Specific Resource Project Design Criteria for Resource Protection and Forest Plan Compliance

Squaw Creek Restoration Phases 2 & 3

Project Number: 0302-2016 **Date:** 7/01/15 **Location:** Squaw Creek from private boundary through Squaw Meadow

Category 1: Fish Passage Restoration
Category 2: Large wood, Boulder, and Gravel placement
Category 14: Riparian Vegetation Planting
Category 16: Beaver Habitat Restoration

Project Description: Fish passage, floodplain, channel and in-stream habitat restoration in Squaw Creek for two project phases. Work will include channel fill, historic channel reconnection, large wood placment, floodplain enhancment, riparian hardwood planting and beaver dam analogues, weir adjustments and culvert replacement.

Heritage

Y	N	Initial	
X		RGD	Specific PDC for Heritage addressed (Heritage Surveys; Avoidance areas)

Botany

Y	N	Initial	
X		JHR	Specific PDC for Botany addressed (Sensitive Plant Surveys)
X		JHR	Specific PDC for Noxious Weeds addressed

Land Management Consistency (applicable)

Y	N	Initial		Y	N	Initial	
x		jh	4A Big Game Winter Range		X	KO	9 Research Natural Area
	X	KO	6A/6B Wilderness		X	KO	10 Semi-Primitive Non-Motorized Rec Areas
	X	KO	7 Scenic Area		X	KO	22/22A Wild and Scenic River
	X	KO	8 Special Interest Areas		X	KO	Inventoried Roadless Areas

Comments:

Project Design Criteria and Forest Plan compliance checklist

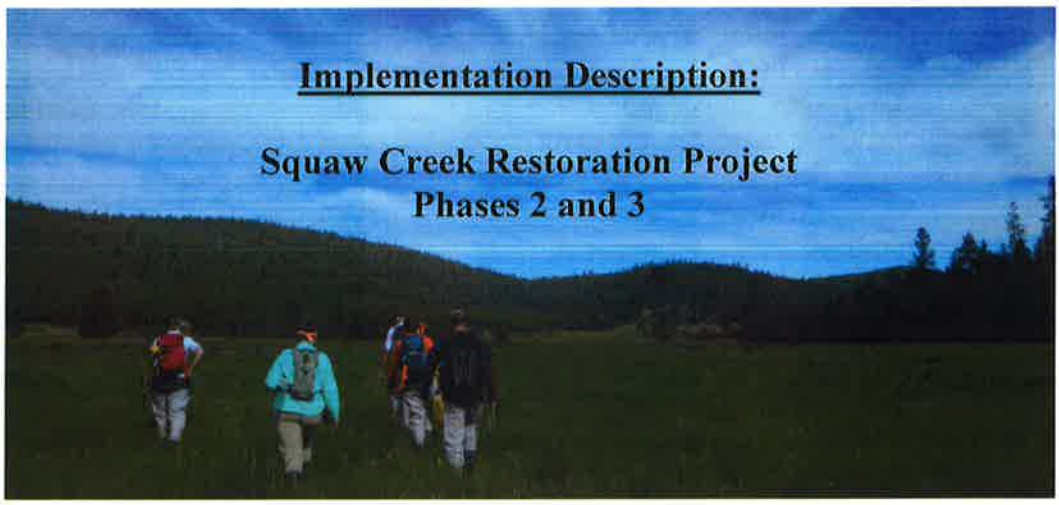
I have reviewed this project and have determined it is within the Project Design Criterial identified for my resource.

Resource	Signature	Date	Comments
Heritage	/S/ Robert Dickenson	4/26/2016	No ground disturbing activities are to occur until SHPO concurs with associated Cultural Resource Inventory Report.
Botany	/s/ Joe Rausch	4/13/2016	Botany staff should be present prior to, or at the beginning of implementation to identify avoidance areas
Wildlife	/s/ Justin Hadwen	4/1/2016	Follow PDCs
Fish*	/s/ Bill Wall	4/1/2016	
Hydrology*	/s/ Hazel Owens	4/13/2016	
Range	/s/ Jason Spence	4/14/2016	Ensure corrdination with Range when fencing or restricting access to livestock
Soils	/s/ Allison Torres	4/14/2016	No existing heavy soil impacts according to project hydrologist. Follow established PDCs. If possible, a Soil Scientist or other qualified individual should be present during recontouring operations to ensure fill is being drawn from acceptable sources and damage to soil resources are kept to a practical minimum.
Recreation	/s/ Shannon Winegar	4/6/2016	No effect to the Recreation Resource
Lands Special Uses	/s/ Stacia Kimbell	4/14/2016	No mining claims identified within the project areas. Lands SUPs -There is a pending application for an irrigation ditch SUP within the project vicinity associated with existing private water rights/diversion on Squaw Creek. Recommend project notification to the sup applicant to ensure project activities do not adversely affect existing private water right/diversion. Paleo - Paleontological Resources Project locations are mainly within areas where paleontological fossil occurrence is unlikely. If during project activities paleontological resources are encountered all activities shall cease immediately and the Malheur National Forest Minerals Program Manger shall be contacted for the evaluation of the discovery. Please see the attached Paleontological Resources Likelihood of Occurrence: Malheur NF map (2015) and Paleontology brochure FS-1058.
Engineering	/s/ John La Liberte	4/27/2016	If the pond forming behind beaver dam affect road access or beaver dam location affect stream flows through culverts, consult engineering. Heavy equipment use on roads should follow commercial road use rules and any damage occurring to the road will be repaired under this project. If stream relocation is adjacent or crossing roads, consult engineering, so new location does not under mine the road prism. Aquatic Culverts will be installed by a designated engineering COR.
Fuels/Fire	/s/ Sarah E. Bush	4/1/2016	Follow PDCs
Sivilculture	/s/ Terry Corning-Seavy	4/26/2016	

*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

Line Officer Signature: _____ Date: 5/6/16

Attachments:
Proposed Action
Program Administration
General Aquatic Conservation Measures
Applicable Project Design Criteria



Category 1: Fish Passage Restoration Category 2: Large wood, Boulder, and Gravel placement; Category 14: Riparian Vegetation Planting Category 16: Beaver Habitat Restoration	Lead Preparers: Kate Olsen (kholsen@fs.fed.us) Hazel Owens (hazellowens@fs.fed.us)
Applicant: Prairie City Aquatics	NEPA Reference: DN For Aquatic Restoration EA (http://www.fs.usda.gov/detailfull/malheur/landmanagement/?cid=STELPRD3817723&width=full)
Location: (T/R, sec.,¼,¼) Downstream end: T. 11S., R. 35.2E., S. 34 Upstream end: T. 12S., R. 35.2E., S. 22 USGS Quad: Austin (E444118)	Lease/ /Case File/ Serial #: na (Reference #):na
Begin Date: 06/30/2015	Due Date: 4/15/2016 (or once field visits occur)

Purpose/Need:

Please refer to the Aquatic Restoration EA[1] for the Purpose and Need of these actions. Photos of the existing condition are attached.

Land Use Plan Conformance:

The project falls mostly under Management Area (MA) 3B or Anadromous Riparian Areas, also identified as Riparian Habitat Conservation Areas (RHCAs). Squaw Creek is within a category 1 RHCA (fish-bearing stream) as designated by PACFISH/INFISH and is listed as designated critical habitat for Mid-Columbia River steelhead by the USFWS (US Fish and Wildlife Service). Squaw Creek MA3B runs through Visual Middle- and Fore-Ground Management Areas (MA14) and one Designated Old Growth management area (MA13) near the confluence of Olmstead Creek. Our project areas currently do not overlap with these management areas. The upper half of Squaw Creek runs through General Forest / Range management areas (MA1 and MA2), which encompasses portions of Squaw Meadow (**Figure 3**).

[1] The Aquatic Restoration EA is available online at http://www.fs.usda.gov/detailfull/malheur/landmanagement/?cid=STELPRD3817723&width=full

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 consist with the schedules described in this Plan to provide for other multiple uses and resources.

MA2- Rangeland

Emphasize forage production on nonforested areas on a sustained yield basis while providing for other resources and values.

MA3B- Anadromous Riparian Areas

Manage riparian areas to protect and enhance their value for wildlife, anadromous fish habitat and water quality. Manage timber, grazing, and recreation to give preferential consideration to anadromous fish on that portion of the management area "suitable" for timber management, grazing, or recreation. Design and conduct management in all riparian areas to maintain or improve water quality and beneficial uses.

In 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 adjacent to riparian habitat. Resources that will benefit from this management will include improved habitat for fish and wildlife and improved ecosystem services. For Anadromous Riparian Areas (MA3B) these actions will allow the Forest Service to directly "manage riparian areas to protect and enhance their value" as well as "maintain or improve water quality and beneficial uses".

The project is located in the Squaw Creek (HUC 170702030101) subwatershed in the Bridge Creek – Middle Fork John Day River (HUC 1707020301) watershed (**Figure 1**). The Bridge Creek – Middle Fork John Day River watershed was designated a focal watershed by the 2009 Basin Restoration Strategy (USDA 2009) as part of the national aquatic restoration strategy (USDA 2005). Regional focus watersheds have been prioritized for restoration at the regional level with emphasis on whole watershed restoration. The region has set 2017 as the target for completion of whole watershed restoration in Squaw Creek. Currently, the district has drafted a Stream Restoration Action Plan for Squaw Creek and outlined all essential projects for the subwatershed. This proposal pertains to Phases 2 (2016) and 3 (2017) of this implementation plan, while Phase 1 should be completed in 2015.

