Section 5: Project Description

1. ***Project Objectives:***

This proposal would support the largest estuarine restoration project north of San Francisco Bay. That project is comprised of two elements: 1) the Salt River Ecosystem Restoration Project (SRERP), led by the Humboldt County Resource Conservation District and the State Coastal Conservancy (SCC), and 2) The Eel River Estuary Preserve Ecosystem Enhancement Project (EREP), led by The Wildlands Conservancy (landowner and partner), California Trout (grantee for design grant and partner), the SCC (lead agency), and many others. The SRERP as a whole is sited on private agricultural land owned by more than 40 participating private landowners, as well as the California Department of Fish and Wildlife, which owns the former Riverside Ranch, now the Salt River Unit of the Eel River Wildlife Area. The EREP is located on the former Connick Ranch, an 1,100 acre property owned by The Wildlands Conservancy. The SCC is intimately involved with each project, providing funding, leadership and technical assistance to landowners and other partners.

The goal of the Project is to restore ecosystem functions within the Eel River Delta, to enhance habitats for native fisheries and aquatic species, support waterfowl and wildlife species, and to enhance agricultural productivity by restoring hydraulic function within the historic but aggraded slough network, thereby decreasing and more effectively managing onsite flooding. In addition to articulating habitat enhancement actions, the Project objectives also provide for extensive adaptive management strategies that are incorporated into the project permits, and the objectives specify how the Project Area can design and plan for its land uses, agricultural productivity, and vegetative communities in anticipation of future climate scenarios and sea level rise.

Once the project is completed and vegetation has established in restored habitats, the project will result in 350.79 t $CO_{2\ eq}$ in net emissions reductions and new carbon sequestration annually (see Appendix 3 for carbon sequestration discussion). This will be achieved through a combination of retiring pasture in order to implement the project, diminishing herd size in specific restoration areas, and restoring reclaimed tidal marsh back to marsh conditions with resulting carbon sequestration.

Specific objectives of the Project include:

- Provide long-term carbon sequestration sites in a heavily altered estuary, while restoring and enhancing habitat for native fish and terrestrial species;
- Restore access to high quality habitat for native salmonid species and other aquatic species by increasing connectivity between estuarine, tidal slough, and inland waters, and providing non-natal winter rearing habitat for juvenile salmonids.
- Improve drainage efficiency and manage sediment loads more effectively, while enhancing tidal processes by reestablishing the Salt River-Francis Creek and Centerville Slough-Russ Creek hydraulic connectivity;
- Enhance agricultural productivity by increasing resiliency to sea level rise, enhancing drainage and establishing an avulsion management area for Russ Creek as it enters the southern portion of the property, and Francis Creek where it enters the Salt River.
- Enhance tidal processes by restoring tidal prism to the Inner Marsh area of the EREP, and to significant portions of the now fully aggraded channel of the historic Salt River, an historic tidal slough;
- Improve tidegate infrastructure to provide adaptability for sea level rise, provide fish passage and increase opportunities for land management;
- Enhance freshwater pond habitat at the EREP.
- Facilitate access for agricultural land management and nature study opportunities
- Suppress invasive species
- Establish long-term Adaptive Management Program to facilitate future coordinated permitting of land management activities.

Co-Benefits:

This proposal supports a multiple benefit, watershed-scale effort to increase GHG sequestration and avoid emissions while restoring hydrologic processes and fish passage across a working landscape of family farms and ranches being undertaken throughout the Salt River Watershed. Although the project area is not significantly affected by environmental pollution or other hazards, the project provides significant co-benefits in an area that tends to produce rapid ecological and social rewards. Those co-benefits include restoring and enhancing wetlands, restoring and enhancing spawning, rearing and migration habitat for native fish species, enhancing riparian diversity and cover, and improving drainage and flood protection for local communities and agriculutral producers while providing habitat for fish and wildlife species.

The first and already completed phase of the project, the restoration of Riverside Ranch to a network of 300-acres of tidal marsh and other habitat types, has already yielded dramatic biological response, some of which is documented, below. This area will serve as a monitoring site for sequestration rates, as discussed under “Monitoring”, below.

From the human dimension, the completion of last year’s channel excavation along the Salt River is already providing dramatic improvements to agricultural operations by alleviating the chronic flooding and ponding resulting from the Salt River’s former hydraulic dysfunction.

Specific species benefitting and expected to benefit from the proposed project include:

Coho Salmon. Coho salmon that reside in the project area are part of the Southern Oregon Northern California (SONCC) Evolutionary Significant Unit (ESU) and are a Federal and State threatened species. The Salt River and its tributaries, including the project area, are designated Essential Fish Habitat for coho salmon, but they currently provide marginal habitat for coho salmon due to loss of channel morphology associated with sedimentation and loss of riparian values. This condition has been partially reversed through earlier phases of this project, and coho salmon observations in the project area have increased from 0 to the hundreds. This trend was expected.

According to the SONCC Coho Salmon ESU Recovery Plan (Recovery Plan) (NMFS 2014), the tributaries and estuary located within the Lower Eel River/Van Duzen population are likely to serve as essential non-natal rearing habitats for all populations in the Eel River watershed, once the Pacific Coast’s fourth largest producer of salmon and steelhead. The mainstem Salt River occasionally provides migration habitat for adult coho salmon during higher flows as suggested by the observation of several coho salmon juveniles in Francis Creek in 2005 within the city limits of Ferndale. However, the Salt River is not considered good juvenile rearing habitat in its current condition. The proposed project would improve this condition, rendering historically productive and currently intact tributaries capable of providing rearing and spawning habitat for coho salmon again.

The Lower Eel River/Van Duzen coho population that resides in the project area is identified in the Recovery Plan as being a core, functionally independent population at high risk of extinction. The Recovery Plan identifies the juvenile life stage as the most limited for this population, and identifies the following limiting factors for juveniles that will be addressed by this project: loss and degradation of the formerly extensive and complex estuarine habitat, elevated water temperatures (addressed by restoring riparian forest) and an increased sediment supply that degrades habitat quality (addressed by restoring sediment transport capacity through tidal prism restoration in Phase 1 and through channel restoration and SMA construction in Phase 2). The Salt River Ecosystem Restoration Project is cited in the Recovery Plan (pg. 26-17) as an important step to restore coho habitat lost to channelization and diking. The project will help accomplish the following recommended actions for the Lower Eel/Van Duzen population:

- SONCC-LEVR.1.2.16: Improve estuarine habitat by restoring brackish marsh in the Salt River.
- SONCC-LEVR.8.1.9: Improve grazing practices to reduce sediment delivery in the Ferndale HSA.
- SONCC-LEVR.2.1.17: Increase channel complexity by increasing LWD, boulders, or other instream structure.
- SONCC-LEVR.2.1.36: Increase channel complexity by constructing off channel ponds, alcoves, backwater habitat, and old stream oxbows.
- SONCC-LEVR.7.1.2: Improve wood recruitment, bank stability, shading, and food subsidies by increasing conifer riparian vegetation.

Restoration of a portion of the Salt River and its tributaries will help to accomplish the following tasks contained in CDFG's (2004) Recovery Strategy for California Coho Salmon:

• Eel River-Ferndale Hydrologic Subarea Task 1: Develop the Salt River Local Implementation Plan to incorporate coho salmon-friendly measures, in cooperation with the agencies.

