Marshall Creek Restoration Project

Emigrant Creek Ranger District, Malheur National Forest

Anticipated Project Start Date: June 27, 2016

Action Plan

The project goal of this project is to restore hydrologic processes and aquatic habitat along Marshall Creek in compliance with the National Environmental Policy Act (NEPA) under the Aquatic EA. The specific objectives are to:

- Stabilize incised stream channel to reestablish water storage capacity, flood control, and habitat.
- Increase water quantity and quality through conifer tree thinning within riparian zone.
- Reduce sedimentation from sloughing head-cuts and mitigate erosion to improve water quality.
- Improve/increase riparian and aquatic vegetation for fish and wildlife habitat.

Potentially site disturbing treatments include:

- Felling trees along the floodplain and place some of them within the stream channel.
- Using an excavator to tip trees and restabilize headcuts and streambanks by moving soil along banks into the channel.

Photo of Marshall Creek showing deep incision, headcuts, conifer encroachment, and unstable banks.

Representative stream restoration using root wads and large wood completed in Camp Creek 2015

Project Description

The project area totals 60 acres and includes 1.7 miles on Marshall Creek between the Forest Service boundary (T20S, R32E, Sec. 19) and FS road 3935 intersection up to 150 feet on both sides of the creek. Phase 1 of the project involves tree thinning and channel rehabilitation slated for July 2016, while Phase 2 includes seeding, planting and shrouding slated for the fall 2016/spring 2017.

The current condition of Marshall Creek diminishes water quality and quantity in the Silvies River watershed and adversely affects riparian vegetation and aquatic habitat. No action on this stream would

result in continued detrimental impacts to the water source, riparian vegetation and aquatic life. The goal of this project is to restore the riparian ecosystem and water quantity and quality within Marshall Creek through vegetation thinning, channel rehabilitation and planting.

To meet the project goal and objectives, juniper, pine and fir trees <21" dbh will either be cut or tipped over, and placed within the channel or set up as slash barrier to retard cattle access. Placing large wood within the stream increases both channel complexity for aquatic habitat and obstacles for trapping sediment needed to aggrade incised channels. By filling the channel to an appropriate height, the water table elevates and reconnects with the floodplain allowing the stream to function properly. This process drowns non-riparian species that have encroached within the floodplain and fosters riparian plant growth. Supplemental planting of aspen, willow, alder, dogwood, and other endemic riparian species along the channel banks will augment the reestablishment of riparian vegetation within the ecosystem. An excavator will be used to tip trees, place large wood within the channel and move stream bank material. Chainsaws will be used to cut vegetation intended to build slash barriers and to supplement large wood material to be placed in the channel.

