Long Meadow Restoration Project

Hydrology Report and Erosion Control Plan

Giant Sequoia National Monument - Sequoia National Forest
Western Divide Ranger District

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Purpose and Need for Action

The purpose of the Long Meadow Restoration Project is to repair a large headcut that has become established in the meadow. This restoration work is needed to move toward, or achieve, the desired condition of returning the stream channel to its proper hydrological function while decreasing erosion and sedimentation.

There is a need to reduce sedimentation back to natural levels (approximately 0.1 - 0.4 cubic yards per year) and restore Long Meadow's hydrologic function and connectivity to its floodplain.

This project proposes five activities (described in more detail following this list) to restore and enhance Long Meadow and move it toward the desired conditions. These proposed activities are:

- Install plug structures.
- Install rock and vegetation (also known as a valley grade control structure).
- Plant various riparian species in the meadow, including willows and sod.
- Use an existing access road during the implementation of the project.
- Install a temporary fence.

Project implementation will take place when flows are at their lowest and meadow conditions are at their driest, often in late summer to early fall. Equipment use will only be allowed in the meadow during this time period as the meadow is dry enough to support the weight. Water upstream of the project area may need to be diverted to other parts of the meadow during excavation to prevent unnecessary sediment delivery downstream.

To minimize equipment disturbance in the meadow, all equipment routes will remain near the gully and along the meadows margins. The shortest and most durable route from the meadow's margin to the installation points will be identified and used for equipment access throughout the implementation of the project.

All mechanical equipment used in the construction will be cleaned to remove all soil, seed, and plant materials, prior to entering the forest, to prevent the spread of noxious weeds. Refueling of mechanical equipment will take place at least 100 feet from the meadow's edge. Vehicles used to transport personnel and materials, personnel clothing and footwear, or any other equipment or hand tools used will be cleaned to remove soil, seed, and plant materials before entering the Forest.

<u>Plug Structures (also known as Pond and Plug)</u>

This technique plugs the existing gully system through the creation of ponds, decreasing the water's velocity that is currently undercutting the existing headcut and causing it to continue to migrate upstream further into the meadow.

Two plugs would be installed and locations would be staked prior to implementation in 2013. Creation of the plug structure would include removing soil from the sides and bottom of the gully and the surrounding areas and using it to create the plugs. The soil removal would be done in a manner that

sculpts the gully in preparation for the ponds, which would fill with water and help raise the water level to restore hydrologic function within the meadow. The ponds would be designed and constructed to have irregular shapes and varying depths that will provide numerous habitats for riparian-dependent species. This process would relocate approximately 1,000 cubic yards of existing soil through the use of mechanical equipment, such as a backhoe, dozer or a tracked excavator.

Sod and willows established in the gully bottom will be stockpiled and transplanted to pond edges and plug surfaces. Topsoil from all excavation areas will be stockpiled adjacent to the plugs and used on top of the plugs once constructed.

Valley Grade Control Structure

A valley grade control structure is made of rock and soil and used to stop the forward progression of the current head-cut as well as preventing future head-cuts. For this project, the valley grade control structure will be located downstream of the plug structures, and above an existing partially intact dam. An estimated 200 cubic yards of 0.5- 2.0 foot diameter rock would be used to provide armoring at the lower end of the meadow, plugs, and grade control structure. Creation of the grade structure would include removing soil from the sides and bottom of the gully and the surrounding areas and using it to create the structure.

Revegetation

Rooted willows (large enough to have established roots) would be planted along the stream banks and around ponds. The willows and transplanted vegetation used with rock is intended to assist in stabilizing the existing bank and trap sediment. Stockpiled sod and willows will be placed on the plug structures. Large conifers outside the meadow will not be cut as part of this project unless they pose a safety hazard or limit equipment access during implementation of the project.

Access

Mechanical equipment would access the meadow using Forest Service Road 22S08A that is currently not open to public vehicle travel. This road would be temporarily opened for the purpose of moving equipment and materials to the meadow to complete the restoration project.

Water bars and/or rolling dips may be installed to prevent erosion during implementation. Once the project is completed, the road will be closed and the proper drainage and structures restored to minimize the potential for future erosion.

Temporary Fence

Install a temporary fence (approximately five to seven years) to prevent livestock access to the restoration site (see enclosed Map I). This fence will be approximately 700 feet total length and will originate and terminate at the existing fence. Fence will be constructed of wood and/or metal posts and a minimum of three wires. The fence will be a take-down type snow fence, where the wire and metal stays are disconnected from the posts during winter months. Prior to livestock entry into the area, the wire would be reconnected to the posts.

Monitoring

Monitoring is a means to determine if conditions in Long Meadow are meeting or moving toward the desired conditions. Extensive surveys have been conducted to document the existing conditions within the meadow and stream channel. Additional monitoring would take place within one year after the project is implemented and annually for five years to document the implementation and effectiveness of the project. This monitoring would include sedimentation, planted vegetation success or mortality, noxious weeds, the integrity of the installed structures, and the absence or presence of new headcuts.

Affected Environment

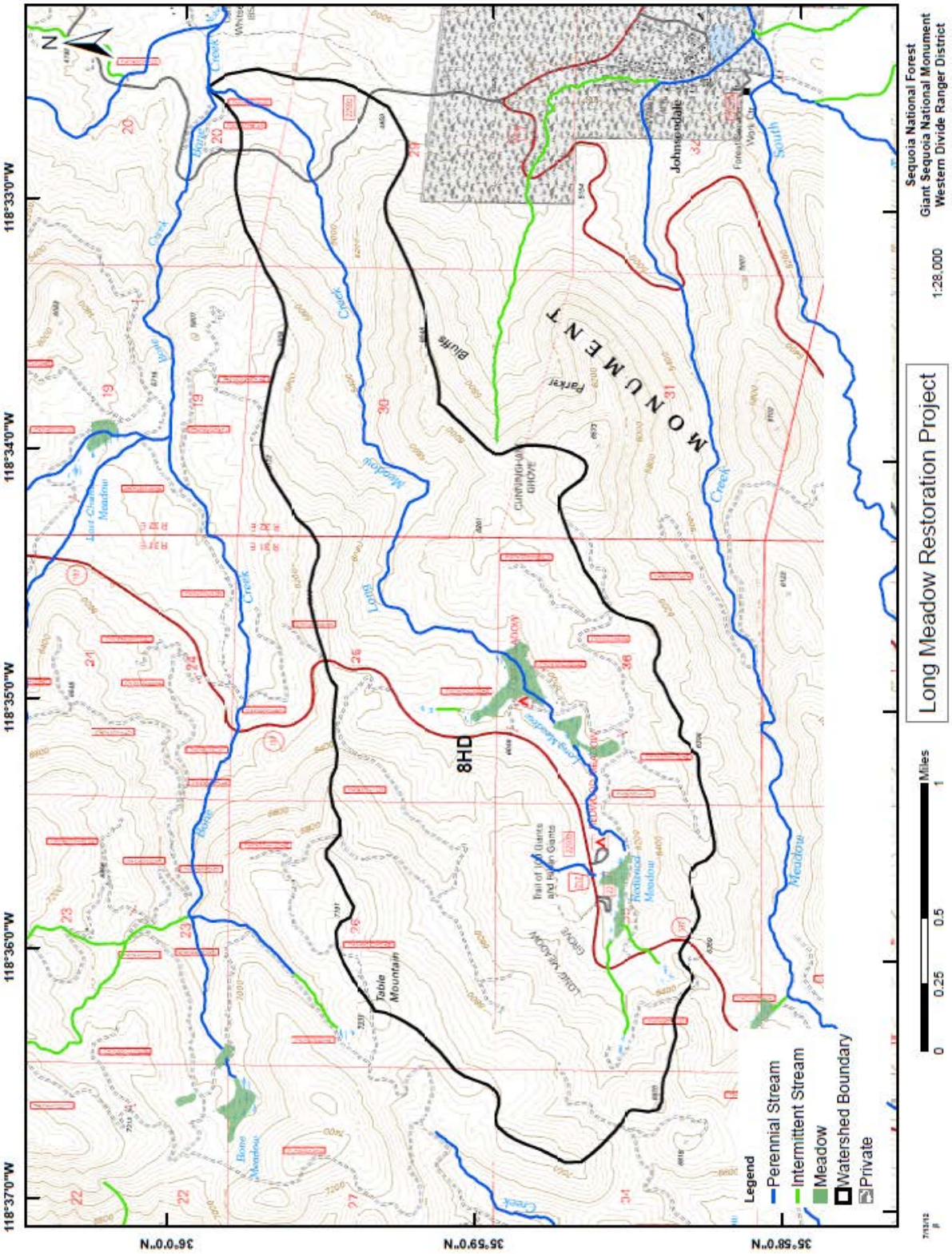
Historically, Long Meadow consisted of 3 pastures used to gather and hold livestock during entry and exit, and for horses used for management of the grazing allotment. The restoration site within Long Meadow has been used annually as a pasture for horses for more than 50 years. A cabin along with other structures lies immediately adjacent to the meadow which is used for management of a grazing permit (Summit Allotment). There are remnants of a partial dam structure at the northeastern end of the meadow (downstream of proposed project). The age of the dam is currently unknown. The Long Meadow Giant Sequoia Grove[1] and the Long Meadow Campground are upstream from the meadow.

The Long Meadow Restoration Project is within the Dry Meadow Creek watershed (6th field HUC[2], #180300010503). The watershed is classified as a Class III Stream (FSM 2500, 1974), rarely used for fishing or recreational purposes and has enough water flow to exert minimum influence on downstream water quality. Known beneficial uses include municipal, recreation, coldwater fisheries, wildlife, spawning, and freshwater. The watershed encompasses 23,088 acres and contains 18 subwatersheds. The only subwatershed of the Dry Meadow Creek affected by this project is the Long Meadow subwatershed 8H-D which encompasses 2,400 acres.

