



Estero Americano Coastal Preserve Mitigation Project

Habitat Mitigation and Monitoring Plan

Sonoma County, California



Prepared for:

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List of Acronyms

Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CCA	California Coastal Act
CCC	California Coastal Commission
CDFW	California Department of Fish and Wildlife
Conservancy	The Wildlands Conservancy
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
ESHA	Environmentally Sensitive Habitat Areas
HSG	Hydrologic Soil Group
NCRRWQCB	North Coast Regional Water Quality Control Board
NOT	Notice of Termination
NWI	National Wetlands Inventory
OHWM	Ordinary High Water Mark
Preserve	Estero Americano Coastal Preserve
Project	Estero Americano Coastal Preserve Mitigation Project
RWQCB	Regional Water Quality Control Board
SR	State Route
SWPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
USGS	U.S. Geological Survey
WRA	WRA, Inc.



1.0 PROJECT INFORMATION

Title:	Estero Americano Coastal Preserve Mitigation Project
Landowner:	The Wildlands Conservancy
Contact Person name, title, email, and phone:	Landon Peppel, Resource Conservation Director landon.p@wildlandsconservancy.org (661) 747-6148 cell
Other Responsible Parties:	Caltrans, California Coastal Commission
Funding:	Caltrans
CEQA Lead Agency:	Sonoma County



2.0 PROPOSED PROJECT

2.1 Project Location

The Estero Americano Coastal Preserve Mitigation Project (Project) is located at the Estero Americano Coastal Preserve (Preserve), a 547-acre property owned by The Wildlands Conservancy, a non-profit with 22 preserves and nearly 200,000 acres under management. The Estero Americano Preserve is protected in perpetuity under a conservation easement held by the Sonoma County Agricultural Preservation and Open Space District to ensure the continuation and improvement of the conservation values at the site. Approximately 250 acres of the Preserve drain south to the Estero Americano while the remaining area drains west to the Pacific Ocean. Appendix A, Figure 1 is a vicinity map showing the location of the Preserve. Appendix A, Figure 2 shows the general Project Area. Estero Americano is a relatively undisturbed coastal tidal estuary, roughly 300-1,000 feet wide that extends four miles inland from the Pacific Ocean to the town of Valley Ford. It has a total watershed area of 49 square miles.

2.2 Project Objectives

The goal of the proposed Estero Americano mitigation project is to restore, establish, rehabilitate, and enhance riparian willow habitat and coastal wetland habitat to compensate for required off-site impacts resulting from the California Department of Transportation (Caltrans) bridge replacement project. The offsite mitigation is designed to provide equivalent or better functional values for wildlife compared to the bridge project site conditions.

The primary objective of the Project is to meet the minimum mitigation requirements determined by the regulatory agencies, although the Project also intends to create additional mitigation (credit, beyond what is needed to satisfy Caltrans's mitigation requirements) for both the Riparian Willow Habitat and Coastal Wetlands and Waters of the U.S. and State.

2.3 Project Purpose

The proposed Estero Americano Coastal Preserve Mitigation Project (Project) will provide compensatory mitigation for the loss of wetlands and riparian habitat, including impacts to state waters, resulting from the Estero Americano Creek Bridge Replacement project on State Route (SR) 1. The bridge replacement project is located in an unincorporated area on the Marin County and Sonoma County line, about 1.5 miles east of Valley Ford, in the same watershed as the Estero Americano Preserve. The Estero Americano mitigation project will provide off-site mitigation to address permanent and temporary impacts to California Department of Fish and Wildlife (CDFW), California Coastal Commission (CCC), and North Coast Regional Water Quality Control Board (NCRWQCB) jurisdictional resources resulting from the bridge replacement. The onsite mitigation work at the bridge project site will completely compensate for permanent and temporary impacts to U.S. Army Corps of Engineers (Corps) jurisdictional resources. If possible, additional mitigation areas will be created as part of the Project.

2.4 Project Need

The Preserve has been used for livestock grazing (primarily cattle) and has several residential and agricultural support buildings onsite. Historic land use practices have degraded the wetland and riparian habitats through over grazing and associated soil compaction, erosion, and non-native plant introductions. The creation of building pads, roads, and water supply infrastructure

along with other direct and indirect impacts over the decades have contributed to the degradation of habitats on site. A review of historic aerial photography of the site over the past two decades indicates that erosion and degradation accelerated substantially between 2006 and 2017.

While grazing and other land use practices have been curtailed and modernized to decrease on-going effects, natural hydrologic and geomorphic processes continue to respond to the legacy impacts, such that the swales and tributaries/drainages are unstable and have poor surface moisture holding characteristics to sustain healthy vegetation and habitats in many areas. Sediment from erosion on site is deposited in the Pacific Ocean and Estero Americano, resulting in diminished water quality during and after high flow events. Without intervention to counteract past degradation and improve geomorphic stability, erosion processes will continue and extend the length, width, and depth of erosion along the drainages on the site. Proposed corrective and protective restoration measures will provide substantial ecological uplift for the site, while meeting the mitigation needs of the Caltrans bridge replacement project.

2.5 Project Areas

The Project Area includes four discrete areas of the Preserve; identified herein as the North Tributary, the Middle Tributary, the Pond, and the South Tributary. The North and Middle tributaries and Pond areas all drain to the Pacific Ocean. The South Tributary drains to Estero Americano. The areas selected for restoration were chosen based on the current condition of each area, and the ability to enhance, restore and create additional aquatic resources. Based on review of historic aerial images, the North and South tributaries experienced rapid erosion between 2002 and 2008, then again between 2012 and 2019. The pond area appears to have experienced accelerated erosion between 2012 and 2019. Figure 2 shows the restoration areas within the preserve. Detailed descriptions of the stressors and associated degradation at each of the four discreet restoration areas are found below.

2.5.1 North Tributary

The North Tributary area is near the top of the main drainage on site that empties into the Pacific Ocean. The restoration area is upslope of the ranch road that bisects the site. Historic grazing has created a series of erosional features, mainly in the form of headcuts up to six feet deep and ten feet wide, along with narrow gullies between one and three feet deep and one to two feet wide. Groundwater expression is seen in many of the headcut areas in the form of saturated soils and ponded water, lasting through the dry season in most years. Vegetation in this area is mainly wetland and upland herbaceous species, with portions of the area mapped as jurisdictional wetland. While grazing management has changed significantly since the property was purchased by The Wildlands Conservancy (Conservancy), the effects of past degradation continue, including continued erosion of headcuts and gullies.

2.5.2 Middle Tributary

The Middle Tributary is the other westerly sloped drainage on the site that flows into the North Tributary just before it empties into the Pacific Ocean. The upper end of this tributary originates along the fault line near a persistent spring that has been developed into a large concrete box structure. Just downstream of the structure, a small area of seasonal wetland exists on a relatively flat sloped area. Downstream of this wetland, an abandoned road crossing serves to concentrate flows into a slightly to moderately eroded intermittent channel that continues



downstream to the confluence with the North Tributary. Several small areas of willow riparian habitat are found within the restoration area, although Monterey cypress (*Hesperocyparis macrocarpa*) dominates many areas along this tributary. Near the downstream end of the restoration area, a significantly eroded wetland swale enters the tributary from the north. This swale has eroded and is now between 15 and 20 feet deep and 20 to 35 feet wide with vertical sides that continue to erode and slump.

2.5.3 Pond Area

The Pond restoration area is just south of the Middle Tributary, around the margins of the persistent man-made pond on the site. The pond has a relatively stable water surface elevation. The south and eastern margins of the pond slope upward, and significant erosion of the marine terrace deposits have created large areas of bare soil that continue to deposit sediment into the pond.

2.5.4 South Tributary

The south tributary is the largest drainage on the site that drains into Estero Americano. The proposed restoration area has experienced significant erosion over the past 20 years, with some areas more than 15 feet deep and 40 feet wide. Bare soils are present throughout the area, and the drainage shows evidence of downcutting, erosion and slumping of the steep side slopes. Groundwater is expressing in the form of ponding along the tributary, which is mapped as an intermittent drainage with areas of seasonal wetland within the channel. Downstream of the restoration area and near the upstream end, willows (*Salix* spp.) have colonized the channel and are helping to minimize ongoing erosion. Despite changes to grazing, the effects of past overgrazing, including head-cutting, side slumping and downstream sedimentation are ongoing.

2.6 Site Characteristics

2.6.1 Topography and Site Hydrology

The Estero Americano Preserve is characterized by rolling grasslands, coastal bluffs, and steep riparian drainages, and is bordered to the south by the waters of the Estero Americano and to the west by the Pacific Ocean coastline. Elevations range from sea level to 610 feet.

Estero Americano terminates at the Pacific Ocean on the southern edge of the Estero Americano Preserve. Three additional drainages are found on the Estero Americano Preserve, two that drain to the west into the Pacific Ocean (North and Middle Tributaries) and one that drains to the south into the Estero Americano (South Tributary). These drainages experience erosive flows during the rainy season and lower flows in the summer as a result of hydrologic contributions from freshwater springs and seeps.

