Redwood Creek Ecosystem Restoration

Continuing Authorities Program - Federal Interest Determination

Section 1135 - Ecosystem Restoration

U.S. Army Corps of Engineers
San Francisco District
3/28/2022

FEDERAL INTEREST DETERMINATION DOCUMENT
CONTINUING AUTHORITIES PROGRAM
Section 1135 Aquatic Ecosystem Restoration,
Redwood Creek
Humboldt County, California
U.S. Army Corps of Engineers

STUDY NUMBER, NON-FEDERAL SPONSOR, AND CONGRESSIONAL DELEGATION

The study name is Redwood Creek Ecosystem Restoration, located in Humboldt County, near the town of Orick, CA (P2: 332021). The local sponsor, Humboldt County requested a meeting and an initial site visit with representatives from U.S. Army Corps of Engineers (USACE or Corps) to discuss on-going flood risk management and restoration opportunities in the study area. The non-federal sponsor provided a letter of interest (LOI) on March 3, 2021, requesting a new start study for Redwood Creek. The project kickoff meeting took place on January 28, 2022.

Congressional representation is as follows:

U.S. Senate
Senator: Alex Padilla (D)
Senator: Dianne Feinstein (D)

Congressional District
Rep. Jared Huffman (D), CA District

STUDY AUTHORITY

This study is being conducted under Section 1135 of the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662). Section 1135 projects are part of a larger Continuing Authorities Program (CAP) under which the Secretary of the Army, acting through the Chief of Engineers, is authorized to plan, design, and implement certain types of water resources projects without additional project-specific authorization. The Section 1135 authority allows USACE to modify existing USACE projects to restore the environment and construct new projects to restore areas degraded by existing USACE projects when it is determined that such modifications are feasible, consistent with the authorized project purpose, and will improve the quality of the environment in the public interest. Work under this authority can include modification to the structures and operations of water resources project constructed by USACE or undertake restoration projects at locations where a USACE project has contributed to environmental degradation.

The Section 1135 program is conducted in partnership with a nonfederal sponsor (NFS). The USACE and the NFS share the study and implementation costs. Federal share of planning, design and construction cannot exceed $10,000,000 per project.

REPORT PURPOSE

The purpose of a Federal Interest Determination (FID) report is to determine if a study is likely to lead to an implementable project. A FID report includes a description of the existing problem, a description of potential solution(s) that would result in a policy-consistent project of a scope appropriate for CAP, the identification of a willing and capable NFS, and the determination as to whether there is federal interest in continuing with a more detailed, feasibility-level report to support potential project implementation.

STUDY AREA AND EXISTING WATER PROJECTS

The proposed study area is Lower Redwood Creek and Redwood Creek Estuary, where the 178,000-acre coastal watershed discharges into the Pacific Ocean. Located in North Humboldt County and situated within ancestral territory of the Yurok Tribe, Redwood Creek flows northwest from the North Coast Range to an alluvial agricultural valley containing the community of Orick and portions of Redwood National and State Parks.

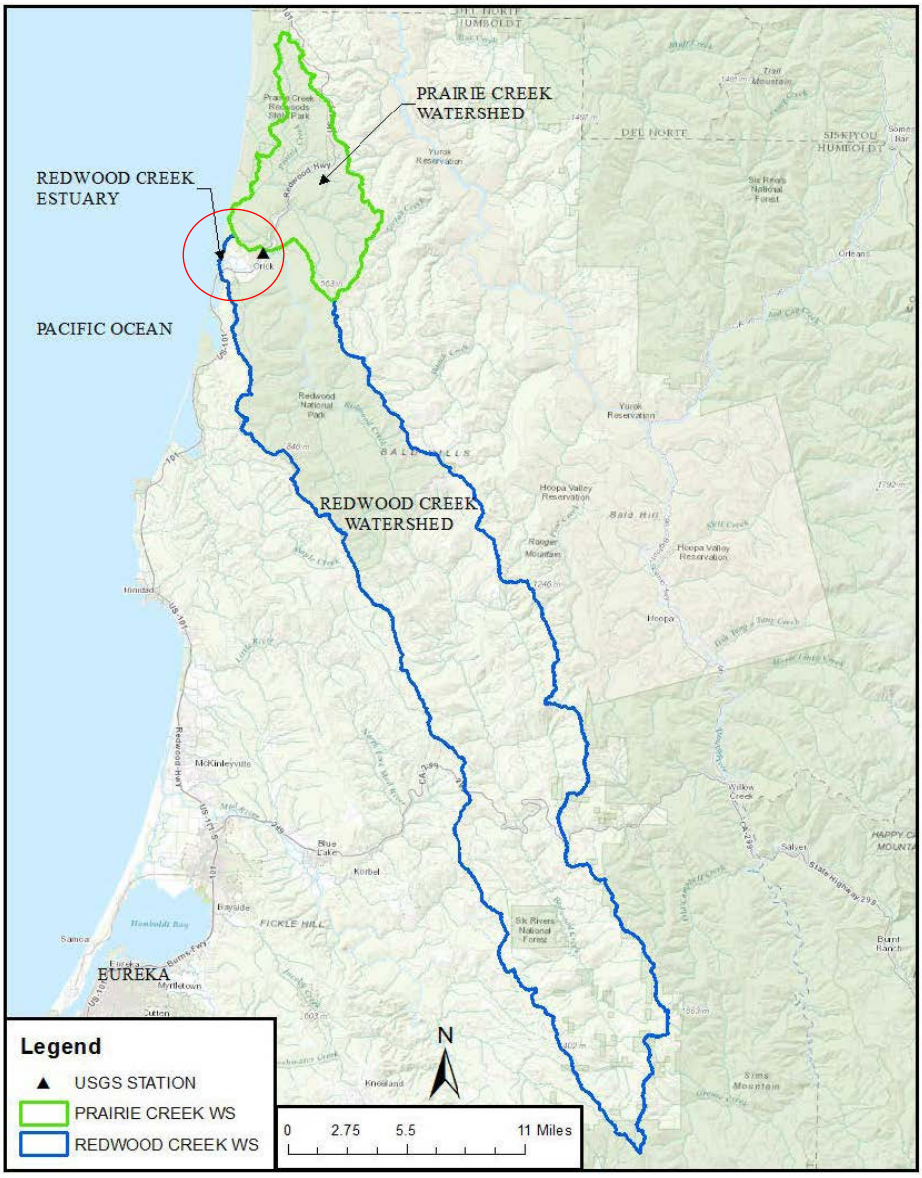

Figure 1. Regional Setting of Study Area – Lower Redwood Creek and Redwood Creek Estuary shown within red circle, at the convergence of the Prairie Creek and Redwood Creek watersheds. (Humboldt County, 2014)

Starting upstream of Orick, the Redwood Creek Flood Control Project levees line Redwood Creek for 3.4 miles to the Redwood Creek Estuary (Figure 2).

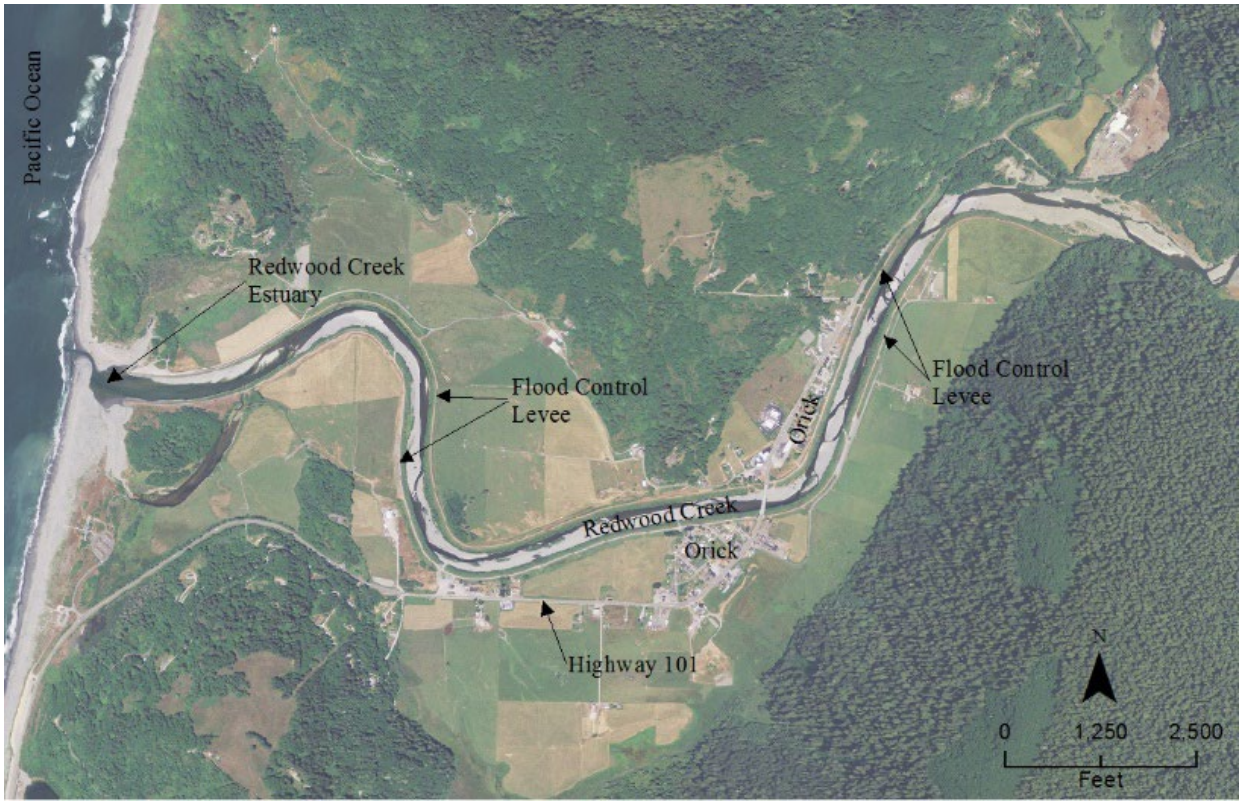

Figure 2. Map of Lower Redwood Creek and Redwood Creek Estuary, Community of Orick, and Redwood Creek Flood Control Project (July 6, 2009, USDA-NAIP) (Humboldt County, 2014).