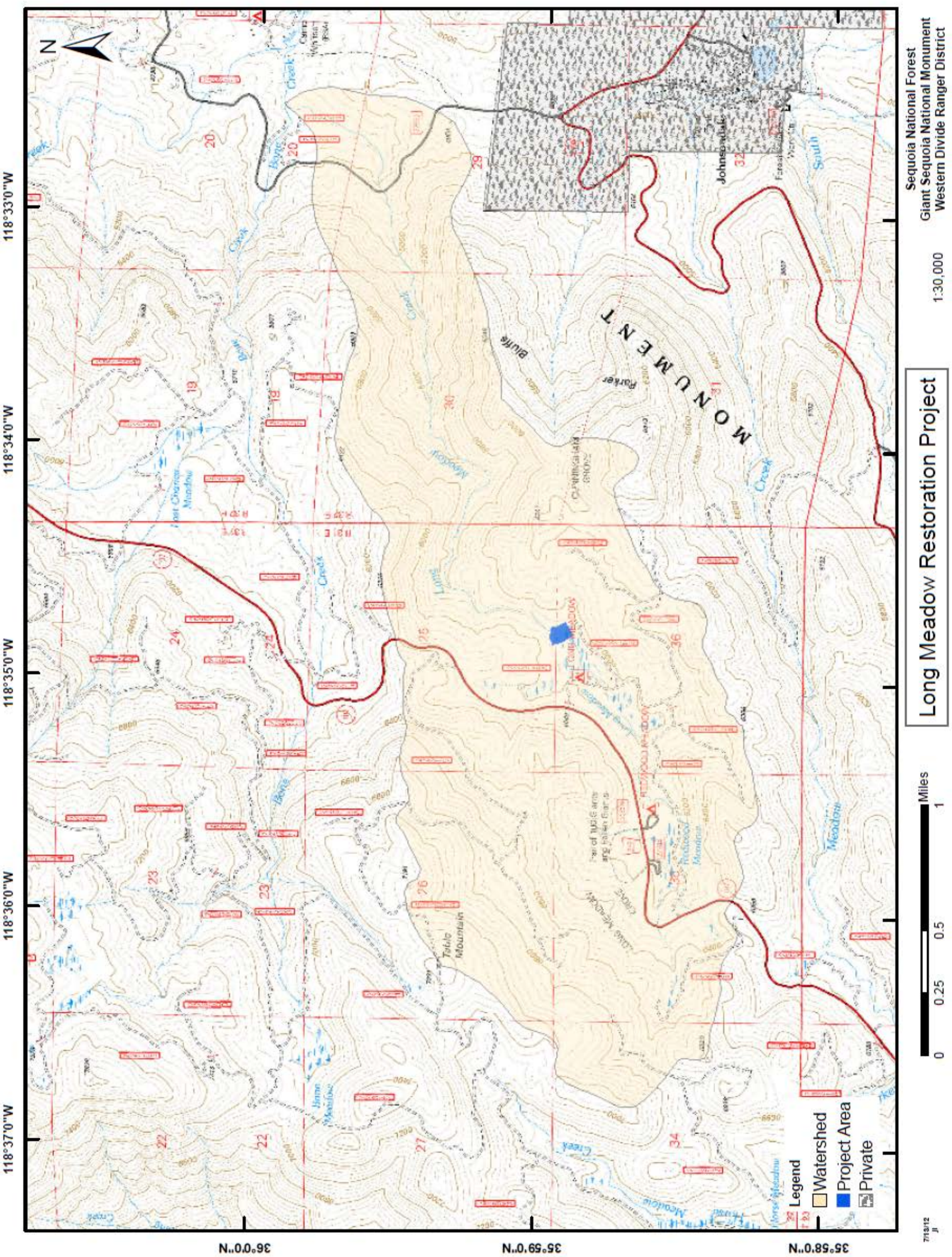
The Long Meadow subwatershed ranges from 7,200 feet to 4,200 feet in elevation with Long Meadow Grove residing in the headwaters and Bone Creek at its terminus. The restoration site is located along Long Meadow Creek at the north end of Long Meadow (see Map 1). Long Meadow Creek encompasses approximately 3.5 linear miles of stream before reaching its confluence with Bone Creek. The restoration site encompasses approximately 325 feet of long meadow creek, with the entire site area for restoration activities encompassing approximately 3 acres, or 0.1% of the Long Meadow subwatershed (see Map 2).

[1] The Trail of 100 Giants is located within the Long Meadow Giant Sequoia Grove

[2] Hydrologic Unit Codes (HUCs) were designated by the United States Geological Service (USGS) in conjunction with other agency input.



Map 1 – Long Meadow Restoration Project in subwatershed 8HD where proposed action would occur.



Map 2 – Subatershed (8HD) area with project area overlaid.

Existing Condition

Long Meadow Creek is the only perennial stream within the Long Meadow subwatershed (8HD). Stream surveys have been completed from Long Meadow upstream to the headwaters of the subwatershed. The steeper headwaters of Long Meadow Creek are naturally-stable, moderate gradient, boulder/bedrock channel types. Where Long Meadow Creek shifts to a lower gradient and flows through both Redwood and Long Meadows, the stream channel changes to stable-sensitive, low gradient, gravel/sand dominated channel. The remaining portion of Long Meadow Creek, below Long Meadow, has not been surveyed. Based on aerial photos and topography, the channels are expected to be similar to the headwaters of Long Meadow Creek as previously discussed.

Long Meadow Creek, within the northern portion of Long Meadow, has been eroding as a result of a headcut. This headcut has eroded upstream approximately 375 feet; creating approximately a seventy foot wide and seven foot deep gully. The total estimated sediment lost from within the gully is approximately 3,400 cubic yards[3]. This erosion process has created five additional smaller headcuts along the sides of the gully. For the last five years, the main headcut continues to erode at an accelerated rate of an average of five cubic yards per year. The increased sediment and erosion continues to affect water quality (non-point source pollution) and downstream aquatic resources' including fish habitat.

As a result of this headcut, the northern portion of the meadow no longer functions hydrologically inhibiting floodwaters from connecting with its natural floodplain. As a result of this dewatering, meadow vegetation composition has shifted from traditional moist meadow species to dryer upland meadow vegetation types allowing for conifers to grow (or encroach) into the meadow. Habitat for water-dependent or water-associated (aquatic) species is currently restricted at the site and threatens upstream resources.

Long Meadow was extensively surveyed in 2009 using the Region 5 Stream Condition Inventory (SCI) protocol. The survey was used to establish pre-project conditions within and below the proposed project area. Below the headcut within the project area the stream is a slightly entrenched C5b channel with a moderate width-depth ratio and sinuosity, sand-dominated substrate, with a relatively steep slope (0.02-0.039). The representative cross section in figure 1 shows the shape and form of the C5b channel within the gully (see photo 1). Just below the dam structure and outside the meadow, the channel becomes more confined and is bedrock controlled.

[3] Five cubic yards is approximately the volume of a small commercial dump truck. Sediment lost from the meadow system to date can be described as about 680 dump truck loads.

Photo 1 – Cross section of the C5b channel within the gully (looking downstream).

Project implementation would alter the SCI cross sections above the dam structure. However, the surveyed portion of the stream channel below the dam would not be altered. The unaltered portion will be used for monitoring downstream effects of the project.

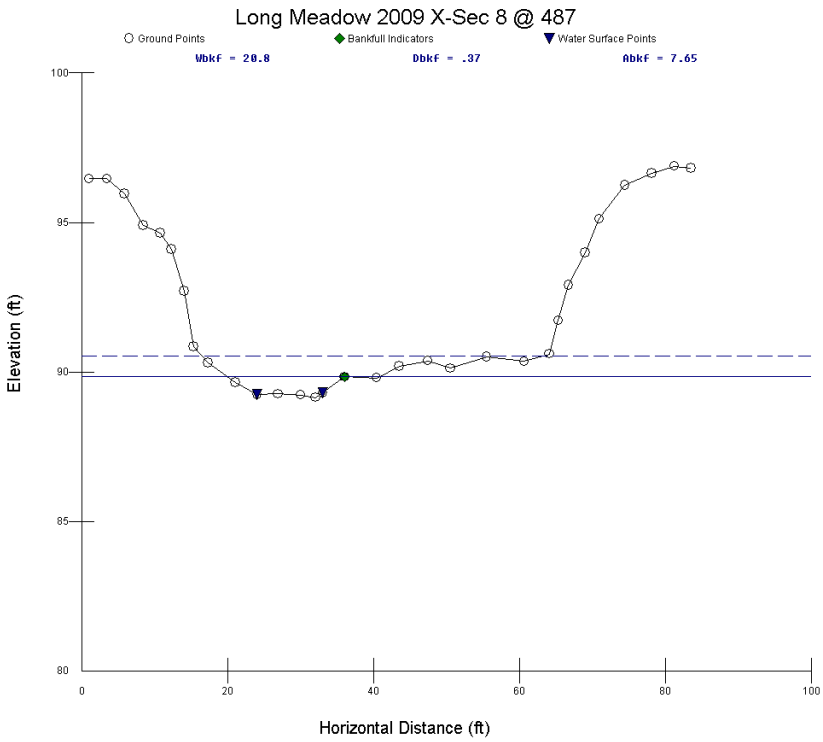


Figure 1 – Representative cross section within the gully at Long Meadow

Stream bed particle size distribution within the gully shows a mean particle size (D_{50}) of 0.1mm. This particle size is classified as sand. Figure 2 below shows a representative cross section of particle size. Macro-invertebrate sampling within Long Meadow using the Hilsenhoff Biotic Index indicates no apparent organic pollution with a value of 2.88.

