

Redwood

National Park

National Park Service
US Department of the Interior



Lower B500 Road Removal Environmental Assessment

**Redwood National Park
Humboldt County, California
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INTRODUCTION

Redwood National Park was established by Congress in 1968 to "preserve significant examples of the coastal redwood ... forests and the streams and seashores with which they are associated for purposes of public inspiration, enjoyment, and scientific study." (Public Law 90-545).

In 1978, Congress expanded the national park, in part "to provide a land base sufficient to insure preservation of significant examples of the coastal redwood in accordance with the original intent of Congress, and to establish a more meaningful Redwood National Park for the use and enjoyment of visitors." (Public Law 95-250). The expansion area included 50,000 acres of privately owned timber lands that had been logged and a road network that had been constructed to provide access to timber cutting areas. Hundreds of miles of logging and ranch roads were abandoned when private landowners vacated the land. Without regular maintenance of surfaces and drainage structures, the rate of erosion from abandoned roads increases. Eventually, the roads fail and sediment washes into stream courses during storm events. Erosion and sedimentation from abandoned unmaintained roads poses threats to water quality of streams and aquatic resources including anadromous salmonids, which require good water quality and clean gravel for spawning.

The 1978 park expansion legislation directed the National Park Service (NPS) to develop and implement "a program for the rehabilitation of areas within and upstream from the park contributing significant sedimentation because of past logging disturbances and road conditions..." to protect the existing irreplaceable park resources, including redwood forests and streams. Since 1978, the NPS has implemented a program to remove abandoned logging roads to protect park resources and restore watersheds that were affected by logging and associated roads. This project seeks to remove the lower final 0.8 mile downstream segment of a what was once part of a major haul road called the B500 road. Between 1989 and 2009, the NPS removed approximately 16 miles of abandoned legacy logging roads in the Larry Damm Creek watershed, including all of the B500 road except for the final segment that terminates near a park visitor facility, the Lost Man Creek Picnic area. Since the park has removed all roads in the Larry Damm Creek watershed, the Lower B500 road is no longer needed for access to the upper watershed, does not serve any visitor function, has no park administrative function (including firefighting access), and has not been maintained to prevent sediment delivery into Larry Damm Creek (Figure 1).

Larry Damm Creek runs alongside the Lower B500 road and supports adult spawning and contains juvenile rearing habitat that is recovering from the effects of past logging and erosion from upstream abandoned roads. Chinook and coho salmon and steelhead, listed as threatened under the federal Endangered Species Act, occupy this creek during some part of their annual life cycle. The creek is designated as critical habitat for these fish.

The Lower B500 road removal environmental assessment is tiered off the Redwood National and State Parks 1999 *Final General Management Plan/General Plan, Environmental Impact Statement/Environmental Impact Report* (GMP/FEIS). Under the 1999 GMP/FEIS, watershed restoration work within the park emphasizes partial landform restoration, with complete removal of all major logging roads and limited removal of minor roads that pose the greatest threat to park resources.

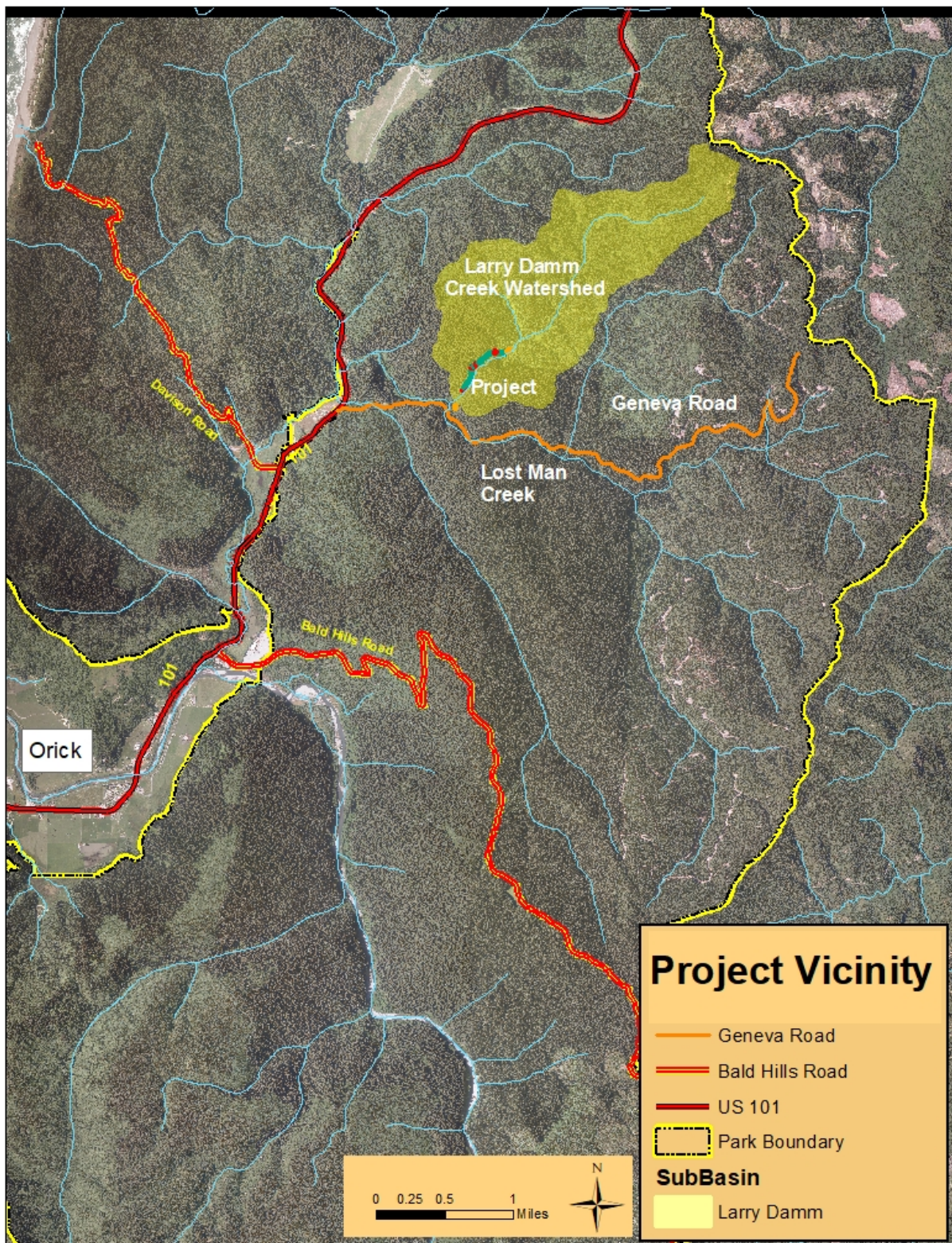


Figure 1. General vicinity of the Lower B500 Road and Larry Damm Creek watershed

PURPOSE AND NEED FOR FEDERAL ACTION

The purpose of the project is to protect park resources, especially threatened salmonids and their habitat in Larry Damm Creek and Lost Man Creek, by reducing the potential for erosion and sedimentation from the Lower B500 Road.

Road removal would reduce the potential for erosion of sediment from the road into the stream, improve fish habitat conditions by restoring drainage patterns affected by the placement of the road adjacent to the stream, and improve watershed function by restoring hydrologic patterns altered by the road. Removal of the Lower B500 would fulfill the legislative direction from the 1978 park expansion legislation to reduce sedimentation through rehabilitation of watersheds damaged by logging.

The Lower B500 is no longer needed for access for watershed restoration or any other administrative purpose such as firefighting, and this road was never identified for visitor use. Under NPS management direction, roads not needed for administrative or visitor use are placed in the lowest tier for available funding for maintenance. Without regular maintenance, road surfaces and drainage structures gradually degrade, causing increased erosion under normal weather conditions. In major storms, unmaintained roads can fail catastrophically. Catastrophic road failure on roads directly adjacent to streams causes larger quantities of sediment to be delivered directly into the stream. Removal of the Lower B500 would prevent sedimentation of the Larry Damm Creek occupied by three threatened salmonid species.

CONSULTATION WITH AGENCIES AND PUBLIC**Natural Resource Consultations**

- California Department of Fish and Wildlife (CDFW)
This project is funded by and complies with the California Department of Fish and Wildlife Fisheries Restoration Grant Program (FRGP) which operates its restoration program under an Army Corps of Engineers Regional Grant Permit (No. 12 - File No.2003-279220). The RGP 12 includes approved programmatic consultation with the National Marine Fisheries Service, the US Fish and Wildlife Service, as well as 401 and 404 certification under the Clean Water Act with the Army Corps of Engineers, and the Regional Water Quality Control Board respectively. A field trip to the project site with FRGP staff of CDFW was held on June 6, 2018. The notice of award under the FRGP was received by the park on December 6, 2019 (CDFW FRGP grant number P1910502).

Projects funded under the FRGP also require compliance with Section 1600 of the California Fish and Game Code. Although projects undertaken by a federal agency on federal lands are exempt from compliance with Section 1600, the FRGP grant provides coverage under Section 1600 for the project, including the portion on federal lands in Redwood National Park. The application for coverage under the Section 1600 permit was approved and fully executed on April 25, 2019.

- National Marine Fisheries Service (NMFS)
The National Marine Fisheries Service was informed of the project on May 14, 2015 during an Interagency Consultation Team meeting at Redwood National Park. Additional meetings were held with NMFS staff in early 2018. A field trip to the site occurred on

March 7, 2018. The Application for Inclusion in the NMFS Restoration Center Arcata Office Programmatic Biological Opinion (WCR-2015-2400) was submitted to NMFS February 2018. On May 6, 2019, NMFS determined that the Strawberry Creek restoration project area fits within the scope of that program and would be covered under Section 7a2 of the Endangered Species Act using the Corps Regional General Permit 12 as the Federal nexus. The Biological Opinion covers the following activities that would be undertaken as part of the Lower B500 project: riparian habitat restoration; instream habitat structure; and upslope watershed restoration. Through the programmatic biological opinion, NMFS determined that these proposed activities are not likely to jeopardize the continued existence of SONCC coho salmon, CC Chinook, or NC steelhead, and are not likely to result in the destruction or adverse modification of designated critical habitat for these species. NMFS expects that the activities will result in incidental take of these species related to dewatering, fish relocation activities, and instream activities. The NOAA RC Biological Opinion authorizes incidental take for effects on listed fish related to these activities. The NMFS incidental take statement includes non-discretionary reasonable and prudent measures and terms and conditions that are expected to reduce the amount or extent of incidental take for SONCC coho salmon, CC Chinook salmon, and NC steelhead.

- US Fish and Wildlife Service

The US Fish and Wildlife Service was informed of the project on May 14, 2015 during an Interagency Consultation Team meeting at Redwood National Park. The project was determined to have no effect to listed terrestrial species due to work timing restrictions and the lack of effect to listed species habitat. No consultation was conducted.