EXISTING PROJECTS AND STUDIES

Redwood Creek Flood Control Project (1968)

The Redwood Creek Flood Control Project was completed by the USACE in 1968 and authorized by Flood Control Act of 1962 (Public Law No. 87-874, 87th Congress, 2nd Session). The flood control project aimed to protect Orick, which had experienced extreme floods in 1950, 1953, 1955, 1964 (Humboldt County, 2014). Currently, the levee system protects roughly 300 Orick residents, businesses, a school, agricultural and cultural facilities, Redwood National Park facilities, public and private roads, and U.S. Highway 101. Orick is a severely disadvantaged community based on median income (Humboldt County, 2014).

Historically, Redwood Creek downstream of Orick consisted of a northward and then southward bend that flowed around Middle Island before entering the Redwood Creek estuary (Figure 3). The creek, estuary and sloughs evolved and migrated within the floodplain based on hydrology, riverine and coastal sediment deposition. During periods of low flow, a barrier beach would form, disconnecting Redwood Creek from the Pacific Ocean (Humboldt County, 2014).

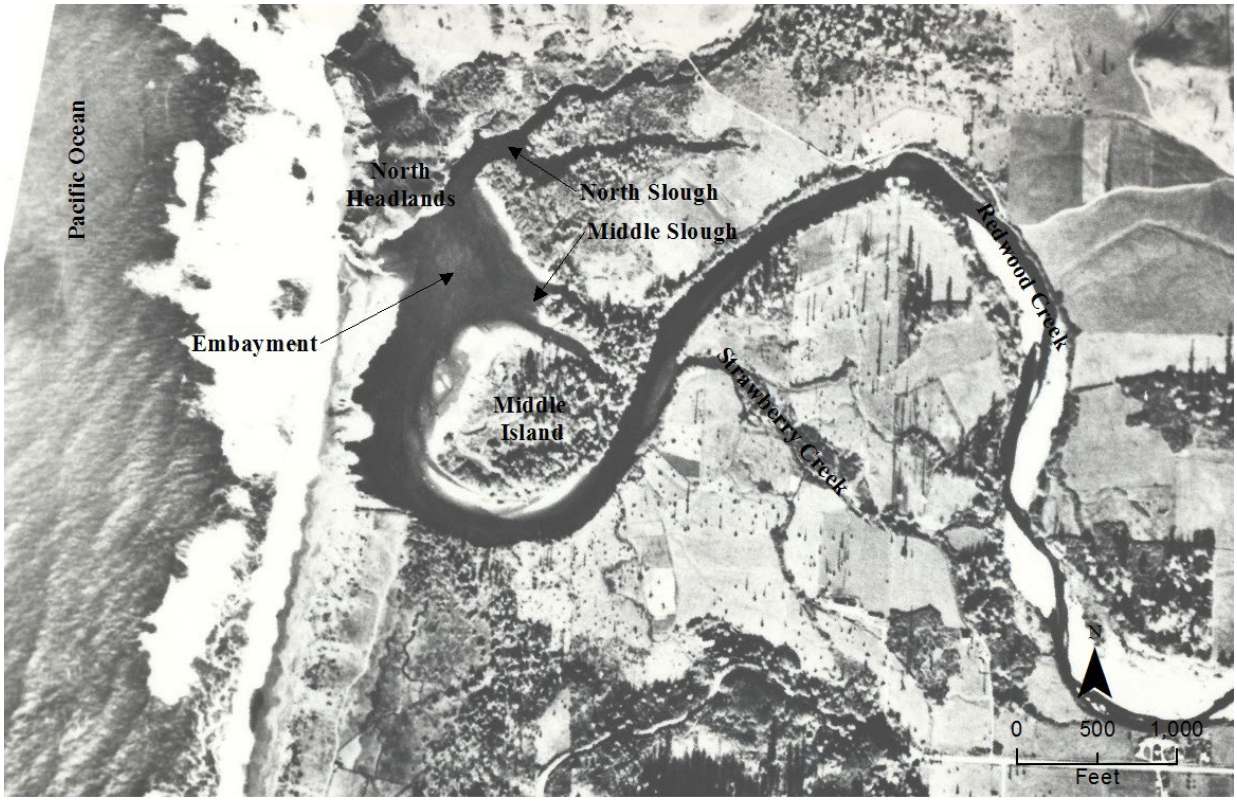

Figure 3. Redwood Creek estuary historical configuration and key features (11 June 1941, Redwood National Park collection). Barrier beach is closed (Humboldt, County, 2014).

The Redwood Creek Flood Control Project straightened and channelized lower Redwood Creek, constrained Redwood Creek Estuary, and disconnected the Redwood Creek from Sand Cache Creek and Strawberry Creek. The lower reaches of Sand Cache Creek and Strawberry Creek became North Slough and South Slough respectively (Figure 4).

Redwood Creek Flood Control Project consists of two earthen embankment levees that extend from the mouth of Redwood Creek upstream for 3.4 miles, with a trapezoidal channel that has riprap on both sides. The Project was designed to have capacity for a standard project flood of 77,000 cfs (USACE, 1966) with three feet of freeboard on either side without sediment or vegetation removal. Recent studies show that the project capacity varies longitudinally. Flood capacity with three feet of freeboard is highest at the upstream extent of the levee system (68,000 cfs) and decreases progressively towards the estuary (53,000 cfs) (NHE, 2009; NHE, 2010). The most recently available levee inspection report is from 2019. This inspection report found that both the left and right bank levees were in a minimally acceptable condition overall. It noted some shoaling in the channel and unwanted vegetation growth along the levee sideslopes.

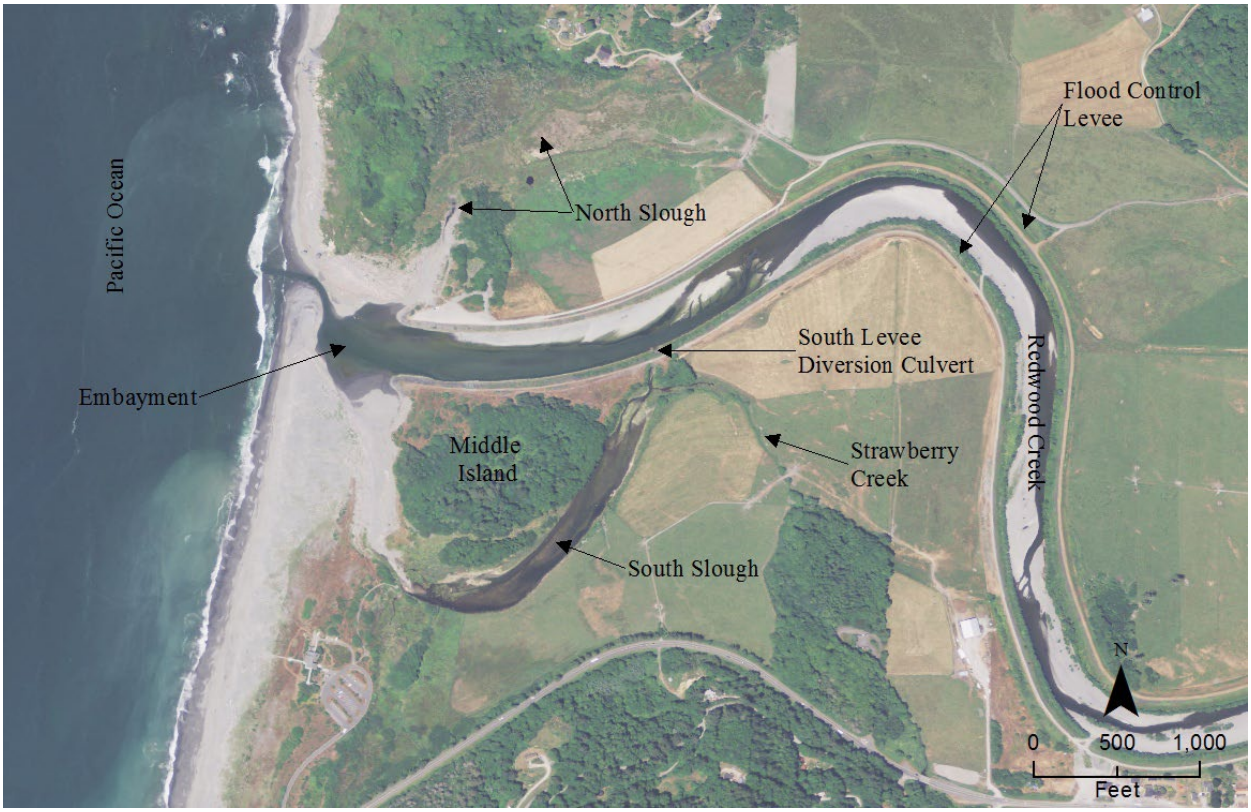

Figure 4. Current configuration of Redwood Creek and key features (July 6, 2009, USDA-NAIP) (Laird, 2009)

Prairie Creek Floodplain Restoration (2022)

Prairie Creek is a 11.5-mile tributary that flows into Redwood Creek upstream of the Redwood Creek Flood Control Project levees. The Prairie Creek watershed is over 98% protected in state and federal parklands, and Redwood Creek watershed is over 40% parkland. There are multiple restoration and partnership efforts ongoing and planned throughout the Prairie and Redwood watersheds, including second growth forest restoration, road removal, large wood additions and other aquatic restoration. In addition, many of the ongoing projects improve public access, recreational opportunities and economic benefits for disadvantaged communities.

PRIOR REPORTS

The following data and reports were reviewed for the FID Report.

