Elk Valley Road Fish Passage Design Project | 2020

Introduction:

The Smith River Alliance will implement the Elk Valley Road Fish Passage Design Project. The purpose of this project is to improve fish passage in Elk Creek at all life stages and restore natural conveyance of spawning gravels and woody debris.

The project is necessary because the Del Norte County Culvert Inventory and Fish Passage Evaluation report (Taylor 2001) identified these culverts as partial barriers to all life stages of salmonids and undersized for 100-year flows, thereby restricting hydrologic functions such as the conveyance of substrate and woody debris. Recent research and survey efforts indicate these crossings restrict salmonid passage to limited spawning habitat in Elk Creek Watershed. While Elk Creek has an abundance of good quality rearing habitat for juvenile salmonids, spawning habitat is rare and likely a limiting factor for coho salmon recovery targets of 80% occupancy of IP habitat in the Elk Creek watershed (NMFS 2014).

Objective(s):

The project will develop designs for three passage barriers in the Elk Creek watershed located on Elk Valley Road. Objectives include: 1) improve fish passage to spawning habitat; 2) improve downstream migration of juvenile salmonids at a greater range of flows; 3) improve conveyance and capacity for flood flows; and 4) restore hydrologic function and conveyance of sediment and debris.

Project Description:

Location:

The project site is in the Elk Creek watershed, a small urban coastal basin located on the southern end of Crescent City. The mainstem of Elk Creek flows in a Northeast to Southwest direction and has tributaries spreading out from the mainstem to the North and South. Elk Valley Road runs parallel to Elk Creek and bisects the southern portion of the watershed, crossing the tributaries of Elk Creek in five separate places. Streams in this part of the watershed are low gradient with gravel substrate, ideal spawning and rearing habitat for coho salmon.

Crossing 1 on Elk Valley Road, 1.78-miles from Hwy 101, intersects South Tributary 3 (ST3) approximately 0.76-miles upstream of the confluence with Elk Creek. There is approximately 0.96-miles of salmonid spawning and rearing habitat upstream of the crossing. Elk Valley Rancheria is currently upgrading a private road/stream crossing on ST3 located approximately 1700 feet upstream of Crossing #1.

Crossing 2 on Elk Valley Road, 2.35-miles from Hwy 101, intersects the southern branch of South Tributary 4. The road/stream crossing is 0.83-miles upstream of the confluence with Elk Creek. Upstream of Elk Valley Road this tributary branches four times and travels across privately owned land and the State Parks North Operation Center. There is approximately 1.6-miles of spawning and rearing habitat upstream of Elk Valley Road. Smith River Alliance is currently designing upgrades for three private stream/road crossings on this tributary upstream of Crossing 2.

Crossing 3 on Elk Valley Road, 2.42-miles from Hwy 101, intersects the north fork of South Tributary 4 (also known as Nunes Creek). The crossing is 0.82-miles upstream of the confluence with Elk Creek and is on the mainstem of South Tributary 4. Upstream of the crossing there is approximately 0.86-miles of spawning habitat. There are no private stream crossings from the headwaters in Jedidiah Smith State Park to the crossing with Elk Valley Road.

Project coordinates are: Crossing 1: 41.7662 North and -124.15719 West; Crossing 2: 41.77282 North and 124.15331 West; Crossing 3: 41.7739 North and -124.15289 West.

Project Set Up:

The project will be completed by a team consisting of the Smith River Alliance (SRA), Stillwater Sciences (SWS), SHN Engineers and Geologists (SHN), and DZC Archaeology and Cultural Resource Management (DZC). SRA will provide ongoing landowner outreach and engagement, coordination with other stakeholders and regulatory agencies, grant management and reporting, guidance on fisheries biology, fish passage, habitat enhancement opportunities, and assistance with SWS survey efforts. SRA will lead the riparian surveys and prepare a planting plan to restore areas disturbed by project construction. SRA will secure permits for the development of shovel-ready designs.SWS will conduct the geological and geomorphic site characterizations, identification of geologic hazards and constraints, characterization of vegetation communities, botanical assessments for CEQA permitting, hydrologic and hydraulic analyses, and preparation of engineering plans and specifications. The Project Geologist will oversee all aspects of the project for SWS and lead the geologic and geomorphic assessments, participate in stakeholder meetings, develop conceptual restoration plans, and author sections of the project report. The Senior Engineer will lead in identification of alternatives and design development, oversee the hydrologic and hydraulic analyses, and author sections of the project report. The Senior Geologist will advise and provide technical oversight of the geologic and geomorphic assessments, and assist with development of restoration plans. The Project Engineer will work on hydraulic analyses, developing crossing designs, and conducting AutoCAD drafting. The Botanist will lead the wetland and rare plant assessments to support project permitting, will assist with development of restoration plans, and author sections of the project

report. The Botanical Assistant will support the Botanist with field and office tasks. The Staff Geologist will assist with survey processing and provide GIS services. The Spatial Analyst will provide additional GIS services. The GIS Technician will support the Spatial Analyst. The Engineer in Training (EIT) will assist with the topographic survey and figure production.SHN will lead the geotechnical investigation foundation design of the road-stream crossings including, characterizing soil conditions for the crossing foundations, providing recommendations on the site suitability and site preparations, and developing the drawings and specifications for the crossing foundation systems. SHN will serve as a subconsultant to SWS.DZC will conduct the necessary cultural and archaeological resource investigations to satisfy CEQA permitting requirements for project implementation. DZC will serve as a subconsultant to SWS.

Materials:

Subcontractor Supplies include:RTK-GPSRobotic total station Hand auger Water level loggers Drill Rig Soil Sample Tubes. SRA will purchase equipment and a software license to support existing conditions surveys and mapping requirements including:GPS Unit (SRA purchase) ArcMap Non-Profit License (SRA fee). This equipment is not currently available because in the past this equipment has been available to the SRA from CDFW as part of collaborative efforts through the Coastal Salmonid Monitoring Program.

Tasks:

Task 1 Project Management
SRA will provide technical and administrative services associated with performing and completing the work for this Project, including managing this Agreement, assuring all permits are finalized, coordination with landowners, stakeholders and members of the project design team, delivering the final landowner access agreement, administering subcontracts, invoicing and payments, drafting and finalizing progress reports and data management

Task 2 Technical Advisory Committee (TAC)
SRA will convene a Technical Advisory Committee (TAC) composed of technical staff from the California Department of Fish and Wildlife (CDFW), NOAA Restoration Center (NOAA RC), SRA, SWS, Del Norte County Road Division, and other technical stakeholders to form consensus and guide technical review and decision criteria for each step of the design process. SRA will facilitate up to three TAC meetings to be held at key project milestones:

Stakeholder Meeting 1 - This will serve as a kick-off meeting with SRA, SWS, and Del Norte County to provide an opportunity to discuss conceptual crossing upgrade options, road-use and maintenance requirements, and potential future constraints.

TAC Meeting 1 - This site meeting will follow submittal of conceptual (30% level) design alternatives and supporting analyses and will provide opportunity to discuss project elements and identify a preferred alternative for 65% design development.

TAC Meeting 2 - This office-based meeting would be used to present the draft 65% design plan set and basis of design report.

TAC Meeting 3 - This office-based meeting would be used to receive comments on the 90% submittal.

Each meeting will provide opportunity for discussion, as well as verbal or written comment from TAC members. Additional input from TAC members may be sought via email and/or focused conference calls throughout the project. SRA will coordinate the TAC process, including selecting TAC members, scheduling, and facilitating meetings and preparing summary meeting notes. In addition to formal TAC meetings, SRA and SWS will facilitate individual coordination with landowners adjacent to the crossing sites to ensure consensus on project designs.

Task 3 Site Characterizations
The site characterizations will include topographic surveys, vegetation assessments, and geologic and geomorphic assessments, and geotechnical investigation (described below under Task 4).

Topographic Survey:
Topographic surveys will be conducted with a robotic total station and/or RTK GPS to characterize channel bed and banks, road and crossing geometry, and floodplain topography. Survey control will be established by the licensed engineer with a minimum of two permanent benchmarks set within the project areas but outside the proposed work areas. Surveys will include general site topography and detailed channel geometry through the crossings extending several hundred feet in the up and downstream directions. Existing NOAA Coastal LiDAR data may be used to augment topographic surveys to create a DTM representing current conditions in the project areas. The existing conditions DTM will be used to create detailed basemaps (e.g., 1-foot contour or less) for field mapping, feasibility analyses, and project design.

Vegetation Community Characterization:
SRA will lead an assessment of existing vegetation communities at the project site and at a reference reach upstream of the project area. The vegetation characterization will define riparian forest alliances, invasive plants, disturbance, and overall health of the stand. The field assessment will follow the methods of the CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Method (CNPS and CDFW 2018) such that a representative location for each stand type will be sampled using the rapid assessment method. Results

from this assessment will inform invasive plant treatment actions and the plant selection for revegetation of disturbed areas.

Geologic and Geomorphic Assessments:
A licensed professional geologist from SWS will lead the geomorphic assessment to evaluate risks and sustainability of project features, inform development of alternatives, and help guide selection of preferred project alternatives. The geomorphic assessment will initially consist of compilation of aerial and ground photos, maps, and other pertinent information regarding channel and floodplain morphology, fluvial processes, and the existing and anticipated sediment supply to the project reach. A historical aerial photo analysis will be conducted to map the evolution of channel and floodplain morphology and riparian vegetation in response to large flood events and anthropogenic disturbance. A field geomorphic assessment will then be conducted to describe existing channel morphology and bed material grain size distributions and identify hydraulic controls. The geologist will produce a geomorphic map of the project area using aerial photo and LiDAR analyses, field assessments, and the surveyed topographic basemap. The methods and results of the geomorphic assessment will be included in the Basis of Design report. Recommendations developed with these data will guide restoration planning and designs of crossing upgrades during Task 5.

Fish Passage and Habitat Use:
SRA will lead a pre implementation assessment of fish passage and redd density upstream and downstream of the culverts. SRA and SWS will review the passage assessment from the 2001 Ross Taylor report and update as needed following guidelines in section IX of volume II California Salmonid Stream Habitat Restoration Manual (CDFW 2004). Updated passage criteria and information from the Ross Taylor report will inform project designs to ensure passage meets all CDFW and NOAA standards (Taylor 2001). SRA's pre-project assessment of adult salmonids following peak flows will provide a benchmark for measuring post implementation effectiveness. This assessment will build on habitat use and availability data from previous studies (Burgess 2005, Garwood 2019) and ongoing habitat use, and availability surveys conducted in 2019 and 2020 for the Elk Creek Restoration Feasibility Study (Contract Q1996003). While these studies provide sufficient data on pre-project use by juvenile salmonids, data on adult use and distribution is limited. Fish passage monitoring will be conducted in line with the guidelines in section IV-6 to IV-10 in the 4th edition California Salmonid Stream Habitat Restoration Manual (Flosi et all 1998) but the monitoring will be limited in scope (above and below the culverts on North Tributary 4) and frequency for replication before and after project Implementation.

Task 4 Hydrology and Hydraulics
A hydrologic analysis will be performed for the project area including a review of nearby USGS gaging stations, FEMA Flood Insurance Rate Maps and Studies, and USGS Streamstats. Flood frequency flows (e.g., 100-year recurrence, 50-year recurrence, etc.) and exceedance probability flows will be calculated for each site using prorations from nearby gaged streams, regional flow regression equations and the Rational method. The assessment will develop a one dimensional (1-D) HEC-RAS model for each site from the digital terrain model (DTM) produced in Task 3 to evaluate water surface elevations, flow depths and velocities, and shear stresses in the creek channels under existing and future conditions. The hydraulic model will be used to identify design opportunities and constraints; evaluate the stability of proposed channel modifications, adequately size the crossing upgrade structures, and inform the design team about erosion and sedimentation patterns under existing and future conditions. Field observations of water surface elevations during winter high flows will aid in model calibration and verification. Pressure transducers installed at the project sites will provide continuous stage measurements throughout the winter/spring high flow season. Methods and results of the hydrology and hydraulics assessment will be included in the Basis of Design report.

Task 5 Conceptual Designs and Feasibility Analysis
The project team will evaluate site opportunities and constraints and identify potential suitable options for upgrading the road-stream crossing structures to improve fish passage, flood flow conveyance, and natural stream function. Developing suitable design alternatives will be based on the assessments and analyses completed in Tasks 3 and 4.

The team will develop conceptual designs for the road-stream crossing structures, as well as riparian corridor improvements near the inlets/outlets of the new crossings. The crossing replacements will be developed using CDFW and NMFS stream simulation methodology. The preliminary crossing designs will be sized to convey the 100-year flood with adequate freeboard to pass sediment and large wood below the low cord of the crossing. The Smith River Alliance expects the crossing upgrades will replace the existing undersized culverts with an appropriately sized open bottom arch or box culvert backfilled with native streambed material. The crossing upgrades will be designed to provide unimpeded fish passage. The riparian assessment will consider strategic plantings of riparian species and conifers to inhibit invasive plant growth such as Himalayan blackberry.

Design alternatives will be developed to the 30% level, including schematic concept plan views, thalweg longitudinal profiles, and typical cross sections. The hydraulic modeling of existing and alternative conceptual designs will support the feasibility analysis. A planning-level cost estimate will be developed for each design and summarized in a draft Basis of Design report. These products will be

discussed at the first TAC meeting and review by the TAC will guide selection of a preferred alternative.