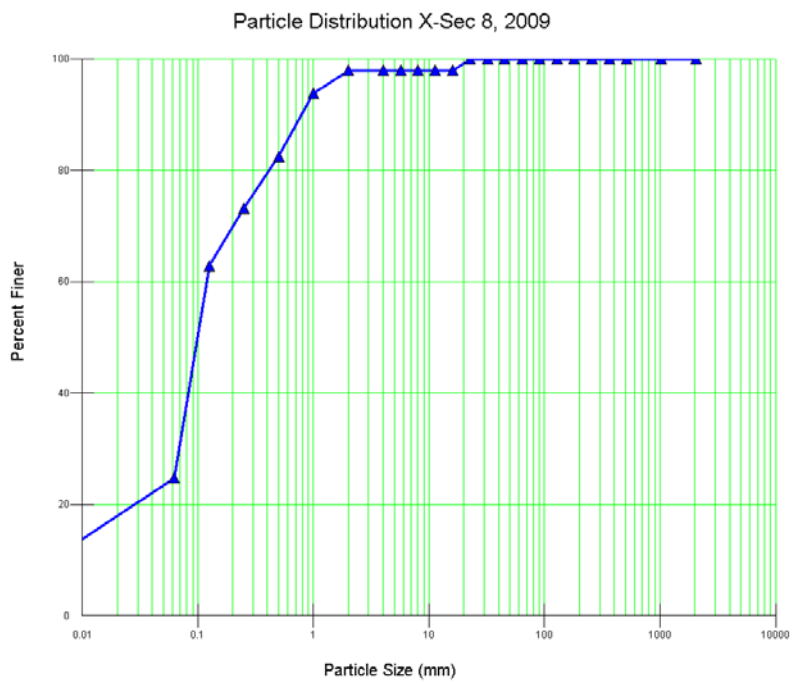


Figure 2 – Particle size distribution within the representative cross section (figure 2)

Cumulative Watershed Effects for Existing Condition

Past and present activities within the Long Meadow Creek subwatershed include grazing, wildfire, prescribed burning, timber harvest, road construction, reconstruction and maintenance, trail construction and maintenance, and recreational use. The Sequoia National Forest Cumulative Watershed Effects (CWE) Model was used to determine existing condition of the subwatershed. Table 1 displays the Long Meadow Creek subwatershed, equivalent roaded acres (ERAs) available, ERAs used from past disturbances/projects, and what ERAs remain before the subwatershed threshold of concern (TOC)[4] is reached.

Table 1 – Subwatersheds, Equivalent Roaded Acres, and Percent Used

Subwatershed	Subwatershed Name	ERA's Available	ERA's Used to Date	ERA's Remaining	ERA Percent Used
8HD	Long Meadow Creek	96.76	25.76	71.00	26.62

Environmental Consequences

Long Meadow Restoration Project contains several components; installation of plug structures, creation of ponds, a valley grade control structure, re-vegetation, temporary fence construction, and temporary reopening and closing of a road. Any of these could have potential direct and indirect effects on hydrologic resources. Concerns with these proposed actions include: increased erosion causing changes

[4] The Threshold of Concern (TOC) is expressed as a percentage (% of ERA's used). The higher the percentage means the greater the possibility of a management action negatively impacting water quality within a subwatershed.

to water quality, hydrologic connectivity/elevation of the water table, increased sedimentation/ deposition, and bank stability. All of these concerns affect meadow and aquatic species habitats and water quality.

Effects by Alternative

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 will allow the headcut to erode further into Long Meadow[5]. This would continue to lower the water table, create excess erosion and sedimentation negatively effecting water quality, increase stream channel instability, fill pools, and increase the loss of aquatic species habitat. These conditions allow delivery of approximately 5 cubic yards of sediment annually, well beyond the natural background rates established for Forest streams of approximately 0.1 - 0.4 cubic yards per year. Smaller headcuts developing along the sides of the gully would also continue to grow in size.

Cumulative Effects

Cumulative effects analysis using the Sequoia National Forest Cumulative Watershed Effects (CWE) model will have the same results discussed previously in the Existing Condition section under Table 1. No management action will occur therefore Thresholds of Concern (TOC) for the watershed would remain the same as well as the Equivalent Roaded Acres.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Alternative 2 would allow for restoration efforts to occur within Long Meadow. Restoration efforts include the creation of ponds and plugs, a valley grade control structure, re-vegetation efforts, re-using an old access road, and installing a temporary fence. All restoration efforts, or project activities, would occur near the end of the summer season or early fall[6] when stream flow is low in order to minimize the potential for sediment transport into the creek. Project activities would result in short term ground disturbance that could allow for transportation of loosened soils if left exposed during a natural rain event. However, an erosion control plan for the project would be implemented as part of the Best Management Practices. The erosion control plan effectively limits and mitigates erosion and sedimentation from these short term ground-disturbing activities. Detailed information regarding the erosion control plan can be read in Appendix A of this document.

<u>Plugs and Ponds and a Valley Grade Control Structure</u>

Creation of plug and pond structures has the potential for both positive and negative impacts to occur within Long Meadow. Reconstruction work includes elimination of several headcuts which are promoting the loss of meadow habitat. Plug and pond installation will allow for the water table to rise, increase water storage, reduce sediment transport back to natural background rates, and stop headcut migration further into the meadow. Loose and bare soil created by the construction of the plugs and

[5] Approximately 123 cubic feet or 5 cubic yards a year is lost on the main headcut.
[6] Typically in August or September.

ponds will have planted willows, native sod and/or seed planted to increase stability of the structures and work to filter suspended sediment under normal runoff flows. It is expected within 1 to 3 years the beneficial effects to the connectivity of the meadow should be visible in the form of standing water across the lower portion of the meadow for longer periods of time each summer, and regeneration of more riparian vegetation, especially in the areas adjacent to and near the gully.

The most downstream plug is a component of the valley grade control structure. This structure is built to create added stability to the plugs above. Long Meadow Creek would flow over and down the structure. In order to prevent erosion along the structure, a step-pool system would be built. The step-pool system is designed to dissipate the stream flow's energy and prevent erosion. Rock would be brought in to build the step-pool system and accommodate the streams flow. Remaining bare soil created during construction would be re-vegetated with willows, native sod and/or seed to prevent erosion and further stabilize the structure. Figure 3 displays where the plug and pond structures would be installed as well as the valley grade control structure.

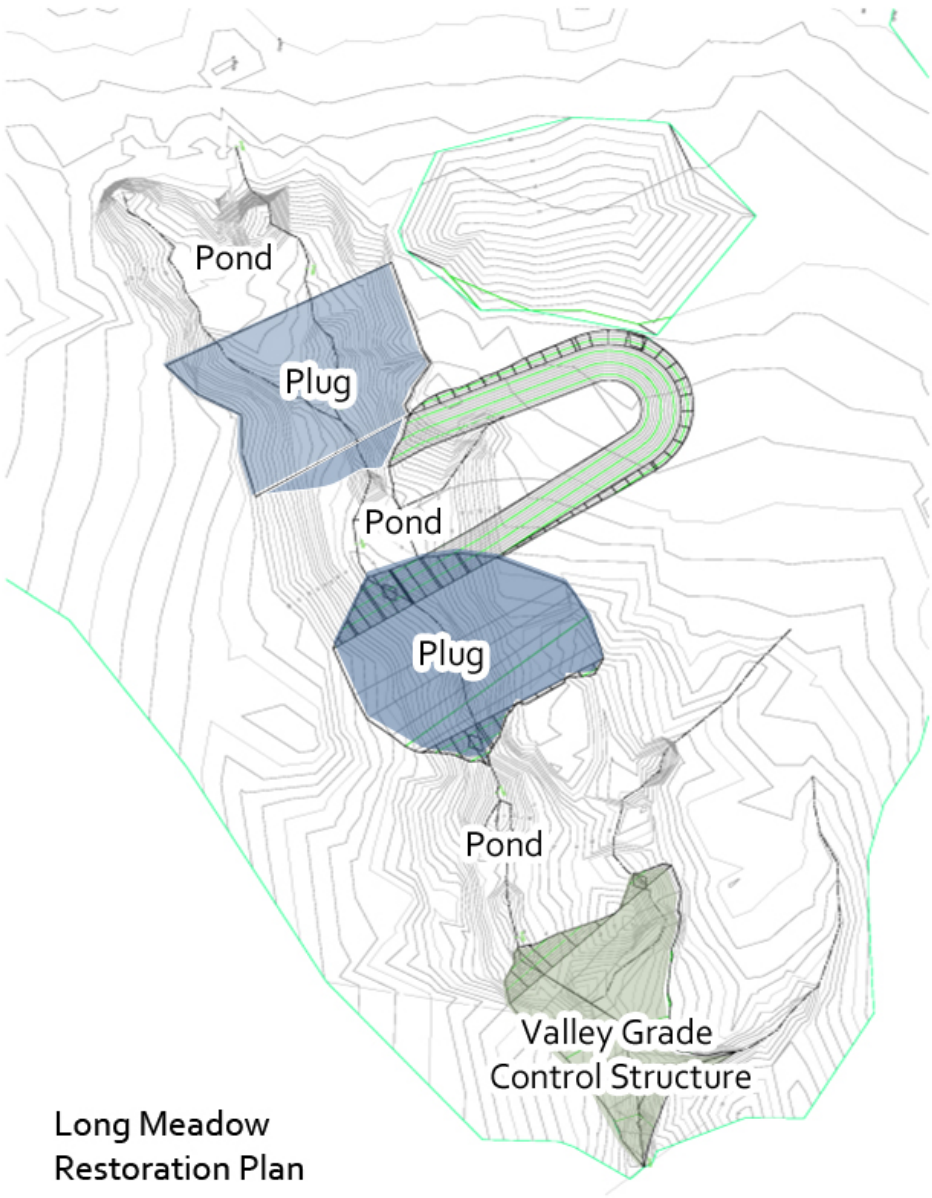


Figure 3 – Long Meadow Restoration Plan layout for Pond, Plug, and Valley Grade Control Structures

Project equipment utilized for creation of these structures may negatively affect the meadow. The equipment could contribute to meadow compaction, loss of meadow vegetation, and creation of loose top soil. When spring runoff flows over the project area, excessive erosion could occur as a result. However, minimizing these potential effects will be accomplished by implementation of the Erosion Control Plan (BMP 2.13) and BMPs. Additional measures to minimize these effects from occurring include limiting travel corridors, use of tracked or wheeled equipment to displace the weight, and implementing the project under the driest conditions for the meadow.