- County of Humboldt, December 2014. Redwood Creek Estuary Restoration and Levee Rehabilitation Conceptual Design Project
- National State Parks, June 2005. Strategies and Opportunities for the Restoration of Redwood Creek Estuary
- Janet Eidsness. July 1988. A Summary of Cultural Resources Projects
- Susie Van Kirk, March 1994. Historical Information on Redwood Creek.
- Susie Van Kirk, March 1996. Cultural Values Lower Redwood Creek
- US Army Corps of Engineers, June 1969, Redwood Creek Local Flood Protection Project Operation and Maintenance Manual
- Aldaron Laird. December 2009. Lower Redwood Creek Land Use Study

- Redwood National and State Parks, April 2008. Redwood Creek Flood Control Project. Part 2 of 2. Redwood Creek Estuary Restoration

EXISTING CONDITIONS

WATER RESOURCES

Watershed characteristics

The Redwood Creek watershed is located within the wooded and steep North Coast Ranges of California. Most of the 285 mi^2 drainage basin is oriented along the north-northwest compass direction and is approximately 65 miles long and 4.5 to 6.5 miles wide. Basin elevations range from sea level to approximately 5,300 feet NAVD88. Prior to entering the ocean, the creek flows through the small bar-built Redwood Creek estuary located about two miles downstream of the town of Orick. The climate of the Redwood Creek basin can be described as Mediterranean with mild, wet winters, and warm, dry summers (Janda et al., 1975). Mean annual basin wide precipitation is approximately 60 inches, with most of the rainfall falling between the months of November through March (Klein and Anderson, 2012). Precipitation generally falls as rain, with snow fall at the higher basin elevations.

Sediment

The combined effects of unstable bedrock, rapid tectonic uplift, steep terrain, intense winter precipitation, and land use change (primarily timber harvest practices and associated road construction) in the Redwood Creek basin produces one of the highest annual sediment yields in the conterminous United States for basins of similar sizes, except for areas draining active volcanoes and glaciers. Several large winter storms occurring in 1953, 1955, 1964, 1972 and 1975 caused extensive flooding, landslides, erosion, and channel aggradation and stored sediment volume within the Redwood Creek basin (Janda et al., 1975; Nolan et al., 1995; Nolan and Marron, 1995; Madej, 1995). The most damaging was the 1964 flood, which caused widespread landsliding and massive channel aggradation and change within Redwood Creek (Janda et al., 1975; Nolan et al., 1995; Madej, 1995).

The export of the channel-stored bed sediment in Redwood Creek moves in a wave-like fashion downstream (Madej and Ozaki, 1996). By 1990, peak channel aggradation was approximately five miles below Tall Trees Grove and about four miles above Orick (RNSP, 1997). Madej and Ozaki (2009) documented the export of channel-stored bed sediment from the 1970s to present and showed channel recovery proceeding in a downstream direction. Klein and Anderson (2012) concluded that the reduction in Redwood Creek sediment loads since the mid-1970s can probably be contributed to natural watershed recovery processes and watershed restoration programs that have occurred within the Redwood Creek basin, along with strengthened land use regulations. The temporal decrease in Redwood Creek annual sediment load appears to be more associated with a decrease in suspended sediment load rather than bedload. Recovery of the Redwood Creek channel toward pre-aggradation bed elevations has been slower in the flatter gradient downstream reaches, which could have long-term implications for estuary restoration. The dominant particle size on the channel bed (D_{84}, or the 84^{th} percentile of the bed surface particle size distribution) is about 40mm in the lower river, and likely considerably lower in the estuary. Madej (2021) provides additional information on geomorphic conditions and trends within the Redwood Creek watershed.

Coastal Hydrology

The hydrology of the lower 2.5 miles of Redwood Creek, including the estuary, is affected by tidal action and streamflow. Tides are mixed semidiurnal with a mean range of 4.99 feet[1], a diurnal range of 6.9 feet, and a mean sea level elevation of 3.33 feet based on the National Oceanic and Atmospheric Administration (NOAA)

[1] All elevations in this section are relative to the North American Vertical Datum of 1988 (NAVD88).

Crescent City Tide Station (NOAA ID: 9419750). Besides Redwood Creek, two small tributaries (Strawberry Creek and Sand Cache Creek) flow into the estuary, along with other unnamed tributaries and sloughs.

Table 1. Tidal datums at Crescent City Tide Station relative to NAVD88.

Datum	Value	Description
MHHW	6.49	Mean Higher-High Water
MHW	5.85	Mean High Water
MTL	3.36	Mean Tide Level
MSL	3.32	Mean Sea Level
DTL	3.06	Mean Diurnal Tide Level
MLW	0.86	Mean Low Water
MLLW	-0.38	Mean Lower-Low Water
GT	6.87	Great Diurnal Range
MN	4.99	Mean Range of Tide

Streamflow

The U.S. Geological Survey (USGS) has operated a stream gaging station on Redwood Creek at Orick, California (station no. 11482500), and streamflow has continuously been monitored since October 1953. The Redwood Creek at Orick gaging station is located just below the confluence with Prairie Creek and has a basin area of 277 mi^2 above the gage. The flood of record is 50,500 cubic feet per second (cfs) on December 22, 1964, with similar flows in 1953 (50,000 cfs), 1955 (50,000 cfs), 1972 (49,700 cfs), and 1975 (50,200 cfs). These floods are all between the 2 and 4% annual chance exceedance (ACE) recurrence interval. Since 1975, the highest flow was 40,300 cfs in 1997 (approximately 10% ACE). Seasonally Redwood Creek flows are high in the fall/winter (November to January) and winter/spring (February to April) periods, decrease in spring/summer (May to July) months, and significantly decrease in the summer/fall period (August to October) (Humboldt County, 2014) (Figure 5).

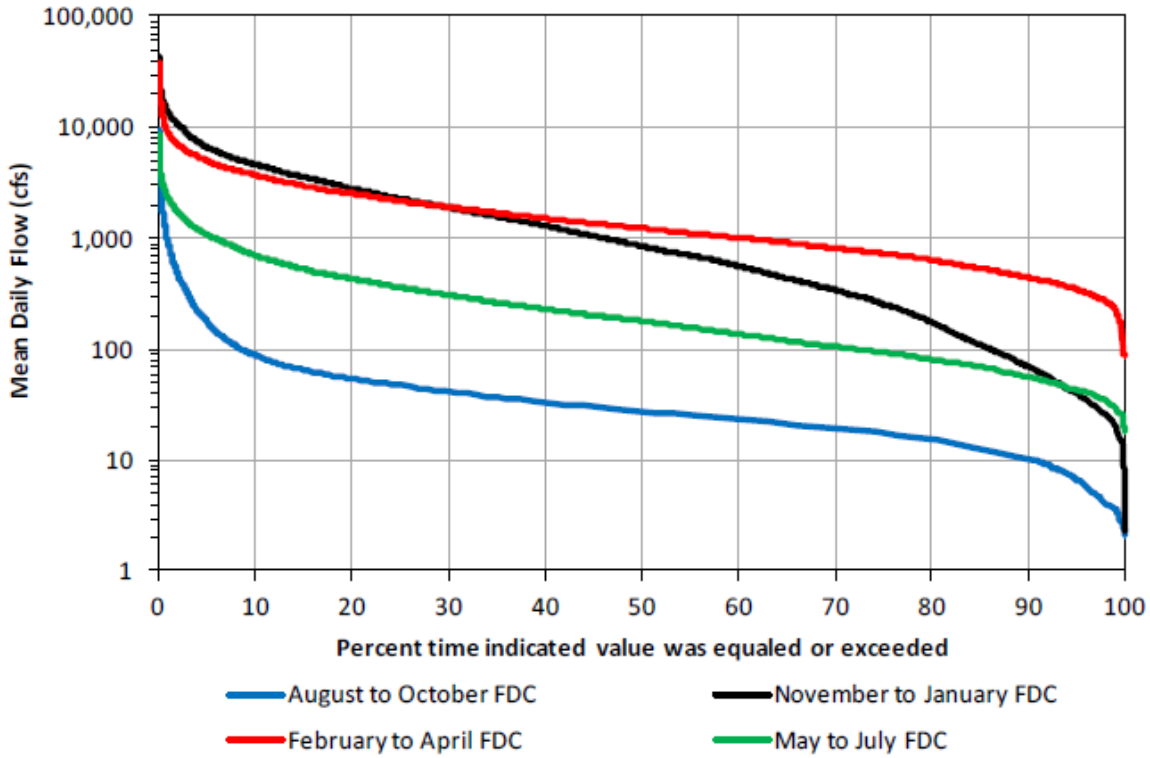

Figure 5. Flow duration curves of seasonal periods for Redwood Creek at Orick, CA mean daily flow for WY 1953 to 2012 (Humboldt County 2014).

Estuary

The Redwood Creek estuary can be classified as a bar-built estuary (Kraus et al., 2008; USACE, 1991) where long-term sedimentation has generally kept in equilibrium with inundation (e.g. sea level rise). A common characteristic of bar-built estuaries is the long, narrow sand or gravel bar or barrier beach that forms across the estuary, lagoon or river mouth and is aligned parallel with the coast (Kraus et al. 2008). Tidal inlet morphology is a dynamic balance between sediment import through tidal and wave-driven processes and sediment export from the scouring action of tidal and river flows (O'Brien 1971, Williams and Cuffe 1994; Kraus et al. 2002 and 2008; Behrens et al. 2013). Historically, the breaching and closure of the Redwood Creek mouth was likely dependent on the interplay between the coastal and fluvial processes. The inlet would remain open if tidal flows and/or Redwood Creek flows form large winter storms were high enough to erode the depositing coastal sediments. Inlet closure occurs when the transport of sediment into the inlet by tidal action and longshore and/or cross-shore transport is not adequately scoured by tidal and river flows, ultimately closing off the inlet (Humboldt County, 2014).

