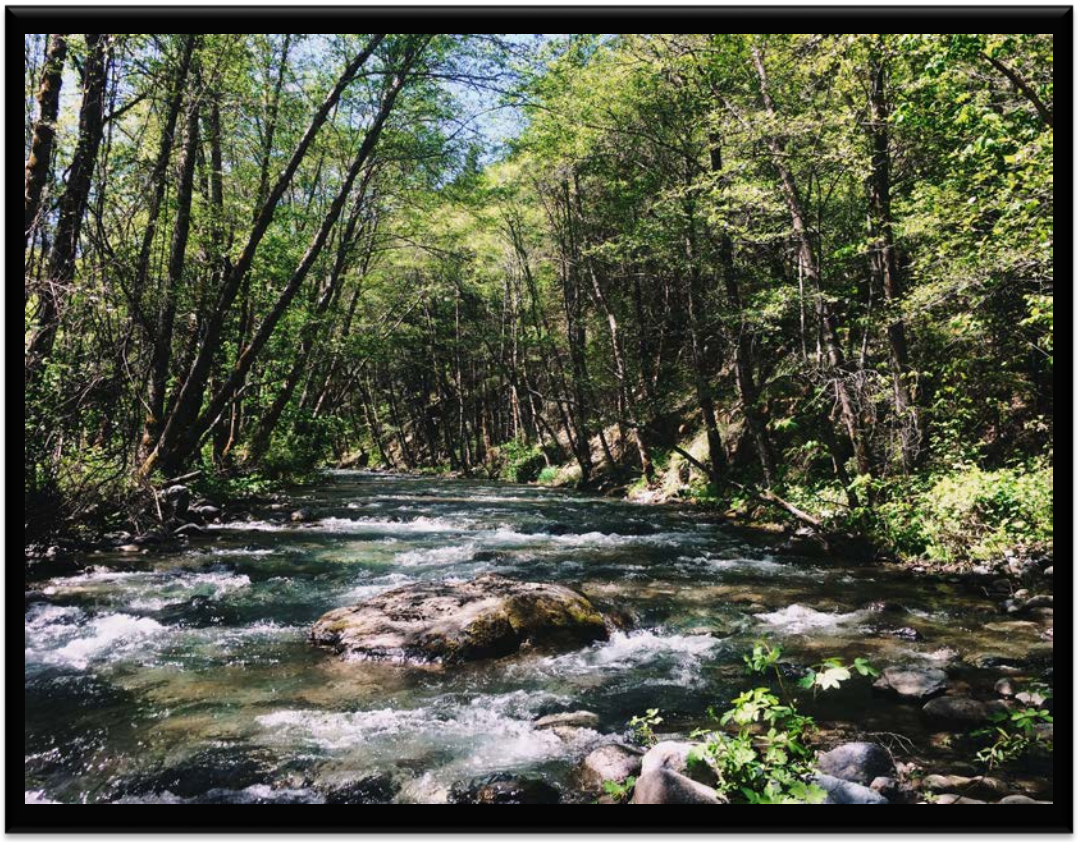
United States Department of Agriculture
Forest Service

South Fork Tributary Habitat Enhancement Project

Environmental Assessment

Salmon/Scott River Ranger District, Klamath National Forest, Siskiyou County, California

Draft May 2017



For More Information Contact:

Maija Meneks
Salmon/Scott River Ranger District
11263 N. Hwy 3 Fort Jones, CA
Phone: 530-468-1272
Email: mmeneks@fs.fed.us
Fax: 530-468-1290

Cover Image: Knownothing Creek, Site 3 (M. Van Scoyoc 2017)

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Introduction

The Salmon River Restoration Council (SRRC), in coordination with the Forest Service, proposes to construct 25 large diameter wood instream structures to enhance salmonid habitat within 19 sites in Knownothing and Methodist Creeks over 3.15 miles of stream (1.42 miles and 1.73 miles respectively) on the Salmon/Scott River Ranger District of the Klamath National Forest. The project is within the South Fork Salmon River watershed, Knownothing Creek is 3 miles upriver from the town of Forks of Salmon, California, in Siskiyou County; Methodist Creek is 6 miles upriver from Forks of Salmon. The sites occur in the Knownothing Creek (180102100107) and Methodist Creek (180102100108) 7th field hydrologic units. The legal description for the Knownothing Creek sites is Township (T) 10 North (N), Range (R) 8 East (E), Sections 29-31 (Humboldt Meridian) and the Methodist Creek sites is T 39N, R 12W, Sections 30 and 31 and T 38N, R 12W, Section 6 (Mt. Diablo Meridian). The entire project area is located on Klamath National Forest lands. See Appendix A for vicinity and site maps.

We prepared this environmental assessment (EA) to determine whether implementation of stream restoration may significantly affect the quality of the human environment and thereby require the preparation of an environmental impact statement. By preparing this EA, we are fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA). For more details of the proposed action, see the Proposed Action and Alternatives section of this document.

Background

The Salmon River is one of the most biologically intact subbasins of the Klamath River. The Salmon River hosts all the native anadromous fish runs present in the Klamath River Basin, including the state and federally listed Southern Oregon-Northern California Coast (SONCC) Ecological Significant Unit population of coho salmon. This almost ½ million acre watershed is 98% publicly owned and many segments of the river are designated as Wild and Scenic. The large proportion of federal land and the comparatively high quality water and habitat conditions make the Salmon River one of the best candidates for succeeding in restoring anadromous fisheries in the Klamath River Basin. Wild runs of coho salmon still persist in the relatively unimpaired waters of the Salmon River, yet they face a high risk of extinction. Little is known about historic run sizes of coho salmon in the Salmon River; however, the National Marine Fisheries Service's Intrinsic Potential model suggests it has a moderate carrying capacity for coho salmon. The Salmon River likely supported a population of a few thousand coho salmon in the past. That number has dropped precipitously in the last two decades, and presently adult returns are likely less than 50 per year (NMFS, 2014). Problems facing coho salmon and other fish on the Salmon River include invasive species, barriers to fish passage, depleted large woody debris, high sediment loads, large wildfires, limited riparian function, unstable spawning gravels, and temperature impairment.

Despite its high habitat and water quality, the fishery of the Salmon River is a remnant of what it once was. Starting in the 1850s land use changes in the Salmon River, such as large scale hydraulic mining and timber harvest, began to alter river channels and riparian areas. Between 1870 and 1950 it is estimated that over 15 million cubic yards of sediment was discharged into the Salmon River as a result of gold mining. Mining impacted the landscape, vegetation, soil, water quality, and channel structure in many fish-bearing streams. Extensive logging occurred from the 1950s - 1980s, the most significant outcomes of these logging activities have been the associated changes in the natural fire regime, the substantial building of road networks throughout the basin, and loss of large diameter wood structures in streams.

Coho life histories are comprised of a chain of habitats with a favorable spatial/temporal distribution. In the Salmon River, the linkages between these habitats have largely been broken. Due to a combination of factors, including simplification and fragmentation of habitat, coho populations are declining. According to the Final SONCC Coho Recovery Plan the highest priority for recovery in the Salmon River should be improving the

quality and extent of rearing habitat and refugia (NMFS, 2014). For summertime rearing, the priority should be reducing water temperatures, along with protecting and restoring thermal refugia. For winter rearing, the priority should be improving connectivity to existing off-channel habitat, and increasing the extent and quality of winter rearing habitat. Therefore, such habitat located primarily in lower tributary reaches, should be restored or recreated wherever possible. The habitat enhancement actions proposed in this project will directly address recommendations from the Plan, as well as all other salmonids in the watershed (NMFS, 2014), by constructing large diameter wood structures on two tributaries of the South Fork Salmon River.

Purpose and Need

The objective is to restore large woody debris into Knownothing and Methodist Creeks, creating habitat features necessary for coho and other salmonid recovery in the Salmon River.

Knownothing and Methodist Creeks are located within a reach of the South Fork Salmon River that is potentially a key coho salmon spawning reach on a river with limited potential for this species, which is listed as Threatened by both the State and Federal Endangered Species Act. The low gradient of these creeks makes them preferred habitat for coho salmon; for both spawning and rearing.

Knownothing and Methodist Creeks have degraded habitat complexity as a result of historic unrestricted stream clearing, logging, and mining. Logging that occurred from the 1950s - 1980s resulted in the removal of most of the large conifers from the creeks. Additionally, large woody debris was pulled out of these tributaries during the 1980s. Taken together, these historic and more recent efforts have resulted in a broad-scale simplification of channel complexity and a corresponding reduction of suitable habitat for all life stages of salmonids.

These creeks are located within a river reach that has been given a high priority ranking for riparian restoration (SRRC, 2008). An instream structure assessment completed by the SRRC in Knownothing and Methodist Creeks in 2014 showed an overall lack of large diameter wood instream structures and the resulting habitat complexity required for successful spawning and rearing for coho salmon and other salmonids. The Final SONCC Coho Recovery Plan (NMFS, 2014) identifies projects like this as high priority actions in the Salmon River watershed (SONCC-SalR.2.1.7). The Recovery Strategy for California Coho Salmon (CDFG, 2004) also identifies projects like this as a high priority action in the Salmon River watershed (SA-HA-09).

The purpose of this project is to:

- Increase over-summer rearing habitat through pool development,
- Increase over-winter rearing habitat by providing velocity refugia,
- Enhance/entrain spawning gravels, and
- Provide for a wide range of habitat heterogeneity for juvenile and adult salmonids.

Additionally, extensive before/after effectiveness monitoring and analysis will be conducted for this restoration project. This will allow us to gain valuable insight into how specific wood loading techniques and structural designs perform in the context of the South Fork Salmon River watershed. Lessons learned from this monitoring study will be broadly applicable to instream habitat restoration activities throughout Northern California and the Pacific Northwest.

Management Direction

The 1995 Klamath National Forest Land and Resource Management Plan (Forest Plan, as amended; Klamath National Forest 1995) includes Standards and Guidelines from the Northwest Forest Plan. The Forest Plan provides forest-wide and management area (MA) direction for project-level activities. The South Fork Tributary Habitat Enhancement Project is mostly within the Riparian Reserve MA (MA-10), specific direction for the Riparian Reserve MA can be found on pages 4-126 to 4-127 in the Forest Plan. Additionally there are three

proposed sites within Special Habitat (MA-5, Late Successional Reserve) pages 4-82 to 4-94 in the Forest Plan. Enhancing these streams would meet Forest Plan Aquatic Conservation Strategy Objectives by aiding the recovery of fish habitat, riparian habitat, and water quality (6-46; see Appendix C).

Decision Framework

The responsible official for this project is Ted McArthur, District Ranger for the Salmon/Scott River Ranger District, Klamath National Forest. This EA is not a decision document; it discloses the environmental consequences of implementing the action alternative, or taking no action. This EA also aids the responsible official in determining whether the effects disclosed would have a significant effect on the environment. If the responsible official determines there would be no significant effects, he will select the proposed action alternative, issue a “Finding of No Significant Impact”, and sign a Decision Notice.

Within the Decision Notice, the responsible official will determine whether to implement the proposed action or choose no action (Alternative 1) at this time. The final decision will be based on the information in this document, the supplementary information contained in the project record, consideration of any public comments, how well the selected alternative meets the purpose and need for the project, and whether the selected alternative complies with agency policy, applicable state and federal laws, and Forest Plan direction.

Public Involvement

On November 8, 2016, the proposal was mailed to thirty-six nearby landowners or claim owners, to four tribes, the United States Fish and Wildlife Service, the National Marine Fisheries Service, Siskiyou County, and to the North Coast Regional Water Quality Control Board for a 30-day public scoping/comment period from November 8, 2016 to December 7, 2016. The proposal was posted on the Forest website and first listed in the Schedule of Proposed Actions on October 1, 2016. One public comment was received during the combined scoping/comment period, the comment letter was in support of the project. Additionally, this project was discussed in the Salmon River Restoration Council’s 2016 fall newsletter as well as the 2016 Annual Report, both of which are accessible to the public.

Alternatives

Alternative 1 – No Action

Under the No Action alternative, no treatments as proposed will be implemented. The No Action alternative provides reviewers a baseline against which to compare the magnitude of environmental effects of the action and any alternatives.

Alternative 2 - Proposed Action

The Salmon River Restoration Council, in coordination with the Forest Service, propose to construct large diameter wood instream structures to enhance salmonid habitat within 19 sites in Knownothing and Methodist Creeks over 3.15 miles of stream (1.42 miles and 1.73 miles respectively) see Project Maps (Appendix A) for locations of the proposed structures. The original proposal had included an additional site on Knownothing Creek, but was removed from the Project in order to avoid disturbance to Heritage Resources.

The proposed action is to place instream habitat structures that consist of large diameter (1-foot to 3.5-foot diameter breast height, DBH) logs, some with rootwads intact as individual logs, as well as constructed woven log jams of two to five logs on the banks of the creeks. Wood materials will be acquired from off-site sources through

purchases and private donations. The structures will be built and anchored in compliance with Chapter VII of the California Department of Fish and Wildlife (CDFW) Habitat Restoration Manual (Flosi et al., 2010) and through the guidance of the CDFW grant manager for this project. Logs will be hauled and placed with the guidance of an experienced restoration practitioner (Pacific Watershed Associates' Project Scientist), using a tracked excavator on a temporary access route or, if access is on a steep slope, cabled down and manually placed. Logs will be intentionally woven into existing live trees on the margins of the channel in order to collect and retain other large and small woody material that is naturally transported in high flow events; which will maintain the highly complex habitat in the long-term. These structures will create complex rearing habitat and pools for all life stages of salmonids. The proposed project does not intend to reconfigure the existing channel.

The effectiveness of the proposed habitat restoration will be evaluated and quantified by conducting a monitoring study aimed at measuring the response of key instream habitat characteristics to wood loading. This proposed monitoring study will incorporate several field-tested and widely applied monitoring protocols targeted at answering questions about the effectiveness of wood loading efforts and to what extent the project meets objectives at both feature-specific and treated reach scales. Pre-implementation monitoring will be conducted prior to wood loading. Restoration effectiveness monitoring will be conducted during the two field seasons following implementation.

Work will be conducted during low flow conditions, with the minimal equipment necessary to implement the project. Implementation will begin after July 9th, and all work along the stream channel will be completed by October 15th. Dewatering the work sites would result in a greater disturbance to the stream and fisheries than will be caused by constructing the structures. Therefore, the sites will not be dewatered and fish relocation will not be necessary. Water quality will be monitored visually at the second pool tailout downstream of active construction. If turbidity occurs extending beyond the second pool tailout, construction will be stopped until it clears. Prior to working at each site an individual will precede the equipment on foot to displace fish and wildlife and prevent them from being injured. Any fish or wildlife in the work area shall be flushed in a safe direction away from the project site.

Tree removal for equipment access/operation will result in minimal canopy shade loss over the streams. In riparian areas, a total of 15 white alders will be removed; all less than 12-inches DBH. In upland areas, three oak trees and two Douglas fir trees will be also be removed; all less than 12-inches DBH. All trees removed during project activities will be retained on-site for use in habitat structures. The streambanks will be minimally disturbed as a result of construction; the total soil disturbance for the project is approximately 0.30 acres and 450 linear feet along the stream channel. However, such disturbance will occur within the annual floodplain; areas annually disturbed by high flows. The total disturbance from temporary access routes (15-foot width) is approximately 1,025 linear feet (0.35 acres) within riparian areas and 2,050 linear feet (0.70 acres) in upland areas. Temporary access routes will be stabilized, obscured, blocked from further use, and if necessary, re-seeded with native, certified weed-free seed, immediately following implementation and completed by November 1st.

Project Design Features

Table 1: Project Design Features incorporated into Alternative 2.

Design Feature	Description
AIR-1	Dust control measures will be implemented to minimize dust generation and effects to visibility to drivers on the Forest Road.

Design Feature	Description
ARCH-1	All sites within the area of potential effects will be clearly identified prior to implementation. This includes but is not limited to flagging site boundaries.
ARCH-2	Any project activities within site boundaries will adhere to Standard Resource Protection Measures as approved by the Forest Heritage Program Manager and documented in the Archaeological Survey Report.
ARCH-3	If any late discoveries of human remains or sites not previously recorded are identified during project implementation, work in the immediate area will stop and the District Archaeologist and Heritage Program Manager will be contacted.
WS -1	For activities that occur within Riparian Reserves, the Normal Operating Season (NOS) will be June 1st to November 15th. Ground disturbing activities will also be restricted during periods of wet weather during the NOS. See BMP 1.5 (Appendix B). However, the more restrictive CDFW NOS of "June 15th to November 1st, or the first significant rainfall, whichever comes first", will be applied to this project.
WS-2	Mulch and/or seed areas disturbed by restoration activities where sufficient levels of soil cover are lacking.
WS-3	Erosion control and other requirements to protect water quality are described in BMPs (Appendix B). If "conditions arise or change in such a manner as to be considered deleterious to aquatic life, operations shall cease until corrective measures are taken" by CDFW.
WS-4	The designated Project drafting site is within a Pacific salmonid-bearing stream reach. Therefore, *NOAA Fisheries Water Drafting Specifications* guidelines will be used. They include, but are not limited to, the following: 1. When in habitat potentially occupied by Chinook and Coho salmon, intakes will be screened with 3/32-inch mesh for rounded or square openings, or 1/16-inch mesh for slotted openings. When in habitat potentially occupied by steelhead trout, intakes will be screened with 1/8-inch mesh size. Wetted surface area of the screen or fish-exclusion device shall be proportional to the pump rate to ensure that water velocity at the screen surface does not exceed 0.33 feet/second. a. Use of a NOAA approved fish screen will ensure the above specifications are met. 2. Fish screen will be placed parallel to flow. 3. Pumping rate will not exceed 350 gallons-per-minute (gpm) or 10% of the flow of the anadromous stream drafted from. 4. Pumping will be terminated when tank is full. For any water drafting that occurs in non-fish bearing waters, Forest Service BMP 2.5 defines restrictions (Appendix B). All water drafting will avoid having any effect on the amount of cold water in thermal refugia at creek mouths and seeps.