Water temperatures before and after implementation of this project are not expected to be negatively affected. Implementation would occur when the lowest amount of water flows through Long Meadow. Restoration efforts will increase water depth in the vicinity of ponds, which is expected to improve meadow vegetative conditions. This allows for an increase in shading which is expected to at least maintain, if not improve, overall water temperatures. No adverse impacts to water temperature are expected as a result of implementing this alternative.

Road Access and Staging Area

Reopening and use of the access road during project implementation is anticipated to provide little to no increase in soil transport impacting water quality or meadow habitat. Where needed, water bars and/or rolling dips would be installed to prevent erosion. Dust abatement practices would also be followed as necessary during implementation. The road would be closed and restored to pre-project condition once the project is complete.

Servicing and refueling of equipment would follow Best Management Practices to eliminate concerns for water contamination. Any servicing or refueling operations would be located a minimum of 100 feet away from the meadows edge. Site specific locations for equipment fueling will be identified during project layout. Refueling and servicing would occur only at these locations. A non-porous mat would be used at the serving/refueling area. Vehicles and heavy machinery needed for restoration purposes would be staged within the project area, but not within the meadow.

Temporary Fence

Once the project is completed a temporary fence will be installed around the restoration site. This measure would exclude livestock from impacting the restoration site. Fence installation would present only small localized disturbance to the area where posts are installed. There is negligible erosion potential associated with installing a temporary fence.

Cumulative Effects

Cumulative effects analysis for this action includes restoration activities such as mechanical equipment and streambed alteration. As previously discussed, these disturbances have the potential to contribute increases in sediment transport, soil compaction, and to negatively affect water quality. However, these disturbances would be short term and greatly minimized by using Best Management Practices. The long term benefits would reduce sedimentation back to natural levels, restoring Long Meadow's hydrologic function and connectivity to its floodplain, and maintain/sustain diverse riparian and aquatic habitats.

The Cumulative Watershed Effects (CWE) Threshold of Concern (TOC) and Equivalent Roaded Acre values do not change from that stated in Alternative 1. The overall impact to the subwatershed will be a subtle shift back to a more stable and natural hydrologic function. As a result there will be no measureable cumulative effects from implementing Alternative 2 of the Long Meadow Restoration Project.

Summary and Conclusion of Alternatives

In summary, Alternative 1 provides the least amount of benefits in regards to the field of hydrology. Allowing the headcut to exist and continue eroding will negatively affect water quality and increase the

loss of aquatic species habitat. Implementing Alternative 2 could have short term disturbances to water quality and aquatic habitat. However, mitigations measures would minimize the short term disturbances created during project implementation. Upon completing the project, the long term benefits to water quality and aquatic habitat outweigh the short term disturbances.

Law, Regulation, and Policy applicable to Hydrology

Laws, regulation and policy applicable to managing soil and water quality include the Clean Water Act and the Giant Sequoia National Monument Plan (2012). Applicable management requirements and constraints provided by the 2012 Giant Sequoia National Monument Plan:

- ☒ Aquatic Management Strategy (AMS) goals and objectives
- ☒ Riparian Conservation Areas
- ☒ Riparian Conservation Objectives (RCO) Analysis standards and guidelines
- ☐ Critical Aquatic Refuges (CAR)
- ☐ Long-term strategy for anadromous fish-producing watersheds

Critical Aquatic Refuges does not apply as the project is not associated with a CAR. Long-term strategy for anadromous fish-producing watersheds applies only to the Lassen National Forest and is therefore not applicable to this project area.

Riparian Conservation Objectives Analysis

The Riparian Conservation Objectives (RCOs) listed in the Giant Sequoia National Monument Plan Record of Decision was reviewed for applicability to the project. RCOs 1, 2, 3, 4, 5, and 6 apply to the project and are listed below. Each RCOs contain standards and guidelines which may or may not apply to a project. Further discussion as to which standards and guidelines apply to the Long Meadow Project can be found in Appendix D.

☒ RCO 1. Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses.

☒ RCO 2. Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic feature, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; (3)hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.

☒ RCO 3. Ensure a renewable supply of large down logs that: (1) can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA.

☒ RCO 4. Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.

☒ RCO 5. Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.

☒ RCO 6. Identify and implement restoration actions to maintain, restore or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.

Best Management Practices

The beneficial uses of water in the project watershed include cold water habitat and wildlife habitat. Proper BMP implementation and effectiveness monitoring would serve to protect identified beneficial uses. Forest management and associated road building in the steep rugged terrain of forested mountains has long been recognized as sources of non-point water quality pollution. Non-point pollution is not, by definition, controllable through conventional treatment means. Non-point pollution is controlled by containing the pollutant at its source, thereby precluding delivery to surface water. Sections 208 and 319 of the Federal Clean Water Act, as amended, acknowledge land treatment measures as being an effective means of controlling non-point sources of water pollution and emphasize their development.

In August 2010, the Ninth Circuit Court recently ruled in NEDC vs. Brown that stormwater runoff from logging roads that is collected by and then discharged through a system of ditches, culverts, and channels to streams comprises a point source of water pollution. Point sources of pollution require National Pollution Discharge Elimination System (NPDES) permits. At this time, there is uncertainty whether a National Pollution Discharge Elimination System (NPDES) permit would be required for stormwater discharges from logging roads associated with this project.

Petitions for rehearing and rehearing en banc were filed on October 5, 2010, contending that subject matter jurisdiction was improper, and that issue had not been discussed in the August opinion. In a replacement opinion, NEDC v. Brown, No. 07-35266, 2011 WL 1844060, filed May 17, 2011, the Ninth Circuit determined that subject matter jurisdiction was in fact proper. The court also reiterated its previous analysis of the Silviculture Rule. Finally, the court denied a petition for rehearing and rehearing en banc. However, the court did concede that the Silviculture Rule should be construed as consistent with the Clean Water Act ("CWA") so long as the “natural runoff” remains natural. That is, the exemption ceases to exist as soon as the natural runoff is channeled and controlled in some systematic way through a “discernible, confined and discrete conveyance” and discharged into the waters of the United States. This two-part test may allow some logging operations to remain exempt where the “natural runoff" is not discharged into streams and rivers.

Currently, the Environmental Protection Agency is not requiring agencies to obtain NPDES permits for stormwater discharges from logging roads and on September 4, 2012, the EPA proposed revisions to its Phase I stormwater regulations to clarify that stormwater discharges from logging roads do not constitute stormwater discharges associated with industrial activity and that a NPDES permit is not required (Federal Register / Vol. 77, No. 171 – pp. 53834-53838). Pending the outcome of this rulemaking and any associated legal challenges, a NPDES could be required at a later date. Based upon

existing general permits, implementation of Best Management Practices and monitoring are likely to be key components if a statewide NPDES permit is required. The Forest Service is already implementing Best Management Practices and conducting monitoring as part of its 1981 Management Agency Agreement (MAA) with the SWRCB. Forests are directed to continue implementation of our Best Management Practices for all road activities (USDA 2010).

Working cooperatively with the California State Water Resources Control Board, the Forest Service developed and documented non-point pollution control measures applicable to National Forest System lands. These measures were termed "Best Management Practices" (BMPs). BMP control measures are designed to accommodate site specific conditions. They are tailor-made to account for the complexity and physical and biological variability of the natural environment. The implementation of BMP is the performance standard against which the success of the Forest Service's non-point pollution water quality management efforts is judged.

The Clean Water Act provided the initial test of effectiveness of the Forest Service non-point pollution control measures where it required the evaluation of the practices by the regulatory agencies (State Board and EPA) and the certification and approval of the practices as the "BEST" measures for control. Another test of BMP effectiveness is the capability to custom fit them to a site-specific condition where non-point pollution potential exists. The Forest Service BMPs are flexible in that they are tailor-made to account for diverse combinations of physical and biological environmental circumstances. A final test of the effectiveness of the Forest Service BMP is their demonstrated ability to protect the beneficial uses of the surface waters in the State.

Best Management Practices, as described in this document have been effective in protecting beneficial uses within the affected watersheds. These practices have been applied in other projects within the Sequoia National Forest. Where proper implementation has occurred there have not been any substantive adverse impacts to cold water fisheries habitat conditions or primary contact recreation (etc.) use of the surface waters. The practices specified herein are expected to be equally effective in maintaining the identified beneficial uses. Stream condition inventory (SCI) plot has been established below the project area in Long Meadow Creek to monitor the effectiveness of the prescribed BMPs.