The Redwood Creek estuary has been highly altered with the construction of the Flood Control Project in 1968 which shortened, channelized, and leveed Lower Redwood Creek, and has been identified as the primary cause of the loss of estuary size, volume, function and habitats (Klein, 1991; Ricks, 1995; RNSP, 2005). Since construction of the Flood Control Project, at least 50 percent of the Redwood Creek estuary has filled with sediment or become isolated from the main channel (Ricks, 1995). In addition, there has been a complete loss of connectivity between the estuary and the freshwater source of Sand Cache Creek which feeds into the North Slough.

The Flood Control Project levees reroute the lower portion of the Redwood Creek channel through Middle

Slough and channelizes a large portion of the embayment[2], creating a more direct flow path to the ocean. The channel relocation bypasses the last downstream meander and shortens the overall length of the historical lower Redwood Creek channel. The levees terminate well into the embayment, and with the placement of excess levee construction spoil material along both sides of the downstream end of the levee (RNSP, 2005), effectively severing connections between North Slough and the last downstream meander with the embayment. After levee construction the last downstream meander was essentially converted to a backwater channel, which became known as South Slough, and has filled in extensively with sediment.

Channelization and reconfiguration of lower Redwood Creek has reduced the size and location of the active barrier beach, and the general location of the creek mouth, to the north immediately west of the downstream extents of the levee. Shortly after completion of the Flood Control Project, marine-derived sediments rapidly accumulated across the barrier beach and created a substantial deposit in the embayment that both filled the deep pool along the north headlands and isolated North Slough from the embayment (Klein, 1991; Ricks, 1995). More recently, South Slough has been increasingly impaired with build-up of sediment and driftwood. With the levees effectively isolating the heads of North and South Sloughs, the directional flow path from the mainstem that would have normally scoured marine-derived sediments from these areas has been dramatically altered, and the sloughs have become sediment traps. Consequently, coastal sediments driven by wave overwash and tidal currents during periods when the barrier beach is breached, continually deposit into the slough mouths and embayment.

Prior to levee construction high creek flows would have routinely scoured marine-derived sediments from the embayment and sloughs and maintained a relatively large active barrier beach. Following levee construction, high creek flows have been prevented from scouring either North or South Sloughs. Excavations have been done multiple times within North Slough in the past 30 years, with no lasting/sustainable effect because the current levee configuration works against sediment scouring. Also, the extent and location of the levee terminus constricts flow so effectively that only a small portion of the embayment and barrier beach are scoured by high creek flows. With the levees, the active barrier beach is mostly relegated to the north end.

ENVIRONMENTAL CONSIDERATIONS

The Redwood Creek estuary is an important part of the overall watershed's ecosystem. The estuary serves as a critical element in the life cycle of anadromous salmonids by providing juvenile fish with critical habitat for growth and marine acclimation. The estuary consists of a beach bar, small lagoon and sloughs which were historically lined by willow/alder thickets and freshwater and brackish marsh. Much of this habitat has been converted to grazing land. The estuary serves as designated critical habitat (rearing, migrating, and smoltification) habitat for the Redwood Creek populations (NMFS 2014, 2016) of federally threatened California Coast Chinook salmon, Southern Oregon/Northern California coho salmon Northern California steelhead. In addition, federally threatened Pacific eulachon and their designated critical habitat occur in the Redwood Creek estuary, and the estuary is important habitat for coastal cutthroat trout. The quality and quantity of estuary habitat affects all salmonid species ocean survival, and ultimately their return as adult spawners. Chinook salmon and steelhead use the estuary during the summer after the embayment forms, but their numbers decline due poor water quality, lack of complex habitat and almost no cover from predation (NMFS 2016). RNSP has characterized habitat degradation over many years of monitoring. Coho salmon are more sensitive to environmental changes in water quality, cover and connectivity, but would likely reoccupy and use improved estuarine habitat if it becomes available (NMFS 2014). Tidewater goby, an estuarine fish and federally listed as endangered, was captured in 1980 and is now extirpated in the estuary.). Populations of Pacific eulachon(candlefish), which spawn in the estuary, are greatly reduced.

The 1968 construction of a U.S. Army Corps of Engineers (Corps) flood control project (levees and channelization) drastically altered the aquatic resources of lower Redwood Creek and impaired the physical

[2] An *embayment* is a recess in a coastline forming a bay.

and biological functioning of the estuary and adjacent wetlands. (RNSP 2008).

Construction of the levees removed streamside riparian and tree cover, impaired the stream-estuary ecotone, reduced adjacent wetlands, altered valley drainage patterns, decreased instream woody debris structure, impaired fish passage, and reduced pool depths along lower Redwood Creek. Approximately 50 percent of the lower estuary has filled in with ocean derived sediment and/or become isolated from the embayment since the project was completed (RNSP 2008).

Sediment buildup in the outlets of North and South Sloughs hampers fish access, water circulation, and impacts water quality. The resultant reduced circulation between the sloughs and embayment has resulted in degraded water quality conditions in both sloughs.

The USACE-built levee system and associated O&M activities have greatly degraded spawning and rearing habitat. This, along with other factors such as removal of riparian vegetation, anthropogenic-induced sedimentation, and major flood events, has resulted in consistently declining populations of rearing salmonids. The numbers of estuary rearing salmonids have been declining over summer because of the lack of cover, high water temperatures, and increased predation, resulting in part from the USACE flood control project. The altered conditions in the estuary may also have led to the extirpation of the tidewater goby (Federal Register 2013) Restoration of estuarine functions would provide an immediate benefit to listed salmonids, as described in the Recovery Plans for these species (NMFS 2014, 2016). The Recovery Plan for SONCC coho salmon (NMFS 2014) describes that habitat restoration in the Redwood Creek estuary is a number one priority recovery action for coho salmon, (i.e., necessary for species recovery). The Multispecies Recovery Plan, which includes CC Chinook salmon and NC steelhead (NMFS 2016) describes that restoring the Redwood Creek estuary is a very high recovery priority for these two species as well. The unique habitat of the estuary cannot be replicated through off-site or other restoration in the watershed and all listed fish require good estuarine habitat to complete portions of their life cycles and contribute to population productivity.

The Recovery Plans for SONCC coho salmon (NMFS 2014), and CC Chinook salmon and NC steelhead (NMFS 2016) describe that the Redwood Creek populations of these threatened species are core and essential to species recovery, and that restoring estuarine habitat in Redwood Creek is critical to the recovery of these populations, and thus, to these species at large.

Using species lists from National Marine Fisheries Service and US Fish and Wildlife Service, a full list of special status species was compiled and can be seen below in Table 2. Not all species in the list are likely to inhabit the study area.

Table 2. Federally listed Special Status Species within the USGS Quadrangle of the Study Location

		Special Status	Likelihood of Occurring
Terrestrial Mammals			
Pacific Marten	*Martes caurina*	Threatened	Not Likely
Birds			
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened	Not Likely
Northern Spotted Owl	*Strix occidentalis caurina*	Threatened	Not Likely
Short-tailed Albatross	*Phoebastria albatrus*	Endangered	Not Likely
Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened	Not Likely
Western Snowy Plover	*Charadrius nivosus nivosus*	Threatened	Likely
Insects			

Monarch Butterfly	*Danaus plexippus*	Candidate	Not Likely
Fishes			
Chinook Salmon Ca Coastal ESU	*Onchorhynchus tshawytscha*	Threatened	Likely
Coho Salmon Southern Oregon/Northern California ESU	*Onchorhynchus kisutch*	Threatened	Likely
Pacific Eulachon Southern DPS	*Thaleichthys pacificus*	Threatened	Likely
Tidewater Goby	*Eucyclogobius newberryi*	Endangered	Not Likely
Steelhead Northern California DPS	*Oncorhynchus mykiss*	Threatened	Likely
Plants			
Beach Layia	*Layia carnosa*	Endangered	Likely

Critical Habitat	Essential Fish Habitat
Pacific Eulachon Southern DPS	Coho Salmon
Chinook Salmon Ca Coastal ESU Coho Salmon Southern Oregon/Northern California ESU Steelhead Northern California DPS	Chinook Salmon

CULTURAL RESOURCES AND TRIBAL PARTNERS

The Lower Redwood Creek basin is a place of ethnographic and historic significance to the Yurok Tribe (Van Kirk, 1996), who are involved in Tribal consultation and planning efforts within the proposed project area. The Yuroks have over 5,000 enrolled members today, making up the largest Tribe in California. Their major Tribal initiatives include: the Hoopa-Yurok Settlement Act, dam removal, natural resources protection, sustainable economic development enterprises and land acquisition. The indigenous Yurok Tribe is comprised from great fishermen, eelers, canoe makers, healers, strong medicine people, basket weavers, singers, dancers, and storytellers. The giant redwood trees in their ancestral territory are regarded as the guardians over their scared places and as the traditional construction materials for their homes and canoes.

Other consulting parties that will be invited to provide cultural review of project effects pursuant to Section 106 of the National Historic Preservation Act, 36 CFR § 800.4(a)(3) include the State Historic Preservation Officer, the public, adjacent land managers at Redwood National and State Parks, and Tribes culturally affiliated with Humboldt County, including: the Wiyot, Hupa, Karuk and Tolowa Tribes. Most of the Lower Redwood Creek basin sites have been impacted by historical land use, including logging, road construction, homesteading, or ranching. An updated records search of cultural resources in the project area and further consultation may indicate the need to update cultural resource sites in the area with new archaeological and ethnographic investigations. This will allow USACE and consulting parties to determine the significance of cultural resources within the project area, and how to avoid or minimize adverse effects to the same.

LAND USE

The parcels surrounding Redwood Creek Flood Control Project and Orick are primarily privately-owned and used for agriculture. Redwood National Park Service owns coastal parcels north and south of Redwood Creek estuary. The North Coast Regional Land Trust owns a parcel on the north side of Redwood Creek. Humboldt County owns two parcels just north of Highway 101. The lower watershed above Orick is held mostly by Redwood National and State Parks for public use and enjoyment. The upper watershed is mostly private timber-production land (Laird, 2009).

