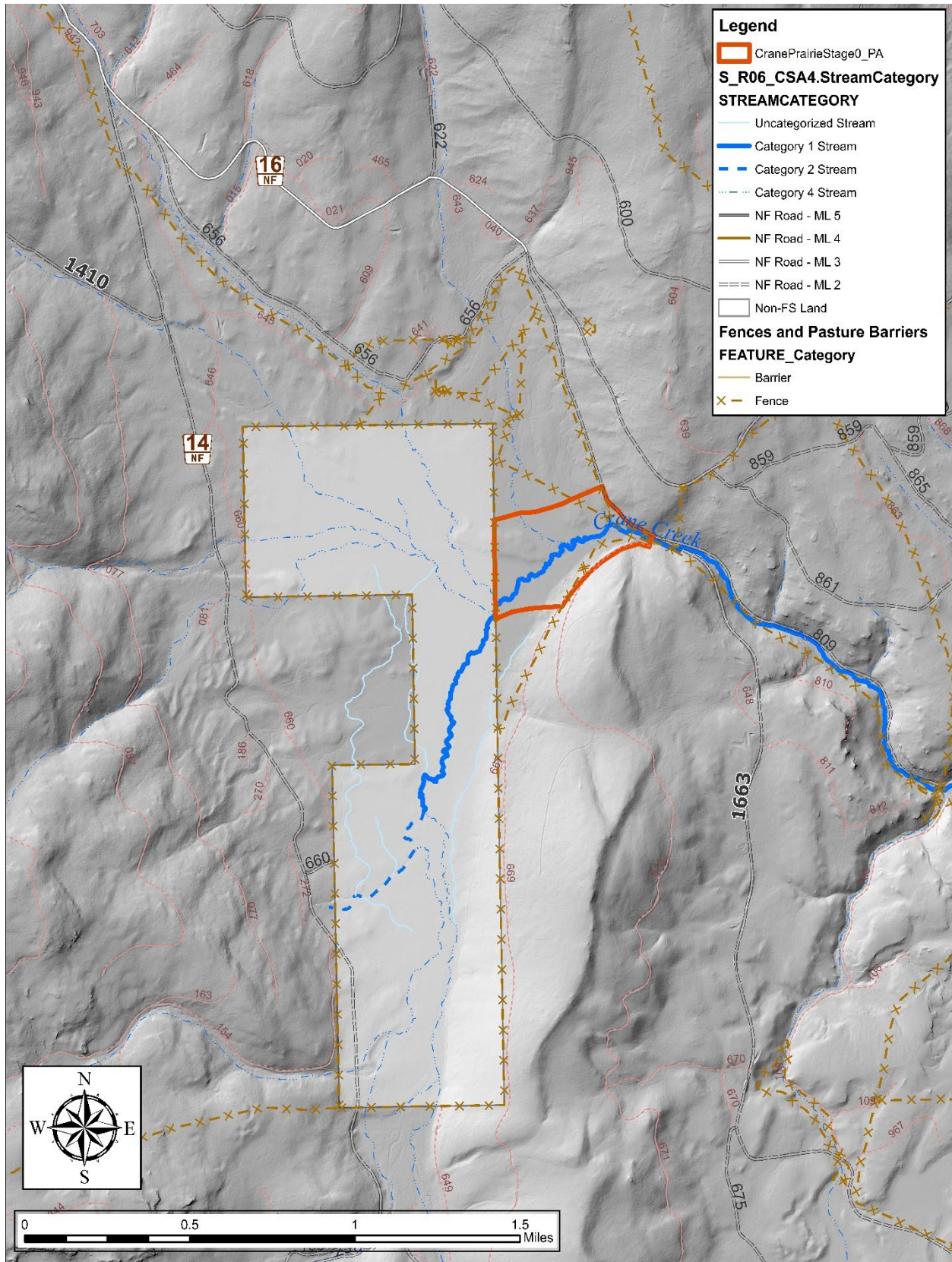


Figure 5. Project area overlain with lidar imagery and shown in relation to the private portion of Crane Prairie.

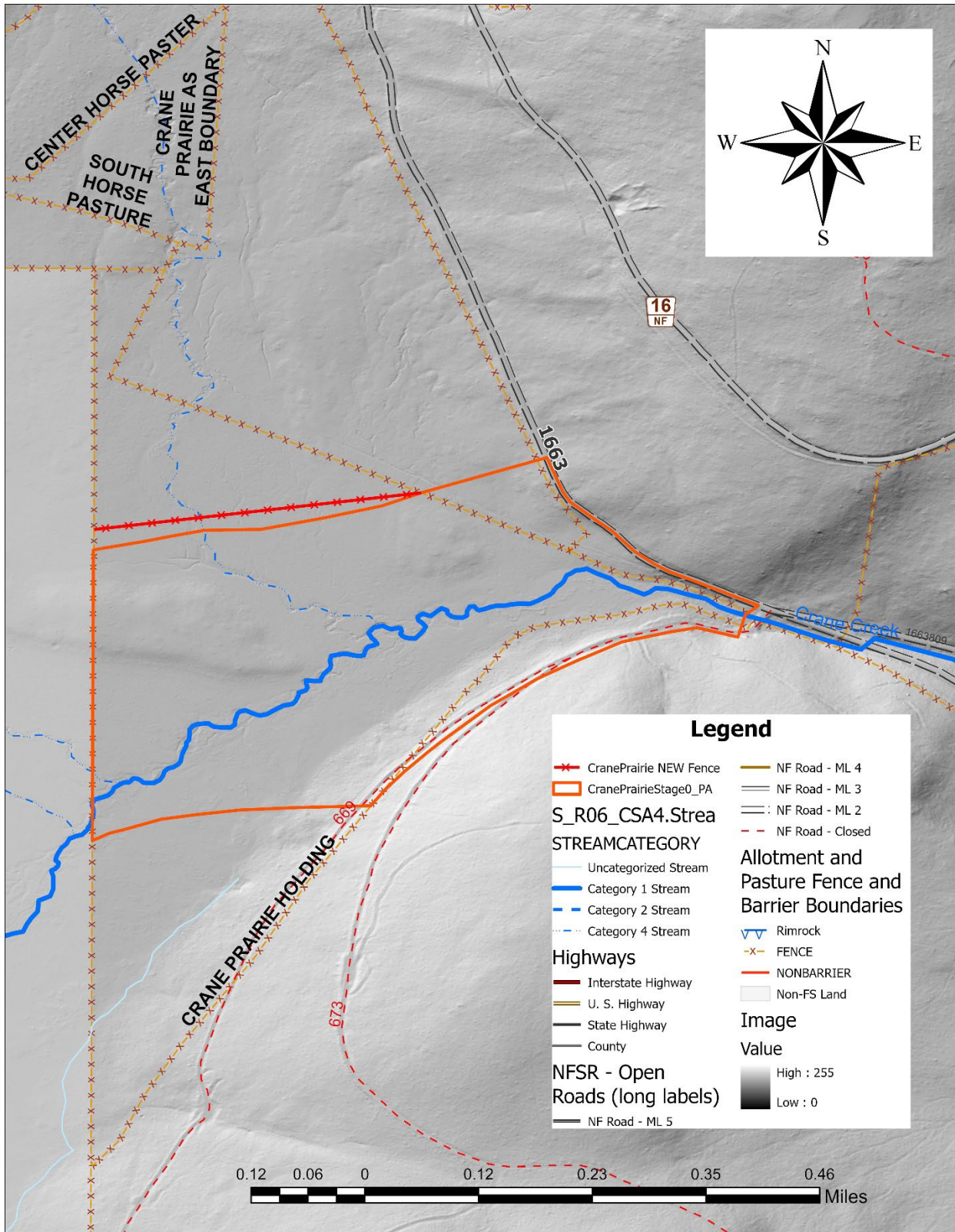


Figure 6. Project area in relation to existing pasture & allotment boundary fences (brown) as well as the proposed new livestock enclosure fencing within Flag Prairie Allotment's Crane Prairie Holding pasture (red).