• Eel River-Hydrologic Unit Task 11: In cooperation with agencies and landowners, plan to reestablish estuarine function, restore and maintain historical tidal areas, backwater channels and salt marsh.

• Rangewide-Water Temperature Task 3: Provide funding…to restore stream habitat where lack of LWD, riparian cover, simplified stream morphology and other conditions have been determined to be limiting factors to coho salmon habitat.

• Rangewide Stream Complexity Task 2: Where appropriate and feasible, reconfigure levees and channelized streams to benefit coho salmon.

• Rangewide Estuaries Task 2: Restore estuarine and associated wetland ecosystems.

Chinook Salmon: California coastal Chinook salmon are federally listed as threatened. Yoshiyama and Moyle (2010) estimate historic runs of Chinook salmon in the Eel River basin between 100,000 and 800,000 fish per year, declining to roughly 50,000-100,000 fish per year in the first half of the 20th century. The most recent numbers suggest that less than 1,000 wild adults per year have returned to the Eel River basin in recent years (ibid.); although 2010-2011 counts were over 2,000, and the 2012 count is over 3,000. The Eel River estuary has been shown to be important rearing grounds for juvenile Chinook salmon (Monroe et al. 1974, Puckett 1973, Roberts 1992, Higgins in Roberts 1992, and Cannata and Hassler 1995). The Project will add approximately 64 acres and many miles of estuarine and floodplain habitat (along with 330 acres of tidal marsh restored by the first phase of the SRERP) and would restore fish passage to 5.9 miles of additional habitat in the Salt River tributaries (11 total for SREP Phase 2), and 4.4 miles in the Russ Creek-Centerville Slough complex, significantly expanding and enhancing available rearing habitat. Chinook salmon will benefit from the addition of large woody debris, alcoves, and seasonal ponds in the channel, active bench, and floodplain. Chinook salmon juveniles have been recovered by CDFG during seining efforts (in 1973, 1977, 1984 and 1995) in the Eel River estuary. Chinook salmon were documented by DFG in the lower Salt River in 1995 (Downie and Lucey 2005) and 1979 (Roberg and Kenyon 1979). The Salt River and its tributaries, including the project area, are designated Essential Fish Habitat for Chinook salmon. The project would help accomplish the following priority task in the 2007 Federal Recovery Outline for the Evolutionarily Significant Unit of California Coastal Chinook Salmon, prepared by the National Marine Fisheries Service: *"Protect and restore watershed and estuarine habitat complexity and connectivity."*

Steelhead: Northern California steelhead is a Federal and State threatened species. The Eel River Steelhead population has experienced a severe decline. Yoshiyama and Moyle (2010) estimate historic steelhead numbers in the Basin at 100,000-150,000 adults per year (winter and summer runs combined), declining to 10,000-15,000 by the 1960s. Present numbers are probably considerably less than 1,000 fish in both runs (ibid.). The project will benefit steelhead by enhancing in-stream habitat complexity in the Salt River and improving passage to Salt River tributaries. In addition, the expanded tidal prism resulting from completion of Phase 1 of the SRERP is critical to restoring and enhancing aquatic habitat upstream in the Salt River, which will greatly benefit steelhead. Steelhead have been documented in Francis Creek, a tributary of the Salt River, as recently as 2005 and have been observed in the sloughs of the Salt River in 1973 and 1995 (Puckett 1973; Cannata and Hassler 1995).

Anadromous fish are largely extirpated from the EREP, however, due to blockage by tidegates proposed for modification under this proposal.

The Project helps accomplish the following priority tasks in the 2007 Federal Recovery Outline for the Distinct Population Segment of Northern California Steelhead, prepared by the National Marine Fisheries Service: *Protect and restore watershed and estuarine habitat complexity and connectivity. Improve freshwater habitat quantity and quality.* The Project furthers the following recovery strategy from CDFG's 1996 Steelhead Restoration and Management Plan for California: *"Restore degraded habitat."* The Project advances the following recommendations of the California Department of Fish and Game Eel River Salmon and Steelhead Restoration Action Plan (1997): *removing barriers, reducing sediment inputs, improving riparian forest conditions, and habitat enhancement.*

Tidewater goby (*Eucyclogobius newberryi*): Tidewater goby is a State Species of Special Concern and is federally listed as endangered. Critical habitat was designated in November 2000 and revised in 2008 to include portions of the Eel River estuary, but not the SRERP area. Tidewater goby were found adjacent to Riverside Ranch in 2010, and have been found subsequently in high numbers at the EREP. Since restoration of Riverside Ranch, Tidewater Goby have recolonized that portion of the project area in high numbers. The SRERP restores at least 34-acres of brackish habitat suitable for tidewater goby, and other brackish-dependent species. The Project helps accomplish the following task contained in the USFWS (2005) Recovery Plan for Tidewater Goby: *"Develop and implement management strategies to avoid further direct net loss/modification of habitat and restore degraded habitat."*

Socio-economic benefits: The project will alleviate chronic and economically damaging flooding of pastureland, as well as improve the function of and access to the Ferndale Wastewater Treatment Plant (WTP). Due to the lack of a defined channel and sediment-plugged culverts, any rain event causes flooding and ponding of water on roads, around homes and barns, and across the pasture lands that are the economic backbone of the delta. HCRCD estimates that 762 acres of valuable dairy and grazing land in the vicinity suffer significant losses due to chronic flooding. Many pastures are unusable October through May due to standing water. Dairy operators in the area report buying supplemental feed because of the loss of forage and cropland due to flooding. Interviews with eight operators, a small fraction of those affected, indicated that they incurring significant additional expenses for supplemental feed, farming, reseeding flooded areas, and pumping out floodwater exceeding $160,000 annually. While project implementation is not expected to result in increased herd size for the area, savings from avoided expenses will provide a significant benefit to the local economy.

Flooding conditions near the rural-residential area of Port Kenyon, at the confluence of Francis Creek and the Salt River, continues to be a serious threat to public safety due to the presence of flowing water and large amounts of sediment on the public road. The flooding conditions are the result of flow constrictions and blockages associated with excess sediment within Francis Creek and the Salt River. The segment of Port Kenyon Road affected by the flooding is critical for providing residents access to their homes, for providing essential access to the City of Ferndale wastewater treatment plant, and for providing access to emergency vehicles, utility workers, and road maintenance crews. The County of Humboldt and the City of Ferndale incur annual maintenance costs dealing with the sediment and flooding. The proposed Project incorporates, as a cash match contribution, the replacement of the Francis Creek crossing on Port Kenyon Road, thereby restoring fish passage and reducing flooding in this area.

Similarly, at the Eel River Estuary Preserve, the project will resolve a longstanding technical and legal challenge whereby the floodwaters and sediment load of Russ Creek have been managed by controlling the avulsion of the creek onto agricultural pastures. While this has succeeded in building up pasture, it entirely disrupted hydraulic connectivity, eliminated fish passage within the watershed, and over time caused drainage of existing pastures to deteriorate. By restoring hydrologic connectivity, and reestablishing natural drainage patterns, ecosystem services, natural resources and agricultural operations can be enhanced.