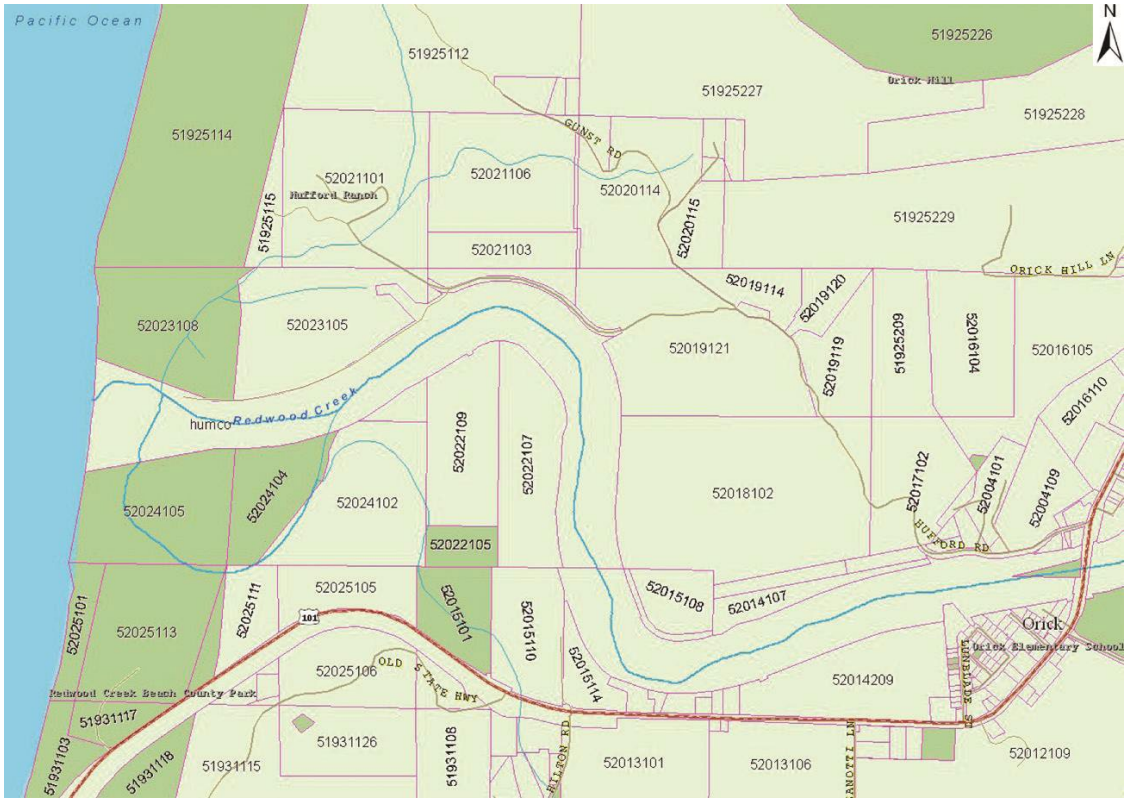

Figure 6. Federal, State, County (dark green) and private ownership (light green) in lower Redwood Creek, Humboldt County GIS 2009 (Laird, 2009).

STAKEHOLDERS AND SUPPORTERS

Ecosystem restoration in Lower Redwood Creek and Estuary is supported by the Redwood Creek Stakeholder Group with representatives from Humboldt County, CalTrout, California Department of Fish and Wildlife (CDFW), Yurok Tribe, National Marine Fisheries Services (NOAA Fisheries), US Fish and Wildlife Service (USFWS), the National Park Service (NPS), North Coast Regional Land Trust (NCRLT), and the Hufford and Zuber Families.

Humboldt County owns and operates the Redwood Creek Flood Control Project with levees that extend 3.4 miles along either side of Lower Redwood Creek. CalTrout is the primary convener and facilitator of the Stakeholder Group and supports efforts to restore salmonid habitat throughout the Redwood Creek watershed and region. The NPS owns and manages land north and south of Redwood Creek estuary in the tidal zone. The NPS also operates a visitor center and recreational facilities just south of Redwood Creek estuary.

The Hufford and Zuber Families live on and farm the land north and south of Lower Redwood Creek. Engagement and voluntary participation of both families in evaluating project measures and alternatives is critical to maximizing the restoration potential of the project.

The Redwood Creek Stakeholder Group has collaborated on Redwood Creek Estuary restoration and flood mitigation efforts since 2018. In 2019 and 2020, group membership advocated for and mobilized actions to clear a flow path and drain flooded areas along Sand Cache Creek, a northern tributary to the Redwood Creek estuary (Burke, 2022).

In September 2021, the group drafted a Partner Agreement, which includes conceptual restoration designs for Redwood Creek Estuary. The design also includes estuary restoration features that are still under discussion and will be informed by hydraulic modeling. Currently, the USFWS is developing a hydrodynamic model of the estuary that the group will use to estimate results and outcomes of different design scenarios to advance agreement on additional project elements (Burke, 2022). Given the group's experience in the Redwood Creek watershed and knowledge of coastal habitat restoration, there is an opportunity to utilize their technical support to efficiently advance the study and incorporate existing information in the USACE planning efforts.

PROBLEMS AND OPPORTUNITIES

Problems are undesirable conditions to be changed through the implementation of an alternative plan. Opportunities are positive conditions to be improved by an alternative plan. Solving problems and taking advantage of opportunities provide a basis for motivating and allocating the partners' pooled resources. The difference between problems and opportunities is often simply a matter of perspective.

IDENTIFIED PROBLEMS

Problem 1. Limited estuarine structural complexity

By establishing the historic Middle Slough as the Redwood Creek flow path, the Redwood Creek Flood Control Project straightened, channelized, and shortened lower Redwood Creek. The levees constrain the lateral area of the creek, prohibiting the creek from avulsing and forming new channel alignments, wetlands, and backwater areas. With the levee toes located just upstream of the surf zone, the levees spatially constrain the area of Redwood Creek estuary and move the sediment transition zone closer to the beach. Furthermore, the levees limit the north-south extent for creek mouth migration along the active barrier beach. The loss of estuarine area and structural complexity results in the accumulation of sediment in the estuary. A 1995 study estimated the estuary volume was approximately half of pre-levee volume due to sediment deposition. Sediment inputs from the watershed have generally improved in recent years, but there is still legacy sediment stored in the Redwood Creek channel upstream of the flood control project that are released during high-flow events and deposit within the low-gradient portions of Redwood Creek, including the flood control project reach and estuary. The primary problem continues to be the loss of geomorphic processes that create and maintain habitat complexity, and specifically the loss of the former meander of Redwood Creek and its function to help clear the mouth of Sand Cache Creek, and the loss of overbank flooding into Sand Cache Creek. This results in the reduction of critical habitat elements for young salmonids and other aquatic and estuarine-dependent species.

Problem 2. Limited floodplain connectivity and poor drainage

The Redwood Creek Flood Control Project Levees hydrologically disconnect Redwood Creek from its tributaries and floodplain. The north and south levees act as barriers to Sand Cache Creek and Strawberry Creek respectively, limiting flushing flows and circulation in the tributaries and estuary system. Levees cause runoff from Sand Cache Creek, Strawberry Creek, and surrounding hillsides to accumulate on the outboard side of the north and south levees. Poor drainage impacts the function of agricultural land adjacent to the levees and causes flooding on public roads. Moreover, the south levee blocks fish passage from Redwood Creek into Strawberry Creek and Sand Cache Creek, both of which previously important rearing habitat for SONCC coho salmon and NC steelhead.

Problem 3: Limited productivity and survival of federally listed species

Limited structural complexity, large reductions in floodplain, tributary and slough connectivity, and loss of geomorphic processes that create and maintain fish habitat, including fish passage, reduce the critical habitat functions of the estuary, such as providing food and cover essential to juvenile salmonid growth and successful ocean rearing. The degraded estuarine habitat also disconnects off-channel rearing areas that

are critical for velocity refuge during high water and prevents fish passage to important tributaries and sloughs. These conditions reduce salmonid population productivity, impair juvenile survival, and reduce the eventual numbers of adult salmon and steelhead that return to spawn. In 1965, CDFW estimated an average run size of 5,000 Chinook salmon, 2,000 coho salmon and 10,000 winter steelhead (CDFW 1965 *in* Good et al. 2005) for the entire Redwood Creek basin. Laird (2009) describes that salmonid run sizes declined abruptly following construction of the Redwood Creek Flood Control project and have never been recovered.

Problem 4. Limited native vegetation cover and proliferation of invasive vegetation

The construction of the Redwood Creek Flood Control project shrank the area of the riparian corridor and estuarine environment along lower Redwood Creek resulting in loss of vegetation and habitat complexity. Impairments in the hydraulic and sediment transport systems of lower Redwood Creek also caused the propagation of invasive Reed Canary Grass in the North Slough and Sand Cache Creek area.

OPPORTUNITIES

- There is an opportunity to improve drainage and reduce the risk of flooding and damages to agricultural areas adjacent to creek and public roads in the study area.
- There is an opportunity to restore working agricultural land that has been degraded by poor drainage, invasive Reed Canary Grass, and accumulated large wood.
- There is an opportunity to increase recreational and public education uses near Redwood Creek Estuary.
- There is an opportunity to restore Yurok ethnobotanical uses and support contemporary Tribal uses of the estuary and lower Redwood Creek.
- There is an opportunity to utilize culturally significant plants in planting palette during restoration.
- There is an opportunity to leverage ongoing work of Redwood Creek Estuary Stakeholder Group partners.
- There is an opportunity to build on fisheries research and recovery efforts of National Marine Fisheries Service, Humboldt County and other resource agencies in the Redwood Creek watershed and region. The project can utilize existing fisheries datasets from Upper Redwood Creek and nearby Prairie Creek to evaluate habitat restoration measures and model ecosystem benefits.
- There is an opportunity to integrate sea level rise adaptation to support a more sustainable and resilient Redwood Creek system.
- There is an opportunity to improve stream-estuary habitat in Sand Cache Creek that extends onto private property for multi-benefit uses including fisheries habitat and duck ponds.