Cultural Resource Consultations

The NPS is consulting with the California State Historic Preservation Officer (SHPO) that an undertaking is being considered and is seeking concurrence with the NPS finding that the proposed action would in no historic properties effected. Any concerns raised by SHPO must be satisfactorily addressed before a FONSI can be completed and proposed actions undertaken.

NPS management policies and Executive Order 13175 require the NPS to consult with affected federally recognized Tribes on a government-to-government basis. This project is located in Yurok ancestral territory. Big Lagoon Rancheria, Resighini Rancheria, Trinidad Rancheria, and Yurok Tribe were contacted on a government to government basis via letter on April 8, 2019. The Tribes were offered an opportunity to meet face-to-face with NPS officials about the project. No face-to face-meetings were requested. In addition, the NPS consulted with the Yurok Tribe's Heritage Preservation Officer along with the Yurok Tribe's Culture Committee of elders on February 24, 2017. No comments or concerns were raised.

Public Involvement

This project to remove the last segment of the Lower B500 adjacent to Larry Damm Creek is similar to the more extensive watershed restoration project completed in other parts of Lost Man Creek watershed (NPS 2006a, b).

Since 2007, the NPS has received public input on four projects involving watershed and stream restoration in the lower Prairie Creek, Lost Man Creek, and Redwood Creek watersheds:

- On North Fork Streelow Creek, failed culverts were replaced with bridge to improve fish passage upstream and improve visitor experience and safety on a trail (NPS 2007a, b).
- On Streelow Creek Trail, an abandoned logging was converted to a trail, with the remaining section stabilized and upgraded for access for planned watershed restoration access; (NPS 2010a, b).
- On the North Fork of Lost Man Creek, two failed culverts that blocked fish passage were replaced with a bridge on an administrative road that also serves as the Lost Man Creek Hike-Bike Trail (NPS 2009a, b).
- The Strawberry Creek Restoration project included removal of upslope logging roads to reduce erosion (NPS 2014a, b).

Public comments received on the programmatic watershed restoration proposal in the 1999 GMP/FEIS, the watershed restoration projects listed above, and similar road removal and watershed restoration projects throughout the north coast region aimed at restoration of salmonid habitat indicate broad public support for such projects. Public Scoping for this project was held from April 8, 2019 to April 22, 2019. No comments were received during the open comment period. The impact topics addressed in this EA are the same as those addressed in the more extensive Lost Man Creek restoration project.

Compliance with Floodplains and Wetlands Executive Orders

The NPS carries out its responsibilities to manage floodplains and wetlands in compliance with Executive Orders 11988 “Floodplain Management” and 11990 “Protection of Wetlands” under procedures described in Director’s Orders #77-1 Wetland Protection and #77-2 Floodplain Management and their associated implementation manuals. A Statement of Findings (SOF) for effects to Floodplains and Wetlands will not be prepared for this project. The purpose of the proposed action is to remove the last segment of a road and associated drainage structures that degrade the natural floodplain and wetland values associated with Larry Damm Creek, and to restore natural floodplain and wetlands functions and values in a small area. Actions designed specifically for the purpose of restoring degraded natural wetland, stream, riparian, or other aquatic habitats or ecological processes are exempt from the NPS requirement to prepare a wetland SOF. Actions located in floodplains that involve little physical development and do not involve overnight occupation are exempt from the NPS requirement to prepare a floodplain SOF.

ALTERNATIVES

This environmental assessment analyzes two alternatives, no action and the proposed action. Several other alternatives were considered but not carried through full analysis because these alternatives did not meet the purpose and need for the project (Appendix A). Under the proposed action, the last remaining segment of the Lower B500 road, the relocatable Bailey bridge, and the log stringer bridge and associated wood abutments would be removed. Under a no action alternative, the road and bridge would remain in place.

Alternative 1 (proposed action): Remove Lower B500 Road

Under the Proposed Action, this project will remove the remaining segment of the Lower B500 road in the Larry Damm Creek watershed, immediately upstream of the confluence of Larry Damm Creek with Lost Man Creek.

Specific Project Goals:

1. Remove 0.8 mile of the Lower B500 road in the Larry Damm Creek sub-watershed. By effectively removing these erosion problems, no future road treatment work will be needed in the Larry Damm sub-watershed.
2. Restore hill slope topography, hydrology, and conditions for the growth of native vegetation.
3. Excavate and stabilize an estimated 15,000 cubic yards of fill material from stream crossings, swales, and unstable slopes.
4. Protect water quality and designated critical habitat for three federally listed anadromous salmonids.
5. Minimize disturbance to 8.2 acres of riparian forest along the main stem of Larry Damm Creek. Trees that appear to be on more stable fill slopes (<35%) would be left in place.
6. Remove modular (Bailey) bridge that will be available for other projects.
7. Remove log stringer bridge and abutments.
8. Place large logs in channel, where access allows, to improve salmonid habitat.

Generalized Methods

Methods will focus primarily on excavation and stabilization of road fill material that poses an erosion risk to aquatic resources. This entails removing road fill from stream channels and swales, stabilizing road fill that was placed along the outer portion of the road, and restoring natural hill slope topography and drainage patterns. Stream channels will be excavated to original width, depth and channel grade to channel indicators. The excavated stream channel side-slopes will generally match and blend with the undisturbed, natural slopes above and below the road. Road reaches between stream channels will be reshaped with excavated road fill material placed on the road, against the cutbank or, where hill slopes are potentially unstable, moved to stable locations (export outslope-EOS and outslope-OS). Upon completion of earth moving, bare soil areas would be mulched to reduce erosion of newly disturbed soils. Mulch would be composed of the vegetation removed along the roadsides during excavations. Revegetation of the area would occur naturally from the local seed sources in the mulch and from the adjacent areas.

Road removal activities would begin on or shortly after September 16th in the year of work. The entire project is expected to be completed in one season but may require a second season if rainy weather slows progress during the first season of work. Work would begin at the far (northern) end and proceed southward towards the Lost Man Picnic Area. If work is not completed by October 15 and a period of dry weather is predicted, an extension will be requested from the regulatory agency and work would be implemented within the window of predicted dry weather. NOAA's Fall Transition Season Precipitation and Hydrology Decision Support Service notifications would be consulted as they become available to ensure the project is completed or

fully winterized prior to the onset of fall rain. All site surfaces would be shaped to provide free draining runoff, with no ponding or un-natural concentration of water, and protected with mulch.

Heavy equipment would be inspected daily to check for leaks. Equipment that may leak lubricants or fuels would not be used until the leaks are repaired. All equipment would be stored, serviced and fueled outside of riparian areas and away from stream crossings. Heavy equipment would be cleaned (e.g., power washed, steam cleaned) prior to use below the ordinary high water mark.

Stream Crossing Treatments

There are four stream crossings identified for treatment (Figure 2 and Table 1). Estimated fill to be excavated ranges from 1,200 cubic yards (CY) to 2,450 CY of fill. The fourth stream crossing (SX03) is a failed log stringer bridge and contains approximately 1,750 CY of road fill. Total fill volume is estimated to be 6,600 CY. Excavating the fill from the stream crossings would prevent approximately 6,000 CY from being delivered to streams. Fill excavated from the stream crossing would be placed in outslope reaches. The area of disturbance from excavating all stream crossings was estimated at 1.1 acres (ac) (Table 1).

Stream crossing excavations entail removal and disposal of road fill, the culvert, if there is one, and woody debris from a stream channel. Fill removed from the crossing would be moved to an outslope reach by pushing it with a dozer or hauling it there. The following bullets outline generalized operational steps to be taken at stream crossings:

- Vegetation growing in the crossing fill would be removed; this vegetation could consist of herbs, shrubs, and trees. Trees would be used later as in-channel structures or as mulch on banks.
- Bulldozers would remove as much road fill as possible. Fill would be moved to a stable location. The stream channel would not be disturbed when water is present.
- An excavator would remove the remaining fill in road prism and channel, and excavate any remaining fill from the channel.

The excavated material from stream crossings would be shaped to blend with the surrounding land. The finished stream crossing excavation would approximate the original (pre-road construction) stream channel profile and side bank configuration as much as feasible (Figure 3). Generally, the original buried topsoil and channel armor beneath the road fill would be exposed during stream channel excavation and left intact when feasible to do so. Large woody debris uncovered during the excavation and cut trees would be placed in the restored channel and on the side slopes providing both sediment control and habitat complexity.

Bare soils adjacent to live channels would be treated for surface erosion as prescribed in the Watershed Restoration Erosion Control and Monitoring Plan (Klein and Spreiter 2002). Streams with significant surface flow capable of sediment transport will be diverted around excavation areas. Streams with subsurface seepage through the buried streambed gravels are not diverted because streamflow is not disturbed during excavation. Most of the time when a culvert is present water is kept flowing through the culvert as long as possible. When a culvert is near the center of the crossing, it is removed section by section, as the excavator works its way up the