Elsewhere on the EREP, tidal exchange and habitat connectivity within the property has been blocked by tidegates that have been in place, in one form or another, since the late nineteenth century. The project offers an historic opportunity to restore tidal exchange in the once vast slough network on the property, while also improving drainage for the benefit of agricultural operations there.

Salt River Ecosystem Restoration Project (SRERP):

When complete, the Salt River Ecosystem Project (SRERP) will restore and enhance approximately 600 acres of fish and wildlife habitat, including tidal marsh, aquatic areas, mudflats, freshwater wetlands, riparian forest, and grassland while also reducing flood damage and enhancing agricultural productivity on more than 800 acres in the project vicinity. For the purposes of this proposal, the SRERP project is differentiated between the "*overall project*" which covers all activities related to the full ecosystem restoration project and the "*funded project*" which relates directly to project activities being proposed for funding in the next phase due to begin construction in 2015. SRERP Project design was supported by hydraulic and sediment modeling with participation by NOAA and private consultants. Project designs underwent extensive peer-review, and were supported by the landowner and agency community.

The goal of the *overall* SRERP is restored hydraulic capacity and sediment transport, improved drainage, reduced flooding, enhanced riparian and wetland habitat, and improved fish passage and related habitat. The objectives of the *overall project* are:

- Reducing and managing sediment inputs from the upper watershed;
- Re-establishing 7 miles of Salt River channel and associated floodplain and riparian corridor;
- Restoring tidal marsh and tidal connectivity;
- Restoring connectivity to over 15 miles of tributaries; and
- Working with the community to monitor changes in the watershed and to implement adaptive management and maintenance efforts to assure continued hydrologic function.

- The *overall project* area extends for approximately seven miles, from approximately 4000 ft. upstream of the Salt River-Eel River confluence to approximately 1800 ft. upstream of the (currently non-existent) Williams Creek-Salt River confluence. The *overall project* also includes restoring fish passage and habitat to approximately 1000 ft. of lower Francis Creek. In addition, the *overall project* implements a variety of erosion control and sediment reduction projects in the upper watershed over a period of several years.
- The *overall project* is further differentiated by two primary phases:

- Phase 1 re-converted over 300 acres of land from pasture back to tidal marsh and a variety of estuarine habitats, while maintaining approximately 75 acres of existing pasture for migratory bird habitat. Phase 1 also restored approximately 2.5 miles of tidally-influenced Salt River channel adjacent to the tidal marsh area. Major construction of this phase was completed in 2013.
- Phase 2 continues upstream for another 5 miles and will be implemented over several years. Rehabilitation of the entire 5 miles of channel will entail removing and agriculturally re-using over 380,000 cubic yards of excavated sediment. When complete, five miles of fluvial Salt River channel and associated riparian floodplain, as well as lower Francis Creek, will be restored. A total of 22 acres of freshwater channel wetlands will be created.
- Phase 2 will also restore fish passage and hydraulic connectivity to the Salt River's three primary tributaries (Williams, Francis and Reas creeks).
- In 2014 work on 1.2 miles of Phase 2 channel and floodplain was completed.

- **The *funded project* will restore approximately 2 miles of Salt River channel and associated floodplain and re-connect Francis Creek, a second order stream with approximately 5.2 miles of blue line stream (USGS Ferndale 7.5 minute quadrangle).**

<u>Eel River Estuary Preserve Ecosystem Enhancement Project: (EREP)</u>

When complete, the Eel River Estuary Preserve Ecosystem Enhancement Project: (EREP) will restore and enhance approximately 300 acres of fish and wildlife habitat, including tidal marsh, aquatic areas, sand dunes, mudflats, freshwater wetlands, riparian forest, and grassland while also reducing flood damage, restoring hydraulic function and enhancing agricultural productivity on more than 200 acres on the property.

EREP Project design is supported by hydraulic and sediment modeling that was extensively peer-reviewed and supported by the landowner and agency community. The EREP Notice of Preparation for CEQA was circulated December 17, 2014, adoption of the final EIS/R is expected in 2015, and the project construction is anticipated to occur 2016-2018.

The goal of the *EREP* is restored hydraulic capacity and sediment transport, improved drainage, reduced flooding, enhanced riparian and wetland habitat, and improved fish passage and related habitat. The objectives of the project are:

- Managing sediment inputs from the upper watershed;

The Russ Creek entrance to the EREP area has always been an alluvial fan, but for the last century, largely due to active manipulation, it appears to have lost any coherent hydrologic connection to the Eel River. The heavy sediment load in the creek –approaching 4,000 ppm under heavy storm events-- has been actively managed in 20-40 acre parcels to decant sediment into pastures from whence sheet flow slowly percolates downwards or towards more defined channels. Therefore, the project proposes to reexcavate a defined channel, and establish defined and predictable sediment management areas that are capable of supporting both pasture and restored riparian canopy. The proposed sediment management areas here are approximately 60 acres in size.

- Re-establishing one mile of Centerville Slough channel and associated floodplain and riparian corridor, thereby restoring hydrologic and geomorphologic connectivity between Russ Creek and the Salt River, via Centerville Slough;

Centerville Slough, once the largest tributary to the Salt River, had been filled and reclaimed by 1942. With that reclamation, all predictable hydrologic connectivity between freshwater inputs to the south, such as Russ and Shaw creeks, as well as the vast system of interior sloughs and terminal ponds, had been lost. The project proposes to excavate and restore one mile of historic Centerville Slough in order to reestablish both hydrologic connectivity and tidal exchange to the remaining inner slough system. In addition to the profound ecological benefits such action would offer, it also has the capability of improving drainage within the EREP area, as well as for adjacent property owners plagued by frequent flooding and ponding in otherwise prime agricultural areas.

- Restoring 34 acres and 3.68 miles of tidal marsh and tidal connectivity within the Inner Marsh complex;

Although it no longer enjoys tidal exchange, nor has it for more than 100 years, the Inner Marsh complex retains a wholly intact dendritic slough network that requires only the restoration of tidal exchange to restore full ecological capacity. Therefore, the project proposes to modify tidegate structures (see below) in order to restore 34 acres of aquatic or marsh habitat and 3.68 miles of tidal marsh and tidal connectivity within the Inner Marsh complex.

- Restoring hundreds of acres of dune habitat at the south spit of the Eel River;

The extensive dune network protects all interior and low lying areas from inundation. Subject to frequent avulsion and wave overwash events, the project seeks to restore dune function, provide room for eastward migration of the dune system, and thereby protect remaining habitat and agricultural land to the east. The Focus of the project is to launch pilot restoration techniques on a specific dune overwash area comprising approximately 20 acres. In addition, the project will include extensive restoration of native dune species and removal of exotics.

- Restoring connectivity and anadromous fish passage to over 4 miles of tributaries .

At present, Russ Creek, once an anadromous fish bearing stream, maintained hydrologic and ecologic connectivity with the Eel River Delta via Centerville Slough. With the reclamation of Centerville Slough, that connectivity was lost. The project will restore approximately one mile of Centerville Slough/Russ Creek channel and associated floodplain and re-connect Russ Creek, a second order stream with approximately 4.4 miles of blue line stream (USGS Ferndale 7.5 minute quadrangle).