OBJECTIVES

The goal of the Redwood Creek Project is to contribute to national ecosystem restoration by achieving the following objectives:

- reestablish hydraulic, sediment transport, and floodplain processes necessary to restore and sustain ecological function in lower Redwood Creek and,
- recover threatened salmonid species including Southern Oregon/Northern California Coast coho salmon, California Coastal Chinook salmon, and Northern California steelhead,
- while improving function and productivity of surrounding agricultural land.

CONSTRAINTS AND CONSIDERATIONS

Planning constraints represent restrictions that limit the extent of the planning process. Constraints are designed to avoid undesirable changes between without and with–project future conditions. Considerations are included to help guide the planning process. Some of the constraints and considerations identified at this stage of the study include:

- Universal Constraint: The project design, construction, and operations and maintenance plan must comply with applicable Federal laws, regulations, and policies such as the National Environmental Policy Act, Endangered Species Act (ESA), Fish and Wildlife Coordination Act (FWCA), Clean Water Act (CWA), Clean Air Act (CAA), National Historic Preservation Act (NHPA), Coastal Zone Management Act (CZMA) and all other applicable environmental laws and regulations.
- Constraint: Any restoration project cannot unduly exacerbate flood risk in the project area.
- Constraint: The NFS is unwilling to invoke eminent domain for restoration, thus any restoration project will only include property acquisition or standard estate if there is voluntary agreement of willing landowners.
- Constraint: Any restoration project will be consistent with the resource protection and preservation responsibilities of the National Park Service for affected federal land in Redwood National Park.
- Consideration: Any restoration project will coordinate closely with stakeholders to avoid, where practicable, adverse impacts on active restoration projects, current or future cultural and land uses, and where impacts are unavoidable, to minimize and mitigate them.
- Consideration: Orick and Humboldt County seek flood risk management improvements to the Redwood Creek Flood Risk Management Project and may pursue a General Investigation study in the future. Consideration will be given to compatibility with a potential future flood risk management project.
- Consideration: Orick and Redwood Creek adjacent areas are slated for a range of economic development and capital investment projects in the next 10-20 years. The Yurok Tribe is acquiring, with plans to develop, the local gas station, hotels, and other levee-adjacent parcels. The County and Orick Community Services District are scoping the development of a neighborhood septic system in levee-adjacent neighborhoods. National Park Service is planning to relocate the Visitor Center that is currently adjacent to South Slough to higher ground in the Prairie Creek watershed, upstream of Orick. Planning efforts of any restoration project will coordinate closely with the County, members of the Redwood Creek Estuary Stakeholder Group, and Orick community groups to avoid adverse impacts on local projects.
- Consideration: The Redwood Creek study area is located within the ancestral land of the Yurok Tribe. Any restoration project will support, to the maximal extent possible, access and contemporary uses by the Yurok Tribe. Any restoration project will strengthen partnership between the US Government and Yurok Tribe and bolster federal Indian trust responsibility.
- Consideration: Project design and selection will consider long-term operations, maintenance (O&M) and lifecycle costs for Humboldt County and avoid unreasonable O&M costs associated with a restoration project in order to enable long-term O+M compliance. To this end, project alternatives will consider opportunities to leverage the sediment supply and demand from active local and Humboldt County projects to reduce removal and fill costs of project alternatives.
- Consideration: Any restoration project will consider the impacts of the large grade control structure at the downstream end of the levees.
- Consideration: Any restoration project will integrate the latest data on sea level rise and marine processes.
- Consideration. Any restoration measures that include the excavation and removal of soils will consider the latest information available on contaminated soils in the area. The National Park Service is currently leading an investigation of soil contamination.

POTENTIAL SOLUTIONS

The project aims to restore historic Redwood Creek floodplain forms, function, and productivity by:

- Restoring the self-maintaining geomorphic processes that created the historic stream-estuarine system
- Re-creating historic channel alignments that provided the necessary hydraulic conditions for self-maintaining geomorphic processes (e.g., reroute mainstem flow into the south slough, excavate the mouth of Sand Cache Creek, etc);
- Reconnecting and restoring fish passage into tributaries, sloughs, floodplains, and wetland areas;
- Expanding extent of active barrier beach extent and creek mouth migration; and
- Restoring native vegetation throughout the stream-estuary system (riparian, wetland, estuarine, etc).

By meeting the objectives to restore the self-maintaining geomorphic processes and stream-estuary habitat, the project actions will address the chronic flooding and drainage issues in land adjacent to the Redwood Creek Flood Control Project.

PRELIMINARY MEASURES

Accordingly, the project considers the following measures for the project area.

1. Remove section of northern levee
2. Remove section of southern levee
3. Create a high flow connection between Redwood Creek and North Slough
4. Notch or lower northern levee
5. Excavate South Slough and fill Middle Slough to re-create Redwood Creek in historic orientation (i.e., restore the previous last meander of Redwood Creek)
6. Excavate North Slough to re-create functional tributary habitat
7. Provide a connection between South Slough and Strawberry Creek for fish passage and flood protection
8. Install at grade bank protection
9. Realign stream banks
10. Excavate (to remove non-native plants and seed bank)
11. Plant and re-seed project area with native plants
12. Maintain and water plants until they are established
13. Install large wood structures in creek

PRELIMINARY ALTERNATIVE SOLUTIONS AND DESCRIPTIONS

Three alternatives are formulated based on the problems, opportunities, objectives, considerations, and constraints in the project area. All alternatives include the reestablishment of South Slough as the primary flow path of Redwood Creek. Alternatives vary based on proposed changes to the conditions of the north and south levees and enhancement of North and South slough areas. Preliminary alternatives are summarized, with key distinctions highlighted, in Table 2. Preliminary measures and alternatives will be evaluated during the Feasibility Study. A key part of the feasibility evaluation will be determining the extent of excavation and fill placement needed and identifying opportunities for cut-and-fill balancing. Some level of excavation will be required in North Slough.

Table 3. Project Alternatives

	Alternative 1	Alternative 2	Alternative 3	No Action
North Levee Removal	Remove to the National Park Service parcel boundary.	Remove to the National Park Service parcel boundary.	Remove to the National Park Service parcel boundary.	NA
North Levee Height	Maintain current ACE level	Maintain current ACE level	Lower levee to allow for 10-year event to over top levee system	NA
Redwood Creek to North Slough Connection	Culvert to allow flows to move into North Slough	Notch in North Levee to allow high flow into North Slough	Notch in North Levee to allow high flow into North Slough	NA
Reestablish Redwood Creek in Historic Orientation	Yes	Yes	Yes	NA
South Levee Condition	Removal to upstream of the South Slough meander	Maintain levee configuration but cut out section of South levee to allow for South Slough reconnection	Removal to upstream of the South Slough meander	NA
Reconnect Strawberry Creek to Redwood Creek	Yes	Yes	Yes	NA
Excavate and move North Slough and South Slough sediment to form Middle Slough	Yes	Yes	Yes	NA
South Slough bank protection	Yes	Yes	Yes	NA
Establish wetland area south of new Redwood Creek	Yes	No	No	NA
Habitat Enhancement and Riparian Revegetation	Yes	Yes	Yes	NA
Construction Cost (rounded)	$10,000,000	$8,900,000	$9,900,000	NA

DETAILED DESCRIPTION OF ALTERNATIVES

Alternative 1 – "South Slough Habitat Expansion" Plan

Alternative 1 includes the following measures (Figure 7):

- Removal of southern levee to just upstream of the South Slough meander
- Remove accumulated sediment from South Slough and fill Middle slough with soil available in study area to train Redwood Creek to flow through South Slough and reestablish in historic footprint.
- Bolster eastern side (bank left) side of South Slough with bank protection to manage flooding in adjacent parcels.
- Reconnect Strawberry Creek to new Redwood Creek orientation with structure that allows for flushing flows and fish passage without exacerbating flooding of upstream parcels.
- Enhance habitat and revegetate areas historic middle slough. Excavate and enhance wetland and side

channel areas south of the new Redwood Creek orientation and south of Highway 101.

- On the north side of the Redwood Creek Flood Control Project, remove northern levee to the National Park Service parcel boundary.
- Construction of culvert or high flow connection in North levee to allow for high flows to pass through levee walls into North Slough to support sediment transport from North Slough into estuary.