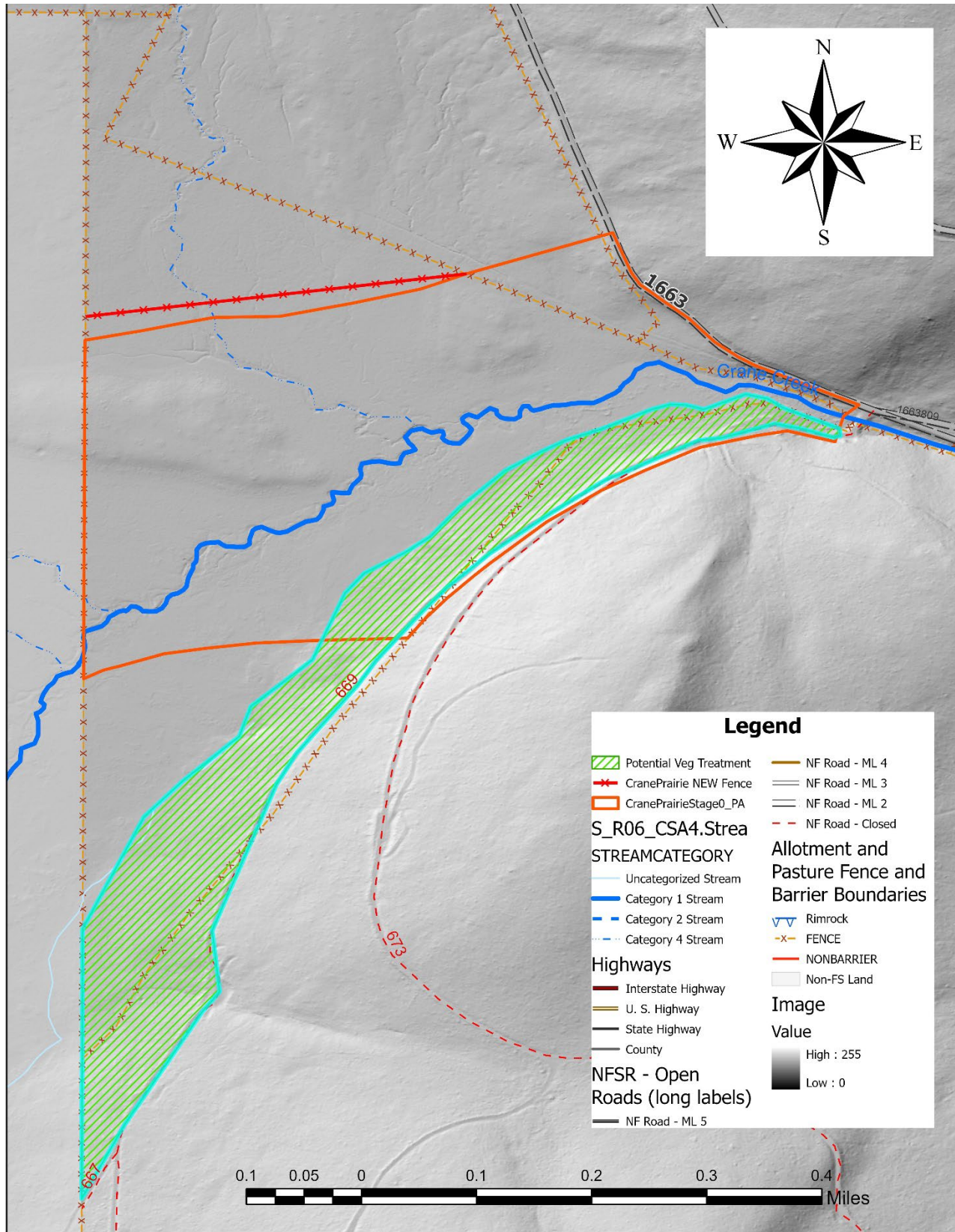


Figure 7. Maximum potential extent of proposed vegetation treatment (conifer encroachment thinning and prescribed burning) in relation to the stage zero project area and proposed new enclosure fence line.

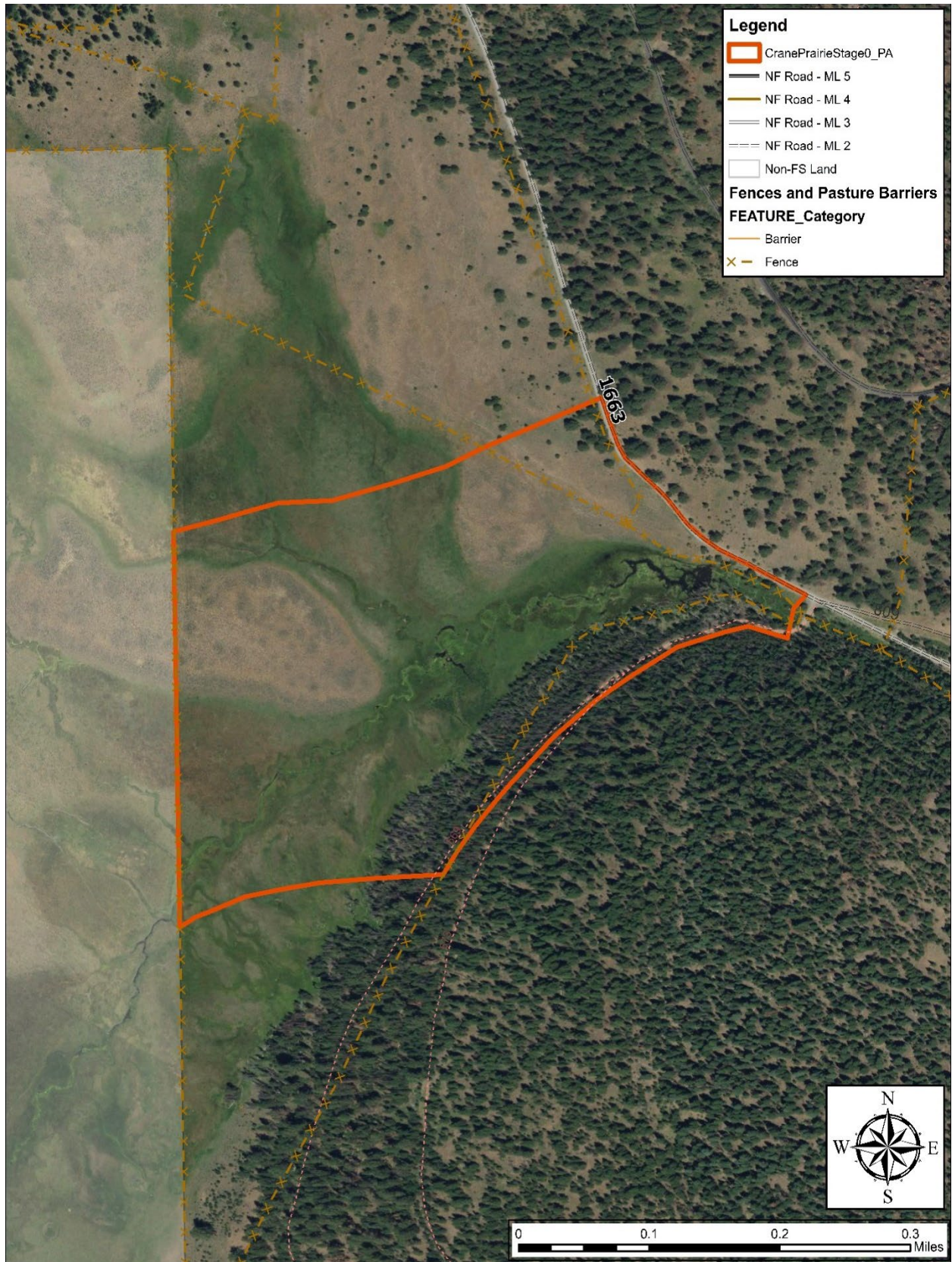


Figure 8. Project area overlain with National Agriculture Imagery Program (NAIP) imagery.



**Figure 9. Photo of Forest Service System road 1663809 bordering Crane Creek in 1938 showing results of “beaverwork”. The stream still appears to be relatively low-energy, with no well-defined channels and abundant large wood throughout the floodplain.**



**Figure 10. Photo of the same reach in 1965. The road grade has been expanded and Crane Creek has incised several feet, developing a single-thread channel with very little roughness within the valley bottom.**



**Figure 11. Condition within the project reach in the fall of 2021 following livestock use. Streambanks are denuded and riparian vegetation has been overgrazed, limiting in-stream shade.**

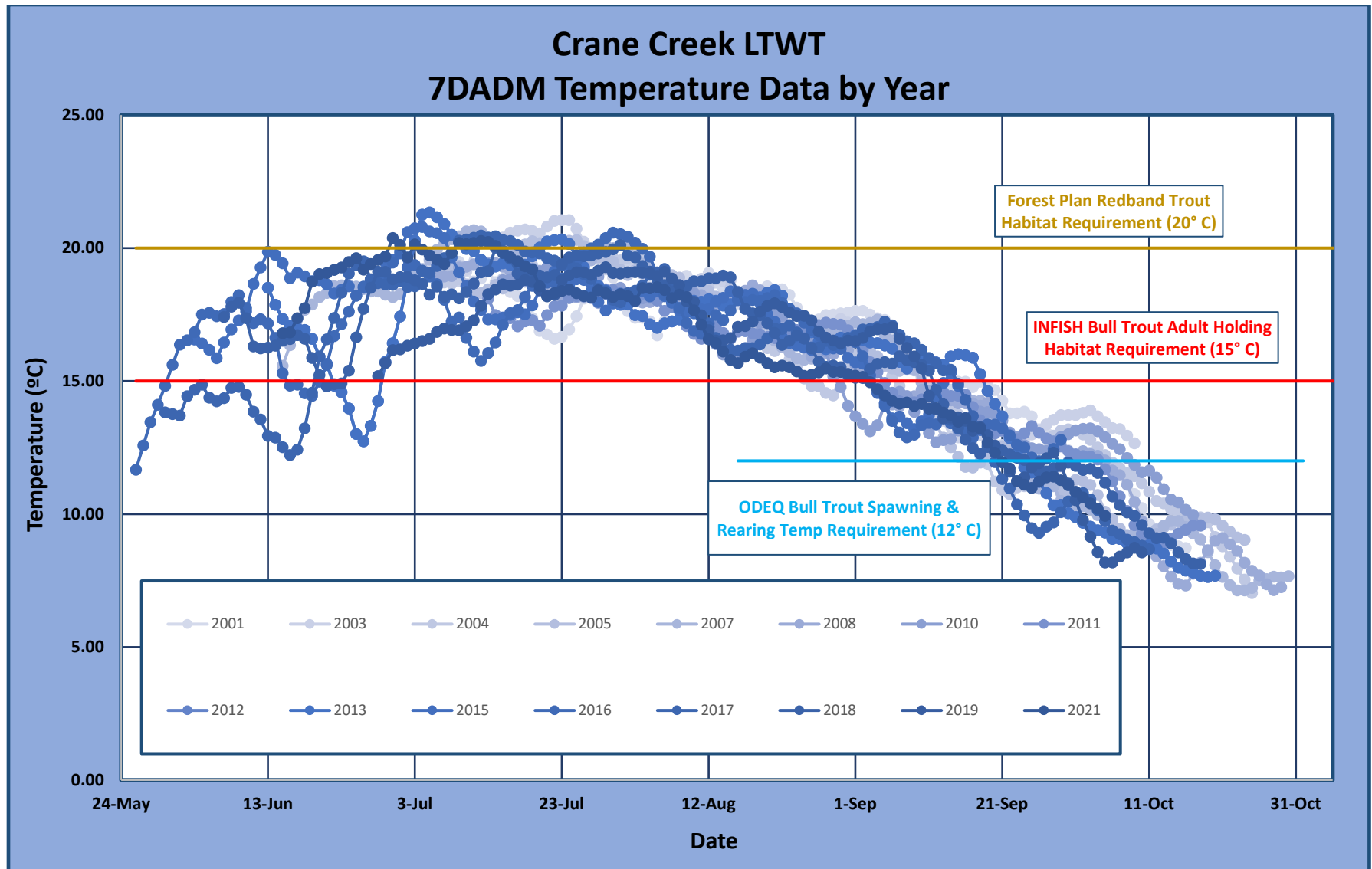


Figure 12. 7-Day-Average-Daily-Maximum (7DADM) data collected at the lower of the two long-term temperature monitoring sites, plotted by year. The site is approximately 6 river-miles below the project area and 500' upstream from Crane creek's confluence with the North Fork Malheur River.