The following management requirements are designed to address the watershed management concerns. Most are BMPs from the Forest Service publication "Water Quality Management Handbook[7]" (USDA Forest Service, 2011). All applicable water quality BMPs shall be implemented. The implementation phase of the BMPs occur after a project is completed, but before the winter season. BMP monitoring of the project is done one year later after the project has experiences one rainy season.

To meet this standard and guideline, the following BMPs would be implemented and tailored to meet site specific needs. The following BMPs are associated with Long Meadow Restoration Project.

[7] *R5 FSH 2509.22 – Soil and Water Conservation Handbook, Chapter 10 – Water Quality Management Handbook.* Effective as of 12-5-2011.

BMP 2.13 Erosion Control Plan:

Implementation of this BMP is required since the restoration site is greater than 50 square feet located in a riparian area and wheeled or tracked equipment will be utilized for construction. This plan is further discussed in detail under Appendix A of this report.

BMP 2.4 Road Maintenance and Operations:

This BMP ensures water-quality protection by providing adequate and appropriate maintenance and by controlling road use and operations. BMP 2.4 would be implemented through the development of an erosion control plan (BMP 2.13), maintenance plan, and planning for emergency interim erosion controls along the road. The access road would be maintained to dissipate intercepted water in a uniform manner by installing rolling dips if needed. Only authorized personnel will be allowed use of this road during implementation. Once the project is complete, this road will be closed and restored to reduce the potential for future erosion and concentrated runoff.

BMP 2.5 Water Source Development and Utilization:

The objective of this BMP applies to dust abatement and other management activities requiring the use of water while protecting and maintaining water quality. Dust abatement may be necessary on the access route to Long Meadow. Additionally water will be needed to assist in construction of structures. Approved drafting sites designated by the district hydrologist would be utilized.

BMP 2.11 Equipment Refueling and Servicing:

This BMP prevents pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels. Servicing and refueling activities will be located a minimum of 100 feet away from the meadow edge. Site specific locations for equipment fueling will be identified prior to or during project implementation. A non-porous mat or equivalent would be used for the refueling at the staging area.

BMP 7.1 Watershed Restoration:

The objective of this BMP is to repair degraded watershed conditions and improve water quality and soil stability. Restoration measures described herein reflect state-of-the-art techniques and have been chosen to custom fit the unique hydrologic, physical, biological and climatic characteristics of Long Meadow. The proposed design for restoration of Long Meadow restores the meadow condition and hydrologic function to the watershed as described in this document.

BMP 7.4 Forest and Hazardous Substance Spill Prevention Control and Countermeasure (SPCC) Plan:

The objective of this BMP is to prevent contamination of waters from accidental spills. BMP 7.4 will be implemented when a total oil product at a site exceeds 1,320 gallons or any single container exceeds 660 gallons. The forest has a SPCC spill plan designed to guide the emergency response to spills during construction. Please refer to the SPCC for further information regarding pollutants and their associated spill plan design for this project.

BMP 7.6 Water Quality Monitoring:

The objective of this BMP is to collect representative water data to determine base line conditions for comparison to established water quality standards, which are related to beneficial uses for that particular watershed. This BMP is implemented through establishment of Stream Condition Inventory (SCI) site prior to project implementation to establish a pre-project condition. Results of this survey are contained in this document.

BMP 7.8 Cumulative Off-site Watershed Effect:

This BMP serves to protect the identified beneficial uses of water from the combined effects of multiple management activities. Beneficial uses and effects have been document in the Hydrology report. Impacts of past and present activities including impacts of the proposed future management activities were considered in the evaluation of the analysis area. Results of the analysis are summarized in this document.

References

Management Agency Agreement between the State Water Resources Control Board, State of California and the Forest Service, United States Department of Agriculture, March 1981.

Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 79-100.

USDA Forest Service. 2011. Water Quality Management Handbook. Pacific Southwest Region, Vallejo, California.

USDA Forest Service, 2012. Giant Sequoia National Monument Plan. Sequoia National Forest. Porterville, California.

Appendix A

Erosion Control Plan

The Erosion Control Plan provides detailed considerations and mitigations applicable to the completion of the project to reduce off site erosion. The plan is broken up into three sections which are pre-project, project implementation, and post project. These sections will contain information regarding, but not limited to, mitigations measures, anticipated ground-disturbing activities, maps, and waste management strategies. For example, information for a section related to closing the access road would be discussed within the post project section and not the pre-project section.

Pre-Project Implementation

Prior to implementing the Long Meadow Restoration Project, several attributes of the Erosion Control Plan must be in place. These include mitigations measures developed through project analysis, requirements to meet Best Management Practices (BMP), project plans and specifications, and required State and Federal permits.

Ground-disturbing activities are expected to occur as a result of the Long Meadow Restoration Project. There are a total of five anticipated activities. The first is opening an old access road on the north end of the project which would require removal of debris and brush along the road bed. The second is closing the old access road after project completion. The third is to construct a series of pond and plug structures. Fourth is to construct one valley grade control structure. Fifth is to plant willows and onsite sod and or native seed if available within the meadow.

Two maps have been prepared for the Long Meadow Restoration Project. One map shows Riparian Conservation Areas and Streamside Management Zones in Appendix B of the hydrology report. Another map shows where the project is located within the Giant Sequoia National Monument in Appendix C of the hydrology report. Directions from Springville, CA, are as follows: Take 190 east towards Camp Nelson/Ponderosa. Once at Ponderosa the highway becomes known as Western Divide Highway. Continue south on the Western Divide Highway until you arrive at the access road, just prior to the Long Meadow Campground sign. See Appendix C of the hydrology report for the map of the project area. The area is not accessible year round due to snow.

Implementation would occur during the driest time of the year for the meadow, typically August thru October. The driest time of the year was chosen to avoid and or minimize effects on meadow and soil resources and reduce the potential for increased erosion. Work would not occur during wet weather.

Dust abatement may be required along the old access road and staging area. Gravel would be added to the access road to minimize dust. If necessary, a designated drafting site would be used if additional dust abatement is required. Any water source utilized would follow BMP 2.5.

Best Management Practices have been determined for the Long Meadow Restoration Project and are discussed in detail in the Hydrology report. A summary of what is applicable to the project is as follows: BMP 2.13 – Erosion Control Plan, BMP 2.4 – Road Maintenance and Operations, BMP 2.5 – Water Source Development and Utilization, BMP 2.11 – Equipment Refueling and Servicing, BMP 7.1 – Watershed

Restoration, BMP 7.4 – Forest and Hazardous Substance Spill Prevention Control and Countermeasure (SPCC) Plan, BMP 7.6 – Water Quality Monitoring, and BMP 7.8 – Cumulative Off-site Watershed Effect. Some of these BMPs are required during the planning stages or pre-project stage:

- As required by BMP 2.13 – Erosion Control Plan, a plan to control erosion is required prior to project implementation. This document addresses this BMP requirement.
- As required by BMP 7.6 – Water Quality Monitoring, baseline conditions have been established within and outside of Long Meadow. Baseline conditions were collected following Region 5 Steam Condition Inventory protocol. Results of the baseline conditions are discussed within the hydrology report.

There are two permits required from other agencies prior to implementation. One is a 404 blanket dredge and fill permit from the Army Corps of Engineers. The other is a Stream Alteration Permit from the California Central Valley Water Quality Control Board. Both of these must be approved in order to proceed with the project.

Flagging will be used to identify the project perimeter, avoidance areas, location of the access road and staging area, fuel storage and equipment servicing locations, and access into the meadow prior to or during implementation. Orange flagging will designate the project boundary. Pink will be used to show the path of the access road to the staging area. Red and blue combo are areas to avoid either for archeological or resource reasons. Yellow and black combo will be used for fuels and equipment. White and pink combination will be used for staging restoration materials. (i.e. rocks for the structures). Contact personnel on the Long Meadow Restoration Project are listed below. Their full name, position, and contact phone numbers are included.

Name	Position	Phone Number
Joshua Courter	District Hydrologist Erosion Control Plan Preparer	559-539-2607 x282
Robin Galloway	District Wildlife Biologist Project Leader	559-539-2607 x280
TBD	Contracting Officer Representative	TBD
Timothy Patrick	Civil Engineer	559-784-1500 x1321
Richard Stevens	District Ranger Erosion Control Plan Approval	559-539-2607

Project Implementation

The Project Implementation portion of the Erosion Control Plan discusses the when, where, why, and how the project activities will be implemented while minimizing or preventing erosion. Project activities during implementation are opening the old access road, creating ponds and plugs, creating a valley grade control structure, and planting willows and onsite sod and or native seed if available within the meadow.

Opening the access road would be the first ground disturbing activity. The road would only be accessible to authorized personnel. Brush and debris will be removed along the road. BMP 2.4 will be followed to

minimize the potential for erosion. A gravel apron would be used to reduce sediment transfer onto the Western Divide Highway. At the end of the access road is a large flat area which would be used as a staging area.

Staged equipment would be kept at least 100 feet or more from the meadows edge. BMP 2.11 would go into effect for any servicing and refueling needs in the staging area. The staging area would require non-porous mat residing around the portion used for refueling. BMP 7.4 would be implemented if fuel stored onsite and above ground exceeds 1320 gallons or a single container exceeds 660 gallons, which produces a Hazardous Substance Spill Prevention Control and Countermeasure Plan.

The use of heavy machinery will be limited to the access road, staging area, and restoration site within the meadow. Since the restoration site is located within a riparian area greater than 50 square feet, wheeled or tracked equipment would be utilized for construction according to BMP 2.13. The machinery used for the restoration would follow the Long Meadow Restoration Plan layout.

