Coastal San Francisco Bay Diversity Stratum

This stratum includes populations of steelhead that spawn in tributaries to San Francisco (SF) Bay, but otherwise exhibit environmental characteristics more similar to coastal watersheds. These watersheds drain the eastern slopes of the coastal mountains that separate San Francisco Bay from the Pacific Ocean.

The populations that have been selected for recovery scenarios are listed in the table below and their profiles, maps, results, and recovery actions are in the pages following. Essential populations are listed by alphabetical order within the diversity stratum, followed by the Rapid Assessment of the Supporting populations:

- Corte Madera Creek
- Guadalupe River
- Novato Creek
- San Francisquito Creek
- Stevens Creek
- Coastal San Francisco Bay Rapid Assessment
    - Arroyo Corte Madera del Presidio
    - Miller Creek (Marin Co.)
    - San Mateo Creek

CCC steelhead Coastal San Francisco Bay Diversity Stratum, Populations, Historical Status, Population's Role in Recovery, Current IP-km, and Spawner Density and Abundance Targets for Delisting.

Diversity Stratum	CCC Steelhead Population	Historical Population Status	Population's Role In Recovery	Current Weighted IP-km	Spawner Density	Spawner Abundance
Coastal S.F. Bay	Arroyo Corte Madera del Presidio	D	Supporting	6.8	6-12	39-80
	Corte Madera Creek	I	Essential	19.8	39.5	800
	Guadalupe River	I	Essential	50.8	35.2	1,800
	Miller Creek (Marin Co.)	D	Supporting	9.1	6-12	53-107
	Novato Creek	I	Essential	28.7	38.2	1,100
	San Francisquito Creek	I	Essential	35.6	37.3	1,300
	San Mateo Creek	I	Supporting	6.7	6-12	38-78
	Stevens Creek	I	Essential	22.7	39.1	900
Coastal San Francisco Bay Diversity Stratum Recovery Target						5,900

CCC steelhead Coastal San Francisco Bay Diversity Stratum

Corte Madera Creek Population

CCC Steelhead Winter-Run

- Role within DPS: Potentially Independent Population
- Diversity Stratum: Coastal San Francisco Bay
- Spawner Density Target: 800 adults
- Current Intrinsic Potential: 19.8 IP-km

Steelhead Abundance and Distribution

We are not aware of any systematic adult or juvenile fish surveys conducted within the Corte Madera Creek watershed, so accurately estimating current or past adult or juvenile fish abundance is difficult. Although estimates of steelhead abundance are not available, we did find several references of steelhead observations from Corte Madera Creek and its tributaries are available. Leidy *et al*. (2005) reports observations of steelhead in Corte Madera Creek from several sources and concluded that "the Corte Madera Creek watershed historically supported steelhead runs and continues to support *O. mykiss* populations in its main stem and in various tributaries." Overall, steelhead are distributed in Corte Madera Creek and some of its remaining tributaries in low densities (Rich 2000). Data were insufficient to determine whether or not density of steelhead has increased or decreased over time in the Corte Madera Creek watershed. Leidy *et al.* (2005) reference a report by Ross Taylor and Associates stating that the Flood Control channel in lower Corte Madera Creek blocks passage into the watershed, however steelhead are known to enter the upper watershed under some flow conditions (L Williams, Marin County Public Works, personal communication, 2014). Ross Taylor and Associates (2006) and Michael Love and Associates and Jeff Anderson and Associates (2007) report many other significant barriers to anadromy throughout the watershed.

History of Land Use

The County of Marin has reporting on the human settlement history of the Corte Madera Creek watershed and states that the Coast Miwok were the earliest residents of the watershed and utilized the entire watershed[1]. In the early 1800s, Mexican ranchos were established in the watershed. During that same period timber harvest and cattle ranching were two common land-uses in the watershed. In the late 1800s, agricultural activities, such as the development of orchards, vineyards, poultry farms, and dairies, within the watershed became more diverse. By 1925 the last big farm in the watershed was sold to developers. Development in the watershed increased substantially when the North Pacific Railroad Coast Railroad built two rail lines in the

[1] http://www.marinwatersheds.org/ross_valley.html

Corte Madera Creek watershed. Construction of the Golden Gate Bridge in 1937 coincided with a surge in human population within the watershed. There is much infrastructure in the watershed to support residential development. Stream channels throughout the watershed have been highly channelized to control flooding. In 1971, the Army Corps of Engineers completed construction of three units of the Corte Madera Creek Flood Control Project. The remaining three units of the Corps' flood project have yet to be constructed. Highway 101 crosses the lower watershed and there is a high density of roads, bridges, and water delivery and drainage systems in the area developed for urban uses. Some stream reaches have been leveed, and rerouted. The Golden Gate Bridge Highway and Transportation District operates the Golden Gate Ferry service in Larkspur.

Current Resources and Land Management

The area of the Corte Madera Creek watershed developed for residential or commercial uses fills much of the valley floor. Much of the slopes and ridgetops of the watershed are owned or managed by the Marin County Open Space District or Marin Municipal Water District. The largest city in the watershed is Larkspur, and largest towns are Corte Madera, San Anselmo, Fairfax, and Ross; other communities in the watershed include, Kentfield, Kent, Sleepy Hollow, and Greenbrae; there is residential development outside those cities in the watershed, e.g., Kent Woodlands. The US Census Bureau reported that human population increased about 5 percent in the cities within the Corte Madera Creek watershed between 2000 and 2010 (from 49,491 to 52,240 people). We found no projections for human population for cities within the Corte Madera Creek watershed. The County of Marin Countywide Plan[2] projects continued growth of the human population within the Upper Ross Valley and Lower Ross Valley areas, the areas containing the Corte Madera Creek watershed, with a theoretical buildout of 62,934 people, about a 15 percent increase over the 2000 human population of the planning area of 54,506. About two-thirds of the Corte Madera Creek watershed is in private ownership, with most of the remaining property owned/managed as parks, open space, or watershed protection[3] (Table 1).

Several agencies or special districts operate within the Corte Madera Creek watershed that may have an effect on aquatic habitat within the watershed. The Marin Municipal Water District (MMWD) is the source of treated water for residents within the Corte Madera Creek watershed. In 2011, the Marin County Public Works conducted a Ross Valley Watershed Programs' Capitol Improvement Study (Marin County Public Works 2011). This study identified four critical reaches in which to maximize channel capacity (Fairfax Creek, Sleepy Hollow Creek, San Anselmo Creek, and Corte Madera Creek and its tributary Ross Creek) (Marin County Public

[2] http://www.co.marin.ca.us/depts/CD/main/fm/cwpdocs/CWP_CD2.pdf
[3] NMFS GIS data – Corte Madera Creek Watershed Characterization.

Works 2011). The Ross Valley Sanitary District provides sewage collection, wastewater treatment, and some recycling programs to homes within the Corte Madera Creek watershed. The Marin Sanitary Service provides solid waste and yard waste handling to homes within the Corte Madera Creek watershed. The Marin Hazardous and Solid Waste Joint Powers Authority provide household hazardous waste collection, recycling and disposal information for residents and businesses, and ensure the County's compliance with recycling mandates. The Marin Resource Conservation District provides technical assistance to private landowners on soil erosion and resource conservation matters. The County of Marin Open Space District manages select County-owned lands to preserve, protect, and enrich the natural aspect of those properties. Also, some open space parcels provide recreational opportunities.

Salmonid Viability and Watershed Conditions

The following key attributes were rated Poor through the CAP process for steelhead in Corte Madera Creek: Estuary/Lagoon, Habitat Complexity, Hydrology, Landscape Patterns, Passage/Migration, Riparian Vegetation, Sediment, Sediment Transport, Velocity Refuge, Viability, and Water Quality.

Current Conditions

The following discussion focuses on those conditions that were rated Fair or Poor as a result of our CAP viability analysis. The Corte Madera Creek CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

Population and Habitat Conditions

Riparian Vegetation: Composition, Cover & Tree Diameter

Systematic data related to riparian tree diameter and correlation to adult steelhead habitat within the Corte Madera Creek watershed are not available. However, poor riparian conditions are common throughout much of the urbanized portions of the Corte Madera Creek watershed, and have likely resulted in elevated summer water temperature, high substrate embeddedness levels, prevalent streambank erosion, and limited recruitment of large woody debris for rearing salmonids. Tree diameter was used as an indicator of riparian function based on the average diameter at breast height of a stand of trees within a buffer that extends 100 meters back from the edge of the active channel. Within the Corte Madera Creek watershed there are few places in which native riparian tree vegetation extends 100 meters back from the edge of the active channel without interruption. In the headwater areas of the watershed, the condition of the riparian vegetation is likely related to anthropogenic factors (e.g., Phoenix Dam, or historic logging and grazing) and natural conditions based on local geology, and hydrologic conditions. Within the

urbanized portion of the watershed, this is certainly attributable to anthropogenic factors, as there is much encroachment of the riparian areas of Corte Madera Creek and its tributaries. Riparian Conditions have an overall rating of Poor due to continued flood-control practices and urban development practices in the lower watershed. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Sediment Transport: Road Density

The Corte Madera Creek watershed has a high density of roads. There are 9.0 miles of roads per square mile of Corte Madera Creek watershed and 8.8 miles of roads per square mile of riparian buffer (NMFS GIS). Road networks within the Corte Madera Creek watershed are largely paved systems associated with urban development, and represent a significant source of the total impervious surface within the basin. There are also several rural and fire service roads in the watershed on the ridgetops and other areas outside of the urbanized portions of the watershed. Roadways amplify storm flow intensity and duration during winter, and deliver road-born pollution (e.g., oils, urban runoff, etc.) and eroded sediments directly to the aquatic system. Threats contributing significantly to this stress include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Estuary: Quality and Extent

The tidal reaches of the system are heavily impacted and have been modified for flood management (Marin County Public Works 2015). In the 1960s, the Army Corps of Engineers designed and constructed an earthen trapezoidal channel on the lower 4.5 miles of creek through the towns of Corte Madera, Larkspur, Kentfield, and Ross. Lower Corte Madera Creek has been widened and straightened. These lower reaches are sediment aggradation and storage zones for upland and tidally-derived sediment. Between 1967 and 1971, the Corps channelized a two-mile portion of Corte Madera Creek from Kentfield near the mouth to the confluence of San Anselmo and Sleepy Hollow Creeks (Leidy et al. 2005). This concrete channel disconnected much of the seasonal or tidal wetlands from the stream. There are some tidal wetlands in the lowermost reaches, however restoration opportunities are limited by adjacent development. The estuarine riparian vegetation community has been greatly modified and likely reduced as well and this may affect the water temperature regime and the amount of allochthonous food items available to steelhead. The majority of the area has been converted for urban or commercial uses, as much of Larkspur and Corte Madera were built on historic wetlands. Urban and commercial land-uses may lead to inputs of pollutants that may reach Corte Madera Creek as stormwater. All of these factors reduce the quality of aquatic and riparian habitat, and reduce opportunities for rearing of juvenile steelhead. Estuary: Quality and Extent conditions have an overall Poor rating due to continued flood-control practices and historical urban development practices (adjacent to the

land side of levees) in the lower watershed. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Velocity Refuge: Floodplain Connectivity

Periodic inundation of floodplains by streams provides several ecological functions beneficial to salmonids, including: coarse sediment sorting, fine sediment storage, groundwater recharge, velocity refuge, formation and maintenance of off-channel habitats, and enhanced forage production. Floodplain connectivity is associated with more diverse and productive food webs. Specific data related to floodplain connectivity are not available. However, based on the amount of urbanization with encroachment into riparian areas, channel modification, bank stabilization, and wetland reclamation found throughout the watershed (visible on satellite photographs available on web sites), floodplain connectivity is poor in the watershed and impaired. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Hydrology: Redd Scour

The Corte Madera Creek watershed has many factors that increase the intensity of storm runoff or confine the channel, including high levels of impervious surfaces, culverted tributaries, disconnected floodplains, channel simplification and hardening, and channelization. Both increased storm run-off and confined channels lead to increased velocity of streamflow and streambed scour. Periods of high streamflow coincide with steelhead spawning periods and increased streambed scour reduces the potential spawning success of steelhead. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Hydrology: Baseflow and Passage Flows

Specific data related to water flow are not available for the Corte Madera Creek watershed. Phoenix Dam is present on Ross Creek and affects streamflow, sediment transport, and fish migration. Other smaller dams are present within the Corte Madera Creek watershed and there is likely some withdrawal of water from these dams or by other riparian users, albeit at a small or moderate amount. The urbanized areas in this watershed have experienced stream channelization and increases in the amount of impervious surfaces. Stream channelization generally cuts off the floodplain access for the stream and leads to accelerated water discharge, which may lead to further bank instability and channel incision. Impervious surfaces reduce rainwater infiltration and natural groundwater recharge, leading to higher peak flows and a quicker return to baseflows, i.e., a flashier hydrologic regime. Several tributaries to Corte Madera Creek have been placed in culverts that concentrate flows leading to a furthering of the flashier

hydrologic regime. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Passage/Migration: Mouth or Confluence and Physical Barriers

Numerous passage and migration impairments exist within the Corte Madera Creek watershed. Dams, flood control structures, the damaged fish ladder in the Town of Ross, culverts, road crossings, and utilities crossings throughout the watershed are either partial or complete barriers to steelhead migration. All of these barriers impair hydrology and constrain migration of both adult and juvenile steelhead throughout the remaining accessible habitat. Ross Taylor and Associates (2003) reports that the long flood-control channel (Corps Unit IV) in lower Corte Madera Creek impairs passage to all steelhead spawning areas in the watershed. This concrete channel has little or no high flow refugia or other resting areas, with the exception of some constructed "pockets" in the channel bottom. Fish must traverse the entire two mile section of concrete channel essentially without stopping. Immediately above the flood control channel is a damaged fish ladder. Funding is currently unavailable to remedy the fish ladder and complete other essential activities proposed in the Corps flood protection program[4]. As mentioned earlier some of the tributaries to Corte Madera Creek have been culverted. Although the hydrologic connection between the Corte Madera Creek and its culverted tributaries persist, these structures are impassable by steelhead. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Hydrology: Baseflow and Passage Flows

Primary factors affecting hydrology in the Corte Madera Creek watershed include the presence and operation of Phoenix Dam, placement of tributary streams into culverts, floodplain development, channelization, and the high amount of impervious surfaces. The naturally xeric hydrologic conditions exacerbate the hydrologic conditions. These factors lead to increased channel instability and the reduction of quality of spawning gravel. Further, these factors combined with riparian encroachment by development cut off the floodplain access for the stream and lead to accelerated water discharge, which may lead to further bank instability and channel incision. Impervious surfaces reduce rainwater infiltration and natural groundwater recharge, leading to higher peak flows and a quicker return to baseflows, i.e., a flashier hydrologic regime. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios

[4] The Corps watershed flood protection program has been largely cancelled, and only the damaged fish ladder is still to be completed (L Williams, Marin County Public Works, personal communication, 2014).

Specific data related to altered pool complexity and/or pool/riffle ratios in the Corte Madera Creek watershed are not available. However, the abundance and quality of primary pools and the ratio of pool/riffle/flatwater habitats is likely substandard given the generally degraded condition of Corte Madera Creek, particularly in the urbanized areas, the paucity of large woody debris, the amount of bank and channel stabilization, and the influence of tidal action in the lower portion of the watershed. Reductions in pool depth often lead to increased water temperature. The amount and diversity of cover elements in pools and an appropriate ratio of pool/riffle/flatwater habitats is important to all lifestages of steelhead. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Habitat Complexity: Large Wood and Shelter

Specific data related to large woody debris or shelter rating for the Corte Madera Creek watershed are not available. However, the abundance of large woody debris within the watershed is likely low because of the removal of large woody debris for flood control, and the poor riparian conditions, associated with encroachment by suburban development and channel hardening, that limit recruitment of large woody debris to the stream. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Sediment: Gravel Quality and Distribution of Spawning Gravels

Specific data related to gravel quality and quantity are not available. The sediment yield of the uplands in the Corte Madera Creek watershed is high and is attributable to logging and grazing from the 19th century (Stetson 2000). More than 90 percent of the sediment yield measured in Corte Madera Creek at Ross comes from uplands. Also, channel incision is common in the watershed, though the rates of channel incision appear to be lessening. Channel incision often leads to streambank instability as the stream attempts to come to equilibrium. Unstable banks lead to more inputs of fine sediment to the stream. These inputs of fine sediment occur during periods of high precipitation – a period that coincides with steelhead spawning times. Excessive fine sediment and unstable substrates reduce the reproductive success of steelhead. Also, those conditions impair gravel quality resulting in reduced feeding opportunities by virtue of changes in available invertebrates. To counter unstable banks, about half of the banks in the watershed have been hardened with rock, concrete or other materials such as tires. Streambank hardening may lead to additional channel incision and may constrain the potential for stream restoration. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Landscape Patterns: Agriculture, Timber Harvest & Urbanization

Major landscape disturbance within the Corte Madera Creek watershed is primarily associated with urban development. Historically the entire watershed has been affected by agricultural practices, such as grazing, and logging, though these practices are not undertaken within the watershed currently. The urbanized portions of the watershed are expressed on much of the valley floor, particularly in the Ross Valley and lower watershed. The Marin Countywide Plan identifies anticipated urban growth in this portion of the watershed. Adverse factors within the Corte Madera Creek watershed associated with urbanization include: high density of dwellings, high amount of miles of roads per square mile of watershed, high amount of impervious surfaces, encroachment of riparian areas, stream channelization, bank stabilization, flood control activities, and filling and piping of historic Corte Madera Creek tributaries. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Viability: Density, Abundance, and Spatial Structure

Given the current assumed abundance and spatial distribution of steelhead within the Corte Madera Creek watershed, this steelhead population is likely not viable. Leidy *et al*. (2005) report that multiple year classes of *O. mykiss* are encountered regularly within the Corte Madera Creek watershed; however, the number of fish encountered is low in most, though not all, streams. Spatial distribution of steelhead within the Corte Madera Creek watershed is fragmented, as well. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Water Quality: Temperature

Systematic data related to stream water temperature within the Corte Madera Creek watershed are few. The Friends of Corte Madera Creek Watershed, in cooperation with Marin Municipal Water District and four local property owners, completed the one-year of water temperature monitoring at Phoenix Lake and Ross Creek. In 2008, surface water temperature in Phoenix Lake exceeded preferred water temperature for summer rearing of steelhead (Friends of the Corte Madera Creek Watershed (2008)). In most Ross Creek locations during the spring of 2008, surface water temperature was consistently within the appropriate range for steelhead; however, surface flow of those portions of Ross Creek dried by mid-May. At the first monitoring location downstream of Phoenix Dam it appeared that surface discharges from Phoenix Reservoir significantly warm the surface flow of Ross Creek. Rich (2000) reports that limiting factors for trout production within the watershed are lack of streamflows and high water temperatures. Threats contributing significantly to this condition include: Residential and Commercial Development; and Roads and Railroads.

Water Quality: Turbidity or Toxicity

Systematic data related to stream turbidity or toxicity within the Corte Madera Creek watershed are not available. However, several factors affecting turbidity or toxicity are present within the watershed: incising channel bed, unstable streambanks, reductions of riparian vegetation, and high amounts of residential and commercial lands with corresponding high amounts of impervious surfaces. Corte Madera Creek is included on the US Environmental Protection Agency's list of impaired streams in the San Francisco area[5], though it is not clear whether inclusion of Corte Madera Creek on the impaired streams list was based on water quality data collected from Corte Madera Creek. The reported sources of the impaired water quality in this watershed are urban runoff and storm sewers. Further, the US Environmental Protection Agency's Better Assessment Science Integrating Point & Non-point Sources database lists 36 hazardous and solid waste or industrial discharges sites within the Corte Madera Creek watershed. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Threats

The following discussion focuses on those threats that were rated as High or Very High (See Corte Madera CAP Results). Recovery strategies will likely focus on ameliorating threats rated as High; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts.

Channel Modification

Much of the Corte Madera Creek watershed has experienced channel modifications, including straightening, streambank hardening, channel realignment, filling and piping, and leveeing. The most significant channel modification in this watershed is the Corps' flood control channel (Unit IV), completed in 1971, which begins in Ross and continues 4.5 miles to San Pablo Bay. These modifications, combined with other landscape altering practices, have destroyed estuarine habitat, disconnected streams from their floodplains, and constrained natural fluvial and geomorphic processes that create and maintain instream and riparian habitat that support viable steelhead populations.

Residential and Commercial Development

Residential and commercial development is present and exerting adverse impacts on steelhead and aquatic habitat in the Corte Madera Creek watershed. There are several neighboring communities within the watershed: Fairfax, Sleepy Hollow, San Anselmo, Ross, Kentfield, Greenbrae, Larkspur, and Corte Madera. The density of people within those communities ranged

[5]http://oaspub.epa.gov/tmdl/attains_waterbody.control?p_list_id=CAR206.200CORTE%20MADERA%20CR&p_cycle=2002&p_report_type=

from 798 people per square mile in Sleepy Hollow to 4,608 people per square mile in San Anselmo[6]. The County of Marin Countywide Plan anticipates moderate human population growth in this watershed in the future. During the 2010 census, the average density of housing units per square mile in communities within the watershed ranged from 290 in Sleepy Hollow to 2,069 in San Anselmo. Housing density is high (greater than 2 units per acre) throughout much of the watershed, particularly in the Ross Valley. The urbanized portions of the watershed are expressed on much of the valley floor, particularly in the Ross Valley and lower watershed. Intensive and widespread urban development has increased the impervious surface area, greatly impacting hydrology as well as the pollutant level within the aquatic environment, and impaired instream conditions.