Design Feature	Description
WEED-1	Equipment will be washed to prevent the spread of invasive species, appropriate equipment cleaning procedures will occur prior to moving to the project area, and after leaving the project area.
WEED-2	Wherever seed and/or straw is used to restore areas of ground disturbance, certified weed free seed and straw will be specified in the contract and used during implementation and any follow up treatments. Only native species will be used for seeding areas of disturbance.
WEED-3	Noxious weed infestations will be flagged on the ground prior to project implementation. Known infestations of noxious weeds will be treated by either manual or mechanical methods prior to seed set to avoid transporting seeds from the infested locations to other portions of the project area.
WL-1	To avoid disturbance to potentially breeding northern spotted owl, in or near the project area, project activities that involve louder than ambient noise levels will be prohibited from February 1st - July 9th each year. This is in conformance with CDFW's restriction for northern spotted owl, other raptors, and migratory birds. This seasonal restriction can be lifted if protocol-level surveys conducted during the year of the action do not detect the presence of nesting owls or identified nests have been determined to have failed or fledged young.
WL-2	Prior to construction, access routes and worksites will be completely surveyed within species preferred habitats by a qualified biologist, to look for blue-gray taildropper, western pond turtle (individuals, nests, and overwintering burrows), salamander, foothill yellow-legged frogs (all life phases), and tailed frogs (all life phases). If such species are observed they will be moved from the exclusion zone downstream or upstream of the work site, to a safe location, prior to construction. This is in conformance with CDFW's recommendation for these species.

Environmental Impacts of the Proposed Action and Alternatives

This section summarizes the biological, physical, and cultural environments of the affected project area and the potential changes to those environments due to project implementation. It also presents the scientific and analytical basis for comparison of alternatives presented. All specialist reports evaluated the entire initial project proposal, consisting of 20 sites. The initial proposal had included a site on Knownothing Creek, which was removed from the Project in order to avoid disturbance to Heritage Resources.

This EA incorporates the Klamath National Forest Plan by reference and tiers to the Final Environmental Impact Statement (USFS 1994). The discussions of resource potential effects take advantage of existing information included in the Forest Plan and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record includes all project-specific information such as resource reports, ecosystem analyses, and other results of field investigations.

The supporting resource specialist reports and their amendments are available on the Forest internet website at: https://www.fs.usda.gov/project/?project=50240. Key points from the analysis documents are summarized in this section and the documents, including resource reports, are incorporated by reference.

Water Quality

Methodology

Analysis Indicators and Measures

- Potential of increased temperature loading to the Salmon River. The potential for increased stream temperature is approximated by the length (linear feet) of stream channel disturbed by placing the structures and placed into context at the watershed scale.
- Likelihood of increased sediment loading to the Salmon River. The potential for increasing sedimentation is approximated by the area (acres) of soil disturbance at the project site, including temporary access roads and storage areas. The risk likelihood for sediment is based on the Equivalent Roaded Area model, which translates management actions to acres of impact and developed thresholds of concern for impacts at the watershed scale. The range of impacts below in Table 2 is based on the levels of impact in relation to the thresholds of concern and in this case, can put potential sediment loading into perspective.

Table 2. Range of risk relating to Equivalent Roaded Area (ERA) acres

Range of ERA acres	Risk Likelihood
Up to 13.4	Low
13.4 to 134	Moderate
134 to 1,1243	High

- Change in the number of large wood pieces within the bankful channel. The change in the number of large wood pieces to the bankful channel will be quantified by calculating the total number of pieces added to the streams within the project area. Additionally, the associated changes to channel function and morphology will be addressed through a qualitative discussion.

Spatial and Temporal Bounding of Analysis Area

The spatial bound for this analysis is the Knownothing Creek (180102100107) and Methodist Creek (180102100108) 7th field hydrologic units. This boundary is appropriate for assessing the project impacts as they might be experienced by an aquatic organism at the confluence with the Salmon River.

The short-term temporal bound for the analysis is 2 years and is based on the assumption that an overbank flow event has a high likelihood of occurring within 2 years of project implementation. The long-term temporal bound for the project is 10 years because it is expected that any potential reductions to stream shade (and indirect and cumulative adverse effects to water temperature) from project activities will recover within 10 years, if not more quickly.

Affected Environment

The project encompasses multiple sites in Knownothing and Methodist Creeks, intermittently extending over 3.2 miles of stream (1.4 miles and 1.7 miles respectively), within the South Fork Salmon River watershed. The upper and middle watershed topography in Knownothing and Methodist Creeks is located in steep, mountainous terrain with hillslope gradients frequently exceeding 70% along inner gorges, headwalls, and upper hillslope positions. The lower reaches of the watersheds (where the proposed project occurs) flow over a low gradient, broad alluvial fan/river terrace complex that is naturally prone to channel deposition and shifting alignments; however, the floodplain is channelized. Both creeks were disturbed by historic placer mining, which has left behind a mix of

natural and man-made landforms including placer tailing piles strewn throughout the natural floodplain terraces adjacent to the active channel(s). Additionally, the streams have an abundance of boulders not suitable for spawning; most of the fine sediment and cobble have been transported out of the stream into the South Fork Salmon River.

An instream structure assessment completed by the SRRC in Knownothing and Methodist Creeks in 2014 showed an overall lack of large diameter wood instream structures and the resulting habitat complexity required for successful spawning and rearing for coho salmon and other salmonids (SRRC unpub. data). The assessment found that within the bankful channel of Knownothing Creek there were 10 dead and down large wood pieces within the project area. In Methodist Creek, there were 17 large wood pieces within the project area. This value has likely changed since the assessment as large wood recruitment and loss out of the system changes on an annual basis. However, the streams lack live and standing dead trees along the banks which could be mobilized and recruited during high flows and therefore the number of large pieces is likely similar to the 2014 assessment.

Knownothing and Methodist Creeks have degraded habitat complexity as a result of historic unrestricted stream clearing, logging, and mining. Logging that occurred from the 1950s - 1980s resulted in the removal of most of the large conifers from the creeks. Large woody debris was also pulled out of these tributaries during the 1980s, resulting in high velocity, shallow, entrenched, channelized streams, which are relatively stable in their current flow paths. The creeks flush water, sediment, organic material, and racking wood too quickly through the system, resulting in limited connection of flows within the floodplain. This lack of floodplain inundation and hyporheic (i.e., groundwater just under the surface of the floodplain which interacts with surface flows) flow limits shade creating riparian vegetation, and exacerbates already high stream temperatures (NCRWQCB 2005), resulting from logging in riparian reserves and high road densities within the watersheds.

The Salmon River hydrologic area (as defined by the North Coast Regional Water Quality Control Board), which includes Knownothing and Methodist Creeks, is registered on the Clean Water Act 303(d) list as impaired for temperature, as part of the Klamath Hydrologic Unit listing (NCRWQCB, 2005). As part of the listing, the 2005 Salmon River Total Maximum Daily Load for Temperature and Implementation Plan adopted a temperature “loading capacity” limit for the river (NCRWQCB, 2005). The threshold of no more than 5°F rise in the temperature of cold water above natural receiving water temperatures applies to the confluences of the Project creeks and the South Fork Salmon River.

The Forest conducted a stream temperature study during low flow conditions in 2010 and 2011. Knownothing and Methodist Creeks were found to have altered shade and maximum floating weekly maximum temperatures greater than 60.8°F, the temperature threshold for core juvenile salmonid rearing. Interestingly, the study found that 85% of the of all the assessed streams on the Forest are warmer than the 60.8°F standard, including 15 out of the 20 reference, or unmanaged streams, suggesting that the natural temperatures of many streams on the Forest are warmer than the threshold standards used to assess them.

A recent study looking at the threshold of concern associated with desired conditions for in-stream sediment in streams within the Klamath National Forest included surveys of Knownothing and Methodist Creeks (USFS 2016). The study found that Knownothing Creek and Methodist Creek had all classes of sediment indicators at less than reference conditions, with the exception of Methodist Creek which exceeded the subsurface sediment indicator (<6.38mm) reference condition in 2014. Therefore, Knownothing Creek is attaining desired conditions for all classes of sediment, while Methodist Creek is failing to meet desired conditions for the subsurface sediment indicator. However, in Methodist Creek there was no significant change between the first and second year sampling periods.

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

If the No Action alternative is selected, there will be no soil or vegetation disturbance by this Project within the 7th field analysis watersheds. However, currently, both Knownothing and Methodist creeks have degraded fish habitat, riparian habitat, and water quality, and are not meeting Forest Plan Aquatic Conservation Strategy Objectives.

The No Action Alternative would continue to directly and adversely affect water quality by maintaining stream flow in simplified channel alignments, greatly lacking in large wood instream structures. Within the bankful channel, the total number of dead and down large wood pieces will remain at levels that limit the natural function of the stream system (10 pieces in Knownothing Creek and 17 pieces in Methodist Creek). The simplified channels of Knownothing and Methodist Creeks will continue to have high velocity flushing events during peak flows. Without the large wood structures to rack debris and slow stream flows, the channels will maintain shallow flows; poorly sorted gravels; and lack cool pools with cover and food sources for juvenile salmonids. The lack of connection to the floodplain and limited hyporheic flow will also result in limited riparian shading, which raises water temperatures. The simplified channels will continue to lose spawning gravels to high velocity flow events, as sediment and large woody debris are flushed into the South Fork Salmon River. There are no beneficial direct or indirect effects from this alternative.

Cumulative Effects

The effects of mining activity within the watershed is minimal and limited to small surface disturbances. If the Discovery Day hard rock mine implements a Plan of Operations it would include management to avoid altering or degrading coho salmon habitat and therefore water quality, so there would be no cumulative impact to Knownothing Creek. The stream restoration and fuels reduction projects are localized and have a small project footprint relative to the 7th field watersheds. None of these activities is expected to affect instream flows, including stream temperature, sediment, channel stability, or groundwater systems within the project area or the 7th field watershed. Therefore, the current condition of the channel in relation to the ongoing activities within the watershed will not combine to result in adverse cumulative effects.

Alternative 2

Direct Effects and Indirect Effects

By constructing large diameter woody debris sites in Knownothing and Methodist Creeks, the pool forming structures will encourage scour, increasing pool depth. The pools will improve thermal refugia and slow stream velocity. Within the bankful channel, the total number of dead and down large wood pieces be increased by 100 pieces in order to improve the natural function of the stream system (68 pieces in Knownothing Creek and 32 pieces in Methodist Creek).

The enhanced channel complexity will increase pool and slow water habitat by creating roughness in the system, which will decrease stream velocity. Slowing stream velocity will improve subsurface groundwater retention within the floodplain, increasing the amount and residence time of hyporheic flow (groundwater/surface water interaction), which will enhance riparian vegetation and result in increased shade (Poole and Berman 2001; Sawyer and Cardenas 2012). This has a beneficial indirect effect on water temperature by maintaining hyporheic flow longer into the water year, improving cool water refugia conditions in-stream, and providing cool water inputs to the South Fork Salmon River during critical summer months for salmonid rearing, benefiting both anadromous fisheries recovery and TMDL implementation goals.

Increased channel complexity and reduced stream velocity will result in better sorted gravels. In particular, the increase in pool and slow water habitat will result in accumulated spawning gravels as they collect in pool tail-outs and low gradient riffles. Pool forming structures will encourage scour, increasing pool depth. As the complexity of the stream increases, sediment will deposit intermittently throughout the creeks, rather than being transported continuously and depositing at the mouth or the South Fork Salmon.

The streambanks will be minimally disturbed as a result of construction; the total soil disturbance for the project is approximately 0.30 acres and 450 linear feet along stream channels; a relatively minimal disturbance to shade providing vegetation along these creeks. However, such disturbance will occur within the annual floodplain; areas annually disturbed by high flows. The total disturbance from temporary access routes (15-foot width) is approximately 1,025 linear feet (0.35 acres) within riparian areas and 2,050 linear feet (0.70 acres) in upland areas. This equates to 3,075 linear feet total of temporary access, which calculates to 2.8 Equivalent Roaded Area acres, low risk of increased sediment within the stream systems.

However, within the short-term (2 years) timeframe, the proposed action has the potential to increase sediment loads within Knownothing and Methodist Creeks, as well as the South Fork Salmon River. Where soil and vegetation are disturbed by construction activities (equipment access, storage areas and placement of large woody debris) water is more likely to erode and deliver sediment to the stream channels increasing turbidity, however the incremental area of ground disturbance for the project is less than 1.4 acres. Sediment would increase turbidity in the streams, the initial suspended sediment release is expected to be short-term, with the amount of suspended sediment rapidly dropping to pre-construction levels both in time and space (Sear et al. 1998; Madej 2001; Brown 2002; Foltz and Yanosek 2005). Most erosion will occur in the first few high water events following channel work, with long-term stabilization occurring once vegetation re-establishes (Sear et al. 1998; Madej 2001). These short-term impacts will be reduced by working during dry conditions and placing erosion controls prior to and during construction, including permanent soil stabilization immediately following construction. Heavy equipment is expected to enter and/or cross the wetted channel of Knownothing and Methodist Creeks. Best Management Practices will be employed to prevent contamination from fuel and oil by heavy equipment.

Within the long-term (10 years), the proposed action has the potential to adversely affect stream temperature through a loss of shade from riparian vegetation where structure placement removes canopy cover. However, the incremental area of riparian disturbance is less than 0.3 acres. The potential long-term impacts can be expected to last no more than 10 years, because riparian vegetation is expected to recover and fully shade the stream within a few years of disturbance. Tree removal for equipment access/operation will result in minimal canopy shade loss over the streams.

Although temporarily increasing temperature and sediments loads in the short term is possible, the potential effects must be put into perspective. When one considers the area of disturbance in comparison to the 7th field watershed area, it is clear the overall potential effects on stream temperature and sediment regime should be very small (insignificant), if not imperceptible, within the short-term and absent during the long-term. The disturbance is expected to be about 1.4 acres total; 0.8 acres in Knownothing Watershed (0.05% of the 7th field watershed) and 0.6 acres in Methodist Watershed (0.007% of the 7th field watershed).

Cumulative Effects

The effects of fuels reduction work, stream restoration, and mining within the watershed is minimal and limited to small surface disturbances in the watersheds. The fuels reduction work and mining is localized and has a small project footprint relative to the 7th field watersheds. If the Discovery Day hard rock mine implements a Plan of Operations it would include management to avoid altering or degrading coho salmon habitat water quality, so there would be no cumulative impact to Knownothing Creek. These activates are not expected to affect instream flows, including stream temperature and sediment within the project area, Knownothing and Methodist Creeks, or the 7th field watersheds. The Hotelling Gulch Fish Passage and Stream Restoration Project aims to improve

conditions for salmonid fisheries on the South Fork Salmon River. The project footprint is minimal, but does combine with this project to have an incremental benefit to water quality on the South Fork Salmon River.

Therefore, the addition of this project to the ongoing activities within the watershed (mining, fuels reduction, and stream restoration) will not combine to result in adverse cumulative effects. Therefore, restoration activities will not produce adverse cumulative effects to water quality due to the small size for the project and specified Project Design Features and Best Management Practices which will mitigate potential impacts of the project.

Compliance with law, regulation, policy, and the Forest Plan

The Klamath LRMP Record of Decision (ROD) is the guiding document for all Forest projects. The Klamath LRMP includes reference to the Aquatic Conservation Strategy (ACS), which incorporates specific standards and guidelines for riparian reserves set within the overarching Northwest Forest Plan (ROD to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl) (USDA Forest Service and USDI Bureau of Land Management 1994). All projects within Riparian Reserves on the Klamath National Forest must therefore be consistent with the objectives, standards, and guidelines of the ACS. The project is located in the Riparian Reserve Management Area (MA-10). Forest-wide standards and guidelines include direction to maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. These include, but are not exclusive to, standards and guidelines: 9-1, 9-4, MA10-13, MA10-17, MA10-18, MA10-19, MA10-20. The South Fork Tributary Habitat Enhancement Project is consistent with the LRMP standards and guidelines, including the ACS objectives (for details please see the Forest Plan Consistency Checklist within the project record and Appendix C for ACS compliance).

The North Coast Regional Water Quality Control Board and US Environmental Protection Agency have listed the Salmon River as impaired due to elevated water temperatures. The Salmon River Temperature Total Maximum Daily Load (TMDL) and Implementation Plan was prepared to reduce the temperature issues in the watershed over the long-term (NCRWQCB, 2005). By enhancing riparian vegetative shading and increasing hyporheic flow, this project will cool flows into the South Fork Salmon River, benefiting both anadromous fisheries recovery and TMDL implementation goals.