The mouth of the Estero Americano is seasonally blocked by a naturally occurring sand bar that is formed by wave action from the Pacific Ocean, commonly known as a built-bar system. The high flows in the Estero Americano during the winter months can breach the sand bar and the estuary then flows directly into the Pacific Ocean. During drought conditions, Estero Americano flows may not reach sufficient volume to breach the sandbar, resulting in enclosed fresh water estuarine conditions that persist year-round.



The man-made pond (the Pond) that historically provided freshwater to support cattle and aquaculture on the property is fed by precipitation runoff and, per anecdotal evidence, a combination of seeps and springs. Downstream of the impoundment, the pond drains into the Middle Tributary.

2.6.2 Geology

The site is underlain mainly by the Franciscan mélange formation, which consists of crushed shale, chert, greenstone, sandstone and schist. This formation is considered “weak,” and steep-sided stream valleys, erosion and landslides are common. The Estero Americano has a “drowned mouth,” an indication that downcutting occurred during the last ice age, with subsequent sea level rise creating the current condition. The San Andreas fault zone lies approximately one mile to the west of the site. In this area, the San Andreas fault is considered “locked, meaning that small and moderate earthquakes result in little movement. This area of the fault is thought to be subject to infrequent large earthquakes” (Swanson, 1977).

A detailed geology map of the site prepared by Michael S. Malone, consulting geologist, shows that most of the areas targeted for restoration are underlain by Quaternary marine terrace deposits and Franciscan bedrock described above. The mapping depicts a fault line with numerous springs and wells running along a line through the middle of the site in a north-northwest to south-southeast alignment. This correlates with observations of wetlands and seeps on the site.

2.6.3 Soils

Mapped soils of the site include Kneeland, Rohnerville, and Steinbeck loams as well as Los Osos clay loams. These soils are not considered hydric by the Soils Survey of Sonoma County, California (USDA, 1972), although hydric soils occur within the mapped units.

Kneeland loam, 15 to 30 percent slopes and Steinbeck loam, 30 to 50 percent slopes, eroded are mapped in the north tributary area. Kneeland loam is well drained (Ksat 0.2 – 1.98 inches/hour) with high runoff potential, and is in hydrologic soil group (HSG) C. The Steinbeck soils are moderately well drained (Ksat 0.2 -0.57 inches/hour), are in HSG C, and have high runoff potential.

The middle tributary and pond areas are mapped as having the aforementioned Steinbeck loam and Rohnerville loam, 9 to 15 percent slopes. The Rohnerville series is moderately well drained and in HSG C with a Ksat rate of 0.2 – 0.57 inches/hour and high runoff potential.

The south tributary is mapped with the Rohnerville loam described above and Los Osos clay loam, thin solum, 30 to 50 percent slopes. The Los Osos soils have moderate permeability (Ksat of 0.06 – 0.2 inches/hour), high runoff potential and are in HSG D.

2.6.4 Plant Communities/Species Composition

Vegetation within the Preserve is dominated by native and non-native grasses and forbs, typically associated with coastal grassland and agricultural/grazing land, coastal scrub, brackish marsh, and non-wetland riparian habitats along the Sonoma coast. The majority of the Preserve is coastal grassland/agricultural land. Vegetation communities and plant species dominance within the coastal grassland and agricultural areas presumably fluctuate due to periodic cattle

grazing. Dominant species within the coastal grassland and agricultural habitats include: velvet grass (*Holcus lanatus*), soft chess (*Bromus hordeaceus*), Italian rye grass (*Festuca perennis*), California brome (*Bromus sitchensis* var. *carinatus*), sweet vernal grass (*Anthoxanthum odoratum*), cranesbill (*Geranium dissectum*), sheep's sorrel (*Rumex acetosella*), English plantain (*Plantago lanceolata*), western blue-eyed grass (*Sisyrinchium bellum*), Douglas iris (*Iris douglasiana*), and bracken fern (*Pteridium aquilinum* var. *pubescens*).

Dominant species within coastal scrub habitats include coyote brush (*Baccharis pilularis*), coffeeberry (*Frangula californica*), coast silk tassel (*Garrya elliptica*), twinberry (*Lonicera involucrata*), sticky monkeyflower (*Diplacus aurantiacus*), ocean spray (*Holodiscus discolor*), poison oak (*Toxicodendron diversilobum*), sword fern (*Polystichum munitum*), vetch (*Vicia* spp.), and hedge nettle (*Stachys rigida*).

2.6.5 Jurisdictional Waters, Wetlands, Streambeds and Riparian Corridors

SEASONAL WETLANDS

Within the Project Area seasonal wetland are slightly concave to deeply concave depressional areas typically located in low gradient to nearly flat topography. Fifteen seasonal wetlands totaling approximately 1.99 acres are present within the Project Area. The vegetation is dominated by a mixture of native and non-native hydrophytic grasses and forbs. The dominant species include Italian ryegrass, velvet grass, annual blue grass (*Poa annua*), waxy manna grass (*Glyceria declinata*), marsh foxtail (*Alopecurus geniculatus*), common spikerush (*Eleocharis macrostachya*), common rush (*Juncus patens*), and bog rush (*Juncus effusus*).

PERENNIAL WETLANDS

Within the Project Area, perennial wetlands are composed of deeply concave hillslope seep features, or adjacent to permanent water sources. Three perennial wetlands, totaling approximately 0.36 acres, are present within the Project Area. Perennial wetlands within the Project Area are supported by a combination of natural seeps and man-altered ponds, water troughs, and wells, that either leak and/or have natural and direct (surface or subsurface) connectivity to the seep hydrology. The vegetation of these wetlands is dominated by native and non-native hydrophytic grasses and forbs. Velvet grass, common rush, common spikerush, brown headed rush (*Juncus phaeocephalus*), and meadow barley (*Hordeum brachyantherum* ssp. *brachyantherum*) are the dominant species in the perennial wetlands.

BRACKISH MARSH

One brackish marsh exists within the southernmost portion of the Project Area, where the primary intermittent stream flows into the Estero Americano. The brackish marsh habitat consists of approximately 0.40 acres within the Project Area. The vegetation within the brackish marsh is dominated by native and non-native hydrophytic grasses and forbs. Baltic rush, fat-hen (*Atriplex prostrata*), alkali heath (*Frankenia salina*), salt grass (*Distichlis spicata*) and Italian ryegrass are dominant species within the brackish marsh.

INTERMITTENT STREAM

Three intermittent streams flow through the Project Area. The three intermittent streams are linear features that have distinct indicators of ordinary high-water mark (OHWM). These features presumably flow for a portion of the year and dry out during the driest time of the year. Each

feature contains either emergent herbaceous vegetation and/or riparian vegetation (trees and shrubs) within its channel and along its banks.

EPHEMERAL STREAM

Eleven ephemeral stream features flow through the Project Area. Features in the ephemeral stream category are naturally formed, linear features that have indicators of OHWM and only convey flows during or immediately after a precipitation event otherwise they remain relatively dry. The onsite ephemeral streams are vegetated, both within their channels and along their banks.

POND

One pond occurs within the Project Area. The pond appears on the 2015 USGS 7.5-minute quadrangle map for Bodega Head and is mapped in the NWI, however it is not listed as an excavated feature, despite the feature clearly being man-altered. The pond was excavated sometime between 1952 and 1971 for agricultural and residential purposes (NETR 2021). The pond historically provided freshwater to support cattle and aquaculture on the property. The pond is fed by precipitation runoff and, per anecdotal evidence, a combination of seeps and springs. Water levels in the pond are relatively stable and can be maintained or adjusted as needed by a pump. The pond contains emergent vegetation around the perimeter, with some patches of emergent vegetation observed growing below the OHWM, where the water level had presumably dropped due to the drought.

RIPARIAN

Within the Project Area, riparian habitat occurs along the Middle and Southern Tributaries, where patches of hydrophytic shrubbery and trees are present. Riparian vegetation was dominated by arroyo willow (*Salix lasiolepis*), Sitka willow (*Salix sitchensis*), red alder (*Alnus rubra*), Pacific wax-myrtle (*Morella californica*), and blackberry/thimbleberry (*Rubus* spp.). Monterey cypress (*Hesperocyparis macrocarpa*), an upland species, is also present along the Middle Tributary.

JURISDICTIONAL DETERMINATION

On March 19, May 5, May 14, and June 4, 2021, WRA, Inc. (WRA) conducted a delineation within the Project Area to identify wetlands and non-wetland waters potentially subject to jurisdiction by the Corps under Section 404 of the Clean Water Act (CWA), and potentially subject to jurisdiction of the California State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB) as defined in the State Wetland Policy (SWRCB 2019). In addition, WRA mapped wetlands that are potentially considered Environmentally Sensitive Habitat Areas (ESHAs) subject to jurisdiction by the CCC under the California Coastal Act (CCA) within the boundaries of a proposed restoration and enhancement within the Estero Americano Preserve property.