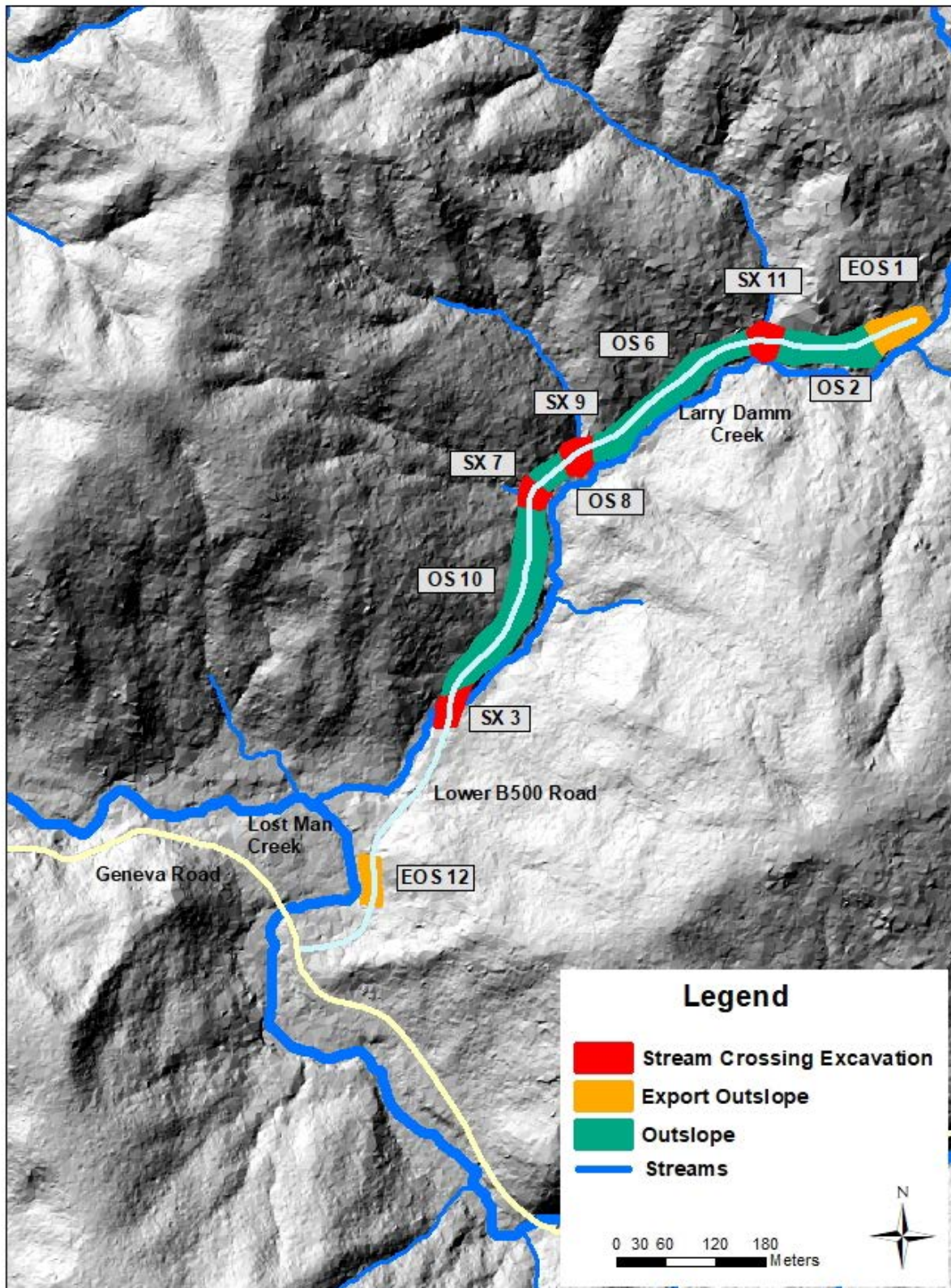


Figure 2. Project Map

Table 1. Stream crossing treatment estimated excavation road fill volume, disturbance area, channel length and distance from Larry Damm Creek.

Stream crossing ID#	Excavation volume (cy)	Deliverable volume (cy)	Disturbance area within 100 ft. either side of stream (ac)	Channel excavation length (ft)	Distance to Larry Damm Creek (ft)
SX 11	1200	1100	0.3	100	<50
SX 9	2450	2200	0.2	110	<50
SX 7	1200	1100	0.3	135	<50
SX 3	1750	1600	0.3	145	<50
Total	6600	6000	1.1	490	N/A

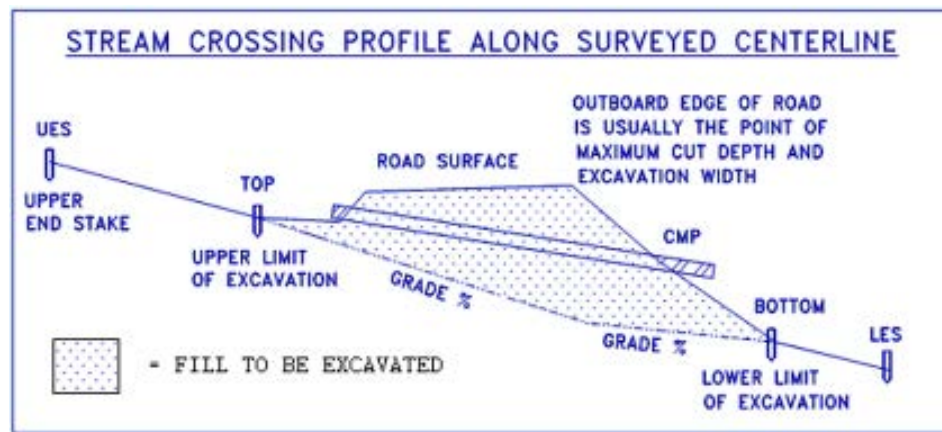


Figure 3. Designed stream crossing excavation profile.

channel; thus water is only allowed to flow on the finished stream channel excavation, and not on partially excavated areas. If there is no culvert, the water is generally flowing along the old channel bottom, buried at the base of the fill. The crossing is still excavated from the downstream end up so that water emerging from the base of the fill is released into the finished channel. When an excavation nears its upstream end, water must flow across a partially excavated area for a brief period while the excavation at the top of the crossing is completed.

Excavated stream channels will likely experience adjustments, mostly during the first winter following excavation. Any remaining road fill and original streambed may be mobilized. Small portions of channel side banks may settle or slide. The original channel bed substrate may adjust in response to the logging slash up and downstream of the excavation site.

Decaying logging slash or natural organic debris may collapse, causing a small chain reaction up and downstream. Much of the material mobilized during these adjustments is trapped by the large woody debris encountered during excavation that is placed back into the channel and augments the natural channel armor. Large wood would be placed in two areas: the main channel

within habitat, or within tributaries to store and meter out sediment from channel adjustment. Woody debris will be placed on the ground adjacent to streams to provide ground cover, reduce surface erosion and provide habitat for seedlings, fungi, microorganisms, invertebrates, birds, amphibians, and small mammals. Removed vegetation would be stockpiled for surface erosion control in areas adjacent to streams after final shaping of excavation and fill areas. Vegetation is primarily coast redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), red alder (*Alnus rubra*) and tanoak (*Notholithocarpus densiflorus*).

Export Outslope Treatments

Two road segments within the project area are proposed for Export Outslope (EOS) treatment (Figure 2). Combined, the EOS reaches total 430 linear feet of road and entails excavation of approximately 1,500 CY of road fill that would prevent this amount from eroding and transporting downslope causing damage to terrestrial and aquatic habitat. Fill excavated from the EOS reaches would be placed in stable outslope reaches. The estimated area of disturbance from export outslope treatments is 0.8 acres (Table 2).

Export outslope treatments remove fill at the outboard portion of the road bench with some or all of the excavated material pushed by a dozer or hauled by dump trucks to a stable location. Either the entire road bench width or only the outboard portion of the bench would be removed (Figure 4). Generally, the original buried topsoil beneath the fill would be exposed during excavation. Any fill that would remain locally on the bench would be placed in a stable location, shaped to re-create or mimic the pre-road construction landforms (ridges, swales, etc.) and create a free draining surface.

Table 2. Export Outslope treatment estimated excavation road fill volume, disturbance area, channel length and distance from Larry Damm Creek.

EOS ID#	Excavation volume (cy)	Deliverable Volume (cy)	Disturbance area (ac)	Length of road reach treated (linear Ft.)	Distance to Larry Damm Creek (Ft.)
EOS01	700	700	0.5	225	<100
EOS12	800	800	0.3	205	<100
Total	1500	1500	0.8	430	N/A

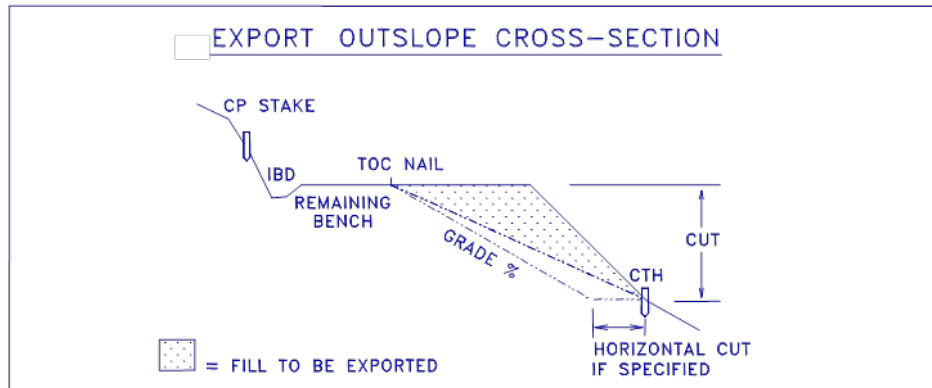


Figure 4. Designed export outslope cross-section.

Outslope Treatments

Four road segments within the project area are proposed for Outslope (OS) treatment (Figure 2). Combined, the OS reaches total 2,115 linear feet of road and entails excavation of approximately 6,200 CY of road fill. Excavating the fill from the EOS road reaches would prevent approximately 420 CY from eroding and transporting downslope causing damage to terrestrial and aquatic habitat. Fill excavated from the adjacent stream crossings and EOS reaches would be incorporated into the fill site areas of the outslope reaches (the upslope side of outslope treatment area). Outslope treatments, including all fill areas within the outslope reach, the fill from stream crossing excavations, and from EOS treatments would disturb an estimated 4.9 ac (Table 3).

Table 3. Outslope treatment estimated excavation road fill volume, disturbance area, channel length and distance from Larry Damm Creek.

OS ID#	Excavation volume (cy)	Deliverable volume (cy)	Disturbance area (ac)	Length of road reach treated (linear feet)	Distance to Larry Damm Creek (Ft.)
OS02	1800	90	1.0	375	<50
OS06	2200	110	1.5	760	<50
OS08	700	150	0.3	140	<50
OS10	1500	70	2.1	840	<50
Total	6200	420	4.9	2115	N/A

An OS treatment removes fill material from the outer edge of a road or landing and stores this fill locally on the remaining road or landing bench (Figure 5). Generally, the original buried

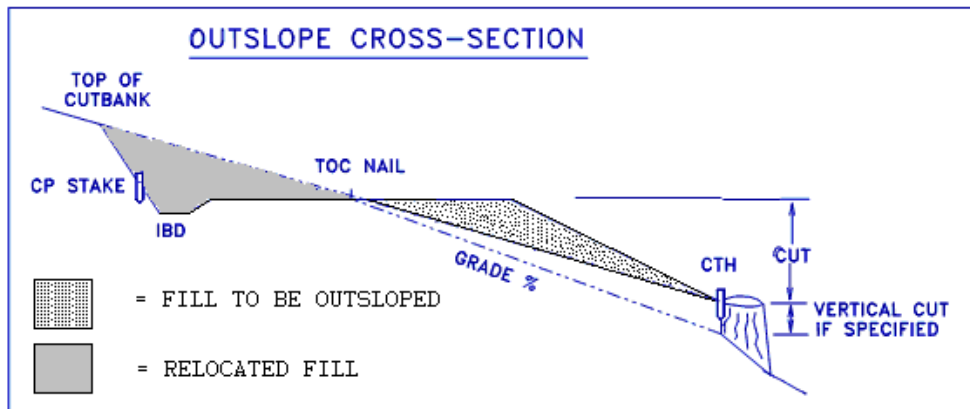


Figure 5. Designed outslope cross-section.

topsoil beneath the fill would be exposed during this process. The excavated fill would be placed in a stable location and shaped to re-create the pre-road construction landforms and provide for a naturally draining surface.

Temporary Bailey and Log Stringer Bridges

The road crosses Larry Damm Creek at a bridged crossing. The crossing is composed of a failing log stringer bridge that has a temporary Bailey bridge that was placed over it by the NPS for access during the larger, completed restoration effort in the Larry Damm Creek watershed. The park proposes removing both bridges. The Bailey bridge would be dismantled and hauled off site. The log stringer bridge removal entails excavation of fill packed behind the abutments and removal of the abutments and log stringers. Some road fill remains on the log stringers although the bulk of it has eroded off the logs. The volume of fill remaining is estimated at between 5 and 20 cubic yards. The 6 log stringers are approximately 50 feet long, and average 3.5 to 4 feet diameter. The abutments are composed of logs and milled wood. Some logs may be suitable for placement in the channel as habitat, where access to channel allows. The park has not yet identified how many logs would be suitable or identified locations for log placement. It is likely that equipment will need to cross the stream during the removal of the bridge and abutments. It is feasible that the equipment crossing will occur up to six times, by an excavator, but possibly more times depending on the dismantling approach.