- Ensuring establishment and adoption of an adaptive management and maintenance program to assure protection and enhancement of ecosystem function in the context of future management needs;

As with the SRERP, project success is dependent upon a robust adaptive management strategy that accommodates changing conditions, sea level rise and climate change. The SRERP Adaptive Management Program (AMP) will serve as the model for the EREP.

2. ***Background and Conceptual Models:***

Historical Background:

Prior to European settlement the Lower Eel River delta was a mosaic of fresh and salt marsh, slough channels and streams interspersed with dense thickets of alders, scattered forests of spruce and redwood, and savannahs filled with six-foot ferns. The Salt River was a wide, tidally-influenced channel connected to sloughs, floodplains and marshes. It functioned as a migration corridor for adult salmonids on their way to tributary spawning habitats and as a rearing area for juveniles emigrating to the Eel River Estuary.

European settlers arrived in the mid-1800's and began clearing the trees and diking and draining the wetlands. Due to the deforestation of the Salt River watershed, channelization of the tributaries, reclamation of 3,000 acres of tidal marsh, loss of tidal prism, timber extraction in the upslopes, and highly erosive geologic formations of the surrounding area, the Salt River channel and its primary tributary Centerville Slough has filled with sediment and vegetation and is impassable and inhospitable to aquatic species. The system lost hydrologic function to the point where the once navigable Salt River and Centerville Slough channels, both 200' wide and fully navigable for commercial purposes, are now on average 6ft across or simply nonexistent.. Most of the historic Salt River and Centerville Slough channels are filled with sediment and grazed. Without a functioning river system in the watershed, fish habitat and fish passage is severely compromised and widespread, flooding is an annual occurrence.

For the past 30 years the watershed community has worked to understand the resource issues and develop a workable project design to restore function to the watershed. The 2005 CDFG Salt River Watershed Assessment provides an excellent assessment of watershed conditions and recommendations for remediation. The assessment found that, despite the impairments, the watershed still has capacity to support aquatic species such as coho, cutthroat, steelhead, and tidewater goby and would benefit from restoration. Yoshiyama and Moyle (2010) state that coho salmon, Chinook salmon, and steelhead are all on a trajectory towards extinction in the Eel River basin, with a 99% decline from historic population numbers. This proposed Project will help reverse that trajectory

Permanence

Virtually all of the proposed project activities will take place on lands determined by the State Lands Commission to be in the jurisdiction of the State of California. Thus, the legal status of the project area ensures permanent protection of investment in perpetuity. However, there is inherent risk in implementing coastal wetland restoration projects. Due to their location, all tidal wetland restoration projects can be vulnerable
to sea-level rise impacts. Nonetheless, once the marsh plain of a restored wetland is colonized by vegetation, marshes become efficient sediment traps. Due to the low relief nature of the Eel River Delta, one can only expect increasing tidal influence and expanding tidal marshes in the context of sea level rise. This is particularly true in light of the extremely high sediment loads of the Salt River tributaries, which have shown every ability to aggrade the landscape faster than the sea can rise under any scenario.

Funding Need

More than $12 million has been spent thus far on this landscape scale, ecosystem restoration project in the Eel River Delta, nearly $2 million thus far from SCC alone, but much remains to be done. In 1890 the estimated acreage of tidal marsh, inclusive of hydraulically connected channels, was approximately 10,000 acres. This acreage was reduced 90% by reclamation and current estimates place the acreage of tidal marsh at 874 acres of hydrologically connected tidal marsh for the entire Eel estuary. The decline in the Eel's fisheries is commensurate with this reduction in acreage.

What is unusual about the Eel River Delta, however, is that tremendous opportunity exists for restoration, and that it represents an ideal location to engage in adaptation to sea level rise to protect existing communities and important local economies. First, the landscape is relatively undeveloped, and is zoned either for agricultural use or natural resources. Second, the agricultural community is receptive to restoration actions that provide mutual benefit as the proposed project demonstrably does. That support is strong, but it is entirely dependent upon the perception of continuing mutual benefit generally, and full implementation of this project, specifically.

Future success of ecosystem restoration and adaptation to sea level rise in the Eel River Delta is dependent upon this grant. Although more than $3 million has been secured for the 2015 phase of the SRERP, the 2015 construction season faces a $3 million shortfall due to unexpectedly high sediment load and associated earthmoving costs. Failure to proceed with the 2015 construction season will prevent project partners from conveying the anticipated hydraulic benefits of the project to the community. If ecological restoration in the Eel Delta is to continue, and achieve meaningful recovery of historic levels of tidal marsh and ecosystem function, project momentum must be maintained.

Maintaining momentum will enable project partners to exhibit continuous construction seasons that meet and likely exceed project goals and objectives. Many funders have expressed interest in its implementation, it will be vital to secure additional funding match to ensure that the project can be implemented in a timely fashion.

Conceptual Models:

Please see Exhibit 4 for a conceptual model of the carbon sequestration analysis.

3. ***<u>Detailed Project Description, Including Tasks to Be Performed</u>:***

Note: See Exhibit 3 for detailed GHG reduction objectives

The State Coastal Conservancy (SCC) will administer the grant and subcontract with the Humboldt County Resource Conservation District (HCRCD) for work to be completed under the SRERP component of the project and with The Wildlands Conservancy for the EREP component of the project. SCC staff time will be utilized for oversight, coordination, legal review, CEQA compliance, permit oversight, reporting and invoicing. HCRCD staff time will be utilized to complete the bidding and contracting process, manage and administer grants and contracts for construction, inspection and management services, process invoices and develop required reports, coordinate and contract for project monitoring, provide ongoing project and monitoring oversight, and for general coordination between all project stakeholders. GHD

The SRERP phase of the project (Exhibit 2) is slated for construction in 2015. The EREP Phase is scheduled for 2016-2018. Hence, some construction details described herein are limited to the SRERP Phase of the proposed project but most of the construction approaches for the EREP will be identical to those applied for the SRERP.

The proposed project extent will restore some 1.75 miles of Salt River channel, one mile of Centerville Slough channel, one mile of Centerville Slough (west) channel, .5 mile of Russ Creek channel and .6 mile of the Francis Creek tributary channel. The channel restoration that is part of this Project will provide fish passage to 11 miles of historic tributary habitat. At least 64 acres of aquatic habitat will be restored and enhanced within an active channel, including extensive floodplain wetlands restored on an active bench within the channels that will support low growing brackish and freshwater wetland vegetation.

The restored channels and floodplain will incorporate additional habitat features such as woody structures, seasonal ponds, and alcoves. The restored corridor will be planted with diverse riparian forest species (Sitka spruce, cottonwood, grand fir, redwood, and alder) characteristic of the historic Salt River riparian forest. The Project incorporates an approximately 9.4 acre Sediment Management Area (SMA) with fish friendly features, three acres of which will be passively managed and function as a freshwater marsh. The SMA is critical to the sustainability of the SRERP, as it will prevent high sediment inputs from degrading restored habitats.