Roads and Railroads

Roads are a significant threat for all lifestages of steelhead in the Corte Madera Creek watershed. Road networks within the Corte Madera Creek watershed are largely paved systems associated with urban development, and represent a significant source of the total impervious surface within the basin. The Corte Madera Creek watershed has a high density of roadways: 9.0 miles of roads per square mile of watershed area. Further, the Corte Madera Creek watershed has a high concentration of roads within riparian zones (8.8 miles of roads per square mile of 100 meter riparian buffer) (NMFS GIS). The thresholds for well-functioning watersheds (rating of good or very good) is less than 2.4 miles of roads per square mile of watershed area and less than 0.4 mile of roads per square mile of 100 meter riparian buffer. Roadways in the Corte Madera Creek watershed amplify storm flow intensity and duration during precipitation events, deliver road-born pollution (e.g., oils, urban runoff, fine sediment, etc.) directly to the aquatic system, and necessitate culverts and other structures that obstruct steelhead migration.

Water Diversion and Impoundments

The most significant diversion and impoundment within the watershed is Phoenix Dam and reservoir. Additionally, there are smaller weirs and dams in the watershed. These dams and weirs affect all lifestages of steelhead and instream habitat by blocking passage, limiting migration periods, and altering hydrology and sediment transport rates.

In addition, there are a number of private wells in Ross Valley which may contribute to intermittent flows in formerly perennial streams (e.g., lower Ross Creek) (L Williams, Marin County Public Works, personal communication, 2014). These effects are worse under drought conditions, when residents may draw on well water for irrigation (L Williams, Marin County Public Works, personal communication, 2014).

[6] http://factfinder2.census.gov/

Limiting Stresses, Lifestages, and Habitats

Threat and stress analyses within the CAP workbook suggest that all lifestages are limited by impaired conditions within the Corte Madera Creek watershed. Primary factors contributing to habitat limitations and limited steelhead abundance are extensive watershed development for urban land-uses, including channel modification and roads. These land-uses have contributed to loss of floodplain connectivity, impaired watershed hydrology, and reduced and simplified instream habitat complexity. Many partial barriers to steelhead movement are found throughout the Corte Madera Creek watershed, too. Also, because of residential and commercial development, the amount of riparian vegetation and large woody debris are greatly reduced. These stresses identified in this paragraph affect all lifestages of steelhead.

General Recovery Strategy

In general, recovery strategies will focus on improving conditions and ameliorating stresses and threats discussed in the previous paragraph. Recovery actions should target addressing habitat constraints within stream reaches with high potential to benefit steelhead recovery, and should consider mechanisms to increase hydraulic and floodplain connectivity, increase and improve riparian vegetation and large woody debris retention and recruitment, and to improve passage within the watershed. Other strategies that address other stresses or threats to steelhead or its habitat may also be developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed.

Passage

Passage barriers downstream of Phoenix Dam should be systematically and opportunistically remediated.

Reservoir Reoperation to Benefit All Lifestages of Steelhead

Phoenix Lake should be operated in such a manner as to benefit all lifestages of steelhead. Considerations should include, but not be limited to: water temperature, flow velocity, ramping rates (as necessary to prevent egg scour, or displacement or stranding of juveniles), sediment transport, channel maintenance, instream habitat, adult and smolt migratory cues, and, to the greatest degree possible, providing a natural (unimpaired) hydrograph.

Minimize Diversions and Diversion Effects Downstream of the Reservoir

The effects of diversion operations downstream of Phoenix Dam should be evaluated. If these operations are found to be detrimental to steelhead or their habitat, they should be either curtailed or re-operated to benefit all steelhead lifestages.

Side Channel and Floodplain Reconnection

Where not limited by existing development, efforts should be made to reconnect floodplain habitat and increase channel complexity by reconnecting side channel habitat with the active stream channel. When possible, existing development should be retrofitted to restore connectivity between streams and adjacent floodplain and flood bench habitat, and to allow for natural channel functions.

Improve Sediment Transport

Restoration efforts should focus on providing channel maintenance/forming flows necessary to mobilize bedload material throughout the watershed, provide suitable gravel material from upstream sources, and remove/remediate structures and areas of the stream that impair sediment transport processes.

Increase Instream Habitat and Cover, and Increase Instream Channel Complexity

Instream habitat and cover should be improved. Methods may include placing large woody debris, rock weirs, and boulders within affected reaches. All structures should be designed to function within the known range of flows at any given project site in order to provide for the needs of all steelhead lifestages.

Increase Instream Shelter Ratings and Pool Volume

Due largely to an absence of LWD and limited channel complexity, shelter and cover ratings are Low within much of the watershed. Where applicable, restoration efforts should incorporate instream wood/boulder structures into degraded reaches to improve habitat complexity and shelter availability.

Improve Water Quality

Efforts should be made to improve water quality. In particular, efforts should focus on limiting or treating urban runoff and limiting input of debris and toxic substances.

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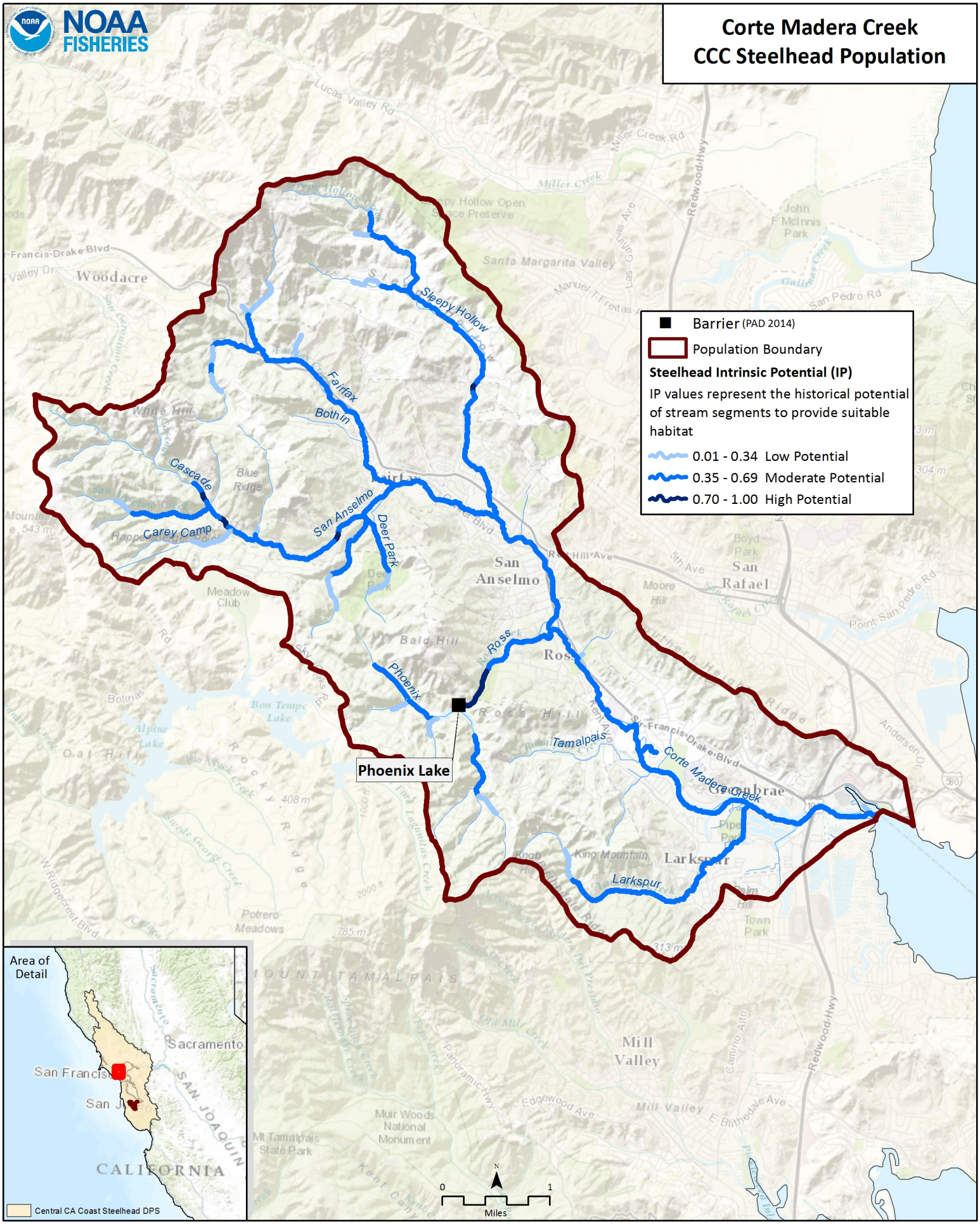
Table 1: Land ownership within the Corte Madera Creek watershed.
Information provided by Management Landscape, California Department of Forestry, 2002.

Land Ownership	Acres	Percent of Watershed
Private	10,532	67%
Local (Parks and Open Space)	2,293	15%
Local (Water District)	2,908	18%
State	25	0%


Corte Madera Creek
CCC Steelhead Population
NOAA FISHERIES
Barrier (PAD 2014)
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
Sleepy Hollow
Fairfax
Bothin
Cascade
Carey Camp
San Anselmo
Deer Park
Phoenix
Ross
Tamalpais
Corte Madera Creek
Larkspur
Phoenix Lake
Area of Detail
Sacramento
San Francisco
San Jose
SAN JOAQUIN
CALIFORNIA
Central CA Coast Steelhead DPS
0
1
Miles
N

#	Conservation Target	*Category*	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Measurement	Current Rating
1	Adults	Condition	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)	>90% of streams/ IP-Km (>30% Pools; >20% Riffles)	<50% of streams/ IP-km (>30% Pools; >20% Riffles)	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	0% Class 5 & 6 across IP-km	Poor
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined		

			Sediment	Quantity & Distribution of Spawning Gravels	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<1 spawner per IP-km to < low risk spawner density per Spence (2008)	>1 spawner per IP-km to < low risk spawner density per Spence (2008)	low risk spawner density per Spence (2008)		<1 spawner per IP-km to < low risk spawner density per Spence (2008)	Poor
2	Eggs	Condition	Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Redd Scour	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score >75	Poor
			Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	<12% (0.85mm) and <30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	Fair
			Sediment	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
3	Summer Rearing Juveniles	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor

Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
Habitat Complexity	Percent Primary Pools	<50% of streams/ IP-Km (>49% of pools are primary pools)	50% to 74% of streams/ IP-Km (>49% of pools are primary pools)	75% to 89% of streams/ IP-Km (>49% of pools are primary pools)	>90% of streams/ IP-Km (>49% of pools are primary pools)	<50% of streams/ IP-km (>49% of pools are primary pools)	Poor
Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)	>90% of streams/ IP-Km (>30% Pools; >20% Riffles)	<50% of streams/ IP-km (>30% Pools; >20% Riffles)	Poor
Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
Hydrology	Flow Conditions (Baseflow)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score >75	Poor
Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score >75	Poor
Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	1.1 - 5 Diversions/10 IP-km	Fair
Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor

			Riparian Vegetation	Canopy Cover	<50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	>90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	50% to 74% of streams/ IP-km (>70% average stream canopy; >85% where coho IP overlaps)	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	0% Class 5 & 6 across IP-km	Poor
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined		
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Water Quality	Temperature (MWMT)	<50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	>90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	<50% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<0.2 Fish/m^2	0.2 - 0.6 Fish/m^2	0.7 - 1.5 Fish/m^2	>1.5 Fish/m^2	0.2 - 0.6 Fish/m^2	Poor
			Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	50-74% of Historical Range	Fair
4	Winter Rearing Juveniles	Condition	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor

			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)	>90% of streams/ IP-Km (>30% Pools; >20% Riffles)	<50% of streams/ IP-km (>30% Pools; >20% Riffles)	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)		
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	0% Class 5 & 6 across IP-km	Poor
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined		
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower		
5	Smolts	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor

			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	>5 Diversions/10 IP-km	Poor
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Smoltification	Temperature	<50% IP-Km (>6 and <14 C)	50-74% IP-Km (>6 and <14 C)	75-90% IP-Km (>6 and <14 C)	>90% IP-Km (>6 and <14 C)	<50% IP-km (>6 and <14 C)	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Abundance	Smolt abundance which produces high risk spawner density per Spence (2008)	Smolt abundance which produces moderate risk spawner density per Spence (2008)	Smolt abundance to produce low risk spawner density per Spence (2008)		Smolt abundance which produces high risk spawner density per Spence (2008)	Poor
6	Watershed Processes	Landscape Context	Hydrology	Impervious Surfaces	>10% of Watershed in Impervious Surfaces	7-10% of Watershed in Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	<3% of Watershed in Impervious Surfaces	10.99% of Watershed in Impervious Surfaces	Poor
			Landscape Patterns	Agriculture	>30% of Watershed in Agriculture	20-30% of Watershed in Agriculture	10-19% of Watershed in Agriculture	<10% of Watershed in Agriculture	0% of Watershed in Agriculture	Very Good

			Landscape Patterns	Timber Harvest	>35% of Watershed in Timber Harvest	26-35% of Watershed in Timber Harvest	25-15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	Very Good
			Landscape Patterns	Urbanization	>20% of watershed >1 unit/20 acres	12-20% of watershed >1 unit/20 acres	8-11% of watershed >1 unit/20 acres	<8% of watershed >1 unit/20 acres	61% of watershed >1 unit/20 acres	Poor
			Riparian Vegetation	Species Composition	<25% Intact Historical Species Composition	25-50% Intact Historical Species Composition	51-74% Intact Historical Species Composition	>75% Intact Historical Species Composition	25-50% Intact Historical Species Composition	Fair
			Sediment Transport	Road Density	>3 Miles/Square Mile	2.5 to 3 Miles/Square Mile	1.6 to 2.4 Miles/Square Mile	<1.6 Miles/Square Mile	9.0 Miles/Square Mile	Poor
			Sediment Transport	Streamside Road Density (100 m)	>1 Miles/Square Mile	0.5 to 1 Miles/Square Mile	0.1 to 0.4 Miles/Square Mile	<0.1 Miles/Square Mile	8.8 Miles/Square Mile	Poor

Corte Madera Creek CAP Threat Results

	Threats Across Targets	Adults	Eggs	Summer Rearing Juveniles	Winter Rearing Juveniles	Smolts	Watershed Processes	Overall Threat Rank
	Project-specific-threats	1	2	3	4	5	6	
1	Agriculture	Medium	Low	Medium	Medium	Medium	Medium	Medium
2	Channel Modification	Very High	Very High	Very High	Very High	Very High	Very High	Very High
3	Disease, Predation and Competition	Medium	Low	Medium	Medium	Medium	Medium	Medium
4	Hatcheries and Aquaculture	Medium	Low	Medium	Medium	Medium	Medium	Medium
5	Fire, Fuel Management and Fire Suppression	Medium	Low	Medium	Medium	Medium	Medium	Medium
6	Fishing and Collecting	Medium	Low	Medium	Medium	Medium	Medium	Medium
7	Livestock Farming and Ranching	Medium	Low	Medium	Medium	Medium	Medium	Medium
8	Logging and Wood Harvesting	Medium	Low	Medium	Medium	Medium	Medium	Medium
9	Mining	Medium	Low	Medium	Medium	Medium	Medium	Medium
10	Recreational Areas and Activities	Medium	Low	Medium	Medium	Medium	Medium	Medium
11	Residential and Commercial Development	Very High	Very High	Very High	Very High	Very High	Very High	Very High
12	Roads and Railroads	Very High	Very High	Very High	Very High	Very High	Very High	Very High
13	Severe Weather Patterns	Very High	High	Very High	Very High	Very High	High	Very High
14	Water Diversion and Impoundments	Medium	Low	High	Medium	Medium	Medium	Medium
	Threat Status for Targets and Project	Very High	Very High	Very High	Very High	Very High	Very High	Very High

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-1.1.1	Recovery Action	Estuary	Increase the quality and extent of estuarine habitat										
CMC-CCCS-1.1.1.1	Action Step	Estuary	Evaluate all floodgates located within the tidal portion of the stream and determine the feasibility of re-claiming historic tidal slough habitat.	3	10	Marin County, MMWD						TBD	Cost will vary with assessment methods and level of detail.
CMC-CCCS-1.1.1.2	Action Step	Estuary	Identify locations to install habitat complexity features to enhance steelhead estuary rearing conditions.	3	10	Marin County, MMWD	169.50	169.50				339	Cost based on estuary use/residence time model at a rate of $338,679/project.
CMC-CCCS-1.1.1.3	Action Step	Estuary	Develop and implement estuary rehabilitation and enhancement strategies.	3	10	Marin County, Marin RCD, MMWD	443.00	443.00				886	Cost based on treating 18 acres of estuarine habitat (assume 10% of total estuarine habitat) at a rate of $49,200/acre
CMC-CCCS-1.1.2	Recovery Action	Estuary	Increase and enhance habitat complexity features										
CMC-CCCS-1.1.2.1	Action Step	Estuary	Evaluate, and if feasible implement restoration projects that integrate upland and intertidal habitats.	3	10	Marin County, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-1.1.2.2	Action Step	Estuary	Evaluate and implement, where feasible, programs to enhance native benthic flora and fauna (such as native bivalves) to reduce habitat related effects of non-native invasive species.	3	15	Marin County, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-1.1.2.3	Action Step	Estuary	Evaluate and implement, where feasible, programs to enhance native riparian and wetland flora to reduce habitat related effects of past or present land-uses.	3	15	Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-1.1.2.4	Action Step	Estuary	Restore areas of tidal marsh in diked and muted tidal marsh areas throughout the watershed.	3	15	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Cost likely accounted for through implementation of other action steps.
CMC-CCCS-1.1.2.5	Action Step	Estuary	Use only native plant species in restoration, inspecting all live restoration and construction materials for aquatic invasive species and cleaning all equipment prior to and post restoration/construction.	2	15	FHWA, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
CMC-CCCS-1.1.2.6	Action Step	Estuary	Monitor all restoration projects to identify success of techniques. Also, when unsatisfactory results are identified, implement responses to address causes of poor results.	3	25	FHWA, Marin County, Marin RCD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-1.1.2.7	Action Step	Estuary	Identify and provide recommendations for potential rehabilitation sites that have been altered by dredging and diking.	3	10	Marin County, MMWD						0	Cost for estuary rehabilitation sites accounted for in above action steps.
CMC-CCCS-1.1.3	Recovery Action	Estuary	Reduce toxicity and pollutants										
CMC-CCCS-1.1.3.2	Action Step	Estuary	Evaluate water quality conditions (salinity, dissolved oxygen, temperature) in potential steelhead estuary rearing areas.	3	10	Marin County, MMWD	7.50	7.50				15	Cost based on installing a minimum of 3 continuous water quality stations at a rate of $5,000/station.
CMC-CCCS-1.1.3.3	Action Step	Estuary	Implement tidal restoration projects that help capture and provide treatment of upland runoff.	3	25	Marin County, Marin RCD, MMWD						0	Cost accounted for through implementation of other action steps.
CMC-CCCS-1.1.3.4	Action Step	Estuary	Plan and implement Total Maximum Daily Load plans for known pollutant impairments.	3	10	Marin County, MMWD, SWRCB, US EPA						0	Existing programs and outreach are considered In-Kind.