Diversion of all fish around the work site will be accomplished by installing temporary fish exclusion fences that will direct all fish away from the active work site. Immediately upon completion of bridge removal, all structures associated with the temporary fish diversion will be completely removed from the channel (see fish relocation plan). All fill and man-made materials associated with crossings (culverts, cables, etc.) will be completely exported from the channel and adjacent sidebanks and placed in stable locations identified and delineated prior to initiation of equipment operations.

Vegetation disturbed during excavation will be stockpiled and dispersed along the finished surfaces of both the fillsites and restored channel in order to prevent post-excavation surface

erosion and to provide habitat and simulate natural forest litter. Additional organic material will be imported to supplement ground cover and further protect exposed finished slopes from post-excavation surface erosion.

Table 4. Lower B500 Road removal project summary of the length and area of disturbance, estimated fill volumes to be excavated, and the volume of sediment delivery prevented from entering streams

Total Length of road to be treated (mi)	0.8
Stream Crossings	
Number of stream crossings to remove	4
Stream crossing fill volume to excavated (cy)	6,600
Sediment volume that will be prevented from eroding and prevented from delivery to streams (cy)	6,000
Road segments between stream crossings	
Length of road to be treated (ft)	3,785
Estimated excavate road fill (cy) EOS = 1500: OS = 6200: HI = 700	8,400
Sediment volume that would be prevented from eroding and prevented from transport downslope (cy) EOS = 1500; OS = 420; HI=100	2020
Sediment volume from stream crossings and road segments saved from entering aquatic habitat (cy)	8,020
Sediment volume from stream crossings and road segments that would be prevented from eroding that would damage terrestrial habitat (cy) .	15,000
Total Disturbance Area	
Area of disturbance from project (ac)	8.2
Area of disturbance in riparian buffers (acres)	8.2

Methods to Minimize Surface Erosion Impacts

To prevent erosion and sediment transport from the Lower B500 road, all road fill from stream crossings and from the outboard edge of the road would be removed as described above. Standard BMPs for road removal and upgrade work would be employed to minimize or eliminate the potential for surface erosion from the project site. BMPs were developed using, and are based on, RNP studies from the park's watershed restoration downstream turbidity monitoring during road removal work in Lost Man Creek from 2003 to 2011 (Holden 2006, Klein 2012). BMPs also would include the use of *Post-Excavation Erosion Control Guidelines, Redwood National and State Parks* (Klein and Spreiter 2002) also known as the park's "mulching guidelines."

Ground cover would be applied on all bare soil areas within the project area and woody debris would be placed in excavated channels after primary treatments are completed. This wood would augment the abundance of logging debris and naturally occurring debris in unlogged areas currently in the channels downstream of the proposed excavation reaches. The abundant logging debris and naturally occurring debris existing in the channels below the excavations provides temporary coarse sediment storage. These practices, plus wood left on slopes to catch sediment and the use of abundant, localized, in-channel sediment storage sites along 50ft of rocky/woody channel below the stream crossing sites, would reduce potential sediment effects to downstream reaches in Larry Damm and Lost Man Creeks. Wherever original ground may not be encountered, excavations would be shaped to conform to adjacent topography to allow for dispersed surface runoff and assure runoff would not be concentrated in areas that would result in sediment transport.

Work would be limited to the late summer/early fall period from September 16th through October 15 unless unseasonably wet or dry weather causes an adjustment to the later date. NOAA's *Fall Transition Season Precipitation and Hydrology Decision Support Service* notifications would be consulted as they become available to ensure the project is completed or fully winterized prior to the onset of fall rain. All site surfaces would be shaped to provide free draining runoff, with no ponding or un-natural concentration of water, and protected with mulch.

Surface Erosion Control

All bare soil would be covered with mulch composed of native stockpiled vegetation debris removed from the road corridor immediately prior to road excavation. Additional mulch, such as straw or shredded redwood bark would be added to the sites where sufficient downed vegetation doesn't exist. BMPs to reduce import of invasive species would be followed (NPS 2017c). Mulch would be applied heaviest in areas near streams and on steeper slope areas.

Where surface erosion control is most critical, equipment operators would be instructed to "mash" the woody debris to increase ground contact. If needed, hand crews would cut and lop debris that is suspended to further increase ground contact. Woody debris scattering may be supplemented with imported mulching material (shredded bark, wood chips, etc.) to achieve the needed ground cover. Weed free mulch may be imported and spread over small gaps in woody debris application.

Channel Erosion Control

Channel erosion control measures that would be implemented include finding original channel structure, supplemented by large woody debris placement. The best case scenario for avoiding significant channel adjustment (scour) is successful excavation of original channel beds and banks, which is usually possible. Large wood encountered during excavation would be placed in arrangements that mimic natural accumulations observed in stream channels; in most cases, abundant woody debris would likely be available for placement in stream crossing excavations. While channel scour would occur even with woody debris placement, the extent of scour would be minimized since much of the sediment would be trapped within the excavated reach behind woody debris, and the channel would have the structural elements needed to re-establish a natural morphology relatively quickly.

Fish Relocation for Bailey Bridge Removal

The following steps shall be followed in the listed order for coordinating timing of fish relocation during the Bailey bridge removal on Larry Damm Creek.

- Fish exclusion fencing shall be installed on the upstream and downstream edges of the work area, far enough from the construction area so as not to be disturbed by the construction activities. Care will be taken to ensure the bottom of all exclusion fencing is securely attached to the stream bottom with no gaps that can allow fish to enter the exclusion area.
- A first attempt to capture fish stranded within exclusion zone-construction area shall be made using seine nets and dip nets, where possible, and, if necessary, electrofishing.
- Another attempt shall be made to capture any remaining fish the following morning.

Prior to capturing fish, the most appropriate release location shall be determined. Suitable areas shall be identified based on quality of habitat, risk of predation, stranding, and water quality using the following order of preference:

- In Larry Damm Creek upstream of the work area
- In Larry Damm Creek downstream of the work area
- In the mainstem of Lost Man Creek, approximately 500 feet downstream of the work area.

Initial fish relocation efforts should be performed 3-5 days prior to the start of construction. This provides the personnel an opportunity to return to the work area and perform additional electrofishing passes prior to construction. A second attempt, the morning following the initial endeavor, should be made to capture any remaining fish.

Fish shall be excluded from re-entering work area by blocking the stream channel above and below the work area with fine-meshed net or screens. Mesh size should be no greater than 1/8". The bottom edge of the net or screen should be completely secure to the channel bed to prevent fish from re-entering work area. Exclusion fencing should be placed in areas of low water velocity to minimize impingement of fish. Screens should be checked periodically and cleaned of debris to permit free flow of water. The following additional protocols will be implemented:

- Periodically measure air and stream temperatures. Cease activities when water temperatures exceed 68 degrees Fahrenheit (20°C).
- Minimize handling of salmonids. When handling is necessary, always wet hands or nets prior to touching fish.
- Place captured fish in cool, shaded, aerated, dark colored containers filled with cool, clear water. Provide aeration with a battery powered external bubbler. Protect fish from jostling and noise and do not remove fish from this container until time of release. Release fish when the container reaches capacity or within one and a half hours after capture.
- Place a thermometer in the holding container, and periodically conduct partial water exchanges, if water temperature gets too warm or there is more than an hour of delay between when the holding container was brought to maximum capacity and the time of release.
- Avoid overcrowding in containers. Have at least two containers and segregate young of the year fish from larger age classes to avoid predation. Densities shall not exceed 5 fish

per gallon of water in each container. If found, place large amphibians, such as Pacific Giant salamanders, in the container with the larger fish.

- Cease capture, and release listed salmonids when containers are filled to capacity.
- Visually identify species and estimate year classes of listed salmonids at time of release. Do not anesthetize or measure listed salmonids.
- If mortality during relocation exceeds 5% of fish captured, efforts will cease and NOAA Fisheries shall be contacted.

Alternative 2: No Action

Under the No Action alternative, the remaining 0.8 mile of the Lower B500 road would not be removed. The road is identified as the lowest tier in the park asset management plan that prioritizes funding for road maintenance. When the culverts and log stringer bridge fail, they would be removed provided that heavy equipment access is available.

ENVIRONMENTAL CONSEQUENCES

This section examines the effects of the alternatives for removal of the Lower B500 road on the natural and cultural resources in the project area, the park ecosystem, park visitors, park operations, and adjacent communities. These effects are discussed in relation to other past, present, and reasonably foreseeable actions related to the alternatives and to the resources in the parks and the region.

Methodology

Impacts on a particular resource are predicted based on impacts observed and measured from similar projects, relevant scientific research and publications, and best professional judgment of park specialists with expertise in geology, soils, botany, plant ecology, wildlife and fishery biology, and cultural resources. Impact analyses based on best professional judgment of park resource managers are derived from their analyses of effects of restoration actions within and outside of RNP, including past monitoring; discussions with knowledgeable local and regional botanists, forest ecologists, geologists, biologists, and cultural resource and watershed restoration specialists; and reports and studies prepared by academic, industry, and government agency personnel with expertise in the above subjects.

Impact Definitions for Natural Resources

Impacts are analyzed according to the type of impact (beneficial or adverse), the timing and duration of impact (short-term, long-term, one-time, occasional, and repeated) and the severity or intensity of impact (no effect, negligible, minor, moderate, or major). These factors are also considered in the context of the geographic location of the park and the region.

Context – The context of an action includes consideration of the effects on resources in the project area, and on similar resources within Redwood National Park, the local area surrounding the park, and the region.

The geographic context of an impact includes consideration of the project area, the parks as a whole, and local and regional conditions.

Timing and Duration – The timing of an impact is also part of its context. For example, removing brush and trees along a road in October does not affect nesting birds but brushing the same road in June would affect any birds that might be nesting in the vegetation.

The duration of an impact considers whether an effect would happen immediately, the length of time over which an impact occurs, and how long it would be noticeable. Duration is defined as short-term or long-term, although the duration of an effect is related to the resource affected. In general, long-term effects would be those that are repeated over at least several years or that would not be immediately noticeable.

Type – The type of impact describes whether an action would benefit or harm a resource. A beneficial effect improves the condition of a resource, protects it from damage or loss, or favors the persistence of a resource. A harmful or adverse effect is one that worsens the condition of a resource, damages or degrades a resource, leads to the loss of the resource, alters it irretrievably in an undesirable way or changes its essential character so that the resource no longer possesses integrity or its defining characteristic. Adverse effects are unfavorable to the conservation and preservation of the resource.