Task 6 Final Design Development
This task will advance conceptual design plans through intermediate to final design submittals (i.e., 65%-100%). TAC members will be provided with interim submittals for review and comment.

Geotechnical Investigation and Crossing Foundation Design:
SHN will conduct a focused geotechnical work scope that includes field investigation of the stream crossing sites, laboratory analysis of soil samples collected during the field investigation, and geotechnical analysis and reporting. The geotechnical investigation will focus on characterization of fill and native soils present in the existing crossings, and development of recommendations for construction of replacement crossings.

Because the stream crossings occur along a well-travelled County road, SHN proposes to complete the subsurface field investigation utilizing a truck-mounted drill rig with geotechnical drilling and testing capabilities. The Del Norte County Road Division will provide traffic control. SRA will secure a County Encroachment Permit for the Geotechnical investigation.

Field exploration will occur at the locations of proposed crossings, and adjacent to the channel. SHN anticipates six borings (two at each crossing site) on the order of 25 feet in depth. Laboratory testing defining the strength and textural character of the soil will be completed at SHN's accredited laboratory in Eureka. The results of the field investigation and laboratory testing will be analyzed by SHN's Senior Geotechnical Engineer and compiled in a geotechnical report, that will include conclusions regarding the suitability of the proposed project, and recommendations regarding site preparation, appropriate crossing subgrade design (e.g., culvert bedding), and specifications for engineered fill. SHN will include discussion of native soil properties to inform the design of the stream crossings.

SHN will prepare a detail design sheet showing the subgrade improvements and bedding for the crossings. The design will follow the guidelines provided in the geotechnical report. The details will include the following main elements: 1) excavation limits (plan and section views), 2) earthwork details such as benching, subgrade modifications, and backfilling, and 3) details related to installing the box culverts in accordance with the geotechnical report and the manufacturer's recommendations, such as bedding thickness and compaction requirements. SHN will prepare an earthwork specification addressing the materials to be installed as part of the design. SHN will provide cost estimation. SHN's products will be provided at the following stages: 65%, 90%, and 100%. The 100% submittal will be stamped/signed by a Professional Engineer licensed in the State of California.

Design Development:
Based on the results of the feasibility analysis, geotechnical investigation, input from the TAC, and consultation with Del Norte County on the conceptual design alternatives, a preferred alternative will be selected and advanced to the 65% design level. Selection will be based on anticipated physical and biological outcomes (e.g., improved fish passage, improved habitat structure, increased riparian cover, bank stabilization, and fine sediment reduction), as well as constructability, implementation costs, and estimated longevity/sustainability of the proposed features.

65% Plans and a Basis of Design report will be developed for the preferred alternative. The design plans will include a plan view of all proposed features, grading plans, cross sections, profiles along construction alignments, typical construction detail drawings, preliminary revegetation plan, erosion, and sediment control plan, description of construction sequence, and technical notes. The Smith River Alliance will also develop an engineer's cost estimate for construction. The draft 65% Plans and Basis of Design report will be presented and discussed at the second TAC meeting. Comments will be incorporated into the final 65% Plans and Basis of Design report.

The 65% design will be advanced to the 90% and 100% levels with TAC review and adjustments to the design at each stage. Final 100% sealed plans will be produced for all three crossings.

Revegetation Plan:
SRA will develop a revegetation plan with input from SWS. The revegetation design will include native woody plant species similar to those observed in the reference site location in addition to other well-adapted native species common to the region. A planting plan schematic will include recommended plant species form (e.g., shrub, tree), planting spacing and depth, and estimated number of plants. The revegetation plan will also include the following: location of the restoration sites, plant species selection and planting stock type, site preparation, procurement of materials, installation methods and schedule, maintenance, and estimated cost.

Task 7 Permitting
SRA will secure all necessary permits to streamline the planning phase with the County and produce shovel ready designs. SRA will coordinate with SWS, SHN and DCZ to complete all surveys necessary to acquire permits for the implementation phase (CEQA review, County, and coastal grading permits, 1602 LSA Agreement). Surveys will be scheduled to coincide with the development of conceptual designs and results will inform and modify final designs. SRA will consult with regulatory agencies during design development and will finalize permits by the 100% design submittal.

Special-Status Plant and Sensitive Vegetation Survey:
SWS will query and review the CDFW California Natural Diversity Database (CNDDB), California Native Plant Society (CNPS) List of Rare and Endangered Plants, and United States Fish and Wildlife Service (USFWS) species lists to form a list of special-status plants and vegetation communities that have the potential to be in the project area. SWS will conduct a one-day protocol-level special-status plant survey timed to coincide within with blooming periods of those species with potential to occur in the project (e.g., June-July). The survey will follow Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities (California Department of Fish and Game 2009). The methods and results of the special-status plant and vegetation characterization surveys will be combined into a single report. The report will include copies of CNDDB forms and maps of documented special status plant populations, if applicable.

Wetland Delineation:
SWS will conduct a pre-field desktop review of Natural Resources Conservation Service (NRCS) soils information (e.g., soils map, hydric soils list, report, and official descriptions), historical conditions, USFWS National Wetlands Inventory (NWI) maps and descriptions, and precipitation data to support the waters and wetlands delineation. SWS will conduct a one-day wetland delineation to map wetland boundaries within the project area in accordance with the 1987 U. S. Amy Corps of Engineers (USACE) Wetlands Delineation Manual and the current Regional Supplement (Western Mountains, Valleys, and Coast Region). Data will be collected using the current regional supplement USACE data form. Wetland boundaries will be mapped in the field using a sub-meter GPS unit. SWS will prepare a wetland delineation report describing potential USACE- and stat jurisdictional wetlands and waters identified in the project area. The report will include existing conditions gathered during the desktop review, detailed maps of delineated waters and/or wetlands in the project, and data forms used during the delineation.

Cultural Resources:
DZC will provide the necessary cultural resources services to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969, Section 106 of the National Historic Preservation Act (NHPA) of 1966, and the California Environmental Quality Act (CEQA) of 1970 (all as amended), in support of the required environmental compliance and the necessary permit applications for the proposed project. The scope of work strategy will fulfill the requirements of both the CEQA and NEPA level review, in full compliance with Section 106 of the NHPA, and with the California State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation.

DZC will conduct a records search of the project area and a 0.5-mile radius around the Area of Potential Effects (APE) at the Northwest Information Center (NWIC). The records search will reveal the nature and extent of any cultural

resources work previously conducted within the project area. DZC will complete an intensive Phase I pedestrian survey of the Area of Potential Effects (APE). DZC will survey the known APE, plus a small buffer of 100 feet radius to allow for design variability, ingress, egress, and staging. Survey area is expected to remain under 5 acres. The location of all previously recorded sites, and any identified features, isolates, and cultural anomalies will also be recorded using sub-meter accuracy GPS units. No testing or excavation will be conducted, nor will any artifacts, samples, or specimens be collected during the survey. All site recordation will be completed on the relevant Department of Parks and Recreation 523 forms.

DZC will prepare a Cultural Resource Inventory Report (CRIR) for submission to the Lead Agency. The CRIR will conform to State Historic Preservation Office (SHPO) Archaeological Resource Management Report format which includes a project description, a list of field staff and report preparers, the methodology and results of the background review and archaeological survey, a map of potentially affected historic resources, literature cited, and relevant appendices.

Deliverables:

Task 1:

1. Quarterly invoices and progress reports
2. Annual Report
3. Copies of Executed Subcontracts
4. Draft Final Report
5. Final Report
6. Final Invoice

Task 2:

1. Meeting agendas in PDF format
2. Draft and final meeting notes in PDF format

Task 3:

1.Topographic base map, longitudinal profile, and typical cross sections of existing conditions in CAD and PDF formats
2.Geomorphic map (PDF format)
3.Vegetation Assessment
4.Maps and summary tabulation of salmonid distribution, habitat use and migration timing.

Task 4:

1. Table of flood frequency and exceedance probability flows
2. Plots of recorded water levels for instream flow in NAVD88
3. Modeled existing and proposed conditions water surface elevations and channel inundation extents

Task 5:

1. Preliminary design plans in 11x17 format (PDF)
2. Draft Basis of Design Report (PDF format)

Task 6:

1. SHN geotechnical report and crossing subgrade preparation designs (to be included in Planset) (PDF format)
2. 65% Planset (11”x17” PDF) and engineer’s cost estimate
3. 90% Planset (11”x17” PDF) and engineer’s cost estimate
4. Final Basis of Design Report (PDF format)
5. Revegetation Plan
6. Final (100%) signed Planset (11”x17” PDF and hardcopy)

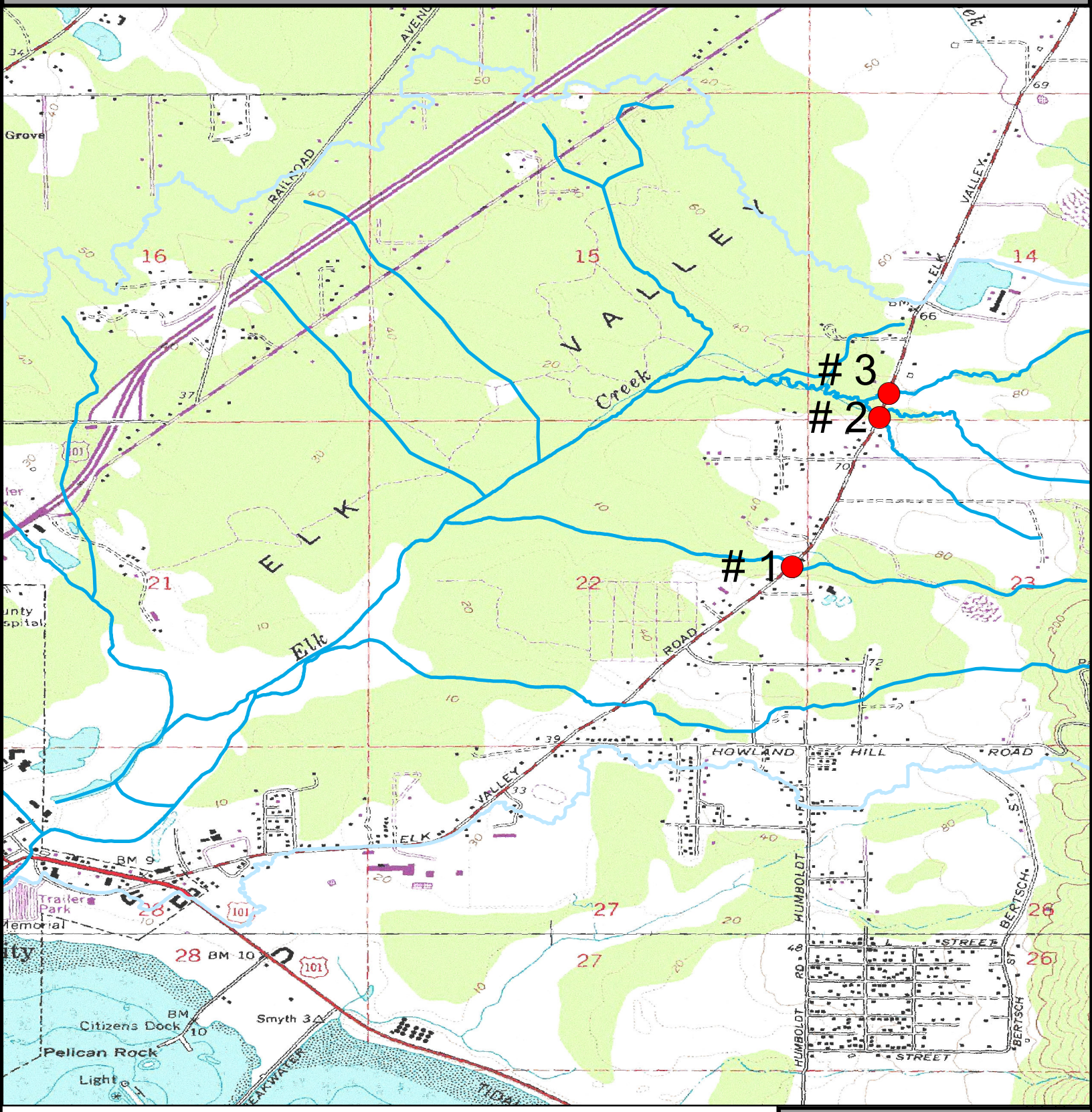
Task 7:

1. Special Status Plan Survey Report
2. Copies of CNDDB forms and maps of documented special status plant populations (if applicable)
3. Wetland Delineation Survey Report (PDF format)
4. Cultural Resources Final Site Report (PDF format)
5. Executed Permits and Permit Reports (LSAA Permits, County and Coastal Grading Permits)
6. Report from CEQA review

Timelines:

Task 1: 8/2/2021 to 9/30/2023
Task 2: 8/2/2021 to 2/1/2023
Task 3: 8/2/2021 to 6/1/2022
Task 4: 8/2/2021 to 6/1/2022
Task 5:1/3/2022 to 6/1/2022
Task 6:6/30/2022 to 3/1/2023
Task 7: 3/1/2022 to 3/1/2023