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-1.1.3.5	Action Step	Estuary	Plan and implement structural solutions to reduce urban storm runoff pollutant loads.	3	25	FHWA, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Action is considered In-Kind
CMC-CCCS-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Increase and enhance velocity refuge										
CMC-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Identify the floodplain activation flow which is the the smallest flood pulse event that initiates substantial beneficial ecological processes when associated with floodplain inundation (Williams et al. 2009).	3	5	MMWD	79.00					79	Cost based on stream flow/precipitation model at a rate of 78,100/project.
CMC-CCCS-2.1.2	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
CMC-CCCS-2.1.2.1	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in modified channel areas.	3	5	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	345.00					345	Cost based on riparian and wetland restoration model at a rate of $88,551 and $255,968/project, respectively.
CMC-CCCS-2.1.2.2	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in low gradient response reaches.	3	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-2.1.2.3	Action Step	Floodplain Connectivity	Evaluate undeveloped and developed floodplain areas in efforts to identify rehabilitation and habitat enhancement sites with emphasis on increasing floodplain habitat.	3	10	Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-2.1.2.4	Action Step	Floodplain Connectivity	Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.	3	15	Marin County, Marin RCD, MMWD, Private Landowners						0	Existing programs and outreach are considered In-Kind. Costs for conservation easements vary.
CMC-CCCS-2.1.2.5	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target velocity refuge for migrating salmonids.	2	25	Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-2.1.2.6	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target winter rearing habitat for juvenile steelhead.	3	15	Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-3.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-3.1.1	Recovery Action	Hydrology	Improve passage flows										
CMC-CCCS-3.1.1.1	Action Step	Hydrology	Reduce impacts of impaired hydrology (reduced pulse-flows, magnitude, duration, and timing of freshets) that preclude adult and smolt passage over critical riffles and other nature obstacles.	1	5	Cities, Marin County, MMWD						TBD	Costs based on implementing other action steps (e.g. off-channel storage, irrigation efficiency, etc.)
CMC-CCCS-3.1.1.2	Action Step	Hydrology	Establish a comprehensive stream flow evaluation program to determine instream flow needs for steelhead.	3	10	Marin County, MMWD	39.50	39.50				79	Cost based on stream flow/precipitation model at a rate of $78,100/project
CMC-CCCS-3.1.2	Recovery Action	Hydrology	Improve flow conditions										

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-3.1.2.1	Action Step	Hydrology	Increase the amount of available spawning and rearing habitat by improving instream flow conditions below Phoenix Lake on Ross Creek.	1	5	Cities, Marin County, Marin RCD, MMWD						0	Action is considered In-Kind
CMC-CCCS-3.1.2.2	Action Step	Hydrology	Release water from Phoenix Lake to augment flows in Corte Madera Creek.	2	20	CDFW, Marin Municipal Water District, NMFS						0	
CMC-CCCS-3.1.2.3	Action Step	Hydrology	Identify and maximize opportunities for aquifer recharge.	3	25	Marin County, MMWD, Private Landowners						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-3.1.2.4	Action Step	Hydrology	Develop and implement strategies for efficient water use.	3	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD, Private Landowners						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-3.1.2.5	Action Step	Hydrology	Develop and implement a water use plan ensuring base-flow sustainability.	3	10	Marin County, MMWD						0	Action is considered In-Kind.
CMC-CCCS-3.1.2.6	Action Step	Hydrology	Require streamflow gaging devices to evaluate impairment to current streamflow conditions.	2	5	Marin County, Marin RCD, MMWD	3.00					3	Cost based on installing a minimum of 3 streamflow gauges at a rate of $1,000/gauge. Cost does not account for data management or maintenance.
CMC-CCCS-3.1.2.7	Action Step	Hydrology	Implement conjunctive use of water for water projects whenever possible to maintain or restore steelhead habitat.	2	5	Marin County, Marin RCD, MMWD						0	Action is considered In-Kind
CMC-CCCS-5.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
CMC-CCCS-5.1.1.1	Action Step	Passage	Continue to identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001).	1	5	Cities, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD, NMFS						0	Action is considered In-Kind
CMC-CCCS-5.1.1.2	Action Step	Passage	Evaluate and prescribe volitional and non-volitional passage methodologies for all dams in the watershed, including Phoenix Lake on Ross Creek.	1	5	Cities, Marin County, Marin RCD, MMWD, NMFS						TBD	
CMC-CCCS-5.1.1.3	Action Step	Passage	Encourage and support the Marin County Flood Control District and the Corps in efforts to improve fish passage through the town of Ross.	2	10	CDFW, Marin County Flood Control District, NMFS, Town of Ross, USACE						0	Action is considered In-Kind
CMC-CCCS-6.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-6.1.1	Recovery Action	Habitat Complexity	Improve large wood frequency										
CMC-CCCS-6.1.1.1	Action Step	Habitat Complexity	Increase wood frequency in spawning and rearing areas to the extent that a minimum of six key LWD pieces exists every 100 meters in 0-10 meters BFW streams.	2	15	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	5.33	5.33	5.33			16	Cost based on treating 0.5 miles at a rate of $31,200/mile. Cost likely higher if greater level of engineering and oversight is needed.

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-6.1.1.2	Action Step	Habitat Complexity	Develop strategies to optimize hydraulic diversity and habitat complexity when implementing/installing LWD structures.	3	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	8.00	8.00				16	Cost based on treating 0.5 miles at a rate of $31,200/mile. Cost likely higher if greater level of engineering and oversight is needed.
CMC-CCCS-6.1.1.3	Action Step	Habitat Complexity	Develop and install seasonal habitat rearing features that achieve optimal performance during spring/fall baseflow conditions throughout the watershed.	3	15	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	5.33	5.33	5.33			16	Cost based on treating 0.5 miles at a rate of $31,200/mile. Cost likely higher if greater level of engineering and oversight is needed.
CMC-CCCS-6.1.2	Recovery Action	Habitat Complexity	Improve frequency of primary pools										
CMC-CCCS-6.1.2.1	Action Step	Habitat Complexity	Increase the number of primary pools to the extent that more than 40% of summer rearing pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams.)	2	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-6.1.2.2	Action Step	Habitat Complexity	Evaluate, develop, and implement strategies to increase primary pool frequency in high priority reaches throughout the watershed.	3	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-6.1.2.3	Action Step	Habitat Complexity	Enhance pool depth: increase depth, cover, and complexity using CDFW protocols (SCWLFA 2006).	3	10	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-6.1.3	Recovery Action	Habitat Complexity	Improve shelter										
CMC-CCCS-6.1.3.1	Action Step	Habitat Complexity	Increase the number of pools that have a minimum shelter of 80 (See NMFS criteria).	3	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-6.1.3.2	Action Step	Habitat Complexity	Evaluate, identify, and improve shelters in pools throughout the watershed.	3	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-6.1.4	Recovery Action	Habitat Complexity	Improve pool/riffle/flatwater ratios (hydraulic diversity)										
CMC-CCCS-6.1.4.1	Action Step	Habitat Complexity	Evaluate, identify, and develop strategies that will encourage riffle habitat formation throughout the watershed.	3	10	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-7.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-7.1.1	Recovery Action	Riparian	Improve canopy cover										
CMC-CCCS-7.1.1.1	Action Step	Riparian	Increase the average stream canopy cover within all current and potential spawning and rearing reaches to a minimum of 80%.	2	5	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	99.00					99	Cost based on treating 0.2 miles (assume 1 project/mile in 5% high IP with 20 acres/mile treated) at a rate of $24,682/acre
CMC-CCCS-7.1.1.2	Action Step	Riparian	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to; initiate tree planting and other vegetation management to encourage the development of a denser more extensive riparian canopy.	3	25	Friends of Corte Madera Creek, Marin County, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-7.1.1.3	Action Step	Riparian	Increase the stream canopy by planting appropriate native riparian trees and shrubs along the stream where shade canopy is not at acceptable levels. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.	2	25	Marin County, Marin RCD, MMWD						0	Cost accounted for in above action steps.

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Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-7.1.1.4	Action Step	Riparian	Assess riparian canopy and impacts of exotic vegetation (e.g., Arundo donax, etc.), prioritize and develop riparian habitat reclamation and enhancement programs (CDFG 2004).	3	10	Marin County, Marin RCD, MMWD	44.50	44.50				89	Cost based on riparian restoration model at a rate of $88,551/project.
CMC-CCCS-7.1.1.5	Action Step	Riparian	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to land management activities (roads, cattle, flood control, etc.).	2	25	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-7.1.1.6	Action Step	Riparian	Evaluate, design, and implement strategies to rehabilitate native riparian communities and encourage large long standing trees.	3	10	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-7.1.1.7	Action Step	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers.	3	25	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-7.1.1.8	Action Step	Riparian	Develop and implement appropriate tree plantings strategies in efforts to rehabilitate summer rearing habitat for juvenile steelhead.	2	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality to reduce embeddedness										
CMC-CCCS-8.1.1.1	Action Step	Sediment	Increase the percentage of pool tail-out embeddness with values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) within all spawning reaches.	2	15	Friends of Corte Madera Creek, Marin County, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-8.1.1.2	Action Step	Sediment	Evaluate. develop, and implement spawning gravel augmentation programs in essential areas.	3	15	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	0.67	0.67	0.67			2	Cost based on treating 0.5 miles (assume 1 project/mile in 5% high IP with 100 cu. yds.mile) at a rate of $39.52/cu. yd.
CMC-CCCS-8.1.1.3	Action Step	Sediment	Add channel roughness (logs, boulders) in strategic locations to encourage spawning tailout formations and gravel sorting.	2	15	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-8.1.2	Recovery Action	Sediment	Improve gravel quantity and distribution for macro-invertebrate production (food)										
CMC-CCCS-8.1.2.1	Action Step	Sediment	Increase the percentage of gravel quality embeddedness to values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) in all current and potential juvenile salmonid summer and seasonal (fall/winter/spring) rearing areas.	2	15	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-8.1.2.2	Action Step	Sediment	Increase stream bed and bank stability using biotechnical materials (vegetation, plant fiber, and native wood and rock), where appropriate (SCWLFA 2006).	2	15	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-8.1.2.3	Action Step	Sediment	Re-mediate upland sources (prevent eroded soils form entering the stream system) (SCWLFA 2006).	3	20	Caltrans, CDFW, FHWA, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-8.1.2.4	Action Step	Sediment	Add channel roughness features (logs, large boulders) to trap cobbles in current and potential seasonal reaches.	2	15	CDFW, Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
CMC-CCCS-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-10.1.1	Recovery Action	Water Quality	Reduce toxicity and pollutants										
CMC-CCCS-10.1.1.1	Action Step	Water Quality	Address water pollution from non-point sources within the watershed through outreach, education and enforcement.	3	10	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-10.1.1.2	Action Step	Water Quality	Identify and remediate sources of pulses of water originating from human activities (e.g. flushing of swimming pools, etc.).	1	10	CDFW, Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-10.1.1.3	Action Step	Water Quality	Identify nutrient loading sources causing poor water quality conditions for steelhead and implement strategies for remediating or avoiding future inputs of pollution to watershed streams.	3	10	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
CMC-CCCS-10.1.1.4	Action Step	Water Quality	Avoid, or at a minimum mimimize, the use of commercial and industrial products (e.g., pesticides) with high potential for contamination of local waterways.	2	10	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-10.1.1.5	Action Step	Water Quality	Encourage the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	3	25	Caltrans, CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD, NMFS						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-10.1.1.6	Action Step	Water Quality	Identify and fix septic systems contributing to high nutrient loading.	3	10	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
CMC-CCCS-10.1.2	Recovery Action	Water Quality	Improve stream temperature conditions										
CMC-CCCS-10.1.2.1	Action Step	Water Quality	Implement comprehensive evaluation and monitoring program to determine areas where poor riparian habitat is contributing to increased water temperatures limiting juvenile steelhead survival and aquatic habitat potential.	3	10	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to riparian.
CMC-CCCS-10.1.2.2	Action Step	Water Quality	Rehabilitate or restore riparian corridor conditions within all current and potential high value habitat summer rearing areas.	3	10	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to riparian.

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-10.1.2.3	Action Step	Water Quality	Develop and implement appropriate tree plantings strategies in efforts to rehabilitate summer rearing habitat for juvenile steelhead.	3	10	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to riparian.
CMC-CCCS-10.1.3	Recovery Action	Water Quality	Reduce turbidity and suspended sediment										
CMC-CCCS-10.1.3.1	Action Step	Water Quality	Identify and remediate unstable banks and other sediment sources.	3	15	Caltrans, CDFW, FHWA, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
CMC-CCCS-10.1.3.2	Action Step	Water Quality	Where feasible, utilize native plants and bioengineering techniques to stabilize banks.	3	25	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-10.1.3.3	Action Step	Water Quality	Identify and implement strategies to reduce landslide hazard areas and other upslope sources of fine sediment (hillslope hollows, deep-seated landslides, etc.).	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
CMC-CCCS-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										
CMC-CCCS-11.1.1.1	Action Step	Viability	Conduct a comprehensive assessment of watershed processes (e.g., hydrology, geology, fluvial-geomorphology, water quality, and vegetation), instream habitat, and factors limiting steelhead production.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Cost will vary with assessment methods and level of detail.
CMC-CCCS-11.1.1.2	Action Step	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed.	3	25	CDFW, Marin County, Marin RCD, MMWD						0	Costs for adults spawner surveys are covered in the Monitoring Chapter.
CMC-CCCS-11.1.1.3	Action Step	Viability	Conduct habitat surveys to monitor change in key habitat variables.	3	25	CDFW, Marin County, Marin RCD, MMWD						0	Cost for conducting standarized habitat assessments will be developed for the Coastal Monitoring Plan.
CMC-CCCS-11.1.1.4	Action Step	Viability	Initiate smolt outmigration study and develop smolt abundance estimates.	2	10	CDFW, Marin County, Marin RCD, MMWD						0	Costs for smolt outmigration studies are covered in the Monitoring Chapter.
CMC-CCCS-11.1.1.5	Action Step	Viability	Develop standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas.	3	25	CDFW, Marin County, Marin RCD, MMWD						TBD	Cost will vary with assessment methods and level of detail.
CMC-CCCS-11.1.1.6	Action Step	Viability	Improve conditions for steelhead through supporting enforcement of environmental laws and regulations.	3	25	CDFW, Marin County, Marin RCD, MMWD, NMFS OLE						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-13.1	**Objective**	**Channel Modification**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-13.1.1.1	Action Step	Channel Modification	Flood control projects or other modifications facilitating new development (as opposed to protecting existing infrastructure) should be avoided.	3	25	Marin County, MMWD						0	Action is considered In-Kind.
CMC-CCCS-13.1.1.2	Action Step	Channel Modification	Review channel modification activities to prevent or minimize future impediments blocking access to off channel habitat used by salmonids as refuge and winter rearing habitat during high stream flows.	2	25	Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-13.1.1.3	Action Step	Channel Modification	Improve channel capacity and habitat quality by incorporating measures identified in the Marin County Public Works Critical Reach Analysis (2011).	2	10	CDFW, Marin County, NMFS, USACE						TBD	Costs cannot be determined until specific projects are identifies and designed. The USACE may contibute at least in their flood control section of Corte Madera and Ross Creeks.
CMC-CCCS-13.1.2	Recovery Action	Channel Modification	Prevent or minimize impairment to habitat complexity (altered pool complexity and/or pool, riffle ratio)										
CMC-CCCS-13.1.2.1	Action Step	Channel Modification	All proposed flood control projects should include habitat protection, and/or features to create salmonid habitat diversity.	2	15	Marin County, Marin RCD, MMWD	892	892	892			2,677	Cost based on treating 0.25 miles (assume 1 project/mile in 25% of flood control channel) at a rate of $1,070,400/mile.
CMC-CCCS-13.1.2.2	Action Step	Channel Modification	Ensure future retention and recruitment of large woody debris and root wads to rehabilitate existing stream complexity, pool frequency, and depth.	3	15	Marin County, MMWD						0	Action is considered In-Kind
CMC-CCCS-13.1.2.3	Action Step	Channel Modification	Protect existing natural channel reaches from channelization and enhance winter refuge and seasonal habitat features where appropriate.	2	15	Marin County, MMWD						0	Cost is dependent on extent and method of enhancement
CMC-CCCS-13.1.3	Recovery Action	Channel Modification	Prevent or minimize impairment to habitat complexity (reduce large wood and/or shelter)										
CMC-CCCS-13.1.3.1	Action Step	Channel Modification	All proposed levees should be designed to account for minimal maintenance associated with an intact and functioning riparian zone.	3	25	Marin County, MMWD						0	Action is considered In-Kind
CMC-CCCS-13.1.3.2	Action Step	Channel Modification	Identify locations where channel modification, including existing flood control projects, has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to improve these conditions. Consider flow rates and discharges when designing LWD and shelter enhancement features.	2	15	Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
CMC-CCCS-13.1.3.3	Action Step	Channel Modification	Incorporate velocity refuge habitat features in all future and existing engineered and modified channels.	2	20	Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
CMC-CCCS-13.1.3.4	Action Step	Channel Modification	Prevent any future removal of habitat forming structures (LWD, boulders, vegetation, etc.) in natural waterways.	3	15	Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-13.1.4	Recovery Action	Channel Modification	Prevent or minimize impairment to stream hydrology (impaired water flow)										
CMC-CCCS-13.1.4.1	Action Step	Channel Modification	Conduct rehabilitation activities that restore channels, floodplains and meadows to extend the duration of the summer flow and provide refuge from high winter flows.	2	15	Marin County, Marin RCD, MMWD						0	Cost accounted for in FLOODPLAIN CONNECTIVITY
CMC-CCCS-18.1	**Objective**	**Livestock**	**Address the present of threatened destruction, modification or curtailment of the species habitat or range**										

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Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-18.1.1	Recovery Action	Livestock	Prevent or minimize impairment to habitat complexity (reduced large wood and/or shelter)										
CMC-CCCS-18.1.1.1	Action Step	Livestock	Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to provide future recruitment of large wood and other shelter components.	3	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD, Private Landowners	197.50	197.50				395	Cost based on treating 0.2 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $24,682/acre.
CMC-CCCS-18.1.2	Recovery Action	Livestock	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										
CMC-CCCS-18.1.2.1	Action Step	Livestock	Complete Farm Conservation Plans (through the SRCD, NRCS, Fish Friendly Farming program or other cooperative conservation programs) to reduce sediment sources and improve riparian habitat within the watershed.	3	10	Marin County, Marin RCD, NRCS						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-18.1.2.2	Action Step	Livestock	Maintain adequate stream corridor buffers to filter and prevent fine sediment input from entering streams of the watershed.	2	25	Marin County, Marin RCD, MMWD, Private Landowners						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-18.1.2.3	Action Step	Livestock	Encourage the NRCS, RCDs, and other appropriate organizations to increase the number of landowners participating in sediment reduction planning and implementation.	3	15	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD, NMFS						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-18.1.3	Recovery Action	Livestock	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
CMC-CCCS-18.1.3.1	Action Step	Livestock	Reduce discharge of chemical effluent and fertilizer related to agricultural practices.	2	25	Marin County, Marin RCD, MMWD, Private Landowners						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-18.1.4	Recovery Action	Livestock	Prevent or minimize alterations to riparian species composition and structure										
CMC-CCCS-18.1.4.1	Action Step	Livestock	Re-establish native plant communities in riparian zones to increase stream canopy to a minimum of 80%.	3	25	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						0	Cost accounted for in RIPARIAN
CMC-CCCS-18.1.4.2	Action Step	Livestock	Develop and implement riparian setbacks/buffers that protect existing native riparian species composition and structure.	3	10	Marin County, MMWD						0	Cost accounted for in RIPARIAN
CMC-CCCS-18.1.4.3	Action Step	Livestock	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to agricultural activities.	3	25	Marin County, MMWD, Private Landowners						0	Action is considered In-Kind
CMC-CCCS-22.1	**Objective**	**Residential/ Commercial Development**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-22.1.1	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to the estuary (impaired quality and extent)										

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-22.1.1.1	Action Step	Residential/ Commercial Development	Reduce and prevent habitat modification that has caused, is causing, or may cause impaired habitat conditions affecting juveniles by minimizing adverse effects of future development in and around the bay. When development is planned, implement projects that incorporate elements to protect and enhance habitat.	3	25	Marin County, MMWD						TBD	Action is considered In-Kind to reduce and prevent the habitat modifications, the implementation is TBD
CMC-CCCS-22.1.1.2	Action Step	Residential/ Commercial Development	Curtail further development in active wetlands through zoning restrictions, county master plans and other Federal, State, and county planning and regulatory processes, and land protection agreements.	3	25	Marin County, USACE, USEPA						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-22.1.1.3	Action Step	Residential/ Commercial Development	Increase monitoring and enforcement of illegal bank or shoreline stabilization activities.	2	15	CDFW, Marin County, MMWD, NMFS OLE						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-22.1.1.4	Action Step	Residential/ Commercial Development	Promote native intertidal and subtidal vegetation through eradication and control of non-native species.	3	5	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	42.00					42	Cost based on treating 0.5 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $1,036/acre.
CMC-CCCS-22.1.2	Recovery Action	Residential/ Commercial Development	Prevent or minimize increased landscape disturbance										
CMC-CCCS-22.1.2.1	Action Step	Residential/ Commercial Development	Minimize new development, or road construction within floodplains, riparian areas, unstable soils or other sensitive areas.	3	25	FHWA, Marin County						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-22.1.2.2	Action Step	Residential/ Commercial Development	Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements.	3	15	Marin County, MMWD						TBD	Costs will vary depending on methods implemented. Costs for conservation easements vary.
CMC-CCCS-22.1.3	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
CMC-CCCS-22.1.3.1	Action Step	Residential/ Commercial Development	Minimize the future use of commercial and industrial products (e.g., pesticides) with high potential for contamination of local waterways.	3	25	Marin County, Marin RCD, MMWD, SWRCB						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-22.1.3.2	Action Step	Residential/ Commercial Development	Upgrade existing stormwater systems into a spatially distributed discharge network (rather than a few point discharges).	3	15	FHWA, Marin County, MMWD						TBD	
CMC-CCCS-22.1.3.3	Action Step	Residential/ Commercial Development	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining riparian vegetation, instream LWD, and LWD recruitment.	3	25	Caltrans, FHWA, Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-22.1.4	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
CMC-CCCS-22.1.4.1	Action Step	Residential/ Commercial Development	Avoid or minimize new development within 100-year floodprone zones.	3	25	Marin County, MMWD						0	Action is considered In-Kind
CMC-CCCS-22.1.4.2	Action Step	Residential/ Commercial Development	Rehabilitate areas where existing and dilapidated infrastructure impairs the quality of floodplain and winter rearing for habitat for steelhead within the watershed.	2	10	Marin County, Marin RCD, MMWD	89.00	89.00				179	Cost based on treating 0.2 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $44,640/acre.
CMC-CCCS-22.1.4.3	Action Step	Residential/ Commercial Development	Recalculate 100-year flood interval that takes into consideration global climate change and rising sea levels.	3	10	FHWA, Marin County, Marin RCD, MMWD						0	Action is considered In-Kind