Intensity – Intensity, degree, or severity of an impact refers to how much of an effect an action has on a resource. Major effects are considered significant. Determining intensity relies on understanding the range of natural variation of a resource. If an action has no effect on a resource, or if the effect is barely noticeable or measurable, the effect is considered negligible. Negligible effects are those that are unnoticeable, undetectable, or result in no change to a resource, or that affect so few individuals that the effect cannot be distinguished from the natural variability for a resource. Significant effects are always noticeable and result in a permanent change to a resource over a large area.

Levels of change between negligible and significant are described as minor or moderate. Minor changes to a resource are detectable but there is no long-term or permanent alteration of the resource and the changes are within the range of natural variability. Minor effects are generally noticeable but result in only a slight change to a resource or occur in a small area, and do not change resource function.

Moderate effects are always noticeable, and result in some change to the resource or its function, and occur in several areas. If an action changes the resource completely or a change is irreversible, the effect is considered significant or major. Actions are more likely to result in a gradient of change rather than a distinct level of change, so that some effects may be judged “minor to moderate” to indicate that portions of a resource in different locations might be affected slightly differently by the same action. For natural resources that are distributed discontinuously across a landscape or where individual elements of a resource are not exactly equivalent to other individuals or pieces of the same resource, a range of effects from a single action is likely.

For sensitive wildlife and plants, there are two sets of definitions for intensity. The definitions used in this EA are based on the NEPA regulations (40 CFR 1500, *et seq.*) and the NPS guidelines for implementing NEPA. The USFWS uses a second set of definitions to accompany

its determinations of effect based on its regulations for implementing the Endangered Species Act. Negligible effects on listed species for the purpose of this EA are defined as those that are unnoticeable or that the USFWS has determined to have “no effect.” The USFWS has defined a “no effect” determination as the “appropriate conclusion when the action agency determines its proposed action will not affect listed species or critical habitat.” USFWS defines impacts that result in a determination of “may affect but not likely to adversely affect” as “discountable or insignificant”; these effects are defined in this EA as minor. Adverse effects occur if impacts are not discountable, insignificant or beneficial. Impacts that are determined to be adverse but can be lessened or minimized, even though incidental take may still result, are considered moderate. An effect that is determined by the USFWS to result in jeopardy to a listed species is defined as major or significant. Impacts on anadromous salmonids are defined using the same terms as for terrestrial species listed under USFWS regulations.

Cultural resources are defined as archeological resources, prehistoric or historic structures, cultural landscapes, and traditional cultural properties. These resources are called “Historic Properties” when they are either listed in or are determined eligible for listing on the National Register of Historic Places. Criteria for determining eligibility of listing such resources on the National Register include the following:

- A. that are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. that are associated with the lives of persons significant in our past; or
- C. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. that have yielded or may be likely to yield, information important in prehistory or history.

Potential impacts to historic properties either listed in or eligible to be listed in the National Register of Historic Places for this project were identified and evaluated in accordance with the Advisory Council on Historic Preservation’s regulations implementing §106 of the National Historic Preservation Act (36 CFR 800, *Protection of Historic Properties*) by (1) determining the area of potential effects; (2) identifying resources present in the area of potential effects that are National Register listed or eligible; (3) applying the criteria of adverse effect to affected resources; and (4) considering ways to avoid, minimize or mitigate adverse effects.

Air Quality and Climate

Air quality in RNP is considered good to excellent because of the low population, scarcity of pollutant sources, and prevailing westerly ocean winds. Redwood National Park is designated as a Class I airshed pursuant to Part C of the Clean Air Act, as amended (42 USC 7401 *et seq.*). The largest source of greenhouse gasses (GHG) in the project area is emissions from mobile combustion, primarily vehicles burning fossil fuels. Non-park sources of transportation-related mobile combustion also contribute to GHG levels adjacent to the project area.

In general, air quality in RNP and the surrounding area meets or exceeds standards set by the EPA because the prevailing winds come from the northwest across the ocean where there are no

emission sources. Air quality returns quickly to very good to excellent after vehicles and equipment cease operating or stirring up dust.

Effects of the Proposed Action Alternative – Under the proposed action, there would be emissions from vehicles, heavy equipment, and gas-powered tools. Vehicle emissions would meet air quality standards required for operation in California. Emissions from vehicles and from gas-powered tools would be negligible, provided the vehicles and tools are in good working order.

Emissions and dust would be localized, temporary and repeated while work is performed, and repeated over the duration of the project. The overall effect on air quality would be adverse and short-term because no significant air quality related values would be affected outside the immediate area where work is being conducted and the dust would be a temporary condition.

Effects of the No Action Alternative – Under this alternative, there would be no dust generated or emissions from vehicles and heavy equipment used for restoration.

Cumulative Effects – Other sources of air pollution in or near the park include emissions generated by vehicles using public roads and highways that pass through the park, emissions from wood stoves, dust from vehicles on unsurfaced roads in and adjacent to the park, smoke from prescribed fires in and adjacent to the park, and smoke from wildfire. Smoke from prescribed and wildland fires are temporary and generally localized. However, large wildland fires can create unhealthy air quality that persists for several weeks, particularly in the Klamath and Trinity River valleys east of the parks. Wildland fires typically occur during late summer and early fall, prior to the onset of the rainy season. Prescribed burns are conducted under permit from the North Coast Regional Air Quality Control Board, which monitors air quality to ensure that air quality is protected.

Conclusions: Effects on Air Quality – The proposed action would not have long-term or widespread adverse effects on air quality or air quality related values in the parks. Adverse effects on air quality would be localized along the road, temporary during the work periods, and negligible.

The no action would not have any effect on air quality or related values.

Topography, Geology, and Soils

The topography of the project area is relatively gentle, and the sediment tends to accumulate in broad, meandering stream valleys. The project area is underlain by the Plio-Pleistocene aged Prairie Creek Formation. This formation represents the onshore and nearshore portion of an extensive sedimentary sequence deposited near the mouth of the ancestral Klamath River. It is dominantly composed of unconsolidated fluvial sediments but also includes nearshore marine, beach, and estuarine deposits.

Topography and soils in the project area was altered by construction of the Lower B500 road. Soils in the project area have been previously disturbed by road construction and tractor logging.

Tractor logging and road construction prior to park establishment resulted in erosion of bare soils, alteration of soil horizons, and interruption of soil formation processes.

Effects of the Proposed Action Alternative – Removing 0.8 mile of road would reduce the potential for road failures that adversely affect soils and topography. The adverse effects on soils, topography and geological resources would be reduced by removal of the Lower B500 road and the topography is restored to resemble original conditions.

Approximately 15,000 cy of earthen fill material would be excavated along the road, swales, and stream crossings (Table 4). The estimated area of disturbance is about 8.2 acres. Approximately 8,000 cy of sediment from stream crossings and road segments will be saved from entering aquatic habitat. Depth of excavation varies, depending on the depth of the original excavation along a slope, swale, or stream crossing. Although soil recovery would be set back in areas where the ground is redisturbed for road removal, the original topsoil would be recovered during excavation and repositioned.

Wherever feasible, organic soil from excavated fill would be placed on the regraded surface to enhance recovery of native vegetation. Trees, shrubs, and other organic nutrient-rich material encountered during excavation would be stockpiled and spread over the finished surface to reduce erosion and provide habitat for seedlings, fungi, and microorganisms that contribute to soil formation. Guidelines for mulching are described in detail elsewhere (NPS 2016) and the park will adhere to these standards.

Effects of the No Action Alternative – Under the no action alternative, there would be no new effects on soils, topography or geological resources because there would be no removal of the Lower B500 road. Adverse effects on altered topography and soils from past logging and road construction in the project area would continue. Soils would continue to recover over decades to centuries. The road would continue to degrade without maintenance. Eventual failure would cause moderate to significant damage to topography and soils, depending on the magnitude of the failure.

Cumulative Effects on Topography, Geology, and Soils – Cumulative effects on topography, geology, and soils in the project area and much of the other parkland in the Redwood Creek basin from road construction associated with logging prior to park establishment and expansion, and from road failures associated with unmaintained legacy roads are widespread over about 50,000 acres, adverse, have persisted over more than 50 years since logging occurred, and in many cases worsened as legacy roads failed. These effects are gradually being reduced as watershed restoration and road removal projects are undertaken, as vegetation reestablishes, and as soils recover (NPS 2006a, 2007a, 2009c, 2010a).

Conclusions: Effects on Topography, Geology, and Soils – Under the proposed action, road removal would have short-term localized adverse effects on soils from excavation of 15,000 cy over 8.2 ac. These effects are minor because the soils are previously disturbed. Long-term effects on soils and topography from removing the Lower B500 road would be beneficial throughout the project area by reducing erosion and the likelihood of road failures, and by recovering and repositioning topsoil to speed regrowth of vegetation. Removing 0.8 mile of road and restoring

the original landform would be a long-term significant benefit to topography in the former road corridor and to stream channels at road crossings. Over the long-term, beneficial effects on soils would be moderate where topsoil is recovered and repositioned on the restored landforms.

Under the no action, adverse effects on topography and soils would continue with a potential for moderate to significant damage should the road fail.

Hydrology and Water Quality

Streamflow in the Larry Damm Creek watershed, is highly variable from year to year as a result of annual rainfall variations. Streamflow also varies seasonally, owing to the highly seasonal distribution of rainfall. Winter flood flows can be as much as four orders of magnitude higher than summer low flows.

Redwood Creek and tributaries in the basin has been identified as temperature- and sediment-impaired by the U.S. Environmental Protection Agency (EPA). In 1998, EPA Region 9 established a Total Maximum Daily Load (TMDL) for sediment for Redwood Creek under Section 303(d)(1)(A) of the Clean Water Act (EPA 1998). Larry Damm Creek is excepted from the temperature-impairment list but is identified as sediment impaired.

The Redwood Creek TMDL is used as a reference to ensure that watershed restoration in tributaries is consistent with the recommendations of the TMDL to protect the beneficial uses of Redwood Creek, particularly the cold water fishery. The position of Larry Damm low in the watershed relative to the entire mainstem of Redwood Creek means that restoration in Larry Damm Creek contributes less to the restoration of the mainstem of Redwood Creek than if tributaries higher in the drainage were being restored. However, Larry Damm Creek is proportionately more valuable than some other tributaries because it still contains streamside old growth redwoods in its lower reaches, good spawning habitat for threatened salmon and steelhead, and viable populations of these fish. The proposed removal of the Lower B500 is fully consistent with the recommendations in the Redwood Creek TMDL.

Effects of the Proposed Action Alternative – Removing 6,600 cy of fill from five stream crossings would prevent an estimated 6,000 cy of sediment from eroding and entering Larry Damm Creek, Prairie Creek, and eventually Redwood Creek. Excavating approximately 8,400 cy of fill for removal of 3,785 feet of road between stream crossings would prevent 2,020 cy of fill from eroding and eventually entering streams or being transported downslope in landslides. A total of 8,020 cy of fill would be prevented from entering aquatic habitat.