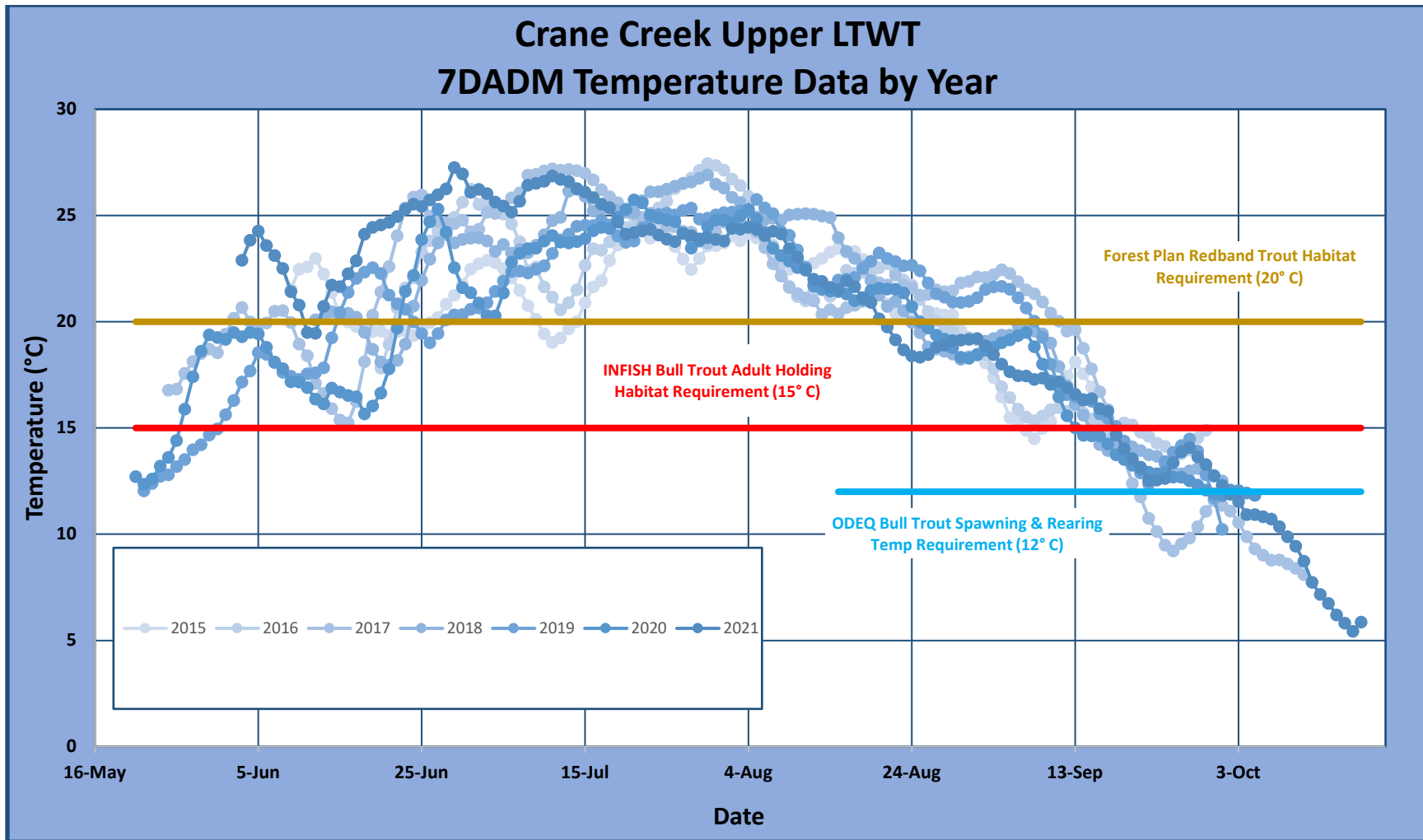


Figure 13. 7-Day-Average-Daily-Maximum (7DADM) data collected at the upper of the two long-term temperature monitoring sites, plotted by year. The site is approximately 1.7 stream-miles below the bottom of the project area.



**Figure 14. Example of a piezometer installed within the Summit Creek Phase 1 stage 0 project area. A "level logger" is placed within the well to provide continuous groundwater level data at the site.**



**Figure 15. Example of a stream gauge installed below the Summit Creek Phase 1 project area. A "level logger" is placed within the pipe to provide continuous surface water (and thus discharge) data at the site.**

## Spatial Information

Project Spatial Data Location:

T:\FS\NFS\Malheur\program\Watershed-2500\GIS\Workspace\Spengler\AREA\Crane Prairie Stage 0\Crane Prairie Stage 0.gdb

In-stream restoration potential extent (including wood/fill material sources): **“CranePrairieStage0\_PA”**

Conifer encroachment thinning and prescribed burning potential extent: **“CP\_potentialvegtreat”**

New livestock exclosure fence potential extent: **“CranePrairie\_Fence”**

# Project Review

## Malheur National Forest Aquatic Restoration Project NEPA Compliance and Implementation Checklist

**Project Number:** 0401-2024      **Date:** 11/20/2023      **Location:** T16S R35E Section 30

**Category:** Category 1: Fish Passage Restoration

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

Category 3: Dam and Legacy Structure Removal

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Category 13: Riparian Vegetation Treatment (Controlled Burning)

Category 14: Riparian Vegetative Planting

Category 17: Fisheries, Hydrology, Geomorphology Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration

**Project Description:** Floodplain restoration on Crane Creek, intended to raise water table to historic levels and subsequently improve fish habitat for ESA listed Bull Trout

**Heritage** (to be completed by heritage specialist)

Y / N    Initial

**Y**      LB      Specific PDCs for heritage addressed (heritage surveys; avoidance areas).

**Botany** (to be completed by botany specialist)

Y / N    Initial

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

**Y**      AH      Specific PDC for noxious weeds addressed.

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

Y / N    Initial

**N**      SS      4A big game winter range

**N**      SS      6A and 6B wilderness

**Y**      SS      7 scenic area

**N**      SS      8 special interest areas

Y / N    Initial

**N**      SS      9 research natural areas

**N**      SS      10 semi-primitive non-motorized recreation areas

**N**      SS      22/22A wild and scenic river

**N**      SS      inventoried roadless areas

**Comments:** [Click here to enter additional comments.](#)

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

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

Resource	Signature	Date	Comments (additional PDCs may be noted if necessary) *May continue on
Heritage	<u>/s/ Laura Bruns</u>	1/17/2024	Project activity areas and proposed actions were
Botany	<u>/s/ Amanda</u>	1/17/2024	<a href="#">Click here to enter comments</a>
Invasive Plants	<u>/s/ Amanda</u>	1/17/2024	<a href="#">Click here to enter comments</a>
Wildlife	<u>/s/ Kale Voll</u>	1/16/2024	Do not cut any Sangs for large woody material or during vegetation treatment unless snags present a safety concern. If the new fence line does need to be constructed, please consult with wildlife for placement and/or wildlife friendly specifications.
Fish*	<u>/s/ Allen Taylor</u>	<u>Date</u>	Consistent with PDCs, no additional comments. Signed
Hydrology*	<u>/s/ Jordan Bass</u>	12/8/2023	No additional comments. Signed 12/8/2023
Range	<u>/s/ Erin Jackson</u>	<u>Date</u>	Livestock enclosure fence may not be built in lieu of 16 road
Soils	<u>/s/ Robert McNeil</u>	1/22/2024	See Soil Review for PDC. All soil standards would be met.
Recreation	<u>/s/ Marley Chynoweth</u>	1/16/2024	<a href="#">Click here to enter comments</a>
Special Uses	<u>/s/ Stacia Kimbell</u>	12/4/2023	No Lands Special Uses identified within or adjacent to PAB.
Lands	<u>/s/ Stacia Kimbell</u>	12/4/2023	Ensure compliance with the National Forest Boundary Line Policy & Direction prior to project implementation and adjacent landowners are adequately notified.
Mining	<u>/s/ Ray Poe</u>	12/5/2023	No active or pending mine claims within or adjacent to PAB. No other mining issues identified.
Engineering	<u>/s/ Matthew Smith</u>	1/23/2024	For all pieces of placed large woody debris within 500 feet upstream of a culvert or bridge, the length of each piece of LWD with a rootwad should be less than 50% of the effective culvert or greater than 300% of the effective culvert opening or bridge opening width, and the length of each piece of LWD without a rootwad should be less than 75% of the effective culvert or bridge opening width. All road activities shall be subject to the Malheur Commercial Road Use Rules. Any equipment marks left on open roads and associated road features shall be removed and road shall be resurfaced if necessary. Preserve culverts, road drainage features, signs, and cattleguards. Repair any damage to these features that are caused from the implementation of this project.
Fuels / Fire	<u>/s/ Brie Myers</u>	11/22/23	Inform Fire/Fuels of implementation start date.
Silviculture	<u>/S/ Craig Lavy</u>	1/17/2024	Please advise Silviculture when implementation starts. No additional comments.

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

District Environmental Coordinator: Frederick Hoeft Date: 1/22/2024

Line Officer Signature: /s/ Your Name. Date: Click to enter a date.