Implementation Plan:

The desired conditions for Squaw Creek includes improved (1) connectivity (aquatic organism passage), (2) stream water temperatures, and (3) habitat to support viable populations of anadromous Mid-Columbia River steelhead, resident fish, and wildlife.

The effectiveness of the desired condition is intended to last into perpetuity and be completed in phases through 2017 (**Figure 2**). Reducing incision and improving floodplain storage through these three phases will allow the system to store nearly 40 million gallons of water (Table 1) moving the system towards this desired condition.

Table 1. Floodplain storage potential of phases 1 through 3.

Phase	Implementation	Stream Length (miles)	Floodplain Area (acres)	Water Storage Gained (gallons)	Steelhead Critical Habitat
1	2015	0.7	8.5	1,338,750	Yes
2	2016	1.3	62.7	32,907,000	No
3	2017	3.1	14.7	4,627,350	Yes

The in-channel restoration would occur during the in-stream work window from July 15 to August 15. Off-channel work may begin as early as snow has melted and last until snow flies the following fiscal year, pending necessary surveys and specialist sign-off to the check list. Obtaining the desired conditions requires phased implementation occurring for up to a decade; this project proposal focuses exclusively on phases 2 and 3 of implementation (**Figure 4** and **Figure 5**) occurring in 2016 and 2017 (the second and third years of implementation). Subsequent phases will involve subsequent project proposals. To attain the desired conditions, the USFS is proposing two phases. These phases will include a number of restoration actions. Some actions will occur in all phases and others in less. As an attempt at site specificity of actions, separate reaches of each phase have been identified and each action occurring within a reach are identified (**Figure 6** and **Table 2**).

Restoration Actions

Aquatic organism passage improvements:

- Culvert removal at RD 2600102 and 2646 crossing – existing culverts are threats to at least one of three condition determination criteria (engineering, hydrology or fisheries). We propose to replace both culverts with structures engineered to provide complete aquatic organism passage as well as allow for improved hydrologic function.
    - The affected area for culvert work, the area of heavy machinery impact and ground disturbing activity, would include the road at the site of existing culvert and the channel and floodplain for up to 200 feet upstream and downstream of each the crossing (**Figure 7**).
    - Actions would include removing the existing culvert(s) and replacing with a larger structure (i.e. bridge or open bottom culvert). Additionally, the channel may require restructuring (moving, improving meander, etc.) to ameliorate the negative, historic impacts of the culvert. A high level of ground disturbing activity is anticipated in relation to these culvert replacements.

- Weir alterations throughout Reach 3, to above the 2646 road crossing- Up to 35 weirs will be altered throughout reach 3 to improve juvenile fish passage. Alter may mean remove, cut, rotate or reinforce (**Figure 8**).
    - Most weirs will require the use of heavy machinery to alter each of the structures (**Figure 9**)
    - There will be the addition of large wood structures throughout the reach as weirs are altered (see Large wood augmentation below).
    - In addition to the logs, the boulder and shoulder berms will also be removed or leveled to return the riparian area to its historic state.
    - Additionally, some of the weirs will be buried as the current (artificial) channel is filled.

Channel restoration (Figure 10 and Figure 11):

- Channel Fill- In locations where the channel is no longer in its historic (low valley) elevation, we will fill the current, artificial channel with local, native material.
    - Fill material will be taken from abandoned constructed features, the floodplain or hillslope, to meet all resource PDC (Project Design Criteria).
    - The majority of fill will be soil, rock and gravel materials with additional large or coarse wood as available. The filled channel would be compacted through heavy machinery traffic across the surface.
- Historic channel reconnection- The only locations where current channels will be filled are stream reaches paired with reconnection of historic channels.
    - Once the location where the channel was diverted out of its historic flow path and into the artificial channel is determined, the berm will be leveled and flow will be redirected back towards Squaw Creek's historic flow path.
    - Current condition of vegetation and sinuosity in historic channels should protect these channels from incision, however, if necessary we will employ any of the techniques discussed for habitat improvements to improve the historic channel. This may include additions of roughness in the form of coarse material or large wood, placement of large wood or logjams and creation or improvement of pool habitat.
- Ditch removal/ maintenance- Numerous diversion and drainage ditches bisect the meadows along Squaw Creek in both phases 2 and 3. Some currently convey water across FS land which we do not intend to decommission. Others haven't been used in recent past and are interfering with both surface and subsurface flows and will be rehabilitated (see map).

- Only under a specific circumstance will a channel that needs to maintain flow be filled. In this circumstance, the channel as it is now is not the historic flow path, however filling the channel and returning flow back to historic channels will cut off flow to active water diversions. In these cases, we will retain the channel characteristics necessary to accommodate flows authorized by the water right, and nothing more.
- Historic ditches will be turned back on themselves throughout the project area. Recontouring the hillslope or floodplain will be necessary in some cases to restore these historic impacts. **Figure 12** and **Figure 13** illustrate the locations of ditches as identified by LIDAR. Ground-truthing the locations of these ditches will be necessary as implementation approaches. It should be anticipated that any unused ditches within any of the project areas will be rehabilitated. For specific locations of ditch work please consult the GIS layers and Kate Olsen or Hazel Owens.

Habitat Improvements: The majority of incision in the system will not be filled with heavy machinery. Instead we will improve mechanisms of sediment capture that will, in time, aggrade the stream back to its original elevation. To augment the weir removal and subsequent gradient steps, placement of large wood will play a role in this channel restoration. Structures will be placed regularly (as frequently at 1 every 50 feet) throughout all the reaches.

- Beaver Dam Analogues (BDAs)- 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 ~30% 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 (**Figure 14**). If successful, these structures will completely inundate the historic floodplain. They will be semi-permanent structures and may need maintenance in the future. Please contact Kate Olsen for more information on BDA construction specs (Figure 15).
- Large wood augmentation- The source and exact amount of off-site material has not yet been determined. Some of the materials will be sourced locally, felled or tipped on the floodplain and toe slopes, but we may have to acquire materials greater than 21" bdh (diameter at breast height) from other locations. Logs will be dragged or carried into place with a skidder or excavator and may be transported on log trucks. We anticipate 1 large wood structure per altered weir (35) and additional structures where the concentration of large material is lower.
- Pool creation/ preservation- In addition to creating large wood structures and adjusting weirs, we also anticipate the excavation of

pools throughout both reaches. This will requires excavation of the bed with heavy machinery in the channel and along the banks.

Floodplain restoration:

- Felling and tipping– The goal of this action is to remove/reduce trees that have encroached onto the floodplain as a result of wildfire suppression and desiccated floodplains (**Figure 16** and **Figure 11**). The encroachment of conifers have led to a de-watered floodplain and incised channel. Conifers located on the floodplain would be felled and left on the floodplain or added to the channel. Slash and small diameter trees may be grapple-piled on the edge of the floodplain to prevent build-up of fuels, based on need as determined by a fuels specialist.
- Riparian hardwood planting – aspen, cottonwood, willow, dogwood, and/or alder would be planted to move riparian areas toward site potential vegetation. Hardwoods would be planted by hand within the floodplain and protected to reduce pressure from wild ungulates and trespass livestock (the allotment is currently vacant). Felled conifers and slash material would be used as a natural barrier, where appropriate, to reduce access by ungulates. Exclosure fencing may be considered if felled trees provided insufficient protection. Cages or pens would be installed using a variety of fencing material and fence posts or rebar installed throughout the floodplain.
- Seeding – may occur in any location where ground disturbance leaves new, bare, exposed ground. Actions such as channel fill and culvert replacements will likely require seeding. Seeding needs will be determined by aquatics or botany resource specialists.

References

USDA Forest Service, 1990. Malheur National Forest Land and Resource Management Plan. http://www.fs.usda.gov/detail/malheur/landmanagement/?cid=fsbdev3_033814

USDA Forest Service, 2005 (updated 2007). Regional Aquatic Restoration Strategy. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_025441.pdf

USDA Forest Service, 2009. John Day Basin Restoration Strategy.

USDA Forest Service, 2015. Malheur National Forest Aquatic Restoration Environmental Assessment.