To prevent erosion and sediment transport from the Lower B500 road, all road fill from stream crossings and from the outboard edge of the road would be removed as described above (see Section IVA). Standard BMPs for road removal and upgrade work would be employed to minimize or eliminate the potential for surface erosion from the project site. BMPs were developed using, and are based on, RNP studies from the park's watershed restoration downstream turbidity monitoring during road removal work in Lost Man Creek from 2003 to 2011 (Holden 2006, Klein 2012). BMPs also would include the use of *Post-Excavation Erosion Control Guidelines, Redwood National and State Parks* (Klein and Spreiter 2002) also known as the park's "mulching guidelines." Ground cover would be applied on all bare soil areas within

the project area and woody debris would be placed in excavated channels after primary treatments are completed. This wood would augment the abundance of logging debris and naturally occurring debris in unlogged areas currently in the channels downstream of the proposed excavation reaches. The abundant logging debris and naturally occurring debris existing in the channels below the excavations provides temporary coarse sediment storage.

Effects of the No Action Alternative – The untreated Lower B500 road would continue to erode, with short-term and long-term adverse effects, depending on frequency, magnitude, and duration of storm events. These effects would accelerate over the long-term as the road ages. This alternative would not meet the intent of the park expansion legislation or achieve the goals of the Redwood Creek TMDL to reduce sediment sources that have in the past or are presently impacting the stream system and to implement associated reductions necessary to attain the numeric targets of the TMDL.

Hydrology and drainage patterns would continue to be altered by presence of the roads across the slope and by inadequate unmaintained drainage structures.

Cumulative Effects – The cumulative effects on hydrology and water quality in Redwood Creek in the park relate to past logging and road building, both within what is now the national park and upstream of current park boundaries.

Hydrology and water quality in Redwood Creek and tributaries, including the streams in the project area, were affected by road construction, clear-cut logging, and associated erosion and landsliding. These effects were widespread over about 43,000 acres altogether, between the 1950s through 1968 (park establishment) and 1978 (park expansion), adverse, and significant. These effects are gradually being reduced as watershed restoration and road removal projects are undertaken (NPS 2006a, 2007a, 2009c, 2010a) and as forest practices on private timberlands upstream of the park incorporate more extensive erosion control and other water quality protection methods.

Conclusions: Effects on Hydrology and Water Quality – There would be immediate beneficial effects on hydrology in the project area under the proposed action where the road and stream crossings are removed or upgraded to restore or improve drainage. These effects are moderate along the road and stream crossings that are completely removed. The beneficial effects on water quality of Larry Damm Creek would be minor under the proposed action. The effects on water quality under the proposed action, if sediment from newly excavated slopes and stream crossings is mobilized, may be adverse and short-term after the first few storms following restoration. These effects would be minor, because mulching would prevent or reduce erosion of newly excavated soils adjacent to stream channels. The long-term effects on water quality under the proposed action would have a minor long-term beneficial effects in Larry Damm and Lost Man Creeks from reducing the threat of road failure that would deliver sediment to the streams by preventing erosion of more than 8,020 cy that would damage aquatic habitat. The proposed removal of the Lower B500 is fully consistent with the recommendations in the Redwood Creek TMDL to reduce sediment input into Redwood Creek and its tributaries.

Under the no action alternative, there would be both short-term and long-term adverse effects to hydrology and water quality. Drainage patterns would continue to be altered by the road with a potential for 8,020 cy of fill entering Larry Damm Creek.

Floodplains and Wetlands

Two types of wetlands are depicted on the U.S. Fish and Wildlife 2013 National Wetlands Inventory (NWI) map of the project area, R3UBH and PFO1C. Most of the project area is mapped as R3UBH (Riverine, Upper Perennial, Unconsolidated Bottom, Semipermanently Flooded). This riverine wetland is present where the steep topography and narrow confined channels prevent the development of a floodplain. The topography also prevents development of a riparian area large enough to be shown on NWI maps. This wetland type is typical of streams of this size in the lower reaches of the tributaries of Lost Man and Prairie Creek. At the lowest end of the project, below the Bailey bridge, the valley broadens slightly as the road crosses into mapped wetland vegetation classified as PFO1C (Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded). This wetland classification is characterized by deciduous broad-leaved trees, typically big leaf maple and alder, where potent winter storms can flood into this zone, saturating soils for a portion of the year. Flooding does not persist, and the water table can vary from near surface to well below ground. This wetland vegetation type is typical of riparian zones throughout the lower Lost Man and Prairie Creek area.

Effects of the Proposed Action Alternative – Floodplain: There would be direct effects on the floodplain under the proposed action from the removal of the Bailey bridge. Indirect effects on floodplains in the main stem of Lost Man and Prairie Creeks downstream of the project area are described under cumulative effects.

Wetlands: Riparian zones along Larry Damm and Lost Man Creek were not destroyed because these areas were not logged, so the riparian zone in these reaches retained most of its original functions and values. The long-term effect on riparian wetlands in the project area from removal of the Lower B500 road would be a minor indirect benefit, but the greatest benefit to riparian wetlands relies on the effectiveness of watershed restoration at preventing erosion that would lead to landslides that could bury riparian areas and vegetation with sediment.

The isolated wetlands that form behind blocked culverts, filled stream channels, ditches with no outflow, and slumps in road fills are drained during watershed restoration. These ponds and puddles serve as breeding habitat for some amphibians, which are adversely affected by loss of this habitat. The overall effect on the forest ecosystem from loss of these isolated created wetlands is negligible because the wetlands are very small, are not an original component of the ecosystem, and have very limited functions and values. The adverse effect from loss of these wetlands is negligible compared to the potential adverse effects from road and/or stream crossing failures.

Effects of the No Action Alternative – There would be no new adverse effects on floodplains or wetlands under the no action alternative. Long-term, there could be new, adverse effects on stream function, including riparian wetlands, if the road and stream crossing in the project area fail.

Cumulative Effects – Significant adverse effects to riparian wetlands in what is now Redwood National and State Park resulted from logging and ranching, associated road construction, conversion to pasture, and road-related landslides. These effects are gradually being reduced as riparian areas recover from this past disturbance. No further watershed restoration projects are anticipated in the Lost Man Creek watershed. Restoration is being proposed in Prairie Creek on park lands and on private property (Mill A). Watershed restoration is proposed on 9200 acres in Prairie Creek by RNSP and will be implemented in 2019 that includes riparian planting and removal of roads in riparian zones. Separately, a restoration/visitor center development project on 115 acres will be implemented at the former Mill A property near the mouth of Prairie Creek. There would be a long-term moderate benefits to the wetlands and floodplains of Prairie Creek from these restoration projects, as floodplain areas continue to recover from the effects of widespread logging, ranching, road construction, and large damaging floods in the previous century, and riparian/wetland conditions dramatically improve post-restoration.

Conclusions: Effects on Floodplains and Wetlands – The benefit to floodplains and wetlands in under the proposed action would be negligible because the volume of sediment prevented from entering the Redwood Creek floodplain under the proposed action is very small relative to the erosion potential of the untreated sediment sources currently in the Prairie Creek watershed.

Small isolated palustrine wetlands would be removed from excavations to improve drainage on the upgraded road segments and to restore original drainage patterns where the road is removed. The primary function of these isolated wetlands is amphibian breeding habitat. The adverse effect from loss of these wetlands from restoring the original drainage pattern is negligible compared to the potential adverse effect of road and stream crossing failures that would release sediment downstream and downslope, resulting in loss of stream function, aquatic habitat, and more extensive loss of riparian wetlands.

The long-term effect on riverine wetlands in the project area from removal and upgrading of road segments would be a moderate benefit from restoring the original hydrology and drainage pattern, and minor where drainage is improved on upgraded road reaches. The greatest benefit to riverine and riparian wetlands relies on the effectiveness of watershed restoration at preventing erosion that would lead to landslides that could bury riverine wetlands in stream channels and adjacent palustrine riparian areas with sediment.

Under the no action alternative, there would be no new adverse effects on floodplains or wetlands under the no action alternative.

Vegetation

Vegetation is composed of native tree species including coast redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), red alder (*Alnus rubra*), and tanoak (*Notholithocarpus densiflorus*). The second growth riparian forest in the project area is dominated by red alder, Douglas-fir, and redwood. Vegetation includes an understory component of ferns, huckleberry (*Vaccinium* sp.), salmonberry (*Rubus spectabilis*), elderberry (*Sambucus* sp.), and cascara (*Rhamnus purshiana*).

Vegetation growing on the road and cut or fill slopes consists of an understory component of fern, huckleberry, salmonberry, elderberry, cascara, and an overstory of alder, tan oak and conifers including redwood, hemlock, Douglas fir and true firs. The trees that would be removed are not tall enough to reach into the lower canopy limbs of old growth on the edge of ground to be disturbed.

Effects of the Proposed Action Alternative – The proposed project is primarily within old growth forests. No old growth or large mature trees would be removed under the proposed action.

Approximately 8.2 acres of vegetation would be disturbed or removed. Vegetation impacted consists of an understory component of fern, huckleberry, salmonberry, elderberry, cascara, and an overstory of maple, alder, tan oak and conifers including redwood, hemlock, Douglas fir and true firs, growing on road surfaces, fill slopes, and cut banks. Approximately 6.2 acres of second growth trees on cut and fill slopes would be removed to restore the landform along the road. The trees to be removed are not tall enough to reach into the lower canopy limbs of the surrounding old growth. The 6.2 acres of understory vegetation affected are berries, other shrubs, young alder, and woody debris remaining from logging.

The vegetation removed would be stockpiled for surface erosion control in areas adjacent to streams after final shaping of excavation and fill areas. Park contracts for restoration work require removal of all vegetative matter or mud from the undercarriage or tracks of vehicles and equipment to prevent transmission of invasive plants or pathogens, especially the pathogens (*Phytophthora* spp.) that cause Port-Orford-cedar root disease and Sudden Oak Death. Vehicles or equipment that travel through or from infected areas in California or Oregon during project implementation would be cleaned before entering the park.

Effects of the No Action Alternative – There would be no effects on vegetation from road removal. As the roads continue to deteriorate without maintenance, road failures have the potential to cause landslides that would topple or bury vegetation. The adverse effect on vegetation from landslides would vary from negligible to major, depending on the volume and area of a landslide.

Cumulative Effects – Significant adverse effects on vegetation, including old growth redwood forests, in what is now Redwood National Park resulted from intensive widespread logging prior to park establishment and expansion. These effects are gradually being reduced through active forest management, primarily thinning in the South and Middle Forks of Lost Man Creek in the Prairie Creek drainage. The NPS in partnership with California State Parks and Save the Redwoods League is planning for forest restoration in the Lower Prairie Creek watershed. In the unlikely event of a wildfire in the project area, the 2015 Fire Management Plan calls for immediate suppression. Prescribed fire in the park is used primarily to maintain grasslands and oak woodlands in the Bald Hills and would not affect the project area. The NPS and California State Park actively manage invasive plants throughout Redwood National and State Parks to protect native plant species and native ecosystems, especially in the Bald Hills area of the national park and the ocean dunes along the beaches.