# Appendix to the Aquatic Restoration EA

## Implementation Description

**Project name:** Crane Prairie Stage 0 Restoration

**Project number:** 0401-2024

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

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

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

## Program Administration

1. Integration of project design criteria and conservation measures and terms and conditions into project design and contract language
  - a. This document is to outline the conservation measures and PDCs that will be used during project implementation to remain compliant with the aquatic restoration biological assessment as well as ARBO II.
2. Project notification: The following information will be provided to the National Marine Fisheries Service (NMFS) Level 1 aquatics members 30 days prior to implementation as a Project Notification Form 7.
  - a. Action identifier – 0401-2024
  - b. Project name – Crane Prairie Stage 0 Restoration
  - c. Location – T16S R35E Section 30

**Table 2. Project location information**

Project Location	Crane Creek Stage 0 Restoration
Stream name	Crane Creek
6th field HUC	Middle Snake-Boise- 170501
10 <sup>th</sup> field HUC	Upper North Fork Malheur River-1705011611
12 <sup>th</sup> field HUC	Crane Creek- 170501161103

- d. Agency contact – Sam Spengler, Hydrologist
- e. Timing – Start date: 7/1/2024 End date: 8/31/2024
- f. Activity category –

**Category 1:** Fish Passage Restoration

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**Category 14:** Riparian Vegetative Planting

**Category 17:** Fisheries, Hydrology, Geomorphology Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration

- g. Project description – Project description is available in the Proposed Action and Implementation Plan section above.
  - h. Species affected –
    - i. Listed species: None
    - ii. Critical Habitat: No
    - iii. MIS Species: Redband Trout (*Oncorhynchus mykiss*)
  - i. Date of submittal – To be completed 4/1/24, at least 30 days before implementation
  - j. Site assessments – Assessment for contaminants is not required at these locations.
  - k. Review – NMFS fish passage review and Restoration Review Team review is scheduled to occur February 2024.
  - l. Verification – N/A
  - m. SOD project notification – N/A
3. Minor Variance: No variances are proposed for this project.
  4. NMFS Fish Passage Review and Approval: National Marine Fisheries Service (NMFS) fish passage review and Restoration Review Team review are required. Approval anticipated February 2024. Project will not proceed until approvals are acquired.
  5. Restoration Review Team: This work does require review by the restoration review team. Review and approval anticipated February 2024. Project will not proceed until approvals are acquired.
  6. Project Completion Report: To be completed after implementation
  7. Annual Program Report: This project will be completed within 1 year, completion and annual reporting will occur in the winter of FY26 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, per *Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act* (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 per *Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act* (NMFS 2011e).
  - ii. For the dewatering of a work site to remove or install culverts, bridge abutments etc., if ESA-listed fish may be present, a fish screen that meets criteria specified by NMFS (2011e) must be used on the intake to avoid juvenile fish entrainment. If ESA-listed salmon, steelhead, eulachon, or green sturgeon may be present, the action agencies will ensure that the fish screen design is reviewed and approved by NMFS for consistency with NMFS (2011e) criteria if the diversion (gravity or pump) is at a rate greater than 3 cubic feet per second (cfs). NMFS approved fish screens have the following specifications: (1) An automated cleaning device with a minimum effective surface area of 2.5 square feet per cfs, and a nominal maximum approach velocity of 0.4 feet per second (fps), or no automated cleaning device, a minimum effective surface area of 1 square foot per cfs, and a nominal maximum approach rate of 0.2 fps; and (2) a round or square screen mesh that is no larger than 2.38 mm (0.094 inches) in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069 inches) in the narrow dimension.
- f. **Stream re-watering:** Upon project completion, slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden release of suspended sediment. Monitor downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

## Applicable Project Design Criteria

### Project Design Criteria for Aquatic Restoration Activity Categories

#### 1. Fish Passage Restoration

Fish passage restoration includes the following: total removal of culverts or bridges, or replacing culverts or bridges with properly sized culverts and bridges, replacing a damaged culvert or bridge, and resetting an existing culvert that was improperly installed or damaged; stabilizing and providing passage over headcuts; removing, constructing (including relocations), repairing, or maintaining fish ladders; and constructing or replacing fish screens for irrigation diversions. Such projects will take place where fish passage has been partially or completely eliminated through road construction, stream degradation, creation of small dams and weirs, and irrigation diversions. Equipment such as excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Stream simulation culvert and bridge projects:** All road-stream crossing structures shall simulate stream channel conditions per *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road- Stream Crossings* (USDA-Forest Service 2008), located at: [http://stream.fs.fed.us/fishxing/aop\\_pdfs.html](http://stream.fs.fed.us/fishxing/aop_pdfs.html).

i. **Culvert criteria:** Within the considerations of stream simulation, the structure shall, at a minimum, accommodate a bankfull wide channel plus constructed banks to provide for passage of all life stages of native fish species (for more information, reference Chapter 6, page 35 of the USFS Stream Simulation Guide). The following crossing-width guidance applies to specific ranges of entrenchment ratios as defined by Rosgen (1996):

1. Non-entrenched Streams: If a stream is not fully entrenched (entrenchment ratio of greater than 1.4), the minimum culvert width shall be at least 1.3 times the bankfull channel width. This is consistent with *Anadromous Salmonid Passage Facility Design* (section 7.4.2 “Stream Simulation Design”) (NMFS 2011e). However, if the appropriate structure width is determined to be less than 1.3 times the bankfull channel width, processes for variances are listed in “iv” and “v” below.

2. Entrenched Streams: If a stream is entrenched (entrenchment ratio of less than 1.4), the culvert width must be greater than bankfull channel width, allow sufficient vertical clearance to allow ease of construction and maintenance activities, and provide adequate room for the construction of natural channel banks. Consideration should be given to accommodate the floodprone width. Floodprone width is the width measured at twice the maximum bankfull depth (Rosgen 1996).

ii. **Bridge design:**

1. Bridges with vertical abutments, including concrete box culverts, which are constructed as bridges, shall have channel widths that are designed using the culvert criteria (PDC 21a-i above). This opinion does not cover bridges that require pile driving within a wetted stream channels.

2. Primary structural elements must be concrete, metal, fiberglass, or untreated timber. Concrete must be sufficiently cured or dried before coming into contact with stream flow.

3. Riprap must not be placed within the bankfull width of the stream. Riprap may only be placed below bankfull height when necessary for protection of abutments and pilings. However, the amount and placement of riprap should not constrict the bankfull flow.

iii. **Crossing design:**

1. Crossings shall be designed using an interdisciplinary design team consisting of an experienced engineer, fisheries biologist, and hydrologist/geomorphologist.

2. Forest Service crossing structures wider than 20 feet or with costs that exceed \$100,000 shall be reviewed by the USDA-Forest Service, Region 6, aquatic organism passage design assistance team.
  3. At least one member of the design team shall be trained in a weeklong aquatic organism passage course based Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USDA-Forest Service 2008).
  4. Bankfull width shall be based on the upper end of the distribution of bankfull width measurements as measured in the reference reach to account for channel variability and dynamics.
- iv. **NMFS fish passage review and approve:** If the structure width is determined to be less than the established width criteria as defined above, a variance must be requested from NMFS for consistency with criteria in NMFS (2011e).
- v. **Opportunity for individual consultation:** The action agencies have a legal duty under the ESA to consult with NMFS and U.S. Fish and Wildlife Service (USFWS) on a project-specific basis if they prefer to operate outside the conditions in this opinion. The standards provided in this document are conservative for the purpose of this programmatic and may or may not be applicable to projects that undergo individual Level 1 Consultation. The standards in ARBO II are not new defaults to be used universally outside the programmatic arena.
- vi. **Headcut and grade stabilization:** Headcuts often occur in meadow areas, typically on Rosgen “C” and “E” channel types. Headcuts develop and migrate during bankfull and larger floods, when the sinuous path of Rosgen E type streams may become unstable in erosive, alluvial sediments, causing avulsions, meander cut-offs, bank failure, and development of an entrenched Rosgen G gully channel (Rosgen 1994).
1. **Stabilize headcuts:**
    - i. In streams with current or historical fish presence, provide fish passage over stabilized headcut through constructed riffles for pool/riffle streams or a series of log or rock structures for step/pool channels as described in part ii below.
    - ii. Armor headcut with sufficiently sized and amounts of material to prevent continued up-stream migration of the headcut. Materials can include both rock and organic materials which are native to the area. Material shall not contain gabion baskets, sheet pile, concrete, articulated concrete block, and cable anchors.
    - iii. Focus stabilization efforts in the plunge pool, the headcut, as well as a short distance of stream above the headcut.
    - iv. Minimize lateral migration of channel around headcut (“flanking”) by placing rocks and organic material at a lower elevation in the center of the channel cross section to direct flows to the middle of channel.
    - v. Short-term headcut stabilization (including emergency stabilization projects) may occur without associated fish passage measures. However, fish passage must be incorporated into the final headcut stabilization action and be completed during the first subsequent in-water work period.
    - vi. In streams without current or historic fish presence, it is recommended to construct a series of downstream log or rock structures as described in part ii below to expedite channel aggradation.
  - vii. **Grade stabilization to promote fish passage associated with headcut stabilization:**
    1. **NMFS fish passage review and approve:** If a grade stabilization structure spans the channel and creates one or more discrete longitudinal drops greater than 6 inches, the action agencies will ensure that the action is individually reviewed and approved by the NMFS for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011e).

2. Provide fish passage over stabilized headcut through constructed riffles for pool/riffle streams or a series of log or rock structures for step/pool channels. If large wood and boulder placement will be used for headcut stabilization, refer to Large Wood, Boulder, and Gravel Placement (PDC 22) below.
  3. Construct structures in a ‘V’ or ‘U’ shape, oriented with the apex upstream, and lower in the center to direct flows to the middle of channel.
  4. Key structures into the stream bed to minimize structure undermining due to scour, preferably at least 2.5 times their exposure height. The structures should also be keyed into both banks—if feasible greater than 8 feet.
  5. If several structures will be used in series, space them at the appropriate distances to promote fish passage of all life stages of native fish. Incorporate NMFS fish passage criteria (jump height, pool depth, etc.) in the design of step structures. Recommended spacing should be no closer than the net drop divided by the channel slope (for example, a 1 foot high step structure in a stream with a two-percent gradient will have a minimum spacing of 50 feet  $[1/0.02]$ ).
  6. Include gradated (cobble to fine) material in the rock structure material mix to help seal the structure/channel bed, thereby preventing subsurface flow and ensuring fish passage immediately following construction if natural flows are sufficient.
  7. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.
- b. Fish ladders:**
- i. **NMFS fish passage review and approve:** The action agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011e).
  - ii. Design preference is based on project type, level of maintenance, and required monitoring essential for reliable fish passage. Typical fishway designs include:
    1. roughened channels/boulder step structures
    2. channel spanning concrete sills
    3. pool and chute, and
    4. pool and weir fishways.