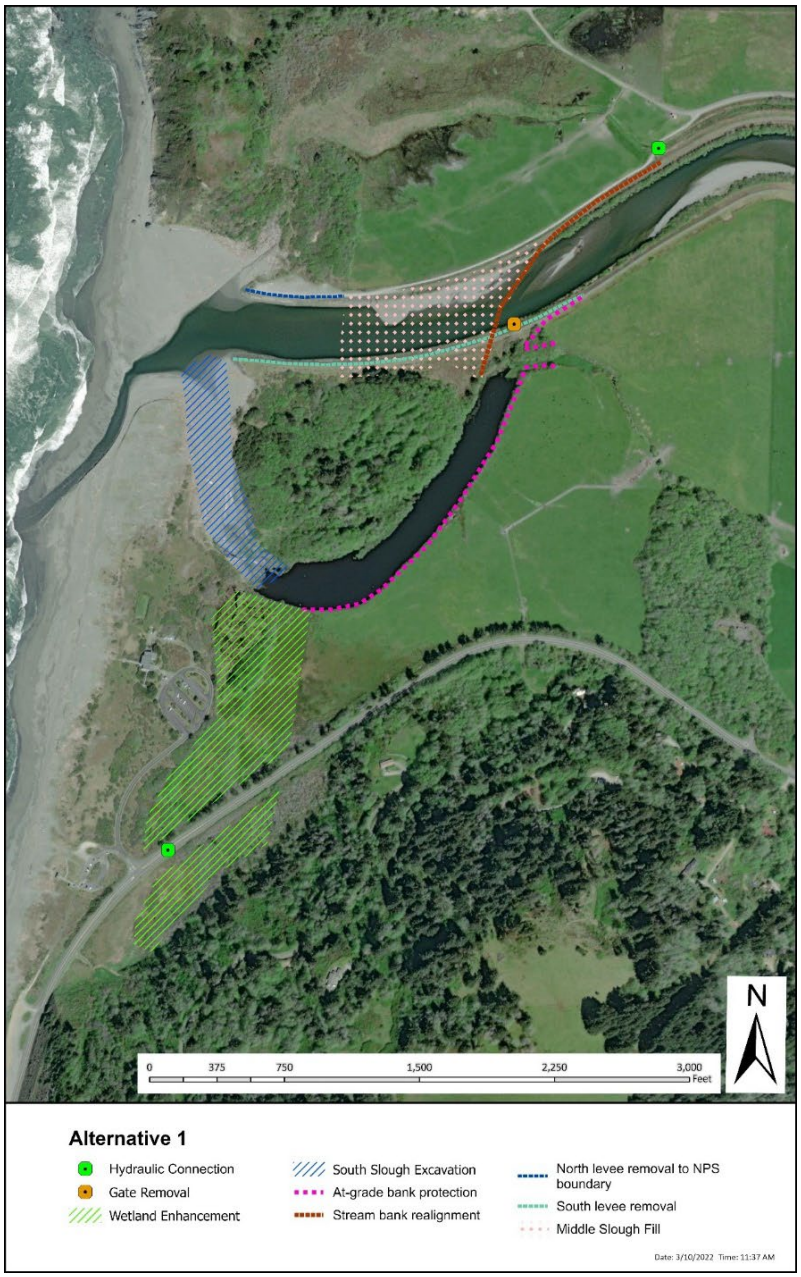

Figure 7. Alternative 1 Concept Plan

Alternative 2 – "Levee Cut and Notch" Plan

Alternative 2 includes the following measures (Figure 8):

- Cut and remove the section of levee where Redwood Creek historically flowed into current South Slough to reconnect south slough with creek mainstem. Leave southern levee alignment along historic middle island.

- Remove accumulated sediment from South Slough and fill middle slough with soil available in study area to train Redwood Creek to flow through South Slough and reestablish in historic footprint.
- Bolster eastern side or bank left side of South Slough with bank protection to manage flooding in adjacent parcels
- Reconnect Strawberry Creek to new Redwood Creek orientation with structure that allows for flushing flows and fish passage without exacerbating flooding of upstream parcels.
- On the north side of the Redwood Creek Flood Control project, remove northern levee to the National Park Service parcel boundary.
- Notch north levee to allow high flow into North Slough

Figure 8. Alternative 2 Concept Plan

Alternative 3 – "North Slough Flushing Flow" Plan

Alternative 3 includes the following measures (Figure 9):

- Removal of southern levee to just upstream of the South Slough meander
- Remove accumulated sediment from South Slough and fill middle slough with soil available in study area to train Redwood Creek to flow through South Slough and reestablish in historic footprint.
- Bolster eastern side or bank left side of South Slough with bank protection to manage flooding in adjacent parcels.
- Bolster eastern side or bank left side of South Slough with bank protection to manage flooding in adjacent parcels.
- Reconnect Strawberry Creek to new Redwood Creek orientation with structure that allows for flushing flows and fish passage without exacerbating flooding of upstream parcels.
- Removal of northern levee to National Park Service parcel boundary
- Lower section of northern levee from NPS parcel boundary to high flow connection to 10-year flood elevation to allow for high flows to overtop and flush North Slough area.
- Notch north levee to allow high flow into North Slough
- Elevate Hufford Road to maintain access during high flow events.

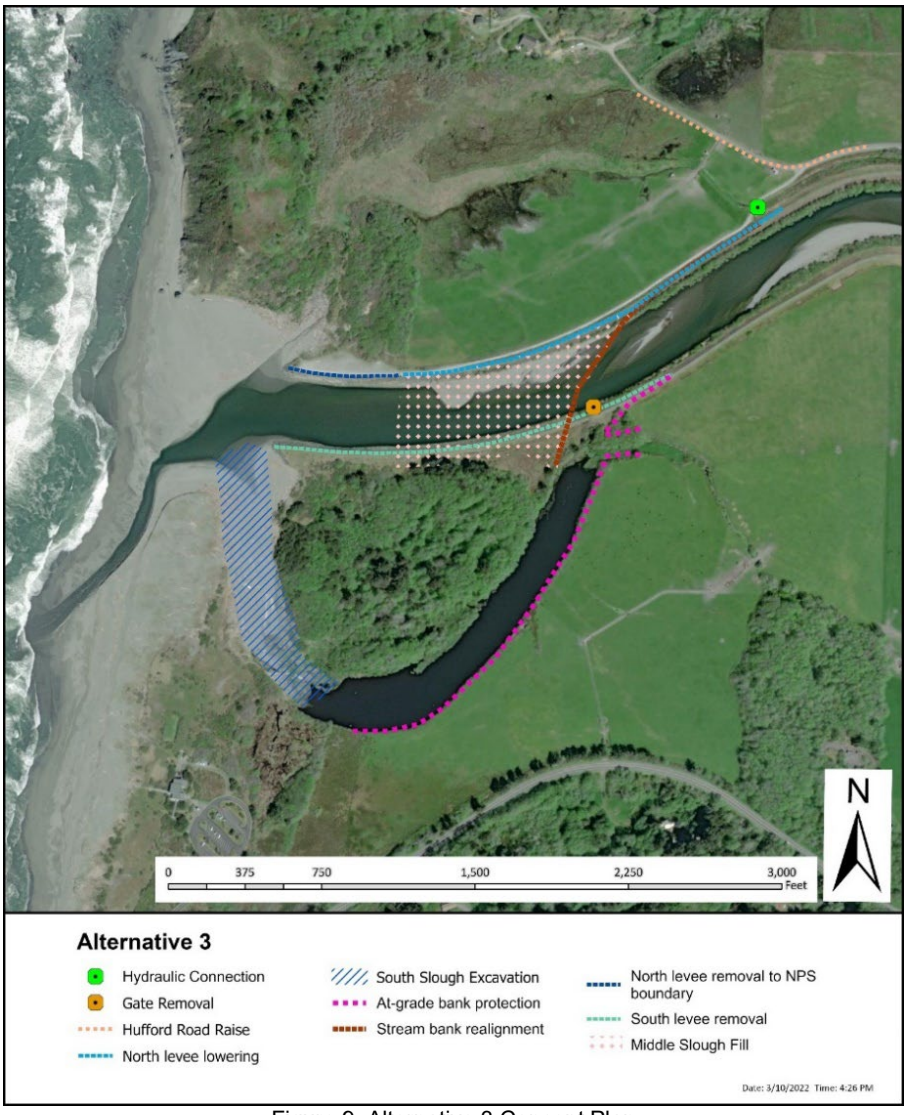

Figure 9. Alternative 3 Concept Plan

ENVIRONMENTAL COMPLIANCE

The NEPA compliance process would be completed during the feasibility phase, pursuant to requirements in Engineer Regulation 200-2-2 (USACE 1988). The study and any future project would be required to comply with all applicable laws and regulatory requirements. An environmental assessment (EA) in accordance with NEPA will be prepared to evaluate probable impacts of a future project on the existing environment. Factors addressed by the evaluation include, but are not limited to, public safety, water quality, terrestrial and aquatic habitat and species, threatened and endangered species, cultural resources, noise, air quality, and recreation. This process includes demonstrating compliance with all applicable laws and regulations – the CZMA, ESA, CWA, NHPA, FWCA, CAA, Noise Control Act, Magnuson-Stevens Act, Executive Order 11988 on Floodplain Management, and Executive Order 11990 on the Protection of Wetlands. At thistime, it appears USACE's obligations under NEPA can be adequately addressed in an EA and will result in a Finding of No Significant Impact (FONSI). It is expected that any impacts other than temporary impacts resulting from construction activities would be avoided or minimized and the action would be expected tobenefit ecosystem resources in the study area

PRELIMINARY EVALUATION OF FEDERAL INTEREST

Ecosystem Restoration Benefits

CAP 1135 projects require realization of discreet ecosystem restoration (NER) benefits. During the feasibility phase, USACE will quantify the NER benefits using an appropriate metric. The project plans to use an existing model to quantify environmental benefits. For example, the PDT may consider applying the US Fish and Wildlife Service's Habitat Evaluation Procedures (HEP) model. A Cost Effective/Incremental Cost Analysis (CE/ICA) will be performed to evaluate and identify the NER plan. During the feasibility phase, the Corps will coordinate with the Arcata USFWS and NOAA Fisheries offices to determine the appropriate habitat modeling for this project and which agency will conduct the modeling. Federal interest for this CAP 1135 project is based on the expectation that significant NER benefits would result from the restoration of Redwood Creek Estuary. Of the three alternatives considered, all would provide ecosystem restoration benefits to support the CAP 1135 program. See the Significance of Resources below for more information about the significance of potential project NER benefits.

Cost Estimate

The PDT will develop a feasibility cost estimate to support the PMP and the FCSA. Based on available information and expertise from USACE and the sponsor, the PDT estimates that the feasibility study will cost between approximately $1,000,000 and $1,500,000. This includes hydraulic modeling, study analysis and formulation as well as costs to develop this FID and future required review processes and procedures.

Rough estimates of the construction costs for the three preliminary alternatives are between $8.9M – 10M, depending onthe scope and scale of the tentatively selected plan. The costs are included in Table 3 above. The cost estimates were developed by the non-federal sponsor and reviewed by the engineer on the PDT. The cost estimates are at a scope of effort appropriate for an FID and may increase during feasibility based on future engineering analysis.

The table below provides a rough cost apportionment breakdown for Alternative 2 to support that based on rough cost estimates, that there is a viable project that could be implemented below the $10M CAP 1135 federal cost limit. Based on these results, Alternative 2 is expected to be within the federal limit for CAP 1135 projects and costs are reasonable when compared to the potential environmental benefits.