2.6.6 Critical Habitat

The Estero Americano Preserve is adjacent to critical habitat for the federally endangered yellow larkspur (*Delphinium luteum*) to the north, and the federally threatened California red-legged frog (*Rana draytonii*) to the south. The Estero Americano that flows along the southern property line is critical habitat for federally threatened Central California Coast steelhead (*Oncorhynchus mykiss*).



3.0 MITIGATION DESIGN

3.1 Mitigation Summary

The Project proposes to accomplish its goals through a combination of initial construction/ implementation activities and long-term management measures. Implementation activities will focus on restoring habitat function by repairing past damage caused by overgrazing and ensuring that ongoing ranching and site-specific recreational activities are consistent with the habitat restoration goals of the Project. The main implementation aspects of the project are defined below.

3.1.1 Earthwork

- Grading of eroded channel banks and bed to restore stable geomorphology to eroded channels.
- Grading of rills and erosional features to restore and reconnect wetland hydrology.
- Grading along the margins of the existing pond to optimize water inundation and depths for wetland establishment.

3.1.2 Channel and Wetland Stabilization

- Installing live willow stakes to provide root mass and associated long term stability.
- Creating live willow trenches and/or brush mattresses to arrest erosion between wetland areas.

3.1.3 Invasive Species Removals

- Removing Cypress trees.
- Treating plants with a California Invasive Plant Council (Cal-IPC) ranking of high or red alert species within and adjacent to restoration areas.

3.1.4 Native Species Re-vegetation

- Seeding disturbed areas with native riparian, wetland, and upland seed.
- Installing live willow stakes harvested on site.
- Installing live herbaceous wetland species plugs.

3.1.5 Exclusion Fencing

- Installing wildlife-friendly livestock exclusion fencing around habitat restoration areas.
- Installing gates to allow for flash grazing or other livestock management techniques within restoration areas on a case-by-case basis.

3.2 Mitigation Details

Restoration means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource areas, restoration is divided into two categories: re-establishment and rehabilitation.

Re-establishment means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-



establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function but does not result in a gain in aquatic resource area.

Establishment (creation) means the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions.

Enhancement means the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s) but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

The resource agencies assign different weighed value to the various treatments, and each has a mitigation ratio,¹ as follows:

- Re-establishment = 1:1 mitigation
- Rehabilitation = 2:1 (2 acres of rehabilitation is the equivalent of 1 acre of establishment)
- Enhancement = 4:1 (4 acres of enhancement is the equivalent of 1 acre of establishment)

3.2.1 Proposed Riparian Willow Habitat

The offsite compensatory mitigation requirement for riparian willow habitat that was previously established by agency partners was a minimum of 1.87 acres of establishment, combined with 1.32 acres of enhancement, for a total of 3.19 acres. **The new total riparian willow habitat requirement that was agreed upon by agency partners was 2.2 acres, taking the mitigation ratios into consideration (Error! Reference source not found.).**

Table 1. Proposed Riparian Willow Habitat

	RE-ESTABLISHMENT (ACRES)	REHABILITATION (ACRES)	ENHANCEMENT (ACRES)	TOTAL (ACRES)
Minimum to meet CDFW and CCC Requirements	1.87		1.32	3.19
To be implemented	1.97	0.10	1.55	3.62
	1:1 ratio	2:1 ratio	4:1 ratio	=2.41
<i>Exceeds 2.2 acres of riparian willow habitat requirement</i>				

1. The riparian willow habitat restoration areas will be replanted with a plant palette based on reference areas within the Preserve in similar landscape positions. The live willow

¹ These definitions and mitigation ratios are not based on CCC practice.

poles will be collected onsite adjacent to the restoration areas. All Riparian Willow Habitat areas will be protected from grazing with livestock exclusion fencing. The riparian mitigation at the Estero Americano Preserve will take place at four locations, as described below.

2. Northern Tributary. This drainage will be restored and enhanced, and 0.05 acre of willow riparian will be planted along this drainage (willow re-establishment). Approximately 0.02 acre of stream channel rehabilitation (willow riparian rehabilitation) is proposed along the northern tributary where the channel will be graded to reduce side slope and bed erosion and intercept shallow groundwater and seeps.
3. Middle Tributary. At least 0.78 acre of willow riparian habitat will be re-established, and 0.59 acre of willow riparian habitat will be enhanced. Channel areas that are completely denuded will receive extensive willow planting, and areas with some willow and other native vegetation will receive additional willow plantings. Some of the cypress trees growing along the channel will be removed, and those areas will be replanted with willows. Several of the larger cypress trees will remain to provide nesting habitat. The drainage will be further enhanced by removing invasive plant species, concrete rubble, bathtub, trough, and the exposed portion of the culvert within the channel, to improve habitat values. Approximately 0.01 acre of stream channel rehabilitation (willow riparian rehabilitation) is proposed along the middle tributary where the channel will be graded to reduce side slope and bed erosion and intercept shallow groundwater and seeps.
4. Southern Tributary. A total of 0.90 acre of riparian willow habitat will be re-established and 0.96 acres riparian willow habitat will be enhanced along the upper portions of this drainage. Approximately 257 feet and 0.07 acre of stream channel rehabilitation (willow riparian rehabilitation) is proposed along the southern tributary where the channel will be graded to reduce side slope and bed erosion and intercept shallow groundwater and seeps. Newly graded channel areas will receive extensive willow planting, and areas with some existing willows and native vegetation will receive additional willow plantings.
5. Pond Area. Locally sourced willow cuttings will be installed along the western edge of the pond and around the proposed wetland area to establish 0.24 acre of riparian habitat and stabilize the bank of the pond.

3.2.2 Proposed Coastal Wetlands Establishment, Rehabilitation and Enhancement

Working collaboratively, Caltrans, CCC, and the Conservancy identified areas suitable for coastal wetlands establishment and enhancement. Because CCC accounts for areas of enhancement, rehabilitation, and establishment at different habitat replacement ratios for compensatory mitigation, the agreeable compensatory mitigation work for coastal wetlands was initially determined to be a minimum of 0.76 acre of establishment combined with 0.12 acre of rehabilitation and 2.64 acres of enhancement, for a total of 3.52 acres. The requirements were subsequently revised to include a greater amount of wetland establishment and rehabilitation, with no wetland enhancement currently proposed. **The new total coastal wetland habitat requirement that was agreed upon by agency partners was 0.95 acre, taking the mitigation ratios into consideration (Table 2).**



Table 2. Proposed Coastal Wetlands and Waters of the State

	ESTABLISHMENT (ACRES)	REHABILITATION (ACRES)	ENHANCEMENT (ACRES)	TOTAL (ACRES)
Minimum to meet NCRWQCB and CCC Requirements	0.76	0.122	2.64	3.52
To be implemented	0.97	0.61	0.35	1.90
	1:1 ratio	2:1 ratio	4:1 ratio	=1.36
<i>Satisfies 0.95-acre coastal wetland mitigation requirement.</i>				

The coastal wetland restoration areas will be replanted with a plant palette based on reference areas within the Preserve. The result will be a mix of native vegetation and naturalized wetland species that are present across the Preserve. All coastal wetland areas will be protected from grazing with livestock exclusion fencing.

The coastal wetlands and waters of the State compensatory mitigation at the Estero Americano Preserve will take place at four locations:

1. Northern Tributary. Approximately 0.15 acre of wetland will be re-established, and 0.07 acre of wetland will be rehabilitated by removing erosional areas and grading to intercept shallow groundwater.
2. Middle Tributary. Two wetland areas totaling 0.13 acres will be established near the upper reaches of the Middle Tributary. The areas will be graded to tie into existing surface hydrology, seeps, and shallow subsurface hydrology. Approximately 0.24 acre of wetland will be enhanced, and 0.02 acre of wetland rehabilitation is proposed along the middle tributary.
3. Southern Tributary. Approximately 0.08 acre of wetland will be enhanced along the southern tributary.
4. Pond Area. The southern edge of the pond will be re-graded to provide a terrace to facilitate the establishment of at least 0.69 acre of coastal wetland and rehabilitation of 0.52 acre of coastal wetland, which includes 0.40 acre of wetland rehabilitation is proposed in a remnant pond feature located upslope of the existing pond by increasing the capacity of the depression. Approximately 0.03 acre of wetland will be enhanced at the pond.

3.3 Functional Outcomes

The off-site mitigation requirements for the Caltrans bridge replacement project will be met by establishment and rehabilitation of willow riparian habitat and establishment and rehabilitation of coastal wetlands and waters of the State within the Preserve. The hydrologic and geomorphic conditions and processes will be improved, such that long-term erosion and sedimentation will be reduced. The following subsections describe the process used to identify appropriate restoration targets and reference sites.

Target habitat types for restoration were determined based on reference areas within the Preserve. This mitigation project aims to restore appropriate native vegetation within the four mitigation areas using conditions observed at reference sites on the Preserve as a model or goal for restoration.