Roughened channel and boulder step structure fishways consist of a graded mix of rock and sediment in an open channel that creates enough roughness and diversity to facilitate fish passage. NMFS’s review will include any appurtenant facilities (such as fish counting equipment, pit tag detectors, lighting, trash racks, or attraction water) that may be included with the fish ladder design. See the most recent version of *Anadromous Salmonid Passage Facility Design* (NMFS 2011e) for guidelines and design criteria. Through the NMFS Level 1 team member, collaborate with NMFS engineering staff prior to the conceptual design process of fishway projects to solicit NMFS’s preferred design type.
  - iii. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.
- c. Irrigation diversion replacement/relocation and screen installation/replacement:**
- i. **NMFS fish passage review and approve:** The action agencies will ensure that the action is individually reviewed and approved by National Marine Fisheries Service (NMFS) for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011e).
  - ii. Diversion structures—associated with points of diversion and future fish screens—must pass all life stages of threatened and endangered aquatic species that historically used the affected aquatic habitat.

- iii. Water diversion intake and return points must be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the diversion.
- iv. NMFS fish screen criteria (NMFS 2011e) applies to federally listed salmonid species under their jurisdiction. This includes screens in temporary and permanent pump intakes.
- v. All fish screens will be sized to match the irrigator’s state water right or estimated historic water use, whichever is less.
- vi. Size of bypass structure should be big enough to pass steelhead kelt into the stream.
- vii. Abandoned ditches and other similar structures will be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them.
- viii. When making improvements to pressurized diversions, install a totalizing flow meter capable of measuring rate and duty of water use. For non-pressurized systems, install a staff gauge or other measuring device capable of measuring instantaneous rate of water flow.
- ix. Conversion of instream diversions to groundwater wells will only be used in circumstances where there is an agreement to ensure that any surface water made available for instream flows is protected from surface withdrawal by another water user.
- x. For the removal of diversion structures constructed of local rock and dirt, the project sponsor will dispose of the removed material in the following manner:
  - 1. Material more than 60 percent silt or clay will be disposed in uplands, outside of the active floodplain.
  - 2. Material with more than 40 percent gravel will be deposited within the active floodplain, but not in wetlands.
  - 3. Material with more than 50 percent gravel and less than 30 percent fines (silt or clay) may be deposited below the ordinary high water mark (HWM).

## 2. Large Wood, Boulder, and Gravel Placement

Large wood, boulder, and gravel placement includes large wood and boulder placement, engineered log jams, porous boulder structures and vanes, gravel placement, and tree removal for large wood projects. Such activities will occur in areas where channel structure is lacking due to past stream cleaning (large wood removal), riparian timber harvest, and in areas where natural gravel supplies are low due to anthropogenic disruptions. These projects will occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Equipment such as helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, and similar equipment may be used to implement projects.

### a. Large wood and boulder projects:

- i. Place large wood and boulders in areas where they would naturally occur and in a manner that closely mimics natural accumulations for that particular stream type. For example, boulder placement may not be appropriate in low-gradient meadow streams.
- ii. Structure types shall simulate disturbance events to the greatest degree possible and include, but are not limited to, log jams, debris flows, windthrow, and tree breakage.
- iii. No limits are to be placed on the size or shape of structures as long as such structures are within the range of natural variability of a given location and do not block fish passage.
- iv. Projects can include grade control and bank stabilization structures, while size and configuration of such structures will be commensurate with scale of project site and hydraulic forces.
- v. The partial burial of large wood and boulders is permitted and may constitute the dominant means of placement. This applies to all stream systems but more so for larger stream systems

where use of adjacent riparian trees or channel features is not feasible or does not provide the full stability desired.

vi. Large wood includes whole conifer and hardwood trees, logs, and rootwads. Large wood size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5 times bankfull channel width, while logs without rootwads should be a minimum of 2.0 times bankfull width.

vii. Structures may partially or completely span stream channels or be positioned along stream banks.

viii. Stabilizing or key pieces of large wood must be intact, hard, with little decay, and if possible have root wads (untrimmed) to provide functional refugia habitat for fish. Consider orienting key pieces such that the hydraulic forces upon the large wood increases stability.

ix. Anchoring large wood – Anchoring alternatives may be used in preferential order:

1. Use of adequate sized wood sufficient for stability
2. Orient and place wood in such a way that movement is limited
3. Ballast (gravel or rock) to increase the mass of the structure to resist movement
4. Use of large boulders as anchor points for the large wood
5. Pin large wood with rebar to large rock to increase its weight. For streams that are entrenched (Rosgen F, G, A, and potentially B) or for other streams with very low width to depth ratios (less than 12) an additional 60 percent ballast weight may be necessary due to greater flow depths and higher velocities.

**b. Engineered logjams:** are structures designed to redirect flow and change scour and deposition patterns. To the extent practical, they are patterned after stable natural log jams and can be either unanchored or anchored in place using rebar, rock, or piles (driven into a dewatered area or the streambank, but not in water). Engineered log jams create a hydraulic shadow, a low-velocity zone downstream that allows sediment to settle out. Scour holes develop adjacent to the log jam. While providing valuable fish and wildlife habitat they also redirect flow and can provide stability to a streambank or downstream gravel bar.

i. **NMFS fish passage review and approve:** For engineered log jams that occupy greater than 25 percent of the bankfull area, the action agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with criteria in Anadromous Salmonid Passage Facility Design (NMFS 2011e).

ii. Engineered log jams will be patterned, to the greatest degree possible, after stable natural log jams.

iii. Grade control engineered log jams are designed to arrest channel down-cutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks.

iv. Stabilizing or key pieces of large wood that will be relied on to provide streambank stability or redirect flows must be intact, solid (little decay). If possible, acquire large wood with untrimmed rootwads to provide functional refugia habitat for fish.

v. When available, trees with rootwads attached should be a minimum length of 1.5 times the bankfull channel width, while logs without rootwads should be a minimum of 2.0 times the bankfull width.

vi. The partial burial of large wood and boulders may constitute the dominant means of placement, and key boulders (footings) or large wood can be buried into the stream bank or channel

vii. Angle and offset: The large wood portions of engineered log jam structures should be oriented such that the force of water upon the large wood increases stability. If a rootwad is left exposed to the flow, the bole placed into the streambank should be oriented downstream parallel to the flow

direction so the pressure on the rootwad pushes the bole into the streambank and bed. Wood members that are oriented parallel to flow are more stable than members oriented at 45 or 90 degrees to the flow.

viii. If large wood anchoring is required, a variety of methods may be used. These include buttressing the wood between riparian trees, the use of manila, sisal or other biodegradable ropes for lashing connections. If hydraulic conditions warrant use of structural connections, such as rebar pinning or bolted connections, may be used. Rock may be used for ballast but is limited to that needed to anchor the large wood.

**c. Porous boulder structures and vanes:**

i. Full channel-spanning boulder structures are to be installed only in highly uniform, incised, bedrock-dominated channels to enhance or provide fish habitat in stream reaches where log placements are not practicable due to channel conditions (not feasible to place logs of sufficient length, bedrock-dominated channels, deeply-incised channels, artificially constrained reaches, etc.), where damage to infrastructure on public or private lands is of concern, or where private landowners will not allow log placements due to concerns about damage to their streambanks or property.

ii. Install boulder structures low in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 1.5-year flow event).

iii. Boulder step structures are to be placed diagonally across the channel or in more traditional upstream pointing “V” or “U” configurations with the apex oriented upstream.

iv. Boulder step structures are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. Plunges shall be kept less than 6 inches in height.

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

vi. Rock for boulder step structures shall be durable and of suitable quality to assure long-term stability in the climate in which it is to be used. Rock sizing depends on the size of the stream, maximum depth of flow, planform, entrenchment, and ice and debris loading.

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

viii. Full spanning boulder step structure placement should be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of large wood.

**d. Gravel augmentation:**

i. Gravel can be placed directly into the stream channel, at tributary junctions, or other areas in a manner that mimics natural debris flows and erosion.

ii. Augmentation will only occur in areas where the natural supply has been eliminated, significantly reduced through anthropogenic disruptions, or used to initiate gravel accumulations in conjunction with other projects, such as simulated log jams and debris flows.

iii. Gravel to be placed in streams shall be a properly sized gradation for that stream, clean, and non-angular. When possible, use gravel of the same lithology as found in the watershed.

Reference the Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USDA-Forest Service 2008) to determine gravel sizes appropriate for the stream.

iv. Gravel can be mined from the floodplain at elevations above bankfull, but not in a manner that would cause stranding during future flood events. Crushed rock is not permitted.

v. After gravel placement in areas accessible to higher stream flow, allow the stream to naturally sort and distribute the material.

- vi. Do not place gravel directly on bars and riffles that are known spawning areas, which may cause fish to spawn on the unsorted and unstable gravel, thus potentially resulting in redd destruction.
- vii. Imported gravel must be free of invasive species and non-native seeds. If necessary, wash gravel prior to placement.

**e. Tree removal for large wood projects:**

- i. Live conifers and other trees can be felled or pulled/pushed over in a Northwest Forest Plan (USDA and USDI 1994a) Riparian Reserve or PACFISH/INFISH (USDA-Forest Service 1995 ; USDA and USDI 1994b) riparian habitat conservation areas (RHCA), and upland areas (for example, late successional reserves or adaptive management areas for northern spotted owl and marbled murrelet critical habitat) for in-channel large wood placement only when conifers and trees are fully stocked. Tree felling shall not create excessive stream bank erosion or increase the likelihood of channel avulsion during high flows.
- ii. Danger trees and trees killed through fire, insects, disease, blow-down and other means can be felled and used for in-channel placement regardless of live-tree stocking levels.
- iii. Trees may be removed by cable, ground-based equipment, horses or helicopters.
- iv. Trees may be felled or pushed/pulled directly into a stream or floodplain.
- v. Trees may be stock piled for future instream restoration projects.
- vi. The project manager for an aquatic restoration action will coordinate with an action-agency wildlife biologist in tree-removal planning efforts.