Sudden Oak Death disease is an emerging threat in Redwood Creek. Sudden Oak Death (SOD) is plant disease caused by a non-native pathogen *Phytophthora ramorum*. Tanoak, an important

species ecologically and culturally in the park and the region has no resistance to SOD. Several other native species, primarily California bay laurel, are not killed outright but serve as hosts for the pathogen. The disease is carried by windborne spores and could infect trees in the project area. Tanoak is an important food source for a variety of birds and mammals, as well as providing structural habitat for wildlife and arthropods. Loss or decline of this keystone species would have indirect impact on other species at all trophic levels as tanoak has no replacement in the assemblage of tree species that typically occur in the redwood forests of Redwood National Park. Tanoak is also an important ethnographic resource, considered sacred by native peoples. Tanoak extirpation, whether localized or otherwise, could represent a major cultural impact.

Conclusions: Effects on Vegetation – Approximately 8.2 acres would be affected for road removal some of which is road surface that is not heavily vegetated. Along the 0.8 mile of the Lower B500 road that would be completely removed, the vegetation would regrow on about 8.2 acres of the restored landform in several years (understory) or a few decades (trees). Alders would be first tree species to recolonize the restored area, followed by conifers.

Removal of vegetation under the proposed action would be a short-term localized adverse effect. All vegetation affected is common in the park and the region. No old growth trees would be removed. Trees to be removed have regrown after logging and road construction ceased in the 1960s and '70s. The short-term adverse effects on vegetation are negligible. Vegetation would regrow on about 8.2 acres where the Lower B500 road is removed; this would be a minor benefit over the long-term.

Under the no action alternative, there would be no effects on vegetation from leaving the road in place, however dependent on the size of a road failure effects would be negligible to major.

Fish and Wildlife

The project area contains suitable habitat for torrent salamander (*Rhyacotriton variegatus*), coastal giant salamander (*Dicamptodon tenebrosus*), ensatina (*Ensatina eschscholtzii*), and coastal tailed frog (*Ascaphus truei*).

Bird species confirmed in the project area include marbled murrelet, band-tailed pigeon, northern pygmy owl, pileated woodpecker, hairy woodpecker, Pacific-slope flycatcher, chestnut-backed chickadee, Steller's jay, common raven, wrentit, brown creeper, Pacific wren, varied thrush, hermit thrush, Swainson's thrush, golden-crowned kinglet, ruby-crowned kinglet, Hutton's vireo, Wilson's warbler, red crossbill, fox sparrow, song sparrow, hummingbird, hairy or downy woodpecker, and hermit or black-throated gray warbler.

Mammals likely to occupy the project area include gray fox, mountain lion, black bear, bobcat, coyote, long-tailed weasel, raccoon, striped skunk, chipmunk, Douglas squirrel, brush rabbit, woodrat, flying squirrel, vole, shrew, deer mouse, and several species of bats.

Effects of the Proposed Action Alternative – There would be short-term localized effects on wildlife from noise and disturbance from heavy equipment during construction. Some individuals of small, less mobile species such as invertebrates, amphibians, and small mammals would be displaced, or killed by heavy equipment. These species are common and widespread

throughout the park and the region. Larger more mobile wildlife would move out of the construction area during the day. Following construction activities, these species would repopulate areas disturbed by construction. Removal of vegetation would occur after the migratory bird nesting season.

Effects of the No Action Alternative – There would be no new construction-related effects to fish and wildlife. Roads and drainage structures would continue to age, erode, and eventually fail. Erosion from unmaintained roads and drainage structures would continue to threaten aquatic species.

Cumulative Effects – The logging that occurred in the project area prior to park establishment and expansion had significant adverse effects on certain terrestrial and aquatic species of wildlife. Small terrestrial species that are less mobile were directly affected by logging. More mobile wildlife species were indirectly affected by widespread loss of forest habitat. Aquatic species were directly affected where stream channels were blocked with Humboldt crossings and by sedimentation of streams from landslides and erosion from bare slopes, and indirectly affected by loss of shade after the forest canopy was removed, which caused the stream temperature to increase. The adverse effects of sedimentation continued after forest vegetation regrew. Several aquatic species that suffered major population declines from loss of forest habitat due to logging throughout their range were listed as threatened under the federal or California endangered species acts.

Conclusions: Effects on Fish and Wildlife – Under the proposed action, there would be short-term localized adverse effects on some aquatic species where stream crossings are excavated; excavations would occur during periods of low flow or when the intermittent streams are dry. There would be short-term adverse effects on wildlife from noise and vegetation removal in construction areas. Some individuals of aquatic species and small wildlife that are common in the area would be killed by heavy equipment. Wildlife would move back into the area following road removal. The effects on wildlife are negligible over the long-term.

Under no action, there would be no construction related effects to fish and wildlife short-term, but there would be minor to moderate effects to fish if the road were to fail.

Rare, Threatened, and Endangered Species

Plants: The project area contains running pine (*Lycopodium clavatum*), ranked by the California Native Plant Society as 4.1 (limited distribution or infrequent throughout a broader area in California; high degree and immediacy of threat.)

Three species of anadromous salmonids and two birds listed as threatened or endangered in the project area. For detailed information on life history, habitat requirements, status, and designated critical habitat for these species, refer to the biological assessments and reference document prepared by the NPS (NPS 2013, 2015, 2016, 2017a).

Fish: Three species of fish currently listed as threatened under the ESA may occur in the project area or be affected by the project. Critical habitat has been designated for all three species. Critical habitat occurs in the project area or may be affected by the project for these species:

- Southern Oregon/Northern California Coho Salmon (*Oncorhynchus kisutch*)
- Northern California Steelhead (*Oncorhynchus mykiss*)
- California Coastal Chinook Salmon (*Oncorhynchus tshawytscha*)

Wildlife: The marbled murrelet (federally listed as threatened and state listed as endangered) and northern spotted owl (federally listed as threatened) are known to occur in the vicinity of the project. The project area does not contain any designated critical habitat for these animals or any other listed terrestrial species. Detailed species accounts and habitat requirements for murrelets and spotted owls are found in the biological assessment of effects to threatened wildlife from this project (NPS 2013, NPS 2017a).

Effects of the Proposed Action Alternative – To reduce potential adverse effects on fish and fish habitat, the project would be conducted during late summer/early fall during low-flow periods when dry weather is expected. Fish Relocation protocols will be implemented 3-5 days before removing the Bailey Bridge to protect fish from harm. Exposed soils would be mulched with local vegetation removed as part of the project. Large woody debris would be placed in stream crossing excavations to minimize erosion and create structural elements needed to re-establish natural channel morphology. Minimization measures and best management practices would be implemented to reduce the likelihood of petroleum products entering stream courses.

There would be no effect on marbled murrelets or the northern spotted owls as the project will be implemented after the breeding season is completed for both species (September 16, 2019). No critical habitat for either northern spotted owls or marbled murrelets would be affected.

Effects of the No Action Alternative - There would be no construction-related effects on listed fish or wildlife species, or other special status fish and wildlife species. Effects on listed species from other activities not part of the proposed action are covered below under Cumulative Effects.

The no alternative would not provide protection for threatened salmon and steelhead, because the road would continue to degrade without maintenance and would eventually deliver sediment to the creek where fish are present. Eventual failure of the road bed could cause damage to fish habitat downstream of the project area in Lost Man Creek, if the failure is large enough.

Cumulative Effects - Cumulative effects on fish and wildlife species listed as threatened include effects from park projects conducted in vicinity of the Lower B500 project area and effects of activities undertaken by other entities outside park boundaries.

Cumulative effects on listed threatened fish and wildlife species are related to land use activities that have occurred throughout the region for over 100 years including timber harvesting and associated road construction, development, farming, ranching, and water diversions. Fish populations have also been affected by dams on streams and rivers outside park boundaries. Activities that have taken place throughout the ranges of fish and wildlife species have resulted in population declines and listing of species under the Endangered Species Act of 1973, as amended (ESA). Impacts of the activities on species resulting in listing under the ESA are considered adverse, wide-spread, and significant.

The NPS is seeking funding for several other road-related projects in Prairie Creek and Tom McDonald and Forty-four Creek watersheds of Redwood Creek. Projects are planned to remove 54 miles of haul road from the Prairie Creek watershed (over the next 15 years), and remove 1 mile of logging road (G-6-1) in the Tom McDonald Creek watershed, upgrading another 0.7 miles of the same road, and implementing maintenance treatments on 1.2 miles of another road in Tom McDonald and Forty-four Creek watersheds, replace eight culverts on a segment of the G Line in the Tom McDonald Creek watershed, and convert 1.7 miles of failing old logging road along Forty-four Creek into a sustainable, single track horse and hiking trail (in the next 5 years). Road removal and maintenance projects in the Prairie Creek and Redwood Creek watersheds would have long-term benefits to fish and fish habitat from reducing the potential for sediment delivery into creeks caused by failure of roads and drainage structures.

The NPS reported incidental take of marbled murrelets and northern spotted owls authorized by the USFWS for park programs and activities conducted in 2018, including annual maintenance of facilities, roads, and trails, and visitor use of campgrounds, trails, picnic areas, and trailheads. Approximately 3,243 acres of potentially occupied suitable marbled murrelet habitat at or within 500 feet to 0.25 miles, depending on the loudness of the noise source emanating from project activities, were potentially impacted by noise disturbance. Approximately 10,544 acres of suitable marbled murrelet habitat were subjected to an increased predation threat due to project activities and/or park visitor use.

Approximately 2,186 acres of unsurveyed spotted owl habitat at or within 500 feet to 0.25 miles, depending on the loudness of the noise source emanating from project activities, were potentially impacted by noise disturbance.

Conclusions: Effects on Rare, Threatened, and Endangered Species – There is no impact of the proposed action on threatened terrestrial species. There will be short term, adverse effects on fish during project implementation, however this project will incorporate BMPs, i.e. timing of work and use of fish relocation protocols during removal of the Bailey bridge, to minimize impact to fish and habitat.

There is no impact to the no action alternative on threatened terrestrial species. There would be long-term moderate to major impact to threatened fish habitat should the road fail.

Cultural Resources

A cultural resources inventory survey of the Area of Potential Effect (APE) was undertaken in 2015 by the Humboldt State University Cultural Resources Facility, under agreement with the NPS. The investigation included a records search and literature review of previous studies prepared for the Lost Man Creek watershed and the general vicinity. No specific resources were noted within one-half mile of the proposed undertaking. An intensive pedestrian field survey of the APE was conducted on November 11, 2014 and on February 23, 2015. The survey area covered approximately 16 acres.

The project is in Yurok ancestral territory and the NPS initiated consultation with federally recognized American Indian Tribes of the Big Lagoon Rancheria, Resighini Rancheria, Trinidad

Rancheria, and Yurok Tribe. In addition, the NPS consulted with the Yurok Tribal Heritage Preservation Office and the Yurok Tribe's Culture Committee of elders. No comments or concerns have been noted.