Reference sites were used to refine initial plant palettes for the restoration areas based on plant composition found in high-quality stands of the habitats targeted for each planting area. Reference sites were also used to develop baseline metrics of native plant diversity and cover for assessment of performance standards during the monitoring period. If extenuating circumstances prevail during the monitoring period (e.g., extended drought, fire, etc.), the reference sites may be re-surveyed to provide a revised baseline for assessing performance standards.

Reference plots with high cover of willow riparian species were assessed in the lower section of the Southern and Middle Tributaries. Plots were located at the upper edge of the riparian margin to reflect conditions expected within the restored stream channels. Wetland vegetation composition reflected local hydrologic conditions where groundwater is expressed near or at the soil surface; these same conditions are expected in the restored stream channels.

Three potential reference sites, or plots, were identified within representative stands of the target vegetation types (riparian and wetland). Vegetation at each reference site was characterized by stratum (herbs, shrubs, trees) to develop a representative community plant palette for each target vegetation type. Within each plot, biologists documented all species present and visually assessed the cover of each species. WRA calculated a range of cover values by stratum (tree/shrub and herb) including absolute plant cover (natives and non-natives), absolute and relative native plant cover, and absolute cover of invasive species. WRA then averaged these values across the three reference plots sampled for each community to establish the baseline values against which the restoration area will be assessed. Reference sites surveyed for each targeted community are shown on Figure 3. In addition to observations of native plant species from each reference plot, WRA biologists also compiled a list of all native plant species observed within the Preserve. Using the list of native plant species observed at the reference sites and elsewhere on the Preserve, WRA developed the plant palettes below.

Table 3. Plant Palette for Riparian Planting Area

SCIENTIFIC NAME	COMMON NAME	SOURCE	PERCENT COVER TARGET	SPACING
Shrubs and Trees				
<i>Rubus ursinus</i>	California blackberry	Cuttings to plug	5%	6-foot on-center
<i>Rubus spectabilis</i>	Salmonberry	Cuttings to plug	5%	6-foot on-center
<i>Equisetum arvense</i>	Common horsetail	Field Division to plug	2%	6-foot on-center
<i>Polystichum munitum</i>	Sword Fern	Field Division to plug	3%	7-foot on-center
<i>Rosa californica</i>	California rose	Seed to plug	10%	10-foot on-center
<i>Salix lasiolepis</i>	Arroyo willow	Pole cuttings	25%	10-foot on center
<i>Salix sitchensis</i>	Sitka Willow	Pole cuttings	50%	10-foot on center

Table 4. Plant Palette for Wetland Planting Area¹

SCIENTIFIC NAME	COMMON NAME	SOURCE	PLS LBS PER ACRE/SPACING
Herbs			
<i>Juncus balticus ssp. ater</i>	Baltic rush	Field Division to plug	5-foot on-center
<i>Juncus phaeocephalus</i>	Brown headed rush	Field Division to plug	5-foot on-center
<i>Juncus effusus ssp. pacificus</i>	Pacific rush	Seed or plugs	.5 lbs./acre
<i>Juncus patens</i>	Spreading rush	Seed or plugs	.5 lbs./acre
<i>Deschampsia cespitosa ssp. holciformis</i>	Coastal tufted hair grass	Seed	6 lbs./acre
<i>Danthonia californica</i>	California oatgrass	Seed	6 lbs./acre
<i>Hordeum brachyantherum</i>	Meadow barley	Seed	12.5 lbs./acre

¹ Initial plant palettes may be refined in consideration of the availability of propagules onsite and the availability of certain species.

3.4 Ancillary Project Objectives

The proposed restoration work is expected to have ancillary benefits for species of special concern on the site and in Estero Americano. The work will stabilize banks to minimize erosion and restore and improve both riparian and wetland habitats. The ranch has developed a capacity-based grazing management plan that will improve livestock practices and reduce impacts to waterways. Long-term objectives for the site include providing limited passive recreation for the general public and ongoing ranching activities. Mitigation credits may be generated for special-status species as described below. Ratios will be negotiated as appropriate.

The restoration of wetland areas is expected to provide benefits to a range of species, including the federally threatened California red-legged frog. Restored and improved wetland and riparian areas will provide breeding, foraging and resting habitat areas. Livestock fencing proposed around the restoration areas will minimize conflict with livestock and create safe migration corridors between habitat types for a range of species.

The restoration of the South Tributary is expected to greatly diminish the amount of fine-grained sediment being delivered to Estero Americano. Studies show that fine-grained, or suspended, sediment effects swimming ability and feeding patterns of juvenile salmonids, and potentially effects navigation of adults (Wilber & Clarke, 2011). Removal of sediment sources is therefore anticipated to improve conditions for federally threatened Central California Coast steelhead in Estero Americano.

3.5 Implementation Elements

3.5.1 Design Features

NORTH TRIBUTARY

Work in the North Tributary will focus on removing erosional features that have caused a series of headcuts and deep, narrow gullies that appear to have lowered the water table, resulting in degradation of habitat and downstream sedimentation. The area will be graded to create a naturalistic swale that will allow overland and shallow subsurface flow to slowly move through the area, intercepting groundwater for an improved hydrograph. The slope of the restored swale feature will vary, and in steeper locations willow trenches and live willow stakes will be installed to attenuate flow, minimize erosion, and create diversity of habitat. Topsoil will be harvested and stockpiled for later re-use within this restored area. Native grasses and juncus bunches will be salvaged for replanting along the restored swale. Other areas will be planted with plugs of native seasonal wetland plants to restore a continuous wetland community. All areas will be seeded with a native wetland seed mix.

Error! Reference source not found.A below shows a typical wetland section for the restored area in the North Tributary.

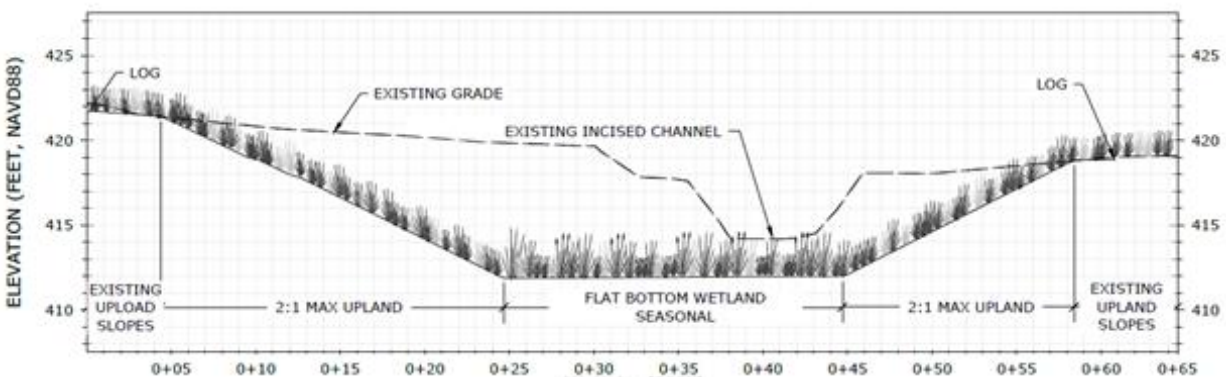


Figure A. Typical North Tributary Wetland Section

MIDDLE TRIBUTARY

The Middle Tributary will receive a range of implementation actions. The upslope end of the drainage is crossed by the apparent fault line that intercepts seeps and springs. Just upslope of the restoration areas, a spring has been developed/contained with a concrete box that holds perennial water. The spring box will be retained as is, with the tank and pump removed. The area immediately downstream has perennial flow through a broad diffuse wetland/stream area that has been degraded by cattle hoof shear and grazing. The wetland area immediately below the spring box that is dominated by *Juncus* will be preserved. Two shallow sloped seasonal wetland areas will be created adjacent to this area, with hydrology supplied by grading that will intercept shallow groundwater near the surface. Topsoil will be harvested and stockpiled for later re-use within this restored area. Native *Juncus* bunches will be salvaged for replanting within the created wetlands. **Error! Reference source not found.**B shows a typical section of the wetland restoration in the Middle Tributary.

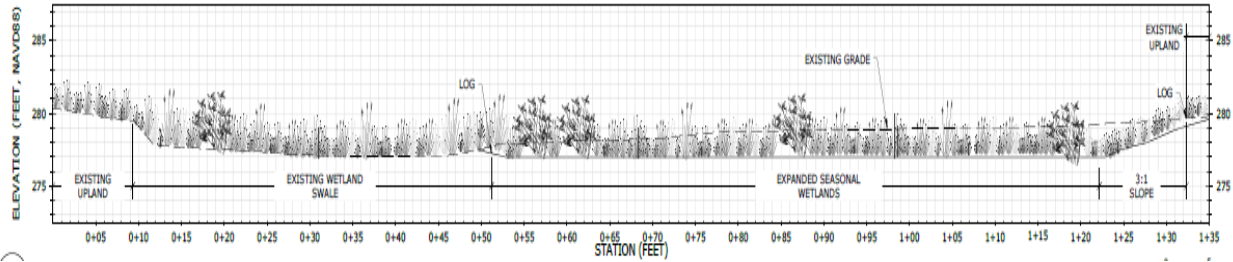


Figure B. Typical Middle Tributary Wetland Grading Section

Downstream of the wetland restoration area, the tributary’s riparian vegetation is dominated by Monterey cypress, which precludes the development of a diverse riparian habitat. All but the largest trees will be removed, with stumps left intact for bank stability and to minimize disturbance to the watercourse. Several larger trees that potentially serve as habitat for raptors will remain, with the lower limbs removed. All areas where cypress trees are removed will be revegetated with live willow stakes along the lower banks to create a dense mass of willow riparian habitat. All disturbed areas will be seeded with native riparian seed.