Figures and Tables

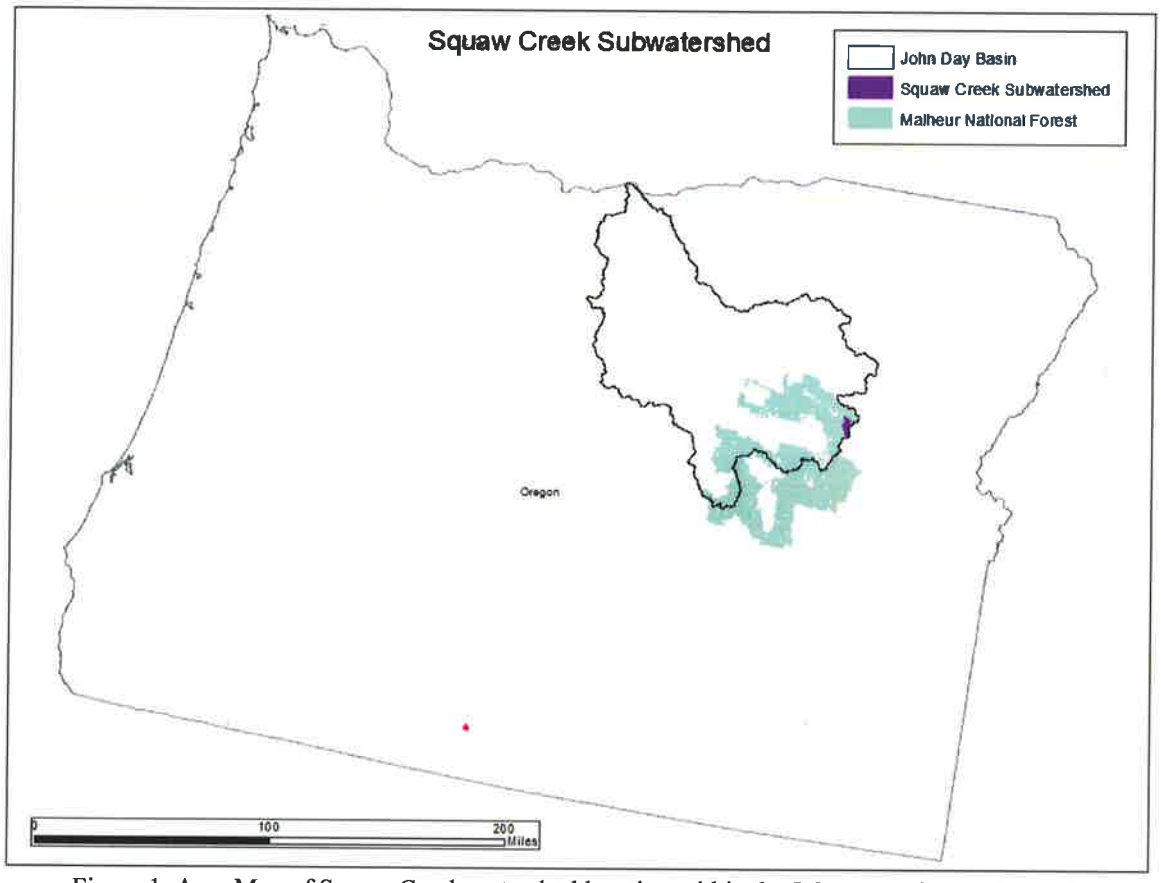


Figure 1. Area Map of Squaw Creek watershed location within the John Day River watershed.