Fisheries

Methodology

Analysis Indicators and Measures

The analysis of the potential effects to fish and their habitat is organized by direct and indirect effects and by effects to seventeen Indicators of anadromous fish habitat conditions. The Indicators originate from the "Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area" (USDI, USDA, and NOAA 2004). Effects of project elements to an Indicator may be neutral (no effect), discountable (extremely unlikely to occur), insignificant (effects are not able to be meaningfully measured, detected, or evaluated), or significant (effects able to be measured). Furthermore, effects may be either positive or negative. After the appropriate Indicators have been evaluated, the resulting information is used to determine overall effects on aquatic species, including Coho Critical Habitat and Essential Fish Habitat.

Although the methodology for effects analysis only technically applies to anadromous fish within the Project area (e.g., coho, Chinook, and steelhead), it may also be used for resident rainbow trout to ensure a consistent assessment of fish species; and indirect effects to anadromous fish will serve as a proxy for lamprey. The three anadromous fish species are potentially prey species for Southern Resident Killer Whales, which require analysis by NMFS. Since analyzed fish species have overlapping needs and habitat, the same Indicators are used to indicate effects to all analysis species. Additionally, Indicators are used to assess the existing environment of

anadromous systems, with each Indicator labeled as to if it is “Properly Functioning,” “Functioning-At-Risk,” or “Not Properly Functioning” for a given stream.

Of the seventeen total Indicators, the following are potentially affected by the Project and will undergo further discussion:

- Temperature
- Turbidity
- Sediment/Substrate
- Chemical/Nutrient Contamination
- Large Woody Debris
- Pool Frequency and Quality
- Refugia
- Width/Depth Ratio
- Streambank Condition
- Disturbance History/Regime
- Riparian Reserves

Temperature – This Indicator is rated by stream temperature, and the expected increase/decrease from the existing condition due to Project activities in fish-bearing reaches of stream channels.

Turbidity – This Indicator is rated by professional judgment following observation of conditions after high water events, amount of substrate fines, Cumulative Watershed Effects models (USLE/GEO), and condition of Riparian Reserves. In addition, the distance to fish habitat and the likelihood of activities to introduce fine sediment into fish-bearing streams will also be incorporated into the effects analysis.

Sediment/Substrate – This Indicator is rated by percentage of substrate composition of finer material. Considered data can include composition of surface and subsurface of non-pool units, as well as volume of pools filled with fines. Where no or limited survey data is available, evaluation may utilize Cumulative Watershed Effects models (USLE/GEO) and professional judgment.

Chemical Contamination and Nutrients – This Indicator is rated by the level of chemical and/or nutrient enhancement contamination from agriculture, industrial, and other sources**.**

Large Woody Debris – This Indicator is rated using amount of “large wood” per linear length of stream; and is only applicable in 3rd order or larger stream systems. The Northwest Forest Plan and Klamath National Forest Land Resource Management Plan offer guidelines as to an acceptable amount of wood, as well as provide definitions of “large wood”. If professional judgment concludes guidelines are inadequate or do not capture the nature of the system under consideration, channel width and potential of the site to produce and retain woody debris may be used. Potential for future large woody debris recruitment in both short- and long-term should also be considered. Recruitment will be determined using the likelihood of the removal of standing trees that have a high probability of becoming large woody debris in the stream channel based on professional judgment and scientific literature.

Pool Frequency and Quality – This Indicator is rated by frequency and quality of pools present in a stream system.

Refugia – This Indicator is a synthesis of presence and degree of functionality of habitat elements available for fish throughout their life history. Considerations for rating include stream temperature, water quality, riparian reserve, water flow, sediment in pools, and connectivity.

Width/Depth Ratio – This Indicator is rated by width-to-depth ratio, in relationship to Rosgen stream type (Rosgen 1994), and amount of braiding due to sediment aggradation. If data is limited or lacking, other

considerations may include drainage history of debris flows and mass wasting, pool frequency and depth, frequency of large woody debris, and Cumulative Watershed Effects models.

Streambank Condition – This Indicator is rated bank stability of a stream system. If data is limited or not available, considerations may include density of road-stream crossings, amount of inner gorge road, type and amount of non-road areas of compaction near the stream, presence of artificial berms, and extent of recent debris flows.

Disturbance History/Regime – This Indicator is primarily rated using Cumulative Watershed Effects models (ERA/USLE/GEO). If professional judgment concludes that these models are not fully capturing disturbance risk, road density and location, current impacts from past stand-replacing timber harvest and wildfire, fire regime, vegetation regime, and development on private property may also be considered.

Riparian Reserves – This Indicator is a consideration of the riparian environs, and extending into the near uplands. It is rated as a synthesis of shade; large woody debris recruitment; disturbance, roading, and other impacts to the Riparian Reserve management zone.

Spatial and Temporal Bounding of Analysis Area

The analysis area for aquatic resources includes effects at the site-specific and watershed-scale extent. Watersheds utilized in the analysis are at the 5th- and 7th-field level. Site-specific analysis discussion will focus on in and near stream channel actions. Temporal analysis timeframe includes effects during implementation, short-term effects expected to occur within the first year following implementation, and long-term effects (greater than one year).

Affected Environment

The project encompasses multiple sites in Knownothing and Methodist Creeks, intermittently extending over 3.2 miles of stream (1.4 miles and 1.7 miles respectively), within the South Fork Salmon River watershed. Knownothing Creek is about 23 miles upriver of the Salmon River/Klamath River confluence and Methodist Creek is about 25 miles from the confluence.

The only Threatened or Endangered fish in the analysis area is the Southern Oregon/Northern California Coasts coho salmon (*Oncorhynchus kisutch*), including Critical Habitat. Sensitive fish species for the Klamath National Forest in the Project are the Upper Klamath-Trinity Rivers Chinook (*Oncorhynchus tshawytscha*), Klamath Mountains Province Steelhead (*Oncorhynchus mykiss*), Klamath River lamprey (*Entosphenus similis*), and Pacific lamprey (*Entosphenus tridentatus*) Both steelhead and resident rainbow trout (*Oncorhynchus mykiss*) are management indicator species in the Forest Plan. Additionally, Essential Fish Habitat designation is associated with coho salmon and Chinook salmon. The NMFS has requested action agencies, including the Klamath National Forest, to consider project impacts on species preyed upon by ESA-listed killer whale (*Orcinus orca*) / i.e., Southern Resident Killer Whales. See Table 3 below for a summary of actual and potential occupancy by analysis species of creeks/rivers within 7th- and 5th-field watersheds.

Table 3. Summary of actual and potential occupancy by analysis species of creeks/rivers within 7th- and 5th-field watersheds.

Species	7th-Field		5th-Field
	Knownothing Creek	Methodist Creek	South Fork Salmon River
Coho	X	X	X
Chinook	X	X	X
Steelhead	X	X	X
Resident Rainbow Trout	X	X	X
Pacific Lamprey			X
Klamath River Lamprey			P

X - confirmed present
P - potential presence

- Lamprey species – Pacific lamprey are confirmed to be present in the Salmon River drainage via the Karuk rotary screw trap at the mouth of the mainstem, and elsewhere by direct observation. Larval lamprey, which could be Pacific or Klamath River lamprey, have been found as far upstream South Fork Salmon River as above the confluence with East Fork. Knownothing and Methodist Creeks do not appear to provide appropriate rearing habitat for lamprey, although spawning may be present.

For the analysis Indicators, baseline existing condition – "Properly Functioning", "Functioning-at-Risk", and "Not Properly Functioning" – applies principally to creeks which directly or indirectly support anadromous species. "Direct" can include spawning and/or rearing habitat; and "Indirect" may refer to providing a recognized cold-water thermal refugia. Baseline for analysis Indicators for stream with anadromous fish habitat in the project area is described in Table 4, below.

Table 4. Baseline for analysis Indicators for streams in the Project area.

Stream/River	Temperature	Turbidity	Sediment/Substrate	Chemical/Nutrients	Large Woody Debris	Pool Frequency/Quality	Refugia	Width/Depth Ratio	Streambank Condition	Dist. History/Regime	Riparian Reserves
Knownothing Creek	FAR	P	P	P	NF	NF	FAR	P	FAR	FAR	FAR
Methodist Creek	FAR	P	FAR	P	NF	NF	FAR	P	FAR	FAR	FAR
South Fork Salmon River	NF	FAR	FAR	P	NF	FAR	P	P	P	FAR	FAR

P - "Properly Functioning"
FAR - "Functioning-at-Risk"
NF - "Not Properly Functioning"

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

Under the No Action alternative, no treatments as proposed will be implemented. Knownothing and Methodist Creeks will continue to exhibit degraded habitat complexity due to an overall lack of large diameter instream wood. Without such structures, the channels will maintain shallow flows with poorly sorted gravels, a scarce amount of cover, and decreased substrate for insect food sources for salmonids. Pool and other slow water habitat will not be increased; during high discharge flushing events, the creeks will persist in excessive transportation of sediment, spawning gravels, and large woody debris downstream into the South Fork Salmon River. In summary, Knownothing and Methodist Creeks will continue to have degraded fish and riparian habitat as well as decreased water quality, and will not meet Forest Plan Aquatic Conservation Strategy Objectives.

Cumulative Effects

Cumulative impact occurs when the effect of one project overlaps with or compounds the effects of another. The Proposed Project does not influence the implementation of any nearby project, nor visa-versa. Therefore, without direct effects or a compounding indirect effect, there cannot be cumulative effects for the No Action Alternative.

Alternative 2

Direct Effects

Direct effects to coho salmon, Forest Service Sensitive species, and management indicator species and their habitat may occur as a result of habitat structure installation in the stream channels of Knownothing and Methodist Creeks.

Instream activities can mobilize suspended sediment to downstream aquatic habitat. These activities will include structure installation (including site preparation) and equipment crossings. Suspended sediment increases turbidity, exposing juvenile fish to gill damage and reduced oxygen uptake, and/or reduced vision and compromised feeding effectiveness. If structure installation sites were to occur with eggs present in adjacent redds, deposition of suspended sediment could fill interstices of stream bottom substrate, depriving incubating eggs of dissolved oxygen and resulting in their mortality.

None of the structures are located in association with thermal refugia. Dewatering the work sites would result in a greater disturbance to fish and fish habitat than will be caused by constructing the structures. Therefore, the sites will not be dewatered and fish relocation will not occur.

There is a very low probability of direct impact to fish because both Knownothing and Methodist Creek has sufficient room for adults and juveniles to distance themselves project activities. Prior to working at each site an individual will precede the equipment on foot to displace aquatic species and prevent them from being injured. It is anticipated that fish temporarily avoiding installation sites are not likely to experience a significant reduction in feeding success, nor result in a significantly higher probability of exposure to predators. Sites will be implemented sequentially, not simultaneously, which means that only a small portion of a given Project stream will be affected at any one time. Additionally, effects are only anticipated during actual instream operations. See the Proposed Action Alternative for Project Design Features, as well as Appendix B for Best Management Practices, which are meant to reduce impacts to fish and fish habitat during implementation. By considering the mobility of fish in the creeks and the limited area of work to be undertaken at each site, there are likely to be only minor, insignificant direct effects on anadromous and resident fish, including habitat, with no long-term effects.

Indirect Effects

--Salmonids--

The proposed action will improve habitat complexity and rearing productivity for all life stages of salmonids, this project will:

- Increase over-summer rearing habitat through pool development,
- Increase over-winter rearing habitat by providing velocity refugia,
- Enhance/entrain spawning gravels,
- Provide for a wide range of habitat heterogeneity for juvenile and adult salmonids, and
- Increase stream flow residence time and improve surface water and groundwater interaction.

Enhancing these streams will meet Forest Plan Aquatic Conservation Strategy Objectives by aiding the recovery of fish habitat, riparian habitat, and water quality (6-46). The cold water of the South Fork Salmon River is vital to providing summer rearing habitat for coho salmon. The lack of habitat complexity inherent to many Salmon River tributaries is currently limiting the potential for the recovery of the coho population in a watershed that has tremendous potential for providing a long-term stronghold (refugia) for salmonids. The proposed project will result in improved habitat complexity during all life stages of the salmonid life cycle through implementing a diverse range of constructed log features that will interact with these channels during a wide range of stream flows.

Temperature – Knownothing and Methodist Creeks could experience an insignificant increase in stream temperature from streamside vegetation removal. However, tree removal is expected to result in minimal canopy shade loss over the streams. Residual effects will diminish within two to three years as riparian vegetation re-establishes and grows large enough to provide effective stream shade. Long-term, the Project is expected to have a slight beneficial effect on Knownothing and Methodist Creek stream temperature. This will occur because large wood structures store sediments and create streambed complexity, which in turn increase hyporheic flow, potentially creating localized but biologically valuable thermal refuge (Poole and Berman 2001; Sawyer and Cardenas 2012). The magnitude of this effect will be insignificant; it will not be discernible from normal background variation on the reach level, but it is expected to provide a localized benefit for fish. There will be no effect in temperature to the South Fork Salmon River.

Turbidity and Sediment/Substrate – Because turbidity and substrate/sediment Indicators are similar facets of a larger sediment component, they will be discussed together. The Project could impact turbidity and substrate/sediment Indicator values in Knownothing and Methodist Creeks due to ground-disturbing work that will occur throughout the Project footprint. Disturbance that will occur within the annual floodplain (areas annually disturbed by high flows) is approximately 0.30 acres and 450 linear feet along the stream channel. This is compared to a cumulative Project stream length of 3.2 miles. Additional disturbance within the Project footprint includes temporary access routes, which are approximately 1,025 linear feet (0.35 acres) within riparian areas and 2,050 linear feet (0.70 acres) in upland areas. The initial suspended sediment release is expected to be short-term, with the amount of suspended sediment rapidly dropping to pre-construction levels both in time and space (Sear et al. 1998; Madej 2001; Brown 2002; Foltz and Yanosek 2005). Sites will be completed one at a time, not simultaneously, which will decrease the intensity of the impact. Therefore, it is assumed that there will be a temporary increase in turbidity within Knownothing Creek, Methodist Creek, and adjacent South Fork Salmon River following Project implementation, as well as a short-term increase in sand/silt mobilization. The potential for and magnitude of long-term impacts will be reduced by working during low-flow conditions, minimizing vegetative disturbance, and placing erosion controls prior to and during construction, including permanent soil stabilization immediately following construction. Therefore, neither substrate/sediment nor turbidity Indicators will be sufficiently elevated during or post-Implementation to negatively affect fish or fish habitat, including food

sources. Importantly, however, instream habitat structures will increase channel complexity and reduce stream velocity, which will result in the long-term benefit of better sorted gravels. In particular, the increase in pool and slow water habitat will result in accumulated spawning gravels as they collect in pool tail-outs and gradient riffles. Any changes will be local in nature, most likely restricted to the vicinity of the proposed structures. As the complexity of the stream increases, sediment will deposit intermittently throughout the creeks, rather than being transported continuously downstream. It is therefore expected that the Project will have a long-term insignificant benefit on the substrate/sediment Indicator.

Due to the volume of the South Fork Salmon River compared to Knownothing and Methodist Creeks, the elevation of sediment and turbidity during storm events will be short-term, returning to baseline by the first year post-construction, if not sooner, nor have an effect on fish habitat parameters.

Chemical Contamination and Nutrients – There is a slight risk for chemicals to enter either Knownothing or Methodist Creek during implementation. Heavy equipment will be crossing creeks; and while most construction activity will be completed with equipment located upon the bank, portions of the machines (i.e., buckets and arms) will at times need to be in water or hovering over the stream. In order to minimize the potential for chemical contamination during equipment crossings, best management practices will be followed (see Appendix B).

Large Woody Debris – The Project will impart a favorable effect to large woody debris in Knownothing and Methodist Creeks during Project implementation. In the short- and long-term following Project completion, large wood within the Project area, and the processes which rely upon the debris, will be benefited, and thus enhance local salmonid habitat. By removing trees adjacent to Knownothing and Methodist Creeks, a detrimental result is that the Project also removes the potential of those trees to eventually recruit to the system as large woody debris. However, all trees removed during project activities will be retained on-site for use in habitat structures and will therefore not be lost from the pool of potential recruits. While the amount of wood to be input to Knownothing and Methodist Creeks will be insufficient to affect the functional level of the Large Woody Debris Indicator, it will nonetheless represent an increase from the current condition. While the structures are not a replacement for naturally produced large wood, they will serve as an interim solution as the riparian continues its very long-term recovery from flood scour and human impacts. The Project will have no effect on large wood loading in the South Fork Salmon River.

Since coho salmon spawn in December when flows are highest, suitable spawning habitat is typically limited in the main river channel with off-channel habitats and tributaries providing the most suitable habitat for spawning. The large woody debris will create slow water rearing habitat and refugia from high flows. Additionally, the structures will provide cover and a food source for juvenile salmonids.

Pool Frequency and Quality – Installation of instream habitat structures will benefit Knownothing and Methodist Creeks in regards to the pool frequency and quality Indicator. The structures will not only form pools, but will also encourage scour, increasing pool depth. The increase in pool and slower water habitat will result in accumulated spawning gravels as they collect in pool tail-outs and low gradient riffles, and is expected to locally increase the availability of suitable spawning habitat. While this Indicator will be benefitted, it will not be sufficient to allow an overall upgrade of the functional level for the two creeks – the number of sites and the area expected to be affected is small compared to the length of stream within the Project area. There will be no effect to the South Fork Salmon River.