The Long Meadow Restoration Plan layout, as displayed on page 11 of the hydrology report, shows the location of the restoration work. Implementation may vary slightly, but the concept of the Pond and Plug method would be followed. Soil used to create the plugs and valley grade control structure would come from the meadow during construction of the ponds. Rock will also be used to armor and form channels on the plugs and valley grade control structures.

Onsite sod and or native seed if available will be used to cover the bare soil of the plugs and valley grade control structure. Native willows would be used along the banks for stability and improvement for future wildlife habitat.

Once the project is completed, Best Management Practices protocol requires all header and implementation portions of the BMP evaluation forms be completed. The Contracting Officer assigned to the project will be responsible for completing all required BMP forms. Submission of these forms will go to the Western Divide Ranger District Hydrologist. If the hydrologist is not available for any reason, the forms will go to the District Ranger.

Post Project Implementation

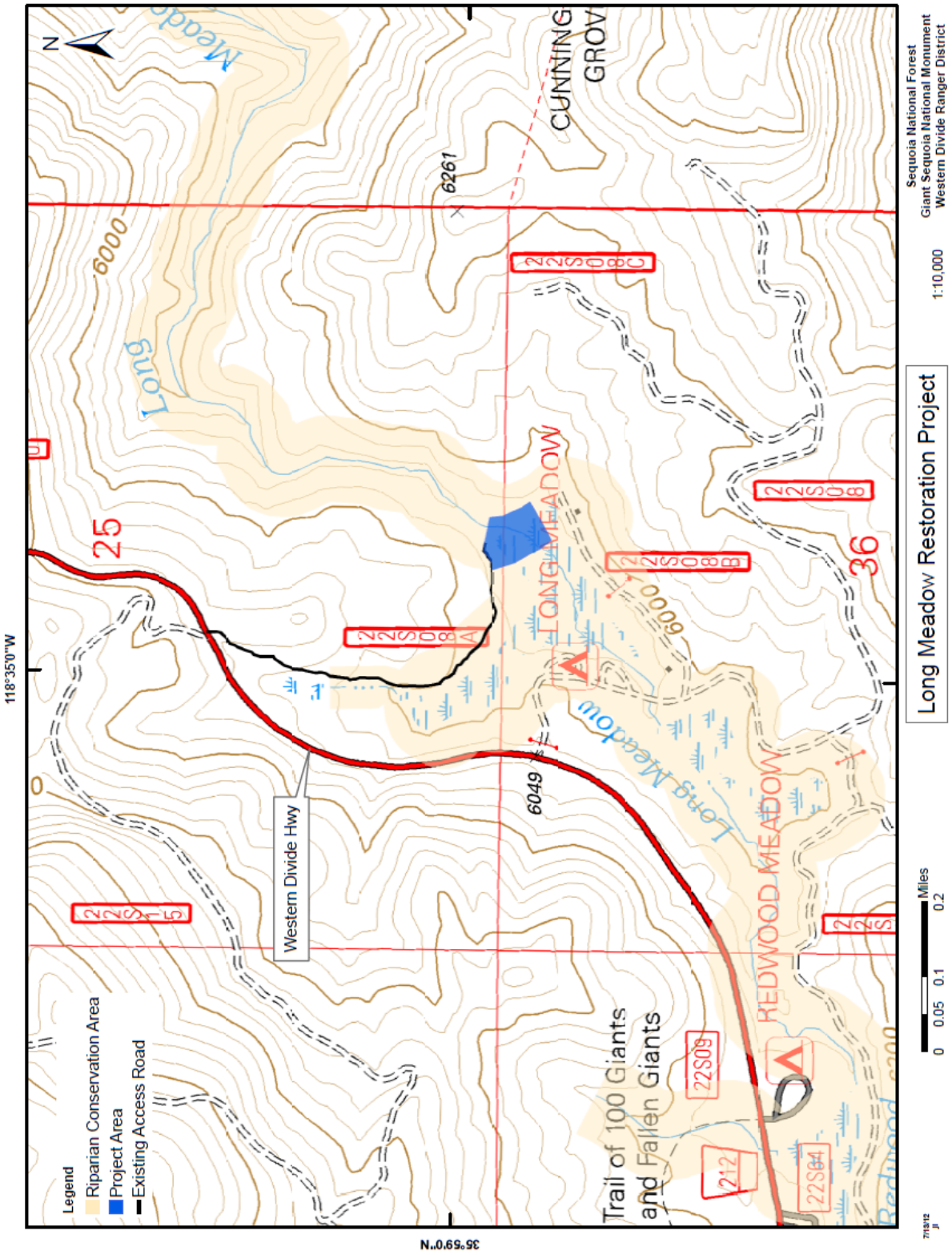
Post project procedures include removal of heavy equipment, removal of any items stored in the staging area, waste management and disposal, and post project water management. The staging area may contain waste generated during project implementation. The contractor will be responsible for removing any and all waste from the site in accordance to all applicable laws. The goal of waste management and disposal is to return the project area, as much as possible, to pre-project conditions. Once those items are removed, the old access road used will need post project water management.

Post Project Water Management is described within BMP 2.13 as a way of implementing water control structures and management practices to minimize pollutants, in this case erosion, after project activities have been completed at the site (pre-project and project implementation). The old access road would be ripped, slash put on the road, and have water bars installed. These actions would minimize the chances for excess erosion and reduce soil compaction created during project implementation. Water

bars would be installed in accordance with Forest Service Handbook 2409.15 R5 supplement 2409.15_2012-01 Chapter 60. Waterbar spacing is expected to use the High Erosion Rating of High for the old access road. The entrance to the old access road will be closed. A natural barrier may be utilized, either down logs or large boulders, berms, or any combination of these to prevent use.

Post project monitoring will occur as required by BMP protocol. BMPs used during pre and project implementation would be evaluated the following year. A Forest Service hydrologist is required during post project BMP monitoring.

Appendix B


Long Meadow Restoration Project
Sequoia National Forest
Giant Sequoia National Monument
Western Divide Ranger District
1:10,000
Legend
Riparian Conservation Area
Project Area
Existing Access Road
Western Divide Hwy
Trail of 100 Giants
and Fallen Giants
LONG MEADOW
REDWOOD MEADOW
Long Meadow
Long
Meadow
CUNNING
GROV
6261
6049
6000
25
36
22S09
212
22S04
22S08A
22S08B
22S08C
22S08
22S-5
N
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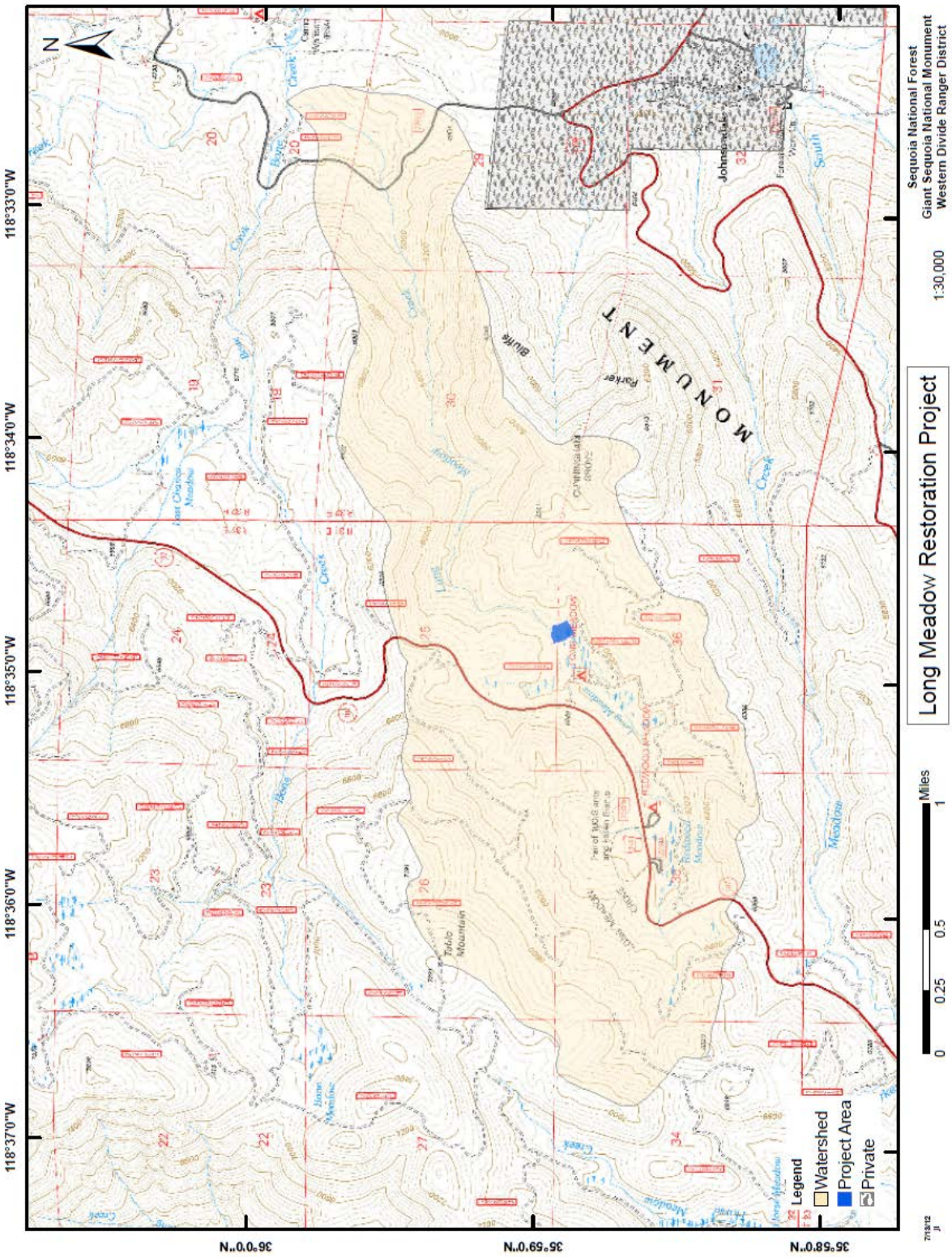
36°59'0"N
Miles
0 0.05 0.1 0.2