At the downstream end of the Middle Tributary work area, a severely eroded side drainage converges with the main drainage. The bottom and lower bank slopes will be planted with live willow stakes to arrest erosion and restore habitat. At the upslope end, an abrupt headcut will be stabilized using branch packing to reduce erosive forces and allow for sediment to accumulate. All disturbed areas will be seeded with native riparian seed mix.

POND AREA

The pond edge will be expanded to create a wide wetland fringe. Grading of the deep marine deposits will create a wide bench and excess spoils will be used to convert a portion of the open water habitat to expand the emergent wetland area to provide cover for California red-legged frog and enhance the breeding habitat. Micro depressions will be graded to provide habitat diversity. All wetland areas will be planted with native freshwater marsh plugs and will also be seeded with herbaceous freshwater marsh species. The hydrology in this area is derived from seeps and shallow groundwater and is set by the outlet elevation of the pond allowing for a continuous source of wetland hydrology in all but extreme drought conditions. A shallow depression is located immediately upslope from the pond. This area will be deepened and planted with a wetland palette to provide enhanced habitat for California red-legged frog.

Just upslope of the created wetlands, a fringe of willow riparian habitat will be installed using live willow stakes. The willow plantings will continue around the west side of the pond at variable planting densities to account for several bedrock outcrops, with the goal of creating a continuous band of willow riparian habitat around the upslope areas of the pond. Due to dam stability concerns, the embankment will be allowed to remain in its current state. Figure C below for a typical grading section in the Pond Area.

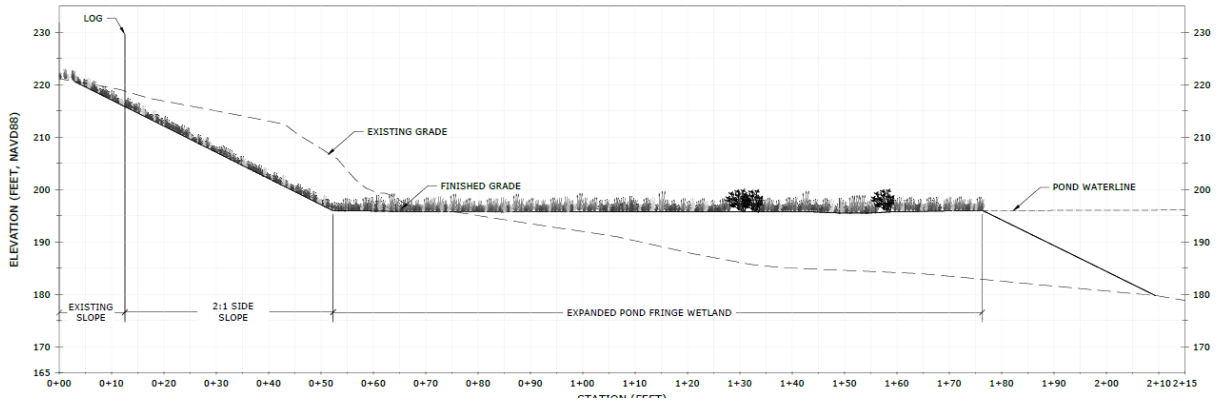


Figure C. Typical Pond Area Wetland Section

SOUTH TRIBUTARY

The South Tributary has experienced rapid erosion over the past 20 years, causing a deep gully to form that has resulted in high sediment delivery to Estero Americano and the loss of vehicular access to the Estero. Restoration actions will include regrading of side slopes and widening the bottom of the feature to minimize erosion and intercept shallow ground water and seeps. Side slopes will only be graded where necessary to create a flat-bottomed swale to support willow riparian plantings. Where possible, a wider bottom area will be created to allow for more willow riparian habitat development. Brush mattresses will be installed on the side slopes to further stabilize the slopes and provide scaffolding for willow riparian establishment. Brush mattresses will also be installed in the incised gully within the lower reach of the Southern Tributary to stabilize this channel and allow willow riparian to become established along this section of the channel. Additional riparian plantings are proposed within this lower section of the Southern Tributary.

Topsoil will be stockpiled for later re-use within the restored tributary. Willows and wetland vegetation will be salvaged where possible for replanting within the channel. The bottoms and all graded slopes will be seeded with wetland species and planted with live native willow stakes to create a continuous, dense riparian corridor. Figure D below shows a typical section of the South Tributary.

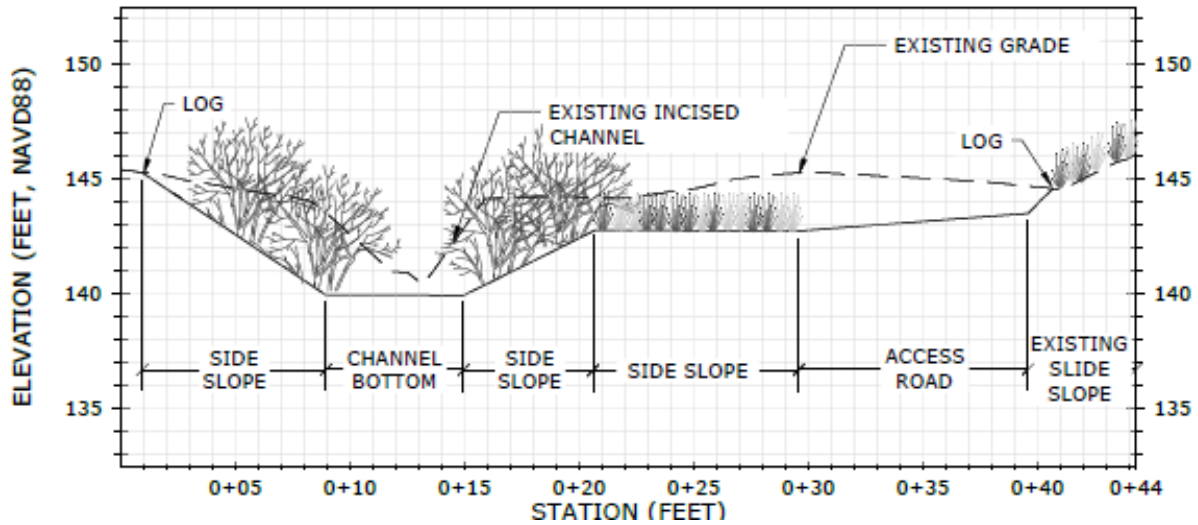


Figure D. Typical South Tributary Restoration

3.6 Construction Activities

The project will be implemented during one construction season (April 15 through October 15), with adjustments made to avoid impacts to special-status species and nesting birds. A full list of regulatory permit requirements and conditions will be made available to the contractor, and the Conservancy will ensure that all work is completed in accordance with the regulatory approvals for the project. Work within the four distinct project areas may occur in sequence or in conjunction with all or some of the other areas. A general description of construction activities is outlined in the sections below.

3.6.1 Invasive Species and Pathogen Control

All equipment and materials entering the site will be cleaned and disinfected prior to entry. Equipment will be cleaned with power washing methods to remove all dirt and seed. Hand and power tools will be disinfected by washing thoroughly and treating with a disinfectant solution. All plant materials and seed will be grown and produced at a facility that employs strict pathogen deterrent practices.

3.6.2 Site Access

The site will be accessed via Estero Lane, the existing main access road from Highway 1 (Shoreline Highway). The road will be maintained both on and offsite during construction to ensure that construction activities do not impact downslope areas. Ongoing maintenance activities during construction will include dust suppression, periodic regrading, and straw wattles or silt fence for sediment control. If deemed necessary by the Conservancy, stabilized rock or shaker plate construction entrances will be installed at access areas for the specific work locations to minimize buildup of fine sediments on the site roadways.

3.6.3 Erosion and Sediment Control

Control of erosion and sediment on the site will be governed by a Stormwater Pollution Prevention Plan (SWPPP) prepared by the contractor. Measures will include both during and post construction actions. During construction, measures will include, but not be limited to,

installation of straw wattles, silt fence, dust suppression, tarping of temporary stockpiles, and installation of temporary dewatering facilities. After construction has been completed, all slopes greater than 2:1 will be covered with coir fabric staked at three feet on center with triangular wooden stakes to minimize direct rainfall erosion and shallow rill erosion. All erosion and sediment control measures will remain in place until at least 75 percent of the disturbed areas have been revegetated.