Although the Lower B500 Road and the associated structures such as the log stringer bridge are 50 years old, the NPS recommends that these resources do not meet the criteria set forth in the NHPA (36.CFR 60.4) for designation as a historic property. The road is not associated with significant events through its use in logging, or by NPS, and is not significant under NHPA Criterion A. Although the creek is named after a person, he is not an individual that has made significant contributions to history, and therefore the road is not significant under NHPA Criterion B. The techniques used in the construction of the road and associated structures were created efficiently by heavy machinery and are ubiquitous in the late 20th Century landscape, and therefore the road is not eligible under NHPA Criterion C. There is no evidence that the Lower B500 Road is significant under NRHP Criterion D. No other significant sites, structures, buildings, district, or objects were identified during this investigation that would qualify as a historic property in the NRHP.

Effects of the Proposed Action Alternative – No properties of historic or cultural significance have been identified, therefore No Effect on Historic Properties is expected from removing the road.

Effects of the No Action Alternative - There would be No Effect to Historic Properties from the No Action alternative. Roads and drainage structures would continue to age, erode, and eventually fail.

Cumulative Effects –The proposed action would have no cumulative effect on cultural resources. Although cultural resources may occur in the vicinity of Larry Damm Creek watershed that may be important cultural resources, no known significant cultural resources are located within the project area. In addition, the proposed action would not change the treatment and/or management of archeological resources in Redwood National Park. Cultural resources throughout the remainder of the Redwood National Park would be unaffected. Under the terminology of the implementing regulations of Section 106 of the National Historic Preservation Act (36 CR 800), no historic properties, determined eligible for or listed on the National Register of Historic Places, would be affected by the proposed action or no action alternative.

Conclusions: Effects on Cultural Resources – There is no effect on properties of cultural or historic significance from either alternative.

Park Operations

This final segment of the Lower B500 road is not needed for access for future watershed restoration or other administrative uses. Any maintenance needed on this road segment would be focused on erosion control to abate severe resource threats, i.e. culvert replacement.

Effects of the Proposed Action Alternative – Removing the road will save the park funding that would be used to upgrade and replace existing culverts on the Lower B500. There would be no other effect as there are no other park operations conducted from this road.

Effects of the No Action Alternative –Under NPS current management direction, roads not needed for administrative or visitor use, such as the Lower B500, are placed in a lower tier for available funding for maintenance. Without maintenance, the road will fail and deliver sediment to Larry Damm Creek. To avoid this scenario, park operations would have to expend funds to eventually replace culverts or repair the road and bridge to prevent sediment delivery or impacts to Larry Damm Creek.

Cumulative Effects – The NPS maintains roads and trails based on available funding; planning occurs over a 5-year timeframe. Funding varies from year to year. Funding to repair facilities after emergency events such as major storms is unpredictable and cannot be counted on.

Conclusions: Effects on Park Operations – There is no effect of the proposed action on park operations. The proposed action will benefit park operations by removing a road segment that will cost the park to maintain long-term. The Lower B500 road has no administrative or public use, and there will be a positive impact on park operations from its removal. Under the no action alternative, the culverts on this road would eventually fail and deliver sediment to Larry Damm Creek, damaging aquatic habitat for threatened fish species, unless the culverts are upgraded.

Visitor Use and Experience

There would be no visitor use and experience effects under either the No Action alternative or the proposed action. The road does not offer visitor use or experience that is not available on the nearby park maintained Lost Man Creek trail.

Socioeconomics

There would be no growth-inducing effects under either the no action alternative or the proposed action.

COORDINATION AND CONSULTATION

The EA, or a letter announcing its availability, has been made available or sent to local and regional offices of federal and state agencies, affected American Indian tribes, and local organizations listed below, in addition to individuals who have expressed an interest in similar park projects. Copies are available in local libraries, at park offices, and on the Internet on the NPS planning website (<https://parkplanning.nps.gov/LowerB500>). The park has also issued a news release to its standard mailing list.

Federal Agencies

Bureau of Land Management, Arcata Resource Area, Arcata CA

National Park Service, Pacific West Region, San Francisco CA

National Park Service, Water Resources Division, Fort Collins CO

U.S. Army Corps of Engineers, San Francisco District

U.S. Department of Commerce, NOAA Fisheries, NMFS California Coastal Area Office, Arcata CA

U.S. Environmental Protection Agency, Region 9, San Francisco CA

U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata CA

United States Representatives
Congressman Jared Huffman (CA 2nd District)

State Agencies
California Department of Fish and Wildlife, Eureka CA
California Office of Historic Preservation, Sacramento CA

American Indian Tribes
Big Lagoon Rancheria
Resighini Rancheria
Trinidad Rancheria
Yurok Tribe

County and Local Governments
Humboldt County Board of Supervisors

Organizations and Businesses
CalTrout
Environmental Protection Information Center
National Parks Conservation Association
Northcoast Environmental Center
Redwood Community Action Agency
Save-the-Redwoods League
Stillwater Sciences

Universities
California State University, Humboldt
Cooperative Fish and Wildlife Research Unit, Humboldt State University, Arcata CA

Libraries
Humboldt County Public Library
Arcata Library
McKinleyville Library
Humboldt State University Library

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REFERENCES

Holden, B. 2006. A Biological Assessment of Impacts to Aquatic Threatened and Endangered Species From the Lost Man Creek Erosion Control and Disturbed Land Restoration Plan in Redwood National Park. Unpub. Report on file at Redwood National Park, South Operations Center, Orick, CA. 80 pp.

Klein, R.D. 2012. Erosion and turbidity monitoring in Lost Man Creek, Redwood National and State Parks. Annual Report for Water Year 2005 and Retrospective on Water Years 2003-2011. 28 pp

Klein, R. D. and T. A. Spreiter. 2002. Post-Excavation Erosion Control Guidelines Redwood National and State Parks. Redwood National and State Parks. Orick California. 9 pp.

National Park Service (GMP/GP), U.S. Department of the Interior, and California Department of Parks and Recreation. 1999. Final General Management Plan/General Plan, Environmental Impact Statement/Environmental Impact Report, Vols 1 & 2. Copy available at park offices in Crescent City and Orick, CA

National Park Service, Department of the Interior. 2005. Road Strategy: Access and Treatment Priorities for Parkland in the Redwood Creek Watershed. Redwood National and State Parks, Division of Resource Management and Science. Copy available at park offices in Arcata and Orick, CA.

National Park Service, U.S. Department of the Interior. 2006a. Lost Man Creek Erosion Control and Disturbed Land Restoration Plan Environmental Assessment. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2006b. Finding of No Significant Impact. Lost Man Creek Erosion Control and Disturbed Land Restoration Plan Environmental Assessment. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2007a. Streelaw Creek Fish Passage. Environmental Assessment. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2007b. Finding of No Significant Impact. Streelaw Creek Fish Passage. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2009a. North Fork Lost Man Creek Bridge. Environmental Assessment. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2009b. Finding of No Significant Impact. North Fork Lost Man Creek Bridge. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2009c. North Fork Lost Man Creek Bridge. Environmental Assessment. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2010a. Streeflow Creek Trail Improvements. Environmental Assessment. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2010b. Finding of No Significant Impact. Streeflow Creek Trail Improvements. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2013. Threatened, Endangered, Proposed, and Candidate Species in Redwood National and State Parks. Biological Assessment Reference Document. Division of Resource Management and Science, Fish and Wildlife Branch. On file at park offices in Arcata, Crescent City, and Orick, CA.

National Park Service, U.S. Department of the Interior. 2014a. Strawberry Creek Restoration. Environmental Assessment. Copy available at park office in Arcata and Orick, CA.

National Park Service, U.S. Department of the Interior. 2014b. Finding of No Significant Impact. Strawberry Creek Restoration. Copy available at park office in Arcata and Orick, CA.

National Park Service, U.S. Department of the Interior. 2015. A Biological Assessment of Impacts to Aquatic Threatened Species From The Redwood National Park 2015 Routine Road Maintenance Program. April 2015. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2016. A Biological Assessment of Impacts to Aquatic Threatened Species from G-6-1 Road Removal and Upgrade, C-12 Road Maintenance and Horse Camp Development in Redwood National Park. November 22, 2016. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2017a. A Biological Assessment of Impacts to Terrestrial Threatened Species from G-6-1 Road Removal and Upgrade, C-12 Road Maintenance and Horse Camp Development in Redwood National Park. July 13, 2017. Copy available at park office in Orick, CA.

National Park Service, U.S. Department of the Interior. 2017c. Invasive Plant Management Plan and Environmental Assessment for Redwood National Park and Santa Monica Mountains National Recreation Area. Copy available at park office in Orick, CA.

U.S. Environmental Protection Agency. 1998. Total maximum daily load for sediment, Redwood Creek, Calif.: U.S. Environmental Protection Agency, Region 9. San Francisco, CA. 76 pp.

APPENDIX A

Other Alternatives Considered

The NPS considered several other alternatives for removing the Lower B500 Road and associated actions in the project area.

Redesign of the Lost Man Creek Bike-Hike Trailhead—An alternative that included expansion and redesign of the trailhead as part of the road removal project was considered. The trailhead is located at the intersection of the LOWER B500 and Geneva Road; it also includes several picnic tables and a comfort station. Trailhead redesign would require additional ground disturbance that would affect Lost Man Creek in addition to effects from Lower B500 removal on Larry Damm Creek above its intersection with Lost Man Creek. The existing trailhead has sufficient parking and adequate turn-around space to accommodate current usage. There are bridge repair projects planned for four bridges on Geneva Road. Improvements to the trailhead prior to bridge repair would expose the trailhead to damage from heavy equipment needed for bridge repair. Based on incompatibility between scheduling and funding availability, more extensive trailhead redesign was not included as part of the proposed action.

Convert Lower B500 Road to a Hiking Trail—Converting the road to a hiking trail as far as the log stringer bridge was considered. Road-to-trail conversion would create an additional trail that requires maintenance. Current funding to maintain the existing trail system at a high level is limited. The trail would be a one-way trail along Larry Damm Creek that would not provide a unique visitor experience. The park has concerns that an additional trail close to a parking area would increase the potential for vandalism to park resources. Original logging roads were constructed without consideration of the most appropriate location to ensure drainage and long-term stability. Experience in Redwood National Park since 1978 has demonstrated that it is difficult to create a sustainable trail from a converted logging road. Based on the consideration of available funding for maintenance, sustainability, and the potential for increased vandalism, conversion of the Lower B500 to a trail was not included as part of the proposed action.

Replace Existing and Provide New Culverts to Prolong Road Lifespan—Culvert replacement would prolong the lifespan of the Lower B500 by improving drainage at three stream crossings. A culvert would be added to a fourth stream crossing. The road has been identified as unneeded for long-term administrative or visitor use. This alternative would not provide protection for threatened salmon and steelhead, because the road itself would continue to degrade without maintenance. Eventual failure of the road bed would cause moderate to significant damage to the stream and fish habitat, and potentially to fish if the road fails while spawning fish or redds are present.