Appendix C


Long Meadow Restoration Project
Sequoia National Forest
Giant Sequoia National Monument
Western Divide Ranger District
1:30,000
Miles
0
0.25
0.5
1
Legend
Watershed
Project Area
Private
118°37'0"W
118°36'0"W
118°35'0"W
118°34'0"W
118°33'0"W
36°0'0"N
36°59'0"N
36°58'0"N
N
MONUMENT
Johnsondale
Tobias Mountain

Appendix D

Giant Sequoia National Monument Riparian Conservation Objectives Analysis			
Standard and Guideline	**Does it Apply?**		**Why or Why Not?**
	YES	**NO**	
Riparian Conservation Objective 1: Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses.			
17. For waters designated as "water quality limited" (Clean Water Act Section 303(d)), implement appropriate state mandates for the waterbodies, such as total maximum daily load (TMDL) protocols.		X	No waters designated as TMDL in project area.
18. Ensure that management activities do not adversely affect water temperatures necessary for local aquatic-and riparian-dependent species assemblages. Maintain temperature at no more than a daily average of 20° C on streams affected by management activities. Evaluate stream courses with special circumstances, such as those affected by hot springs or other geologic and geochemical features, on a site-by-site basis at the project level. Maintain average stream surface shade at >60 percent on streams affected by management activities. Assess meadow environments and streams with limited overhead vegetation on a site-by-site basis at the project level. Ensure that management activities do not adversely affect pH values necessary for local aquatic and riparian-dependent species as defined by the Central Valley Water Quality Board Basin Plan. Maintain pH values between 6.5 and 8.5 on streams affected by management activities. Evaluate water bodies that exhibit special conditions at the project level, including waters affected by hot springs in the presence of CO_2 springs or other geologic and geochemical features (such areas would be expected to yield pH values outside the range of state standards). Ensure that management activities do not adversely affect alkalinity values, which can affect pH values, necessary for local aquatic- and riparian-dependent species as defined by the Central Valley Water Quality Board Basin Plan. Maintain alkalinity values of no less than 10 mg/L. Site-specific differences could occur based on local geology and water chemistry. Evaluate values outside this range at the project level.	X		Water temperatures are not expected to be negatively impacted by the project. Detailed discussion can be found in the Effects Analysis portion of Hydrology and Erosion Control Plan report.
19. Limit pesticide applications to cases where project-level analysis indicates that pesticide applications are consistent with RCOs. Use local channel geometry curves to determine the location of flood prone areas. Do not apply pesticides, including gopher baiting, within the floodprone area of		X	Not applicable to project. No pesticide used.

perennial or intermittent stream courses. If a project's objectives include treatment of riparian areas, evaluate conditions on a site-by-site basis at the project level.			
20. Within 500 feet of known occupied sites for the California red-legged frog, foothill yellow-legged frog, or mountain yellow-legged frog, design pesticide applications to avoid adverse effects to individuals and their habitats.		X	Not applicable to project. No habitat for these species within project area.
21. Prohibit storage of fuels and other toxic materials within RCAs and CARs except at designated administrative sites and sites covered by a special use authorization. Prohibit refueling within RCAs and CARs unless there is no other alternative. Ensure that spill plans are reviewed and up-to-date.	X		Staging area will be used for refueling equipment. Use mitigations from BMP 2.11 for equipment refueling and servicing. BMP 7.4 will be used if storage of fuels exceeds.
Riparian Conservation Objective 2: Maintain or restore: (1) The geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.			
22. Maintain and restore the hydrologic connectivity of streams, meadows, wetlands, and other special aquatic features by identifying roads and trails that intercept, divert, or disrupt natural surface and subsurface water flow paths. Implement corrective actions, where necessary, to restore connectivity. Maintain and restore the hydrologic connectivity of meadows by identifying those at risk. Implement corrective actions, where necessary, to restore connectivity of meadows to their floodplain. A stream condition inventory (SCI) may be used instead of proper functioning condition (PFC) to validate an existing PFC determination or existing meadow condition. Perform a full hydrologic survey prior to restoration. Include a longitudinal profile and adequate cross-section surveys to determine design parameters. At a minimum, determine meadow pattern, profile, and dimensions for the impaired site and the design. Design projects by a qualified specialist prior to implementation. A qualified specialist is one that has received training in river restoration and natural channel design. Have the design reviewed by a forest hydrologist prior to implementation. Make sure all restoration is sustainable. Designs that require continued maintenance are not considered sustainable.	X		There are no permanent roads or trails that intercept, divert, or disrupt natural surface and subsurface water flow paths in the project area. Project is proposing to restore hydrologic connectivity in Long Meadow. SCI surveys were completed in 2009. Design for Long Meadow was reviewed by qualified specialists prior to implementation (Jim Wilcocks and Dave Rosgen Ph. D.). Forest Hydrologist reviewed and approved design prior to retirement (11/2012).
23. Ensure that culverts or other stream crossings do not create barriers to upstream or downstream passage for aquatic-dependent species. Locate water drafting sites to avoid adverse effects on stream flows and depletion of pool habitat. Where possible, maintain and restore the timing, variability, and duration of floodplain inundation and water		X	No culverts or stream crossings in project area.

table elevation in meadows, wetlands, and other special aquatic features.			
24. Prior to activities that could adversely affect streams, determine if relevant stream characteristics are within the range of natural variability. If characteristics are outside the range of natural variability, implement mitigation measures and short-term restoration actions needed to prevent further declines or cause an upward trend in conditions. Evaluate required long-term restoration actions and implement them according to their status among other restoration needs. Maintain width to depth ratios for A and E channels of values less than 14 on streams affected by management activities. Maintain width to depth ratios for B, C, and F channels of values greater than 10 on stream channels affected by management activities. Encourage G and F channels to trend towards width to depth ratios greater than 12. Evaluate streams affected by management activities to detect shifts in mean particle size toward fine material in stable channel types (A, B, C, or E) to the extent that a change in channel type occurs. Mean particle size would be expected to change in impaired systems or following restoration activities. Evaluate stream courses with special circumstances on a site-by-site basis at the project level. Manage for specific components of the Pfankuch channel and stream stability indices that might be affected by management activities. Evaluate special conditions at the project level. For stable streams (A, B, C, or E), maintain or improve the channel, as necessary, based on the Pfankuch channel and stream stability indices. Take action to maintain or improve stream sites based on successional stage shifts away from stable conditions. For impaired stream reaches (G, F, or D), successional stage shifts from the impaired stream reach would show a trend toward an unimpaired condition.	X		As described in the Existing Condition portion of the Hydrology and Erosion Control Plan report, several portions of the meadow and stream channel are not within the range of natural variability at this time.
25. Prevent disturbance to streambanks and natural lake and pond shorelines caused by management activities and resource use (such as livestock and dispersed recreation) from exceeding 20 percent of a stream reach or 20 percent of natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. This standard does not apply to developed recreation sites, sites authorized under special use permits, or roads.	X		Disturbance would not occur on more than 20 percent of the meadow.
26. In stream reaches occupied by, or identified as “essential habitat” in the conservation assessment for the Little Kern golden trout, limit streambank disturbance from livestock to 10 percent of the occupied or “essential habitat” stream reach (conservation assessments are described in the 2004 SNFPA ROD, page 10; see http:// www.tucalifornia.org/cgtic/GTCAssessmnt&Strategy9-04.pdf).		X	No essential habitat in project area.

Cooperate with state and federal agencies to develop streambank disturbance standards for threatened, endangered, and sensitive species. Use the regional streambank assessment protocol. Implement corrective action where disturbance limits have been exceeded. Maintain width to depth ratios for A and E channels of values less than 14 on streams affected by management activities. Maintain width to depth ratios for B, C, and F channels of values greater than 10 on streams affected by management activities. Encourage G channels to trend towards width to depth ratios greater than 12.			
27. At either the landscape or project level, determine if the age class, structural diversity, composition, and cover of riparian vegetation are within the range of natural variability for the vegetative community. If conditions are outside the range of natural variability, consider implementing mitigation and/or restoration actions that will result in an upward trend. Actions could include restoration of aspen or other riparian vegetation where conifer encroachment is identified as a problem.	X		The age class, structural diversity, composition, and cover of riparian vegetation are deviating away from the range of natural variability within the meadow due to the loss of hydrologic function. Conifers are encroaching on the meadow edges as well as a result.
28. Cooperate with federal, tribal, state, and local governments to secure in-stream flows needed to maintain, recover, and restore riparian resources, channel conditions, and aquatic habitat. Maintain in-stream flows to protect aquatic systems to which species are uniquely adapted. Minimize the effects of stream diversions or other flow modifications from hydroelectric projects on threatened, endangered, and sensitive species.		X	No other agency has jurisdiction.
29. For exempt hydroelectric facilities on national forest lands, ensure that special use permit language provides adequate in-stream flow requirements to maintain, restore, or recover favorable ecological conditions for local riparian- and aquatic-dependent species.		X	No hydroelectric facilities.
Riparian Conservation Objective 3: Ensure a renewable supply of large down logs that: (1) can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA.			
30. Determine if the level of coarse large woody debris is within the range of natural variability in terms of frequency and distribution and is sufficient to sustain stream channel physical complexity and stability. Ensure that proposed management activities move conditions toward the range of natural variability for coarse large woody debris. Maintain woody material in and adjacent to stream courses. Where fire is responsible for removal of woody material, replace at levels associated with pre-fire conditions if possible. Evaluate the amount of wood necessary for maintenance of stream stability, sediment reduction, and aquatic species habitat.	X		CWD is within the range of natural conditions within the project area.
Riparian Conservation Objective 4: Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.			