Work accomplished under this proposal will also improve fish passage and floodwater conveyance at the Port Kenyon road crossing over Francis Creek. The existing plugged culvert for Francis Creek at Port Kenyon Road (0.3 miles upstream of the confluence with the Salt River and 4 miles upstream of the Eel River estuary) is identified as a fish migration barrier in the Humboldt County Culvert Inventory and Fish Passage Evaluation (Ross Taylor & Assoc., 2000). The SRERP proposes to widen the Francis Creek channel, re-locate a sewer main, remove existing undersized culverts and install a 42-foot arch prefabricated culvert/bridge structure. The roadway will be built up to design specifications and guard rails will be installed. This work will be accomplished in cooperation with the County of Humboldt, Public Works Department and has been funded in part through the CDFW Fisheries Restoration Grants Program. The proposed project will restore, enhance, and increase capacity of habitat and passage for four fish species listed as threatened or endangered under the federal Endangered Species Act: coho salmon (*Oncorhyncus kisutch*), Chinook salmon (*O. tshawytscha*), steelhead (*O. mykiss*), and tidewater goby (*Eucyclogobius newberryi*).

<u>Project Performance Measures and Outcomes</u>:

- Restore 1.75 miles of Salt River Channel
- Restore 2 miles Centerville Slough Channel
- Restore .5 mile Russ Creek Channel
- Restore .6 miles of Francis Creek Channel
- Restore 16 acres of saltmarsh vegetation
- Restore 20 acres of marsh vegetation
- Restore 64 acres of aquatic habitat
- Restore 18 acres of riparian forest
- Restore fish passage to 11 miles of historic habitat

<u>Technical/Scientific Merit:</u> An extensive bibliography of technical memos and reports utilized in the development of the proposed project and associated regulatory and procedural compliance

is available online and by request of the applicant. In summary, design specifications for the Salt River channel were developed in concert with NOAA, USFWS, CDFW (CDFG), and other agencies, and are described in detail in the Basis of Design Report, available from HCRCD. Kamman Hydrology and Engineering developed an unsteady flow HEC-RAS model that was used for the hydraulic assessment of the project design. Proposed channel design for the project area is discussed below. typical cross sections are shown in Exhibit 3. The historic channel cannot be fully restored due to the extent of historic drainage modification and current land use. However, the proposed active channel and floodplain configuration can restore significant hydrologic and ecologic function to the area by restoring instream and riparian habitat, conveying flows to a feasible level, and optimizing sediment transport by maximizing velocity in the active channel.

Salt River Fluvial (Non-Tidal) Reach: The fluvial reach of the Salt River channel between Perry Slough and approximately Reas Creek, which includes the Project area, is designed to connect a proposed channel corridor to sediment management areas as well as the existing floodplain. The capacity of the proposed channel depends on topographic relief of the adjoining floodplain and fluctuates between the 1- and 1.5-year return period. Within the channel, there are two principal geomorphic features: the active channel and the active bench. Baseflow is contained within the primary active channel. As the hydraulic capacity of the active channel is exceeded at higher flows, water begins to inundate the active bench and flow through ephemeral secondary channels on the bench. Berms will be constructed adjacent to the active channel to provide additional confinement and control the amount of flow conveyed across the active bench.

Active channel: The active channel will contain summer base flows and high flow capacity that exceed approximately 60 to 70 days/year, limiting the available woody vegetation species suitable to tolerate the frequent flow and sediment inundation. The active channel cross section would possess a relatively low width to depth ratio (approximately 10:1). The cross section will have relatively steep side-banks leading to an initially, broad flat bottom. It is expected that channel processes will reshape the channel bottom.

Vegetation lining the active channel and associated root strength will prevent the banks from scouring and widening. As there are limited suitable species, the active channel banks are proposed to be planted with live willow stakes obtained from nearby native cuttings, as well as other riparian-wetland shrubs. This bioengineering approach provides quick vegetative establishment benefiting bank stability, desirable roughness characteristics and riparian habitat. Sustained flow velocities in the active channel are intended to impede re-colonization of woody vegetation that would otherwise promote aggradation. Some natural recruitment of woody vegetation is anticipated to occur in the active channel and would be minimized through adaptive management and long-term maintenance as prescribed in the project's approved Adaptive Management Plan.

Transport of bed material will be concentrated within the active channel. The confinement produced by the active channel and berms are intended to produce sufficient velocity in this relatively flat area to prevent excessive deposition of sediment. The depth of the active channel and the adjacent berms will also prevent most bedload from being transported onto the active bench. During high flows, gaps in the active berm will allow waters to flow onto the active bench and then return back into the active channel. These gaps will be shaped to reduce the flow velocity onto the bench, thus maintaining the bulk of streamflow and stream power in the active channel. As water flows downstream on the active bench, the bench will widen and water depths and velocities will decrease, allowing coarser suspended sediment to deposit. The flow will then return to the active channel through another gap in the berms. This gap will also be a constriction, causing the returning flow to scour and maintain alcoves.

The active bench and floodplain will be restored to riverine wetland habitat populated by sedges, grasses, and forbs within the active channel, while spruce, cottonwood, and other species will be planted at the edge of the active bench. This outer canopy, together with riparian willow stands along the active channel, will shade the main channel, thereby reducing water temperatures while inhibiting colonization by invasive species such as Reed Canary Grass. Expansion of tidal flows, shade from large woody species, and zones of higher salinity within the lower Salt River channel will help maintain the desired plant communities and channel configuration by increasing scour effects and inhibiting willow growth within the active channel.

Active Bench: Flows exceeding the active channel capacity will occupy the active bench, providing an area for sediment deposition, morphological diversity outside of the active channel and the establishment of riparian vegetation and wildlife habitat. The active bench is anticipated to be a highly dynamic interface between the active channel and the floodplain. Topographic diversity will be graded into the active bench to create slower water areas for deposition, as well as low-flow constrictions that promote scour of side channels and allow return of flow back into the active channel. Outside of active sediment management areas, natural recruitment of woody vegetation is anticipated on the active bench and would be maintained and managed pursuant to the channel design intent. The transition slope from the active bench up to the existing floodplain would be vegetated with a variety of riparian species including Alder, Cottonwood, Maple, Sitka Spruce and Redwood. The Active Bench would transition from riparian dominated habitats to tidal wetland habitat between Dillon Road Bridge and the Reas Creek confluence, in response to increased tidal influence with the lower Salt River and Eel River estuary.

Multi-function Habitat Elements: These elements will enhance aquatic habitat by creating pools, cover, and areas suitable for macro-invertebrates and refugia for fish and amphibians.

Gravel Riffles: The channel may scour and degrade in the vicinity of gaps in the active berm. Simple gravel riffles will be installed immediately downstream of these gaps to maintain the constructed channel grade. They would consist of medium sized gravel, approximately 1.5 feet thick, spanning the bottom of the channel. Gravel will be sized to remain stable at high flows.

Large Woody Debris Deflector: These structures will deflect high water velocities away from berms and banks while creating localized scour to maintain pool habitat for aquatic species.