ELK VALLEY ROAD FISH PASSAGE IMPROVEMENT PROJECT



Project Topographic Map

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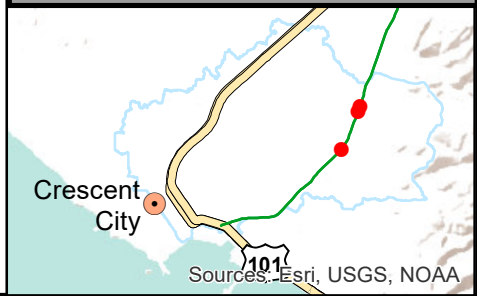
Map Sources:
Imagery: USGS Quad Map
Imagry, Roads, Cities
ESRI World Mapping Service

- Crossings
- Elk Streams
- Watershed Boundary

0 0.2 0.4 0.8 Miles

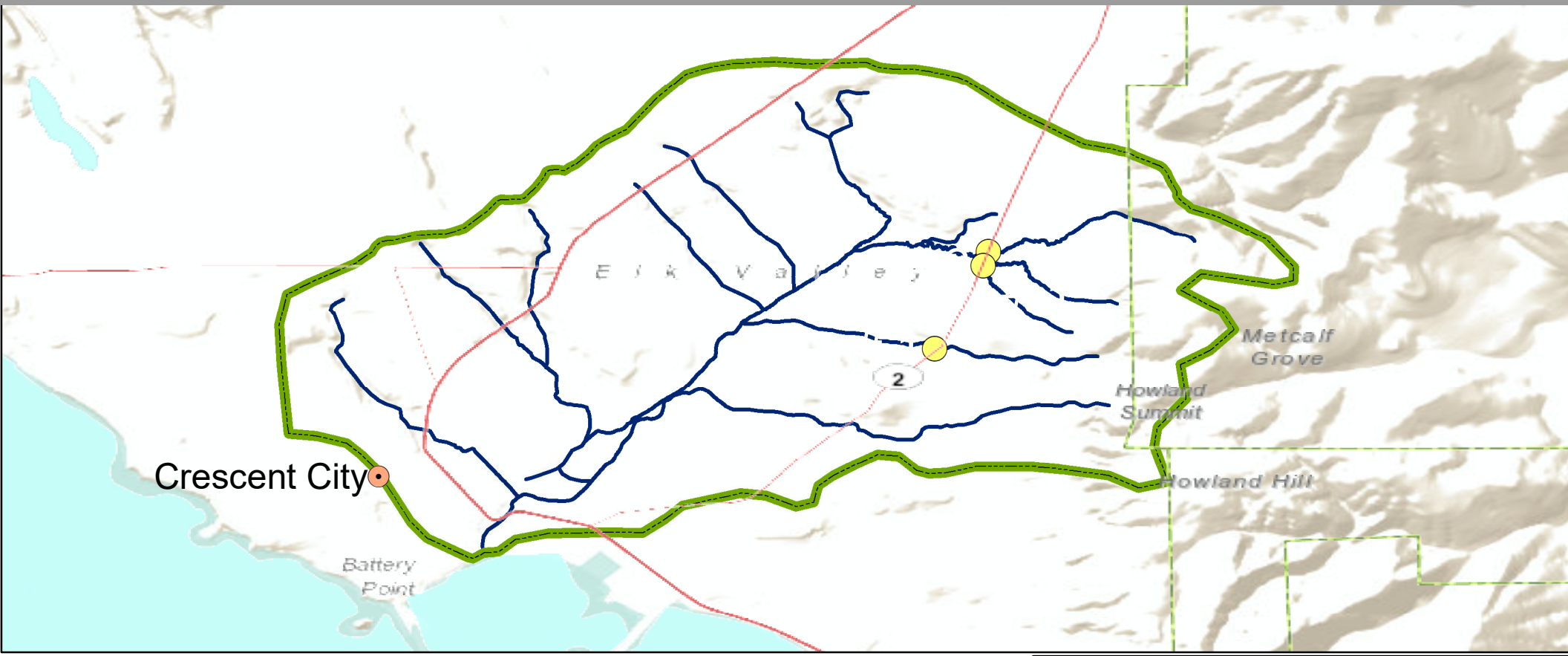
SMITH RIVER ALLIANCE

Map Location



Sources: Esri, USGS, NOAA

Elk Valley Road Fish Passage Improvement Project



Watershed Map

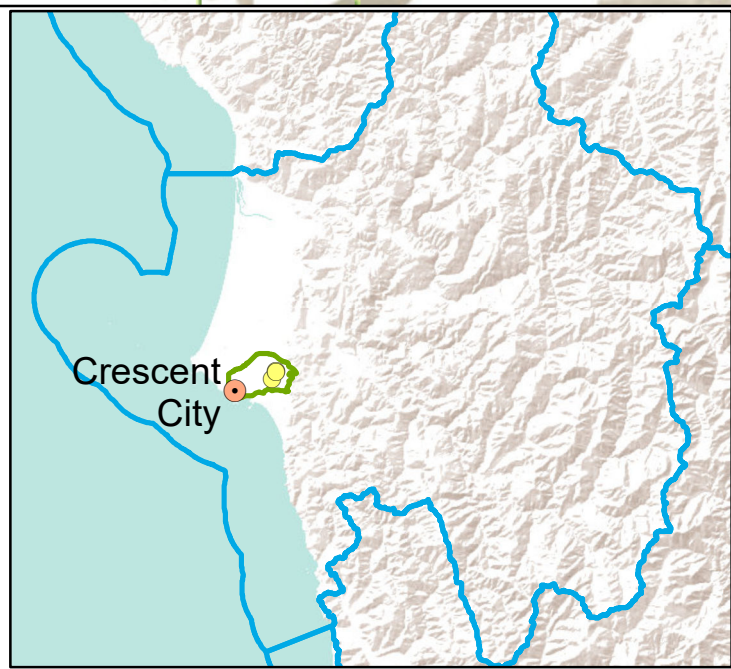
SMITH RIVER ALLIANCE

- Crossings
- Elk Creek Watershed
- Smith River HUC 8
- Elk Streams

0 0.5 1 2 Miles

N

Service Layer Credits: Sources: Esri, USGS, NOAA
Sources: Esri, Garmin,



Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Crescent City (4112472) OR Sister Rocks (4112462) OR Smith River (4112482) OR High Divide (4112481) OR Hiouchi (4112471) OR Childs Hill (4112461))

Possible species within the Crescent City and surrounding quads for 1723489 - Elk Valley Road Fish Passage Design Project, Del Norte County

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Abronia umbellata var. breviflora pink sand-verbena	PDNYC010N4	None	None	G4G5T2	S2	1B.1
Anthoxanthum nitens ssp. nitens vanilla-grass	PMPOA0F041	None	None	G5	S2	2B.3
Arabis aculeolata Waldo rockcress	PDBRA06010	None	None	G4	S2	2B.2
Arabis mcdonaldiana McDonald's rockcress	PDBRA06150	Endangered	Endangered	G3	S3	1B.1
Arborimus pomo Sonoma tree vole	AMAFF23030	None	None	G3	S3	SSC
Ardea alba great egret	ABNGA04040	None	None	G5	S4	
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Ascaphus truei Pacific tailed frog	AAABA01010	None	None	G4	S3S4	SSC
Asplenium trichomanes ssp. trichomanes maidenhair spleenwort	PPASP021K2	None	None	G5T5	S1	2B.1
Atractelmis wawona Wawona riffle beetle	IICOL58010	None	None	G3	S1S2	
Boechera koehleri Koehler's stipitate rockcress	PDBRA060Z0	None	None	G3G4	S3	1B.3
Bombus caliginosus obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
Bombus occidentalis western bumble bee	IIHYM24250	None	Candidate Endangered	G2G3	S1	
Brachyramphus marmoratus marbled murrelet	ABNNN06010	Threatened	Endangered	G3G4	S1	
Branta hutchinsii leucopareia cackling (=Aleutian Canada) goose	ABNJB05035	Delisted	None	G5T3	S3	WL
Bryoria spiralifera twisted horsehair lichen	NLTEST5460	None	None	G1G2	S1S2	1B.1
Calamagrostis crassiglumis Thurber's reed grass	PMPOA17070	None	None	G3Q	S2	2B.1
Calicium adspersum spiral-spored gilded-head pin lichen	NLT0005640	None	None	G3G4	S1	2B.2
Calystegia atriplicifolia ssp. buttensis Butte County morning-glory	PDCON04012	None	None	G5T3	S3	4.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Cardamine angulata seaside bittercress	PDBRA0K010	None	None	G4G5	S3	2B.1
Cardamine nuttallii var. gemmata yellow-tubered toothwort	PDBRA0K0R3	None	None	G5T3Q	S2	3.3
Carex arcta northern clustered sedge	PMCYP030X0	None	None	G5	S1	2B.2
Carex lenticularis var. limnophila lagoon sedge	PMCYP037A7	None	None	G5T5	S1	2B.2
Carex lyngbyei Lyngbye's sedge	PMCYP037Y0	None	None	G5	S3	2B.2
Carex praticola northern meadow sedge	PMCYP03B20	None	None	G5	S2	2B.2
Carex serpenticola serpentine sedge	PMCYP03KM0	None	None	G4	S3	2B.3
Carex viridula ssp. viridula green yellow sedge	PMCYP03EM5	None	None	G5T5	S2	2B.3
Cascadia nuttallii Nuttall's saxifrage	PDSAX0U160	None	None	G4?	S1	2B.1
Castilleja elata Siskiyou paintbrush	PDSCR0D213	None	None	G3	S2S3	2B.2
Castilleja litoralis Oregon coast paintbrush	PDSCR0D012	None	None	G3	S3	2B.2
Cerorhinca monocerata rhinoceros auklet	ABNNN11010	None	None	G5	S3	WL
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Circus hudsonius northern harrier	ABNKC11011	None	None	G5	S3	SSC
Coastal and Valley Freshwater Marsh Coastal and Valley Freshwater Marsh	CTT52410CA	None	None	G3	S2.1	
Coastal Brackish Marsh Coastal Brackish Marsh	CTT52200CA	None	None	G2	S2.1	
Cochlearia groenlandica Greenland cochlearia	PDBRA0S020	None	None	G4	S1	2B.3
Coenonympha tullia yontockett Yontocket satyr	IILEPN6035	None	None	G5T1T2	S1	
Coptis laciniata Oregon goldthread	PDRAN0A020	None	None	G4?	S3?	4.2
Coturnicops noveboracensis yellow rail	ABNME01010	None	None	G4	S1S2	SSC
Cypseloides niger black swift	ABNUA01010	None	None	G4	S2	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Downingia willamettensis Cascade downingia	PDCAM060E0	None	None	G4	S2	2B.2
Egretta thula snowy egret	ABNGA06030	None	None	G5	S4	
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Empetrum nigrum black crowberry	PDEMP03020	None	None	G5	S1?	2B.2
Empidonax traillii brewsteri little willow flycatcher	ABPAE33041	None	Endangered	G5T3T4	S1S2	
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Erethizon dorsatum North American porcupine	AMAFJ01010	None	None	G5	S3	
Eriogonum nudum var. paralinum Del Norte buckwheat	PDPGN08498	None	None	G5T2	S1	2B.2
Eriogonum pendulum Waldo wild buckwheat	PDPGN084Q0	None	None	G4	S2S3	2B.2
Erysimum concinnum bluff wallflower	PDBRA160E3	None	None	G3	S2	1B.2
Erythronium hendersonii Henderson's fawn lily	PMLIL0U070	None	None	G4	S2	2B.3
Erythronium howellii Howell's fawn lily	PMLIL0U080	None	None	G3G4	S2	1B.3
Erythronium oregonum giant fawn lily	PMLIL0U0C0	None	None	G4G5	S2	2B.2
Erythronium revolutum coast fawn lily	PMLIL0U0F0	None	None	G4G5	S3	2B.2
Eucyclogobius newberryi tidewater goby	AFCQN04010	Endangered	None	G3	S3	SSC
Eumetopias jubatus Steller (=northern) sea-lion	AMAJC03010	Delisted	None	G3	S2	
Fissidens pauperculus minute pocket moss	NBMUS2W0U0	None	None	G3?	S2	1B.2
Fratercula cirrhata tufted puffin	ABNNN12010	None	None	G5	S1S2	SSC
Gentiana setigera Mendocino gentian	PDGEN060S0	None	None	G2	S2	1B.2
Gilia capitata ssp. pacifica Pacific gilia	PDPLM040B6	None	None	G5T3	S2	1B.2
Gilia millefoliata dark-eyed gilia	PDPLM04130	None	None	G2	S2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Haliaeetus leucocephalus bald eagle	ABNKC10010	Delisted	Endangered	G5	S3	FP
Hesperevax sparsiflora var. brevifolia short-leaved evax	PDASTE5011	None	None	G4T3	S3	1B.2
Juga chacei Chace juga	IMGASK4180	None	None	G1	S1	
Kopsiopsis hookeri small groundcone	PDORO01010	None	None	G4?	S1S2	2B.3
Lanx alta highcap lanx	IMGASL7010	None	None	G2G3	S1S2	
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Lasthenia californica ssp. macrantha perennial goldfields	PDAST5L0C5	None	None	G3T2	S2	1B.2
Lathyrus japonicus seaside pea	PDFAB250C0	None	None	G5	S2	2B.1
Lathyrus palustris marsh pea	PDFAB250P0	None	None	G5	S2	2B.2
Lewisia oppositifolia opposite-leaved lewisia	PDPOR040B0	None	None	G3	S2	2B.2
Lilium occidentale western lily	PMLIL1A0G0	Endangered	Endangered	G1	S1	1B.1
Limnephilus atercus Fort Dick limnephilus caddisfly	IITRI15020	None	None	G3G4	S1	
Lysimachia europaea arctic starflower	PDPRI0A020	None	None	G5	S1	2B.2
Margaritifera falcata western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Martes caurina humboldtensis Humboldt marten	AMAJF01012	Proposed Threatened	Endangered	G5T1	S1	SSC
Mitellastra caulescens leafy-stemmed mitrewort	PDSAX0N020	None	None	G5	S4	4.2
Monadenia fidelis pronotis rocky coast Pacific sideband	IMGASC7032	None	None	G4G5T1	S1	
Moneses uniflora woodnymph	PDPYR02010	None	None	G5	S2	2B.2
Monotropa uniflora ghost-pipe	PDMON03030	None	None	G5	S2	2B.2
Myotis evotis long-eared myotis	AMACC01070	None	None	G5	S3	
Myotis thysanodes fringed myotis	AMACC01090	None	None	G4	S3	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Myotis yumanensis Yuma myotis	AMACC01020	None	None	G5	S4	
Northern Coastal Salt Marsh Northern Coastal Salt Marsh	CTT52110CA	None	None	G3	S3.2	
Nycticorax nycticorax black-crowned night heron	ABNGA11010	None	None	G5	S4	
Oceanodroma furcata fork-tailed storm-petrel	ABNDC04010	None	None	G5	S1	SSC
Oenothera wolfii Wolf's evening-primrose	PDONA0C1K0	None	None	G2	S1	1B.1
Oncorhynchus clarkii clarkii coast cutthroat trout	AFCHA0208A	None	None	G4T4	S3	SSC
Oncorhynchus mykiss irideus pop. 36 summer-run steelhead trout	AFCHA0213B	None	Candidate Endangered	G5T4Q	S2	SSC
Packera bolanderi var. bolanderi seacoast ragwort	PDAST8H0H1	None	None	G4T4	S2S3	2B.2
Pandion haliaetus osprey	ABNKC01010	None	None	G5	S4	WL
Pekania pennanti fisher - West Coast DPS	AMAJF01021	Endangered	Threatened	G5T2T3Q	S2S3	SSC
Phacelia argentea sand dune phacelia	PDHYD0C070	None	None	G2	S1	1B.1
Phalacrocorax auritus double-crested cormorant	ABNFD01020	None	None	G5	S4	WL
Pinguicula macroceras horned butterwort	PDLNT01040	None	None	G4	S2	2B.2
Piperia candida white-flowered rein orchid	PMORC1X050	None	None	G3	S3	1B.2
Plethodon elongatus Del Norte salamander	AAAAD12050	None	None	G4	S3	WL
Polemonium carneum Oregon polemonium	PDPLM0E050	None	None	G3G4	S2	2B.2
Polites mardon mardon skipper	IILEP66030	None	None	G2G3	S1	
Potamogeton foliosus ssp. fibrillosus fibrous pondweed	PMPOT030B1	None	None	G5T2T4	S1S2	2B.3
Pyrrocoma racemosa var. congesta Del Norte pyrrocoma	PDASTDT0F4	None	None	G5T4	S2	2B.3
Ramalina thrausta angel's hair lichen	NLLEC3S340	None	None	G5?	S2S3	2B.1
Rana aurora northern red-legged frog	AAABH01021	None	None	G4	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Rana boylii foothill yellow-legged frog	AAABH01050	None	Endangered	G3	S3	SSC
Rhyacotriton variegatus southern torrent salamander	AAAAJ01020	None	None	G3G4	S2S3	SSC
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Romanzoffia tracyi Tracy's romanzoffia	PDHYD0E030	None	None	G4	S2	2B.3
Sabulina howellii Howell's sandwort	PDCAR0G0F0	None	None	G4	S3	1B.3
Sagittaria sanfordii Sanford's arrowhead	PMALI040Q0	None	None	G3	S3	1B.2
Sanguisorba officinalis great burnet	PDROS1L060	None	None	G5?	S2	2B.2
Sidalcea malachroides maple-leaved checkerbloom	PDMAL110E0	None	None	G3	S3	4.2
Sidalcea malviflora ssp. patula Siskiyou checkerbloom	PDMAL110F9	None	None	G5T2	S2	1B.2
Sidalcea oregana ssp. eximia coast checkerbloom	PDMAL110K9	None	None	G5T1	S1	1B.2
Silene scouleri ssp. scouleri Scouler's catchfly	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2
Silene serpentinicola serpentine catchfly	PDCAR0U2B0	None	None	G3	S3	1B.2
Speyeria zerene hippolyta Oregon silverspot butterfly	IILEPJ6087	Threatened	None	G5T1	S1	
Streptanthus howellii Howell's jewelflower	PDBRA2G0N0	None	None	G2G3	S2	1B.2
Thaleichthys pacificus eulachon	AFCHB04010	Threatened	None	G5	S3	
Usnea longissima Methuselah's beard lichen	NLLEC5P420	None	None	G4	S4	4.2
Vaccinium scoparium little-leaved huckleberry	PDERI180Y0	None	None	G5	S3	2B.2
Viola langsdorffii Langsdorf's violet	PDVIO04100	None	None	G4	S1	2B.1
Viola palustris alpine marsh violet	PDVIO041G0	None	None	G5	S1S2	2B.2
Viola primulifolia ssp. occidentalis western white bog violet	PDVIO040Y2	None	None	G5T2	S2	1B.2