31. Within CARs, in occupied habitat or “essential habitat” as identified in conservation assessments for threatened, endangered, or sensitive species, evaluate the appropriate role, timing, and extent of prescribed fire. Avoid direct lighting within riparian vegetation; prescribed fires may back into riparian vegetation areas. Develop mitigation measures to avoid effects to these species whenever ground-disturbing equipment is used.		X	Project is not located in a CAR.
32. Use screening devices for water drafting pumps (fire suppression activities are exempt during initial attack). Use pumps with low entry velocity to minimize removal of aquatic species, including juvenile fish, amphibian egg masses, and tadpoles.	X		Drafting screens will be utilized at all identified drafting sites to minimize removal or loss of aquatic species.
33. Design prescribed fire treatments to minimize disturbance of ground cover and riparian vegetation in RCAs. In burn plans for project areas that include or are adjacent to RCAs, identify mitigation measures to minimize the spread of fire into riparian vegetation. In determining mitigation measures, weigh the potential harm of mitigation measures (e.g., firelines) against the risks and benefits of prescribed fire entering riparian vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances when fire suppression or fuel management actions could be damaging to habitat or the long-term function of a riparian community.		X	Prescribed fire is not part of the project.
34. Post-wildfire management activities in RCAs and CARs should emphasize enhancing native vegetation cover, stabilizing channels by non-structural means, minimizing adverse effects from the existing road network, and carrying out activities identified in landscape analyses. Post-wildfire operations shall minimize the exposure of bare soil.		X	Not a post-wildfire project.
35. Allow hazard tree removal within RCAs or CARs if it is clearly needed for public safety. Allow mechanical ground-disturbing fuels treatments or fuelwood cutting within RCAs or CARs when the activity is consistent with RCOs and is clearly needed for ecological restoration and maintenance or public safety. Utilize low-ground-pressure equipment, helicopters, or other non-ground-disturbing actions off of existing roads when needed to achieve RCOs. Ensure that existing roads meet best management practices (BMPs). Minimize the construction of new roads into RCAs for access for fuel treatments, fuelwood cutting, or hazard tree removal.	X		Machinery will be used within the RCA to improve watershed conditions. All hazard trees felled will remain onsite.
36. As appropriate, assess and document aquatic conditions following the regional stream condition inventory protocol prior to implementing ground-disturbing activities within suitable habitat for California red-legged frogs, foothill yellow-legged frogs, and mountain yellow-legged frogs. Maintain average stream surface shade at or above 60 percent on streams affected by management activities. Assess meadow environments and other streams with limited		X	Long Meadow contains pockets of suitable habitat for Mountain Yellow-legged Frogs, though none exist within the project area. Surveys were conducted by both Cal Academy of Science personnel (2001) and Forest Service staff (2011). No individuals were detected.

overhead vegetation for site-specific projects. Maintain width to depth ratios for A and E channels of values less than 14 on streams affected by management activities. Maintain width to depth ratios for B, C, and F channels of values greater than 10 on streams affected by management activities. Encourage G channels to trend towards width to depth ratios greater than 12. Evaluate streams affected by management activities to detect shifts in mean particle size toward fine material in stable channel types (A, B, C, or E) to the extent that a change in channel type occurs. Mean particle size would be expected to change in impaired systems or following restoration activities. Evaluate stream courses with special circumstances on a site-by-site basis at the project level. Maintain 85 percent of any waterbodies affected by management activities at no less than very good water quality based on the Hilsenhoff biotic index or similar indices. Evaluate waterbodies outside of this range for site-specific effects. Indices would be less than 4.50 on Hilsenhoff biotic index or indicate very good water quality with similar indices. A biotic index or other index of this value should indicate no apparent to possible slight organic pollution. Evaluate waterbodies outside of this range for site-specific projects. Manage for specific components of the Pfankuch channel and stream stability indices that might be affected by management activities. Evaluate special conditions at the project level (see previous table).			
37. During fire suppression activities, consider effects to aquatic- and riparian-dependent resources. Where possible, locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of RCAs or CARs. During pre-suppression planning, include guidelines for suppression activities that avoid potential adverse effects to aquatic- and riparian-dependent species.		X	Not a fire suppression activity.
38. Identify roads, trails, staging areas, developed recreation sites, dispersed campgrounds, areas under special use permits or grazing permits, and day use sites during landscape analysis. Identify conditions that degrade water quality or habitat for aquatic- and riparian-dependent species. At the project level, evaluate and consider actions to ensure consistency with standards and guidelines.		X	Landscape analysis is not necessary for this size of a project. Water quality degradation comes from the headcut. Horses use the meadow for a brief period and will be excluded from the project area by a fence.
Riparian Conservation Objective 5: Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.			
39. Assess the hydrologic function of meadow habitats and other special aquatic features during site-specific range management analysis. Ensure that characteristics of special features are, at a minimum, at proper functioning condition (PFC), as defined in the following technical reports (or their	X		This is a restoration project to fix the hydrologic connectivity and aquatic habitat.

successor publications): (1) Process for Assessing PFC, TR 1737-9 (1993); (2) PFC for Lotic Areas, USDI TR 1737-15 (1998); (3) PFC for Lentic Riparian-Wetland Areas, USDI TR 1737-11 (1994); and (4) Assessing Proper Functioning Condition for Fen Areas in the Sierra Nevada and Southern Cascade Ranges in California: A User Guide, USDA Forest Service, R5-TP-028 (April 2009). Assess the hydrologic function of at-risk meadow habitats. Ensure that characteristics are, at a minimum, at PFC as defined in the Process for Assessing PFC, TR 1737-9 (1993); PFC for Lotic Areas, USDI TR 1737-15 (1998); or PFC for Lentic Riparian-Wetland Areas, USDI TR 1737-16 (Rev. 2003).			
40. Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles. Criteria for defining bogs and fens include, but are not limited to, the presence of sphagnum moss (Sphagnum spp.), mosses belonging to the genus Meessia, or sundew (Drosera spp.). Complete initial plant inventories of bogs and fens within active grazing allotments prior to re-issuing permits. Maintain temperature at a daily average of no more than 20o C on streams affected by management activities. Evaluate stream courses with special circumstances or conditions, such as those affected by hot springs, for site-specific projects.		X	There are no known bog or fen ecosystems within the project area.
41. Locate new facilities for gathering livestock and pack stock outside of meadows and RCAs. During project-level planning, evaluate and consider relocating existing livestock facilities outside of meadows and riparian areas. Prior to re-issuing grazing permits, assess the compatibility of livestock management facilities located in RCAs with RCOs.		X	No new facilities for livestock use are part of the project.
42. Determine ecological status on all key areas monitored for grazing utilization prior to establishing utilization levels. Use regional ecological score cards and range plant list in regional range handbooks to determine ecological status. Analyze meadow ecological status every 3 to 5 years. If meadow ecological status is determined to be moving in a downward trend, modify or suspend grazing. Include ecological status data in a spatially explicit geographic information system (GIS) database.		X	Not a grazing project.
43. Under intensive grazing systems (such as rest-rotation and deferred rotation) where meadows are receiving a period of rest, utilization levels can be higher than the levels described above if the meadow is maintained in late seral status and meadow-associated species are not being affected. Degraded meadows (such as those in early seral status with greater than 10 percent of the meadow area in		X	Not a grazing project.

bare soil and active erosion) require total rest from grazing until they have recovered and have moved to mid- or late seral status.			
44. Limit browsing to no more than 20 percent of the annual leader growth of mature riparian shrubs and no more than 20 percent of individual seedlings. Remove livestock from any area of an allotment when browsing indicates a change in livestock preference from herbaceous vegetation to woody riparian vegetation.	X		Restoration site will be fenced to exclude horses as no other livestock use is currently active in the meadow.
Riparian Conservation Objective 6: Identify and implement restoration actions to maintain, restore, or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.			
45. Recommend restoration practices in: (1) areas with compaction higher than that allowed in soil quality standards, (2) areas with lowered water tables, or (3) areas with either active downcutting or historic gullies. Identify other management activities (e.g., road building, recreational use, grazing, and fuels reduction) that may be contributing to the observed degradation. Use water-dependent vegetation as a surrogate to evaluate riparian soil moisture condition. Maintain width to depth ratios for A and E channels of values less than 14 on streams affected by management activities. Maintain width to depth ratios for B, C, and F channels of values greater than 10 on streams affected by management activities. Encourage G channels to trend towards width to depths greater than 12. For stable streams (A, B, C, or E), maintain or improve the channel as necessary based on stability indices. Take action to maintain or improve stream sites based on successional stage shifts away from stable conditions. For impaired stream reaches (G, F, or D), successional stage shifts from the impaired stream reach would show a trend toward an unimpaired condition.	X		The Long Meadow Restoration Project was prioritized because of the lowering of the meadow's water table and active down cutting resulting in a large gully.

Reviewed by the following specialists:

Name	Position	Date
Name	Position	Date
Name	Position	Date