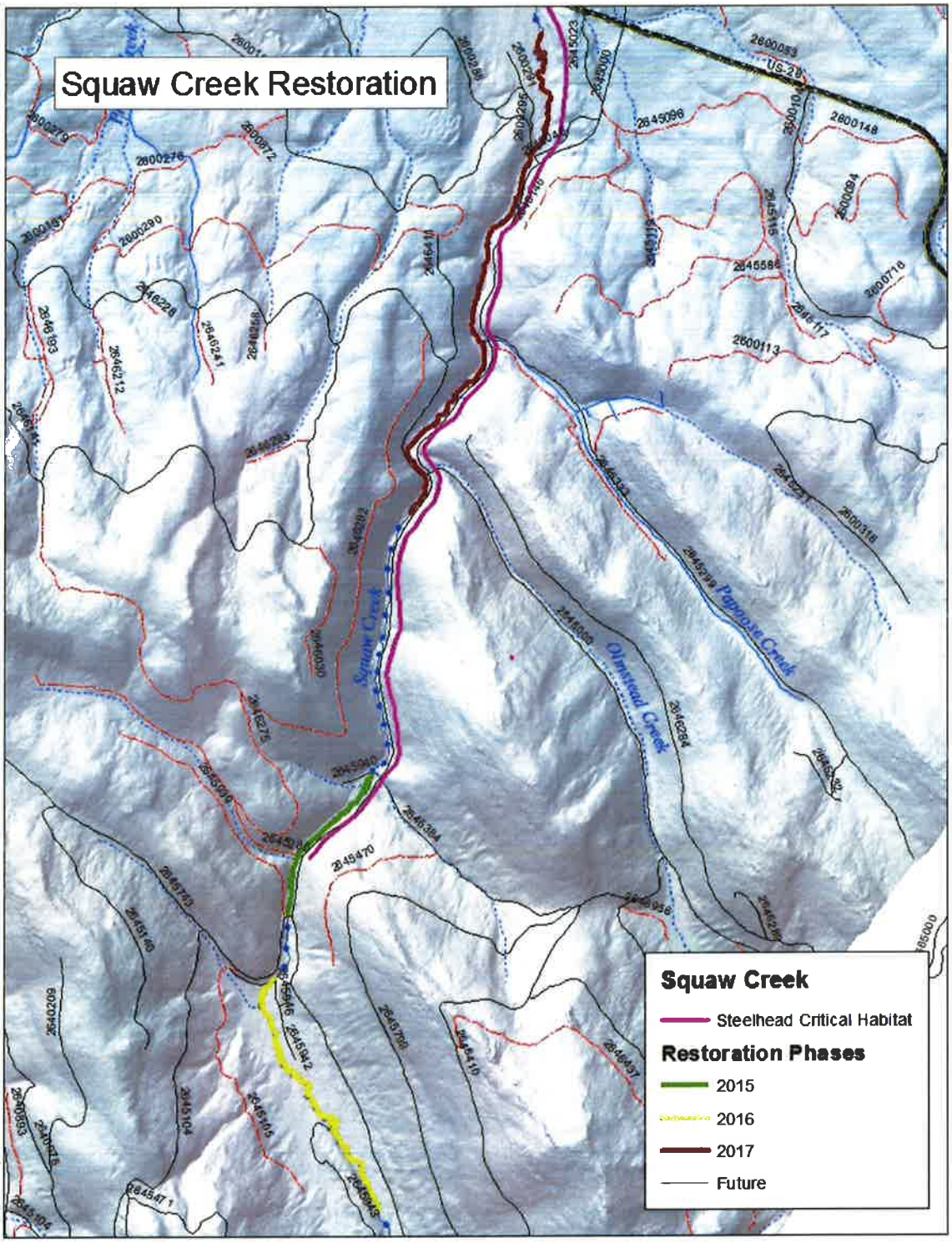


Figure 2. Project Map showing Phases 1 through 3 of Squaw Creek Restoration

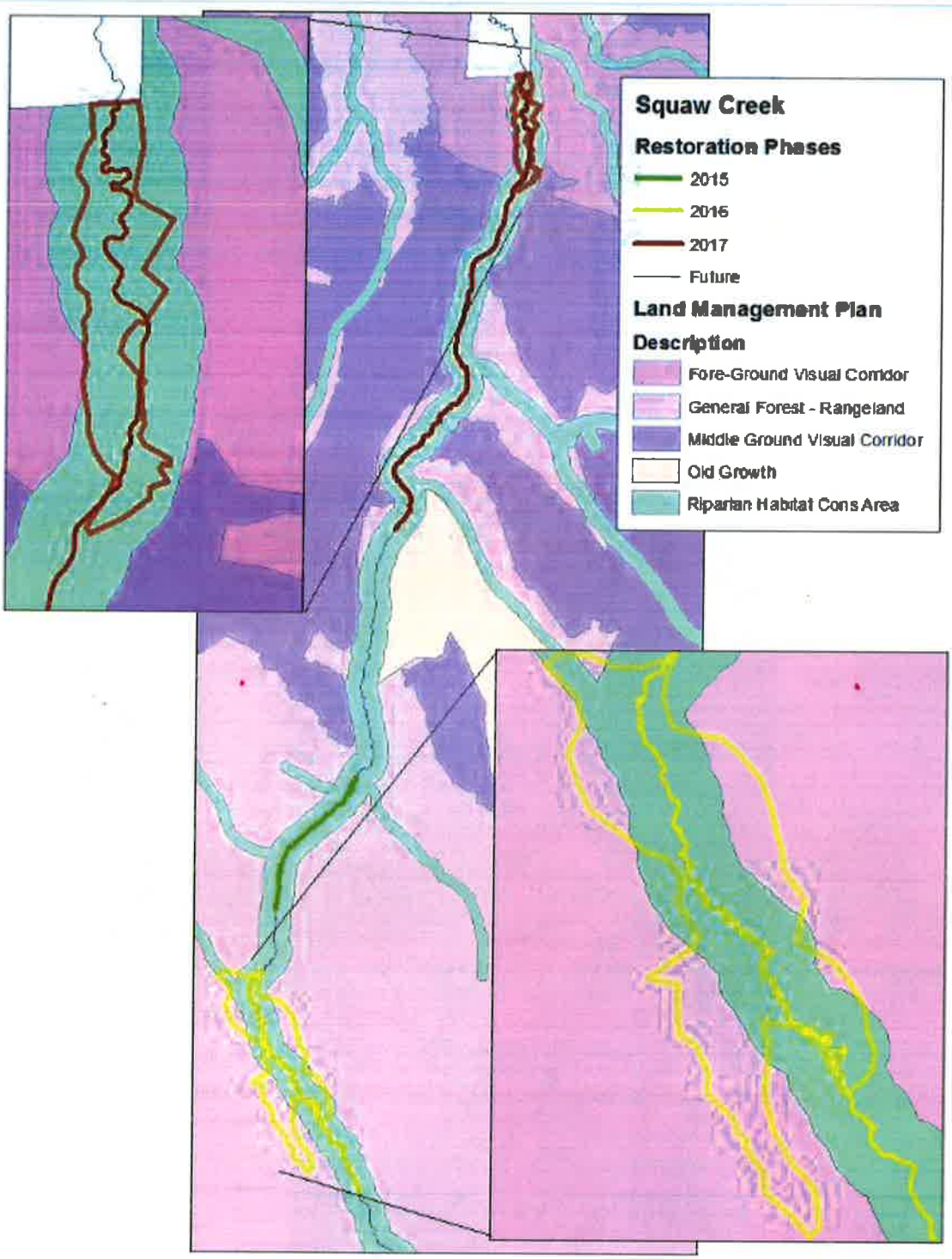
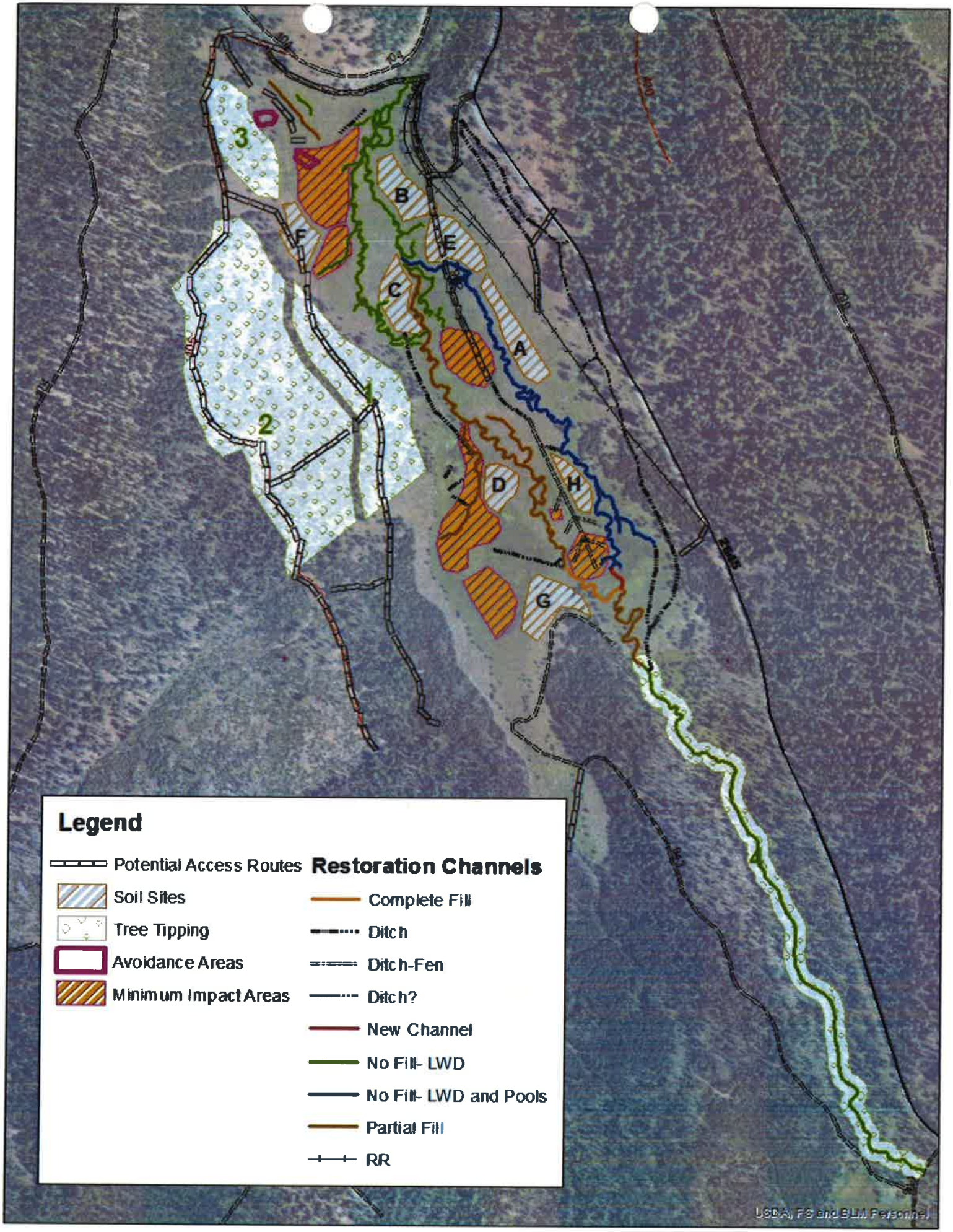


Figure 3. Land and Resource Management Plan (USDA 1990) Management Areas of Squaw Creek Phases 1 through 3.


3
2
1
A
B
C
D
E
F
G
H
Legend
Potential Access Routes
Soil Sites
Tree Tipping
Avoidance Areas
Minimum Impact Areas
Restoration Channels
Complete Fill
Ditch
Ditch-Fen
Ditch?
New Channel
No Fill- LWD
No Fill- LWD and Pools
Partial Fill
RR
USDA, FS and BLM Personnel

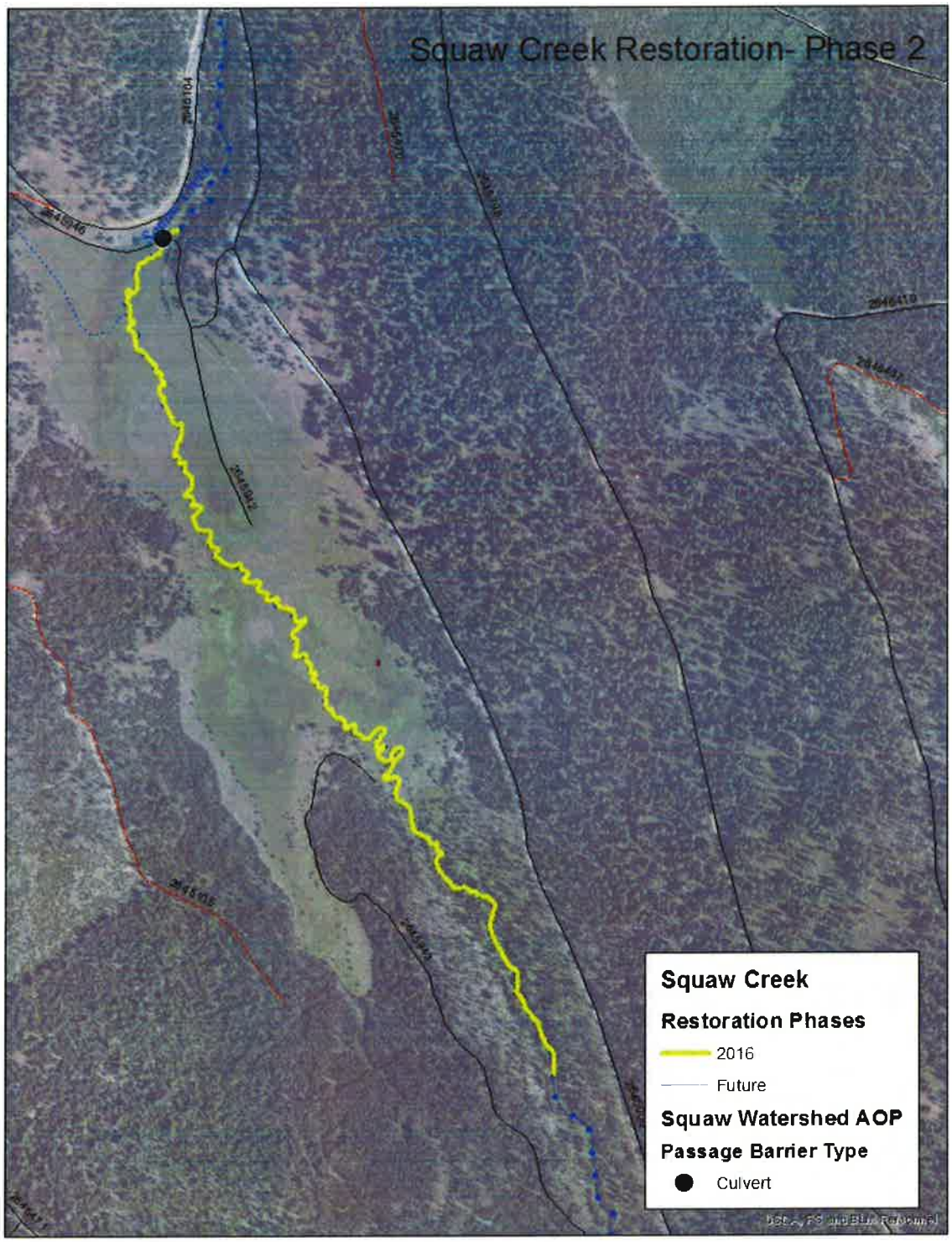


Figure 4. Imagery map of Phase 2 (2016) where the meadow and forested reaches are apparent.