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-22.1.5	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to stream hydrology (impaired water flow)										
CMC-CCCS-22.1.5.1	Action Step	Residential/ Commercial Development	Encourage and identify opportunities for on-site rain retention facilities.	2	15	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD, NMFS						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-22.1.5.2	Action Step	Residential/ Commercial Development	Develop filter or buffer systems that reduce pollutants from entering streams and waterways.	3	10	Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented. Estimate for filter or buffer strip system range from $11464 to $29,039/filter for a 25 ft. wide grass filter.
CMC-CCCS-22.1.6	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to hydrology (gravel scouring events)										
CMC-CCCS-22.1.6.1	Action Step	Residential/ Commercial Development	Minimize impervious surfaces in new and development projects (SCWLFA 2006).	3	25	Marin County, Marin RCD, MMWD, NMFS, NRCS, USACE						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-22.2	**Objective**	**Residential/ Commercial Development**	**Address the inadequacy of existing regulatory mechanisms**										
CMC-CCCS-22.2.1	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to stream hydrology (impaired water flow)										
CMC-CCCS-22.2.1.1	Action Step	Residential/ Commercial Development	Develop policy and guidelines that address land conversion and attempt to minimize conversion-related impacts within the aquatic environment.	3	10	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance										
CMC-CCCS-23.1.1.1	Action Step	Roads/Railroads	Decommission and or re-locate riparian roads upslope to achieve desirable riparian road density criteria (<0.1 to 0.4 Miles/Square Mile).	2	10	Caltrans, FHWA, Marin County	17.50	17.50				35	Cost based on decommissioning 2.4 miles of riparian road network at a rate of $14,440/mile. Cost will be significantly higher if riparian roads are part of urban/suburban infrastructure.
CMC-CCCS-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration										
CMC-CCCS-23.1.2.1	Action Step	Roads/Railroads	Ensure all future new, repair, and replacement road/stream crossing provide unimpaired passage for all steelhead life stages.	2	10	Caltrans, FHWA, Marin County						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-23.1.2.2	Action Step	Roads/Railroads	Use the results of the 2006 Corte Madera Stream Crossing Inventory and Fish Passage Evaluation to establish priorities for treatment of road-related passage barriers.	2	5	Caltrans, FHWA, Marin County						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-23.1.2.3	Action Step	Roads/Railroads	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001) and appropriate barrier databases when developing new or retrofitting existing road crossings.	2	5	Caltrans, FHWA, Marin County, NMFS						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-23.1.2.4	Action Step	Roads/Railroads	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) must accommodate 100-year flow event and associated sediment transport.	3	10	Caltrans, FHWA, Marin County						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-23.1.3.1	Action Step	Roads/Railroads	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) must accommodate 100-year flood flows and associated bedload and debris.	3	10	Caltrans, FHWA, Marin County						0	Costs accounted for in previous actions related to passage and migration.
CMC-CCCS-23.1.3.2	Action Step	Roads/Railroads	Utilize best management practices for road construction, maintenance, management and decommissioning (e.g., Fishnet 4c County Roads Manual; Hagans & Weaver, 1994; Oregon Department of Transportation, 1999; Sommarstrom 2002).	2	25	Caltrans, FHWA, Marin County						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-23.1.3.3	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.	3	25	Caltrans, FHWA, Marin County						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-23.1.3.4	Action Step	Roads/Railroads	Minimize the construction of new roads near high value habitat areas or sensitive habitat areas.	3	25	Caltrans, FHWA, Marin County						0	Action is considered In-Kind
CMC-CCCS-23.1.3.5	Action Step	Roads/Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	3	25	Caltrans, FHWA, Marin County						TBD	
CMC-CCCS-23.1.4	Recovery Action	Roads/Railroads	Prevent or minimize impairment to stream hydrology (impaired water flow)										
CMC-CCCS-23.1.4.1	Action Step	Roads/Railroads	Conduct actions that hydrologically disconnect roads.	3	25	Caltrans, FHWA, Marin County, Marin RCD, Private Landowners						TBD	Cost based on number and type of methods used to hydrologically disconnect roads.
CMC-CCCS-23.1.5	Recovery Action	Roads/Railroads	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
CMC-CCCS-23.1.5.1	Action Step	Roads/Railroads	Assess and redesign transportation network to minimize road density and maximize transportation efficiency.	3	15	Caltrans, FHWA, Marin County, Marin RCD	86.00	86.00	86.00			258	Cost based on road inventory for 224 miles of road network at a rate of $1,148/mile.
CMC-CCCS-23.1.5.2	Action Step	Roads/Railroads	Establish a moratorium on new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.	3	25	Caltrans, FHWA, Marin County						TBD	
CMC-CCCS-23.1.5.3	Action Step	Roads/Railroads	Evaluate existing roadways within 200 meters of the riparian corridor, and develop plans to decrease the ongoing impacts associated with these roads.	3	10	Caltrans, FHWA, Marin County						0	Cost accounted for in other ROADS action steps.
CMC-CCCS-23.1.5.4	Action Step	Roads/Railroads	Reduce road densities by at least 10 percent over the next 10 years, prioritizing high risk areas.	3	10	Caltrans, FHWA, Marin County	159.00	159.00				318	Cost based on decommissioning 22 miles of road network at a rate of $14,440/mile.
CMC-CCCS-25.1	**Objective**	**Water Diversion /Impoundment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CMC-CCCS-25.1.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
CMC-CCCS-25.1.1.1	Action Step	Water Diversion /Impoundment	Assess and map water diversions (CDFG 2004).	3	5	CDFW, Marin County, Marin RCD, MMWD						TBD	Cost will vary with assessment methods and level of detail.
CMC-CCCS-25.1.1.2	Action Step	Water Diversion /Impoundment	Implement passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).	3	25	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented.

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-25.1.1.3	Action Step	Water Diversion /Impoundment	Identify and eliminate depletion of summer base flows from unauthorized water uses.	2	10	CDFW, Marin County, Marin RCD, MMWD, SWRCB						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-25.1.1.4	Action Step	Water Diversion /Impoundment	Identify areas where groundwater pumping or direct stream diversion is impacting stream water temperature and summer or fall baseflows.	2	10	Marin County, Marin RCD, MMWD, SWRCB						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-25.1.1.5	Action Step	Water Diversion /Impoundment	Develop strategies to reduce groundwater pumping impacts on summer and fall instream water temperatures and baseflows.	2	10	Marin County, Marin RCD, MMWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-25.1.1.6	Action Step	Water Diversion /Impoundment	Continue to prohibit new or increased surface water diversions for existing permit holders.	3	25	CDFW, Marin County, MMWD, SWRCB						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-25.1.1.7	Action Step	Water Diversion /Impoundment	Develop and implement alternative off-channel storage to reduce impacts of water diversions during the spring and summer.	3	25	CDFW, Marin County, Marin RCD, MMWD, Private Landowners						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-25.1.1.8	Action Step	Water Diversion /Impoundment	Work with partners to ensure that current and future water diversions (surface or groundwater) do not impair water quality conditions in summer or fall rearing reaches.	2	25	CDFW, Marin County, Marin RCD, MMWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-25.1.1.9	Action Step	Water Diversion /Impoundment	Work with SWRCB and landowners to improve survival and migration opportunities for all lifestages.	2	25	Marin County, Marin RCD, MMWD, Private Landowners, SWRCB						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-25.1.2	Recovery Action	Water Diversion /Impoundment	Prevent or minimize alterations to sediment transport (road conditions/density, dams etc.)										
CMC-CCCS-25.1.2.1	Action Step	Water Diversion /Impoundment	Evaluate effect of dams and weirs on sediment transportation rates.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Cost will vary with assessment methods and level of detail.
CMC-CCCS-25.1.2.2	Action Step	Water Diversion /Impoundment	Implement actions that minimize adverse effects of dams and weirs.	2	15	CDFW, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-25.1.2.3	Action Step	Water Diversion /Impoundment	Re-establish natural sediment delivery processes and implement sediment reduction activities where necessary.	3	15	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-25.1.3	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to passage and migration										
CMC-CCCS-25.1.3.1	Action Step	Water Diversion /Impoundment	Ensure water supply demands can be met without impacting flow either directly or indirectly through groundwater withdrawals and aquifer depletion.	2	25	CDFW, Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.
CMC-CCCS-25.1.3.2	Action Step	Water Diversion /Impoundment	Adequately screen water diversions to prevent entrainment of all steelhead life stages.	3	15	CDFW, Marin County, Marin RCD, MMWD, NMFS						TBD	Costs will vary depending on methods implemented and number of diversions to be screened.
CMC-CCCS-25.2	**Objective**	**Water Diversion /Impoundment**	**Address the inadequacy of existing regulatory mechanisms**										
CMC-CCCS-25.2.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										

Corte Madera Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CMC-CCCS-25.2.1.1	Action Step	Water Diversion /Impoundment	Support the development and implementation of groundwater use or direct diversion regulations.	3	15	CDFW, Marin County, Marin RCD, MMWD, NMFS						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-25.2.1.2	Action Step	Water Diversion /Impoundment	Allow all "fisheries flows" (baseflows, and passage, attractant, and channel maintenance flows) to bypass or flow through the diversion facilities.	1	5	CDFW, Marin County, MMWD, NMFS						0	Operations conducted normally or with minor modifications are considered In-Kind.
CMC-CCCS-25.2.1.3	Action Step	Water Diversion /Impoundment	Assess, map, and install stream gages on all water diversions (CDFG 2004).	3	5	CDFW, Marin County, Marin RCD, MMWD, NMFS						TBD	Costs will vary depending on methods implemented.
CMC-CCCS-25.2.1.4	Action Step	Water Diversion /Impoundment	Prevent and/or minimize the adverse effects of water diversion on salmonid habitat by establishing a more natural hydrograph, by-passing adequate downstream flows, regulating season of diversion, and promoting and implementing off-stream storage solutions (CDFG 2004).	1	5	CDFW, Marin County, Marin RCD, MMWD, NMFS, SWRCB						0	Operations conducted normally or with minor modifications are considered In-Kind.

Guadalupe River Population

CCC Steelhead Winter Run

- Role within DPS: Independent Population
- Diversity Stratum: Coastal San Francisco Bay
- Spawner Density Target: 1,800 adults
- Current Intrinsic Potential: 50.8 IP-km

Steelhead Abundance and Distribution

The approximately 177 square mile Guadalupe River watershed contains about 70 miles of perennial channel (NMFS GIS 2008). Systematic adult or juvenile fish surveys covering a substantial period of time have not been conducted within the Guadalupe River watershed, so accurately estimating past adult or juvenile fish abundance is difficult. However, accounts and reports do indicate the historical presence of a sustained steelhead run within the Guadalupe River system, although the size of this run may have been somewhat limited by the arid nature of the watershed (Leidy *et al.* 2005). Migratory barriers restrict current steelhead distribution to approximately 46 miles of stream channel, limited to mainstem Guadalupe River (formed at the confluence of Guadalupe and Alamitos creeks) and its four main tributaries: Los Gatos Creek, Guadalupe Creek, Alamitos Creek, and Arroyo Calero (NMFS GIS 2011). The upstream limits of anadromy on Los Gatos Creek, Guadalupe Creek, Alamitos Creek, and Arroyo Calero are: the Camden Avenue drop structure, Guadalupe Reservoir, Almaden Reservoir, and Calero Reservoir, respectively (NMFS GIS 2008 and 2011). Significant additional barriers also exist on Los Gatos Creek upstream of the Camden Avenue Drop structure (NMFS 2008). Within the Guadalupe River system, year-round flows that sustain current steelhead distribution are primarily maintained via releases from Guadalupe, Almaden, Lexington, and Calero reservoirs (Santa Clara Valley Water District *et al.* 2003).

Leidy *et al*. (2005) noted *O. mykiss* distribution within the following creeks currently upstream of known anthropogenic barriers to anadromy: Los Gatos Creek and its above-reservoir tributary Austrian Gulch; Guadalupe Creek and its below-reservoir tributaries of Pheasant and Hicks creeks, and its above-reservoir tributary, Rincon Creek; Alamitos Creek and its above-reservoir tributaries of Barrett, and Herbert creeks; and Arroyo Calero, indicating that suitable salmonid habitat persists within these reaches. With the exception of Los Gatos Creek, which would require numerous passage projects and stream restorations spanning several miles of channel, anthropogenic habitat alterations and migratory barriers within these above-barrier reaches remain limited (NMFS GIS 2008), suggesting that they could support an anadromous steelhead population once again if passage were restored.

History of Land Use

A discussion regarding the progression of development and land use within the Guadalupe River watershed and the broader Santa Clara Valley is available in SCBWMI (2001). In general, watershed alterations began in the mid to late 1700s with the establishment of Spanish missions and settlements in the area; agricultural and light suburban development gradually transitioned to more intensive suburban, and then urban development, as the primary land uses within the watershed. Presently, approximately 51% of the watershed by area is developed as urban land uses (NMFS GIS 2008). Most urban development is concentrated within the watershed area downstream of the reservoirs on Guadalupe Creek, Alamitos Creek, and Arroyo Calero, and downstream of the Camden Avenue drop structure on Los Gatos Creek (see *Residential and Commercial Development*, below) where steelhead presently have access. Urbanization and reservoir operations have important effects on watershed processes, hydrology, passage, and instream habitat within the Guadalupe River system.

Current Resources and Land Management

By percentage, approximately 92 percent of the Guadalupe River watershed is privately held. Approximately 5 percent is a combination of local (city/county) parks and recreational holdings, while the remaining 3 percent is federally owned and managed by the U. S. Fish and Wildlife Service (NMFS GIS 2008).

Within the Santa Clara Valley, the Santa Clara Valley Water District (SCVWD) is the primary water resource agency (SCVWD 2011 A). Within the Guadalupe River watershed, SCVWD provides flood control services, performs stewardship duties, and operates water–system infrastructure (including Guadalupe Reservoir, Almaden Reservoir, and Calero Reservoir, and numerous instream diversion and ground-water recharge facilities). Additional water-system development occurs within the watershed. Additionally, the SCVWD is in the process of drafting a Habitat Conservation Plan [the Three Creeks Habitat Conservation Plan (TC-HCP)] to address current and future operations throughout its coverage area, including the Guadalupe River system, which limits conditions for steelhead, as well as a host of Federal and state-listed and special-concern species. The schedule for finalizing and implementing the TC-HCP is uncertain at the time of this assessment; NMFS and SCVWD are currently involved in ongoing discussions towards the goal of a plan that will improve instream conditions for steelhead.

Resource management within the basin, including survey and instream restoration efforts, is largely carried out by SCVWD. However, a host of public interest groups, including Santa Clara Valley Audubon Society, CLEAN South Bay, Santa Clara County Creeks Coalition, and the

California Nature Conservancy, are active within the Guadalupe River watershed. For more information on the organizations active in Guadalupe River Watershed see SCBWMI 2001, SCBWMI 2003, and SCBWMI 2011.

Salmonid Viability and Watershed Conditions

The following habitat attributes were rated Poor through the CAP process: passage/migration, sediment, velocity refuge, water quality, viability, sediment, estuary/lagoon, hydrology, habitat complexity, landscape patterns, and sediment transport. Recovery strategies will typically focus on ameliorating these habitat indicators, although strategies that address other indicators may also be developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed.

Current Conditions

The following discussion focuses on those conditions that were rated Fair or Poor as a result of our CAP viability analysis. The Guadalupe River CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

Population and Habitat Conditions

Water Quality: Turbidity or Toxicity

Water quality is limiting steelhead survival in the Guadalupe River watershed. Entrix (2000) identifies water quality as a primary factor constraining habitat quality in the Guadalupe River. Furthermore, the United States Environmental Protection Agency (USEPA) lists the Guadalupe River, Alamitos Creek, Guadalupe Creek, Calero Reservoir, and Guadalupe Reservoir as impaired waterbodies (USEPA 2011). USEPA (2011) also lists Los Gatos Creek as a threatened waterbody. Water quality is impaired by debris, metals (other than mercury), mercury, pesticides, and unknown toxicity. Several water quality attainment measures are currently threatened, including cold freshwater habitat and groundwater recharge, and likely affect steelhead distribution and survival. Additionally, historic mercury mining operations in the Guadalupe River watershed have resulted in high concentrations of mercury within the system that persist to this day; affecting water quality and steelhead condition (see *Mining*, below). Threats contributing significantly to this condition include: Mining, and Roads and Railroads.

Sediment: Gravel Quality and Distribution of Spawning Gravels

Sediment transport, and thereby instream substrate and its ability to support spawning and invertebrate food resources, are highly affected by development and water system management within the Guadalupe River system. Generally, overall distribution of high quality stream

substrate in the watershed is affected by reservoirs that block access to above-reservoir habitat, block downstream transport of sediment, and affect sediment transport within downstream reaches due to hydrograph alterations. Additionally, urbanization and flood control projects within lower gradient reaches downstream of reservoirs, to which steelhead distribution is currently confined, likely result in accumulation of fines that can also impair substrate quality. Entrix (2000) identifies food productivity and transport as insufficient or constraining in: Los Gatos, Alamitos and Calero creeks, and the Guadalupe River. Threats contributing significantly to this condition include: Channel Modification; and Water Diversion and Impoundments.

Viability: Density, Abundance, and Spatial Structure

The presence of significant barriers likely limit abundance and distribution of all lifestages by blocking adult migration, limiting smolt outmigration, and constraining up- and down-channel movement of juveniles (further discussion on barriers is provided below in *Impaired Passage and Migration*). Although the Guadalupe River system currently supports a reproducing steelhead population and non-migratory *O. mykiss* persist in upper portions of the watershed (Leidy *et al.* 2005; Becker *et al.* 2007), Leidy *et al.* (2005) note that substantial alteration of the lower watershed for flood control as well as construction of dams and other passage barriers has restricted anadromous salmonid habitat in the drainage to a fraction of its original extent . . . [and] the steelhead population had declined significantly by 1962 following construction of reservoirs on all main tributaries and the construction of a drop structure upstream of Blossom Hill Road (Alamitos Drop Structure).

Recent restoration efforts have reconnected some access within the watershed, likely improving the ability of the system to support increased steelhead abundance. For example, fishway installation at the Alamitos Drop Structure (located on the Guadalupe River) and Masson Dam (located on Guadalupe Creek) in 1999 and 2000 respectively, has reconnected passage to 17 miles of upstream habitat (Nishijima *et al.* 2009). Monitoring performed by SCVWD (Nishijima *et al.* 2009) has documented passage of steelhead through these structures, and associated spawning surveys have identified steelhead redds within upstream reaches (Nishijima *et al.* 2009).

Steelhead density estimates within the watershed are limited. However, summertime electrofishing surveys performed downstream of Guadalupe Reservoir in August 2000 (Li 2001), and Guadalupe River and Guadalupe Creek between 2004 and 2009 (inclusive) (Nishijima 2011) encountered average densities of approximately 0.29- and 0.23 steelhead *O. mykiss* (multiple year classes) per linear foot, respectively. Additional studies and reports performed by SCVWD documenting *O. mykiss* in the system include construction related fish relocation efforts (Fields 2011), and trapping studies (Porcella 2002). Further steelhead density and distribution information for the Guadalupe River system is limited, and although *O. mykiss* are known to

persist above reservoirs, densities within above-reservoir reaches are not well known. Threats contributing significantly to this condition include: Channel Modification and Water Diversion and Impoundments.

Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios

Habitat assessment summaries (Entrix 2000) indicate instream habitat complexity is lacking within Los Gatos, Alamitos and Calero creeks, and the Guadalupe River. Cover and spawning habitat availability was rated as Poor or limiting within the Guadalupe River and Alamitos, Calero, and Los Gatos creeks, and rearing habitat was rated as limiting for the Guadalupe River and Los Gatos Creek (Entrix 2000). These impaired stream functions are an effect likely associated with reservoir-related hydrology alterations and the high concentrations of development within the watershed (see *Residential and Commercial Development*, below). Some fair to good quality rearing and spawning habitat is present (although in limited quantities) in Guadalupe, Pheasant, and Calero creeks (Entrix 2000).

Above-reservoir data are limited, but considering that these reaches continue to support *O. mykiss* (Leidy *et al.* 2005), and above-reservoir development is relatively limited (NMFS GIS 2008), it is likely they contain high quality habitat and would suitably support steelhead spawning and rearing. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Hydrology: Baseflow and Passage Flows

Primary factors affecting hydrology in the Guadalupe River watershed include flow regulation downstream of reservoirs and urbanization (e.g., channelization, increased impervious surfaces, and flood control projects). A historically intermittent stream system, seasonal drying is a limiting factor within some reaches of the Guadalupe River watershed. Current reservoir operations provide flows that extend the summer rearing habitat to reaches downstream of historical limits. Threats contributing significantly to this condition include: Channel Modification, Residential and Commercial Development, Roads and Railroads, and Water Diversions and Impoundments.

Passage/Migration: Mouth or Confluence and Physical Barriers

Numerous passage and migration impairments exist within the Guadalupe River system. Dams and urban development completely block passage to approximately 82 percent of the stream miles in the Guadalupe River watershed (NMFS GIS 2011), precluding access to historically important spawning and rearing reaches. Additionally, numerous partial or seasonal barriers exist downstream of complete barriers (Cleugh and Mcknight 2002, NMFS GIS 2008), impairing hydrology, constraining adult migration, and limiting juvenile movement throughout the

remaining accessible habitat. Threats contributing significantly to this condition include: Channel Modification; Roads and Railroads; and Water Diversions and Impoundments.