### 3. Dam, Tidegate and Legacy Structure Removal

Dam, tidegate and legacy structure removal includes removal of dams, tidegates, channel-spanning weirs, legacy habitat structures, earthen embankments, subsurface drainage features, spillway systems, outfalls, pipes, instream flow redirection structures (for example, drop structure, gabion, and groin), or similar devices used to control, discharge, or maintain water levels. Projects will be implemented to reconnect stream corridors, floodplains, and estuaries, reestablish wetlands, improve aquatic organism passage, and restore more natural channel and flow conditions. Any instream water control structures that impound substantial amounts of contaminated sediment are not proposed. Equipment such as excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

**a. Dam removal:**

**i. Design review:**

- 1. **NMFS fish passage review and approve:** The action agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with criteria in NMFS (2011e).
- 2. **Restoration review team:** The action agencies will ensure that the action is individually reviewed by the restoration review team.

ii. Dams greater than 10 feet in height require a long-term monitoring and adaptive management plan that will be developed between the services and the action agency.

iii. At a minimum, the following information will be necessary for review:

- 3. A longitudinal profile of the stream channel for 20 channel widths downstream of the structure and 20 channel widths upstream of the reservoir area (outside of the influence of the structure) shall be used to determine the potential for channel degradation.
- 4. A minimum of three cross-sections – one downstream of the structure, one through the reservoir area upstream of the structure, and one upstream of the reservoir area (outside of the influence of the structure) to characterize the channel morphology and quantify the stored sediment.

5. Sediment characterization to determine the proportion of coarse sediment (greater than 2 millimeters) in the reservoir area.
  6. A survey of any downstream spawning areas that may be affected by sediment released by removal of the water control structure or dam. Reservoirs with a d35 greater than 2 millimeters (65 percent of the sediment by weight exceeds 2 millimeters in diameter) may be removed without excavation of stored material, if the sediment contains no contaminants; reservoirs with a d35 less than 2 millimeters (65 percent of the sediment by weight is less than 2 millimeters in diameter) will require partial removal of the fine sediment to create a pilot channel, in conjunction with stabilization of the newly exposed streambanks with native vegetation.
  7. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.
- b. **Tide gate removal:** This action includes the removal of tide gates.
- i. **NMFS fish passage review and approve:** For projects that constrain tidal exchange, the action agencies will ensure that the action is individually reviewed and approved by the NMFS for consistency with criteria in NMFS (2011e).
  - ii. Follow Work Area Isolation, Surface Water Withdrawals, and Fish Capture and Release (PDC 20). If a culvert or bridge will be constructed at the location of a removed tide gate, then the structure should be large enough to allow for a full tidal exchange.
- c. **Removal of legacy structures:** This action includes the removal of past projects, such as large wood, boulder, rock gabions, and other in-channel and floodplain structures.
- d. If the structure being removed contains material (large wood, boulders, concrete, etc.) not typically found within the stream or floodplain at that site, remove material from the 100-year floodplain.
  - e. If the structure being removed contains material (for example, large wood or boulders) that is typically found within the stream or floodplain at that site, the material can be reused to implement habitat improvements described under the Large Wood, Boulder, and Gravel Placement activity category in this opinion.
  - f. If the structure being removed is keyed into the bank, fill in “key” holes with native materials to restore contours of stream bank and floodplain. Compact the fill material adequately to prevent washing out of the soil during over-bank flooding. Do not mine material from the stream channel to fill in “key” holes.
  - g. When removal of buried log structures may result in significant disruption to riparian vegetation or the floodplain, consider using a chainsaw to extract the portion of log within the channel and leaving the buried sections within the streambank.
  - h. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.
  - i. If the legacy structures (log, rock, or gabion weirs) were placed to provide grade control, evaluate the site for potential headcutting and incision due to structure removal. If headcutting and channel incision are likely to occur due to structure removal, additional measures must be taken to reduce these impacts.
  - j. If the structure is being removed because it has caused an over-widening of the channel, consider implementing other ARBO II restoration categories to decrease the width to depth ratio of the stream to a level commensurate with the geomorphic setting.

#### 4. Channel Reconstruction/Relocation

Channel reconstruction/relocation projects include reconstruction of existing stream channels through excavation and structure placement (large wood and boulders) or relocation (rerouting of flow) into historic or newly constructed channels that are typically more sinuous and complex. This proposed action

applies to stream systems that have been straightened, channelized, dredged, or otherwise modified for the purpose of flood control, increasing arable land, realignment, or other land use management goals or for streams that are incised or otherwise disconnected from their floodplains resulting from watershed disturbances. This activity type will be implemented to improve aquatic and riparian habitat diversity and complexity, reconnect stream channels to floodplains, reduce bed and bank erosion, increase hyporheic exchange, provide long-term nutrient storage, provide substrate for macroinvertebrates, moderate flow disturbance, increase retention of organic material, and provide refuge for fish and other aquatic species. Equipment such as excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

**a. General project design criteria:**

**i. Design review:**

1. **NMFS fish passage review and approve** – The action agencies will ensure that the action is individually reviewed and approved by NMFS for consistency with NMFS (2011e).
2. **Restoration Review Team** – The Action Agencies will ensure that the action is individually reviewed by the Restoration Review Team.

**ii. Design guidance:**

1. Construct geomorphically appropriate stream channels and floodplains within a watershed and reach context.
2. Design actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.
3. To the greatest degree possible, remove nonnative fill material from the channel and floodplain to an upland site.
4. When necessary, loosen compacted soils once overburden material is removed. Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain where appropriate to support the project goals and objectives.
5. Structural elements shall fit within the geomorphic context of the stream system. For bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in poolriffle stream types, while roughened channels and boulder step structures shall be preferentially used in step-pool and cascade stream types.
6. Material selection (large wood, rock, gravel) shall also mimic natural stream system materials.
7. Construction of the streambed should be based on Stream Simulation Design principles as described in section 6.2 of Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings or other appropriate design guidance documents (USDA-Forest Service 2008).

**iii. Project documentation:** Prior to the design review, the project contact will provide NMFS and the restoration review team with the following documentation:

1. Background and problem statement
  - a. Site history.
  - b. Environmental baseline.
  - c. Problem description.
  - d. Cause of problem.
2. Project description
  - a. Goals/objectives.
  - b. Project elements.
  - c. Sequencing, implementation.
  - d. Recovery trajectory –how does it develop and evolve?

3. Design analysis
  - a. Technical analyses.
  - b. Computations relating design to analysis.
  - c. References.
4. River restoration analysis tool: The river restoration analysis tool ([restorationreview.com](http://restorationreview.com)) was created to assist with design and monitoring of aquatic restoration projects. The following questions taken from the tool must be addressed in the project documentation:
  - a. Problem identification
    - i. Is the problem identified?
    - ii. Are causes identified at appropriate scales?
  - b. Project context
    - i. Is the project identified as part of a plan, such as a watershed action plan or recovery plan?
    - ii. Does the project consider ecological, geomorphic, and socioeconomic context?
  - c. Goals and objectives
    - i. Do goals and objectives address problem, causes, and context?
    - ii. Are objectives measurable?
  - d. Alternatives/options evaluation
    - i. Were alternatives/options considered?
    - ii. Are uncertainties and risk associated with selected alternative acceptable?
  - e. Project design
    - i. Do project elements collectively support project objectives?
    - ii. Are design criteria defined for all project elements?
    - iii. Do project elements work with stream processes to create and maintain habitat?
    - iv. Is the technical basis of design sound for each project element?
  - f. Implementation
    - i. Are plans and specifications sufficient in scope and detail to execute the project?
    - ii. Does plan address potential implementation impacts and risks?
  - g. Monitoring and management
    - i. Does monitoring plan address project compliance?
    - ii. Does monitoring plan directly measure project effectiveness?
  - h. Monitoring: Develop a monitoring and adaptive plan that has been reviewed and approved by the restoration review team and the services. The plan will include the following:
    - i. Introduction
    - ii. Existing monitoring protocols
    - iii. Project effectiveness monitoring plan
    - iv. Project review team triggers
    - v. Monitoring frequency, timing, and duration
    - vi. Monitoring technique protocols
    - vii. Data storage and analysis
    - viii. Monitoring quality assurance plan
    - ix. Literature cited

## 5. Off- and Side-Channel Habitat Restoration

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

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

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

## 6. Streambank Restoration

Streambank restoration will be implemented through bank shaping and installation of coir logs or other soil reinforcements as necessary to support riparian vegetation; planting or installing large wood, trees, shrubs, and herbaceous cover as necessary to restore ecological function in riparian and floodplain habitats; or a combination of the above methods. Such actions are intended to restore banks that have been altered through road construction, improper grazing, invasive plants, and more. Benefits include increased amounts of riparian vegetation and associated shading, bank stability, and reduced sedimentation into stream channels and spawning gravels. Equipment such as excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

- a. Without changing the location of the bank toe, restore damaged streambanks to a natural slope and profile suitable for establishment of riparian vegetation. This may include sloping of unconsolidated bank material to a stable angle of repose or the use of benches in consolidated, cohesive soils.
- b. Complete all soil reinforcement earthwork and excavation in the dry. When necessary, use soil layers or lifts that are strengthened with biodegradable fabrics and penetrable by plant roots.
- c. Include large wood to the extent it would naturally occur. If possible, large wood should have untrimmed root wads to provide functional refugia habitat for fish. Wood that is already within the stream or suspended over the stream may be repositioned to allow for greater interaction with the stream.
- d. Rock will not be used for streambank restoration, except as ballast to stabilize large wood.
- e. Use a diverse assemblage of vegetation species native to the action area or region, including trees, shrubs, and herbaceous species. Vegetation, such as willow, sedge, and rush mats, may be gathered from abandoned floodplains, stream channels, etc.
- f. Do not apply surface fertilizer within 50 feet of any stream channel.
- g. Install fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
- h. Conduct post-construction monitoring and treatment or removal of invasive plants until native plant species are well established.

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

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

### a. Livestock fencing:

- i. Fence placement must allow for lateral movement of a stream and to allow establishment of riparian plant species. To the extent possible, fences will be placed outside the channel migration zone.
- ii. Minimize vegetation removal, especially potential large wood recruitment sources, when constructing fence lines.
- iii. Where appropriate, construct fences at water gaps in a manner that allows passage of large wood and other debris.