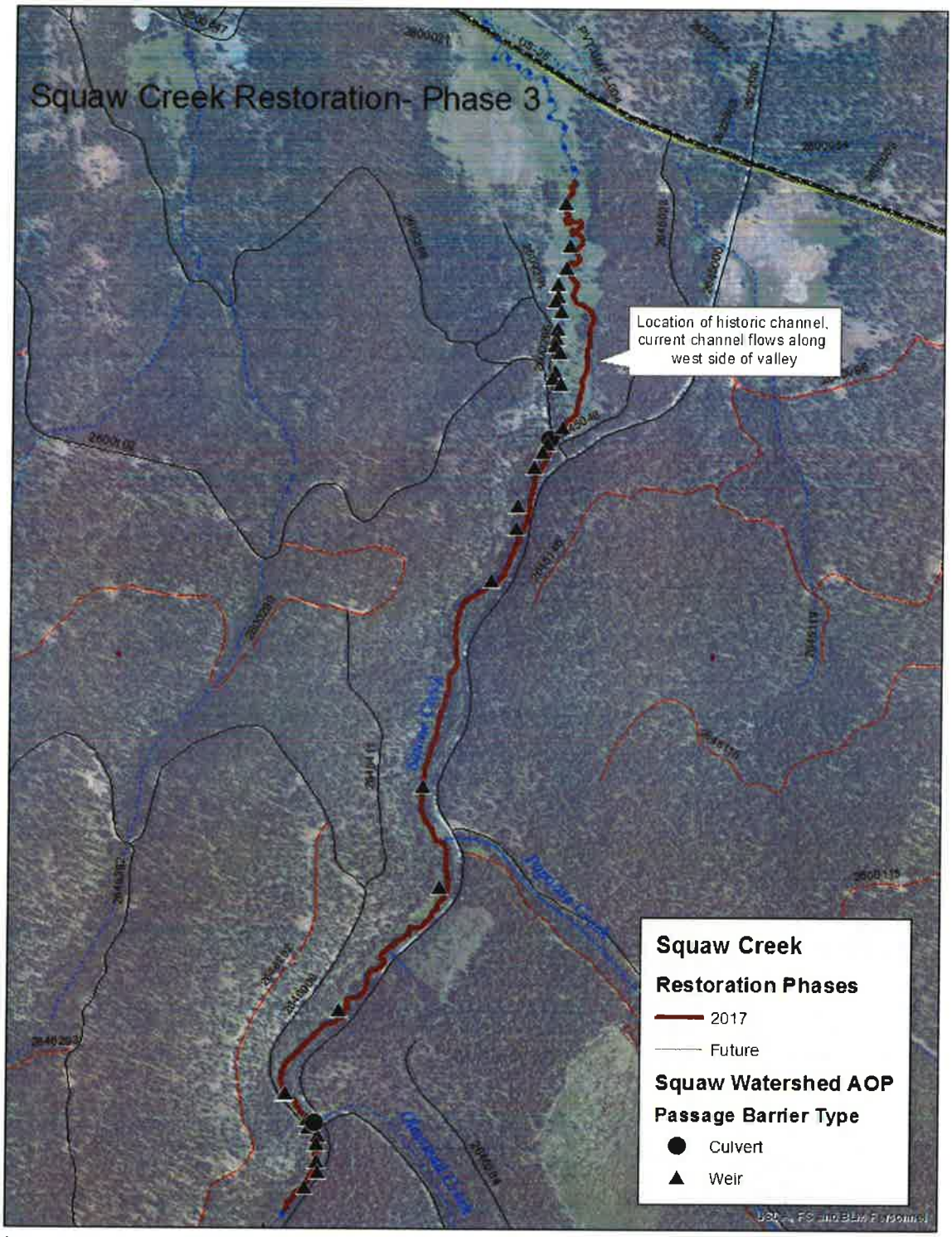


Figure 5. Imagery map of Phase 3 (2017) identifying the lower meadow, culverts and weirs requiring work. The location of the current channel compared to historic is apparent in the meadow.

Table 2. Restoration action we plan to implement broken down by reach of each phases.

Type	Restoration Action	Phase 2 Squaw Meadow	Phase 2 Above Meadow	Phase 3 Lower Meadow	Phase 3 Above Culvert
Fish Passage	Weir adjustment			X	X
	Culvert replacement			X	X
Channel Restoration	Channel Fill	X		X	
	Historic channel reconnection	X		X	
	Ditch removal/ maintenance	X	X	X	
Habitat Restoration	Beaver Dam Analogues (BDAs)			X	
	Large wood augmentation (tipping)	X	X	X	X
	Pool creation/ preservation	X	X	X	X
Floodplain Restoration	Floodplain thinning (felling)	X	X	X	X
	Planting		X	X	X

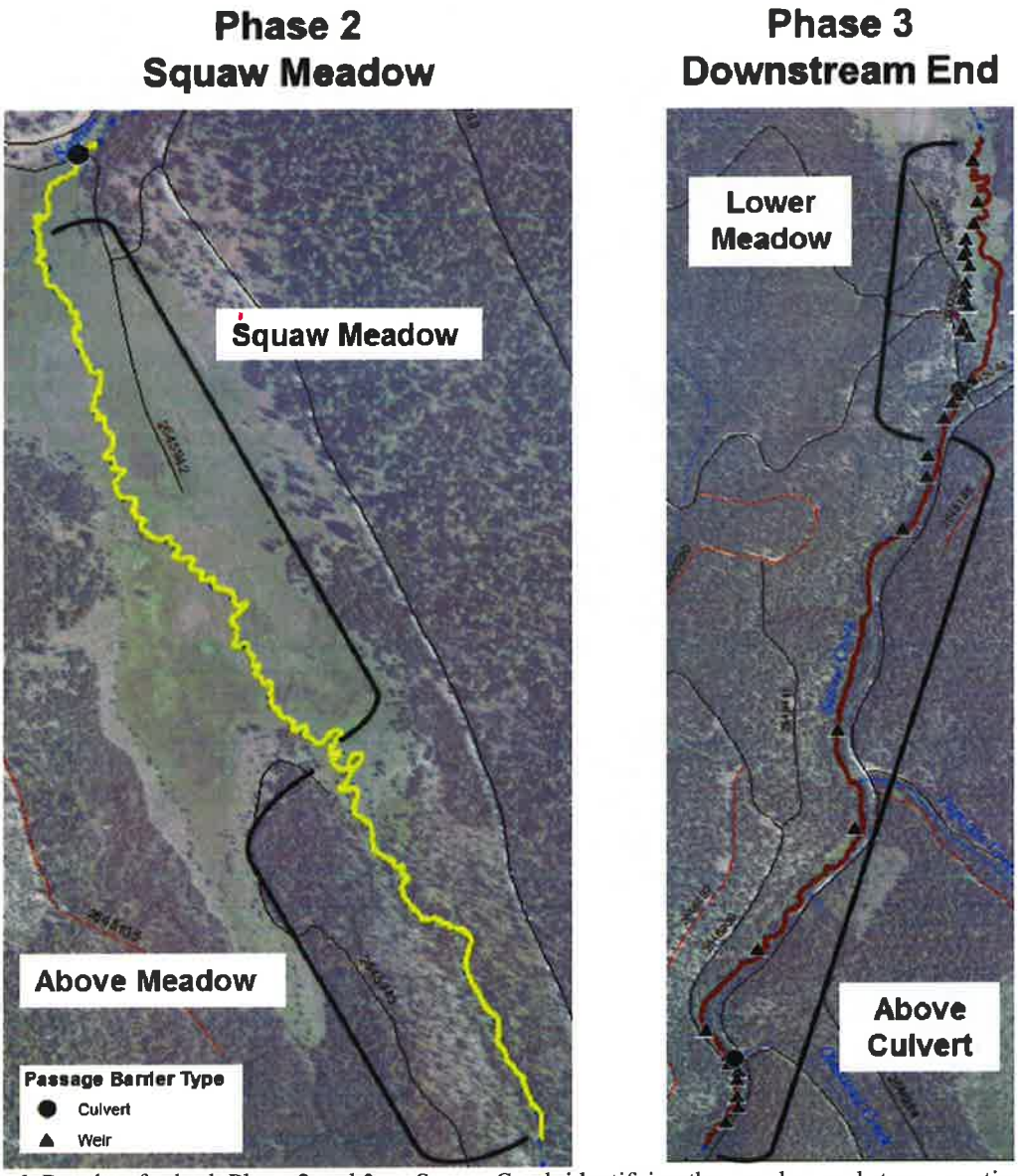


Figure 6. Reaches for both Phase 2 and 3 on Squaw Creek identifying the meadow and stream portions of the each phase.

Figure 7. Culvert in Phase 3 that is slated for replacement by ODFW in 2017 due to passage issues at low flows.

Figure 8. Example of dry channel and weir preventing passage of juvenile fish in late summer. This weir and many others will be adjusted and replaced with large and coarse woody materials.

Figure 9. Example of weir alteration with augmentation of large wood from a restoration project on Camp Creek on the Blue Mountain Ranger District.

Figure 10. Example of incision in Squaw Meadow showing the lack of floodplain connectivity, quality habitat and riparian vegetation. This portion of incised channel will be filled in phase 2 and flow will be returned to historic flow paths (not identified in this photo).