Velocity Refuge: Floodplain Connectivity

Floodplain habitat and function within the Guadalupe River is currently impaired, primarily due to urbanization and the resulting effects of altered hydrology and channel confinement. However, future restoration efforts are expected to improve connectivity between stream channel and floodplain habitat in some locations within the Guadalupe River. Similarly, the installation of flood control projects that remediate out-dated flood control methods and incorporate methods that allow for steam functions, such as efforts underway to design some reaches of the Upper Guadalupe River Flood control Project (Gurin et. al. 2010; Philip Williams and Associates, Ltd. and H.T. Harvey and Associates 2011) to better allow stream functions, may benefit steelhead by improving floodplain connectivity and instream habitat quality. Since floodplain connectivity has in many cases been irretrievably lost due to urbanization, and the overall degraded condition is expected to persist throughout much of the system, improvements such as these are critically important for recovery of the steelhead population. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Sediment Transport: Road Density

Within the CAP workbook, road density is used to indicate the degree of sediment transport alteration within the watershed. The Guadalupe River watershed has high road densities concentrated within urbanized areas downstream of the reservoirs (NMFS GIS 2008). Altered flow patterns and channel alterations, together with reduced sediment supply downstream of the dam and fine sediment input both above and below the reservoir, likely affect sediment transport in the Guadalupe River system. Ongoing substrate movement studies and gravel augmentation efforts are being performed by SCVWD to aide understanding of, and address, sediment transport limitations in the system. Upstream of reservoirs, sediment transport processes in the Guadalupe River watershed are likely minimally altered. Threats contributing significantly to this condition include: Channel Modification; and Water Diversions and Impoundments.

Landscape Patterns: Agriculture, Timber Harvest and Urbanization

Major landscape disturbance within the Guadalupe River system is primarily associated with urban development. Approximately half of the entire Guadalupe watershed is developed as urban land uses (NMFS GIS 2008), with most urbanization concentrated within the watershed area downstream of the reservoirs (Lexington, Guadalupe, Almaden, and Calero). Due to these impassable reservoirs, the current spatial extent of urbanization limits the current steelhead distribution within the watershed, and steelhead are likely affected to a high degree by altered

watershed processes resulting from these landscaped disturbances. Threats contributing significantly to this condition include: Water Diversions and Impoundments.

Habitat Complexity: Large Wood and Shelter

Habitat providing instream cover is limited within the Guadalupe River and Los Gatos, Alamitos, and Calero creeks (Entrix 2000). Throughout the urbanized reaches downstream of reservoirs, many reaches have been armored and channelized to minimize flood risk. Furthermore, the large urban interface between the stream environment and upslope areas that traditionally supplied LWD has likely impaired wood recruitment to the stream. Juvenile steelhead within these LWD-poor reaches most likely experience reduced summer survival and growth due to poor shelter condition. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Roads and Railroads.

Threats

The following discussion focuses on those threats that rate as High or Very High (See Guadalupe River CAP Results). Recovery strategies will likely focus on ameliorating High rated threats; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts.

Channel Modification

Much of the Guadalupe River system, especially the downstream most reaches, has been channelized. Channel modification, combined with other channel and landscape altering practices, has destroyed estuarine habitat, disconnected streams from their floodplains, and constrained natural fluvial and geomorphic processes that create and maintain instream and riparian habitat that support viable steelhead populations.

Residential and Commercial Development

The 2010 census estimated the population within the Guadalupe river watershed area at over 529,006 individuals; 44% of the watershed has a housing density higher than 1 unit per 20 acres, and 21% of the watershed area is developed as urban land uses (NMFS GIS 2015). Development is concentrated within the watershed area downstream of the reservoirs (Lexington, Guadalupe, Almaden, and Calero) with 76% of the watershed area downstream of these reservoirs developed as urban (NMFS GIS 2011). Intensive and widespread urban development has increased the impervious surface area, greatly impacting hydrology as well as the pollutant level within the aquatic environment, and impaired instream conditions (passage, instream habitat, hydrology, and floodplain connection) necessary for the support of a robust steelhead population. The

current spatial extent of this urbanization traces the current steelhead distribution in the Guadalupe River watershed, suggesting that steelhead are likely affected to a high degree.

Roads and Railroads

Road networks within the Guadalupe River watershed are largely paved systems associated with urban development, and represent a significant source of the total impervious surface within the basin. Further, the Guadalupe River watershed has a relatively high concentration of roads within riparian zones (4.8 miles of roads per square mile of 100 meter riparian buffer) (NMFS GIS 2008). Roadways in the Guadalupe River system amplify storm flow intensity and duration during winter, and deliver road-born pollution (e.g., oils, urban runoff, etc.) directly to the aquatic system.

Water Diversion and Impoundments

The Guadalupe River watershed is highly affected by water management operations. These water management operations affect all lifestages of steelhead by blocking passage, limiting migration periods, and altering hydrology and instream habitat. Lexington, Guadalupe, Almaden, and Calero reservoirs, and water diversions downstream of these reservoirs, affect hydrology and instream habitat quality. For further discussion on the effects of water diversion and impoundments on the *O. mykiss* population in the Guadalupe River watershed, see the above sections: *Sediment Transport: Road Density; Velocity Refuge: Floodplain Connectivity; Passage/Migration: Mouth or Confluence and Physical Barriers; Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios; Sediment: Gravel Quality and Distribution of Spawning Gravels; Viability: Density, Abundance, and Spatial Structure.*

Mining

Although there are no ongoing mining operations within the Guadalupe River watershed, historic mercury mining operations in the upper watersheds of Guadalupe and Alamitos creeks have a legacy effect on water quality and instream habitat. Mercury continues to leach from some of the former mining locations, and mercury-laden sediments are present throughout the watershed downstream. These toxic compounds have a continuing impact on ecosystem health (SCVWD 2011B), and limit instream conditions for salmonids. The SCVWD notes that the effects of mercury in the water and on fish assemblages are the single largest health concern in the Alamitos Creek watershed and throughout the South (San Francisco) Bay (SCVWD 2011B). Through its Stewardship Plan for Guadalupe and Alamitos creeks, the SCVWD envisions reducing existing sources and levels of mercury contamination (SCVWD 2011B).

Limiting Stresses, Lifestages, and Habitats

Threat and stress analyses within the CAP workbook suggest that all lifestages are limited by impaired conditions within the Guadalupe River watershed. Primary factors contributing to habitat limitations and limited steelhead abundance are extensive watershed development for urban, suburban, and commercial land uses, and municipal water system development. All reservoirs within the watershed are complete barriers to migration, and downstream of these reservoirs numerous partial barriers exist, affecting movement of adults and juveniles. Restoration actions should target addressing habitat constraints within stream reaches with high potential to benefit steelhead recovery, and should consider above-reservoir passage in order to provide access to important spawning and rearing reaches.

General Recovery Strategy

Passage Downstream of Reservoirs

Passage barriers downstream of reservoirs in the Guadalupe River watershed should be systematically and opportunistically remediated. Passage improvement is of the highest priority in the Guadalupe River watershed.

Passage above Reservoirs

The above-reservoir reaches were historically important for the support of a robust steelhead population within the Guadalupe River system, and the habitat and function of these above-reservoir reaches cannot be effectively replaced through enhancement of downstream reaches due to natural differences in gradient and hydrology between the below- and above-reservoir reaches, and the effects of anthropogenic landscape alteration (e.g., urbanization and floodplain development) within the below-reservoir reaches. Reservoirs in the Guadalupe River watershed were assessed for passage options and passage is recommended for Lake Almaden and Guadalupe Reservoir (See Appendix H for more information). Biologically sound passage programs or volitional passage facilities should be evaluated and implemented.

Reservoir Reoperation to Benefit All Lifestages of Steelhead

Reservoirs in the Guadalupe River watershed should be operated in such a manner as to benefit all lifestages of steelhead. Considerations should include, but not be limited to: water temperature, flow velocity, ramping rates (as necessary to prevent egg scour, or displacement or stranding of juveniles), sediment transport, channel maintenance, instream habitat, adult and smolt migratory cues, and, to the greatest degree possible, providing a natural (unimpaired) hydrograph.

Minimize Diversions and Diversion Effects Downstream of the Reservoir

The effects of diversion operations downstream of reservoirs should be evaluated. If these operations are found to be detrimental to steelhead or their habitat, they should be either curtailed or re-operated to benefit all steelhead lifestages.

Assess Imported Water Uses for Affects to Steelhead

A detailed study assessing the effect of imported water on the steelhead population within the Guadalupe River watershed should be implemented. The degree to which this practice affects the steelhead population is not well known. The study should include recommendations to minimize, and where feasible, curtail this practice within the Guadalupe River system if effects are determined to be detrimental.

Side Channel and Floodplain Reconnection

Where not limited by existing development, efforts should be made to reconnect floodplain habitat and increase channel complexity by reconnecting side channel habitat with the active stream channel. When possible, existing development should be retrofitted to restore connectivity between streams and adjacent floodplain and flood bench habitat, and to allow for natural channel functions.

Improve Sediment Transport

Restoration efforts should focus on providing channel maintenance/forming flows necessary to mobilize bedload material throughout the watershed downstream of reservoirs and impoundments, provide suitable gravel material from upstream sources, and remove/remediate structures and areas of the stream that impair sediment transport processes.

Increase Instream Habitat and Cover, and Increase Instream Channel Complexity

Instream habitat and cover should be improved. Methods may include placing large woody debris, rock weirs, and boulders within affected reaches. All structures should be designed to function within the known range of flows at any given project site in order to provide for the needs of all steelhead lifestages.

Increase Instream Shelter Ratings and Pool Volume

Due largely to an absence of LWD and limited channel complexity, shelter and cover ratings are Low within much of the Guadalupe River watershed downstream of the reservoirs. Where applicable, restoration efforts should incorporate instream wood/boulder structures into degraded reaches to improve habitat complexity and shelter availability.

Improve Water Quality

Efforts should be made to improve water quality throughout the Guadalupe River system. In particular, efforts should focus on limiting or treating urban runoff, remediating mercury mine sites and locations with mercury-laden sediments, and limiting input of debris and toxic substances.

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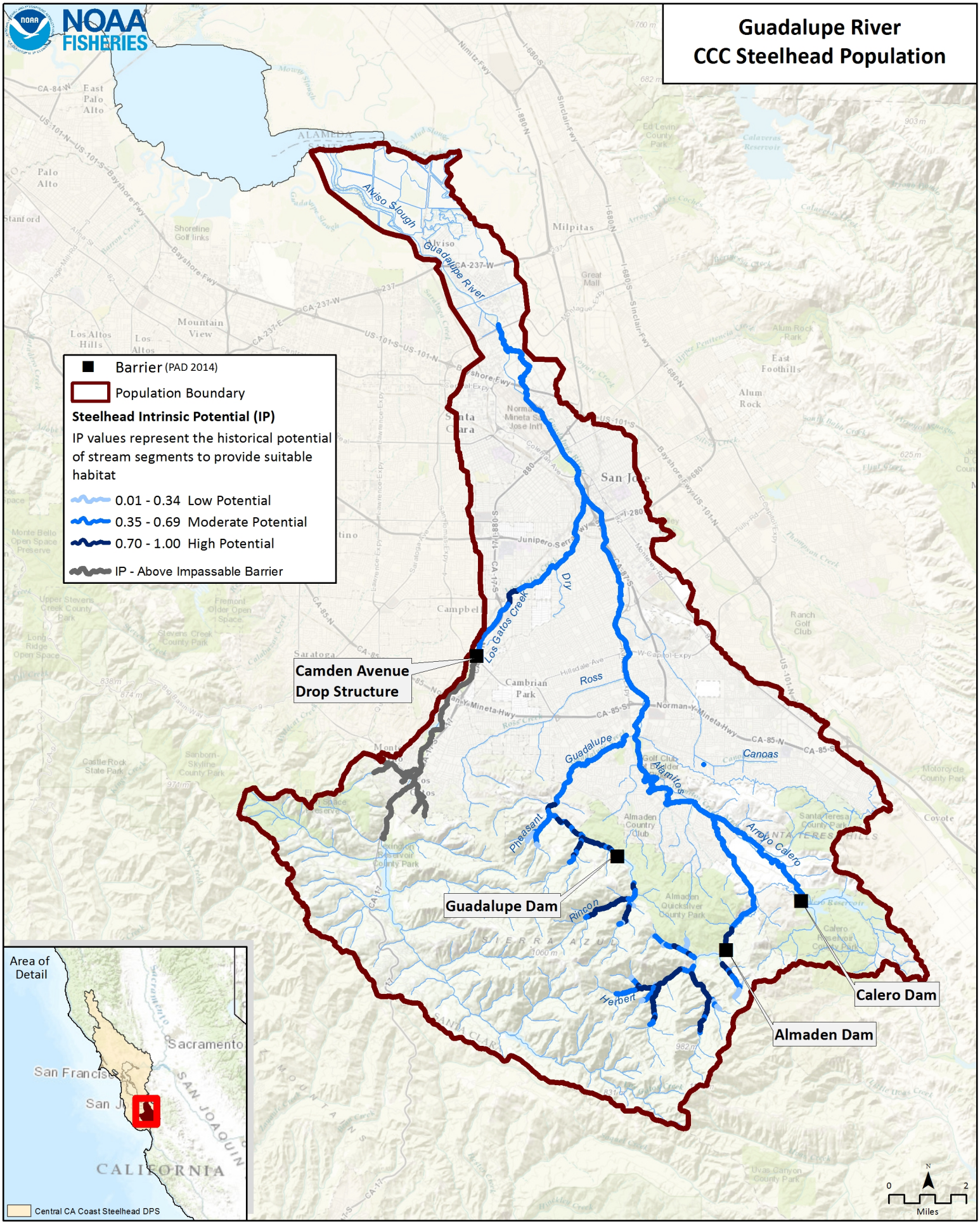
Guadalupe River
CCC Steelhead Population
NOAA FISHERIES
Barrier (PAD 2014)
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
IP - Above Impassable Barrier
Camden Avenue Drop Structure
Guadalupe Dam
Calero Dam
Almaden Dam
Alviso Slough
Guadalupe River
Los Gatos Creek
Dry
Ross
Guadalupe
Alamitos
Canoas
Pheasant
Rincon
Herbert
Arroyo Calero
Area of Detail
Sacramento
San Francisco
CALIFORNIA
Central CA Coast Steelhead DPS
0
2
Miles

#	Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Measurement	Current Rating
1	Adults	Condition	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	Fair
			Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-km (>40% Pools; >20% Riffles)	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-km (>80 stream average)	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	70-79% Density rating "D" across IP-km	Fair

			Sediment	Quantity & Distribution of Spawning Gravels	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<1 spawner per IP-km to < low risk spawner density per Spence (2008)	>1 spawner per IP-km to < low risk spawner density per Spence (2008)	low risk spawner density per Spence (2008)		<1 spawner per IP-km to < low risk spawner density per Spence (2008)	Poor
2	Eggs	Condition	Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Redd Scour	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	<12% (0.85mm) and <30% (6.4mm)	>17% (0.85mm) and >30% (6.4mm)	Poor
			Sediment	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	<50% of streams/ IP-km (>50% stream average scores of 1 & 2)	Poor
3	Summer Rearing Juveniles	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor

			Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	Fair
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Percent Primary Pools	<50% of streams/ IP-Km (>40% average primary pool frequency)	50% to 74% of streams/ IP-Km (>40% average primary pool frequency)	75% to 89% of streams/ IP-Km (>40% average primary pool frequency)	>90% of streams/ IP-Km (>40% average primary pool frequency)	50% to 74% of streams/ IP-km (>40% average primary pool frequency)	Fair
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	<50% of streams/ IP-km (>40% Pools; >20% Riffles)	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Flow Conditions (Baseflow)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score >75	Poor
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	>5 Diversions/10 IP-km	Poor
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor

			Riparian Vegetation	Canopy Cover	<50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	>90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	50% to 74% of streams/ IP-km (>70% average stream canopy; >85% where coho IP overlaps)	Fair
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	70-79% Density rating "D" across IP-km	Fair
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Water Quality	Temperature (MWMT)	<50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	>90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<0.2 Fish/m^2	0.2 - 0.6 Fish/m^2	0.7 - 1.5 Fish/m^2	>1.5 Fish/m^2	<0.2 Fish/m^2	Poor
			Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	<50% of Historical Range	Poor

4	Winter Rearing Juveniles	Condition	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	Fair
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-km (>40% Pools; >20% Riffles)	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)		
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	70-79% Density rating "D" across IP-km	Fair
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	50-80% Response Reach Connectivity	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor

			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower		
5	Smolts	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	>5 Diversions/10 IP-km	Poor
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Smoltification	Temperature	<50% IP-Km (>6 and <14 C)	50-74% IP-Km (>6 and <14 C)	75-90% IP-Km (>6 and <14 C)	>90% IP-Km (>6 and <14 C)	75-90% IP-km (>6 and <14 C)	Good
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Abundance	Smolt abundance which produces high risk spawner density per Spence (2008)	Smolt abundance which produces moderate risk spawner density per Spence (2008)	Smolt abundance to produce low risk spawner density per Spence (2008)		Smolt abundance which produces high risk spawner density per Spence (2008)	Poor

6	Watershed Processes	Landscape Context	Hydrology	Impervious Surfaces	>10% of Watershed in Impervious Surfaces	7-10% of Watershed in Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	<3% of Watershed in Impervious Surfaces	24.5% of Watershed in Impervious Surfaces	Poor
			Landscape Patterns	Agriculture	>30% of Watershed in Agriculture	20-30% of Watershed in Agriculture	10-19% of Watershed in Agriculture	<10% of Watershed in Agriculture	0.4% of Watershed in Agriculture	Very Good
			Landscape Patterns	Timber Harvest	>35% of Watershed in Timber Harvest	26-35% of Watershed in Timber Harvest	25-15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	0% of Watershed in Timber Harvest	Very Good
			Landscape Patterns	Urbanization	>20% of watershed >1 unit/20 acres	12-20% of watershed >1 unit/20 acres	8-11% of watershed >1 unit/20 acres	<8% of watershed >1 unit/20 acres	>25% of watershed >1 unit/20 acres	Poor
			Riparian Vegetation	Species Composition	<25% Intact Historical Species Composition	25-50% Intact Historical Species Composition	51-74% Intact Historical Species Composition	>75% Intact Historical Species Composition	25-50% Intact Historical Species Composition	Fair
			Sediment Transport	Road Density	>3 Miles/Square Mile	2.5 to 3 Miles/Square Mile	1.6 to 2.4 Miles/Square Mile	<1.6 Miles/Square Mile	>3 Miles/Square Mile	Poor
			Sediment Transport	Streamside Road Density (100 m)	>1 Miles/Square Mile	0.5 to 1 Miles/Square Mile	0.1 to 0.4 Miles/Square Mile	<0.1 Miles/Square Mile	>1 Miles/Square Mile	Poor

Guadalupe River CAP Threat Results

	Threats Across Targets	Adults	Eggs	Summer Rearing Juveniles	Winter Rearing Juveniles	Smolts	Watershed Processes	Overall Threat Rank
	Project-specific-threats	1	2	3	4	5	6	
1	Agriculture	Low		Low	Low	Low		Low
2	Channel Modification	Very High	High	Very High	Very High	Very High	High	Very High
3	Disease, Predation and Competition	Low		Low	Low	Medium	Low	Low
4	Hatcheries and Aquaculture							
5	Fire, Fuel Management and Fire Suppression							
6	Fishing and Collecting	Low		Low		Low		Low
7	Livestock Farming and Ranching	Low		Low	Low	Low		Low
8	Logging and Wood Harvesting							
9	Mining	High		High	High	High	Medium	High
10	Recreational Areas and Activities	Medium		Medium	Medium	Medium	Low	Medium
11	Residential and Commercial Development	High	High	Very High	Very High	Very High	Very High	Very High
12	Roads and Railroads	Very High	Medium	Very High	Very High	Very High	Very High	Very High
13	Severe Weather Patterns	Medium	Low	Medium	Medium	Medium	Low	Medium
14	Water Diversion and Impoundments	Very High	High	Very High	Very High	Very High	Very High	Very High
	Threat Status for Targets and Project	Very High	High	Very High	Very High	Very High	Very High	Very High

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-1.1.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat										
GudR-CCCS-1.1.1.1	Action Step	Estuary	Restore and enhance estuarine habitat; improve complex habitat features; provide fully functioning habitat (CDFG 2004).	3	10	Santa Clara Valley Water District, USFWS						TBD	Cost would vary with extent of restoration efforts.
GudR-CCCS-1.1.1.2	Action Step	Estuary	Evaluate the estuary to determine the degree to which conditions are limiting steelhead use; identify key limiting factors, and develop and implement a plan to remedy these limiting factors.	3	10	Santa Clara Valley Water District, USFWS	250.00					250	Cost estimate for estuary/marsh habitat assessment.
GudR-CCCS-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
GudR-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Develop and implement plans to provide seasonally appropriate flows from reservoirs necessary to activate the floodplain (see Restoration- Habitat Complexity, Restoration- Hydrology, Threat- Water Diversion/Impoundment).	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	
GudR-CCCS-2.1.1.2	Action Step	Floodplain Connectivity	Assess floodplain conditions within the Guadalupe River watershed. Develop and implement plans to maintain floodplain connection where existing, and reconnect disconnected floodplain habitat where feasible (see Restoration- Habitat Complexity, and Restoration- Riparian).	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost will vary with amount of watershed area assessed and extent of floodplain connection restoration efforts. Moderate estimate is $39,240 /acre of earthmoving (NMFS2008, pg 26).
GudR-CCCS-2.1.1.3	Action Step	Floodplain Connectivity	To provide stream channel maintenance flows, during winter and spring, implement periodic large pulse "maintenance" flows at the full capacity of the outlet works at Guadalupe, Almaden, and Calero reservoirs. When possible, time these flows so that they coincide with natural rainfall events (see Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, Santa Clara Valley Water District						TBD	cost will vary depending on water requirements.
GudR-CCCS-3.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-3.1.1	Recovery Action	Hydrology	Improve flow conditions										

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-3.1.1.1	Action Step	Hydrology	Avoid and/or minimize the adverse effects of water diversion and storage on steelhead by releasing more water to maintain a more natural hydrograph, and which would provide flows to benefit all life stages of steelhead.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-3.1.1.2	Action Step	Hydrology	Establish and implement a comprehensive stream flow program to improve survival at all life stages by improving the spatial and temporal pattern of surface flows throughout spawning, rearing, and migration areas (see Objectives, Actions, and Action Steps within: Threat- Water Diversion/Impoundment, Restoration- Floodplain Connectivity, Restoration- Habitat Complexity, Threat- Channel Modification, and Threat- Residential/Commercial Development).	1	10	Santa Clara Valley Water District						TBD	cost will be dependent upon amount of water required, and extent of the program.
GudR-CCCS-5.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
GudR-CCCS-5.1.1.1	Action Step	Passage	Expedite projects providing improved steelhead passage and stable channel conditions. See the California Department of Fish and Game barrier survey report (Cleugh and McKnight 2002), coordinate with Santa Clara Valley Water District, and perform more current surveys as needed.	1	5	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	1,392					1,392	Estimate of $278,409/project within suburban setting used (CDFG 2004, pg I-16), and an estimate of 5 barriers to be improved/removed. Passage improvement is of the absolute highest priority - expedite.
GudR-CCCS-5.1.1.2	Action Step	Passage	Evaluate existing above-reservoir habitat for its ability to support steelhead.	1	5	Santa Clara Valley Water District	112.52					113	Cost estimate from: Steelhead Abundance/Distribution project type (NMFS 2008, pg 58). Cost is approximate. Support and expedite projects that contribute to above-reservoir passage investigation/implementation.
GudR-CCCS-5.1.1.3	Action Step	Passage	Implement feasible, biologically sound passage program(s) that are coupled with the reservoir flow plans and operations necessary to facilitate long-term implementation.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-5.1.1.4	Action Step	Passage	Perform a passage feasibility study specific to each dam and reservoir. Almaden Reservoir on Alamitos Creek is of highest priority for this action in this watershed. Include water system uses, reservoir operations, and both adult immigration and adult/smolt emigration passage requirements. See HDR's field report prepared for the Santa Clara Valley Water District (HDR 2010) for initial reconnaissance efforts. Coordinate with NMFS.	1	5	Santa Clara Valley Water District	44.00					44	Consider both volitional and non-volitional passage methods in the assessment. Cost based on escapement monitoring at a rate of $43,654/project.