### b. Livestock stream crossings:

- i. The number of crossings will be minimized.
- ii. Locate crossings or water gaps where streambanks are naturally low. Livestock crossings or water gaps must not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (for example, wetlands) due to congregating livestock.
- iii. To the extent possible, crossings will not be placed in areas where ESA-listed species spawn or are suspected of spawning (for example, pool tailouts where spawning may occur), or within 300 feet upstream of such areas.
- iv. Existing access roads and stream crossings will be used whenever possible, unless new construction would result in less habitat disturbance and the old trail or crossing is retired.
- v. Access roads or trails will be provided with a vegetative buffer that is adequate to avoid or minimize runoff of sediment and other pollutants to surface waters.
- vi. Essential crossings will be designed and constructed or improved to handle reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the trail if the crossing fails.
- vii. If necessary, the streambank and approach lanes can be stabilized with native vegetation or angular rock to reduce chronic sedimentation. The stream crossing or water gap should be armored with sufficient-sized rock (for example, cobble-size rock) and use angular rock if natural substrate is not of adequate size.
- viii. Livestock crossings will not create barriers to the passage of adult and juvenile fish. Whenever a culvert or bridge—including bridges constructed from flatbed railroad cars, boxcars, or truck flatbeds—is used to create the crossing, the structure width will tier to project design criteria listed for Stream Simulation Culvert and Bridge Projects under Fish Passage Restoration (PDC 21).
- ix. Stream crossings and water gaps will be designed and constructed to a width of 10 to 15 feet in the upstream-downstream direction to minimize the time livestock will spend in the crossing or riparian area.
- x. When using pressure-treated lumber for fence posts, complete all cutting or drilling offsite (to the extent possible) so that treated wood chips and debris do not enter water or flood-prone areas.
- xi. Riparian fencing is not to be used to create livestock handling facilities or riparian pastures.

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

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

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

### 13. Riparian Vegetation Treatment

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.

## 17. Fisheries, Hydrology, Geomorphology, Wildlife, Botany, and Cultural Surveys in Support of Aquatic Restoration

This includes assessments and monitoring projects that could or are associated with planning, implementation, and monitoring of aquatic restoration projects covered by this opinion. Such support projects may include surveys to document the following aquatic and riparian attributes: fish habitat, hydrology, channel geomorphology, water quality, fish spawning, fish presence<sup>19</sup>, macro invertebrates, riparian vegetation, wildlife, and cultural resources (including excavating test pits less than 1 m<sup>2</sup> in size). This also includes effectiveness monitoring associated with projects implemented under ARBO II, provided the effectiveness monitoring is limited to the same survey techniques described in this section.

- a. Train personnel in survey methods to prevent or minimize disturbance of fish. Contract specifications should include these methods where appropriate.
- b. Avoid impacts to fish redds. When possible, avoid sampling during spawning periods.
- c. Coordinate with other local agencies to prevent redundant surveys.
- d. Locate excavated material from cultural resource test pits away from stream channels. Replace all material in test pits when survey is completed and stabilize the surface.
- e. Does not include research projects that have or should obtain a permit pursuant to section 10(a) of the ESA.

## Project Design Criteria by Resource

### Fisheries and Hydrology

Fisheries and hydrology resources will follow all mitigation measures and project design criteria for aquatic restoration activities as shown in the ‘Aquatic Restoration Project Categories, Program Administration, General Aquatic Conservation Measures, and Project Design Criteria for Aquatic Restoration Activity Categories on the Malheur National Forest.’

Additional Aquatic project design criteria were developed for the following elements: tree tipping and felling, juniper treatments, tree hauling, and prescribed burning.

#### *General For Inside Riparian Habitat Conservation Areas*

All snags will be maintained within the RHCA unless deemed a hazard to the restoration activity.

#### *Tree Tipping and Tree Felling for Large Wood Projects*

Source trees being extracted (either by tipping or felling) as part of this project for instream restoration will not be harvested from within the primary shade zone.

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

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

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

- The trees are located on a south facing slope (175 to 185 degree azimuth) and therefore do not provide stream shade;
- An appropriate level of analysis is completed and documented, such as shade modeling, using site-specific characteristics to determine the primary shade tree width; and/or
- Field monitoring or measurements are completed to determine the width where optimum angular canopy density (65 percent or greater) is achieved (see TMDL Implementation Strategies).
- If trees are being felled for safety reasons they can be felled towards the stream.
- Source trees should come from but are not limited to: over or fully stocked upland and riparian stands, hazard trees, trees generated from administrative sites (maintenance, expansion, or new construction), and hardwood restoration.

There is no DBH (diameter at breast height) restriction for large wood, but consider the following before removing and placing trees:

Diameter:

- The key to establishing a logjam is utilizing larger diameter wood that resists decay. These pieces of wood are often called “key pieces,” and serve as the anchors for the logjam structure. Wood can improve fish habitat only if the wood is large enough to stay, influence flow patterns, and sediment sorting. Larger diameter wood retains its size longer as abrasion and decay occurs over the years. Larger diameter wood is more effective in creating pools and complex channels that improve fish populations. The minimum diameter required for a key piece of wood depends on the bankfull width of the stream is found in the following table:

**Table 4. Bankfull widths and minimum diameter of logs to be considered key pieces**

Bankfull width* (in feet)	Minimum diameter* (inches)
0 to 10	10
10 to 20	16
20 to 30	18
Over 30	22

\*This table was taken from '1995 A Guide to Placement of Large Wood in Streams.

Length:

- The length of the wood is also important to stability. To be considered a key piece a log with a rootwad still attached should be at least 1 1/2 times (1.5 times) the bankfull or a log without a rootwad should be twice (2 times) the length of the stream’s bankfull width. As the best fish habitat is formed around jams composed of three to seven logs, at least two key pieces should be used at each structure.
- Mimic natural accumulations of large woody debris based on stream type, valley setting, and community type and ensure future large woody debris recruitment
- Tailholds as part of tree tipping operations are permitted across perennial, intermittent and ephemeral streams, but the use of protective straps will be required to prevent tree damage.

**Juniper Treatments**

The majority of the juniper treatment areas would be within the riparian habitat conservation areas and adjoining uplands. For each area evaluated for juniper treatments, interdisciplinary teams would discuss the following questions in order to identify the attributes of an area and select the appropriate treatments:

- What kind of site (potential natural vegetation, soils)?
- Successional state of site?
- Components that need to be restored?
- How units may fit into the overall landscape mosaic?
- Long-term goals and objectives?

Utilize the "Western Juniper Field Guide: Asking the Right Questions to Select the Appropriate Management Actions (Bates et al. 2007, Circular 1321) (see <http://pubs.usgs.gov/circ/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 outsloped roads with no ditch or stream crossings

**Prescribed Burning and Related Activities**

- Mechanical piling and burning of large piles will be restricted to existing roads and landings.
- Include all relevant PDC in silviculture prescriptions and burn plan objectives for all fuel treatment activities within RHCAs.
- Use all available fuel treatments and preparation activities as necessary (for example, multiple entries, slash pull-back, modified ignition methods, locations, timing, and sequence, thinning of small green trees, pruning of green trees and snags, prescribed fire, fire suppression, jack pot burning, etc.) to achieve the specific PDC. Suppression should be used only as a last resort to achieve other PDC.

**For Perennial and Fish-Bearing Stream Channels:**

- Avoid removing trees along stream banks (for example, don't cause bank instability or increase erosion).
- Within primary shade zone retain 100 percent of the overstory canopy closure with the exception of hardwood treatment.
- For intermittent, non-fish-bearing stream channels:
  - ◆ Within 50 feet of the stream channel backing fire is preferred.
- For the maintenance and use of water sources and draft sites:
  - ◆ Minimize disturbance of existing riparian vegetation to the greatest extent practical; in particular, maintain shade, bank stability, and large woody material recruitment potential.
  - ◆ Use sediment control measures such as straw bales, filter cloth, or sediment fences when conditions warrant.
  - ◆ Maximize maintenance activities during late summer and early fall to best avoid wet conditions.
  - ◆ Do not pump from streams that do not have continuous surface flow. When pumping water in all situations from streams, ensure that at least one-half of the original streamflow remains below the pump site.
  - ◆ Refuel power equipment, or use absorbent pads for immobile equipment, and prepare concrete at least 150 feet ( or as far as possible from the water body where local site conditions do not allow a 150 foot setback) from water bodies to prevent direct delivery of contaminants into associated water bodies.
  - ◆ Fisheries, hydrology or other qualified personnel must work with engineering/fire personnel to review proposed activities to minimize potential effects to fish, stream channel conditions, and water quality.

- ◆ Use and develop off-channel ponds outside of stream channels were feasible and appropriate. Work with fire folks to prioritize and decommission unnecessary in-stream drafting sites.
- ◆ Water withdrawal equipment must have a fish screen installed, operated and maintained in accordance to NOAA Fisheries guidelines.

## Wildlife

### *Threatened, Endangered or Sensitive Species*

- If wolves become established (denning) while project implementation is occurring, measures will be taken to avoid activity in that vicinity
- If any evidence of wolverines is discovered during project implementation, measures will be taken to provide protection. If a den is found we would protect it from human disturbance.

### *Raptors*

- No activities will occur within currently known goshawk or other raptor nest stands. To conserve nesting habitat and to minimize disturbance to nesting individuals, restrictions would be executed according to the requirements of the species involved.
- With all newly discovered raptor nests, a buffer zone would be established by the wildlife biologist to restrict activities near the nest area during occupancy.
- Where possible, retain trees with inactive nests that may be important to secondary nesters (for example, great gray owl).
- Any snags in riparian areas or uplands will be protected from disturbance, removal, or use in stream restoration activities unless deemed a safety hazard at a specific work site.

### *Big Game*

- Within big game winter range a wildlife biologist will be consulted between December 1 and April 1 to determine if activities should be restricted for big game needs.

## Botany

Note: Pre-implementation planning project design criteria are identified.

### *Rare and Sensitive Plants and Habitats*

- **Pre-Implementation:** Proposed restoration projects shall be completely surveyed early in the implementation planning process by a qualified botanist or rare plant technician, to identify and assess any sensitive or rare plant populations or habitats.
- **Pre-Implementation:** Proposed restoration projects shall develop restoration plans for degraded sensitive species habitats and/or mitigation plans in areas where sensitive plant populations are documented. This shall be accomplished by a journey-level Forest Service botanist in collaboration with the interdisciplinary team and other stakeholders.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, recreation sites, prescribed fires, fire lines, and other operational activities shall not be allowed in any documented sensitive plant sites unless it is for the demonstrated benefit or protection of the site. All sensitive plant populations should be buffered 100 feet. from all operational activities where topography does not restrict such a distance. Sensitive plant sites and associated buffers shall be identified as areas to protect.