Record Count: 123

East Fork Mill Creek Floodplain Restoration Design Project 2020

Introduction:

The Smith River Alliance will implement the East Fork Mill Creek Floodplain Restoration Design Project. The purpose of this project is to improve spawning and rearing habitat for the Smith River coho salmon population by enhancing floodplain connectivity.

The project is necessary because the project reach along East Fork Mill Creek became channelized when the elevated road was built across its wide alluvial valley, which greatly reduced the migration potential and floodplain connectivity of the stream. The simplified channel platform lacks floodplain connectivity and off- channel habitat, resulting in reduced rearing habitat, particularly affecting the juvenile life stages. A simplified floodplain and channel structure are considered a high threat to the Smith River population of coho salmon (NMFS 2014). Channelization is identified in the SONCC Coho Recovery Plan as an overall high threat affecting all coho salmon life stages except the egg stage in the Smith River.

Objective(s):

This project will develop all designs required to achieve the restoration objectives including: 1) removing Rock Creek Road and Rock Creek Road Bridge, which constrict the channel of East Fork Mill Creek; 2) relocating the road and bridge onto an old roadbed; and 3) restoring floodplain connectivity and natural channel form and complexity upstream and downstream of the relocated road. Achieving these objectives will improve spawning and rearing habitat for the Smith River coho salmon population.

Project Description:

Location:

The project is located in the Mill Creek watershed in Del Norte County, approximately 7-miles southeast of Crescent City and 4-miles inland from the coast. The project is on East Fork Mill Creek, a tributary to Mill Creek, which is a tributary to the lower Smith River.

The project is located in a 25,000-acre tract of land called the “Mill Creek Acquisition” owned by CA State Parks and is also part of Redwood National and State Parks.

Rock Creek Road Bridge crosses East Fork Mill Creek at kilometer post 20.63 on Rock Creek Road (though some maps label this as Westbranch Road). It is located 4.1-miles (via roads) east of US 101 Freeway and 0.1-miles southeast of Hamilton Road.

The bridge is located 2.2 river miles above East Fork Mill Creek's confluence with mainstem Mill Creek and 15.6 river miles above the mouth of the Smith River. The Smith River flows into the Pacific Ocean four miles south of the California-Oregon state line. The Smith River drains a portion of the west slope of the Siskiyou Mountains, a subrange of the Klamath Mountains Geologic Province.

The project area covers approximately 20 acres and extends upstream and downstream of this site. The new bridge will be designed for installation approximately 700-feet upstream on an abandoned road located in a natural constriction in the channel. Project coordinates are 41.725551 North and 124.075702 West.

Project Set Up:

Smith River Alliance will lead project management and oversight (Task 1), as well as assist with assessments and field surveys when necessary (Task 3). Smith River Alliance will assist with meeting facilitation and design/document review throughout the project (Tasks 2, 4, 5, 6). SHN Engineers & Geologists will lead the design development for the road removal, old road reoccupation, and new bridge realignment, as well as perform all surveys and meetings associated with this work (Tasks 2 - 6). APEX Civil Engineering will provide support for bridge and abutment configuration and designs (Tasks 2 - 6). Michael Love & Associates will lead bridge hydraulic analysis, serve in a review capacity for the bridge crossing design, and lead design development for restoration of the floodplain and channel (Tasks 2 - 6). State Parks will assists with project management (Task 1), site assessment, meeting facilitation, and field work when necessary (Task 2 - 3). State Parks will review all designs and provide input throughout the project (Tasks 4 - 6). Lastly, State Parks will lead CEQA development and all associated surveys (i.e., vegetation, wetland, and cultural) for implementation (Task 7).

Materials:

Minimal materials will be used as the proposed project will be a planning and design project. Equipment used to perform surveys includes but is not limited to: Survey Supplies (hubs, monuments, tree tags, flagging) purchased and used by MLA, and a Trimble S-7 Robotic Total Station to be rented by MLA to complete the project site characteristics survey (Task 3). SHN will also rent survey equipment to complete the topographic and geotechnical report (Task 3).

Tasks:

Task 1 Project Management:

Smith River Alliance (SRA) will provide project management, contract oversight, and administration. Task 1 includes, but is not limited to, contract oversight, scheduling, invoicing, preparing progress reports for submittal to CDFW, and coordination with stakeholders and members of the project design team. SHN and MLA will provide invoicing and reporting.

Task 2 Meetings and Stakeholder Coordination:

The project will involve several meetings and ongoing coordination with CA State Parks (Landowner), and other stakeholders including but not limited to fisheries agencies and Smith River Alliance (SRA) (collectively called "Stakeholder" in the list below). SRA and State Parks will coordinate to organize and attend these meetings and provide meeting notes. SHN, APEX and MLA will attend the meetings, prepare meeting agendas, and review draft meeting notes.

Stakeholder Meeting 1 - An on-site kick-off meeting with stakeholders will be held to provide an opportunity for reviewing the project objectives, schedule, and deliverables, conduct field reconnaissance as a group, discuss technical aspects of the project, including extents of field characterization studies and surveys, and potential restoration opportunities and approaches for the project area.

Stakeholder Meeting 2 - This site meeting would be used to discuss with project stakeholders' findings from the site characterization and the 30% design submittal. The meeting would also serve as an opportunity to discuss initial findings from the site characterizations and basis of preliminary design.

Stakeholder Meeting 3 - This meeting would be used to present the 65% designs, address questions, and receive comments and suggestions. Any updated findings from the 30% conceptual designs will also be provided. This meeting is assumed to occur in Eureka and be offered as a web-based meeting to participants.

Stakeholder Meeting 4 - The meeting will be used to present to the stakeholders the 90% design report for the project, receive comments, and provide clarifications. This meeting is assumed to occur in Eureka and be offered as a web-based meeting to participants.

Stakeholder Meeting 5 - This meeting may not be necessary but is included in case an additional on-site visit or office meeting is requested by the stakeholders between the 65% to 90% design or between the 90% and final designs.

Stakeholder Coordination:
Additional one-on-one coordination with stakeholders and project partners is anticipated. This includes ongoing discussions with State Parks. SRA will lead this effort with SHN, APEX and MLA providing support.

Task 3 Site Characterization:

This task supports the collection of field data and office-based analysis to characterize existing site conditions within East Fork Mill Creek around the project site. Please see tasks 3.1, 3.2, 3.33, 3.3.1, and 3.3.2 for description of activities.

Task 3.1 Topography and Basemap Preparation [SHN]:

This task supports the collection of field data and office-based analysis to characterize existing site conditions within East Fork Mill Creek around the project site.

SHN will contract with a qualified aerial mapping contractor to provide a Lidar topographic map of the 80 acre +/- project site. The topography will be produced at a 1' = 40' Horizontal Scale with a 1' contour interval. A digital scaled color ortho photo image will be included in the mapping. To facilitate the aerial survey, SHN's field surveyors will set a minimum of 12 ground control targets based on the North American Datum of 1983 and the North American Vertical Datum of 1988. SHN's field surveyors will also provide additional field surveys of the rerouted (Alternative 2) road alignment, bridge area, truck turning alignment across the East Fork Mill Creek and the truck turning alignment at the intersection of the existing access road. In addition, field surveys will be conducted of the existing raised roadbed, the existing bridge area, and the raised roadbed across the East Fork Mill Creek. These field infill surveys will locate all trees greater than 6', the roadway prism, a corridor of sufficient width to construct or rehabilitate access roads and associated drainage channels impacting the existing and proposed access roads. The field surveys and mapping of the East Fork Mill Creek and its associated floodplain will be provided by MLA as part of the geomorphic assessment.

SHN's office surveyors will process the aerial mapping files from the aerial mapping contractor and produce an AutoCAD Civil 3D mapping set which includes the infill data from the field surveys. The compiled topographic mapping and color ortho photo will be provided in a hard copy and digital format for use by the project design team.

Task 3.2 Hydrology:

MLA will calculate return period flows for the project site using multiple methods, which may include the USGS regional regression equations, probabilistic analysis of historical peak flow records from nearby gages, and NRCS TR-55 rainfall run off model. Supporting calculations will be provided in the Project Hydraulics Technical Memorandum (TM) produced in Task 4.