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-5.1.1.5	Action Step	Passage	Expeditiously implement the most feasible and biologically beneficial passage program.	1	100	Santa Clara Valley Water District	1,250	1,250	1,250	1,250	1,250	25,000	Using cost estimates from a draft fish passage assessment performed by HDR engineering Inc. (2009) for Los Padres Dam: cost estimates range depending on methodology. For this estimate: 15 million for ladder installation (trap and haul less) 10 million for 100 years of operation (trap and haul similar). This estimates for one reservoir - multiply for multiple reservoirs.
GudR-CCCS-5.1.1.6	Action Step	Passage	If beneficial and feasible, acquire funding necessary to ensure the long-term operations, and future improvement of this passage program.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind because the grants would be written by county staff
GudR-CCCS-5.1.1.7	Action Step	Passage	Develop and implement a long term study program to assess the efficacy of the passage program.	1	5	Santa Clara Valley Water District	112.52					113	From NMFS 2008, Pg 58 - Steelhead Abundance/Distribution Monitoring
GudR-CCCS-5.1.1.8	Action Step	Passage	Maintain and improve passage facilitates associated with the Guadalupe Flood Project.	2	50	CDFW, NMFS, Santa Clara Valley Water District, USACE						TBD	
GudR-CCCS-5.1.1.9	Action Step	Passage	Return Lake Almaden to stream/riverine conditions.	2	40	Santa Clara Valley Water District, USACE						TBD	
GudR-CCCS-6.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-6.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency and shelter										
GudR-CCCS-6.1.1.1	Action Step	Habitat Complexity	Identify locations where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to improve these conditions. Consider flow rates and discharges when designing LWD and shelter enhancement features.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	69.00	69.00				138	Cost based on fish/habitat restoration at a rate of $137,833/project.
GudR-CCCS-6.1.1.2	Action Step	Habitat Complexity	Focus initial efforts within upstream-most accessible reaches, management zones and "Cold Water Management Zone(s)" (see Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	2	10	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-6.1.1.3	Action Step	Habitat Complexity	Perform pre- and post-project monitoring to assess steelhead use within improved reaches.	3	10	Santa Clara Valley Water District						TBD	Likely to be coupled with other habitat restoration related monitoring -see cost estimates for Pool Frequency within Restoration - Habitat Complexity.
GudR-CCCS-6.1.2	Recovery Action	Habitat Complexity	Improve frequency of primary pools										

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-6.1.2.1	Action Step	Habitat Complexity	Identify locations where pool frequency and habitat complexity are limiting, and develop and implement site specific plans to improve these conditions. Consider flow rates and discharges when designing pool enhancement features.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	69.00	69.00				138	Cost based on fish/habitat restoration at a rate of $137,833/project. This action step should be coordinated with other action steps to reduce redundancy and cost.
GudR-CCCS-6.1.2.2	Action Step	Habitat Complexity	Perform pre- and post-project monitoring to assess steelhead use within improved reaches.	3	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	48.35	48.35				97	Cost will vary with area surveyed.
GudR-CCCS-6.2	**Objective**	**Habitat Complexity**	**Address the inadequacy of existing regulatory mechanisms**										
GudR-CCCS-6.2.1	Recovery Action	Habitat Complexity	Increase large wood frequency and shelter										
GudR-CCCS-6.2.1.1	Action Step	Habitat Complexity	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining riparian vegetation, instream LWD, and LWD recruitment.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	38.07	38.07				76	Estimate from General Education and Outreach cost: $76,136/program (CDFG, 2004 pg I.42)
GudR-CCCS-7.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-7.1.1	Recovery Action	Riparian	Improve canopy cover and species composition										
GudR-CCCS-7.1.1.1	Action Step	Riparian	Identify reaches dominated by exotic vegetation, and develop and implement site specific plans to restore these reaches.	3	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						TBD	Cost will depend upon extent and duration of exotic vegetation removal / native vegetation restoration efforts. Cost for non-native removal estimated at $1036/acre
GudR-CCCS-7.1.1.2	Action Step	Riparian	Continue, and expand upon current efforts, including those of Santa Clara Valley Water District's Stream Maintenance Program, to remove exotic vegetation (including Arundo donax), and restore these reaches.	3	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	20.00	20.00				40	Cost based on treating 0.5 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $$1,036/acre.

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-7.1.1.3	Action Step	Riparian	Identify reaches suffering from riparian encroachment, and develop and implement site specific plans to restore and maintain these reaches. Consider thinning of dense native riparian vegetation as necessary to better allow healthy species- and age- composition.	3	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	120.00	120.00				240	Cost based on treating 1.7 miles (assume 1 project/mile in 15% high IP with 80 acres/mile) at a rate of $1,761/acre.
GudR-CCCS-7.1.1.4	Action Step	Riparian	Develop and implement flow schedules from reservoirs necessary to maintain healthy riparian conditions (see Objective, Actions, and Action Steps within: Restoration- Hydrology).	2	10	City of Campbell, City of Los Gatos, City of Santa Clara, Santa Clara Valley Water District						0	Cost accounted for in HYDROLOGY
GudR-CCCS-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality										
GudR-CCCS-8.1.1.1	Action Step	Sediment	Identify sources of sedimentation, and develop and implement a plan to address these sources.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	69.00	69.00				138	Cost based on fish/habitat restoration monitoring at a rate of $137,833/project.
GudR-CCCS-8.1.1.2	Action Step	Sediment	Provide flows and instream conditions necessary to provide mobilization and maintenance of gravels.	2	10	Santa Clara Valley Water District						0	Cost accounted for in HYDROLOGY
GudR-CCCS-8.1.1.3	Action Step	Sediment	Perform reach restoration to facilitate gravel "maintenance". Include methods such as instream restoration, isolation of current on-stream percolation ponds, and a gravel placement program. Include flow schedules necessary for mobilization and "maintenance" of gravel quantity and quality suitable for steelhead.	1	5	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost will vary depending on extent of restoration efforts, and methodologies employed.
GudR-CCCS-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-10.1.1	Recovery Action	Water Quality	Improve instream temperature conditions										
GudR-CCCS-10.1.1.1	Action Step	Water Quality	Maintain suitable temperatures downstream of reservoirs (see the reservoir rule curves that provide for maintenance of a "cold water management zone" downstream of Guadalupe Reservoir - Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	2	5	Santa Clara Valley Water District						0	Action is considered In-Kind

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-10.1.1.2	Action Step	Water Quality	Evaluate the effects of groundwater recharge facilities on stream temperature. Develop and implement a plan to address any effects. Include methods to address warming of stream water within restoration plans for these reaches.	2	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-10.1.1.3	Action Step	Water Quality	To aide maintenance of cool instream temperatures, decrease channelization, and increase riparian cover (see Restoration - Riparian, and Threat - Channel Modification).	1	5	Santa Clara Valley Water District						0	Costs accounted for in RIPARIAN and CHANNEL MODIFICATION
GudR-CCCS-10.1.2	Recovery Action	Water Quality	Improve stream water quality conditions										
GudR-CCCS-10.1.2.1	Action Step	Water Quality	Evaluate point and non-point sources contributing to poor water quality, including sources contributing debris, pesticides, and sediment (turbidity); develop and implement a plan to address these sources.	1	5	City of Cupertino, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	15.00					15	Cost based on installing a minimum of 3 continuous water quality monitors at a rate of $5,000/station.
GudR-CCCS-10.1.2.2	Action Step	Water Quality	Encourage the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	3	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-11.1	**Objective**	**Viability**	**Address the inadequacy of existing regulatory mechanisms**										
GudR-CCCS-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										
GudR-CCCS-11.1.1.1	Action Step	Viability	Support (fund) the hiring and retention of dedicated environmental law enforcement personnel (i.e., CDFW wardens; park rangers, federal service enforcement agents, etc.).	3	10	CDFW, CDFW Law Enforcement, City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, NMFS OLE, Santa Clara Valley Water District	28.02	28.02				56	Cost estimate for Fish and Wildlife Warden from Bureau of Labor Statistics 2009.
GudR-CCCS-11.2	**Objective**	**Viability**	**Address other natural or manmade factors affecting the species' continued existence**										
GudR-CCCS-11.2.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-11.2.1.1	Action Step	Viability	Implement a monitoring program to evaluate the performance (population response) of recovery efforts.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Future monitoring will be part of the Coastal Monitoring Plan. Costs for the CMP are accounted for in the Monitoring Chapter.
GudR-CCCS-11.2.1.2	Action Step	Viability	Implement standardized assessment protocols (i.e., CDFW habitat assessment protocols) to ensure ESU-wide consistency.	2	10	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-11.2.1.3	Action Step	Viability	Perform standardized adult upmigration surveys. Include assessment above significant below-reservoir barriers.	2	10	Santa Clara Valley Water District						0	Costs for salmonid monitoring are covered in the Monitoring Chapter
GudR-CCCS-11.2.1.4	Action Step	Viability	Perform standardized adult spawning (redd) surveys.	2	10	Santa Clara Valley Water District						0	Costs for salmonid monitoring are covered in the Monitoring Chapter
GudR-CCCS-11.2.1.5	Action Step	Viability	Perform standardized smolt outmigration surveys.	2	10	Santa Clara Valley Water District						0	Costs for salmonid monitoring are covered in the Monitoring Chapter
GudR-CCCS-11.2.1.6	Action Step	Viability	Perform standardized juvenile rearing surveys.	2	10	Santa Clara Valley Water District						0	Costs for salmonid monitoring are covered in the Monitoring Chapter
GudR-CCCS-11.2.1.7	Action Step	Viability	Monitor population status for response to recovery actions, habitat improvements, and recovery action implementation - adjust population and life stage monitoring efforts to reflect new habitat improvements and accessible habitat expansions; use this information to adapt recovery strategies.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Costs for salmonid monitoring are covered in the Monitoring Chapter
GudR-CCCS-13.1	**Objective**	**Channel Modification**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
GudR-CCCS-13.1.1.1	Action Step	Channel Modification	Where feasible, implement alternatives to bank hardening; utilize bioengineering.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-13.1.1.2	Action Step	Channel Modification	All proposed levees should be designed to account for minimal maintenance associated with an intact and functioning riparian zone.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-13.1.1.3	Action Step	Channel Modification	When levees are utilized, design to allow maintenance of an intact and functioning riparian zone where feasible.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-13.1.1.4	Action Step	Channel Modification	Where riprap and other bank hardening is necessary, integrate other habitat-forming features – including large woody debris and riparian plantings and other methodologies to minimize habitat alteration effects.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-13.1.1.5	Action Step	Channel Modification	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Identify and target remediation of watershed process disruption as an overall priority.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-13.1.1.6	Action Step	Channel Modification	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (CDFG 2004).	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-13.1.1.7	Action Step	Channel Modification	Avoid or minimize the effects from flood control projects on salmonid habitat.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						0	Action is considered In-Kind

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-13.1.1.8	Action Step	Channel Modification	Evaluate existing and future stream crossings to identify threats to natural hydrologic processes. Replace or retrofit crossings to achieve more natural conditions, and improved passage and stream function.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Cost accounted for in PASSAGE
GudR-CCCS-13.1.1.9	Action Step	Channel Modification	Counties and municipalities should adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						0	Action is considered In-Kind
GudR-CCCS-14.1	**Objective**	**Disease /Predation /Competition**	**Address disease or predation**										
GudR-CCCS-14.1.1	Recovery Action	Disease /Predation /Competition	Prevent or minimize reduced density, abundance, and diversity										
GudR-CCCS-14.1.1.1	Action Step	Disease /Predation /Competition	Identify locations within the watershed that support exotic piscivorous fish species, and develop and implement a plan to decrease the effects of predation by these species. Consider provision of instream habitat and cover that provides refuge for salmonids, and/or the elimination of instream conditions that support and favor exotic species.	2	10	CDFW, City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost based on amount of exotic piscivorous fish species to be removed. Cost for pikeminnow eradication estimated at $9.38/fish.
GudR-CCCS-14.1.1.2	Action Step	Disease /Predation /Competition	Continue programs to screen inputs of off-channel water to prevent the introduction of exotic, predatory, warm water fishes into the channel from these sources. Develop and implement these programs where not in place.	2	100	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District	80.57	80.57	80.57	80.57	80.57	1,611	Cost estimate for 4 fish screens installation, and 100 year maintenance. Fish screen installation 11,364 each (NMFS 2008, pg 16); maintenance 1,566 /screen/year (NMFS 2008, pg 68). Estimate for installation and four years maintenance = $1,611,456.
GudR-CCCS-14.1.2	Recovery Action	Disease /Predation /Competition	Prevent or minimize adverse alterations to riparian species composition and structure										
GudR-CCCS-14.1.2.1	Action Step	Disease /Predation /Competition	Improve conditions for steelhead by decreasing the effects of exotic vegetation within the stream and riparian corridor (see Restoration- Riparian).	3	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Cost accounted for in RIPARIAN

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-20.1	**Objective**	**Mining**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-20.1.1	Recovery Action	Mining	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
GudR-CCCS-20.1.1.1	Action Step	Mining	Improve conditions for steelhead within the Guadalupe River system by decreasing the effects of past mining operations.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost based on methods and amount of improvements needed.
GudR-CCCS-20.1.1.2	Action Step	Mining	Evaluate mining areas for contributions to poor water quality, including sources contributing sediment (turbidity), and mercury; develop and implement a plan to address these sources (see Restoration - Water Quality and Restoration - Sediment).	2	5	County of Santa Clara, Santa Clara Valley Water District	15.00					15	Cost based on a minimum of 3 continuous water quality monitoring stations at a rate of $5,000/station.
GudR-CCCS-21.1	**Objective**	**Recreation**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-21.1.1	Recovery Action	Recreation	Rehabilitate and enhance floodplain connectivity										
GudR-CCCS-21.1.1.1	Action Step	Recreation	Evaluate the effects of recreational facilities such as bike/pedestrian trails, and road crossings that may constrain opportunities to expand channel width and/or reconnect floodplain.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara	44.50	44.50				89	Cost based on riparian restoration monitoring at a rate of $88,551/project.
GudR-CCCS-21.1.1.2	Action Step	Recreation	Develop and implement a plan that remediates existing recreational facilities to allow for stream functions, and sites new facilities in such a way that their placement does not constrain channel width or floodplain connection (see Restoration- Floodplain Connectivity).	1	5	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	
GudR-CCCS-21.1.2	Recovery Action	Recreation	Prevent or minimize impairment to riparian species composition and structure										
GudR-CCCS-21.1.2.1	Action Step	Recreation	Encourage acquisition and protection of riparian corridors and stream areas, and incorporate these areas into existing or new protected areas.	2	100	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Private Landowners, State Parks						0	Action is considered In-Kind

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-21.1.3	Recovery Action	Recreation	Modify or remove physical passage barriers										
GudR-CCCS-21.1.3.1	Action Step	Recreation	Identify existing passage barriers within recreational areas and develop and implement a plan to remove or remediate these structures.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						TBD	Cost based on amount of passage barriers. Cost estimated at $639,247/project.
GudR-CCCS-22.1	**Objective**	**Residential /Commercial Development**	**Address the present or threatened destruction, modification, or curtailment of habitat or range**										
GudR-CCCS-22.1.1	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to watershed hydrology										
GudR-CCCS-22.1.1.1	Action Step	Residential /Commercial Development	Improve conditions for steelhead by reducing the density of existing residential and commercial development where feasible, and remediating existing development contributing to poor stream conditions.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara						TBD	Cost based on amount of habitat available to improve. This area is highly urbanized and opportunities to reclaim floodplain are few.
GudR-CCCS-22.1.1.2	Action Step	Residential /Commercial Development	Upgrade existing stormwater systems into a spatially distributed discharge network (rather than a few point discharges).	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						TBD	Cost based on amount of existing system needing to be upgraded. Cost estimated at $11,065/storm drain.
GudR-CCCS-22.1.1.3	Action Step	Residential /Commercial Development	Assess and where feasible restore areas where existing infrastructure exists within streams, historical floodplains or off channel habitats in any steelhead watersheds. Proactively work with landowners.	2	20	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	Conduct an assessment to determine areas where infrastructure can reasonably be modified or relocated to accommodate habitat enhancement features. Implement where found necessary and suitable.
GudR-CCCS-22.1.1.4	Action Step	Residential /Commercial Development	Maintain intact and properly functioning riparian buffers to filter and prevent fine sediment input from entering streams.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-22.1.1.5	Action Step	Residential /Commercial Development	Improve steelhead survival by minimizing the input of sediment or toxic compounds originating from commercial or residential development.	2	10	City of Cupertino, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						0	Cost have been accounted in other action steps.