Refugia – The Project will benefit the refugia Indicator for Knownothing and Methodist Creeks by positively affecting the following key fish habitat indicators (see individual discussions for specifics): temperature, sediment/substrate, large woody debris, pool frequency and quality, and Riparian Reserves. Some benefits will be observable immediately following Project completion, while other responses will require short-term (months) or long-term (years) to fully transpire. Restoration will not be entire, in that Knownothing and Methodist Creeks as a whole will continue to be impacted by past and current stressors, but the Project will create an increased degree of

functionality in regards to fish spawning and rearing habitat. There will be no effect to the South Fork Salmon River.

Width/Depth Ratio – Project activities will cause sediment movement in Knownothing and Methodist Creeks, both directly because of construction and indirectly due to post-project modification of the stream by the structures (i.e., gravel retention, redirection of stream flow, expected creation of new pool features). Localized adjustments in the width/depth ratio may occur, similar to the range of natural variability which occurs on an annual basis during higher discharge events, as the creeks respond on the site-level to the new wood structures. However, there is no expectation of any change to the width/depth ratio of the streams on the larger reach scale because the number of sites and the area expected to be affected is small compared to the length of stream within the Project area. There will be no effect to the South Fork Salmon River.

Streambank Condition – The Project is expected to impact the streambanks of Knownothing and Methodist Creeks through removal of vegetation and installation of instream habitat structures. In addition to the physical disturbance caused by the installation process, the structures may affect the nearby streambank due to changes in how stream flow is directed. In the short-term (during and immediately after construction), streambanks at and near the installation sites may be more prone to erosion. However, stabilization will occur as vegetation re-establishes in the months and years post-implementation. In the long-term, bank stability will likely be similar to the current condition with site specifics dependent on local adjustments to the presence of the structures. There will be no effect to the South Fork Salmon River.

Disturbance History/Regime – Ground disturbance within the Project area is limited to use of temporary access routes and installation of habitat structures on the streambanks and in the stream channel. Therefore, disturbance indices will not increase as a result of Project implementation. Therefore, there will be no change in the existing risk represented by the respective Cumulative Watershed Effects models at either the 5th- or 7th-field watershed level. Further, the Project will not undercut sensitive landforms and is not likely to increase hillslope instability. By implementing the Project, a degree of habitat complexity will be restored to Knownothing and Methodist Creeks. The Project will therefore address some of the legacy effects associated with human impact to the drainage (e.g., broad-scale simplification of channel complexity). There will be no effect to the South Fork Salmon River.

Riparian Reserves – The Project will benefit the Riparian Reserves Indicator for Knownothing and Methodist Creeks. While there is potential for insignificant, localized short-term negative impacts to temperature during and/or immediately after implementation due to site preparation, recovery of shade following vegetation re-establishment is anticipated. In the long-term, the Project is expected to positively affect large woody debris presence/processes and instream temperature. The overall benefit to Riparian Reserves is insignificant when considered at the landscape level due to the confounding influence of past natural and anthropogenic events. However, the purpose of the Project is not to fully restore the creeks, but rather to create an increased degree of functionality in regards to fish habitat and channel complexity. The improvement of local Riparian Reserves character is a step towards long-term recovery of habitat for all aquatic species. There will be no effect to the South Fork Salmon River.

--Lamprey--
For lamprey, indirect effects to habitat are anticipated to be similar to those listed for salmonids. While the creation of pools and slower water habitats may also foster the settling of finer sediment material, preferred by lamprey ammocoetes, overall percentage of the sands/silts required for lamprey rearing within the stream matrix for the Knownothing and Methodist Creek drainages is low (USFS 2016). Therefore, material suitable for ammocoete rearing will continue to be available at its current levels. The increase in spawning gravel suitable for salmonids has the potential to benefit lamprey as well due to the use of similar sized material to construct their redds. Effects to substrate composition will be undetectable in the South Fork Salmon River. More important than the effect of individual project components to lamprey is the effect of the Project to stream habitat as a whole.

Maintenance of lamprey habitat and abundance best occurs in a heterogeneous system, one which encompasses complex instream features at multiple spatial scales (Torgensen and Close 2004). The Project will maintain a complex habitat for salmonids; and in doing so, will also benefit lamprey at all life stages.

--Killer Whale (Orca)--

Southern Resident Killer Whales may be found as far south as central California during the winter months. Southern resident Orca are fish-eaters. Therefore, potential prey fish of interest would be anadromous salmonid species such as coho salmon, Chinook salmon, and steelhead. Activities which measurably affect availability of these species as food could lead to an impact to Orca. Effects to anadromous fish habitat will be beneficial; however, those effects are localized. Therefore, the determination for Killer Whale is “No Effect." The Project has very low potential to result in lethal take of anadromous salmonids during implementation. The Project is expected to increase local habitat for anadromous fish, although the number of fish to be benefitted is likely too low to impart a discernible increase to prey availability for Orca. Overall, without a measurable change in food-fish species numbers, there can be no effect to Orca.

Summary of Effects

Table 5: Determinations of effects of the project on Threatened, Endangered, Forest Sensitive and Management Indicator Species (MIS).

Species	Special Status	[1]Determination
Fishes		
Coho Salmon (and CH)	Federally Threatened	NLAA
Chinook Salmon (Spring/Fall runs) (Upper Klamath-Trinity Rivers)	FSS	MANL
Steelhead Trout (Klamath Mountains Province)	FSS, MIS	MANL
Rainbow Trout (resident)	MIS	MANL
Pacific Lamprey	FSS	MANL
Klamath River Lamprey	FSS	MANL
Mammal		
Killer Whale (Orca)	Federally Endangered	NE
Other Habitat		
Essential Fish Habitat (Coho/Chinook)	EFH	NLAA

[1]Federally Listed Species
NE - Will not affect the species or its Critical Habitat
NLAA - May affect, not likely to adversely affect the species or its Critical Habitat
LAA - May affect, likely to adversely affect the species or its Critical Habitat

Forest Sensitive Species (FSS) / Management Indicator Species (MIS)
NE - No effect to the species (FSS and MIS)
MANL - May affect individuals, but is not likely to lead to a trend towards listing (FSS); and/or
May affect individuals, but is not likely to lead to a decreasing population trend (MIS)
MALT - May affect individuals, and is likely to result in a trend towards listing (FSS); and/or
May affect individuals, and is likely to lead to a decreasing population trend (MIS)

Installation of instream habitat structures will benefit several Indicators, in particular Large Woody Debris, Substrate Condition, Pool Frequency and Quality. However, it will primarily be localized in nature and not be of sufficient degree to permit an upgrade from current baseline functionality when considered at the larger reach or landscape level.

Table 6: Comparison of effects of alternatives for fisheries analysis Indicators.

Indicator	Alternative 1 (no action)	Alternative 2 (proposed)
Temperature	0	-/+
Turbidity	0	-/0
Substrate/Sediment	0	-/+
Chemical Contamination/Nutrients	0	-/0
Large Woody Debris	0	+/+
Pool Frequency/Quality	0	0/+
Refugia	0	+/+
Width/Depth Ratio	0	0/0
Streambank Condition	0	-/0
Disturbance History/Regime	0	0/+
Riparian Reserves	0	-/+

0 = Neutral effects
- = Insignificant or discountable negative effects
+ = Insignificant or discountable positive effects
S-= Significant negative effects
S+ = Significant positive effects
/ = Short-term/long-term effects

Cumulative Effects

Cumulative impact occurs when the effects of one project overlaps with or compounds the effects of another. In the Project area, the Hotelling Gulch Fish Passage and Channel Restoration Project, an ongoing fuels project and several mining claims (including the Discovery Day Mine in Knownothing Creek) occur within the analysis area. There will be no adverse additive effects to fisheries habitat Indicators in either Knownothing or Methodist Creeks or the South Fork Salmon River from implementing this project along with those other activities. Cumulative Watershed Effects models remain below the threshold of concern when the effects of the Proposed Action and all current and future foreseeable projects are included in the model. Mining claims are not included in the analyses because the models are insensitive to the very small amounts of disturbance which may occur with this activity type. There will be no cumulative impacts to fisheries from current and reasonably future foreseeable projects within the vicinity of this Project.

Compliance with law, regulation, policy, and the Forest Plan

All Alternatives will meet Forest Plan Standards and Guides, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Northwest Forest Plan, and all other relevant regulations, laws, and policies. Section 7 consultation will be completed with the National Marine Fisheries Service for Alternative 2 (Proposed Action) by coverage under the Restoration Center's programmatic document (NOAA 2012).

The Project is consistent with the goals and objectives, and would implement specific recovery actions, in the SONCC Coho salmon recovery plan (NOAA 2014). That document identifies large woody debris as a desirable action for increasing channel complexity to benefit Coho habitat (pg. 35-21). The Project would increase Coho habitat by constructing large woody debris instream habitat structures in Knownothing and Methodist Creeks.

Soils and Geologic Resources

Methodology

Analysis Indicators and Measures

- Potential for the project to cause hillslope instability, which is measured by determining how likely the project is to change the mass balance of the hillslope.
- Potential for naturally occurring asbestos to be disturbed, which is measured by determining if any ultramafic bedrock will be disturbed during the project implementation.
- The functioning category of soil productivity in the project area, which is measured by determining the effects of the project on soil stability, organic matter, soil strength, and moisture regimes.

Spatial and Temporal Bounding of Analysis Area

The spatial analysis boundary will be the project area because this is the extent that effects are likely to be noticeable for the indicators defined above. The temporal bounds for cumulative effects will be four to five years for the hillslope instability and soil productivity. This is about how long we will see an increase in soil erosion as well as how long it will likely take for any changes in hillslope mass balance to become apparent (likely during a 2-10 year storm event). The temporal bounds for the naturally occurring asbestos analysis is during construction only. Dust generated during construction will settle within a few hours of cessation of work.

Affected Environment

The project area is on the margins of the active channel and floodplain bar of both Methodist and Knownothing Creeks. These areas have been actively placer mined in the past, which has left behind a mix of natural and man-made landforms including placer tailing piles strewn throughout the natural floodplain terraces adjacent to the active channel(s). There is no ultramafic bedrock underlying the Knownothing Creek project area. However, there are serpentinite bedrock exposures near the Methodist Creek Project area. Soils range from a moderate to severe erosion hazard ratings. Moderate erosion is noticeable from just above average precipitation (3-5 year storm event), which would cause some rilling or gullying and moderate sheetwash erosion. Severe erosion is noticeable from average precipitation (1-2 year storm event) due to steep slopes, which would cause rilling, gullying, and sheetwash erosion. Currently, in the Knownothing and Methodist Creek project areas the soils are properly functioning for soil productivity in the river bar environment.

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

There would be no action taken in the No Action Alternative so there is no effect to geologic or soils resources.

Cumulative Effects

There are no direct or indirect effects as a result of the No Action Alternative so there are no cumulative effects.

Alternative 2

Direct Effects and Indirect Effects

The work proposed is on gentle, relatively stable landforms (alluvial floodplain terraces and adjacent stream banks) for the project area and therefore, the proposed action is not likely to increase hillslope instability.

There is no ultramafic bedrock within or near the Knownothing Creek project area. There is ultramafic bedrock on exposed road cutbanks and hillslopes near the Methodist Creek project area. However, these ultramafic rocks will not be disturbed as a result of this project. Therefore, the probability of disturbing naturally occurring asbestos is very low.

Heavy machinery will cause a small amount of soil compaction in the project area. This will be mitigated by strategic use of heavy equipment, minimizing the footprint of the project, and de-compacting soils following construction. There may be some localized compaction in the short-term, but once vegetation is re-established soils will be fully functional.

Where soil and vegetation are disturbed by construction activities water is more likely to erode soils, however the incremental area of ground disturbance for the project is less than 1.4 acres. These short-term impacts will be reduced by working during dry conditions, minimizing vegetative disturbance, and placing erosion controls prior to and during construction, including permanent soil stabilization immediately following construction.

Soil cover will be maintained or enhanced by stabilizing and re-vegetating disturbed areas with native vegetation. Certified weed-free straw, mulch or other soil erosion measures will also be used as needed to temporarily stabilize the disturbed areas until vegetation can be established. This will keep the post-implementation soil cover and organic matter in the disturbed areas at desired conditions that will meet the Forest Plan standards and guidelines (Forest Plan, Standard and Guides 3-2, page 4-20). The project area will continue to be in the properly functioning category for soil productivity.

In addition to the small project scale, standard permit requirements, Project Design Features, and Best Management Practices (Appendix B) are integrated into the proposed action.

Cumulative Effects

The other current or reasonably foreseeable projects in the project area do not directly overlap with the areas of disturbance for this project so there are no cumulative effects for soils resources. There are no effects to geologic resources so there are no cumulative effects.

Compliance with law, regulation, policy, and the Forest Plan

This project complies with USFS direction in Forest Service Manual 2550 (Soil Management) (USDA Forest Service, 2012) and the Forest Plan standards and guidelines (USDA Forest Service, 2010). The project is also in compliance with the Asbestos Air Toxic Control Measures (CARB, 2002).

Botanical Resources and Non-Native Invasive Species

Methodology

Analysis Indicators and Measures

Threatened, Endangered, or Proposed Species

There are no plant species listed as Threatened, Endangered, or Proposed within the project area, therefore, there will be no impacts to analyze as a result of project activities and no further analysis completed for this category of plant species.

Sensitive Species

- The likelihood that the level of disturbance would decrease the ability of the species to maintain reproducing, self-sustaining populations within the project area.
- The likelihood that habitat would be managed in a manner that most closely imitates the natural ecological processes that created and maintained the habitat historically.

Survey & Manage Plant Species

There are no known sites of any Survey and Manage plant species within the project area, additionally, under the Pechman Exemptions, the proposed action will not require surveys for the species listed as Survey and Manage within the Northwest Forest Plan (USDA 2006). The South Fork Tributary Habitat Enhancement Project complies with the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA 2014a). There will be no impacts to analyze for Survey and Manage species as a result of project activities.

Noxious Weeds

- Risk of spread of Noxious Weeds.

Spatial and Temporal Bounding of Analysis Area

Sensitive Plant Species

The project area is the analysis area. This boundary is appropriate for assessing the project impacts as they might be experienced by existing sensitive species within the project area.

The temporal boundary is the time it takes to complete project implementation and for a layer of mulch and debris to recover bare ground, three to five years.

Noxious Weeds
The spatial boundary is the project area and adjacent access roads. The temporal boundary is the time it takes to complete project implementation and for a layer of mulch and debris to recover bare ground, three to five years.

Affected Environment

A pre-field review was conducted to determine which species of concern are present, and for which species a field survey may be necessary. There are no known sites and surveys were not triggered for any species listed as Threatened, Endangered, or Proposed. Field surveys were conducted for the specific project area. The pre-field review revealed that no sensitive plant species are known to occur within the project area and that the noxious weed species *Centaurea solstitialis* occurs in the project area. Though the pre-field review (Botany Resource

Report Appendix A2, step 3) indicated that the fungal species, *Cudonia monticola* (Forest Service Sensitive) and *Phaeocollybia olivacea* (Forest Service Sensitive), and the bryophyte, *Mielichhoferia elongata* (Forest Service Sensitive), could occur in the area, surveys for preferred habitat were conducted for all species, while occurrence surveys were not conducted for the two fungal species because they would not be fruiting until fall.

Table 7. Plant species of concern present or potentially present in the project area.

SPECIES	STATUS
Centaurea solstitialis	Noxious Weed; Forest Service moderate priority; State CW-rated
Cudonia monticola	Forest Service Sensitive
Mielichhoferia elongata	Forest Service Sensitive
Phaeocollybia olivacea	Forest Service Sensitive

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

Sensitive Plant Species

The no action alternative would have no effect on the ability of *Cudonia monticola, Mielichhoferia elongata,* or *Phaeocollybia olivacea* to maintain a reproducing, self-sustaining population within the project area. It is unlikely that the no action alternative would result in developing habitat that most closely imitates the natural ecological processes that created and maintained the habitat for the three species historically.

Noxious Weeds

The no action alternative would have no effect to Klamath National Forest listed noxious weeds.

Cumulative Effects

Sensitive Plant Species

The current condition of the channel in relation to the ongoing activities within the watershed will not combine to result in adverse cumulative effects.

Noxious Weeds

There will be no effect to the risk of spread of noxious weeds and therefore, no cumulative effects.

Alternative 2

Direct Effects and Indirect Effects

Sensitive Plant Species

The Project would not significantly affect Sensitive plant species. It is very unlikely that the proposed action would decrease the ability of the *Cudonia monticola, Mielichhoferia elongata,* and *Phaeocollybia olivacea* to maintain reproducing, self-sustaining populations within the project area due to the small and localized area of ground disturbance that would take place. It is highly likely that the proposed action would result in developing habitat that most closely imitates the natural ecological processes that created and maintained the habitat for the

three species historically due to the projects objective of enhancing hyporheic flow, shade, and moisture levels, thereby increasing the quality of preferred habitat.

Noxious Weeds

There is a low risk that the Project would cause the introduction or spread of Klamath National Forest listed noxious weeds due to the anticipated effectiveness of project design features.