Geomorphic Assessment:
MLA will lead the fluvial geomorphic site assessment for the project. This will characterize current and historical fluvial processes to assess any channel modifications at the new bridge crossing location and to develop engineering designs for floodplain restoration/accelerated reoccupation as part of removing the existing earthen causeway combined with large wood augmentation and physical reconnection of abandoned side-channel features.

Channel Field Mapping:
MLA will map geomorphic features and supplement the LiDAR based topography within the channel using a total station. The survey will be tied to the project datum using the SHN established control points. MLA will survey the channel bed, including the thalweg, in areas that the acquired LiDAR does not sufficiently reflect actual topography due to water inundation at time of flight. The project DEM will be updated to reflect the supplemental channel survey. MLA will also map larger trees in the channel/floodplain restoration footprint, with a focus on conifers, on the floodplain and along the channel margins within the anticipated project footprint.

MLA will use a combination of surveying and hand sketching on the project basemap to map geomorphic features within the channel and across the floodplain. This includes mapping the bankfull and active channel margins, historical and recent flow patterns on the floodplain and resulting scour and depositional features, and existing large wood pieces, including constructed structures and accumulating jams. The size and length of large wood transported by the stream will be measured for reference. A geomorphic sketch map will be created as part of this task.

A reference reach will be selected and used as needed for design and evaluation of the channel under the bridge. It is anticipated that the reference reach will be at, and immediately upstream, of the new bridge crossing, within this confined channel reach. It will be characterized following methods in CDFW Part XII (2009) and USFS (2008), including surveying representative cross sections, survey of the channel thalweg, active channel, and bankfull slopes, mapping geomorphic forcing features, and characterizing bed substrate.

MLA will conduct Wollman pebble counts at a minimum of 3 locations to characterize the gradation of the streambed surface substrate, including in the reference reach and restoration reaches. Results will be used to support scour analysis for the bridge, estimation of hydraulic roughness of the bed, evaluation of bedload mobility, and design of large wood structures.

Channel/Floodplain Geomorphic Analysis:
The channel will be divided into reaches within the project footprint based on channel slope and type. The channel thalweg and bankfull profiles will be plotted and slopes segments analyzed. Based on analysis of the profiles and field observations, the long-term degradation, and aggradation (low and high vertical adjustment potential [VAP]) at the new crossing site will be estimated. Hydraulic geometry of the existing channel and flood-prone area will be analyzed, including width/depth and entrenchment ratios, bankfull width and depth, and active channel width. Uniform flow hydraulic analysis of the cross sections will be conducted to estimate bankfull flow and associated return period calculated as part of the hydrology. This will be used to evaluate the frequency of floodplain inundation. Flow associated with critical shear stress for the dominant substrate size in each reach will also be calculated and related to a return period to evaluate floodplain activation relative to bed mobilization.

Results from the reference reach will be used to ensure the new bridge crossing does not constrict the bankfull channel nor change the critical discharge for sediment transport. In the event that crossing construction will disturb the existing channel bed and banks, recommended channel geometry will be provided for its restoration.

To help inform design of large wood structures, MLA will also attempt to obtain information about the subsurface conditions encountered during previously constructed ELJs upstream and downstream of the existing bridge, and the geotechnical properties of the soils assumed for securing large wood pieces. Methods and findings from the geomorphic assessment will be provided in the Site Geomorphic Assessment Memorandum and will guide design development of the channel and floodplain restoration.

Task 3.3 Geological and Geotechnical Investigation [SHN]:

The geotechnical investigation for the relocation of the Rock Creek Road crossing at km 20.63 will focus on two primary tasks:

- Geotechnical assessment of bridge abutments at the new crossing point (Task 3.3.1).
- Engineering geologic assessment for re-occupation of the previous road alignment (Task 3.3.2).

Task 3.3.1 Geological Bridge Investigation:

Drilling of the Rock Creek Road Bridge will follow the approach of other recent bridge site investigations within the Mill Creek watershed. SHN will retain the services of a licensed C-57 drilling subcontractor to advance a geotechnical boring at the northern abutment of the proposed bridge crossing. The southern abutment is not currently accessible. We anticipate a 50-foot-deep boring based on our understanding of site conditions; however, the boring will extend at least 20 feet beneath the intended foundation depth (per LRFD guidelines). The boring will be closed with bentonite chips from the bottom of the borehole to the ground surface. All drill cuttings (soil) will be wasted on-site.

SHN will supervise the drilling of the machine-drilled geotechnical boring, perform laboratory tests on selected soil samples, and develop recommendations for site grading, and bridge foundation support. SHN will be responsible for obtaining a Del Norte County boring permit, if required, to conduct the sub-surface investigation, including payment of any boring permit application fees. SHN will be responsible for pre-marking the investigation sites and notifying Underground Services Alert (USA) a minimum of 72 hours in advance of conducting the field work. A State Park archeologist will conduct cultural surveys prior to all boring operations and if deemed necessary will be on site during boring operations to ensure no impacts to cultural or archeological resources occur during the geotechnical investigation.

Laboratory testing will be determined based on the materials we encounter. We expect rocky alluvial materials that may preclude most tests; however, as feasible, we will complete testing for dry density and moisture content, Plasticity index, and grain size distribution. Corrosivity testing will be completed. Results of the bridge geotechnical investigation will be included in the final geotechnical investigation report (discussed below) with discussions of existing site conditions and foundation recommendations. Specifically, the following information, recommendations, and design criteria will be included in the final geotechnical report:

- Description of soil, bedrock, and groundwater conditions interpreted based on the field exploration, and laboratory testing.
- Log of the geotechnical boring, and results of laboratory tests conducted for the investigation.
- Assessment of potential earthquake-related geologic/geotechnical hazards (e.g., strong earthquake ground shaking, liquefaction, seismic settlement, slope instability) and discussion of possible mitigation measures, as necessary.
- Seismic design parameters from AASHTO Circular 5 will be provided, as appropriate.

- Recommendations for earthwork, including site and subgrade preparation, fill material specifications, fill placement and compaction requirements, and criteria for temporary excavation support.
- Recommendations will be provided for temporary flow control, as appropriate.
- Discussion of appropriate foundation options.
- Recommendations regarding foundation elements, including allowable bearing pressures or capacities (dead, live, and seismic loads); estimates of settlement (total and differential; allowable lateral passive and sliding resistance characteristics for footings; and, minimum foundation embedment.
- Recommendations for support of slabs-on-grade.
- Recommendations for the design and construction of retaining walls, if required.
- Recommendations for observation of foundation installation, materials testing and inspection, and other construction considerations.

Task 3.3.2 Engineering Geologic Assessment of Previous Road Alignment:

Historic aerial photographs show the previously utilized forest road alignment following a raised terrace surface upstream (east of) the existing crossing. During preliminary reconnaissance, the former road surface was noted to be overgrown and somewhat degraded, but largely intact. Several wet areas were noted, and the surface is poorly graded. While most of the legacy roadbed appears to retain adequate running width, several narrow areas were noted. There is inadequate turning radius at the southwestern intersection end of the former roadbed, so improvements will be required in this area. Expansion of the fill prism or development of retaining walls would be options at this site. The engineering geologic assessment of the non-bridge related aspects of the project will be completed in the field by an SHN Senior Engineering Geologist. Using available LiDAR and other available map sources, pertinent geologic observations will be documented. Specific items to be assessed during this preliminary field phase includes:

- Observations regarding width and general condition of the legacy road.
- A general assessment of the feasibility of re-using the legacy road.
- Mapping wet areas and general drainage patterns along the legacy road.
- Evaluation and documentation of existing cut and fill slope condition and gradient along the legacy road.
- Identification of unstable areas along the legacy road if they exist.
- Assessment of rock quality and the need for blasting at the rock outcrop at the north approach to the proposed bridge crossing; and,
- Assessment of the feasibility to increase turning radius at the north bridge approach and southwest end of the legacy truck road.

- Characterization of floodplain soils in the area between the existing bridge/causeway and the proposed bridge, in order to inform design of large woody debris structures and any grading that may be required. The results of the field investigation will be compiled to develop a Road Reconstruction Plan to facilitate re-occupation of the legacy truck road. The Plan will, at a minimum, include the following:
    - Identification of road points where specific earthwork is required.
    - Drainage planning (culverts, ditches, dips, and so on).
    - Recommendations related to cuts and fills.
    - Recommendations for road widening, where necessary (retreat into slope, extend fill outward).
    - Geotechnical recommendations for site preparation, grading, and fill placement (with appropriate consideration given to the specific task of fill placement along the outboard edge of an existing road.
    - Treatment of wet areas (stabilization of the roadbed, drainage planning). The Road Reconstruction Plan will be developed on whatever preliminary base map is available in the early stages of the project. By nature, the geotechnical investigation precedes much of the survey and design work. Therefore, it will be important to facilitate effective transfer of the information provided in the Road Reconstruction Plan to the project engineering plans, grading plans, and so on.

Reporting:
The results of the geotechnical investigations will be provided in a phased approach. Initial results of the bridge drilling, lab testing, and legacy road assessment will be included in a Preliminary Geotechnical Report. This report will include the basic components of a Preliminary Foundation Report for the bridge assessment, as well as the Road Reconstruction Plan for the legacy road. Once bridge type, geometry, and loads have been determined, a Final Geotechnical Report will be provided. This report will follow Caltrans LRFD guidelines. We expect the relevant bridge parameters to have been identified by the 30% design level; therefore, the Final Geotechnical Report would be provided at or about the 65% design milestone. The report will include all boring logs, test results, maps, and relevant figures developed during the course of the investigation. We will include specific recommendations regarding bridge abutments, cut and fill slope recommendations, earthwork recommendations relative to reconstruction along the legacy road and at areas requiring additional turning radius, and treatment of the rock outcrop at the proposed northern bridge approach.

Task 4 Preliminary Design (30%) Developments:

SHN will lead the design development for the road and bridge realignment. APEX Civil Engineering will provide support for bridge configuration and abutments. MLA will lead bridge hydraulic analysis, serve in a review capacity for the bridge

crossing design, and lead design development for restoration of the floodplain and channel. See tasks 4.1, 4.2, 4.3, and 4.4. for description of activities.

Task 4.1 Road Improvements (SHN):

SHN will provide the design for the new road. This design will be coordinated with the various other design team members, the permitting agencies, the funding agency, and State Parks. The roadway design effort is expected to consist of 30%, 65%, and 100% (Final) design submittals.

The 30% Roadway Design will establish an initial alignment for the new road and will consist of the following elements:

- 30% Roadway Design Plans. The plan set will include the following sheets:
    - General Sheets (Title Sheet); Clearing & Grubbing and Demolition Plan. This sheet will show the general limits of clearing and grubbing for the new roadway, and the general limits of demolition and decommissioning of the existing roadway and bridge, and Roadway Plan & Profile Sheets. These sheets will show the preliminary plan and profile of the new roadway. Truck turning movements will be conducted along the alignment of the new roadway to confirm that the roadway will accommodate logging trucks.
- 30% Construction Cost Estimate for the new road segment. This cost estimate will include the primary elements of construction of the new road. This construction cost estimate will have a 30% contingency.
- Basis of Design Memo (Roadway). The purpose of this report will be to inform all parties of the approach that has been taken to develop the preliminary design for the roadway. This will help to ensure that all team members are on the same page and will help team members and State Park staff make informed decisions about how to best proceed with the design. This report will summarize the criteria that was used to develop the 30% Roadway Design. It will address the following: vehicle types that were used in the truck turning analysis; figures showing truck turning movements; roadway widths and sections; roadway alignment options to be considered, summary of potential constraints and challenges. This memo will be added to the overall project basis of design report upon completion.

Task 4.2 Bridge and Bridge Abutments (APEX):

The existing Rock Creek Road Bridge crosses East Fork Mill Creek and is considered both functionally obsolete and structurally deficient. Replacement and relocation of the bridge for the purpose of restoring the floodplain is considered a high priority by both agencies and funding partners. The bridge is proposed to be

relocated further upstream at the confluence with Kelly Creek. The future bridge crossing is expected to be approximately 120 long by 22 wide. Bridge types considered will be prefabricated steel and possibly cast in place post-tensioned with tubular railing and seat type abutments. The preferred alternative bridge type and configuration will be determined based on the evaluation of the existing site conditions, hydraulic requirements, and cost. The new bridge will be designed to meet Caltrans Bridge Design standards. The roadbed width will meet AASHTO Guidelines for Geometric Design of Low-Volume Roads requirements.

During the preliminary phase of the project, the bridge replacement will require analysis and evaluation of numerous items in order to develop a preferred alternative. The key issues we believe that will be most influential in the successful delivery of the project starts with adequate hydraulic capacity of the new bridge. Construction access and a constructability review will also be performed as part of the preliminary phase. APEX will provide technical support to the Hydraulic and Geotechnical engineering teams to assure proper data is obtained prior to the initial field work. APEX will also coordinate with bridge fabricators during the initial phase to assist with the selection of the preferred alternative and to develop the bridge cost estimate.

The project development process will follow standard Caltrans project development procedures. APEX will prepare a Bridge Type Selection Memo which summarizes information from the preliminary hydraulic information, survey data, draft foundation memo, and required design data such as alignment, plan and profile, lane and shoulder widths, bridge widths, barrier railings, clearances, approach treatments, scour depths, slope protection, utilities, temperature ranges, and falsework requirements.