3.6.4 Equipment Maintenance and Storage

All equipment used on site will be maintained in good working order. Any leaks will be repaired immediately, and if on-site repairs are not possible the equipment will be removed from the site immediately. Equipment will be stored in designated staging areas when not in use, with drip pans placed underneath. Staging areas will be surrounded with silt fence, and daily inspections will be completed on perimeter fencing and equipment. Equipment will be thoroughly cleaned prior to leaving the site.

3.6.5 Materials Handling and Storage

All materials used on site, including but not limited to silt fence, straw wattles, seed, plants, and soil stabilization fabric will be stored in designated staging/stockpile locations when not in use.

3.6.6 Wildlife Protection

Wildlife on the site will be protected throughout construction. Prior to commencing work during the nesting bird season (generally March through August), a preconstruction nesting bird survey will be completed for all work areas at least 72 hours before the start of work. If nests are found, a buffer will be flagged around the nest, within which no activities will be permitted until the nest is no longer occupied.

Special-status species, including California red-legged frog, will be protected during all phases of work. Protection measures may include installation of a wildlife exclusion fence or oversight of construction activities by an approved wildlife biologist. If any special-status species are found, a qualified wildlife biologist will relocate them to a designated safe location.

3.6.7 Work within Watercourses and Wetlands

When working within channels on the site, the contractor will ensure that all work is completed in dry conditions. Stream diversion or pump-around practices may be employed, and any turbid water that accumulates in work areas will be filtered prior to re-entry into the waterway or wetland. All work areas that contain water will be surveyed for amphibians prior to dewatering. If any special-status species are found, a qualified wildlife biologist will relocate them to a designated safe location.

In addition, the Project will require the partial dewatering of the Pond on the Estero Americano Coastal Preserve to assure soils around the edges of the pond are dry enough and suitable for grading to expand the wetland bench and rehabilitate riparian habitat along the pond's edge. The Dewatering Plan for the Project, that includes a temporary pump system to divert water out of the pond, which will then be released to an upland area adjacent to the pond.

Prior to and during dewatering, the following measures will be taken to minimize adverse impacts to fish and wildlife and to reduce erosion:



1. A qualified biologist will survey the dewatering site and will relocate any wildlife (or their eggs) in the vicinity of the pump or at risk of being stranded in the dewatered pond to suitable habitat.
 - a. Aquatic wildlife to be relocated will be temporarily held in buckets and/or coolers with water temperatures comparable to the source water. Buckets/coolers will be shaded from the sun and covered to minimize escape but allow for air flow.
 - b. Biologists will minimize the time all wildlife are held and will monitor the temperature in the buckets/coolers to assure they do not exceed appropriate air or water temperatures for the species and life stage being held.
 - c. Prior to releasing aquatic wildlife, the biologist will normalize the water in the bucket/cooler to the receiving water temperature.
 - d. Mobile wildlife that are not in danger of being impinged by the pumps or stranded in the pond (e.g., adult frogs or turtles) will be allowed to move out of the Project Area by their own volition, if feasible.
2. Wildlife protection screens will be installed on pumps to minimize the potential to entrap or impinge aquatic species and will conform to regulatory guidelines.
 - a. The contractor will monitor screens throughout the process and maintain them as needed.
 - b. Screen size will be no larger than 5 mm.
3. Temporary pumps will be relocated as necessary through the process depending on the bathymetry of the pond, available materials etc. Each time the pump is relocated a biologist will inspect the area to capture and relocate any wildlife in the vicinity and will inspect pump screening prior to reinitiating pumping.
4. Water will be discharged into adjacent uplands and allowed to infiltrate and will not be discharged into downstream receiving waters.
5. Water discharged to uplands will use appropriate dissipating devices or be placed over suitable upland features. If necessary, an energy dissipation device may be added or constructed. Such a device may consist of one or more of the following: filter sock, perforated pipe, gravel bags, filter fabric (non-woven geotextile), hay bales, silt fence or wattles.
6. Any temporary materials used for dissipation shall not contain monofilament netting and all materials will be removed at the conclusion of the Project.
7. Prior to any work at the site, and following the completion of all work associated with fish removal, any equipment used to collect fish or amphibians (e.g. waders, seines, nets etc.) will be cleaned to remove any soil or vegetation buildup. Equipment will then be sanitized using freezing, or a solution of quartary ammonia or bleach.

3.6.8 Pre-Project Nursery/Plant Material Collection

Seed will be collected from areas of the site for use in revegetation efforts. If necessary, seed bulking will be employed to produce the required quantity of seed required for the project. The Conservancy may also propagate plants from onsite areas for use in replanting wetland restoration areas. Areas proposed for disturbance will be targeted first. *Juncus* and willows will be opportunistically salvaged prior to onsite restoration activities. In areas not proposed for impacts during construction, less than 25 percent of any single species and 25 percent of the entire vegetation community will be harvested from any area. Plants will be grown in a commercial nursery or onsite using strict anti-pathogen measures to prevent the spread of phytosphthora and other pests.



3.6.9 Invasive Species Management

Prior to starting construction activities, all invasive species will be treated within the limits of disturbance of the project areas. Treatments will include mechanical removal and herbicide applications, as allowed outside drainages and wetlands. Treatments will occur at least 30 days before the start of construction within each area.

3.6.10 Site Preparation

Site preparation will include installation of fencing or flagging to demarcate all work areas and access routes, clearing, and grubbing of work areas, and installing preliminary erosion and sediment control measures. Access roads will be graded as necessary to facilitate ingress and egress to work areas. Staging and stockpile areas will be located outside of sensitive habitat and waters of the U.S. and State, and appropriate perimeter controls will be installed.

3.6.11 Tree Removals

Tree removal work will be confined to the Middle Tributary, where Monterey cypress will be removed to facilitate restoration of willow riparian habitat. Trees will be removed using chainsaws, with stumps remaining to reduce the risk of channel instability. Removed material will be transported to disposal areas using backhoes or dump trucks. Small branches may be chipped and removed from the site. Some of the materials may be used to stabilize the headcut on the side channel at the lower end of the Middle Tributary.

3.6.12 Topsoil Removal and Stockpiling

Areas within the limit of grade will be stripped of the top eight inches of topsoil prior to beginning work. If topsoil depths are found to be deeper than eight inches, the restoration specialist may ask the contractor to excavate to the bottom of the topsoil layer. Topsoil will be temporarily stockpiled adjacent to work areas. If stockpiles are expected to be left in place for long periods, appropriate stabilization measures will be employed to minimize dust and/or erosion.

3.6.13 Grading

Grading will be completed using a variety of equipment, due to the varied nature of the topography and proposed work. In the North and Middle Tributary and Pond wetland areas, it is expected that work will be completed using excavators, dozers, skid loaders, motor graders, loaders, sheep's foot rollers and/or scrapers. Articulated trucks or tandem axle dump trucks may be used to transport soil to permanent stockpile locations.

The grading work on the South Tributary will consist of re-grading the drainage, which will be best facilitated using excavators, small dozers, skid loaders, loaders, sheep's-foot rollers and backhoes. Articulated track trucks and/or tandem trucks will be used to remove soil to permanent stockpile locations.

Areas of fill will be compacted to at least 85 percent maximum dry density. After compaction is completed, and before topsoil is placed, the subgrade will be scarified to a depth of four inches to minimize stratification of the topsoil layer.



3.6.14 Topsoil Placement

Salvaged topsoil will be replaced in all graded areas to a depth of at least four inches. Topsoil will be compacted to a minimum of 85 percent maximum dry density and scarified to a depth of three inches using a disc to maximize seed to soil contact. Any large areas of organic or other matter in topsoil will be removed during the process.

3.6.15 Structure Installation

The use of structures will be limited on the project. At this time, the only structures planned are willow revetments in the steeper sections of the North Tributary. Each one will be installed by first excavating a trench approximately two feet wide and two feet deep perpendicular to the flow line across the entire bottom area after final grading has been completed. Willow branches will then be placed into the trenches with bottom ends down and tops extending up between six inches and two feet above final grade. Interstitial voids will be backfilled with topsoil and compacted with hand tools.

3.6.16 Seeding

Seeding will be completed using seed gathered on site, bulked seed gathered on site, or commercially available seed collected from within the local area. Seeding will be completed after topsoil placement using a hydroseeder, seed drill, or by hand broadcast and raking. If hydroseed is used, mulch and tackifier will be mixed with the seed to maximize germination potential. In areas that are hand broadcast, weed free straw will be applied over the seed at a rate of one bale per 100 square feet, and crimped using shovels, rolling crimpers or hoedads.

3.6.17 Planting

Plant material used in the restoration will come from the Preserve or local, native stock as described above. If it is not possible to collect sufficient stock on site, additional plants may come from a coastal region as close as possible to the Preserve, or a local nursery (not cultivars).