Table 4. Alternative 2 Cost Apportionment Table

Alternative 2	Federal Cost Share	Non-Federal Cost Share	Total Cost	Federal Cost	Non-Federal Cost	Assumptions
FID/PMP	100%	0%	$100,000	$100,000	$0	
Feasibility Study	50%	50%	$1,500,000	$750,000	$750,000	
Real Estate/ LERRDs	0%	100%	$625,000	$0	$625,000	Based on local and regional easement costs
Design + Review (for 35%-100% designs) (see assumptions)	75%	25%	$1,290,000	$967,500	$322,500	Design cost estimate is 15% of the construction cost
Construction* (*see assumptions*)	75%	25%	$8,600,000	$7,150,000	$1,450,000	Estimates based on unit costs from 2014 Humboldt County report, other projects, and published literature, adjusted for inflation using consumer price index
Monitoring and Adaptive Management	75%	25%	$430,000	$322,500	$107,500	Assumed 5% of construction cost
TOTAL			**$12,545,000**	**$9,290,000**	**$3,255,000**	
*These estimates were adjusted to meet the 75/25 cost share requirement for the total project cost.						

Real estate

Reestablishing Redwood Creek in its historic orientation may require a fee simple estate for a 50-foot buffer along the south bank of the creek to allow for bank protection and riparian habitat enhancement. Land adjacent to the new Redwood Creek orientation is owned by the Zuber Family. A standard estate may be required adjacent to the north side of the levee and North Slough on lands owned by the Hufford Family. Additionally, the Hufford and Zuber families will consider the opportunity to trade fee title of two parcels held by the North Coast Regional Land Trust that were expressly purchased with State Coastal Conservancy funding to be used to create favorable outcomes for recovery of Redwood Creek estuary function.

The NFS is aware of the requirements to provide all LERRDs and real estate interests for this project. The standard estate for ecosystem restoration projects is fee simple in accordance with ER 405-1-12, 12-9 b(6)). The real estate cost estimates are based on local and regional fee simple costs for agricultural land.

Cost Sharing

The study's FCSA will provide for 50/50 cost sharing of all feasibility phase costs in excess of $100,000 incurred after execution of the FCSA, except for the costs of the Independent External Peer Review (IEPR) panel, if applicable. A Project Partnership Agreement (PPA) will be executed if the study proceeds to the Design and Implementation phase (i.e., detailed engineering design and construction phase) with the non-federal sponsor responsible for a minimum 25% of total project costs. The NFS would be responsible for the costs of lands, relocations, rights-of-way, and disposal areas (LERRDs), which are creditable towards the 25% non-federal cost share. Section 1135 also allows creditfor certain in-kind contributions, including design, coordination, materials, and construction.

The NFS will assume 100% of all costs and responsibilities related to the Operations, Maintenance, Repairs, Rehabilitation, and Replacements (OMRR&R) of the constructed project. After the construction is completed, USACE will provide NFS with an interim OMRR&R manual. Once the monitoring and adaptive management

phase is complete and ecological success has been determined[3], the final OMRR&R manual will be provided to the NFS, and OMRR&R is required for 10 years. The NFS can continue O&M on a voluntary basis past this 10-year period.

SIGNIFICANCE OF RESOURCES

USACE National Significance

Environmental restoration is a priority in the USACE budgeting process for their Civil Works program. In contrast to more traditional project outputs, many of the outputs of environmental restoration projects cannot be measured in monetary terms. Without the option of quantifying environmental outputs in monetary terms, other criteria must be considered for evaluating and justifying environmental restoration projects. One criterion is the "significance" of the environmental resource(s) associated with such projects. For this purpose, resource significance can be described in terms of institutional, public, and technical significance.

• Institutional significance means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Northern California coastal watersheds and the species they support have substantial institutional significance. Redwood Creek and its Prairie Creek, Sand Cache Creek, and Strawberry Creek tributaries are important habitat of federally listed endangered and threatened species such as the coho salmon (Oncorhynchus kisutch, Southern Oregon/Northern California ESU), Chinook salmon (Oncorhynchus tschawytscha), California Coastal ESU), Steelhead (Oncorhynchus mykiss, Northern California DPS), and eulachon. There is a great deal of interest on the local and national level in restoring estuarine habitat and coastal watersheds with the goal of ensuring survival and encouraging stable populations of these species. Additionally, other species will benefit from the ecosystem restoration.

[3] WRDA 2016 and Implementation Guidance for Section 1161 of WRDA 2016, Completion of Ecosystem Restoration Projects

• Public significance means that some segment of the public recognizes the importance of an environmental resource. There is a large segment of the public that recognizes the value of restoring salmonid species within the region. The local community recognizes the value of a functional estuarine ecosystem for the economic and cultural benefits associated with subsistence and commercial fisheries, ecotourism, recreational activities, and natural appreciation. In addition, from an agricultural management perspective, the impairment to the north and south side drainages into the estuary have significantly degraded or destroyed acres of productive pasture on the north side and are starting to impact south side pastures with prolonged flooding.

• Technical significance means that the importance of environmental resources is based on the scientific or technical knowledge or judgment of critical resource characteristics. Technical significance is demonstrated by the ESA listing and recovery plans for three salmonid species and eulachon, based on scientific and technical knowledge of the population status, life histories, and threats to these species. Survival listed salmonids rests in large part on restoring and maintaining coastal watersheds like Redwood Creek as cornerstones of recovery for SONCC coho salmon, CC Chinook salmon, and NC steelhead (NMFS 2014, 2016).

RECOMMENDATION

This FID recommends that a feasibility study be conducted to evaluate alternative plans for project implementation. This FID includes a description of the existing problem and concludes that there is Federal interest, a willing and capable NFS, and a strong potential for a solution that will result in a policy-compliant project of a scope appropriate for Section 1135.

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ATTACHMENTS

Attachment 1: Sponsor Request Letter

BOARD OF SUPERVISORS
COUNTY OF HUMBOLDT
825 5th Street, Suite 111, Eureka, CA 95501-1153
Telephone (707) 476-2390 Fax (707) 445-7299

May 9, 2022

District Engineer
U.S. Army Corps of Engineers
Attn: Planning Branch
450 Golden Gate Avenue
San Francisco, CA 94102

Subject: Continuing Authorities Program (CAP) Section 1135 New Start Request for Redwood Creek Flood Control Project

Dear Sir or Madam:

This letter is to request the assistance of the U.S. Army Corps of Engineers under Section 1135 of the Water Resources Development Act of 1986, as amended, in improving the environment in the lower Redwood Creek and in the town of Orick, Humboldt County, CA, which has been adversely affected by the 1968 Redwood Creek Flood Control Project.

Redwood Creek is a critically important watershed in northern coastal California. The watershed hosts Redwood National and State Parks, working agricultural and timber lands, the town of Orick, and populations of threatened salmon and steelhead. The estuary and four miles of lower Redwood Creek are confined by a 1968 Army Corps levee system that was installed to provide flood protection to the community of Orick. The levee system has reduced flooding but has presented long-term unintended environmental consequences and increasingly undesirable conditions for agricultural land use operations, public safety, and salmonid habitat. The historic productive estuary, sloughs, freshwater mainstem, riverine floodplain, and tributaries that once connected to a broad and deep embayment are greatly diminished and disconnected. The endangered Tidewater Goby has been locally extirpated and listed salmonid species are severely compromised by the degraded conditions.

The levee project created an armored and straightened channel that terminates approximately 750 feet from the ocean and impair natural estuarine processes of free-flowing connections with freshwater tributaries. On the north side, annual high flows no longer drain to the estuary and create nuisance flooding of agricultural property and Hufford Road, a County roadway. The drainage issues occur adjacent to the terminal end of the north levee where floodwater backs up due a plug of sand and driftwood at mouth of Sand Cache Creek. On the south side, the

agricultural land use is protected and Strawberry Creek drains to the historic mainstem. However, the historic mainstem has impaired water quality and poor habitat due to being cut-off by the southern levee, non-functional tide gates, and increasing blockage at the downstream end.

A process-based restoration approach supported by the CAP 1135 program would create the rich aquatic habitat where fresh and salt water mix and drainage functions to support agricultural activities along with resilient populations of native wild fish. A Redwood Creek Estuary Stakeholder Group formed in 2017 is in full support of the County's request for a new start (see attached letters of support). The Stakeholder Group includes: the Hufford and Zuber families; Northcoast Regional Land Trust; National Park Service as a land manager; 5th District Supervisor Madrone; US Fish and Wildlife Service; NOAA/NMFS; CDFW; and non-profit California Trout. The Stakeholder Group has developed consensus around conceptual design elements and are actively assessing the concept's ability to restore aquatic habitat and maintain protection for the agricultural activities that are currently protected by the levees.

We, County of Humboldt, understand that the Section 1135 program has two Phases: (1) a feasibility study, and if a feasible project is identified then (2) a subsequent design and construction phase. This letter is a request for a new start for a feasibility study phase. As the local sponsor we acknowledge that we are responsible for 50 percent of feasibility study costs exceeding $100,000 in Federal expenditures. For the design and construction phase the local sponsor will be responsible for 25 percent of project design and construction costs. In the design and construction phase a local sponsor's cost share obligation would include provision of all lands, easements, rights-of-way, relocations, and dredged material disposal areas required for the project. In the design and construction phase a local sponsor would assume responsibility for operation and maintenance of the project upon completion. We acknowledge that the cost share contribution can be in the form of "in-kind" services that contribute a direct component to the study, cash, or a combination. We intend to pursue budgetary actions so that funds are available to meet our cost sharing requirements.

The County of Humboldt has designated Hank Seemann (707-445-7741; hseemann@co.humboldt.ca.us) as the point of contact for this project.

Sincerely,

Virginia Bass

Virginia Bass, Chair
County of Humboldt Board of Supervisors

Attachment: Support Letters