Guide Logs: For ease of construction, the active channel will be excavated with a horizontal bottom, rather than a v-shaped bottom. The channel bed material is predominantly fine sands and silts, and is expected to rapidly shape into a dune-riffle morphology during the first flow event. To increase bank diversity and facilitate the formation of complex channel bed topography during the first flow events after construction, “guide logs” will be installed into the banks of the active channel. They will be installed on the outside bends of the active channel, and will consist of salvaged alder and cottonwood trunks, driven horizontally into the bank. They will protrude into the active channel and shape the thalweg by creating local scour and deposition. Because they will be constructed with salvaged hardwoods, their design life is expected to be only 4 to 6 years, sufficient time for bank vegetation to establish and provide bank complexity.

Meander Pools: Because the active channel will meander, water flowing on the active bench will cross over the channel in some locations. In these locations, the active berms and banks will be shaped to form a constriction. The constriction will increase water velocities of the returning flow, with sufficient scouring force to maintain a backwater meander pool, providing habitat for aquatic species.

Alcoves: Potential backwater alcoves have been identified in several locations in the project area, including pools formed at culvert outfalls, where “clear water” draining from pastures enters the Salt River. The project will include grading such that these alcoves are connected to the active channel and accessible to fish across a wide range of flows. The alcoves will serve as off-channel winter rearing habitat for salmonids. Instream Cover Structures: Large wood cover structures to enhance fish habitat will be located in areas that are expected to experience minimal sedimentation, such as meander pools and alcoves. They will consist of fir, spruce, or redwood logs protruding into the water column, and will be embedded into the bank. Logs with rootwads intact will be used when available.

Active Bench Habitat Cover Features: Rootwads and trunks from alders and cottonwoods salvaged during vegetation removal will be placed on the active bench. These features will increase surface irregularity, providing roughness and promoting deposition on the active bench during higher flow events. They will also provide habitat cover, complexity, and diversity for amphibians and other species. The cover features will consist of individual logs or clusters of logs or rootwads embedded into the active bench to resist buoyancy and drag forces.

Port Kenyon Road Crossing: The replacement of the Port Kenyon County Road crossing of Francis Creek is included as a cash match contribution to the Project. The existing crossing consists of a 7- x 10-foot concrete box culvert. The replacement crossing, designed by the County of Humboldt, consists of a 12-ft rise x 42-ft wide pre-cast concrete bottomless arch culvert crossing. The roadway will be built up to design specifications and guard rails will be installed. This work will be accomplished in cooperation with the County of Humboldt, Public Works Department and funded through grants with the Fisheries Restoration Grants Program and the Department of Water Resources.

Francis Creek Sediment Management Area Design: Over time it is expected that sediment inputs to the mainstem Salt River would be reduced through ongoing erosion control and sediment trapping projects in the upper watershed. However, in order to maintain optimal flows, sediment conveyance, riparian forest and associated aquatic and wetland ecosystems along the corridor in the interim, sediment management areas (SMAs) will be required. The most important SMA is located on Francis Creek, immediately upstream from the stream’s confluence with the Salt River. Concentrating sediment management here helps avoid frequent management elsewhere, such as within the Salt River channel and adjacent riparian zone. The Francis Creek SMA will divert a portion of sediment-laden flows from Francis Creek into a sedimentation area, where the heavier particles of the sediment load will settle out before flows return to the Salt River at the downstream end of the SMA. The SMA will consist of an Upper and Lower Chute, an alcove that will function as a sedimentation basin, and an outlet to the Salt River. The design incorporates guidance received from a design charrette with NOAA, CDFW, and USFWS agency staff regarding layout and function of the Francis Creek SMA.

Alcove: The alcove will be approximately 1,000 feet long and up to 350 feet wide. A narrow mouth will join the outlet of the alcove with the Salt River. No grade control structures will be installed at the outlet. The alcove will be excavated to elevation 8.6 feet (NAVD88), which is one foot below the thalweg of the excavated Salt River. The alcove is designated as “full” when the level of sediment aggrades to the level of the Active Bench in the adjacent Salt River. This allows for up to 3 feet of sediment to accumulate within the alcove before requiring cleanout, giving a sediment storage volume of 8,000 cubic yards. Based on preliminary sediment loads developed for Francis Creek, it is presumed that the alcove would reach capacity most years, and clean-out would be annual. Streamflows will be diverted from Francis Creek into the alcove in two locations: the Upper Chute and the Lower Chute. The slopes and elevations of the chutes will be sufficient to keep sediment in transport until they reach the alcove. Once in the alcove, water velocities are reduced to a level sufficient to promote sedimentation of all sands and gravels. The narrow outfall configuration and tailwater elevation from the Salt River will control flow depths and velocities within the alcove.

Upper and Lower Chute: The Upper Chute will provide for fish passage, with a slope of 0.7%. To prevent scour of the chute and to support fish passage, a series of rock weirs with roughened pool tailouts will be constructed. Spacing between weirs will be approximately 55 feet, and drop from weir to weir will be less than 6 inches. A water control structure will be placed at the head of the Upper Chute to divert a portion of Francis Creek stream flows into the SMA. The structure allows for adjustment and adaptive management of the flow diverted into the SMA and facilitates cleanout. The floor of the water control structure is set 0.5 feet below the constructed thalweg of Francis Creek. It contains stoplogs that set the elevation of the chute crest, allowing for adaptive management of the facility on a seasonal basis (i.e. spring and fall). To ensure fish passage through the water control structure, two slots for stoplogs are provided. This will ensure that the drop over a stoplog does not exceed 6 inches.

The crest elevation of the Lower Chute will be constructed of a log sill and placed 2.3 feet above the elevation of adjacent Francis Creek thalweg. Water will begin to flow into the Lower Chute at flows slightly greater than a 1-year return period flow. The crest of the Lower Chute was placed high to help maintain stream power in Francis Creek for sediment transport.

Revegetation Design By Reach: All suitable areas within the project footprint will be utilized to maximize the acreage and function of wetland and riparian habitat. Project designs outline revegetation designs for each reach, which is summarized in the table below.

Community type	Location	Dominant species
Spruce/Cottonwood Riparian Forest with Freshwater Marsh	Upper Reach (Francis Creek to Dillon Rd)	Black cottonwood, Sitka spruce, redwood, grand fir, red alder, and big leaf maple, native shrubs and ferns, and slough sedge, spike rush, and alkali bulrush on the active bench.
Spruce/Cottonwood Riparian Forest with Tidal Freshwater Marsh	1,800 foot reach downstream of Dillon Rd Bridge	As above for forest species, but no black cottonwood and spruce on the active channel edge. Tufted hairgrass and common rush added on active bench.
Spruce Dominated Riparian Forest with Brackish Marsh	From 1,800 feet downstream of Dillon Rd Bridge to Reas Creek confluence.	Preserve existing willow and alder outside project footprint. Sitka spruce, red alder, and Sitka willow, with native shrubs and ferns, will be planted on outer slope. Brackish marsh species: Tufted hairgrass, saltgrass, arrowgrass.

Channel excavation and restoration at the EREP will be largely patterned after the approach on the SRERP, and will be guided by elevations, soil depths and salinities and other factors.