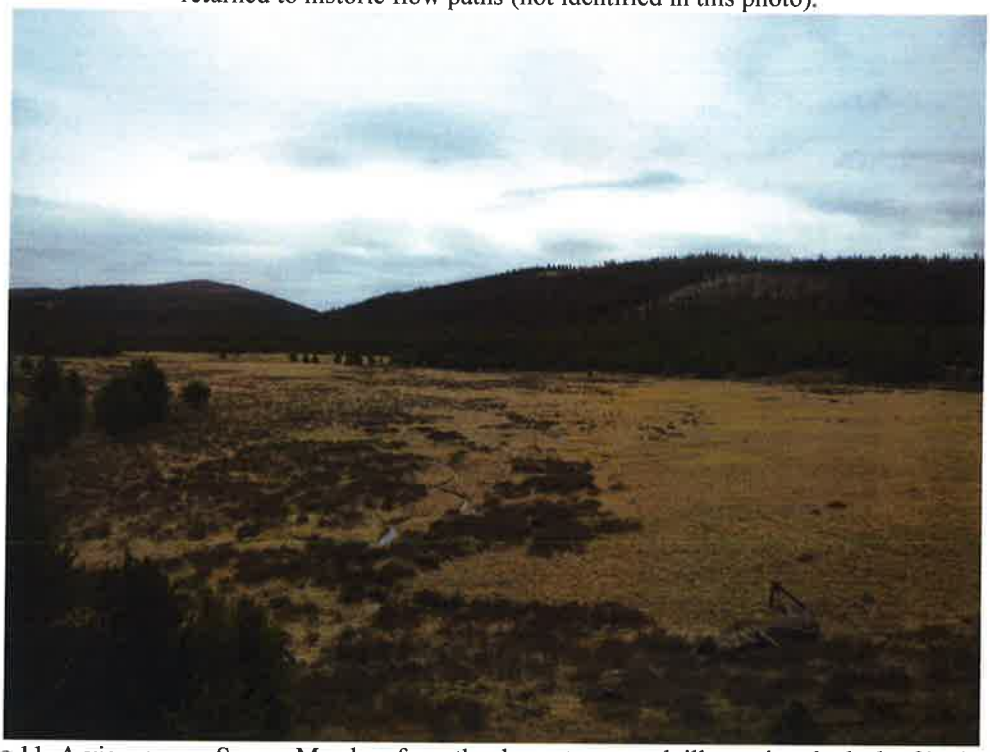


Figure 11. A view across Squaw Meadow from the downstream end, illustrating the lack of hydrologic connection between the channel and the floodplain as well as conifer encroachment at the upstream end.

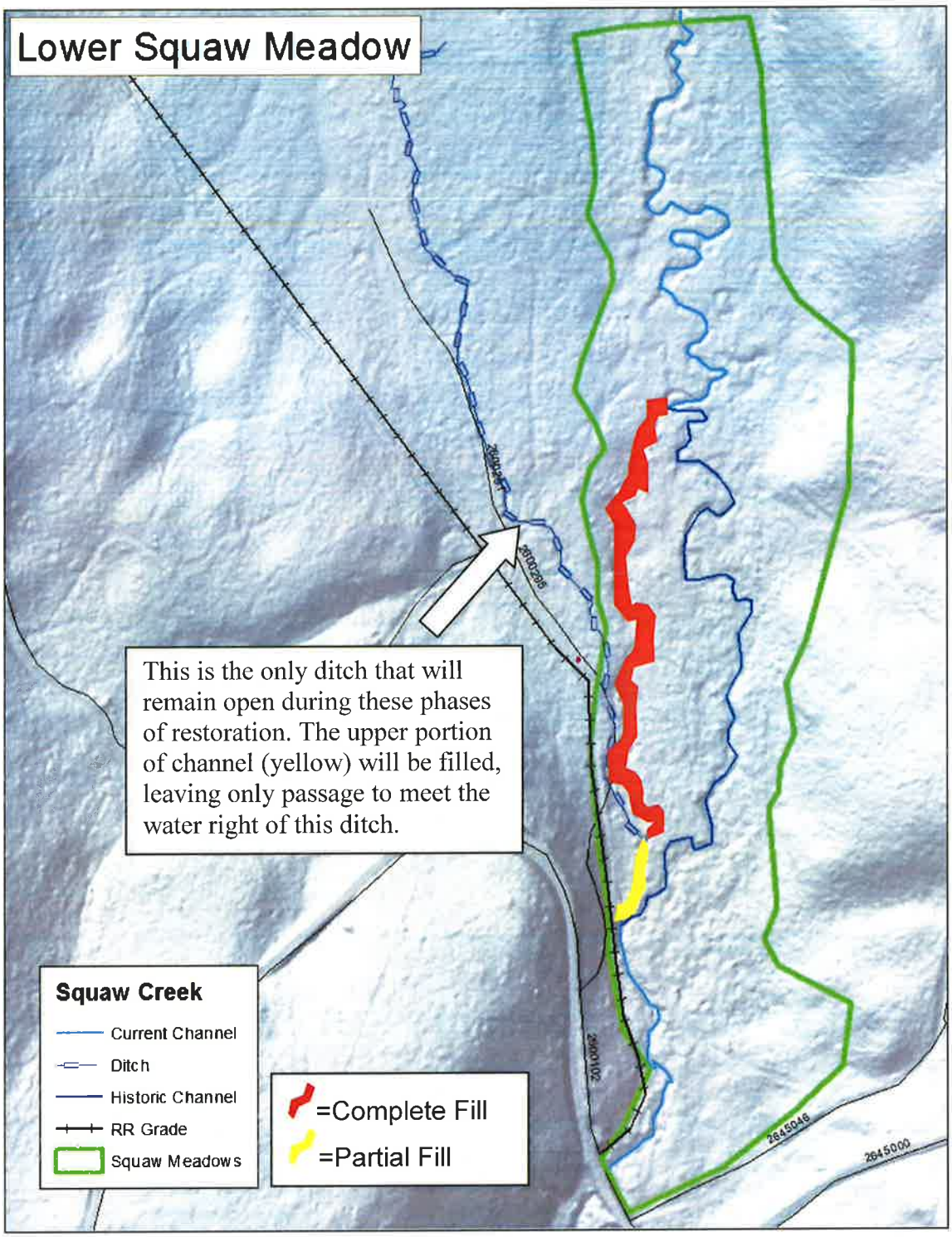


Figure 12. LIDAR image of Phase 3, illustrating historic and current channels as well as the current ditch. The current channel will be filled below the ditch down to the re-entry of the historic channel. Road material along the toe slope may be used as fill material for the current channel.