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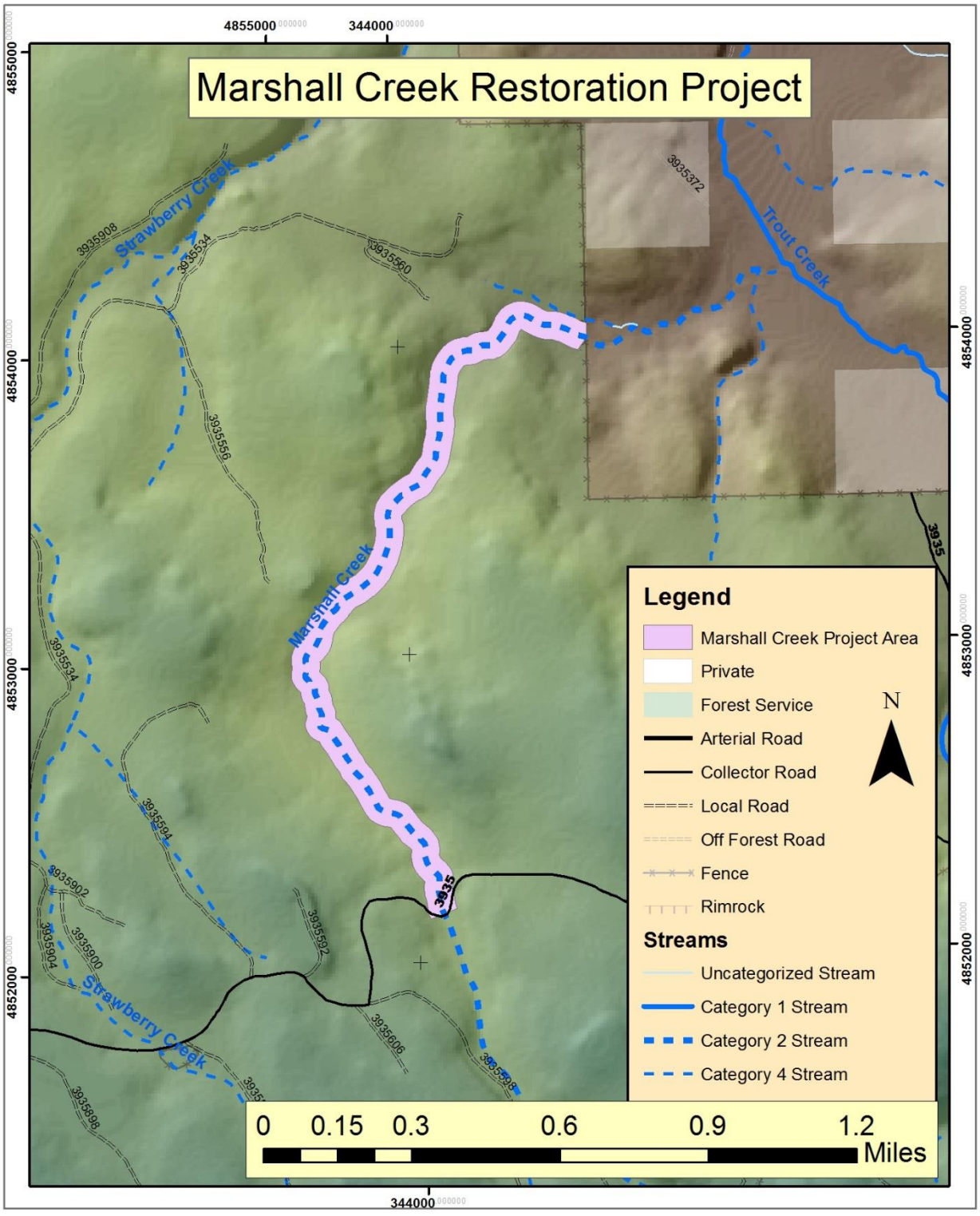
Marshall Creek Restoration Project
4855000
344000
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Strawberry Creek
Trout Creek
Marshall Creek
3935908
3935534
3935560
3935372
3935556
3935594
3935902
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3935900
3935592
3935606
3935598
3935896
Legend
Marshall Creek Project Area
Private
Forest Service
Arterial Road
Collector Road
Local Road
Off Forest Road
Fence
Rimrock
Streams
Uncategorized Stream
Category 1 Stream
Category 2 Stream
Category 4 Stream
N
0 0.15 0.3 0.6 0.9 1.2
Miles

Forest Aquatic Restoration Project
NEPA Compliance and Implementation Checklist

Project Number: _____ **Date: June 2016**

Category: Fish Passage Restoration, Large Wood, Boulder, and Gravel Placement, Streambank Restoration, Juniper Tree Removal

Location: Marshall Creek, Emigrant Creek RD, Malheur NF

Project Description: Marshall Creek Channel Restoration

Heritage

☐ - Specific PDC for Heritage addressed (Heritage Surveys; Avoidance areas).

Botany

☐ - Specific PDC for Botany addressed (Sensitive Plant Surveys).
☐ - Specific PDC for Nox. Weeds addressed.

Land Management Consistency

☐4A	Big Game Winter range
☐6A & 6B	Wilderness
☐7	Scenic Area
☐8	Special Interest Areas
☐9	Research Natural Areas
☐10	Semi-Primitive Non-Motorized
Recreation Areas	
☐22	Wild and Scenic River
☐	Inventoried Roadless Areas

Comments:_____

_____

Table 1. Projects Design Criteria and Forest Plan compliance checklist.

I have reviewed this project and have determined it is within the Project Design Criteria identified for my resource.			
Resource	Signature	Date	Comments
Heritage			
Botany			
Wildlife			
Fish*			
Hydrology*			
Range			
Soils			
Recreation			
Lands and Special Uses			
Engineering			
Fuels / Fire			
Silviculture			

* 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:_____

Category and Associated Project Design Criteria

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.

Headcut and grade stabilization – Headcuts often occur in meadow areas, typically on Rosgen "C" and "E" channel types. Headcuts develop and migrate during bankfull and larger floods, when the sinuous path of Rosgen E type streams may become unstable in erosive, alluvial sediments, causing avulsions, meander cut-offs, bank failure, and development of an entrenched Rosgen G gully channel (Rosgen 1994).