Cumulative Effects

Sensitive Plant Species

The addition of this project to the ongoing activities within the watershed will not combine to result in adverse cumulative effects because other activities proposed within the general area do not directly overlap with this project proposal.

Noxious Weeds

The Hotelling Gulch Fish Passage and Stream Restoration Project and the Knownothing Fuels Reduction project are adjacent to Cecilville Road which goes through the project area. These projects are expected to have a low risk of introducing or spreading listed noxious weeds with the implementation of project design features that include heavy machinery washing. When this Project is combined with other on-going activities within the watershed, the risk of introduction or spread of weeds remains low.

Compliance with law, regulation, policy, and the Forest Plan

Threatened, Endangered, Proposed, and Sensitive Plants: This Project complies with section 7 of the Endangered Species Act, as amended, Forest Service Policy (FSM 2670), and Klamath National Forest LRMP Standards and Guidelines for Sensitive plant species.

Survey and Manage Plants: Under the Pechman Exemptions, the proposed action will not require surveys for the species listed as Survey and Manage within the Northwest Forest Plan (USDA 2006). This Project complies with the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA 2014a).

Noxious Weeds: This Project complies with the Forest Service Manual 2900 and Forest Plan Standards and Guidelines for noxious weed species.

Wildlife Resource

Methodology

Analysis Indicators and Measures

This project will be analyzed based on the following analysis indicator:

Threatened, Endangered, or Proposed Species - The likelihood that project implementation would lead to mortality, harm, failed breeding attempts, or displacement for wildlife species.

Sensitive Species - For the Pacific fisher and northern goshawk, the effects to northern spotted owl (NSO) nesting/roosting and foraging habitat was used as a proxy for analyzing the effects to the preferred habitat of these species as they utilize habitats with similar forest structure, typically associated with more mature forest stands. For all other Sensitive species analyzed, a habitat assessment was performed to estimate the potential impacts to preferred habitat of these species.

Management Indicator Species (MIS) - For the MIS species, a habitat assessment was performed to estimate the number of habitat acres disturbed by the proposed action. No potential habitat will be affected or removed by Project activities, therefore MIS species will not be analyzed further.

Survey and Manage Species - Under the Pechman Exemptions, the proposed action will not require surveys for the species listed as Survey and Manage within the Northwest Forest Plan (USDA 2006). The Project complies with the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA 2014a). There will be no impacts to analyze for Survey and Manage species as a result of project activities.

Migratory Bird Species - Migratory birds are considered by the analysis of migratory bird species within the analysis for Sensitive, MIS, and Threatened, Endangered, and Proposed species, and will not be evaluated further through a specific analysis.

Spatial and Temporal Bounding of Analysis Area

The project area is the analysis area. This boundary is appropriate for assessing the project impacts as they might be experienced by existing species of concern within the project area.

The short-term temporal bound is the time it takes to complete project implementation and for a layer of mulch and debris to recover bare ground, three to five years.

The long-term temporal bound for the project is 10 years because it is expected that any potential reductions to vegetation from project activities will recover within 10 years, if not more quickly.

Affected Environment

A review was conducted to determine which Threatened, Endangered, or Proposed Forest Service Sensitive species are present, and for which species a field survey may be necessary. Field surveys were conducted for blue-gray taildropper, western pond turtle, salamander, foothill yellow-legged frogs, and tailed frogs. No species of concern were observed. An evaluation of species-habitat associations, presence of suitable or potential habitat, and a review of the literature on the effects to the species of concern were used to determine potential effects.

Table 8. Threatened Endangered Proposed and Sensitive wildlife species of concern present or potentially present in the project area.

SPECIES	STATUS
Northern Spotted Owl (*Strix occidentalis caurina*)	ESA Threatened; Forest Service Sensitive
gray wolf (*Canis lupus*)	ESA Endangered; Forest Service Sensitive
North American wolverine (*Gulo gulo luscus*)	ESA Proposed as Threatened; Forest Service Sensitive
blue-gray taildropper (*Prophysaon coeruleum*)	Forest Service Sensitive
Tehama chaparral snail (*Trilobopsis tehamana*)	Forest Service Sensitive
western bumble bee (*Bombus occidentalis*)	Forest Service Sensitive
foothill yellow-legged frog (*Rana boylii*)	Forest Service Sensitive
western pond turtle (*Emys marmorata)*	Forest Service Sensitive

SPECIES	STATUS
northern goshawk (*Accipter gentilis*)	Forest Service Sensitive
willow flycatcher (*Empidonax trailii*)	Forest Service Sensitive
Pacific fisher (*Martes pennanti pacifica*)	Forest Service Sensitive
fringed myotis (*Myotis thysanodes)*	Forest Service Sensitive
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forest Service Sensitive
pallid bat (*Antrozous pallidus*)	Forest Service Sensitive

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

If the no action alternative is selected, there will be no soil or vegetation disturbance within the project area and the habitat for Threatened, Endangered, Proposed, and Sensitive species will remain the same as the current condition resulting in no direct or indirect effects.

Cumulative Effects

There are no direct or indirect effects as a result the No Action Alternative so there are no cumulative effects.

Alternative 2

Direct Effects and Indirect Effects

Prior to working at each site an individual will precede the equipment on foot to displace fish and wildlife and prevent them from being injured. Any fish or wildlife in the work area shall be flushed in a safe direction away from the project site. Additionally, the Project Design Features WL-1 and WL-2 are applied to the proposed action specifically to reduce impacts to sensitive wildlife species (See Proposed Action).

Within the short-term timeframe, the proposed action has the potential to disturb soil and vegetation from construction activities (equipment access, storage areas and placement of large woody debris), such areas may have minimal soil compaction and erosion, however the incremental area of ground disturbance for the project is minimal: site features will be placed within 0.30 acres of annual floodplain/riparian habitat, which is also disturbed annually by high flows. Temporary access routes will disturb approximately 0.35 acres within riparian areas and 0.70 acres in upland areas. These short-term impacts will be reduced by appropriate work windows, Project Design Features, Best Management Practices, and post treatment restoration of temporary access routes.

Within the long-term, the proposed action has the potential to alter riparian and upland vegetation habitat. The potential long-term impacts to vegetation can be expected to last no more than 10 years, as it recovers from disturbance. Project disturbance (construction and temporary access) will result in minimal loss of shade provided by canopy cover and disturbance to the habitats preferred by special status species.

However, the Proposed Action aims to restore the stream channels of Knownothing and Methodist Creeks to a more natural condition, which will also enhance riparian vegetation thereby increasing preferred habitat for aquatic and riparian associated species. Enhancing these streams will meet Forest Plan Aquatic Conservation Strategy Objectives by aiding the recovery of fish habitat, riparian habitat, and water quality (6-46).

Northern Spotted Owl

The proposed action will not remove any suitable northern spotted owl habitat and is not expected to pose a direct danger of mortality, harm, failed breeding attempts or displacement of northern spotted owl individuals. To avoid direct effects associated with noise/human disturbance (as defined above), a Limited Operating Period (LOP) is incorporated into the project design to prevent these activities between February 1 and July 9 (WL-1). Therefore, the proposed action will have no direct effects on northern spotted owl. No indirect effects (i.e., changes to Critical Habitat) to northern spotted owl are expected to result from implementation of the proposed action. Therefore, no measurable change to canopy closure will result nor will forest fragmentation occur. No suitable northern spotted owl habitat will be degraded, downgraded, or removed. Further, no adverse impacts to the existing habitat for northern spotted owl prey species, such as woodrats, are expected. Therefore, the proposed action will not result in any short- or long-term indirect effects to northern spotted owl.

The proposed project with have *no effect* on northern spotted owl.

Gray Wolf

Gray wolf is not known from the project area. However, it has a large home range and range expansion is documented and could result in wolves re-inhabiting the area at some point. However, due to the small project footprint relative to the large home range size of gray wolf, the proposed project will not alter enough habitat to have any impact on the species. Further, gray wolf is highly mobile and capable of avoiding project-related disturbance.

Therefore, the proposed action will have *no effect* on gray wolf.

North American Wolverine

Habitat for North American wolverine is limited and low quality within the project area thus not likely used for reproduction, although possibly for foraging and individuals may traverse the area along the riparian corridor. There are no records of North American wolverine from within or adjacent to the project area. However, this species has a relatively large home range and is known to avoid areas where human disturbance is a factor. All proposed construction activities within the project area will occur in only very small portions of wolverine habitat and will be conspicuous enough as to likely be avoided by the species. Further, the project will not modify suitable wolverine habitat.

The proposed action will have *no effect* on North American wolverine.

Blue-gray Taildropper

Blue-gray taildropper is known from the greater project vicinity. While the species is not expected to occur in the project area, its preferred elevation range is near enough to the project site that potential disturbance to suitable habitat was analyzed. Temporary access routes occurring in upland areas will disturb approximately 0.7 acres of preferred habitat. However, site clearance and Project Design Features (WL-2) implemented for potentially occurring blue-gray taildropper will result in the avoidance of impacts to any potentially occurring individuals. In addition, there are no known occurrences of this species, and the likelihood of impacting this species is minimal because the timing for project implementation (late summer through early fall) will avoid disturbing individuals.

The proposed project *may affect preferred habitat and individuals, but will not cause a trend toward federal listing* for blue-gray taildropper.

Tehama Chaparral Snail

There are no known sites of Tehama chaparral snail in the project area. Although suitable habitat for the species occurs within the larger project vicinity, there is no talus habitat within the Methodist or Knownothing Creeks project sites and the species is assumed absent for the purposes of this analysis.

The proposed action will have *no effect* on Tehama chaparral snail.

Foothill Yellow-legged Frog

Suitable habitat for the species does occur at both the Methodist and Knownothing Creeks project sites. Construction and temporary access routes occurring in upland areas will disturb approximately 0.65 acres of preferred habitat for this species. However, site clearance and Project Design Features (WL-2) will result in the avoidance of impacts to any potentially occurring individuals.

The proposed action *may affect preferred habitat and individuals, but will not cause a trend toward federal listing* for foothill yellow-legged frog.

Western Bumble Bee

Disturbance to streambank, riparian, and upland areas could potentially impact approximately 1.35 acres of western bumblebee preferred habitat. However, the short-term impacts of soil erosion and compaction will be reduced by appropriate work windows, Project Design Features, Best Management Practices s, and post treatment restoration of temporary access routes.

The proposed action *may affect preferred habitat and individuals, but will not cause a trend toward federal listing* for western bumble bee.

Western Pond Turtle

Western pond turtle is known to occur in the project vicinity and could occur in both the Methodist and Knownothing Creeks project sites. Therefore, ground-disturbing activities at the streamside and in adjacent upland areas where western pond turtle nests or overwintering habitat could occur may result in adverse impacts to individuals. Construction and temporary access routes occurring in upland areas will disturb approximately 0.65 acres of preferred habitat for this species. However, site clearance and Project Design Features (WL-2) will result in the avoidance of impacts to any potentially occurring individuals. If any western pond turtle nests or overwintering individuals are observed they will be moved from the exclusion zone downstream or upstream of the work site, to a safe location, prior to construction.

The proposed action *may affect preferred habitat and individuals, but will not cause a trend toward federal listing* for western pond turtle.

Northern Goshawk

No known northern goshawk nesting territories are known from the project vicinity and habitat at the site is not suitable for nesting. However, the project area could function as foraging and/or roosting habitat for the species. Site clearance and Project Design Features (WL-1) will result in the avoidance of effects to northern goshawk possibly occurring in the action area.

The proposed action will have *no effect* on northern goshawk.

Willow Flycatcher

Riparian habitat associated with Methodist and Knownothing Creeks within the action area is marginally suitable for willow flycatcher. The Proposed Action will not occur in dense willow thickets preferred by willow flycatcher. Further, site clearance and Project Design Features (WL-1) will result in the avoidance of direct effects associated with mortality and noise/human disturbance of potentially breeding willow flycatchers.

The proposed action will have *no effect* on willow flycatcher.

Pacific Fisher

Fisher habitat is limited and low quality within the project area thus not likely used for reproduction or foraging, but the species may traverse the project area along the riparian corridor. There are no records of fisher from within or adjacent to the project area. However, this species is nocturnal, has a large home range and is known to avoid areas where human disturbance is a factor. All proposed construction activities within the project area will occur during daylight hours, will take place in only very small portions of fisher habitat and will be conspicuous enough as to likely be avoided by the species. Further, the project will not modify suitable fisher habitat.

The proposed action will have *no effect* on Pacific fisher.

Pallid Bat, Townsend's Big-eared Bat and Fringed Myotis

Many bat species, especially including those analyzed here, are susceptible to noise disturbance during young rearing and roosting periods both seasonally and daily. It is highly unlikely that noise disturbance from heavy equipment utilized within the proposed project areas will generate enough noise to disturb or affect these sensitive bat species. Noise levels will remain below critical thresholds due to distance from potential roosting areas and duration of use in any one treatment area at a time. Also, no snags or other structures that could provide potential roost sites for these species will be removed.

The proposed action will have *no effect* on pallid bat, Townsend's big-eared bat or fringed myotis.

Cumulative Effects

Mining within the watersheds is minimal and limited to small surface disturbances. Within the Knownothing Watershed, the Discovery Day hard rock mine could implement a Plan of Operations, however, it would include management to avoid impacts to listed wildlife species and habitat for species of concern. No other projects are proposing ground disturbing activities in the foreseeable future within this analysis area. Therefore, the addition of this project to the ongoing activities within the watershed (mining, fuels reduction, and stream restoration) will not combine to result in adverse cumulative effects. Therefore, restoration activities will not produce adverse cumulative effects to Threatened, Endangered, Proposed, or Forest Service Sensitive wildlife species due to the small size for the project and specified Project Design Features and Best Management Practices which will mitigate potential impacts of the project.

Compliance with law, regulation, policy, and the Forest Plan

The South Fork Tributary Habitat Enhancement Project complies with Forest Service Policy (FSM 2670), and Klamath National Forest LRMP Standards and Guidelines for Threatened, Endangered, Proposed, and Sensitive species. The project is covered under the programmatic US Army Corps of Engineers Clean Water Act section 404 Regional General Permit 12, which includes Section 7 consultation for the ESA. The project also has a Section 1600 Streambed Alteration Agreement with California Department of Fish and Wildlife, which includes timing restrictions for northern spotted owl.

Forest Plan

The Klamath National Forest is operating in full compliance with the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and the Northwest Forest Plan ROD was incorporated into the Forest's Land and Resource Management Plan (USFS 1994). The Forest Plan adopts the ROD as the Federal contribution to the recovery of the northern spotted owl.

2011 Northern Spotted Owl Recovery Plan

On June 28, 2011, the FWS released the final Revised Northern Spotted Owl Recovery Plan (USDI FWS 2011). This 2011 revised edition replaced wholly the 2008 version. The 2011 plan describes recovery objectives or goals, primary recovery criteria, implementation, and recovery actions. The proposed project is consistent with the

objectives of Recovery Action 32 because it would have no negative effect on suitable northern spotted owl habitat and is therefore in compliance with the Recovery Plan.

Critical Habitat

Critical Habitat for northern spotted owl was designated on January 15, 1992 (USDI FWS 1992) and was revised August 13, 2008, becoming effective on September 12, 2008 and again on December 4, 2012 (USDI FWS 2008, 2012). The 2008 re-designation modified the boundaries of the Critical Habitat Unit. The habitat is designated using multiple Primary Constituent Elements, effects to which, equate to effects to Critical Habitat whether or not northern spotted owls are present in the area. Critical Habitat Units was used in determining effects to northern spotted owl.

Heritage Resources

The purpose of this section is to analyze the South Fork Tributary Habitat Enhancement Project in sufficient detail to determine its effects on properties included in or eligible for the National Register of Historic Places. This analysis is required under Section 106 of the Historic Preservation Act of 1966, as amended and is accomplished by the Klamath National Forest (Forest) under the *Programmatic Agreement Among the USDA Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Office and the Advisory Council on Historic Preservation* (Region 5 PA).

Methodology

Analysis Indicators and Measures

Indicators for analyzing project effects on historic properties are (1) the number of historic properties in the project area that are at risk from project activities and (2) the degree (level) to which the integrity of historic values of these properties may be diminished by the project activities. Direct and indirect effects, as well as the effects of reasonably foreseeable future actions (cumulative effects) that may diminish the integrity of historic properties identified in the area of potential effects, are analyzed.

At-risk historic properties are those that are significant and retain integrity and have been identified as being susceptible to adverse effects by specific undertaking activities. The degree to which an at-risk historic property's integrity is diminished by project activities is indicated by relative degree within four categories – negligible, minor, moderate, or major. If the project activities would change one or more of the character-defining features and diminish the integrity of the resource to the extent that it would no longer be eligible for listing on the National Register of Historic Places, the effects would be adverse (the degree of change would be moderate or major). Adverse effects to sites must be resolved in consultation with the State Historic Preservation Office.

Spatial and Temporal Bounding of Analysis Area

The spatial boundary for the analysis is the "Area of Potential Effect", or those areas within the project boundaries where treatment activities are proposed and areas within or outside of the project boundaries used in support of treatment activities. Temporal boundaries for the short term are based on the effect being anticipated to occur during or within one to five years of implementation. Long-term effects will occur after the first five years following implementation.