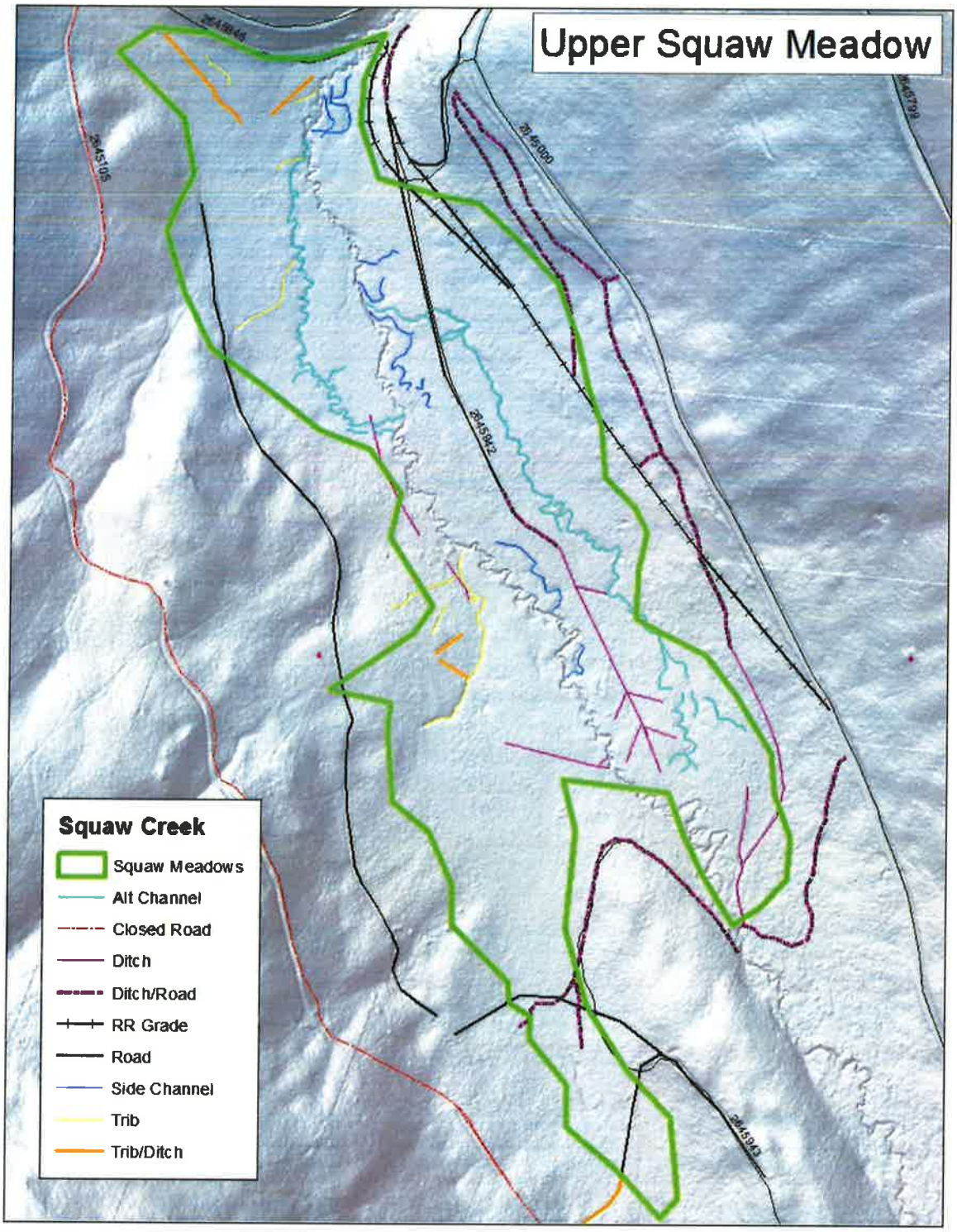


Figure 13. LIDAR image illustrating the numerous ditch and road disruptions in Squaw Meadow. Historic flow paths (turquoise to the east) are identified. Flow will be redirected into the channel at the top of the meadow (south). The current channel (easily identifiable as the channel on LIDAR, will be filled down to the location where the spring enters in the northwest portion of the meadow. Many of the ditches highlighted here will be filled, turning the berm material back into the channel.

Updated on April 1, 2016 to include avoidance areas and contracting specifications for Phase 2.

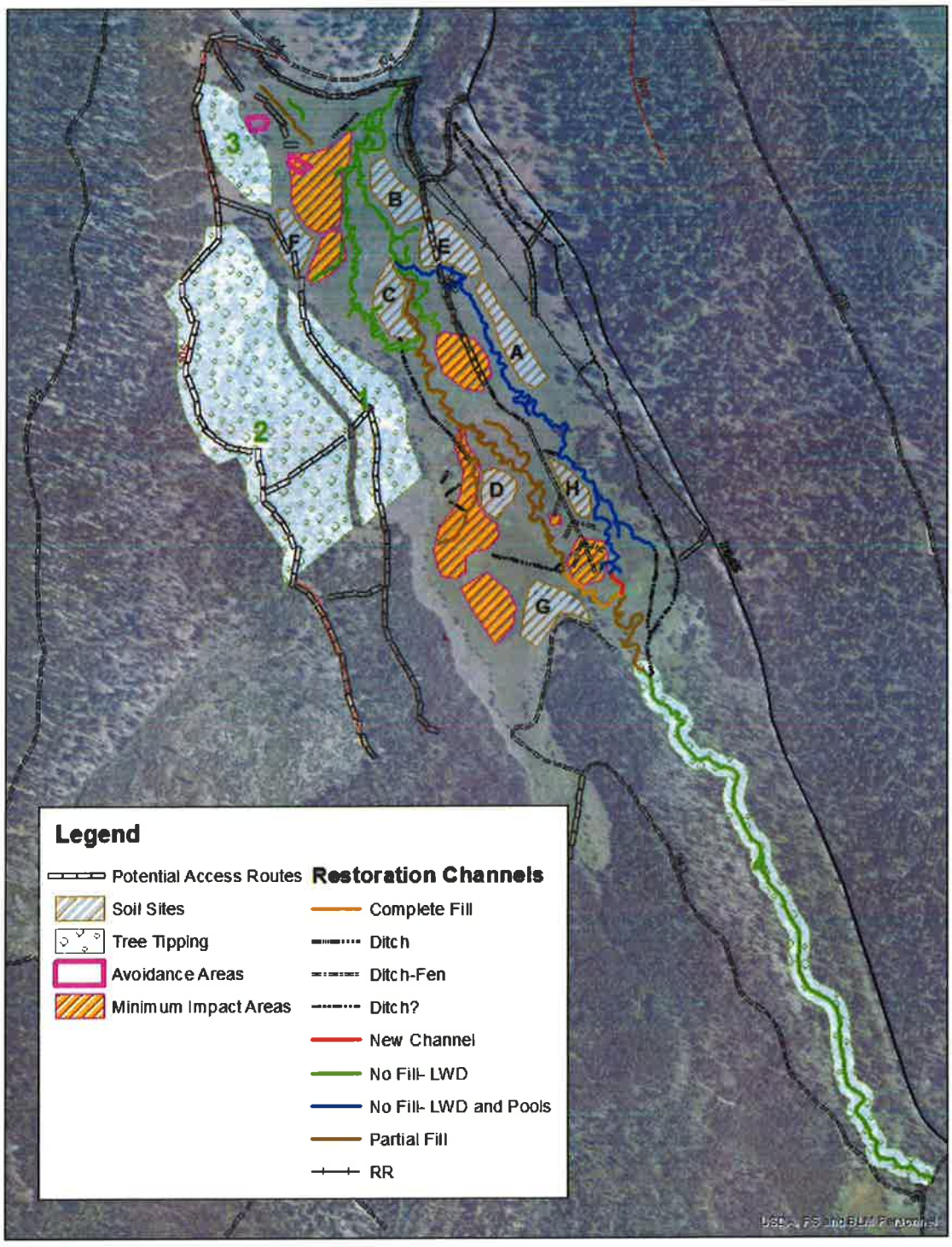


Figure 14. Examples of Beaver Dam Analogues in Pine Creek, a tributary to the John Day River near Fossil, OR, using fence posts which were installed with a manually operated hydraulic post-pounder.

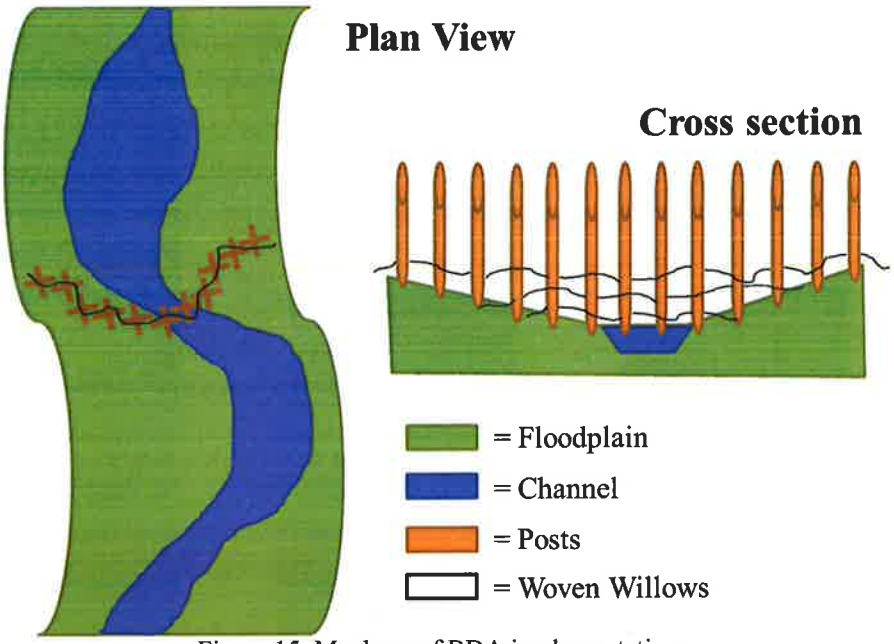


Figure 15. Mock-up of BDA implementations.

Figure 16. Example of floodplain encroachment by conifers (Phase 1).

Appendix to the Aquatic Restoration EA Implementation Description

Project Title: Squaw Creek Restoration Project- Phase 1
Project Number: 0302-2015

Category 1: Fish Passage Restoration
Category 2: Large wood, Boulder, and Gravel placement
Category 14: Riparian Vegetation Planting
Category 16: Beaver Habitat Restoration

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

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 BA as well as ARBO II.
2. Project notification: The following information will be provided to the NMFS Level 1 Aquatics members 30 days prior to implementation as a Project Notification Form 7.
    a. Action identifier- 03022016
    b. Project name- Squaw Creek Restoration Project- Phase 2 and 3
    c. Location-

Project	Squaw Creek Restoration Phase 2&3
Stream Name	Squaw Creek
6th field HUC	170702030105
Downstream End (Lat, Long in DD)	-118.4026, 44.57193
Upstream End (Lat, Long in DD)	-118.40022, 44.51388

    d. Agency contact- Kate Olsen, Forest Service, kholsen@fs.fed.us, 541-820-3818
    e. Timing- Work will occur during 2016 and 2017, with in-stream work happening between July 15 to August 15 and out of stream work when weather permits.
    f. Activity category-
        Category 1: Fish Passage Restoration
        Category 2: Large wood, Boulder, and Gravel placement; including tree removal for large wood placement
        Category 14: Riparian Vegetation Planting
        Category 16: Beaver Habitat Restoration

g. Project description- Project description is available in the Implementation Description under the section "Implementation Plan" above.
h. Extent- Work will occur on Squaw Creek as identified in **Figure 2** in the headwaters of the Middle Fork John Day River watershed.
i. Species affected-
    i. Listed species: Mid-Columbia River steelhead
    ii. Critical Habitat: Critical habitat and upstream
    iii. MIS Species: Redband trout
j. Date of submittal- To be completed in Spring of 2016, at least 60 day prior to implementation
k. Site assessments- Assessment for contaminants is not required at these locations.
l. Review- NMFS fish passage review and Restoration Review Team review are not required.
m. Verification- _____
n. SOD project notification- _____

3. Minor Variance: No variances from the criteria specified in the aquatic restoration document are being considered.
4. NMFS Fish Passage Review and Approval: This work does not require review by the NFMS level 1 team member.
5. Restoration Review Team: This work does not require review by the restoration review team.
6. Project Completion Report: To be completed after implementation
7. Annual Program Report: This project will be completed within two years, completion and annual reporting will occur in the winter following the fiscal year of work before February 15th.