Live willow poles used for revegetating the streambanks and riparian areas should be harvested onsite and planted within three days of harvest. Poles should be at least 48 inches long and minimum one inch in diameter. All side branches should be removed, and poles should be planted with the larger end in the soil, with at least 75 percent of the pole length installed below ground. Willow pole cuttings will be collected from riparian corridors in the Preserve to help ensure genetic variation in stock. A maximum of 25 percent of the total willow plant mass will be collected from any individual plant.

All container plants and plugs shall be planted by hand using hand tools or using a mechanical auger, where appropriate. Live willow poles will be planted using a deadblow hammer (sand-filled mallet) or hand auger. Backfill shall be compacted until firm, to avoid leaving air pockets within the root zone. No fertilizer or soil amendments shall be used during planting.

3.6.18 Irrigation

The goal of irrigation is to develop a robust and self-sustaining community with deep-rooted plants that are resilient enough to withstand the long, dry summers common in the region. This will be accomplished through regular, deep watering separated by days or weeks (depending on weather and evapotranspiration rates) to encourage deep rooting. Irrigation frequency will be

guided by weather conditions and if the restoration areas are meeting the performance standards. General guidelines are:

Years 1-2: Irrigate planting locations twice per month during the dry season (typically late March through October) and as needed during the wet season, if ambient temperatures exceed 24°C. Watering may be reduced to every 3 to 4 weeks depending on vegetation health with the objective of using long, deep watering to promote deep root establishment.

Year 3: Irrigate planting locations once per month during the dry season and as needed during the wet season, if ambient temperatures exceed 24°F. Watering may be reduced to monthly depending on vegetation health with the objective of using long, deep watering to promote deep root establishment.

Due to practical constraints related to staffing and the remoteness of the area, all irrigation activities will occur during daylight hours.

The Restoration Specialist will recommend any adaptive management actions, including alterations to the irrigation schedule to assure performance standards are met. Irrigation will be discontinued as soon as possible, as determined by the Restoration Specialist.

3.6.19 Erosion Control

After final grading has been completed, final erosion and sediment control measures will be installed prior to the first rainfall event. Erosion control measures will include but not be limited to silt fence, straw wattles, and coir fiber erosion control matting. Erosion controls will remain in place until the SWPPP Notice of Termination (NOT) has been submitted and accepted. All non-biodegradable measures will be removed immediately after acceptance of the NOT. Biodegradable measures may remain in place indefinitely.

4.0 PERFORMANCE STANDARDS AND MONITORING

4.1 Performance Standards

Performance standards have been developed based on the site-specific expected trajectories of each restoration area toward self-sustaining communities similar in composition and structure to nearby, reference sites in similar landscape positions. The performance standards are intended to document increasing levels of native cover and decreasing cover of highly invasive species.

The performance standards for the Willow Riparian Planting Areas are aimed at developing a self-sustaining riparian community similar to that of nearby reference sites. These standards are also aimed at the creation of stable channels without significant erosion or other failures.



Table 5. Performance Standards for Willow Riparian Planting Areas

CRITERION	PERFORMANCE STANDARDS		
	YEAR 1 (AFTER PLANTING)	YEAR 3	YEAR 5
Native Tree and Shrub Cover¹	50% of relative native cover of reference site	75% of relative native cover of reference site	90% of the relative native cover of reference site
Species Diversity of Tree and Shrubs (target species richness)	20% relative to species diversity at reference site	40% relative to species diversity at reference site	80% relative to species diversity at reference site (target species richness = 4)
Invasive Plant Cover across all strata²	≤40% absolute cover	≤20% absolute cover	≤5% absolute cover of Cal-IPC “high” or “moderate” species
Channel Stability	No major erosion will be present	No major erosion will be present	No major erosion or sedimentation will be present

¹ Including any natural recruits.
² Does not include non-native grasses, or other species such as *Hypochaeris radicata*.

Table 6. Performance Standards for Coastal Wetland Re-establishment Areas

CRITERION	PERFORMANCE STANDARDS		
	YEAR 1 (AFTER PLANTING)	YEAR 3	YEAR 5
Wetland Species Cover¹	25% of the reference site absolute cover by wetland species	50% of the reference site absolute cover by wetland species	90% of the reference site absolute cover by wetland species
Percent Native Cover	20% of the native cover of the reference site	50% of the native cover of the reference site	90% of the native cover of the reference site
Species Diversity (target species richness)	20% of the reference site species diversity	40% of the reference site species diversity	80% of the reference site species diversity (target species richness = 6)
Invasive Plant Cover²	≤40% absolute cover	≤25% absolute cover	≤5% absolute cover of Cal-IPC “high” or “moderate” species

¹ Wetland species (FAC, FACW or OBL)
² Does not include non-native grasses, or other species such as *Hypochaeris radicata*.

4.2 Monitoring Methods

4.2.1 Hydrology Monitoring

The Restoration Specialist will survey the restored and rehabilitated stream channels for erosion or other failures. If incision/erosion is identified in the restored channels, it will be repaired prior to the commencement of winter rains.

4.2.2 Vegetation Monitoring

Annual monitoring will occur in each of the planting areas to document plant establishment and success in meeting performance standards. Monitoring shall occur in June, when plants have put

on most of their annual growth and are most identifiable. During each monitoring event, a biologist shall document conditions in each restoration area following the methods outlined below.

During the first year of monitoring, semi-random monitoring plots will be located within each restoration area; once established, the plots will be permanent, and data will be collected from those locations in each subsequent monitoring event. The goal of using permanent plots is to provide consistency in monitoring and ensure adequate coverage of the planting areas.

Biologists shall establish a minimum of five 20-foot x 10-foot rectangular plots (200 square feet per plot, 1,000 square feet total) within the Willow Riparian Planting Areas along the restored channels, and the biologists shall establish a minimum of five 15-foot radius circular plots (706 square feet per plot, 3,530 square feet total) within the Coastal Wetland Establishment and Rehabilitation Areas. Within each plot, biologists will use visual estimates to determine the cover of each species within the planting areas. These data will be analyzed to determine (1) total plant cover, (2) total native plant cover, (3) native species diversity (i.e., species richness), and (4) the relative cover of invasive weeds. These data will be used to assess progress toward performance standards.

4.2.3 Photo-Documentation

Permanent photo points will be established from which photographs will be taken during monitoring visits to compare site conditions through time. Photo points will be established following implementation of restoration activities; however, representative photos will also be taken prior to implementation activities in the same area as the permanent photo points to document baseline or pre-existing conditions. The location of permanent photo points will be recorded using a handheld GPS device with sub-meter accuracy or using surveying equipment. Permanent photographic stations will be shown on the appropriate topographic map or map showing as-built conditions with an arrow indicating direction of view. The location, direction of view, and date will be recorded for each photograph, and the photos kept in a file, and shall be included in the annual monitoring report for that year.

5.0 MONITORING REPORTS

5.1 As-Builts

Within thirty (30) days of the completion of the restoration work described in this Plan, a letter report outlining the as-built conditions will be prepared and submitted to all agencies within three months of completing the construction of the restored areas.

5.2 Annual Reports

Annual reports will be prepared that discuss monitoring methodology and results. Full annual reports will be provided for each monitoring year, which will be submitted to the agencies by December 31 for each monitoring year. A qualified biologist with experience in biological monitoring will supervise the report preparation. Photographs of the Restoration Areas prior to and following completion of restoration activities shall be included in the report. All photographs taken from designated photo points shall be taken at the same time each year. The report will specify performance standards that have been met, and those that are inconsistent, and will describe adaptive management actions taken during the reporting period and if necessary, make



recommendations or improvements to ensure the success criteria will be met during the monitoring period.

5.3 Final Report

At the end of the 5-year monitoring period, a final detailed report documenting restoration success shall be submitted for review and approval by the resource agencies. The report shall include a summary of dates when work was performed, and photographs taken from predesignated photograph points representing implementation of respective components of this Plan.

6.0 MAINTENANCE DURING MONITORING PERIOD

Management of restoration areas is expected to be minimal and diminishing over time as the site becomes established. Actions will be limited to those listed below.

1. Invasive Species Management – Non-native invasive species above will be removed from restoration areas using mechanical or acceptable chemical methods.
2. Trash Removal – Trash and rubbish will be removed on a semi-annual basis. It should be noted that due to the relatively remote location of the site and the planned limited public access scenario proposed by the Conservancy, trash and debris accumulation are expected to be minimal.
3. Fence Maintenance – A large component of the perpetual maintenance of the restoration areas will be maintaining the livestock exclusion fencing. Fencing will be monitored regularly, and any breaks will be repaired immediately. Any damage that occurs from livestock entering restoration areas will be repaired immediately.

7.0 ADAPTIVE MANAGEMENT MEASURES

If regular inspections or annual monitoring reveals that the restoration is not on track to meet performance standards to achieve the goals of the restoration or if during the long-term monitoring of the project shows that stressors have impacted the viability of the restoration, an assessment will be made to determine the cause and develop potential solutions consistent with the mitigation requirements. After one or more potential solutions are selected and implemented, a focused assessment of outcomes will be made to determine whether alternative solutions are needed. Some potential causes or sources of underperformance include:

- Drought or excessive rains (flooding)
- Erosion
- Fire
- Herbivory
- Failure of irrigation system
- High competition from invasive weeds

Remedial measures will be selected in conjunction with the Conservancy and regulatory agencies. In situations where the stressors are regional or global, the Conservancy and agencies may agree to modify performance standards to align with current regional or global conditions. All remedial measures will be implemented under the oversight of a qualified Restoration Specialist.