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-22.1.1.6	Action Step	Residential /Commercial Development	Disperse discharge from new or upgraded commercial and residential areas into a spatially distributed network rather than a few point discharges.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-22.2	**Objective**	**Residential /Commercial Development**	**Address the inadequacy of existing regulatory mechanisms**										
GudR-CCCS-22.2.1	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to watershed hydrology										
GudR-CCCS-22.2.1.1	Action Step	Residential /Commercial Development	New development should minimize storm-water runoff, changes in duration, or magnitude of peak flow.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-22.2.1.2	Action Step	Residential /Commercial Development	Design new development to allow streams to meander in historical patterns; protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						0	Action is considered In-Kind
GudR-CCCS-22.2.1.3	Action Step	Residential /Commercial Development	Design new developments to minimize impacts to unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to a steelhead watercourse.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-22.2.1.4	Action Step	Residential /Commercial Development	Minimize new development within riparian zones and the 100 year floodprone zones.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-22.2.1.5	Action Step	Residential /Commercial Development	Institutionalize programs to purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities. Restore uplands for watershed processes; restore stream channel and floodplain for steelhead use.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-22.2.1.6	Action Step	Residential /Commercial Development	Minimize future development in floodplains or off channel habitats.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-22.2.1.7	Action Step	Residential /Commercial Development	Encourage infill and high density developments over dispersal of low density rural residential development.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)										
GudR-CCCS-23.1.1.1	Action Step	Roads/Railroads	Evaluate existing roadways within 200 meters of the riparian corridor, and develop plans to decrease the ongoing impacts associated with these roads.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara						0	Action is considered In-Kind
GudR-CCCS-23.1.1.2	Action Step	Roads/Railroads	Design new roads that minimize impacts to riparian areas and are hydrologically disconnected from the stream network.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-23.1.1.3	Action Step	Roads/Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	2	10	City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						TBD	
GudR-CCCS-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration										
GudR-CCCS-23.1.2.1	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.	2	10	CalTrans, City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.1	**Objective**	**Water Diversion /Impoundment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
GudR-CCCS-25.1.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
GudR-CCCS-25.1.1.1	Action Step	Water Diversion /Impoundment	During winter and spring implement moderate winter baseflows to provide adequate water depths necessary for upstream and downstream migration	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.1.1.2	Action Step	Water Diversion /Impoundment	During winter and spring implement periodic migrant attractant flows necessary to attract adult fish upstream, and encourage outmigration of smolts.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.1.1.3	Action Step	Water Diversion /Impoundment	To provide stream channel maintenance flows, during winter and spring, implement periodic large pulse "maintenance" flows at the full capacity of the outlet works at Guadalupe, Almaden, and Calero reservoirs. When possible, time these flows so that they coincide with natural rainfall events.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.1.1.4	Action Step	Water Diversion /Impoundment	During summer and fall, manage release rates so that depths and velocities favoring fry and juvenile steelhead are provided.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.1.1.5	Action Step	Water Diversion /Impoundment	Ramp all reservoir releases (flood maintenance releases, fisheries passage releases, summer baseflow, and other planned releases) as necessary to minimize deleterious effects of flow increases/decreases.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind

Guadalupe River, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
GudR-CCCS-25.1.1.6	Action Step	Water Diversion /Impoundment	Design all habitat enhancements to function within the anticipated range of flows.	1	5	CDFW, City of Campbell, City of Los Gatos, City of San Jose, City of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.1.1.7	Action Step	Water Diversion /Impoundment	Install instream habitat enhancement features designed to increase the quantity and quality of fry and juvenile steelhead habitat by creating habitats with depth, velocity, and cover components that favor these life stages.	1	5	AC Alliance, Santa Clara Valley Water District	94.00					94	Cost based to treat 3 miles (assume 1 project/mile in 25% high IP) at a rate of $31,200/mile. Engineered structures will likely be used, which will increase cost.
GudR-CCCS-25.1.1.8	Action Step	Water Diversion /Impoundment	Manage streamfllow and temperature to improve habitat conditions, and mimic seasonal variability.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.2	**Objective**	**Water Diversion /Impoundment**	**Address the inadequacy of existing regulatory mechanisms**										
GudR-CCCS-25.2.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
GudR-CCCS-25.2.1.1	Action Step	Water Diversion /Impoundment	Allow all "fisheries flows" (baseflows, and passage, attractant, and channel maintenance flows) to bypass diversion facilities.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.2.1.2	Action Step	Water Diversion /Impoundment	Maintain and operate fish ladders on laddered diversion facilities and bypass flows necessary for passage over critical riffles.	1	5	Santa Clara Valley Water District						0	Action is considered In-Kind
GudR-CCCS-25.2.1.3	Action Step	Water Diversion /Impoundment	Perform a detailed study assessing the degree to which imported water is used within Guadalupe River system and its effects on the steelhead population. Develop and implement a plan to minimize and, where feasible, curtail the practice of discharging imported water within the Guadalupe River system.	1	5	Santa Clara Valley Water District						TBD	Estimate for stream flow/precipitation model is $$78,100/project. However, because of the detail needed for this action step, this is likely an underestimate.

Novato Creek Population

CCC Steelhead Winter-Run

- Role within DPS: Potentially Independent Population
- Diversity Stratum: Coastal San Francisco Bay
- Spawner Density Target: 1,100 adults
- Current Intrinsic Potential: 28.7 IP-km

Steelhead Abundance and Distribution

NMFS is unaware of any estimates of steelhead (*Oncorhynchus mykiss*) abundance from Novato Creek. However, there have been several limited fish surveys undertaken in Novato Creek in recent years (Rich 1997, Fawcett Environmental Consulting 2000, Leidy *et al*. 2005, Fawcett Environmental Consulting 2006, Fawcett Environmental Consulting 2009); all of these surveys encountered steelhead. NMFS assumes that the population of steelhead in the Novato Creek watershed is small given the numbers of fish observations reported in those reports and the current habitat conditions in Novato Creek and its tributaries. Becker *et al.* 2007 reports reproducing steelhead from Novato Creek and two of its tributaries: Vineyard Creek and Bowman Canyon. These authors conclude that although steelhead have been observed in Arroyo San Jose, another Novato Creek tributary, there isn't sufficient information to characterize the system as supporting a reproducing population. Further, Becker *et al*. 2007 report observations of steelhead from Arroyo Avichi although they don't reach a conclusion as to whether or not steelhead are reproducing in that Novato Creek tributary. However, steelhead are likely blocked from accessing spawning habitat in Arroyo Avichi by culverts and trash racks about ¼ mile from that stream's confluence with Novato Creek. Leidy *et al*. 2005 surveyed Pacheco Creek, another Novato Creek tributary and observed no steelhead. Although that was only one survey, the current habitat in much of Pacheco Creek is poor, and there are several migration barriers, so the likelihood of steelhead presence is low.

History of Land Use

The Marin County Department of Public Works has reported on the human settlement history of the Novato Creek watershed[1]. The following information is from that report: Miwok and Pomo people were the earliest residents of the watershed. In 1839, Rancho Novato was created through a Mexican land grant and led to significant conversion of the watershed, primarily for grazing uses. Other agricultural uses followed with conversions of grassland, oak woodlands, and tidal marshlands to grazing, orchards, and croplands. By the mid-1850s many of the creeks in the

[1] http://www.marinwatersheds.org/novato_creek.html

watershed had been channelized for irrigation. The tidal marshlands had also been diked and drained for agriculture (primarily oat-hay production) by the middle of the nineteenth century.

An interesting consequence of the California Gold Rush (beginning in the late 1840s) was the filling of the San Francisco Bay margins by sediments mobilized in the Sierra region by hydraulic mining operations.[2] By the 1890s, the shoreline extended a mile farther into the Bay because of the massive transfer of sediment from the Sierra Nevada foothills. The wetlands, including marshlands of lower Novato Creek watershed, have likely changed in area and location due to the influx of sediment to San Pablo Bay during this time.

Transportation has been significant in the development of the City of Novato. In the 1880s Novato Creek was dredged to make way for schooners bound for San Francisco, though currently, boat traffic is restricted to pleasure craft in the lower portion of the watershed, near Bel Marin Keys. Novato's population grew after the railroad was built in the mid- to late-1870s. Interstate Highway 101 traverses the eastern side of Novato, and Hamilton Air Force Base (commissioned from 1935 until 1974), and Marin County Airport (Gnoss Field) are other significant parts of transportation infrastructure that were or are found in the watershed.

Current Resources and Land Management

The County of Marin states that Novato is the fastest growing municipality in Marin County[1]. The U.S. Census Bureau reports the 2000 human population of Novato was 47,630 and the 2010 population was 58,652[3] -- more than a 23 percent increase in that decade. The County of Marin anticipates continued growth in the population of Novato and has projected a theoretical build-out population of Novato of approximately 63,000[4]. The Marin Countywide Plan does not provide a definitive time horizon for the theoretical build-out or for the plan in general; however, many projections for various elements throughout the Marin Countywide Plan go through 2020.

The City of Novato covers about half of the Novato Creek watershed and urban and commercial development is widespread within that area. "Novato is actively engaged in downtown redevelopment with proposed development of commercial and residential uses and supporting infrastructure. The Marin Countywide Plan[5] identifies Novato as having the greatest growth potential in Marin for commercial and industrial development."[1]

[2] http://www.nbwatershed.org/millercreek/index6.html
[3] http://factfinder.census.gov/
[4] http://www.co.marin.ca.us/depts/cd/main/fm/cwpdocs/CWP_CD2.pdf
[5] http://www.co.marin.ca.us/depts/CD/main/fm/cwpdocs/CWP_CD2.pdf

More than three-quarters of the Novato Creek watershed is in private ownership[6]. Land ownership within the Novato Creek watershed is included in Table 1.

Table 1: Land ownership within the Novato Creek watershed.

Land Ownership	**Acres**	**Percent of Watershed**
Private	24,453	77%
Local (City/County Park)	147	0%
Local (Open Space)	4,335	14%
Local (Water District)	236	1%
State (Fish & Game)	700	2%
State (Parks & Recreation)	4	0%
Federal (USAF-Hamilton)	1,784	6%

Information provided by Management Landscape, California Department of Forestry, 2002.

Several agencies or special districts operate within the Novato Creek watershed that may have an effect on aquatic habitat within the watershed. The North Marin Water District (NMWD) provides treated water for residents within the Novato Creek watershed. About 80 percent of the water delivered by the NMWD is purchased from the Sonoma County Water Agency (water is derived from the Russian River watershed), and about 20 percent of the water delivered by NMWD comes from Stafford Lake, an on-stream reservoir on Novato Creek. Additionally, since 2007, the NMWD operates the Deer Island Recycled Water Facility, located adjacent to Highway 37. Presently, water from this facility provides irrigation water to the Stone Tree Golf Course and Novato Fire Protection District Station 62. Ultimately, the expanded recycled water facilities will be used to offset approximately 220 million gallons per year of potable water demand for landscape irrigation, and reduce dependence on imported water supply from the Russian River and wastewater discharge into San Pablo Bay.

The Marin County Flood Control and Water Conservation District conducts the periodic dredging of portions of Novato Creek, Warner Creek and Arroyo Avichi for flood control, an annual creek clearance program carried out by the Marin Conservation Corps under the direction of District staff, and operation and maintenance of four stormwater pumping stations; and consults with the City of Novato regarding development proposals and their related flood control issues. Recently, the Marin County Flood Control and Water Conservation District undertook the Vineyard Creek Capital Improvement Project to increase flood conveyance, stabilize incised banks, and promote an ecologically healthy stream corridor along the approximately 2500 feet

[6] NMFS GIS data – Novato Creek Watershed Characterization.

reach of Vineyard Creek, a major Novato Creek tributary. In 2007, the Marin County Flood Control and Water Conservation District produced Bank Stabilization Guidelines for a portion of Novato Creek.

Marin County's Department of Public Works also staffs the Novato Watershed Program, a collaboration of the County, Novato Sanitary District, North Marin Water District, and the City of Novato to provide a system-wide analysis of flood protection and habitat restoration options. The Novato Watershed Program is still in the process of determining project alternatives, but one initial project has been developed for flood protection and habitat restoration in lower Novato Creek baylands (behind Target/Costco) north of Hwy 37. The proposed project would lay back levees, increase tidal prism, and open 80 acres to tidal flushing and conversion to tidal marsh. The Novato Watershed Program has sought IRWMP grant funding for the project.

The Novato Sanitary District provides wastewater collection and treatment to Novato and some surrounding areas, as well as solid waste management, water education, and recycled wastewater[7, 8]. The Marin Hazardous and Solid Waste Joint Powers Authority provide household hazardous waste collection, recycling and disposal information for residents and businesses, and ensures the County's compliance with recycling mandates. The Marin Resource Conservation District provides technical assistance to agricultural landowners on soil erosion and resource conservation matters. The County of Marin Open Space District manages select County-owned lands to preserve, protect, and enrich the natural aspect of those properties. Also, some open space parcels provide recreational opportunities.

The County of Marin reports the following land protection and restoration efforts in the Novato Creek watershed: Hamilton Wetland Restoration project, Rush Creek and Bahia restoration projects, and planning by the City of Novato and Marin County Open Space District for preservation and land acquisition for trails.

Salmonid Viability and Watershed Conditions

The following key attributes were rated Poor through the CAP process for steelhead: Estuary, Habitat Complexity, Hydrology, Landscape Patterns, Passage/Migration, Riparian, Sediment, Sediment Transport, Velocity Refuge, Viability, and Water Quality. Recovery strategies will focus on improving these poor conditions as well as those needed to ensure population viability and functioning watershed processes.

[7] http://www.novatosan.com/
[8] http://www.nmwd.com/pdf/conservation/FAQ%20Web%20Final%20030311.pdf

Current Conditions

The following discussion focuses on those conditions that were rated Fair or Poor as a result of our CAP viability analysis. The Novato Creek CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

Population and Habitat Conditions

Riparian Vegetation: Composition, Cover & Tree Diameter

The portions of the Novato Creek watershed that are tidally-influenced likely had limited abundance of riparian trees. However, the upper portions of the watershed were likely dominated by coast redwood (*Sequoia sempervirens*), quickly transforming to mixed woodland of California bay (*Umbellularia californica*), buckeye (*Aesculus glabra*), coast live oak (*Quercus agrifolia*), and California black oak (*Quercus kelloggii*), then becoming more savannah-like in lower elevations. Systematic data related to riparian tree diameter effects on adult steelhead within the Novato Creek watershed are not available. However, poor riparian conditions are common throughout much of the Novato Creek watershed, and have likely resulted in elevated summer water temperature, high substrate embeddedness levels, prevalent stream bank erosion, and limited recruitment of large woody debris for rearing salmonids. Tree diameter was used as an indicator of riparian function based on the average diameter at breast height of a stand of trees within a buffer that extends 100 meters back from the edge of the active channel. Within the Novato Creek watershed there are few (if any) places in which riparian tree vegetation extends 100 meters back from the edge of the active channel. In the headwater areas of the watershed, the condition of the riparian vegetation is likely related to anthropogenic factors and natural conditions based on local geology, and hydrologic conditions. Within the urbanized portion of the watershed, the area west of Highway 101, this is certainly attributable to anthropogenic factors, as there is much encroachment of the riparian areas of Novato Creek and its tributaries. The NMWD has worked with the County of Marin and private property owners in the watershed upstream of Stafford Dam to improve riparian conditions.[9] The portion of the watershed east of Highway 101 has been highly modified through channelization, levees, and various water control structures, and is used primarily for agricultural activities, though some residential development has occurred. Threats contributing significantly to this condition include: Channel Modification; and Residential and Commercial Development.

Estuary: Quality and Extent

All of the main channel of Novato Creek east of Highway 101 is channelized and leveed, disconnecting the seasonal or tidal wetlands from the stream. The portion of Novato Creek near

[9] January 23, 2012, letter from NMWD to NMFS,

Highway 101 is dredged on a regular basis (about every 3 or 4 years) as a flood control measure. The riparian vegetation community has been greatly modified and likely reduced as well and this may affect water temperature regime and the amount of allochthonous food items available to steelhead. Also, tide gates and other water management structures are present in that general area, and the majority of the area has been converted for agricultural uses. Bel Marin Keys is an unincorporated community of about 700 homes in the lower Novato Creek watershed. This community is east of Highway 101 and south of Highway 37 and lies on the southern flank of Novato Creek in an area of historic tidal wetlands that were converted to agricultural land in the early 20th century. Agricultural and urban land uses may lead to inputs of pollutants that may reach Novato Creek as stormwater. Fish kills in Novato Creek concomitant with discharge from Pacheco Pond, an artificial water body that is filled from discharges from Arroyo San Jose and Pacheco Creek, have been reported. All of these factors reduce the quality of aquatic and riparian habitat, and reduce opportunities for rearing of juvenile steelhead. Threats contributing significantly to this condition include: Agriculture and Channel Modification.

The Novato Watershed Program is still in the process of determining project alternatives, but one initial project has been developed for flood protection and habitat restoration in lower Novato Creek baylands (behind Target/Costco) north of Hwy 37. The proposed project would lay back levees, increase tidal prism, and open 80 acres to tidal flushing and conversion to tidal marsh. The Novato Watershed Program has sought IRWMP grant funding for the project. This project, if constructed, would reduce channelization, connect the stream and tidal habitats, increase amount of estuary, and increase tidal flushing. Additional projects may include further removal of levees, reduction of channelization, and conversion of agricultural lands currently used by Novato Sanitary District as summer sprayfields to marsh; however, these alternatives are still being developed.

Velocity Refuge: Floodplain Connectivity

Periodic inundation of floodplains by streams provides several ecological functions beneficial to salmonids, including: coarse sediment sorting, fine sediment storage, groundwater recharge, velocity refuge, formation and maintenance of off-channel habitats, and enhanced forage production. Floodplain connectivity is associated with more diverse and productive food webs. Specific data related to floodplain connectivity are not available. However, based on the amount of urbanization with encroachment into riparian areas, channel modification, bank stabilization, and wetland reclamation found throughout the watershed, floodplain connectivity is likely significantly reduced in the watershed. Threats contributing significantly to this condition include: Channel Modification, Residential and Commercial Development, Roads and Railroads, and Water Diversions and Impoundments.

As noted above, the Novato Watershed program is proposing a floodplain and marsh restoration project in the tidal portions of the watershed.

Hydrology: Baseflow and Passage Flows

The USGS maintains a stream gauge on Novato Creek (#11459500) that provides flow data. The record shows that in most years, there was little or no flow in Novato Creek in the summer and fall months. Stafford Dam on the upper mainstem of Novato Creek is a large-scale diversion facility that is used to provide about 20 percent of the potable water used by the residents of Novato. The reservoir behind Stafford Dam is filled at a time coinciding with the period of adult immigration and smolt emigration. The CDFG(W) prepared a flow-release schedule for Stafford Dam in 1983 that requires NMWD to release 150 acre-feet during the period May 1 through October 30. The flow-release schedule for Stafford Dam is:

May	0.2 cubic feet per second (cfs)	August	0.3 cfs
June	0.9 cfs	September	0.2 cfs
July	0.7 cfs	October	0.2 cfs.

Further, the urban areas in this watershed have experienced stream channelization and increases in the amount of impervious surfaces. Stream channelization generally cuts off the floodplain access for the stream and leads to accelerated water discharge, which may lead to further bank instability and channel incision. Impervious surfaces reduce rainwater infiltration and natural groundwater recharge, leading to higher peak flows and a quicker return to base flows, i.e., a flashier hydrologic regime. Threats contributing significantly to this condition include: Water Diversions and Impoundments.

Passage/Migration: Mouth or Confluence and Physical Barriers

Numerous passage and migration impairments exist within the Novato Creek watershed. Stafford Dam is a large on-channel reservoir that it used primarily for water supply, incidental flood control, and recreation. Several culverts and road crossings are either partial or complete barriers to steelhead migration, and some historic streams have been filled or placed in pipes (NMFS GIS 2015). All of these barriers impair hydrology and constrain migration of both adult and juvenile steelhead throughout the remaining accessible habitat. Threats contributing significantly to this condition include: Channel Modification; and Residential and Commercial Development.

Hydrology: Impervious Surfaces

Primary factors affecting hydrology in the Novato Creek watershed include flow regulation by Stafford Dam and urbanization, coupled with naturally xeric hydrologic conditions. Stafford

Dam diverts water year-around and does not have bypass flows that are sufficient to maintain watershed processes. Stafford Dam interrupts sediment transport below the dam and that may lead to increased channel instability and incision downstream of the dam, and the loss of spawning gravel. The urban areas in this watershed have experienced stream channelization and increases in the amount of impervious surfaces. Stream channelization generally cuts off the floodplain access for the stream and leads to accelerated water discharge, which may lead to further bank instability and channel incision. Impervious surfaces reduce rainwater infiltration and natural groundwater recharge, leading to higher peak flows and a quicker return to base flows, i.e., a flashier hydrologic regime. Threats contributing significantly to this condition include: Channel Modification and Water Diversions and Impoundments.

Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios

Specific data related to altered pool complexity and/or pool/riffle ratios in the Novato Creek watershed are not available. However, the abundance and quality of primary pools and the ratio of pool/riffle/flatwater habitats are likely substandard given the generally degraded condition of Novato Creek, particularly in the urbanized areas, the paucity of large woody debris, the amount of bank and channel stabilization, and the influence of tidal action in the lower portion of the watershed. The amount and diversity of cover elements in pools and an appropriate ratio of pool/riffle/flatwater habitats are important to all lifestages of steelhead. Threats contributing significantly to this condition include: Channel Modification and Residential and Commercial Development.

Habitat Complexity: Large Wood and Shelter

Specific data related to large woody debris or shelter rating for the Novato Creek watershed are not available. However, the abundance of large woody debris within the watershed is low. This paucity can be attributed to the poor riparian conditions, associated with encroachment by suburban development and channel hardening that limit recruitment of large woody debris to the stream, and to the removal of large woody debris for flood control. Threats contributing significantly to this condition include: Channel Modification and Residential and Commercial Development.

Sediment: Gravel Quality and Distribution of Spawning Gravels

Specific data related to gravel quality and quantity are not available for Novato Creek. However, observations by NMFS staff revealed abundant fine sediment at many sites within the watershed. The County of Marin reports extensive bank erosion in the watershed and upslope gully development in the watershed.[10] Also, in the lower portions of Novato Creek and its lower

[10] http://www.marinwatersheds.org/novato_creek.html

tributaries, Arroyo Avichi and Warner/Vineyard Creek have very high amounts of fine sediment and are subject to mechanical sediment removal activities on a four-year cycle. This high amount of fine sediments impairs gravel quality resulting in reduced feeding opportunities by virtue of changes in available invertebrates, and reduced spawning success. Stafford Dam interrupts sediment transport to the lower watershed and the increased frequency of channel incision increases sediment transport out of the lower watershed. Threats contributing significantly to this condition include: Water Diversion and Impoundments.

Landscape Patterns: Agriculture, Timber Harvest & Urbanization

Major landscape disturbance within the Novato Creek watershed is primarily associated with urban and water development, though agriculture is a major disturbance in the watershed east of Highway 101. The City of Novato covers about one-half of the Novato Creek watershed. Also, there is urban development at Bel Marin Keys and Ignacio. The Marin Countywide Plan identifies Novato as having the greatest growth potential in Marin for commercial and industrial development.[1] Urban and commercial development are widespread within the watershed. Adverse factors within the Novato Creek watershed associated with urbanization include: high density of dwellings, high amount of miles of roads per square mile of watershed, high amount of impervious surfaces, encroachment of riparian areas, stream channelization, flood control activities, and filling and piping of historic Novato Creek tributaries. The agricultural development in the watershed has led to leveed and channelized streams, loss of wetlands through conversion to grazing lots and hay fields, and filling and piping of some historic streams. Threats contributing significantly to this condition include: Channel Modification; and Water Diversion and Impoundments.