Monitoring: Project evaluation will be conducted using multiple methods. A Habitat Monitoring and Management Plan (HMMP) and a supplementary Adaptive Management Plan (AMP) have been developed for the SRERP which describe the process of monitoring and management decision-making to ensure the long term viability of the project relative to the overall goals and objectives. Both physical (topography, geomorphology and hydrology) and biological (vegetation and fish) parameters will be monitored annually. Surveys of water quality parameters, channel geomorphology, riparian and wetland species success, salmonid and tidewater goby presence and abundance, salmonid habitat elements, and predator species presence will be performed post construction.

WATER QUALITY MONITORING

Multiple water quality sampling will occur throughout the project area to measure parameters such as water level, dissolved oxygen (DO), temperature, pH, salinity, conductivity, total dissolved solids, and alkalinity which will play a determining role in species abundance and distribution. Tributary Monitoring - Five sites within tributaries (Reas (2 sites), Francis (2 sites), and Williams (1 site) Creeks) that feed the Salt River will be sampled twice a year between May and October for dissolved oxygen (DO), temperature, pH, salinity, conductivity, total dissolved solids, and alkalinity. In- field measurements will be taken using an OAKTON, hand held, multi-parameter meter. HOBO data logging recorders will be deployed at these sites to continuously measure water temperature. Data will be recorded and will estimate water quality conditions in the watershed based on comparisons with regulatory standards and aquatic life criteria. Monitoring will occur the first, second, and third years post- construction of the Salt River Ecosystem Restoration Project. Protocols used: Storm Water Ambient Monitoring Program and standard procedures.

Water Level, Salinity, and DO Monitoring - Multi-parameter water level and salinity recorders will be used to determine seasonal changes in the tidal salinity gradient within and adjacent to the restored estuary. In order to quantify and evaluate tidal and salinity exchange up the Salt River channel, a network of 5 multi-parameter recorders (measuring water level, temperature, salinity) are proposed in the mainstem Salt River and Eel River Estuary. Four of the recorders shall be installed at the following locations: 1) immediately downstream of the confluence with the new northern tidal marsh connector channel; 2) immediately downstream of the confluence with the new southern (upstream) tidal marsh connector channel; 3) at Dillon Road Bridge; and 4) immediately downstream of the confluence of Francis Creek. In order to evaluate the tidal and salinity exchange within restored estuary/tidal marsh, the fifth multi-parameter recorder shall be located inside the restored estruary.

Turbidity Monitoring - Humboldt County Department of Public Works has established a sediment monitoring station in the form of a Turbidity Threshold Sampling Station within Francis Creek. Turbidity measurements (suspended sediment) inform the project of potential impacts to the physical habitat by sedimentation. Continued operation of this station will be required the first, second, and third years post-construction of the Salt River Ecosystem Restoration Project. Protocol used: County of Humboldt protocols.

HABITAT SURVEYS
The Salt River Ecosystem Restoration Project (SRERP) includes various types of habitat restoration including habitat creation (tidal marsh and channel excavation), habitat enhancement (installation of large woody debris), and habitat restoration (tidal reconnection and creation of slough channels). To assess whether the SRERP is successful in creating and restoring stable refugia and rearing habitat for salmonids, salmonid instream habitat surveys will be conducted.
Salmonid Habitat Monitoring - Three index reaches have been previously established, two in the Salt River and one in Francis Creek (at confluence of the Salt River), and will be surveyed during low flow periods postproject to assess instream habitat. Data will be compared across years to determine if any habitat changes are occurring. Monitoring will occur the first, second, and third years post-construction. Protocol used: CDFG Salmonid Stream Habitat Restoration Manual will be used to quantify pre- and post-project habitat types.
Cross-Sectional and Longitudinal Surveys - To further establish the stability of the restored habitat, numerous cross-sectional and longitudinal surveys will be performed. Ten site locations will be distributed along the Salt River channel to capture points in six freshwater reach sections and four in tidally influenced sections. Twelve site locations will be sited in the restored tidal marsh capturing channel slough structure. The data collected will be compared to As-Built designs to determine how the environment is impacting the physical attributes of the restoration design. These surveys will be conducted during low flow periods in the first, second, and third years post-construction. Protocol used: Salt River Ecosystem Restoration Project Adaptive Management Plan and Final EIR.

Project monitoring will also include taking a series of soil cores from representative areas throughout the project footprint and having the cores analyzed for carbon levels to determine GHG reductions.

A. Monitoring organic soil loss – Prior to and following restoration construction, elevation and sediment accretion will be measured to confirm that no subsidence, and thus no loss of organic soil, is occurring. The abundance of suspended sediment in the project area makes it highly unlikely that subsidence would occur. However, if soil loss is occurring, subsequent GHG emissions will be estimated following *Section 9.3.9* of the VCS protocol (Silverstrum et al. 2013).

B. Monitoring GHG emissions – Similar to baseline conditions, portions of the project area are assumed to not emit GHG as waters will be >18 ppt. This assumption will be confirmed following restoration construction by measuring sulfides as stated in *Section A* of the monitoring plan.

C. Determining start date for authochthonous carbon sequestration – Vegetation colonization will be monitored twice a year to confirm or change the start date of 5 years for quantifying carbon sequestration.

D. Confirming carbon sequestration values – Once vegetation has colonized, soil cores will be collected to confirm carbon sequestration rates following *Section 9.3.7* of the VCS protocol (Silverstrum et al. 2013). Soil cores will be collected above a consistent reference plane.

Monitoring will be conducted by staff of HCRCD, private consultants, and qualified professionals and volunteers. Monitoring tasks may be carried out in collaboration with the

Wiyot Tribe, Humboldt State University through the Dean of Research, and staff of Natural Resources Conservation Service.CDFW and NOAA/NMFS staff also provide direct technical assistance with fish surveys and other fish monitoring activities.

4. *Timeline:*

SRERP: Environmental compliance has been completed and the following permits and opinions have been received: County of Humboldt Conditional Use Permit and Building/Grading Permit, North Coast Regional Water Quality Control Board 401 Water Certification, US FWS Tidewater Goby Biological Opinion, CDFW Streambed Alteration Agreement, NOAA/NMFS Federal Biological Opinion, California State Lands Commission Lease, and US ACOE 404/EA.

The proposed project is set to commence in early summer 2015. Work is currently underway to prepare construction bid documents. Pre-project vegetation removal is planned for this winter with mobilization of equipment and pre-implementation activities expected to begin in May of 2015. In-stream work will take place June 15 through October 15th depending upon conditions, with re-vegetation work in October through December.Milestones and timeframes for required pre-and-post implementation monitoring and maintenance are spelled out in the SRERP permits, Adaptive Management Plan, Habitat Mitigation and Monitoring Plan and other documents; all of which are available upon request.

EREP: The Notice of Preparation for the EREP was circulated December 17, 2014, final designs will be completed in early 2015, and the final EIR/S will be adopted in mid to late 2015. Construction for the EREP will occur between 2017-2018.

Monitoring for carbon sequestration, mitigation monitoring and reporting requirements and project benefits will be managed by the Coastal Conservancy in partnership with the HCRCD and The Wildlands Conservancy, and will continue to 2020.

5. *Deliverables:*

- Construction-related documents include completed Final Design and Specifications,
- Construction Bid Documents, final Phase 2 Adaptive Management and Applied Studies Plan, completed As-built Plans.
- Adaptive Management Applied Studies results summarized in completed reports by lead researchers.
- Final Report completed by SCC per CDFW requirements.