Affected Environment

The project lies within the ancestral territory of the Konomihu, who are part of the larger Shastean Complex. While no direct evidence exists in the project area for Konomihu occupation, evidence may have been present prior to landscape level changes that occurred during historic period mining. Euro-American entered the area by

the early 1840s and were present in ever growing numbers once placer gold deposits were discovered in the Salmon River region in 1848 (North and South Forks).

Although mining in this area began early in the historical period, mining activity in the project area lagged behind that of other areas, as access was difficult and miners were dependent on supplies from the outside. Once the more easily accessed surface placers exhausted, it took capital investment to make mining profitable, and operations had to become larger and more organized. By the 1870s, large scale hydraulic mining of the region's placer deposits began. From the 1870s into the early twentieth century, systems of high ditches, head boxes, iron-pipe penstocks, "giant" nozzles, hug sluice systems, and the other accoutrements of "hydraulicking" transformed many of the area's stream bottoms into a landscape of vast, linear 'washing pits' (the mined-out areas of ancient alluvium) located within, adjacent, and parallel to the stream course. The project area is within at least two overlapping historic mining districts.

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

No project activities would occur under this alternative; hence, there are no direct or indirect effects.

Cumulative Effects

Without direct or indirect effects there would be no cumulative effects from the no action alternative.

Alternative 2

Direct Effects and Indirect Effects

Alternative 2 includes actions which have the potential to directly affect archaeological sites that may be eligible for the National Register of Historic Places. However, effectively employing site specific Standard Resource Protection Measures as provided for in the Archaeological Survey Report will prevent adverse direct effects that would potentially jeopardize these sites' eligibility for the National Register. There will be no indirect effects to archaeological sites within the Area of Potential Effect.

Cumulative Effects

There are no ongoing or reasonably foreseeable future projects that overlap spatially with the Area of Potential Effects for this project. There will not be any cumulative effects from other ongoing or reasonably future foreseeable projects in addition to the direct and indirect effects described above.

Compliance with law, regulation, policy, and the Forest Plan

The South Fork Tributary Habitat Enhancement Project complies with the National Historic Preservation Act, other applicable heritage resource laws, regulation, policy, and the Klamath National Forest LRMP Standards and Guidelines for Cultural Resources. Consultation was conducted with the Karuk Tribe, Quartz Valley Indian Reservation, the Shasta Indian Nation and the Shasta Nation, Inc., Butte Valley Indian Community, Winnemum Wintu, and Wintu Tribe of Northern California. No tribal concerns have been identified.

Wild and Scenic River

The South Fork Salmon River is a Designated Scenic River for recreational opportunities. The outstandingly remarkable value for the river is fisheries. The management goals for this designation include that the free-

flowing condition be maintained and the outstandingly remarkable value not be adversely impacted (Forest Plan, pg. 4-120:121). Also, Partial Visual Quality Objectives must be met in the Wild and Scenic River Corridor (Forest Plan, pg. 4-121). This means that the management activities may be noticeable but remain subordinate to the character of the landscape.

The project will increase the probability of late instream flows on Knownothing and Methodist Creeks and cold water refugia on the South Fork Salmon River. There will be a positive benefit to fisheries resources and habitat (see fisheries input). So the outstandingly remarkable values will be benefited by this project. The visual effects of this project will not be noticeable from the South Fork Salmon River. Therefore, the project will meet the Partial Retention Visual Quality Objectives.

Air Resources

Siskiyou County is identified as in attainment for all criteria air pollutants under both state and federal standards. The project is not likely to lead to the non-attainment and is therefore consistent with the Conformity Rule. Dust emissions will be local, last only during construction, and will not lead to the violation of the Regional Haze Rule. The project is compliant with all applicable rules under the Clean Air Act.

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Appendix A – Project Maps

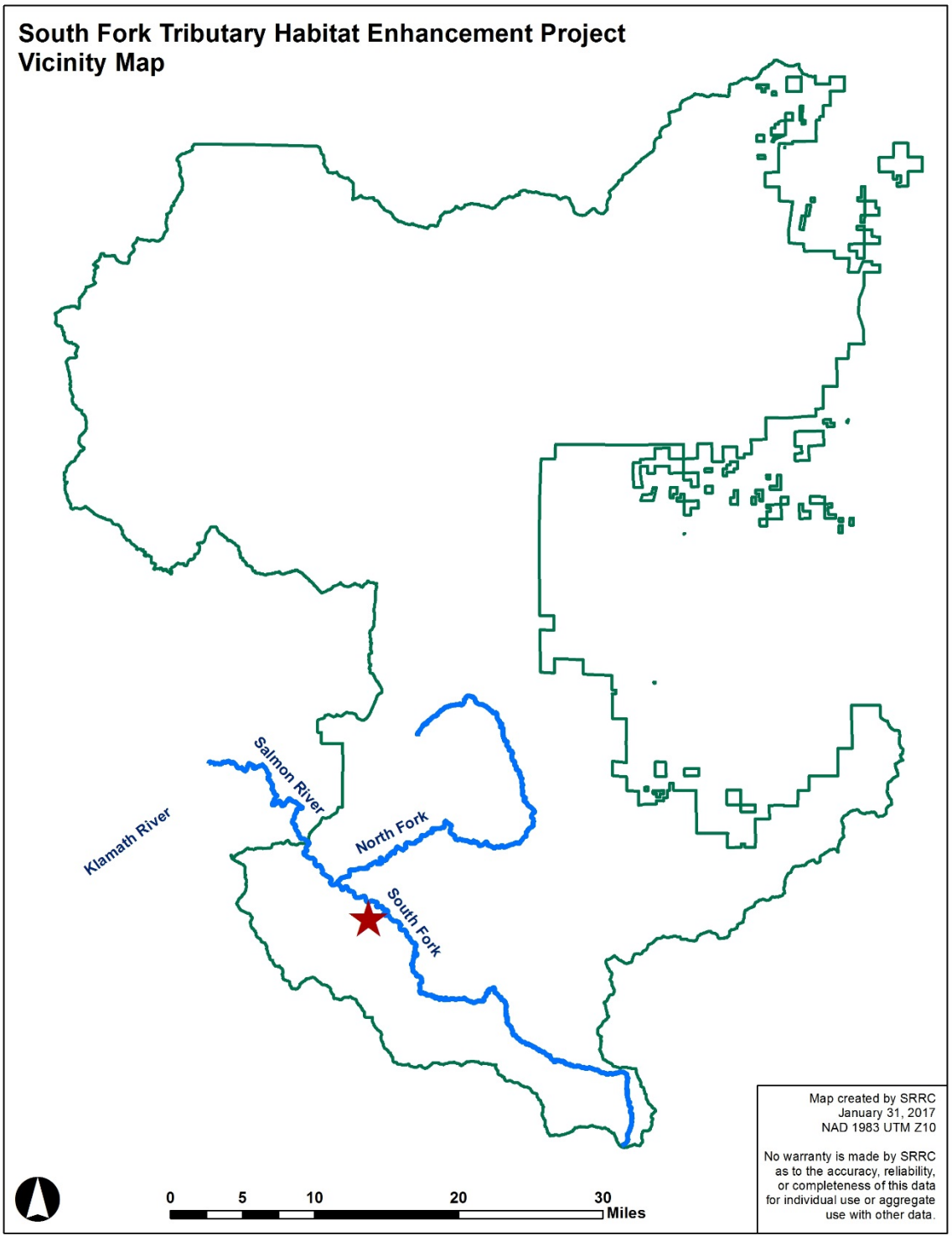

Figure 1: Vicinity map showing the project area relative to the Forest boundary.

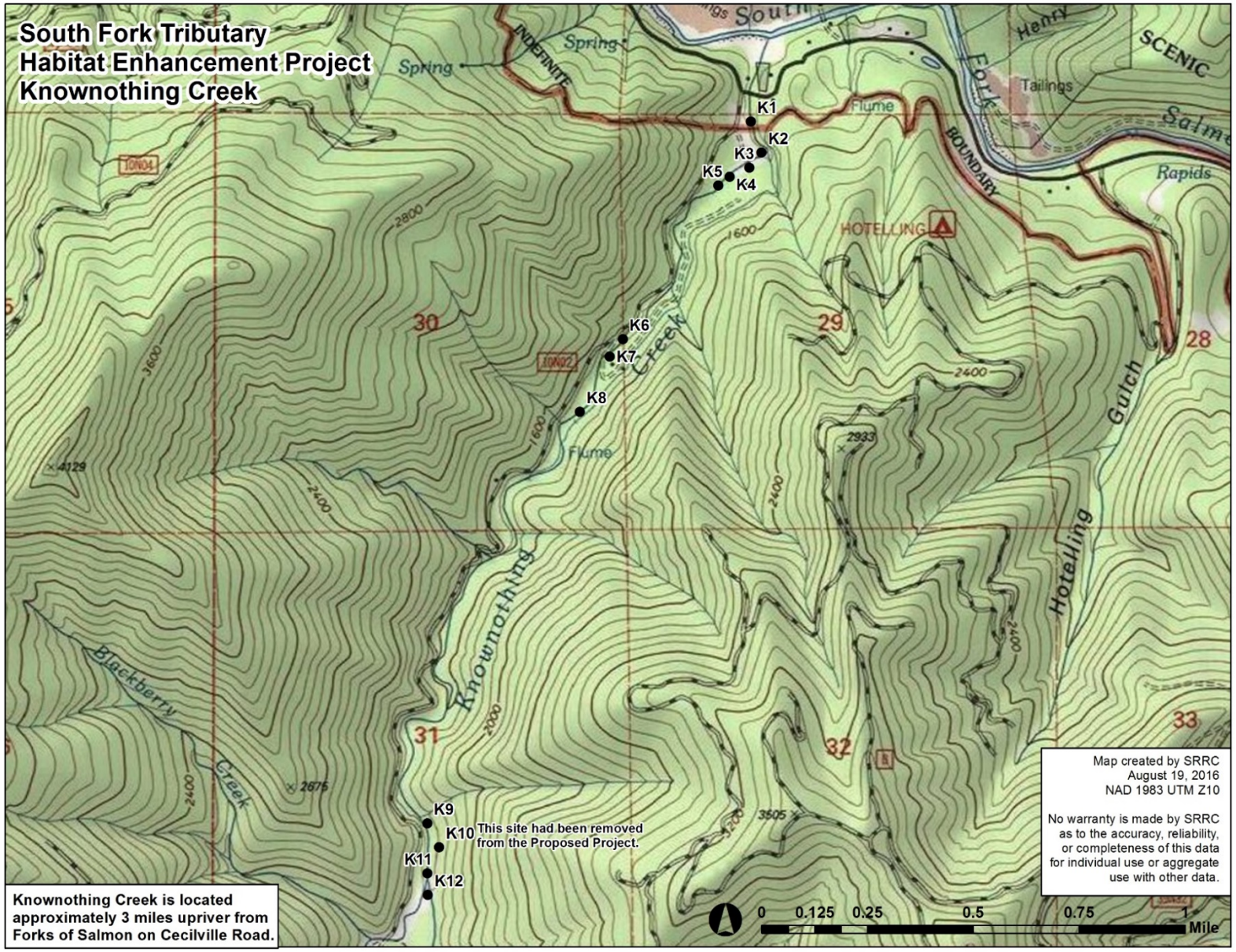

Figure 2: Project area map for Knownothing Creek.

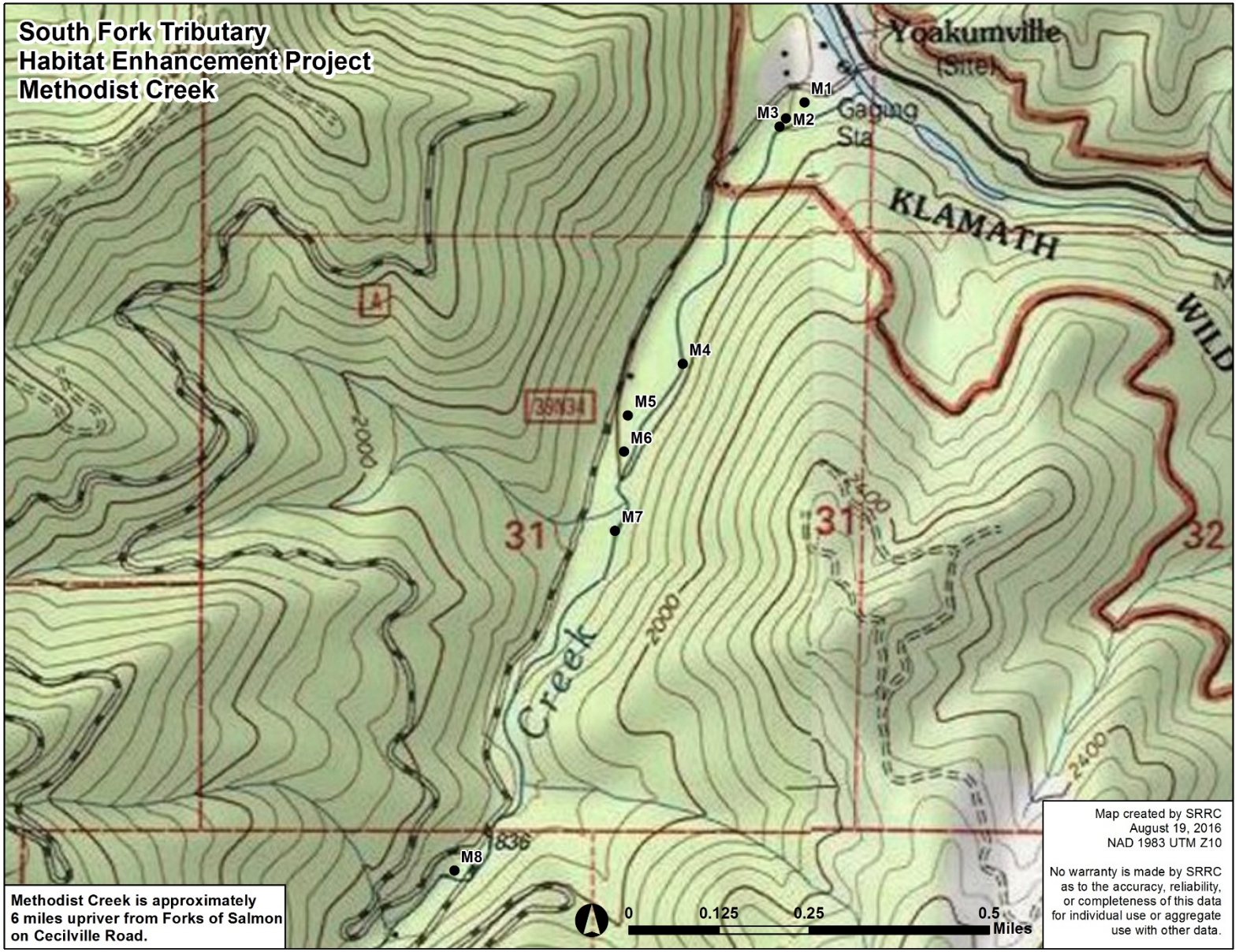

Figure 3: Project area map for Methodist Creek.

Appendix B – Best Management Practices

Best management practices were developed to comply with Section 208 of the Clean Water Act. Best management practices have been certified by the State Water Quality Resources Control Board and approved by the Environmental Protection Agency as the most effective way of protecting water quality from impacts stemming from non-point sources of pollution. These practices have been applied to forest activities and application of the Region 5 USFS BMPs has been found to maintain water quality that is in conformance with the water quality objectives in the North Coast Regional Water Quality Control Board's (Control Board) Basin Plan http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/

Region 5 Forest Service best management practices have been monitored and modified since their original implementation in 1979 to make them more effective. Numerous on-site evaluations by the Control Board have found the practices to be effective in maintaining water quality and protecting beneficial uses.

The Klamath National Forest (Forest) monitors the implementation and effectiveness of best management practices on randomly selected projects each year. From 2000 to 2012, best management practice implementation requirements were met on 78 to 100 percent (91 percent average) of sites samples, and best management practice effectiveness requirements were met on 88 to 100 percent (94 percent average) of the sites sampled. The critical best management practice evaluation is *effectiveness* which is a field evaluation and determines how well the best management practice worked to prevent sedimentation. Best management practice implementation is an office evaluation and is not critical to the best management practices field performance. The success rate for effectiveness has been in the high eighties and nineties each year since 1993. Results of this monitoring can be found on the Forest (Fiscal Year 2012 Best Management Practices Report [USFS 2013]).

Best management practices utilized by the Forest are listed in Appendix D of the Forest Plan (USFS 1995). These basic best management practices are similar to those listed in the 2011 Region 5 Best Management update in Chapter 10 of the Soil and Water Conservation Handbook, which additionally includes a narrative and objective of each (USFS 2011); where there are differences, direction is to employ the newer best management practice list.

The following list of best management practices will be implemented in the South Fork Tributary Habitat Enhancement Project (Project). A description of the objective of each best management practice is included, as well as how each practice will be specifically implemented within the Project in regards to watershed-associated resources of fisheries, geology, hydrology, and/or soils. All other provisions of the best management practices will also be followed. For additional information on the best management practices and their objectives, see the Region 5 Soil and Water Conservation Handbook (USFS 2011).

BMPs identified as specific mitigation through analysis of this Project:

- Shrub, and tree removal to allow equipment access/operation will result in the least possible amount of vegetation and canopy shade loss over the stream channels.
- All trees removed during project activities will be retained on-site for use as in habitat structures.