An Advance Planning Study (APS) of three bridge alternatives will be evaluated for cost and constructability. These are: 1) Prefabricated Steel Bridge, 2) Cast in Place post tensioned box girder bridge, 3) Pre-Cast Concrete girder bridge. Prepare Advance Planning Study drawings and cost estimates for each alternative. Submit to funding partners for evaluation, and upon approval, send to permitting agencies for review and comment.

Based on the Owner's preferred and approved type, detailed Bridge General Plan will be developed with sufficient details for budgeting and planning purposes. In addition, a General Plan Estimate will be prepared in conjunction with the Type Selection Memo and a Vicinity Map. These will be submitted to State Parks and their funding partners for approval before proceeding to the 65% design phase.

APEX Civil Engineering’s staff has the design experience to provide guidance for environmental, safety, structural, economic, and other consideration that may be applicable with the bridge replacement.

Hydraulic and Scour Analysis of New Stream Crossing:
A 1-D steady state HEC-RAS hydraulic model will be developed by MLA for the new stream crossing reach. A 1-D model was selected for this portion of the project as these results are the basis for standard bridge conveyance and scour analysis, and RAS 1D includes FHWA supported modules for these analyses. The model will be used to set the soffit/low cord of the bridge to place it above the 100-year water surface elevation with freeboard for passage of large woody debris, set the free-span length of the crossing opening, and estimate scour under the bridge. The model will be executed for proposed conditions and with the channel bed set to the high VAP elevation to ensure sufficient capacity under an aggraded channel condition and low VAP for evaluating scour. If the bridge abutment may cause contraction of the flow at the 100-year event, then contraction scour calculations will be prepared. Through an iterative process, MLA will work closely with the bridge engineer to identify the layout of the bridge soffit and abutments that result in a design consistent with FHWA Circular 18 Evaluation of Scour at Bridges and provides acceptable geomorphic performance while meeting other project objectives and constraints.

MLA will prepare a draft Bridge Hydraulics Report in PDF format with supporting results and calculations. The report will provide guidance for design development of the new steam crossing. The report will be finalized as part of the 65% design submittal.

Task 4.3 Floodplain Restoration Preliminary Design:

Based on the geomorphic characterization and results from initial 2D hydraulic analysis (described below), MLA will lead the scoping of options to restore floodplain processes and enhance aquatic habitat. Options will be schematically developed and discussed with CSP to determine the preferred path forward for preliminary design. These options will also be presented in the Channel Restoration Design Memorandum and discussed during the 30% design review.

Hydraulic Analysis of Restored Floodplain:
MLA will prepare a HEC-RAS 2D hydraulic model of the project area using the project DTM, starting upstream of the proposed stream crossing and extending to (but not including) the Kelly Creek confluence. A 2D model was selected to provide the resolution needed to develop and evaluate floodplain restoration design and associated proposed large wood structures and side-channel features. Model predicted velocities and shear stress will be used to predict locations of induced scour and aggradation. The basemap DTM will be updated in Civil 3D to reflect proposed grading and used in the model geometry. The model will be used in both developing preliminary design as well as for developing the final restoration design element and associated large wood stability calculations.

Preliminary Design Development for Floodplain Restoration:
The floodplain restoration design will be preliminarily developed by MLA. This includes developing the grading of the floodplain associated with removal of the existing earthen causeway, with an emphasis on connecting historical flow paths from upstream to downstream. Other aspects include any off-channel/side-channel features to be graded and identifying locations for placement of engineered log jams (ELJs) and other types of large wood structures to initiate geomorphic change and improve instream habitat. These structures may be designed to increase floodplain inundation frequency, activate abandoned side-channels, backwater alcoves, provide cover for fish, and cause scour for pool formation and sorting of gravels. Some structures may be conceptually designed to accumulate more large wood, thus increasing their overall influence.

At the 35% design level MLA will identify the risk level and appropriate design criteria for large wood stability. This will involve a risk assessment following protocols outlined in the Bureau of Reclamation (BOR, 2014) Risk Based Design Guidelines, WDFW (2012) Stream Habitat Restoration Guidelines, the NOAA RiverRAT (Skidmore et al. 2011), and the FRGP PSN.

For preliminary design, hydraulic analysis will assist in evaluating effectiveness of placed large wood, the amount of channel constriction/aggradation needed to activate floodplain features, likely location of induced scour, structure vulnerability, and potential to create adverse channel/floodplain responses.

Preliminary Design Drawings for Floodplain Restoration:
MLA will lead the preparation of the preliminary (30%) design drawings for the floodplain restoration components of the project, to be incorporated into the overall project planset. The drawings are anticipated to include:

- Proposed condition plan sheet(s) clearly identifying proposed restoration actions
- Typical cross sections
- Design profiles (if applicable)

The drawings will be prepared in AutoCAD Civil3D and provided in a PDF in 11x17 format. MLA will coordinate with SHN on development of the drawings to facilitate SHN's compiling of the complete planset.

Draft Channel Restoration Design Memorandum:
MLA will prepare the draft Channel Restoration Design Memorandum that will describe the restoration options scoped, the selected approach, results from the large wood risk assessment and applicable design criteria for the project, and preliminary design development, findings from supporting geomorphic and hydraulic analysis conducted.

Task 4.4 Draft Basis of Design Report:

A draft Basis of Design Report (BODR) will be prepared by SHN that compiles the various project memorandum and reports prepared by members of the project team. The BODR will consist of:

- Site description
- Project goals and objectives
- Summary of site characterization activities
- Overall description of the proposed project
- Rational for preliminary design decisions

The report will include as supporting attachments all memorandums and reports prepared as part of Tasks 3 and 4 associated with the various disciplines and activities engaged in project development. The preliminary design drawings will be provided as an attachment to the report.

The 30% submittal will be provided to stakeholders for review and comment. A minimum review period of 30 days will be provided.

Task 5 Intermediate Design Development (65%):

This task will take the preliminary (30%) design for the project and develop them into intermediate (65%) design level. Review comments from the 30% submittal will be addressed. Stakeholders will be provided the 65% design submittal for review and comment. A minimum 30-day review period will be provided. Comments will be addressed within the following submittal. Please see tasks 5.1, 5.2 and 5.3 for detailed description of activities.

Task 5.1 Roadway Intermediate Design (SHN):

The 65% Roadway Design will be based on the decisions made at the end of the 30% Design Phase and will present the design in more detail. The Roadway Design Plans for the 65% Design submittal will include the following sheets:

1. General Sheets (Title Sheet, Abbreviations & Legend Sheet, General Notes Sheet)
2. Overall Site Sheets (Project Overview, Access Plan, Staging/Stockpiling Areas, Water Management Plan)
3. Clearing & Grubbing and Demolition Plan. This sheet will show the limits of clearing and grubbing for the new roadway, and the limits of demolition and decommissioning of the existing roadway and bridge. It will also provide information specifying what activities must be conducted in order to decommission the existing road.
4. Roadway Plan & Profile Sheets. These sheets will show the plan and profile of the new road.

5. Roadway Cross Section Sheets. Cross sections of the proposed roadway will be shown at 50-foot intervals. These cross sections will show the new road and the existing ground surface.
6. Detail Sheets. These sheets will show roadway typical sections, and details necessary to facilitate construction of the road.

Preliminary Technical Specifications for the roadway design will be developed during this stage of the project. SHN will also prepare a preliminary construction cost estimate for the roadway.

Bridge and Bridge Abutments (APEX):
APEX will further develop construction details for the bridge abutments. Based on the preferred alternative and the approved road alignment, engineering calculations and a draft set of bridge construction plans will be developed.

Foundation Design:
The foundation design and analysis will be performed based on current AASHTO LRFD and Caltrans Seismic Design Guidelines. Plans will be prepared in accordance with Caltrans Bridge Design Details.
Bridge Plan Sheets:

- S1 General Plan
- S2 Deck Contour
- S3 Foundation Plan
- S4 Abutment layout
- S5 Abutment Details/RSP
- S6 Typical Section
- S7 Tubular Handrailing Details
- S8 Log of Test Borings

Bridge Fabricator Procurement Package:
Develop and review the plans for the plans, which includes engineering calculations and sample details for development of the final plans, specifications, and estimates. Bridge design requirements will be in accordance with Caltrans, Bridge Design Aids, Bridge Design Practice, AASHTO LRFD Bridge Design Specifications, Bridge Memo to Designers and Seismic Design Criteria. The design will meet Caltrans and FHWA standards in effect as of the date of Notice to Proceed.

Quantity Calculations and Bid Item List:
APEX will prepare a preliminary construction cost estimate and submit it after the preliminary construction plans have been drafted. The estimate will be comprised of unit prices based on detailed quantity calculations. Unit prices will be developed using current bid results from similar projects, Caltrans database information and Caltrans latest Construction Cost Manual. All estimates will be done in Caltrans BEES format using Microsoft Excel.

Updated Hydraulics and Rock Sizing:
As part of the intermediate design development of the new steam crossing, MLA will update the 1D HEC-RAS model to reflect any changes to the crossing layout and update any applicable scour analysis. MLA will also perform rock (RSP) stability calculations, as needed, using the hydraulics from the model. The Bridge Hydraulics Report will be finalized by MLA to reflect any design refinement developed.

Task 5.2 Floodplain Restoration Intermediate Design:

Design Development of Floodplain Restoration:
MLA will continue to develop and refine the restoration design for the channel and floodplain, including updating grading, large wood placements, and the HEC-RAS 2D model. Detailed design of large wood structures will be developed, and force balance calculations utilize methods outlined by D'Aust and Miller (2000) and the Computational Design Tool for Evaluating the Stability of Large Wood by Rafferty (USFS, 2017), among others.

Intermediate Design Drawings for Floodplain Restoration:
MLA will lead the preparation of the intermediate (65%) design drawings for the floodplain restoration components of the project, to be incorporated into the overall project planset. The 30% design drawings will be updated. Additional drawings are anticipated to include:

- Detailed placement plan for large wood structures
- Detailed drawings for large wood structures
- Specifications for installation of large wood as notes
- Grading sections (as appropriate)
- Construction access points for channel and floodplain restoration
- Erosion and sediment control measures on the floodplain

Task 5.3 65% Opinion of Probable Construction Cost (OPCC):

SHN will develop a template for the OPCC and will complete the OPCC for the roadway portion of the project. SHN will also prepare a summary sheet for the OPCC which will include items that are shared between all elements of the project such as mobilization/demobilization, water management, and erosion control. APEX will prepare the OPCC for the bridge and bridge foundation portion of the project. MLA will prepare the OPCC for the floodplain restoration components, including developing quantities and estimation of costs for construction of large wood structures and floodplain grading.

Updated Basis of Design Report:
The draft BODR will be updated at 65% design to include necessary updates to the project description and rationale for any design changes, along with

attachments containing design calculations for large wood structures, bridge foundation calculations.

Task 6 - Finalize Plans, Specifications and Estimate (PS&E) Package:

SHN, APEX, and MLA will prepare a draft-final (90%) plans, specifications, and opinion of probable construction cost (PS&E) package for review. This draft-final design submittal is intended to contain a draft of the completed construction documents, with the expectation that only minor changes will occur between draft-final and the final submittal. Any notable changes to the project from the 65% design will be described in the transmittal letter with the PS&E package. Stakeholders will be provided the draft-final submittal for review and comment. A minimum 30-day review period will be provided. Comments will be addressed in the final submittal as part of this task.

Final Roadway Design (SHN):
The Final Roadway Design will be based on the decisions made at the end of the 65% Design Phase and will present the final design for the roadway. The Roadway Design Plans for the Draft-Final Design submittals is expected to include the sheets described in the 65% Design submittal. Additional plan sheets will be added as needed to complete the design for the roadway.

Technical Specifications necessary for the construction of the new road will be updated and finalized. The Final Roadway Design will include final stamped and signed plans and specifications and a final construction cost estimate.

Final Bridge Engineering (APEX):
As part of the final bridge engineering phase, an independent bridge check will be performed. This involves a completely independent analysis of the bridge using the unchecked bridge plans and 65% roadway plans by an engineer that has not been intimately involved in the design. This is a big part of the Team's QA/QC Plan and is identical to the Caltrans/Local Agency process. Based upon the independent bridge check and agreement to revisions by the checker and designer, the bridge plans will be revised.

Technical specifications will be prepared based upon the current edition of the Caltrans Standard Specifications and Bid Item List. Probable cost estimates will be developed based on historic project data provided by State Parks and a database search of Caltrans District 1 construction projects completed within the last 3 years.

Floodplain Restoration Final Design (MLA):
Based on review comments and guidance provided at the end of the 65% Design Phase, MLA will finalize the design plans for the restoration of the channel and floodplain. This includes adding additional detail to the drawings, and refinement

of the project specifications, which will be included as notes on the design drawings. Additional plan sheets will be added as needed to complete the design. The drawings will be incorporated by SHN into the 90% planset for review by stakeholders. MLA will also update related quantities and costs as part of the project OPCC.

Comments on the 90% submittal regarding the channel and floodplain restoration components will be addressed by MLA as part of the final (100%) submittal. A California registered Professional Engineer from MLA will sign and seal the MLA design drawings as part of the final 100% PS&E package.

Task 7 Environmental Compliance:

State Parks will complete the CEQA consultation process for implementation. Surveys and reports pertaining to rare plants, wetland delineation, and cultural/archeological resources will be included in the CEQA review and consultation process.