6. *Expected quantitative results (project summary):*

The proposed project will result in the following restored habitats:

- 16 acres brackish marsh;
- 20 acres freshwater marsh;
- 18 acres riparian,
- 14 acres brackish aquatic (slough and tidal channels);
- 4 acres brackish pond;

- 9 acres freshwater aquatic (channels); and
- 350.79 t $CO_{2\ eq}$ in net emissions reductions and new carbon sequestration annually beginning seven years after implementation.

For the analysis supporting the calculation of carbon sequestration and avoided emissions, please see attached Exhibit 3.

7. ***Protocols:***

Please see attached Exhibit 3 for discussion of carbon sequestration analysis
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Project evaluation post implementation will be conducted using multiple methods. A Habitat Monitoring and Management Plan (HMMP) and a supplementary Adaptive Management Plan (AMP) have been developed for the SRERP which describe the process of monitoring and management decision-making to ensure the long term viability of the project relative to the overall goals and objectives. Both physical (topography, geomorphology and hydrology) and biological (vegetation and fish) parameters will be monitored annually. Surveys of water quality parameters, channel geomorphology, riparian and wetland species success, salmonid and tidewater goby presence and abundance, salmonid habitat elements, and predator species presence will be performed post construction. The results of the monitoring will be summarized in an annual report. Additionally, Green House Gas Reduction monitoring will occur for both the SRERP and EREP projects.

Water Quality

Multiple water quality sampling will occur throughout the project area to measure parameters such as water level, dissolved oxygen (DO), temperature, pH, salinity, conductivity, total dissolved solids, and alkalinity which will play a determining role in species abundance and distribution. Tributary Monitoring - Five sites within tributaries Reas (2 sites), Francis (2 sites), and Williams (1 site) Creeks) that feed the Salt River will be sampled twice a year between May and October for dissolved oxygen (DO), temperature, pH, salinity, conductivity, total dissolved solids, and alkalinity. In- field measurements will be taken using an OAKTON, hand held, multi-parameter meter. HOBO data logging recorders will be deployed at these sites to continuously measure water temperature. Data will be recorded and will estimate water quality conditions in the watershed based on comparisons with regulatory standards and aquatic life criteria. Monitoring will occur the first, second, and third years post- construction of the Salt River Ecosystem Restoration Project. Protocols used: Storm Water Ambient Monitoring Program and standard procedures.

Water Level, Salinity, and DO Monitoring - Multi-parameter water level and salinity recorders will be used to determine seasonal changes in the tidal salinity gradient within and adjacent to the restored estuary. In order to quantify and evaluate tidal and salinity exchange up the Salt River channel, a network of 5 multi-parameter recorders (measuring water level, temperature, salinity) are proposed in the mainstem Salt River and Eel River Estuary. Four of the recorders shall be installed at the following locations: 1) immediately downstream of the confluence with the new northern tidal marsh connector channel; 2) immediately downstream of the confluence with the new southern (upstream) tidal marsh connector channel; 3) at Dillon Road Bridge; and 4) immediately downstream of the confluence of Francis Creek. In order to evaluate the tidal and salinity exchange within restored estuary/tidal marsh, the fifth multi-parameter recorder shall be located inside the restored estuary.

Turbidity Monitoring - Humboldt County Department of Public Works has established a sediment monitoring station in the form of a Turbidity Threshold Sampling Station within Francis Creek. Turbidity measurements (suspended sediment) inform the project of potential impacts to the physical habitat by sedimentation. Continued operation of this station will be required the first, second, and third years post-construction of the Salt River Ecosystem Restoration Project. Protocol used: County of Humboldt protocols.

Habitat

The SRERP includes various types of habitat restoration including habitat creation (tidal marsh and channel excavation), habitat enhancement (installation of large woody debris), and habitat restoration (tidal reconnection and creation of slough channels). To assess whether the SRERP is successful in creating and restoring stable refugia and rearing habitat for salmonids, salmonid instream habitat surveys will be conducted.

Salmonid Habitat Monitoring - Three index reaches have been previously established, two in the Salt River and one in Francis Creek (at confluence of the Salt River), and will be surveyed during low flow periods postproject to assess instream habitat. Data will be compared across years to determine if any habitat changes are occurring. Monitoring will occur the first, second, and third years post-construction. Protocol used: CDFG Salmonid Stream Habitat Restoration Manual will be used to quantify pre- and post-project habitat types.

Vegetation Monitoring - Quantitative monitoring of the Salt River restoration area will include mapping and estimating the total cover of broad community types (habitat acreage) and percent cover based on aerial or commercially available imagery. Field sampling will also be completed to verify the mapping. Average percentage cover of native trees, shrubs and herbaceous species will be estimated for all areas planted.

The presence of invasive species shall be identified and mapped during all site visits to the revegetated areas. Maintenance protocols will include methods for eradication of any invasive plant species form the project area if they should colonize during the monitoring period.

Monitoring activities to be completed as part of this task include;

- Percent Cover of Riparian Species
- Mapping Percent Cover of Wetland Species
- Riparian Habitat Acreage Mapping
- Riparian Boundary Assessment

- Rare Plant Cover Monitoring

Avian Species Monitoring - Bird count surveys will be conducted three times per year during post construction years 3 and 5 in the restoration areas using presence/absence point count techniques.

Geomorphology and Green House Gas Reduction

To further establish the stability of the restored habitat, numerous cross-sectional and longitudinal surveys will be performed. Ten site locations will be distributed along the Salt River channel to capture points in six freshwater reach sections and four in tidally influenced sections. Twelve site locations will be sited in the restored tidal marsh capturing channel slough structure. The data collected will be compared to As-Built designs to determine how the environment is impacting the physical attributes of the restoration design. These surveys will be conducted during low flow periods in the first, second, and third years post-construction. Protocol used: Salt River Ecosystem Restoration Project Adaptive Management Plan and Final EIR.

Project monitoring will also include taking a series of soil cores from representative areas throughout the project footprint and having the cores analyzed for carbon levels to determine GHG reductions.

Monitoring organic soil loss – Prior to and following restoration construction, elevation and sediment accretion will be measured to confirm that no subsidence, and thus no loss of organic soil, is occurring. The abundance of suspended sediment in the project area makes it highly unlikely that subsidence would occur. However, if soil loss is occurring, subsequent GHG emissions will be estimated following *Section 9.3.9* of the VCS protocol (Silverstrum et al. 2013).

Monitoring GHG emissions – Similar to baseline conditions, portions of the project area are assumed to not emit GHG as waters will be >18 ppt. This assumption will be confirmed following restoration construction by measuring sulfides as stated in *Section A* of this monitoring plan.

Determining start date for authochthonous carbon sequestration – Vegetation colonization will be monitored twice a year to confirm or change the start date of 5 years for quantifying carbon sequestration.

Confirming carbon sequestration values – Once vegetation has colonized, soil cores will be collected to confirm carbon sequestration rates following *Section 9.3.7* of the VCS protocol (Silverstrum et al. 2013). Soil cores will be collected above a consistent reference plane.

8. ***Literature Cited:***

Literature cited for carbon sequestration analysis is at end of Exhibit 3.