- Work will be conducted during low flow conditions, with the minimal equipment necessary to implement the project.
- All structure implementation and work along the stream channel will be completed by October 15th, avoiding winter weather working conditions.
- The worksites will not be dewatered, nor will sediment controls be used, because the disturbance to implement those mitigations would be greater than the work itself. Water quality will be monitored visually at the second pool tailout downstream of active construction. If turbidity occurs extending beyond the second pool tailout, construction will be stopped until it clears.
- No fueling/refueling of mechanical equipment will occur within 100 feet of any flowing watercourse or intermittent drainage, and contour berms will surround equipment refueling areas in order to prevent surface water contamination through runoff. If a spill occurs, it will be reported and cleaned-up in accordance with applicable State and Federal laws, rules, and regulations. Vegetable oil or other biodegradable hydraulic oil will be used wherever possible in order to lessen the environmental impact of a leak.
- Mechanized equipment will be inspected for oil, grease, fuel, and other leakage prior to crossing the channel. If necessary, it will be cleaned in a designated area with suitable absorbent material. Absorbent material will be disposed of in an appropriate manner
- During the initial crossing operation at a given site, absorbent booms will be placed downriver to capture any petroleum leaks. Booms will be removed from the river following the crossing, and properly cleaned or disposed, if contaminant leak is evident. After the initial crossing at a given site, if it is demonstrated that future crossings at the same site will pose a low risk, the boom may not be required.

BMP 1.4 – Use of Project Maps for Designating Water Quality Protection: Identify sensitive areas and water uses as part of the Project contract to assist operators in locating water concerns and applying protection methods. This is accomplished during contract preparation and implemented during Project operations.

- All protected locations will be illustrated on the site plans.
- Vehicle access points to the work site will be illustrated on the site plans.
- Staging areas will be illustrated on project maps and site plans.
- Water drafting, if necessary, will be from existing drafting sites and will be identified on project map.
- Temporary and permanent storage area for spoils will be illustrated on the site plans.

BMP 1.5 – Limiting Operating Period: To prevent soil compaction and erosion from operations during wet weather; and to ensure placement of erosion control structures prior to the onset of winter to reduce water quality impacts. This is accomplished during the Project operations.

- The Project is proposed to take place during the normal operating season (NOS) that is defined as June 1 to November 15. Activities will be restricted during periods of wet weather during the NOS.
- When there is a 30% chance of rain in the next 24 hours the Contracting Officer (CO) will be on site to insure that erosion control procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil, and forecast conditions exist.

- The Klamath Wet Weather Operation Standards (WWOS) (USDA Forest Service 2002) will be used for all project activities.
- The WWOS will be used to guide operations during periods of wet weather. The CO will examine field conditions to determine when the soil and/or road has dried out enough to enable operations to resume. The Project earth scientist or hydrologist may be called on to make recommendations to the CO who will provide direction to the Contractor as to when operations may resume to insure that BMPs will be met and adverse impacts will be avoided.
- All ground disturbing Project activities will be conducted during appropriate periods of weather and soil moisture to insure BMP attainment and the avoidance of adverse impacts to listed species. Forecast periods will also be of a suitable length to allow completion of the task undertaken before precipitation events occur.

BMP 1.8 – Streamside Management Zone (SMZ) Designation: Designate zones adjacent to water and/or riparian areas as zones of special management. This is accomplished during the planning and layout phase of the project.

- Sites for water drafting, if necessary, will be designated by the Forest Service and agreed to by the Contractor.
- Activities will occur during the least critical periods for water and aquatic resources: when streams are dry; during low-water conditions; and/or in compliance with spawning and breeding season restrictions. Low-water/dry conditions for the Project area generally occur June through November, dependent upon snowpack and individual drainage characteristic. Consultation will be made with the District Fish Biologist or Hydrologist for timing in regards to specific sites.

BMP 1.13 – Erosion Prevention and Control Measures During Project Operations: Ensure that Project operations shall be conducted reasonably to minimize soil erosion. This is accomplished during the pre-Project project design process, including consultation with Project consultants/engineers, and throughout the operations phase of the Project.

- Erosion control measures are discussed during the pre-Project meeting with the Contractor and the Forest Service. They are updated throughout the operations phase of the project.
- The Klamath Wet Weather Operation Standards (WWOS) (USDA Forest Service 2002) will be used for all project activities.

BMP 1.19 – Streamcourse and Aquatic Protection (National BMP AqEco-2): Conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values, provide unobstructed passage of stormflows, and control sediment and other pollutants entering streamcourses.

- All modifications to a streamcourse, including damage to banks and channels, shall be repaired to the extent practicable prior to project completion.
- All project generated debris shall be removed from the streamcourse, unless otherwise agreed to by the project implementation lead.
- Equipment use within the streamside management zone shall be limited to designated access routes.
- Project activities shall only be implemented during base flow conditions, so as to reduce the risk of introducing sediment to the stream course or disrupting salmonid spawning.
- Project activities shall be coordinated with the appropriate State and Federal agencies.

- The project design and plan shall incorporate Clean Water Act (CWA) 404 permit requirements and other Federal, State, and local permits/requirements. Project implementation shall not begin until required permits are obtained.
- The work zone shall be clearly delineated.
- Tracked equipment, which produces less soil compaction than wheeled equipment, shall be used.
- All project equipment shall be inspected prior to arriving at the project site. It shall be well maintained, clean of aquatic invasive species, as well as oil and grease.
- Vegetable oil or other biodegradable hydraulic oil shall be used wherever possible.
- The number of access routes, and equipment entry into or across the stream channel, shall be minimized as much as possible.
- At project completion, access routes will be closed to prevent continued use. If necessary, water bars, seeding, and other erosion control measures will be utilized to minimize post-project movement of sediment from access routes to watercourses.
- Erosion control measures shall be promptly installed and appropriately maintained.
- Materials brought to the site (e.g., plans, see, rock) shall be free of toxins and invasive species.
- Implementation monitoring by Forest fisheries and watershed personnel shall occur in order to identify necessary corrections to work quality and/or materials.
- Effectiveness monitoring by Forest fisheries and watershed personnel shall occur in order to evaluate the success of the project in meeting design objectives and avoiding unacceptable impacts to water quality.

BMP 1.20 – Erosion Control Structure Maintenance: To ensure that constructed erosion-control structures are stabilized and working.

- The Contractor will maintain, inspect, and repair erosion-control structures at project site. A status and repair log will be kept.

BMP 2.5 – Water Source Development and Utilization: To supply water for road construction, maintenance, dust abatement, fire protection, and other management activities, while protecting and maintaining water quality.

- Road approaches will be armored, as necessary.

Fish-Occupied (Anadromous) Water
The designated Project drafting site is within a Pacific salmonid-bearing stream reach. Therefore, *NOAA Fisheries Water Drafting Specifications* guidelines will be used. They include, but are not limited to, the following:

5. When in habitat potentially occupied by Chinook and Coho salmon, intakes will be screened with 3/32-inch mesh for rounded or square openings, or 1/16-inch mesh for slotted openings. When in habitat potentially occupied by steelhead trout, intakes will be screened with 1/8-inch mesh size. Wetted surface area of the screen or fish-exclusion device shall be proportional to the pump rate to ensure that water velocity at the screen surface does not exceed 0.33 feet/second.
    b. Use of a NOAA approved fish screen will ensure the above specifications are met.
6. Fish screen will be placed parallel to flow.
7. Pumping rate will not exceed 350 gallons-per-minute (gpm) or 10% of the flow of the anadromous stream drafted from.

8. Pumping will be terminated when tank is full.

In general, *NOAA Fisheries Water Drafting Specifications* are more strict and specific than those provided by BMPs, and thus take precedence. Additional applicable requirements as specified by the BMP includes:

- Water drafting by more than one truck shall not occur simultaneously.

BMP 2.10 – Parking and Staging Areas (National BMP Road-10): Ensure parking and staging areas shall not impact water quality though runoff.

- Parking, staging, and refueling areas shall be located to avoid sensitive areas such as riparian areas, wetlands, meadows, bogs, fens, inner gorges, overly steep slopes, and unstable landforms to the extent practicable.
- The size of parking, staging and fueling areas shall be minimized.
- Signage shall clearly indicate parking, staging and fueling areas.
- Parking, staging, and fueling areas shall be located upon existing road pull-outs and similar wherever possible.
- Upon project completion, and where necessary, parking, staging and fueling areas shall be rehabilitated through decompaction, grading/contouring, mulching and/or planting.

BMP 2.11 – Equipment Refueling and Servicing (National BMP Road-10): Prevent fuels, lubricants, cleaners, and other harmful materials from discharging into nearby surface waters or infiltrating through soils and to contaminate groundwater resources.

- No fueling/refueling of mechanical equipment will occur within 100 feet of any flowing watercourse or intermittent drainage.
- Petroleum and chemical delivery and storage facilities shall be located and maintained consistent with local, State and Federal regulations.
- Contour berms shall surround equipment refueling areas in order to prevent surface water contamination through runoff. Liners shall be used to prevent groundwater contamination through seepage though the soil. The measures shall be promptly installed at the start of the project and maintained throughout implementation.
- Project implementation personnel shall be trained on proper fuel and chemical storage, handling, and disposal.
- Excess chemicals or wastes shall not accumulate or be stored within the project area.
- Upon project completion residues, waste oil, and other materials shall be promptly removed from National Forest System land and properly disposed of.
- Should a spill occur, it shall be reported and cleaned-up in accordance with applicable State and Federal laws, rules and regulations. The Forest hazardous materials coordinator's name and phone number shall be available to personnel who administer or manage activities utilizing petroleum-powered equipment.
- Should a spill occur, contaminated soil and other material shall be promptly removed from National Forest System lands and disposed of in an appropriate manner.
- Should a spill occur, the Forest shall notify the State Water Board.
- Should a spill which may affect listed aquatic species occur, NOAA Fisheries shall be notified for emergency consultation.

BMP 5.6 – Soil Moisture Limitations for Mechanical Equipment Operations: Prevent compaction, rutting, and gullying, with resultant sediment production and turbidity.

- The Klamath National Forest Wet Weather Operation Standards shall be followed during implementation of the project at all sites.
- Outside of areas where groundwater is intersected to meet project objectives, equipment shall not be operated when ground conditions are such that excessive damage shall result to the soil resource. This includes observations of soil smearing, oozing, and/or caking on tracks/tires/boots, and/or rutting (4+ inches deep). These conditions are indicators of excessive damage through the destruction of the original soil structure.

BMP 7.1 – Watershed Restoration: To repair degraded watershed conditions, and improve water quality and soil stability.

- Proposed action is for purposes of watershed restoration.

Appendix C – Aquatic Conservation Strategy Objective Analysis

The Klamath National Forest Land and Resource Management Plan contains the components, objectives and standards and guidelines for consistency of projects with the Aquatic Conservation Strategy. The Record of Decision for the Klamath National Forest - Forest Plan (USDA 1995) is the guiding document for Forest projects; the Klamath National Forest Record of Decision incorporates the aquatic conservation strategy standards and guidelines from the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (commonly known as the Northwest Forest Plan) (USDA and USDI 1994).

The following rationale was developed to inform the decision maker for the South Fork Tributary Habitat Enhancement Project in making the aquatic conservation strategy consistency findings. A description of the existing watershed conditions, including important physical and biological components is located in the following applicable specialist reports (Hydrology, Geology, Aquatic Resources, Wildlife and Botany).

The Klamath National Forest – Forest Plan lists four components of the aquatic conservation strategy, as stated on pages 4-25 through 4-27 of the Klamath National Forest – Forest Plan: "1) Riparian reserves, 2) Key watersheds, 3) Watershed analysis and 4) Watershed restoration" (USDA 1995). The four components of the aquatic conservation strategy are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems (USDA and USDI 1994).

Riparian Reserves:

- The relevant Riparian Reserve width for the Project area is defined as two-site potential trees to each side of a fish-bearing waterway (USFS 1997; page 3-9). Within the Lower South Fork Salmon River Ecosystem Analysis area, one-site potential tree is 170 feet. Therefore, the width of the Riparian Reserve within the Project area is 340 feet.

Key Watershed and Watershed Analysis:

- Key Watershed – Salmon River (inclusive the South Fork Salmon River)
    - Relevant Watershed Analysis
      *Lower South Fork of the Salmon River Ecosystem Analysis (USFS 1997)
      *Upper South Fork of the Salmon River Ecosystem Analysis (USFS 1994)

Watershed Restoration:

- Project is a restoration action

Aquatic Conservation Strategy Objective 1: *Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.*

Watershed complexity in this project is primarily a consideration of effects to complex channel habitat associated with large diameter wood accumulations.

Background – Knownothing and Methodist Creeks have degraded habitat complexity as a result of historic unrestricted stream clearing, logging, and mining. Little quantitative data is available

regarding the historic range of variability of large woody debris (in-channel wood) in the Riparian Reserves. Assumptions can be made considering the history of disturbance. The sources of large woody debris have been reduced from historical conditions by commercial harvest, historic mining, altered fire regime, and flood scour. In the past, frequent wildfires would have contributed to well-distributed instream wood by creating snags that eventually fall, thereby recruiting to creeks. The drainage network has been modified by mining and roads.

Determination – **Meet/Maintain** – The Proposed Action will maintain the distribution, diversity, and complexity of watershed and landscape-scale features for aquatic systems within the Project area.

The Proposed Action will increase habitat complexity within Knownothing and Methodist Creeks by (a) creating slow water rearing habitat and refugia from high flows; (b) providing cover and a food source for juvenile salmonids; and (c) increasing the amount and residence time of hyporheic flow, thereby improving thermal refugia conditions in-stream (see Sawyer and Cardenas 2012 and Poole and Berman 2001).

The Proposed Action will lead to long-term localized improvement of the distribution, diversity, and complexity of watershed features, thereby providing benefit to the local 7th-field Knownothing Creek and Methodist Creek watersheds. The purpose of the Project is not to fully restore the watersheds, but rather to create an increased degree of functionality in regards to fish habitat and channel complexity.

Aquatic Conservation Strategy Objective 2: *Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.*

Watershed connectivity takes into consideration the effect to aquatic species, fish, and riparian dependent terrestrial species passage in the project area and within the larger 5th field watershed. Abiotic connectivity (e.g., wood and sediment regimes) may also be discussed.

Background – The upper and middle watershed topography in Knownothing and Methodist Creeks is located in steep, mountainous terrain with hillslope gradients frequently exceeding 70% along inner gorges, headwalls, and upper hillslope positions. The lower reaches of the watersheds (where the proposed project occurs) flow over a low gradient, broad alluvial fan/river terrace complex. As recently as 1950, Knownothing and Methodist Creeks flowed across the entire floodplain, utilizing the potential channel capacity and discrete side channels. Therefore, there is a possibility that during an extreme storm event the active streams could utilize their floodplains and develop a more complex channel alignment.

Roads which have been constructed upon the landscape for timber and minerals extraction, and are currently in use for recreational purposes, disrupt watershed network connections and can affect the life histories of aquatic- and riparian-dependent species by altering natural channel pathways for surface flow. There is a human-made barrier upon Knownothing Creek, which is within the Project area footprint. This barrier is a small, non-functional diversion dam. Knownothing Creek supports both anadromous species and resident rainbow trout, and the degree that the barrier inhibits free movement of fish is unknown. There are no known barriers on Methodist Creek.

Determination – **Meet/Maintain –** The Proposed Action will maintain spatial and temporal connectivity within and between watersheds for aquatic- and riparian-dependent species.

Under normal conditions, spatial and temporal connectivity between the 5th-field mainstem system of the South Fork Salmon River and the local 7th-field Knownothing Creek and Methodist Creek watersheds is intact and stable. During years of exceptional drought, poor winter snowpack/run-off, and/or delayed fall precipitation events, access through the mouth of Knownothing and Methodist Creeks can become limited due to low flow conditions, such as occurred in 2015.

The Proposed Action may provide a slight improvement in subsurface groundwater retention within the floodplain, but it will be highly localized due to the relatively few number of structures as well as the placement of structures relative to local geology and landscape. Any improvement will still be within the normal variability and therefore it will not change the current observed condition as a result of this project.

Aquatic Conservation Strategy Objective 3: *Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.*

Aquatic systems integrity considers effects to channel geomorphology and includes evaluations of road density, hydrology connectivity of road systems, and direct impact to bank and stream bottom.

Background – Streambanks, shorelines and stream bottoms in the Project area are naturally varied and heterogeneous. A downed tree or small landslide may impact bank, shore, and bottom configurations, and debris flows can affect features along miles of stream channel. Knownothing and Methodist Creeks are considered to have moderate channel stability; streambanks have been compromised from the pre-settlement state due to human-mediated impacts, including channelization, presence of tailing piles, and other legacy mining effects. Bedrock and boulders provide for good bank stability, although a history of flood scour and historic mining has removed the smaller, more mobile particles.

Determination – **Meet/Maintain –** The Proposed Action will maintain the physical integrity of the aquatic system, including streambanks, shorelines, and channel bottoms.

The Proposed Action is expected to cause short-term, localized reduction in streambank stability of Knownothing and Methodist Creeks through removal of vegetation and installation of instream habitat structures, which includes the use of heavy machinery on the streambanks. In addition to the physical disturbance caused by the installation process, the structures may affect the nearby streambank due to changes in how stream flow is directed.