1. **Stabilize Headcuts**

   A. In streams with current or historic fish presence, provide fish passage over stabilized headcut through constructed riffles for pool/riffle streams or a series of log or rock structures for step/pool channels as described in part ii below.

   B. Armor headcut with sufficiently sized and amounts of material to prevent continued up-stream migration of the headcut. Materials can include both rock and organic materials which are native to the area. Material shall not contain gabion baskets, sheet pile, concrete, articulated concrete block, and cable anchors.

   C. Focus stabilization efforts in the plunge pool, the headcut, as well as a short distance of stream above the headcut.

   D. Minimize lateral migration of channel around headcut ("flanking") by placing rocks and organic material at a lower elevation in the center of the channel cross section to direct flows to the middle of channel.

   E. Short-term headcut stabilization (including emergency stabilization projects) may occur without associated fish passage measures. However, fish passage must be incorporated into the final headcut stabilization action and be completed during the first subsequent in-water work period.

   F. In streams without current or historic fish presence, it is recommended to construct a series of downstream log or rock structures as described in part ii below to expedite channel aggradation.

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:

a. Use of adequate sized wood sufficient for stability
b. Orient and place wood in such a way that movement is limited
c. Ballast (gravel or rock) to increase the mass of the structure to resist movement
d. Use of large boulders as anchor points for the large wood
e. 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**

These structures are 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.

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

a. Without changing the location of the bank toe, restore damaged streambanks to a natural slope and profile suitable for establishment of riparian vegetation. This may include sloping of unconsolidated bank material to a stable angle of repose or the use of benches in consolidated, cohesive soils.

b. Complete all soil reinforcement earthwork and excavation in the dry. When necessary, use soil layers or lifts that are strengthened with biodegradable fabrics and penetrable by plant roots.

c. Include large wood to the extent it would naturally occur. If possible, large wood should have untrimmed root wads to provide functional refugia habitat for fish. Wood that is already within the stream or suspended over the stream may be repositioned to allow for greater interaction with the stream.

d. Rock will not be used for streambank restoration, except as ballast to stabilize large wood.

e. Use a diverse assemblage of vegetation species native to the action area or region, including trees, shrubs, and herbaceous species. Vegetation, such as willow, sedge and rush mats, may be gathered from abandoned floodplains, stream channels, etc.

f. Do not apply surface fertilizer within 50 feet of any stream channel.

g. Install fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

h. Conduct post-construction monitoring and treatment or removal of invasive plants until native plant species are well established.

Category 12. Juniper Tree Removal will be conducted in riparian areas and adjoining uplands to help restore plant species composition and structure that would occur under natural fire regimes. Juniper removal will occur in those areas where juniper have encroached into riparian areas as a result of fire exclusion, thereby replacing more desired riparian plant species such as willow, cottonwood, aspen, alder, sedge, and rush. This action will help restore composition and structure of desired riparian species, thereby improving ground cover and water infiltration into soils. Equipment may include chainsaws, pruning shears, winch machinery, feller-bunchers, and slash-busters. The following measures will apply:

a. Remove juniper to natural stocking levels where BLM and Forest Service determines that juniper trees are expanding into neighboring plant communities to the detriment of other native riparian vegetation, soils, or streamflow.
b. Do not cut old-growth juniper, which typically has several of the following features: sparse limbs, dead limbed or spiked-tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of cambium layer at base of tree, and limited terminal leader growth in upper branches (Miller et al. 2005).
c. Felled trees may be left in place, lower limbs may be cut and scattered, or all or part of the trees may be used for streambank or wetland restoration (e.g., manipulated as necessary to protect riparian or wetland shrubs from grazing by livestock or wildlife or otherwise restore ecological function in floodplain, riparian, and wetland habitats).
d. Where appropriate, cut juniper may be placed into stream channels and floodplains to provide aquatic benefits. Juniper can be felled or placed into the stream to promote channel aggradation as long as such actions do not obstruct fish movement and use of spawning gravels or increase width to depth ratios.
e. On steep or south-facing slopes, where ground vegetation is sparse, leave felled juniper in sufficient quantities to promote reestablishment of vegetation and prevent erosion.
f. If seeding is a part of the action, consider whether seeding would be most appropriate before or after juniper treatment.
g. When using feller-buncher and slash-buster equipment, operate equipment in a manner that minimizes soil compaction and disturbance to soils and native vegetation to the extent possible. Equipment exclusion areas (buffer area along stream channels) should be as wide as the feller-buncher or slash-buster arm.