Vegetation Assessment [State Parks]:
Surveys will be conducted to identify individuals or populations of rare, threatened, endangered plants, or those listed as California Native Plant Society Ranks 1 and 2. Surveys will be conducted when the plants are in a phenological stage conducive to positive identification, by a qualified botanist able to surveys for special-status plant species and sensitive communities throughout the project area. Surveys will be conducted in conformance with the California Department of Fish and Wildlife Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities (CDFW 2018). A memo outlining findings from surveys along with spatial data outlining locations of any sensitive plant species will be provided to ensure plants are avoided with an appropriate buffer delineated when implementation is conducted.

Wetland Delineation [State Parks]:
State Parks will provide a wetland delineation to support the project permitting requirements. Delineation will follow the 1987 U.S. Army Corp of Engineers Wetland Delineation Manual and Supplements as outlined in State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State. A report of findings including spatial information will be recorded and outlined in a report.

Cultural/Archeological Survey and Consultation [State Parks]:
The proposed project area will be inventoried for the presence or absence of historical and archaeological resources within the project area and a report will be prepared by the California State Parks North Coast Redwood District (NCRD) Archaeologist. Any cultural resources identified will be recorded during the inventory to ensure they can be flagged with an appropriate buffer as needed,

based on topography and access points, to protect the find during the implementation phase of the project. NCRD Tribal Liaison will conduct outreach and consultation with local tribes. Additionally, the Archaeologist will survey sites where geotechnical coring will be conducted for the planning phase prior to coring operations.

Deliverables:

Task 1:
- Contracts
- Quarterly invoices and progress reports
- Final report

Task 2:
- Meeting agendas in PDF format
- Draft and final meeting notes in PDF format

Task 3:
- Topographic base map of existing conditions and channel profile in CAD and PDF formats
- MLA Geomorphic Assessment Memorandum (PDF format)
- Draft bridge geotechnical report
- Draft Road Reconstruction Plan (PDF)
- Preliminary Geotechnical Report (PDF)
- Final Geotechnical Report (PDF)

Task 4:
- SHN Roadway Design Memorandum (PDF Format)
- Apex Bridge Type Selection Memorandum (PDF format)
- MLA Draft Bridge Hydraulics Report (PFD Format)
- MLA Draft Channel Restoration Design Memorandum (PDF format)
- Preliminary (30%) design plans in 11x17 format compiled by SHN (PDF format). Will include information/sheets prepared by SHN, APEX, and MLA into a single plan set.
- Draft Basis of Design Report compiled by SHN (PDF format)

Task 5:
- Response to TAC comments from 30% designs
- MLA Final Bridge Hydraulics Report (PFD Format)
- MLA Final Channel Restoration Design Memorandum (PDF format)
- APEX Structural Calculations
- 65% design plans in 11x17 format compiled by SHN (PDF)
- 65% Opinion of Probable Construction Cost (PDF format)
- Final Basis of Design Report (PDF format)

Task 6:
- Draft-Final (90%) Planset (11”x17” PDF) and Specifications (PDF format)
- Final (100%) Opinion of Probable Construction Cost (PDF format)
- Final Basis of Design Report (PDF format and 1 hard copy to CDFW)

- Final (100%) Signed and Sealed Planset for entire project (11"x17" PDF format and 1 hardcopy for CDFW and 22"x34" PDF format)

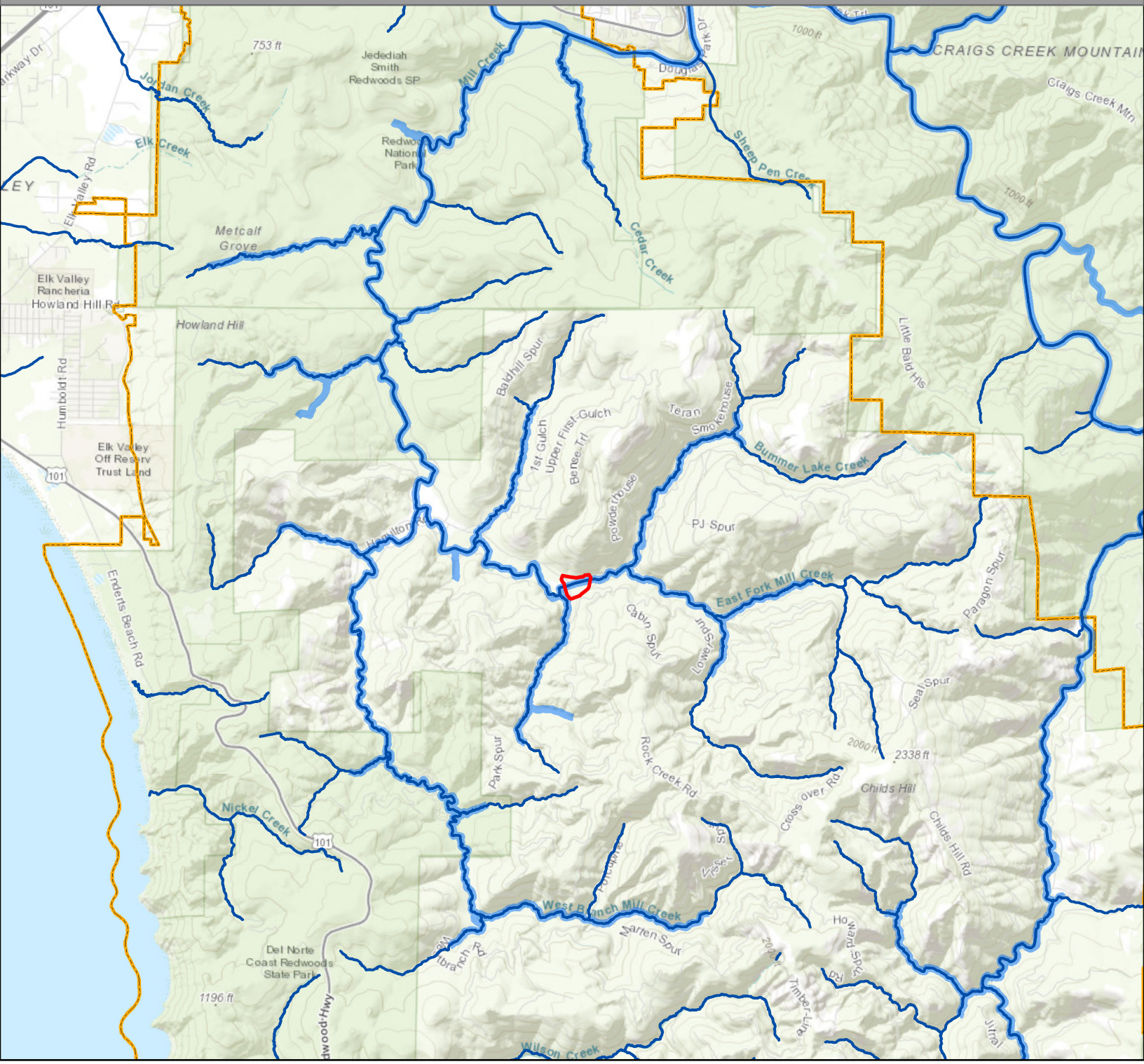
Task 7:

- Draft and Final CEQA document for implementation
- Vegetation Memo with maps showing composition and rare plant findings (PDF format)
- Cultural/Archeological Inventory report including maps (PDF format)
- Wetland delineation report including maps (PDF format)

Timelines:

Task 1: 4/15/2021 to 3/1/2023
Task 2: 4/30/2021 to 8/15/2022
Task 3: 4/30/2021 to 3/1/2023
Task 4: 4/30/2021 to 11/1/2021
Task 5: 1/1/2022 to 3/15/2022
Task 6: 1/1/2022 to 10/30/2022
Task 7: 4/30/2021 to 3/15/2022

East Fork Mill Creek Floodplain Restoration Design Project



Project Topographic Map

- Perennial Stream
- Anadromous Streams
- Proposed Project Location
- Redwood National and State Parks

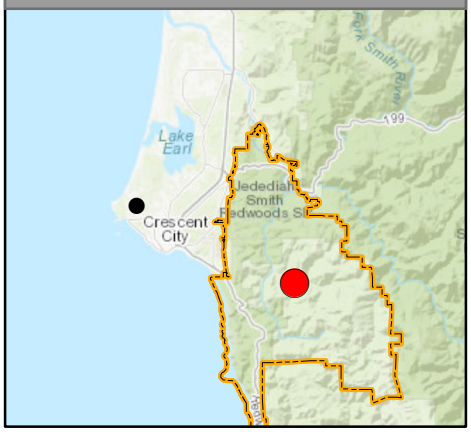
Map Sources:
Imagery: USGS SMith River Quad Map
Imagery, roads, cities:
ESRI World Mapping Service

N

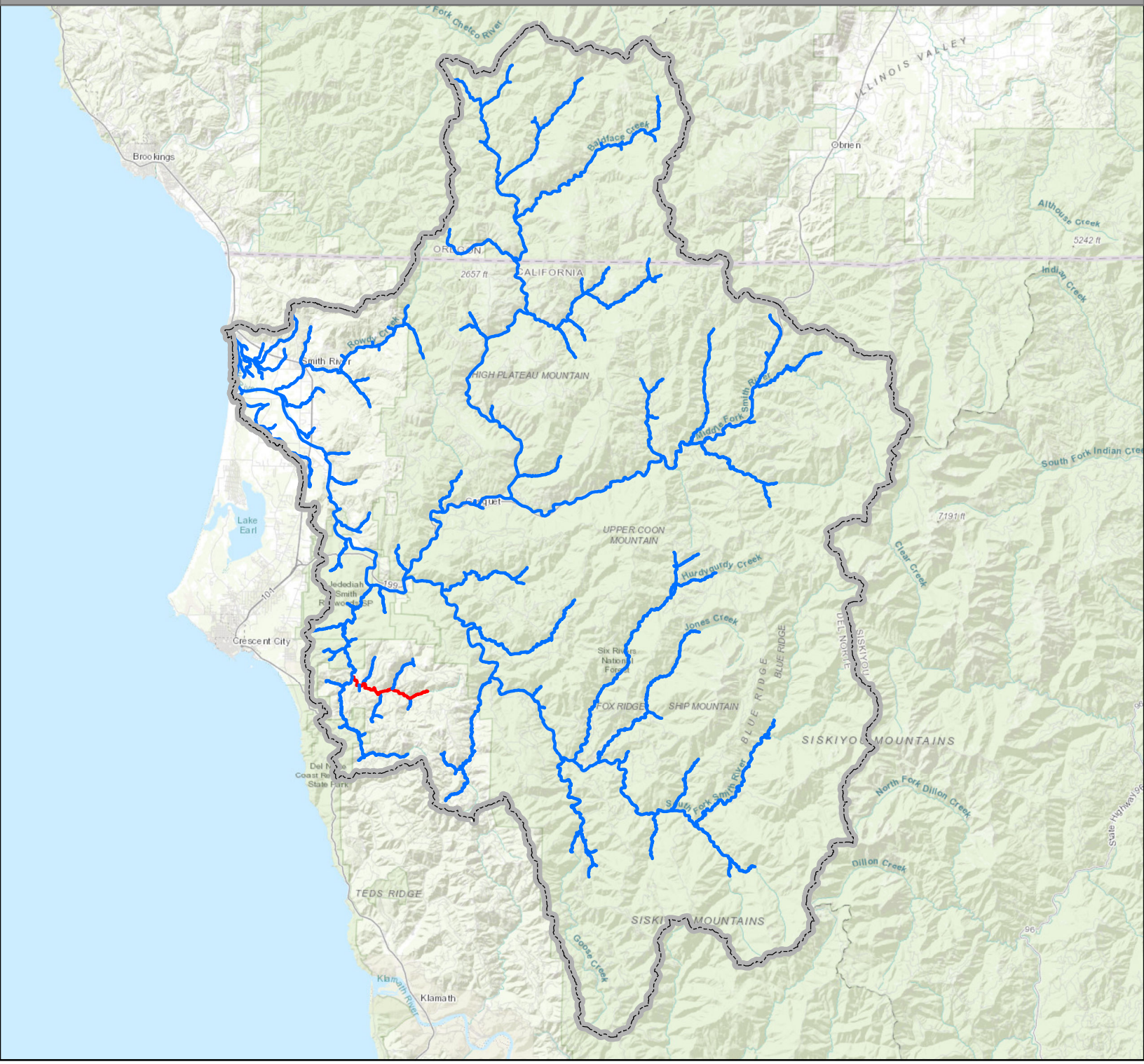
0 5,000 10,000 Feet

0 1 2 Miles

Map Location



East Fork Mill Creek Floodplain Restoration Design Project



Watershed Map

- Smith River Anadromous Streams
- East Fork Mill Creek
- Smith River Watershed

Map Sources:
Imagery: USGS SMith River Quad Map
Imagery, roads, cities:
ESRI World Mapping Service

N

0 25,000 50,000 Feet

0 5 10 Miles

Map Location

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Childs Hill (4112461) OR Sister Rocks (4112462) OR Crescent City (4112472) OR Hiouchi (4112471) OR Gasquet (4112378) OR Cant Hook Mtn. (4112368) OR Klamath Glen (4112358) OR Requa (4112451))

Possible species within the Childs Hill and surrounding quads for 1723570 - East Fork Mill Creek Floodplain Restoration Design Project, Del Norte County