In the short-term (during and immediately after construction), streambanks at and near the installation sites may be more prone to erosion. However, stabilization will occur as vegetation re-establishes in the months and years post-implementation. In the long-term, bank stability will likely be similar to the current condition with site specifics dependent on local adjustments to the presence of the structures.

The Proposed Action will mostly maintain the existing condition of physical integrity of the aquatic system of the 7th-field watersheds, although minimal, localized improvement to the bottom configurations is expected. Under the existing condition, the streambed is relatively

uniform; there is a deficiency in pool frequency and quality as well as large diameter wood accumulations; spawning-size gravel is flushed quickly out of the system. The installation of instream habitat structures will encourage pockets of scour, which will increase the ratio of pool to fast-water habitat. The structures will also rack debris and slow stream flows, which will result in localized accumulations of spawning gravels as they collect in pool tail-outs and low gradient riffles.

Although in the short term, bank erosion is possible, when one considers the area of disturbance in comparison to the 7th field watershed area, the overall potential effects insignificant, if not imperceptible, within the short-term and absent during the long-term. The disturbance is expected to be about 1.4 acres total; 0.8 acres in Knownothing Watershed (0.05% of the 7th field watershed) and 0.6 acres in Methodist Watershed (0.007% of the 7th field watershed).

Aquatic Conservation Strategy Objective 4: *Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*

The Salmon River in the Project area is listed as impaired by the California State Clean Water Act 303(d) list for stream temperature. Tributaries, unless specified otherwise, are included in the listing of their primary "mainstem" system. Water quality analysis will primarily focus on temperature (with stream shade as a proxy, where applicable). Stream sediment is addressed by Objective #5 and, therefore, is excluded from the discussion of this objective.

Background – Stream shade was assessed for Project units within Riparian Reserves. Knownothing Creek has a human-caused shade loss of 0.1%, which has an undetectable effect on stream temperatures at the watershed scale, whereas Methodist Creek shows an alteration of the natural stream shade at 1.1% human-caused shade loss (Aquatics Report). Where human-induced shade loss occurs, there is the potential for stream temperature to be elevated above the expected normal.

Determination – **Meet/Maintain –** In the short-term, the Proposed Action may insignificantly increase stream temperature. In the long-term, water quality is expected to improve beyond the current condition.

Knownothing and Methodist Creeks may experience an insignificant increase in water temperature after implementation if streamside vegetation removal results in reduction of effective stream shade. 200 linear feet of stream channel will be disturbed along Knownothing Creek and 250 linear feet will be disturbed along Methodist Creek. However, the effect will diminish in two or three years as effective shade is re-established. Long-term, the Project is expected to have a slight beneficial effect on stream temperature, because hyporheic flow will be maintained longer into the water year, potentially creating localized but biologically valuable thermal refuge. Shade to the South Fork Salmon River will not be affected by the Proposed Action and therefore there will be no change in temperature.

In summary, the Proposed Action will restore water quality at the local and 7th-field watershed level, and maintain existing water quality at the 5th-field level.

Aquatic Conservation Strategy Objective 5: *Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

The Salmon River in the Project area is not listed as impaired for sediment by the California State Clean Water Act 303(d). Sediment regime primarily focuses on Cumulative Watershed Effects modeling, with use of other measures as applicable.

Background - Cumulative Watershed Effects modeling shows the total current modeled potential soil loss (USLE model) risk ratios are 0.33 in Lower Knownothing Creek 7th field watershed and 0.29 in Methodist Creek 7th field watershed; this model indicates the potential of soil loss into stream systems. While mass-wasting (GEO model) risk ratios are 0.50 and 0.34 for Lower Knownothing Creek and Methodist Creek, respectively; this model indicates the potential of landslide inputs to the stream systems. Equivalent Roaded Area (ERA) risk ratios are 0.31 in Lower Knownothing and 0.25 in Methodist; the ERA model indicates the potential for sediment delivery from disturbed areas within the watersheds. The models indicate that there are management related factors that are increasing the risk of sedimentation. Those likely being a degrading road system, past timber harvest, and the 2013 Butler fire in a small portion of the Knownothing watershed. However, the modeled risk ratios are all well below the threshold of concern (TOC), which would be a risk ratio of 1.0. TOCs are points beyond which there is increasing susceptibility for significant adverse cumulative effects within a watershed (Bell, 2012). The project impacts were not evaluated using the Cumulative Watershed Effects model because the effects of project alternatives will not result in a disturbance large enough to be detected by the model.

Within the project area, streambed sediment data is available for Knownothing Creek and Methodist Creek. The most recent set of comprehensive surveys (between 2009 and 2015) detailed pool volume (V*) and surface/subsurface sediment composition. In Knownothing Creek, all four key indicators under consideration met reference conditions, whereas three of four key indicators met reference conditions in Methodist Creek (the subsurface sediment indicator exceeded the reference condition in 2014). Sediment variables are subject to fluctuation on an annual basis (USFS 2016).

Determination – **Meet/Maintain –** The Proposed Action will maintain the local sediment regime in regards to timing, volume, rate, and character of sediment input, storage, and transport on the local level. While there may be a short-term negative impact to sediment, long-term effects of the Project will be neutral.

The risk of potential for increasing sedimentation is approximated by ERA acres. An excess of 1,343 acres of development related to roads would cause the 7th field watersheds to exceed the TOC of 1.0 for the ERA model. An exceedance of the TOC does not necessarily mean that adverse effects will occur, it's just an indication that the risk (likelihood) of adverse effects are high. Project impacts will result in 3,075 total linear feet of temporary access, which calculates to 2.8 ERA acres (using the Klamath National Forest standard disturbance threshold calculation), which is well below the ERA acre TOC and has a low risk of increasing sediment within the watersheds and the South Fork Salmon River (Water Quality Report).

Turbidity and the mobilization of fine sediments are most likely to occur during and immediately following Project activities, especially following storm events during the first winter. Therefore, it is assumed that there will be a temporary increase in human-caused sediment input in the form of

turbidity, silt and sand mobilization into Knownothing and Methodist Creeks and adjacent South Fork Salmon River. The elevation of turbidity during storm events will be short-term, returning to baseline by the first-year post-construction, if not sooner. Similarly, while there may be an insignificant to unmeasurable exportation of fine sediment, it will not alter the current substrate composition of the South Fork Salmon River. The occurrence of fine sediment mobilization will decrease as riparian vegetation regrows along the creeks.

Aquatic Conservation Strategy Objective 6: *Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*

Water quality discussion primarily considers the effect to base flow using a qualitative assessment and peak flow using Equivalent Roaded Acres model. However, other measures can be used, as appropriate.

Background – The historical range of variability for base and peak flow for streams in the Project area falls from 100-year flood events like the flood of 1964 to drought years where the snow pack is less than 10% of normal. On an annual basis, spring-fed perennial steams have less variation in their base flows than snow-melt driven intermittent streams. Large fires can increase peak flows because of reduction of plants which uptake water, and decrease in precipitation interception and roughness that slow the water on the hillslope. There are no noteworthy diversions in the Project area.

Determination – **Meet/Maintain –** The Proposed Action will not affect the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Although enhanced channel complexity will slow stream velocity, which may increase the amount and residence time of hyporheic flow, contributions to subsurface groundwater retention will be minimal and localized due to the relatively few number of structures spread over a large area. The Proposed Action will not affect overall flows on the reach level due to the relatively few number of structures spread over a large area.

Aquatic Conservation Strategy Objective 7: *Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.*

Flow regime considers effects to the potential inundation of floodplains in the Project area.

Background – Floodplain inundation is a natural process that recharges groundwater. High flows also naturally increase watershed complexity by modifying stream banks and gravel bars. Portions of the floodplain are inundated every year or two, with flood years filling the floodplain with slow moving water the entire width of the inner canyon. Mining within the Project area has modified the floodplain by channelizing and confining the streams with berms, largely disconnecting creeks from their historic floodplains under normal high-water conditions. Tailing piles also influence stream connectivity.

Determination – **Meet/Maintain –** The Proposed Action is not expected to affect floodplain inundation; current timing, variability, and duration of floodplain inundation in the 5th-field and 7th-field watersheds will be maintained.

Aquatic Conservation Strategy Objective 8: *Maintain and restore the species composition and structural diversity of plant communities in riparian reserves and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.*

Species composition and structural diversity considers the expected response of conifer and hardwood trees in Riparian Reserves. Discussion will include coarse woody debris on the hillslopes. Sediment regime, bank stability, and instream wood elements have previously been discussed (see Objectives 1, 3, and 5).

Background – The composition of vegetation is influenced by elevation. Upper elevations (above 5,000 feet) are typically dominated by red fir. Conversely, stands blend into the mixed conifer timber type at lower elevations, dominated by Douglas fir. Structurally, there has been a departure from historic condition as a result of extensive timber harvesting between the 1950s and 1990s: the vast majority of overstory has been removed, and the landscape is largely lacking in pole and medium/large conifer stands, which have been replaced by a smaller conifer class.

Little quantitative data is available regarding the historic range of variability of coarse woody debris (i.e., terrestrial downed wood). The sources of large coarse wood have been reduced from historical conditions by commercial harvest and altered fire regime. In the past, frequent wildfires would have contributed to well-distributed coarse woody debris by creating snags that eventually fall, thereby recruiting to the hillsides and other terrestrial environments.

Determination – **Meet/Maintain–** The Proposed Action will maintain species composition and structural diversity of plant communities in Riparian Reserves.

In the short-term, the Proposed Action will cause an insignificant detrimental effect to vegetation due to removal of shrubs and 15 riparian trees to allow equipment to access the construction sites. As the plants regenerate, post-construction surface erosion will decrease, effective shade will re-establish, and streambanks are expected to stabilize. The time horizon for re-growth of riparian vegetation is months to years, depending upon the plant species. There will be no long-term change in the species composition or diversity of Riparian Reserves.

Aquatic Conservation Strategy Objective 9: *Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.*

Discussion considers the effect of the Project upon the quantity and quality of Riparian Reserve habitat for riparian-dependent animal and plant species, including the risk of spread of noxious weeds.

Background – Historically, near-stream vegetation was likely a mix of conifer, willow, and alder in streams; the edges of the riparian zone transitioned to the large conifers representative of old-growth forest. Site- and reach-level character could experience modification and reset to an earlier seral state as a result of flood scour and debris flows. Logging and mining activities, as well as changes to the fire regime, have altered the Riparian Reserve condition. Yellow star-thistle, a non-native noxious weed species has been introduced along Forest Road 39N34 in the Methodist Creek drainage. The subsequent effect to native plants and animals within the Project

area is unknown, but current distribution is likely similar to historical. (See Objective 2 for discussion about watershed connectivity.)

Determination – **Meet/Maintain –** The Proposed Action will maintain, in both the short- and long-term, the quantity and quality of habitat for riparian-dependent/aquatic animal and plant species at the local and watershed scales. Minimal, localized benefits to habitat are expected in the long-term because enhanced channel complexity will create pockets of slow water rearing habitat and refugia from high flows as well as cover and food sources for juvenile salmonids.

The overall benefit to Riparian Reserve habitat is insignificant at the landscape level due to the small footprint of the Project and the confounding influence of past natural and anthropogenic events. The Proposed Action will therefore enhance but not fully restore the ability of Knownothing and Methodist Creeks to support well-distributed populations of native species. Project design features have been incorporated into the proposed action to reduce the risk of introducing or spreading noxious weeds.

Appendix D – Actions Considered for Cumulative Effects Analysis

The interdisciplinary team used the Schedule of Proposed Actions and the Bureau of Land Management's mining claim database to determine the on-going and reasonably foreseeable future actions to consider for the cumulative effects analysis. The Hotelling Gulch Negro Creek-South Fork Salmon River (18010210010802), Knownothing Creek (18010210010703), and Methodist Creek (18010210010801) 7th field watersheds and the northern spotted owl home range (KL4018) were the spatial boundaries for consideration based on the needs identified by the interdisciplinary team. The present and reasonably foreseeable future actions that are considered for cumulative effects analysis may vary by resource (see chapter 3 and resource reports for resource-specific details).

Hotelling Gulch Fish Passage and Channel Restoration Project (Planning Stages) The Salmon/Scott River Ranger District, in coordination with the Salmon River Restoration Council, are proposing this project to increase access to low gradient salmon and other fish habitat in Hotelling Gulch, and improve natural stream function and the transport of watershed products to the Salmon River. Proposed channel modification along the gulch and upgrading the culvert crossing will be implemented to achieve project objectives.

Knownothing Fuels Reduction Project (Implementation on-going) The Salmon/Scott River Ranger District of the Klamath National Forest proposed the Knownothing Fuels Reduction Project to remove ladder fuels, brush re-growth, and hazardous snags through cutting and handpiling. Piles will be burnt to dispose of the cut material. Implementation began in 2013 and is on-going as burn windows and force account staff are available.

There were five active mining claims identified in the mining claims database for Methodist Creek, five in Hotelling Gulch, and nine in Knownothing Creek. The location is described using quarters of a township and range section. Because of the imprecise location information in the database it was difficult to distinguish the exact location of one mine versus another. All of these mining claims are placer (mining in river sediment) and none of the mines have a Plan of Operations. This means that only exploratory activities are being performed such as gold panning, the excavation of small test holes for prospecting, and small scale processing of the mined material. The Discovery Day Mine may have a Plan of Operations in the foreseeable future however, and an environmental assessment for this mine is in the planning stages, this mine is displayed on the map below.

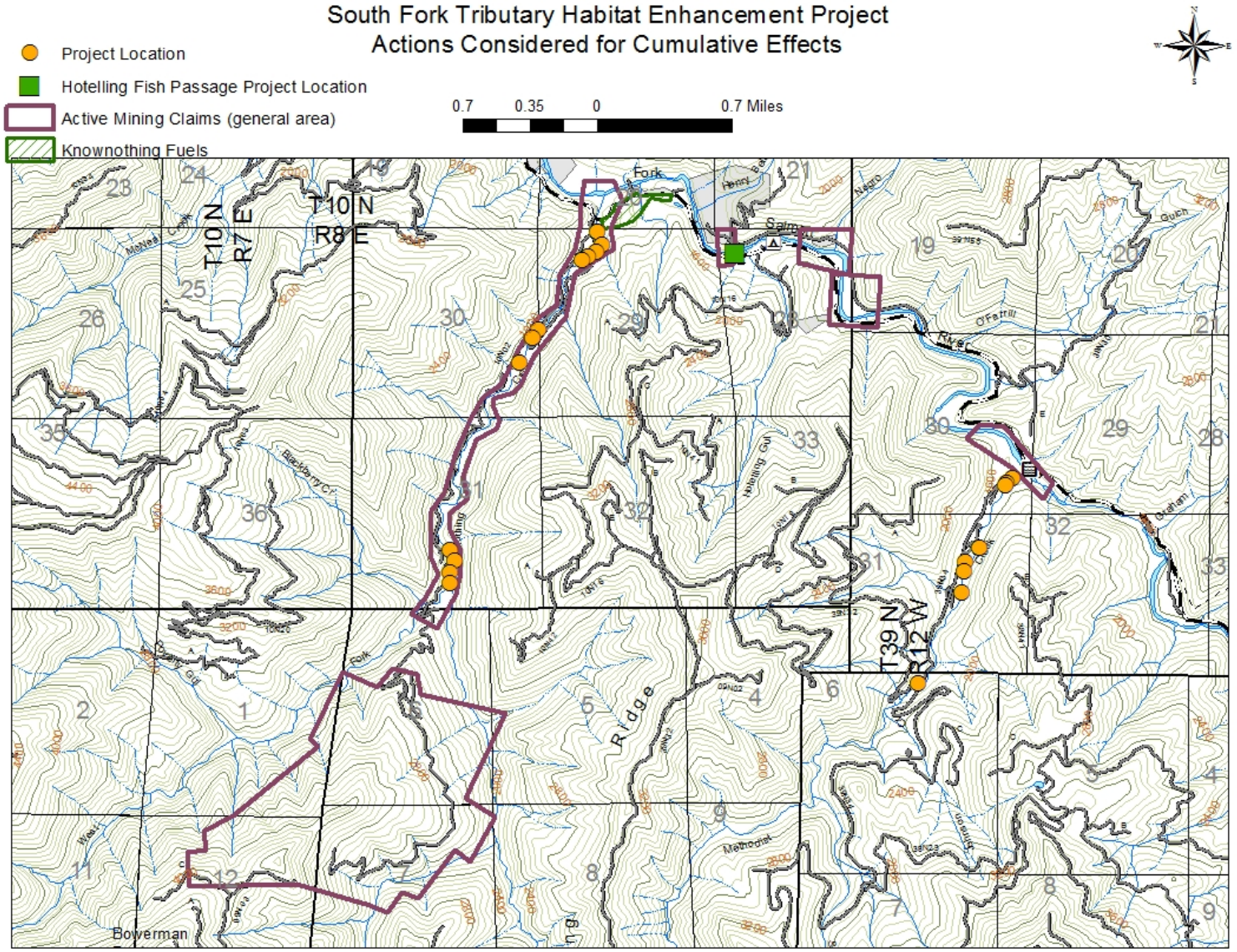

Figure 4: Map of actions considered for cumulative effects.