### *Sensitive and Unique Habitats*

- The integrity of unique habitats shall be maintained. Unique habitats [may] include meadows, rimrock, talus slopes, cliffs, animal dens, wallows, bogs [fens], seeps and springs. This shall be accomplished by incorporating cover buffers approximately 100 feet in width.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, recreation sites, prescribed fires, fire lines, and other operational activities shall not occur within, or at the interface of lithosols (scablands).
- Cutting of old-growth juniper shall be prohibited. Old-growth characteristics include: sparse limbs, dead limbed or spiked-tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of cambium layer at base of tree, and limited terminal leader growth in upper branches.

### *Groundwater-Dependent Ecosystems*

- The integrity of groundwater-dependent ecosystems shall be maintained. Spring developments shall not dewater groundwater-dependent ecosystems. Spring developments shall not be allowed if the spring is occupied by rare or sensitive plant species, or in peatlands, fens, or where histic soils are present. These sites should be buffered 100 feet from all operational activities where topography does not restrict such a distance, and be identified as areas to protect.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, fire lines, and other operational activities shall not be allowed in springs, seeps, or any other groundwater dependent ecosystem, unless it is for the benefit or protection of the groundwater dependent ecosystems or development of the spring.
- Spring developments should not disturb the spring orifice (point where water emerges). Spring head boxes should be placed in a location that will cause the least amount of disturbance to the soils and vegetation of the groundwater dependent ecosystems. Preferable locations for spring head boxes should be in an established channel downstream from the orifice or a location where flowing water becomes subsurface.
- When necessary, construct fenced exclosures around spring developments to prevent damage from wild ungulates and livestock.
- Spring developments shall have a return flow system to minimize the diversion of surface and subsurface water from the catchment area. Consider using a float valve or similar device to reduce the amount of water withdrawn from the groundwater dependent ecosystems.
- When developing springs, place troughs far enough away from groundwater-dependent ecosystems, wetlands, and other sensitive or unique habitats to prevent erosion, compaction, or degradation to sensitive soils and vegetation due to livestock congregation.

### *Invasive Plant Species*

- ***Pre-Implementation:*** Proposed restoration projects shall be surveyed for invasive plants early in the implementation planning process by a qualified invasive plant specialist /technician, to identify and assess any undocumented invasive plant infestation.
- ***Pre-Implementation:*** For project areas that overlap or are adjacent to invasive plant infestations, assure that there is sufficient time prior to develop a long-term site strategy for control, eradication, and revegetation of the site. This shall be accomplished by a qualified invasive plant specialist in collaboration with the interdisciplinary team and other stakeholders.
- All activities shall be conducted in a manner as to minimize or prevent the potential spread or establishment of invasive species.
- Actions conducted on National Forest System Lands that will operate outside the limits of the road prism, require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump

trucks, etc.) prior to entering the Malheur National Forest. Cleaning will be inspected and approved by the forest officer in charge of administering the project.

- Assure that all materials are weed-free. Use weed-free straw and mulch for all projects conducted or authorized by the Forest Service on National Forest System Lands. If State certified straw or mulch is not available, individual national forests should require sources certified to be weed-free using the North American Weed Free Forage Program standards or a similar certification process.
- Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, or rock that are judged to be weed free by District or Forest weed specialists.
- Prohibit heavy equipment operation, vehicle travel, staging areas, fire-control lines, and any other operational activities in invasive plant infestations, unless the activities are for the express purpose of eradicating the infestation or INV1 and INV2 have been completed.
- Conduct post-implementation monitoring for invasive plants. Continue monitoring, treating, and removing invasive plants until all infestations are eradicated and native plant species are well established.

### *Native Plant Materials and Revegetation*

- **Pre-Implementation:** Where the need for native plant materials is anticipated, assure that there is sufficient time for the plant materials specialist to develop a native plant materials plan and/or prescription prior to implementation of planned revegetation, rehabilitation, and restoration projects. This may include allowing for enough time to harvest and store hardwood cuttings, produce suitable quantities of native seed, and/or grow-out container stock.
- Locally adapted, genetically appropriate native plant materials are the first choice for use in revegetation, restoration, and rehabilitation, where timely natural regeneration of the native plant community is not likely to occur. Use a diverse assemblage of species that have the potential to naturally occur in the project area. Acquire native seed or plant sources as close to the watershed as possible. Examples of areas that may need treatment include: habitat restoration efforts, log decks, staging areas, landing zones, temporary roads, slash piles, culvert replacements, severely burned areas, skid trails, decommissioned roads, invasive species treatments, and other disturbances.
- Non-native, non-invasive plant species may be used in the following situations: (1) when needed in emergency conditions to protect basic resource values (for example, soil stability, water quality, and to help prevent the establishment of invasive species), (2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, (3) if native plant materials are not available or not economically feasible, and (4) in permanently altered plant communities.
- Under no circumstances shall non-native invasive plant species or noxious weeds be used for revegetation.
- Development, review, and/or approval of revegetation, rehabilitation, and restoration prescriptions, including species selection, genetic heritage, growth stage, seed mixes, sowing guidelines, and any needed site preparation, shall be accomplished by a plant materials specialist who is knowledgeable and trained or certified in the plant community type where the revegetation will occur.
- Concentrate plantings above the bank-full elevation. Sedge and rush mats should be placed and sized to prevent their movement during high flow events.
- Newly planted or seeded areas should be protected from animals and activities that may prevent, retard, or slow the establishment and recovery of native vegetation. Site-specific measures may include building fences, piling slash, jackstrawing, closing areas to vehicles, and/or temporarily changing grazing regimes until the desired condition is sufficiently achieved.

## Soils

- For projects involving heavy machinery off roads, the project proponents shall inspect the site for existing impacts to the soil. If existing impacts appear to be heavy on the Malheur National Forest or moderate on the Ochoco National Forest, they shall contact a soil scientist, who shall determine what site specific project design criteria are necessary to meet Forest Plan and Forest Service Manual standards and guidelines. (If a soil scientist is not available, a silviculturist or hydrologist can do the work.) If standards and guidelines cannot be met, heavy machinery shall not be used.
- Erosion would be minimized by following General Aquatic Conservation Measures (see section, above) and by implementing the appropriate project design criteria based on the type of activity (see Appendix A).
- Erosion from heavy machinery use would be minimized; by minimizing compaction and puddling, rutting would be minimized.
- For Livestock Stream Crossings and Off-Channel Watering Facilities, out-of-channel erosion would be minimized.
- For Road Erosion Control, erosion would be minimized.
- For Juniper Removal, erosion would be minimized. It is possible that juniper removal would increase ground cover within a few years, and thereby reduce erosion.
- Prescribed fire (including for disposal of slash after juniper removal) can involve only low- and moderate-severity fire, and erosion from fire lines would be minimized, so erosion from prescribed fire would not be significant.

## Fire and Fuels

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

## Heritage Resources

- Compliance with section 106 of the National Historic Preservation Act for activities authorized under this analysis will be completed and concurred with by the Oregon State Historic Preservation Office before any ground disturbing action takes place. For each potential activity the district or zone archaeologist will determine which of the criteria in the 2004 Programmatic Agreement with the Oregon State Historic Preservation Office best fit the particular project. This will vary somewhat project to project based on the scale of the particular activity, the location on the landscape, and the nature of associated cultural resources, if any.

- The district or zone archaeologist will document their findings on a programmatic agreement form with a project description, rationale and location map which will be attached to the Forest Service Heritage Event database. The forest archaeologist will review and sign off on the programmatic review form if concurred with. For appendices A, B and C projects as defined in the 2004 Programmatic Agreement, the Forest will retain the documentation and provide the Oregon State Historic Preservation Office with the annual summary of projects as described in the Preservation Act.
- For full inventories the district or zone archaeologist will complete an inventory report meeting current Oregon State Historic Preservation Office (SHPO) standards which will be reviewed by the forest archaeologist. The forest archaeologist will forward the completed inventory report to the Oregon State Historic Preservation Office for review and concurrence signature or further discussion as appropriate.
- Consultation with Native American tribes is conducted under the terms of the Memorandums of Understanding the Forest has with each individual tribe. The Forest regularly consults with the Burns Paiute Tribe, the Confederated Tribes of the Umatilla Indian Reservation and the Confederated Tribes of Warm Springs Reservation.
- For work requiring a full inventory under the terms of the 2004 Programmatic Agreement any identified cultural resources sites will generally be avoided. For cases where site avoidance is impractical mitigation procedures will be developed in consultation with the Oregon SHPO before project work begins.
- If any previously unidentified cultural resources are located during project implementation, ground disturbing work will be halted until the resources are evaluated by the district or zone archaeologist. If the cultural resources are determined to be potentially eligible for listing on the National Register of Historic Places work will either be permanently halted or a mitigation plan will be developed in consultation with the Oregon SHPO before work continues.

## Recreation

- Motorized aquatic restoration methods would not be used within wilderness, wild portions of wild and scenic rivers, and inventoried roadless areas.
- Mechanized aquatic restoration methods would not be used within wilderness or wild portions of wild and scenic rivers.

## Grazing

### *General*

- Range and fire specialists and permittees would coordinate activities including scheduling of burning activities in grazing units.
- Utilize the Forest Post-Fire Interim Grazing Guidelines to aid in determining when to resume grazing activities.
- Whenever possible, units to be rested would be burned in the spring of the year to be rested or in the fall prior to the rest year.
- If a rest period is required following a burn the permittee has the option to exclude cattle grazing from those portions of a pasture that were burned through the use of fencing and could continue to graze the unburned areas of a unit.

### *Protection of Government and Permittee Investments*

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

- Maintain structural integrity of range improvements.
- If structural improvements are damaged during project operations they would be repaired to Forest Service standards prior to livestock scheduled use by the party responsible for causing the damage. Repairs would be required of the purchaser if damage were done during thinning or fuel treatment contractors or by force account where appropriate.
- Three or more splices to a single wire within a distance of 20 feet will be replaced with a single splice.
- Fence right-of-ways (6 feet either side of fence), trails, other developments and access to them would be cleared of slash produced by project activities.

### *Aspen Restoration*

- New aspen 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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