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Abronia umbellata var. breviflora pink sand-verbena	PDNYC010N4	None	None	G4G5T2	S2	1B.1
Ancotrema voyanum hooded lancetooth	IMGAS36130	None	None	G1G2	S1S2	
Anthoxanthum nitens ssp. nitens vanilla-grass	PMPOA0F041	None	None	G5	S2	2B.3
Aplodontia rufa humboldtiana Humboldt mountain beaver	AMAFA01017	None	None	G5TNR	SNR	
Arabis mcdonaldiana McDonald's rockcress	PDBRA06150	Endangered	Endangered	G3	S3	1B.1
Arborimus pomo Sonoma tree vole	AMAFF23030	None	None	G3	S3	SSC
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Ascaphus truei Pacific tailed frog	AAABA01010	None	None	G4	S3S4	SSC
Asplenium trichomanes ssp. trichomanes maidenhair spleenwort	PPASP021K2	None	None	G5T5	S1	2B.1
Atractelmis wawona Wawona riffle beetle	IICOL58010	None	None	G3	S1S2	
Boechera koehleri Koehler's stipitate rockcress	PDBRA060Z0	None	None	G3G4	S3	1B.3
Bombus caliginosus obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
Bombus occidentalis western bumble bee	IIHYM24250	None	Candidate Endangered	G2G3	S1	
Brachyramphus marmoratus marbled murrelet	ABNNN06010	Threatened	Endangered	G3G4	S1	
Branta hutchinsii leucopareia cackling (=Aleutian Canada) goose	ABNJB05035	Delisted	None	G5T3	S3	WL
Bryoria spiralifera twisted horsehair lichen	NLTEST5460	None	None	G1G2	S1S2	1B.1
Calamagrostis crassiglumis Thurber's reed grass	PMPOA17070	None	None	G3Q	S2	2B.1
Calamagrostis foliosa leafy reed grass	PMPOA170C0	None	Rare	G3	S3	4.2
Calicium adspersum spiral-spored gilded-head pin lichen	NLT0005640	None	None	G3G4	S1	2B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Calystegia atriplicifolia ssp. buttensis Butte County morning-glory	PDCON04012	None	None	G5T3	S3	4.2
Cardamine angulata seaside bittercress	PDBRA0K010	None	None	G4G5	S3	2B.1
Cardamine nuttallii var. gemmata yellow-tubered toothwort	PDBRA0K0R3	None	None	G5T3Q	S2	3.3
Carex arcta northern clustered sedge	PMCYP030X0	None	None	G5	S1	2B.2
Carex lenticularis var. limnophila lagoon sedge	PMCYP037A7	None	None	G5T5	S1	2B.2
Carex leptalea bristle-stalked sedge	PMCYP037E0	None	None	G5	S1	2B.2
Carex lyngbyei Lyngbye's sedge	PMCYP037Y0	None	None	G5	S3	2B.2
Carex praticola northern meadow sedge	PMCYP03B20	None	None	G5	S2	2B.2
Carex serpenticola serpentine sedge	PMCYP03KM0	None	None	G4	S3	2B.3
Carex viridula ssp. viridula green yellow sedge	PMCYP03EM5	None	None	G5T5	S2	2B.3
Cascadia nuttallii Nuttall's saxifrage	PDSAX0U160	None	None	G4?	S1	2B.1
Castilleja elata Siskiyou paintbrush	PDSCR0D213	None	None	G3	S2S3	2B.2
Castilleja litoralis Oregon coast paintbrush	PDSCR0D012	None	None	G3	S3	2B.2
Cerorhinca monocerata rhinoceros auklet	ABNNN11010	None	None	G5	S3	WL
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Circus hudsonius northern harrier	ABNKC11011	None	None	G5	S3	SSC
Coastal and Valley Freshwater Marsh Coastal and Valley Freshwater Marsh	CTT52410CA	None	None	G3	S2.1	
Coastal Brackish Marsh Coastal Brackish Marsh	CTT52200CA	None	None	G2	S2.1	
Cochlearia groenlandica Greenland cochlearia	PDBRA0S020	None	None	G4	S1	2B.3
Coenonympha tullia yontockett Yontocket satyr	IILEPN6035	None	None	G5T1T2	S1	
Coptis laciniata Oregon goldthread	PDRAN0A020	None	None	G4?	S3?	4.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Corynorhinus townsendii Townsend's big-eared bat	AMACC08010	None	None	G3G4	S2	SSC
Cottus klamathensis polyporus Lower Klamath marbled sculpin	AFC4E02153	None	None	G4T2T4	S2S4	SSC
Cypseloides niger black swift	ABNUA01010	None	None	G4	S2	SSC
Darlingtonia Seep Darlingtonia Seep	CTT51120CA	None	None	G4	S3.2	
Discelium nudum naked flag moss	NBMUS2E010	None	None	G4G5	S1	2B.2
Downingia willamettensis Cascade downingia	PDCAM060E0	None	None	G4	S2	2B.2
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Empetrum nigrum black crowberry	PDEMP03020	None	None	G5	S1?	2B.2
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Erethizon dorsatum North American porcupine	AMAFJ01010	None	None	G5	S3	
Eriogonum nudum var. paralinum Del Norte buckwheat	PDPGN08498	None	None	G5T2	S1	2B.2
Eriogonum pendulum Waldo wild buckwheat	PDPGN084Q0	None	None	G4	S2S3	2B.2
Erysimum concinnum bluff wallflower	PDBRA160E3	None	None	G3	S2	1B.2
Erythronium hendersonii Henderson's fawn lily	PMLIL0U070	None	None	G4	S2	2B.3
Erythronium howellii Howell's fawn lily	PMLIL0U080	None	None	G3G4	S2	1B.3
Erythronium oregonum giant fawn lily	PMLIL0U0C0	None	None	G4G5	S2	2B.2
Erythronium revolutum coast fawn lily	PMLIL0U0F0	None	None	G4G5	S3	2B.2
Eucyclogobius newberryi tidewater goby	AFCQN04010	Endangered	None	G3	S3	SSC
Eumetopias jubatus Steller (=northern) sea-lion	AMAJC03010	Delisted	None	G3	S2	
Fissidens pauperculus minute pocket moss	NBMUS2W0U0	None	None	G3?	S2	1B.2
Fratercula cirrhata tufted puffin	ABNNN12010	None	None	G5	S1S2	SSC

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Gentiana setigera Mendocino gentian	PDGEN060S0	None	None	G2	S2	1B.2
Gilia capitata ssp. pacifica Pacific gilia	PDPLM040B6	None	None	G5T3	S2	1B.2
Gilia millefoliata dark-eyed gilia	PDPLM04130	None	None	G2	S2	1B.2
Gonidea angulata western ridged mussel	IMBIV19010	None	None	G3	S1S2	
Hesperevax sparsiflora var. brevifolia short-leaved evax	PDASTE5011	None	None	G4T3	S3	1B.2
Juga chacei Chace juga	IMGASK4180	None	None	G1	S1	
Kopsiopsis hookeri small groundcone	PDORO01010	None	None	G4?	S1S2	2B.3
Lanx alta highcap lanx	IMGASL7010	None	None	G2G3	S1S2	
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Lasthenia californica ssp. macrantha perennial goldfields	PDAST5L0C5	None	None	G3T2	S2	1B.2
Lathyrus japonicus seaside pea	PDFAB250C0	None	None	G5	S2	2B.1
Lathyrus palustris marsh pea	PDFAB250P0	None	None	G5	S2	2B.2
Lewisia oppositifolia opposite-leaved lewisia	PDPOR040B0	None	None	G3	S2	2B.2
Lilium occidentale western lily	PMLIL1A0G0	Endangered	Endangered	G1	S1	1B.1
Limnephilus atercus Fort Dick limnephilus caddisfly	IITRI15020	None	None	G3G4	S1	
Lomatium martindalei Coast Range lomatium	PDAPI1B140	None	None	G5	S2	2B.3
Lysimachia europaea arctic starflower	PDPRI0A020	None	None	G5	S1	2B.2
Margaritifera falcata western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Martes caurina humboldtensis Humboldt marten	AMAJF01012	Proposed Threatened	Endangered	G5T1	S1	SSC
Mitellastra caulescens leafy-stemmed mitrewort	PDSAX0N020	None	None	G5	S4	4.2
Monadenia fidelis pronotis rocky coast Pacific sideband	IMGASC7032	None	None	G4G5T1	S1	

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Moneses uniflora woodnymph	PDPYR02010	None	None	G5	S2	2B.2
Monotropa uniflora ghost-pipe	PDMON03030	None	None	G5	S2	2B.2
Myotis evotis long-eared myotis	AMACC01070	None	None	G5	S3	
Myotis thysanodes fringed myotis	AMACC01090	None	None	G4	S3	
Myotis yumanensis Yuma myotis	AMACC01020	None	None	G5	S4	
Northern Coastal Salt Marsh Northern Coastal Salt Marsh	CTT52110CA	None	None	G3	S3.2	
Nycticorax nycticorax black-crowned night heron	ABNGA11010	None	None	G5	S4	
Oceanodroma furcata fork-tailed storm-petrel	ABNDC04010	None	None	G5	S1	SSC
Oenothera wolfii Wolf's evening-primrose	PDONA0C1K0	None	None	G2	S1	1B.1
Oncorhynchus clarkii clarkii coast cutthroat trout	AFCHA0208A	None	None	G4T4	S3	SSC
Oncorhynchus mykiss irideus pop. 36 summer-run steelhead trout	AFCHA0213B	None	Candidate Endangered	G5T4Q	S2	SSC
Packera bolanderi var. bolanderi seacoast ragwort	PDAST8H0H1	None	None	G4T4	S2S3	2B.2
Packera hesperia western ragwort	PDAST8H1L0	None	None	G3	S1	2B.2
Pandion haliaetus osprey	ABNKC01010	None	None	G5	S4	WL
Pekania pennanti fisher - West Coast DPS	AMAJF01021	Endangered	Threatened	G5T2T3Q	S2S3	SSC
Phacelia argentea sand dune phacelia	PDHYD0C070	None	None	G2	S1	1B.1
Phalacrocorax auritus double-crested cormorant	ABNFD01020	None	None	G5	S4	WL
Pinguicula macroceras horned butterwort	PDLNT01040	None	None	G4	S2	2B.2
Piperia candida white-flowered rein orchid	PMORC1X050	None	None	G3	S3	1B.2
Plethodon elongatus Del Norte salamander	AAAAD12050	None	None	G4	S3	WL
Polemonium carneum Oregon polemonium	PDPLM0E050	None	None	G3G4	S2	2B.2

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Polites mardon mardon skipper	IILEP66030	None	None	G2G3	S1	
Potamogeton foliosus ssp. fibrillosus fibrous pondweed	PMPOT030B1	None	None	G5T2T4	S1S2	2B.3
Prosartes parvifolia Siskiyou bells	PMLIL0R014	None	None	G2	S1S2	1B.2
Pyrrocoma racemosa var. congesta Del Norte pyrrocoma	PDASTDT0F4	None	None	G5T4	S2	2B.3
Ramalina thrausta angel's hair lichen	NLLEC3S340	None	None	G5?	S2S3	2B.1
Rana aurora northern red-legged frog	AAABH01021	None	None	G4	S3	SSC
Rana boylii foothill yellow-legged frog	AAABH01050	None	Endangered	G3	S3	SSC
Rhyacotriton variegatus southern torrent salamander	AAAAJ01020	None	None	G3G4	S2S3	SSC
Romanzoffia tracyi Tracy's romanzoffia	PDHYD0E030	None	None	G4	S2	2B.3
Rosa gymnocarpa var. serpentina Gasquet rose	PDROS1J1V1	None	None	G5T3T4	S2	1B.3
Sabulina howellii Howell's sandwort	PDCAR0G0F0	None	None	G4	S3	1B.3
Sagittaria sanfordii Sanford's arrowhead	PMALI040Q0	None	None	G3	S3	1B.2
Sanguisorba officinalis great burnet	PDROS1L060	None	None	G5?	S2	2B.2
Sedum citrinum Blue Creek stonecrop	PDCRA0A200	None	None	G2	S2	1B.2
Sidalcea malachroides maple-leaved checkerbloom	PDMAL110E0	None	None	G3	S3	4.2
Sidalcea malviflora ssp. patula Siskiyou checkerbloom	PDMAL110F9	None	None	G5T2	S2	1B.2
Sidalcea oregana ssp. eximia coast checkerbloom	PDMAL110K9	None	None	G5T1	S1	1B.2
Silene scouleri ssp. scouleri Scouler's catchfly	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2
Silene serpentinicola serpentine catchfly	PDCAR0U2B0	None	None	G3	S3	1B.2
Speyeria zerene hippolyta Oregon silverspot butterfly	IILEPJ6087	Threatened	None	G5T1	S1	
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	

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Streptanthus howellii Howell's jewelflower	PDBRA2G0N0	None	None	G2G3	S2	1B.2
Thaleichthys pacificus eulachon	AFCHB04010	Threatened	None	G5	S3	
Triquetrella californica coastal triquetrella	NBMUS7S010	None	None	G2	S2	1B.2
Usnea longissima Methuselah's beard lichen	NLLEC5P420	None	None	G4	S4	4.2
Vaccinium scoparium little-leaved huckleberry	PDERI180Y0	None	None	G5	S3	2B.2
Viola langsdorffii Langsdorf's violet	PDVIO04100	None	None	G4	S1	2B.1
Viola palustris alpine marsh violet	PDVIO041G0	None	None	G5	S1S2	2B.2
Viola primulifolia ssp. occidentalis western white bog violet	PDVIO040Y2	None	None	G5T2	S2	1B.2

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