Table 7. Adaptive Management Measures

SYMPTOM OF UNDERPERFORMANCE	THRESHOLD	POTENTIAL CAUSES OF UNDERPERFORMANCE	POTENTIAL ADAPTIVE MANAGEMENT MEASURES
Poor germination in seeded areas	Germination is lacking in one or more areas greater than 100 sq. ft.	Low rainfall levels	Reseed in the subsequent fall/winter. Install temporary overhead irrigation to trigger germination
		Seed or seedling herbivory	Reseed in the subsequent fall/winter. Install deterrence measures (e.g., reflective mylar tape, fake owls, or other predators)
Poor long-term establishment of seeded areas	Seeded areas do not meet performance standards for native plant diversity	Low overall germination due to low rainfall	Reseed in the subsequent fall/winter. Install temporary overhead irrigation to trigger germination
		Low germination of specific species	Reseed in the subsequent fall/winter with other native species known from similar habitats at the Preserve
Poor establishment of willows	Willow pole plantings do not meet performance standards	Die off from water stress, plant disease, or other factors	Modify irrigation regime. Test affected species for plant pathogens or other health issues and implement recommendations from testing lab. Replant with alternative species known from similar habitats at the Preserve
		Poor growth of one or more species due to herbivory	Install protective fencing around individual plantings. Replant with alternative species with known resistance to specific herbivores
Presence of highly invasive species	Highly invasive species are present in any portion of the planting areas	Insufficient weed control	Increase frequency of inspections and weed control efforts. Utilize alternative weed control methods, potentially including alternative herbicides
		Propagule sources adjacent to restoration area	Target source populations for weed control
Erosion in restoration areas	Significant erosion is observed	Poor establishment of herbaceous vegetation	Implement measures above for poor seed germination or poor long-term establishment of seeded areas
		Failure of erosion control measures	Increase density/cover of erosion control materials. Install more robust erosion control measures. Repair eroded areas as needed
		Poor establishment of riparian vegetation	Implement measures above for poor seed and/or potted plant establishment. Consider increasing density of riparian plantings



8.0 LONG-TERM MANAGEMENT

8.1 Grazing Management and Exclusion

The Conservancy will install livestock exclusion fencing to protect the restoration and riparian plantings, restored channels and adjacent upland areas from grazing and hoof shear. In addition, some high value existing wetlands and riparian areas will be fenced to remove pressure from livestock grazing. Fencing will be wildlife-friendly and permanent and will include gates to allow for maintenance and the use of “flash” grazing (for approximately one month) as a vegetation and weed management tool to reduce thatch and enhance native grass habitat as a potential adaptive management strategy.

The Conservancy has also implemented a ranch-wide grazing management plan based on the carrying capacity of the site. Overgrazing by former ranch owners is seen as a likely stressor for existing degraded areas, and the Conservancy’s program is structured to promote soil and vegetation health while restoring natural hydrologic processes.

8.2 Invasive Species Control

A weed management program will be undertaken to control non-native, invasive plant species in the planting areas. Weed species to be controlled will include plants on the California Department of Food and Agriculture’s (CDFA) List A and those plants listed by the Cal-IPC as having a “high” or “moderate” invasive impact, excluding non-native annual grasses. These highly invasive plants will be targeted for control to the fullest extent feasible.



9.0 REFERENCES

- NETR 2021** National Environmental Title Research (NETR). 2021. Historic Aerials. Available at: <https://historicaerials.com/viewer>.
- SWRCB 2019** State Water Resources Control Board (SWRCB). 2019. State Wetland definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State.
- Swanson 1977** Swanson, J. 1977. The Natural Resources of Esteros Americano and De San Antonio. California Department of Fish and Game.
- USDA 1972** U.S. Department of Agriculture (USDA). 1972. Soil Survey of Sonoma County, California. In cooperation with the University of California Agricultural Experiment Station.
- Wilbur & Clarke 2011** Wilber, D. H., & Clarke, D. 2011. Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries. North American Journal of Fisheries Management, 855-876.



APPENDIX A. FIGURES



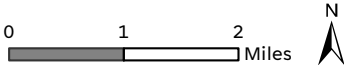


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Sources: National Geographic, WRA | Prepared By: rochelle, 2/19/2023

Figure 1. Study Area Regional Location Map

Estero Americano Coastal Preserve Mitigation Project
 Sonoma County, California

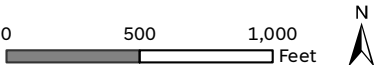




Sources: NRCS SURGGO Soils, 2018 Sonoma County Aerial, WRA | Prepared By: rochelle, 3/20/2023

Figure 2. Study Area Site Overview

Estero Americano Coastal Preserve Mitigation Project
 Sonoma County, California



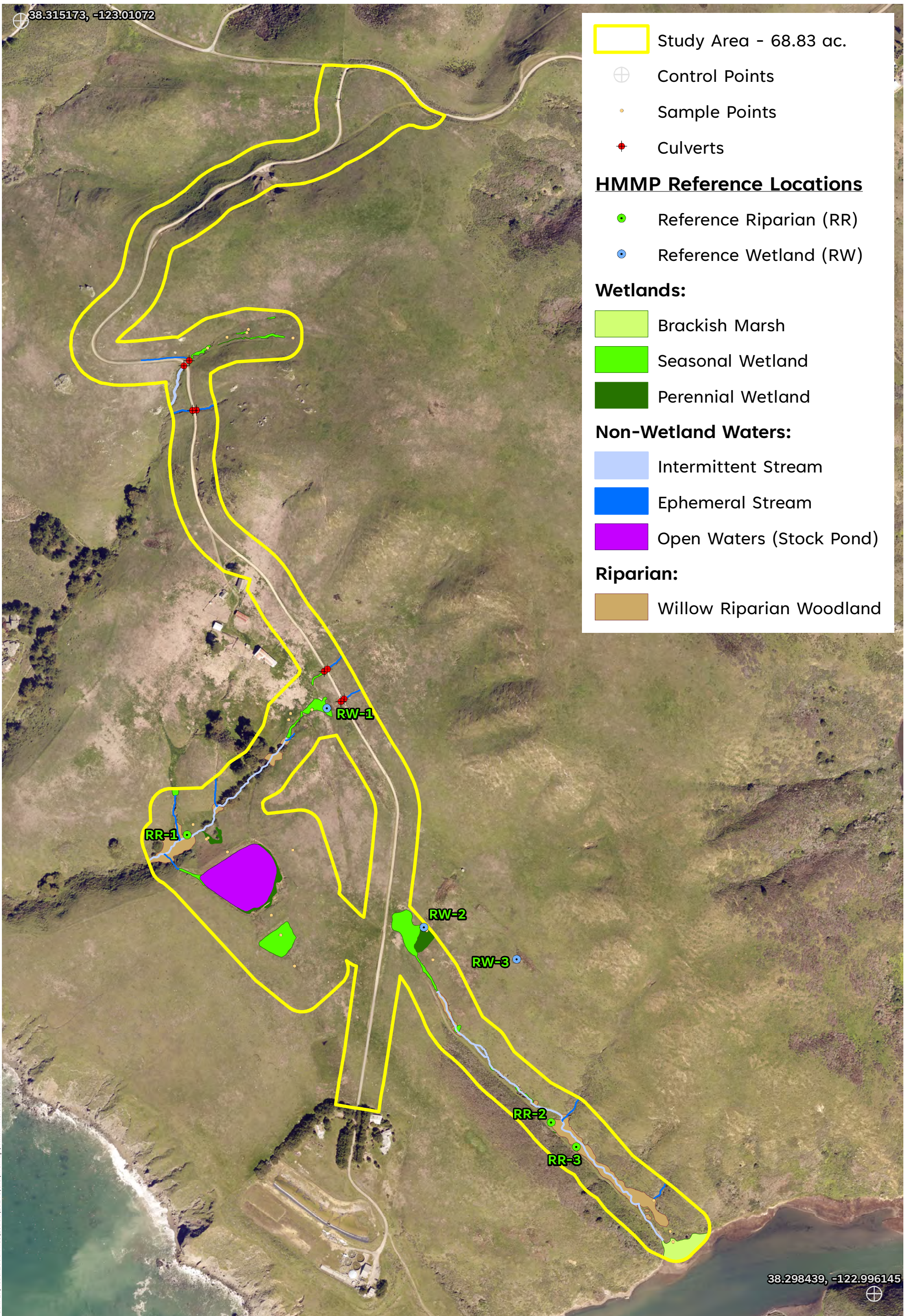


Figure 3. HMMP Reference Locations