Project Design Criteria

General Aquatic Conservation Measures

1. 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.
2. Climate Change: due to the small scale of this work, future climate changes impacts will not have dramatic effects on this work while providing resistance to and resilience from climate change by improving cold-water storage in the floodplain throughout the system.
3. In-Water Work Period: In-stream activities will occur between July 15th and August 15th.
4. Fish passage: This work is occurring because there is potential that fish passage did not exist before construction for different age classes and at different times of year. It is also the case that this stream reach is naturally impassible at the time of construction, due to low water flow. However, if it is the case that there is a need, fish passage will be provided for any adult or juvenile fish present in the action area during construction. After construction, adult and juvenile passage will be improved through this reach.
5. 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 >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
6. 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 (e.g., 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.

7. 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, and 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 (e.g., large wood, boulders, 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.

8. 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 (e.g., minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, 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 (e.g., generators, canes), and gas-powered equipment with tanks larger than five 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

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.

9. 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% 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 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.

10. 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 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.

11. 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; 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 and or traps at least on a daily basis to ensure they are secured to the banks and free of organic accumulation and to minimize fish predation in the trap.
    b. Capture and release – Fish trapped within the isolated work area will be captured and released as prudent to minimize the risk of injury, then released at a safe release site, preferably upstream of the isolated reach in a pool or other area that provides cover and flow refuge. Collect fish in the

best manner to minimize potential stranding and stress by seine or dip nets as the area is slowly dewatered, baited minnow traps placed overnight, or electrofishing (if other options are ineffective). Fish must be handled with extreme care and kept in water the maximum extent possible during transfer procedures. A healthy environment for the stressed fish shall be provided—large buckets (five-gallon minimum to prevent overcrowding) and minimal handling of fish. Place large fish in buckets separate from smaller prey-sized fish. Monitor water temperature in buckets and well-being of captured fish. If buckets are not being immediately transported, use aerators to maintain water quality. As rapidly as possible, but after fish have recovered, release fish. In cases where the stream is intermittent upstream, release fish in downstream areas and away from the influence of the construction. Capture and release will be supervised by a fishery biologist experienced with work area isolation and safe handling of all fish.

c. Electrofishing – Use electrofishing only where other means of fish capture may not be feasible or effective. If electrofishing will be used to capture fish for salvage, NMFS's electrofishing guidelines will be followed (NMFS 2000).
    i. Reasonable effort should be made to avoid handling fish in warm water temperatures, such as conducting fish evacuation first thing in the morning, when the water temperature would likely be coolest. No electrofishing should occur when water temperatures are above 18°C or are expected to rise above this temperature prior to concluding the fish capture.
    ii. If fish are observed spawning during the in-water work period, electrofishing shall not be conducted in the vicinity of spawning fish or active redds.
    iii. Only Direct Current (DC) or Pulsed Direct Current shall be used.
    iv. Conductivity <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.
    vi. 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 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% of the available flow and fish screen(s) will be installed, operated, and maintained according to NMFS's fish screen criteria (NMFS 2011e).
    ii. For the dewatering of a work site to remove or install culverts, bridge abutments etc., if ESA-listed fish may be present, a fish screen that meets criteria specified by NMFS (2011e) must be used on the intake to avoid juvenile fish entrainment. If ESA-listed salmon, steelhead, eulachon, or green sturgeon may be present, the Action Agencies will ensure that the fish screen design is reviewed and approved by NMFS for consistency with NMFS (2011e) criteria if the diversion (gravity or pump) is at a rate greater than 3 cfs. NMFS approved fish screens have the following specifications: a) 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 b) 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.

Project Design Criteria for Aquatic Restoration Activity Categories

Category 1. 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, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Stream Simulation Culvert and Bridge Projects** –All road-stream crossing structures shall simulate stream channel conditions per *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings* (USDA-Forest Service 2008), located at: http://stream.fs.fed.us/fishxing/aop_pdfs.html

   i. ***Culvert criteria*** –Within the considerations of stream simulation, the structure shall, at a minimum, accommodate a bankfull wide channel plus constructed banks to provide for passage of all life stages of native fish species (for more information, reference Chapter 6, page 35 of the USFS Stream Simulation Guide). The following crossing-width guidance applies to specific ranges of entrenchment ratios as defined by Rosgen (1996):
      1. **Non-entrenched Streams**: If a stream is not fully entrenched (entrenchment ratio of greater than 1.4), the minimum culvert width shall be at least 1.3 times the bankfull channel width. This is consistent with *Anadromous Salmonid Passage Facility Design* (section 7.4.2 "Stream Simulation Design") (NMFS 2011e). However, if the appropriate structure width is determined to be less than 1.3 times the bankfull channel width, processes for variances are listed in "iv" and "v" below.
      2. **Entrenched Streams**: If a stream is entrenched (entrenchment ratio of less than 1.4), the culvert width must be greater than bankfull channel width, allow sufficient vertical clearance to allow ease of construction and maintenance activities, and provide adequate room for the construction of natural channel banks. Consideration should be given to accommodate the floodprone width. Floodprone width is the width measured at twice the maximum bankfull depth (Rosgen 1996).

Category 2. 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 mimic 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 1.5x bankfull channel width, while logs without rootwads should be a minimum of 2.0x 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 (<12) an additional 60% 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 >25% 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 (e.g., 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.

Category 14. 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 and or rush mats; 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.

Category 16. 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 (e.g., aspen, willow, alder, and cottonwood) associated with quality beaver habitat, follow project design criteria in the *Riparian Vegetation Treatment (controlled burning) b. Noncommercial thinning associated with Moderate-severity burns* category.

Project Design Criteria by Resource

Fisheries and Hydrology

Fisheries and Hydrology resources will follow all mitigation measures and project design criteria for aquatic restoration activities as shown in the 'Aquatic Restoration Project Categories, Program Administration, General Aquatic Conservation Measures, and Project Design Criteria for Aquatic Restoration Activity Categories on the Malheur National Forest.'
Additional Aquatic project design criteria were developed for the following elements: Tree Tipping and Felling, Juniper Treatments, Tree Hauling, and Prescribed Burning.

General For Inside Riparian Habitat Conservation Areas

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

Tree Tipping and Tree Felling for Large Wood Projects

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

Table 3 Primary shade zone width, based on adjacent hill slope.

	Hill Slope less than 30%	Hill Slope 30% to 60%	Hill Slope greater than 30%
Primary Shade Zone Width (slope distance	50 ft.	55 ft.	60 ft.

The Temperature Implementation Strategies allow the distances in the above table to be less (but not less than 25 ft.) if any of the following conditions applies:
The trees are located on a south facing slope (175-185 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% 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* - 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 one and one-half times (1.5X) the bankfull or a log without a rootwad should be twice (2X) the length of the stream's bankfull width. As the best fish habitat is formed around jams composed of 3 to7 logs, at least 2 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) 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 (Do 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 RHCA's.
Use all available fuel treatments and preparation activities as necessary (e.g. 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 (e.g. don't cause bank instability or increase erosion)
Within 100' of the stream channel backing fire is preferred.
Within primary shade zone retain 100% of the over-story canopy closure with the exception of hardwood treatment.

For intermittent, non-fish-bearing stream channels:

Within 50' 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 (e.g. 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 ft. 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 (ATPs).

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 (GDE) shall be maintained. Spring developments shall not dewater GDEs. 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 ft. from all operational activities where topography does not restrict such a distance, and be identified as Areas to Protect (ATPs).

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 GDE, unless it is for the benefit or protection of the GDE 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 GDE. 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 GDE.

When developing springs, place troughs far enough away from GDEs, 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 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 and/or mulch is not available, individual 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, and/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 (e.g., 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 and/or are not economically feasible, and (4) in permanently altered plant communities.

Under no circumstances shall non-native invasive plant species and/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 and/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 or moderate on the Ochoco, 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 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 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 (6ft either side of fence), trails, other developments and access to them would be cleared of slash produced by project activities.

Aspen Restoration

New aspen exclosure fences would have gates installed in proper locations to allow for removal of stray livestock. Aspen fences would be maintained each year and repaired whenever necessary. Plans for aspen exclosures will define when restoration of the protected stand has been achieved and who has responsibility for maintenance of the structure. When fences are no longer needed, aspen fences should be removed.

Alternate livestock water sources to those being used in aspen stands would be developed off-site before fencing aspen or re-evaluate fencing of the aspen site. Coordinate with range specialist and permittee.

Notification

During 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.