Water Quality: Temperature

Systematic data related to stream water temperature within the Novato Creek watershed are not available. However, several factors may affect water temperature within the watershed: presence and operation of Stafford Dam, water withdrawals, reductions of riparian vegetation, high amounts of impervious surfaces, and stream channelization. Some spot water temperature data taken during fish relocation activities in lower Novato Creek and its tributaries indicate that summertime and fall water temperature may exceed 20 degrees Celsius (Fawcett Environmental Consulting 2006, Fawcett Environmental Consulting 2009, Fawcett, unpublished data.) Threats contributing significantly to this stress include: Channel Modification, Residential and Commercial Development, and Water Diversion and Impoundments.

Water Quality: Turbidity or Toxicity

Systematic data related to stream turbidity or toxicity within the Novato Creek watershed are not available. However, several factors may affect turbidity or toxicity within the watershed: incising

channel bed, unstable stream banks, reductions of riparian vegetation, and high amounts of residential and commercial lands with corresponding high amounts of impervious surfaces. Novato Creek is included on the US Environmental Protection Agency's list of impaired streams in the San Francisco area[11]. The reported sources of the impaired water quality in this watershed are urban runoff and storm sewers. Further, the US Environmental Protection Agency's Better Assessment Science Integrating Point & Non-point Sources database lists 70 hazardous and solid waste, industrial discharges, or toxic release sites within the Novato Creek watershed. Threats contributing significantly to this condition include: Channel Modification, Residential and Commercial Development, Roads and Railroads, and Water Diversion and Impoundments.

Threats

The following discussion focuses on those threats that were rated as High or Very High (see Novato Creek CAP Results). Recovery strategies will likely focus on ameliorating High rated threats; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts.

Agriculture

Historically, within the Novato Creek watershed grasslands, oak woodlands, and tidal marshlands were converted to grazing lands, orchards, and croplands. However, currently those activities are not occurring within the watershed on a significant scale. By the mid-1850s many of the creeks in the watershed had been channelized for irrigation. The portion of the watershed east of Highway 101 has been highly modified for agricultural benefit (primarily oat-hay production) by channelization of streams, construction of levees, and filling and piping of stream channels. This area continues to be used for agricultural practices, and the Novato Sanitary District uses some areas as sprayfields. As noted above, the Novato Watershed program is proposing a floodplain and marsh restoration project in the tidal portions of the watershed. Additional projects south of Hwy 37 and east of Hwy 101 could include restoration of agricultural lands/spray fields, further laying back of levees, and increasing the tidal prism.

Channel Modification

Much of the Novato Creek watershed has experienced channel modifications, including straightening, stream bank hardening, channel realignment, filling and piping, levee construction, and dredging. These modifications, combined with other landscape altering practices, have destroyed estuarine habitat, disconnected streams from their floodplains, and constrained natural fluvial and geomorphic processes that create and maintain instream and

[11] http://oaspub.epa.gov/tmdl/attains_waterbody.control?p_list_id=CAR206%2E200NOVATO%20CREEK&p_cycle=2002&p_report_type=T

riparian habitat that support viable steelhead populations. As noted above, the Novato Watershed program is proposing a floodplain and marsh restoration project in the tidal portions of the watershed.

Recreational Areas and Activities

The primary recreational lands within the watershed are associated with Open Space, parks, the Marin Country Club, and the Stone Tree Golf Course. Parks and golf courses can be sources of decreased water quality associated with diversions, reductions of riparian vegetation, and use of polluting chemicals associated with landscape maintenance.

Residential and Commercial Development

The County of Marin states that Novato has been the fastest growing municipality in Marin County[1]. The city's population grew 23 percent between 2000 and 2010, and the County of Marin is anticipating significant human population growth in this current decade too. Novato covers about half of the Novato Creek watershed and other smaller communities occur in the watershed, too, and urban and commercial development is widespread. The City of Novato is engaged in downtown redevelopment with proposed development of commercial and residential uses and supporting infrastructure. The Marin Countywide Plan identifies Novato as having the greatest growth potential in Marin for commercial and industrial development.[1]

During the 2010 census, the average density of housing units in Novato was 756.8 per square mile (NMFS GIS, 2015). Intensive and widespread urban development has increased the impervious surface area, greatly impacting hydrology as well as the pollutant level within the aquatic environment, and impaired instream conditions (e.g., passage, instream habitat, hydrology, and floodplain connection).

Roads and Railroads

Roads are a significant threat for adult and smolt lifestages of steelhead in the Novato Creek watershed. Road networks within the Novato Creek watershed are largely paved systems associated with urban development, and represent a significant source of the total impervious surface within the basin. Further, the Novato Creek watershed has a relatively high concentration of roads within riparian zones (4.5 miles of roads per square mile of 100 meter riparian buffer) (NMFS GIS 2015). Roadways in the Novato Creek watershed amplify storm flow intensity and duration during precipitation events, deliver road-born pollution (e.g., oils, urban runoff, etc.) directly to the aquatic system, and necessitate culverts and other structures that obstruct steelhead migration.

Water Diversion and Impoundments

The Novato Creek watershed is highly affected by the presence and operation of Stafford Dam. Additionally, there are on-channel reservoirs on Arroyo San Jose, a Novato Creek tributary. These dams may affect all lifestages of steelhead by blocking passage, limiting migration periods, and altering hydrology and instream habitat.

Limiting Stresses, Lifestages, and Habitats

Threat and stress analyses within the CAP workbook suggest that all lifestages are limited by impaired conditions within the Novato Creek watershed. Primary factors contributing to habitat limitations and limited steelhead abundance are extensive watershed development for urban, suburban, and commercial land uses. Stafford Lake is a complete barrier to migration and dramatically affects the hydrology of Novato Creek. In addition many other complete and partial barriers to steelhead movement are found throughout the Novato Creek watershed. Also, because of residential and commercial development and some flood control actions, riparian vegetation and large woody debris are reduced. These stresses identified in this paragraph affect all lifestages of steelhead.

General Recovery Strategy

In general, recovery strategies will focus on improving conditions and ameliorating stresses and threats discussed in the previous paragraph. Recovery actions should identify and target habitat constraints within stream reaches with high potential to benefit steelhead recovery and may consider mechanisms for reoperation of and passage around dams by increasing hydraulic and floodplain connectivity, increasing and improving riparian vegetation and large woody debris retention and recruitment, and improving passage within the watershed. Other stresses or threats to steelhead or their habitat may also be developed where implementation of these strategies is critical.

Improve Canopy Cover and Riparian Recruitment

The Novato Creek watershed would benefit from improved riparian composition and structure, which would increase stream shading, and improve large woody debris recruitment for eventual increases in instream shelter for steelhead. Practices to improve riparian condition include native riparian planting, and development and enforcement of riparian buffers. As noted above, the NMWD has worked with the County of Marin and private property owners in the watershed upstream of Stafford Dam to improve riparian conditions.[12]

Improve Connectivity of Streams and Floodplains

[12] January 23, 2012, letter from NMWD to NMFS,

Floodplain habitat and function within much of the Novato Creek watershed is impaired, primarily due to urbanization and the resulting effects of altered hydrology and channel confinement. Novato Creek and its tributaries would benefit from utilizing bio-technical vegetative techniques to reestablish floodplain benches and create a defined low flow channel.

Improve Connectivity of Wetlands

Most of the wetland habitats within the Novato Creek watershed have been separated hydraulically from the stream habitats. This separation has occurred primarily through levees and filling for agricultural and urban development land uses. Aquatic habitat, and perhaps flood capacity, would benefit from reconnection of wetlands to the stream habitats, thereby benefitting steelhead.

As noted above, the Novato Watershed program is proposing a floodplain and marsh restoration project in the tidal portions of the watershed.

Increase Instream Shelter Ratings and Pool Volume

Shelter ratings should be improved within poor quality reaches throughout the Novato Creek watershed. Adding large woody debris will improve the habitat complexity of existing pool habitats where shelter components are currently comprised of undercut banks and a few pieces of woody debris. Restoration efforts may include construction of wood/boulder structures into degraded reaches to increase pool frequency and volume and increase stream channel heterogeneity, thereby increasing the carrying capacity of steelhead for Novato Creek and its tributaries. The NMWD has completed a project to reduce bank erosion using large woody debris for habitat enhancement.

Residential and Commercial Development

Novato Creek and its tributaries would benefit from restoration actions that reduce the amount of impervious surfaces and from measures that collect stormwater in a manner that reduces adverse effects on hydrology and water quality associated with stormwater runoff. Further, future development should avoid or minimize features to increase impervious surfaces, and should include greater setbacks from streamside locations.

Channel Modification

Recovery actions that reconnect historic floodplains to stream channels, reconstruct floodplains, reconnect wetlands, replace lost wetlands, increase channel complexity, and improve fluvial and geomorphic processes should improve habitat conditions in the Novato Creek watershed. As noted above, the Novato Watershed program is proposing a floodplain and marsh restoration project in the tidal portions of the watershed.

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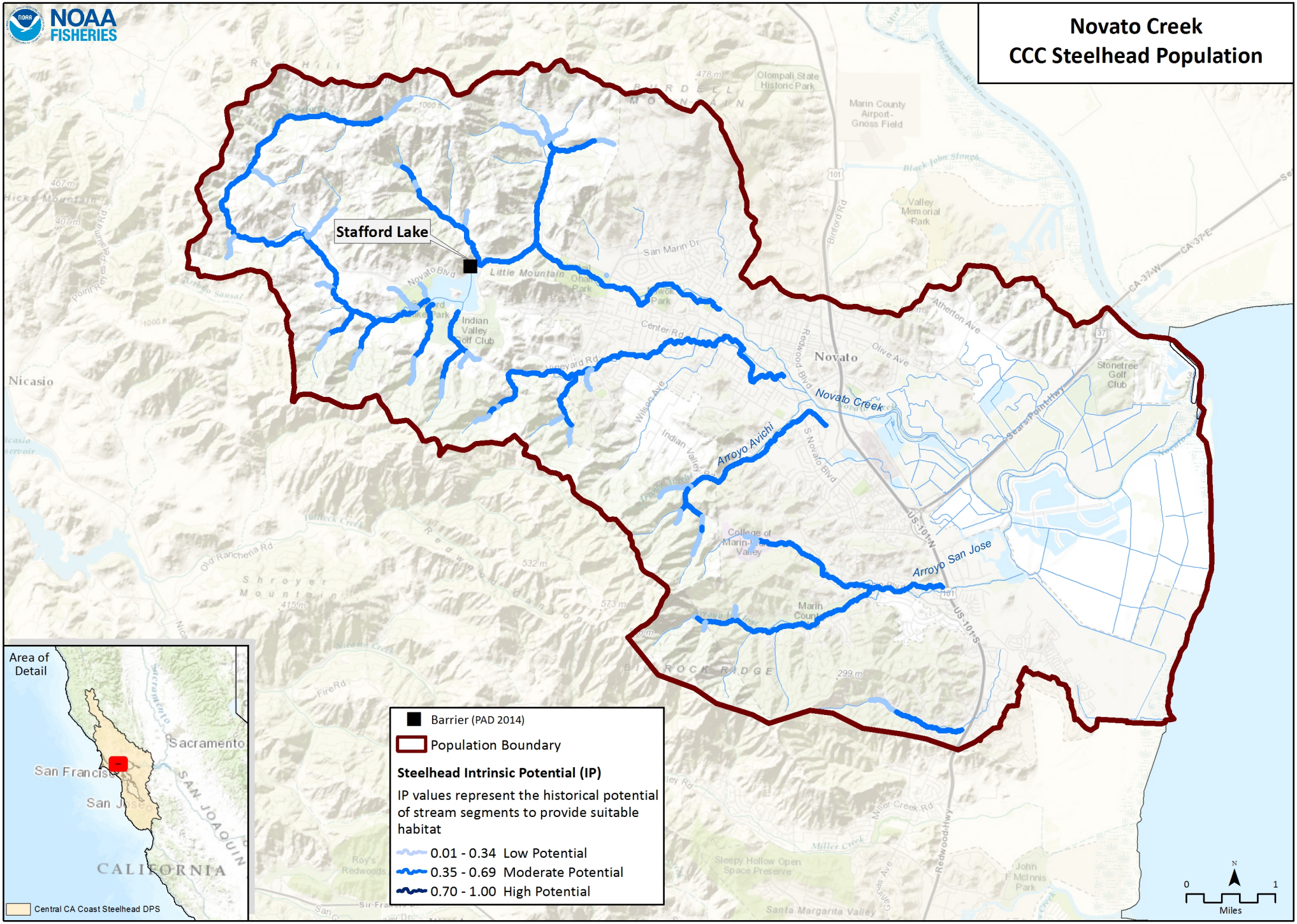
NOAA FISHERIES
Novato Creek
CCC Steelhead Population
Stafford Lake
Novato Creek
Arroyo Avichi
Arroyo San Jose
Novato
Nicasio
Little Mountain
Indian Valley Golf Club
Olompali State Historic Park
Marin County Airport-Gnoss Field
Valley Memorial Park
Stonetree Golf Club
College of Marin-Indian Valley
Sleepy Hollow Open Space Preserve
John F McInnis Park
Area of Detail
Sacramento
San Francisco
San Jose
SAN JOAQUIN
CALIFORNIA
Central CA Coast Steelhead DPS
Barrier (PAD 2014)
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
0
1
Miles

#	Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Measurement	Current Rating
1	Adults	Condition	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	<50% of streams/ IP-km (>40% Pools; >20% Riffles)	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 92	Poor
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km	Poor
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75.9 of IP-km	Fair
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	?39% Class 5 & 6 across IP-km	Poor
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined		

			Sediment	Quantity & Distribution of Spawning Gravels	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km	Poor
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Fair
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<1 spawner per IP-km to < low risk spawner density per Spence (2008)	>1 spawner per IP-km to < low risk spawner density per Spence (2008)	low risk spawner density per Spence (2008)		<1 spawner per IP-km to < low risk spawner density per Spence (2008)	Poor
2	Eggs	Condition	Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Redd Scour	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	<12% (0.85mm) and <30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	Poor
			Sediment	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	<50% of streams/ IP-km (>50% stream average scores of 1 & 2)	Poor
3	Summer Rearing Juveniles	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor

			Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Percent Primary Pools	<50% of streams/ IP-Km (>40% average primary pool frequency)	50% to 74% of streams/ IP-Km (>40% average primary pool frequency)	75% to 89% of streams/ IP-Km (>40% average primary pool frequency)	>90% of streams/ IP-Km (>40% average primary pool frequency)	<50% of streams/ IP-km (>40% average primary pool frequency)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	<50% of streams/ IP-km (>40% Pools; >20% Riffles)	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Flow Conditions (Baseflow)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score >75	Poor
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	1.1 - 5 Diversions/10 IP km	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75.9 of IP-km	Fair

			Riparian Vegetation	Canopy Cover	<50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	>90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	<50% of IP-km (>70% average stream canopy; >85% where coho IP overlaps)	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	?39% Class 5 & 6 across IP-km	Poor
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined		
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	<50% of streams/ IP-km (>50% stream average scores of 1 & 2)	Poor
			Water Quality	Temperature (MWMT)	<50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	>90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	<50% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Sublethal or Chronic	Fair
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<0.2 Fish/m^2	0.2 - 0.6 Fish/m^2	0.7 - 1.5 Fish/m^2	>1.5 Fish/m^2	<0.2 Fish/m^2	Poor
			Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	50-74% of Historical Range	Fair

4	Winter Rearing Juveniles	Condition	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	<50% of streams/ IP-km (>40% Pools; >20% Riffles)	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)		
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75.9 of IP-km	Good
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	?39% Class 5 & 6 across IP-km	Poor
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined		
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	<50% of streams/ IP-km (>50% stream average scores of 1 & 2)	Poor
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Sublethal or Chronic	Fair

			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower		
5	Smolts	Condition	Estuary/Lagoon	Quality & Extent	Estuary/Lagoon Decision Matrix					Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	1.1 - 5 Diversions/10 IP km	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score >75	Poor
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Smoltification	Temperature	<50% IP-Km (>6 and <14 C)	50-74% IP-Km (>6 and <14 C)	75-90% IP-Km (>6 and <14 C)	>90% IP-Km (>6 and <14 C)	50-74% IP-km (>6 and <14 C)	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Sublethal or Chronic	Fair
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Abundance	Smolt abundance which produces high risk spawner density per Spence (2008)	Smolt abundance which produces moderate risk spawner density per Spence (2008)	Smolt abundance to produce low risk spawner density per Spence (2008)		Smolt abundance which produces high risk spawner density per Spence (2008)	Poor

6	Watershed Processes	Landscape Context	Hydrology	Impervious Surfaces	>10% of Watershed in Impervious Surfaces	7-10% of Watershed in Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	<3% of Watershed in Impervious Surfaces	>10% of Watershed in Impervious Surfaces	Poor
			Landscape Patterns	Agriculture	>30% of Watershed in Agriculture	20-30% of Watershed in Agriculture	10-19% of Watershed in Agriculture	<10% of Watershed in Agriculture	27% of Watershed in Agriculture	Fair
			Landscape Patterns	Timber Harvest	>35% of Watershed in Timber Harvest	26-35% of Watershed in Timber Harvest	25-15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	Very Good
			Landscape Patterns	Urbanization	>20% of watershed >1 unit/20 acres	12-20% of watershed >1 unit/20 acres	8-11% of watershed >1 unit/20 acres	<8% of watershed >1 unit/20 acres	43% of watershed >1 unit/20 acres	Poor
			Riparian Vegetation	Species Composition	<25% Intact Historical Species Composition	25-50% Intact Historical Species Composition	51-74% Intact Historical Species Composition	>75% Intact Historical Species Composition	<25% Intact Historical Species Composition	Poor
			Sediment Transport	Road Density	>3 Miles/Square Mile	2.5 to 3 Miles/Square Mile	1.6 to 2.4 Miles/Square Mile	<1.6 Miles/Square Mile	5.2 Miles/Square Mile	Poor
			Sediment Transport	Streamside Road Density (100 m)	>1 Miles/Square Mile	0.5 to 1 Miles/Square Mile	0.1 to 0.4 Miles/Square Mile	<0.1 Miles/Square Mile	4.5 Miles/Square Mile	Poor

Novato Creek CAP Threat Results

	Threats Across Targets	Adults	Eggs	Summer Rearing Juveniles	Winter Rearing Juveniles	Smolts	Watershed Processes	Overall Threat Rank
	Project-specific-threats	1	2	3	4	5	6	
1	Agriculture	Medium	Low	Very High	Medium	Low	Medium	High
2	Channel Modification	Very High	High	Very High	Very High	High	Very High	Very High
3	Disease, Predation and Competition	Medium	Low	Medium	Medium	Low	Medium	Medium
4	Hatcheries and Aquaculture	Low	Low	Medium	Low	Low		Low
5	Fire, Fuel Management and Fire Suppression	Low	Low	Medium	Medium	Low	Low	Medium
6	Fishing and Collecting	Low	Low	Medium		Low		Low
7	Livestock Farming and Ranching	Medium	Low	Medium	Medium	Low	Low	Medium
8	Logging and Wood Harvesting	Low	Low	Medium	Medium	Low	Low	Medium
9	Mining	Low	Low	Medium	Medium	Low	Low	Medium
10	Recreational Areas and Activities	Medium	Medium	Medium	High	Low	Medium	Medium
11	Residential and Commercial Development	Very High	High	Very High	Very High	High	Very High	Very High
12	Roads and Railroads	High	High	High	High	High	Very High	Very High
13	Severe Weather Patterns	Medium	Low	Medium	Medium	Low	Low	Medium
14	Water Diversion and Impoundments	Very High	High	Very High	Very High	High	High	Very High
	Threat Status for Targets and Project	Very High	High	Very High	Very High	High	Very High	Very High

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-1.1.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat										
NvC-CCCS-1.1.1.1	Action Step	Estuary	Evaluate all floodgates located within the tidal portion of Novato Creek and determine the feasibility of re-claiming historic tidal slough habitat.	3	5	City of Novato, Marin County						0	Action is considered In-Kind
NvC-CCCS-1.1.1.2	Action Step	Estuary	Evaluate water quality conditions (salinity, dissolved oxygen, temperature) in potential steelhead estuary rearing areas.	3	5	City of Novato, Marin County	15.00					15	Cost based on installing a minimum of 3 continuous water quality monitoring stations at a rate of $5,000/station. Cost does not account for data management or maintenance.
NvC-CCCS-1.1.1.3	Action Step	Estuary	Identify and provide recommendations for potential rehabilitation sites that have been altered by dredging and diking.	3	5	City of Novato, Marin County	339.00					339	Cost based on estuary use/residence timing model at a rate of $338,679/project.
NvC-CCCS-1.1.1.4	Action Step	Estuary	Identify locations to install habitat complexity features to enhance steelhead estuary rearing conditions.	3	5	City of Novato, Marin County						0	Action is considered In-Kind
NvC-CCCS-1.1.1.5	Action Step	Estuary	Develop and implement estuary rehabilitation and enhancement strategies.	3	15	City of Novato, Marin County	613	613	613			1,838	Cost based on treating 5% of total estuarine acres at a rate of $49,200/acre.
NvC-CCCS-1.1.2	Recovery Action	Estuary	Increase and enhance habitat complexity features										
NvC-CCCS-1.1.2.1	Action Step	Estuary	Evaluate, and if feasible implement restoration projects that integrate upland and intertidal habitats.	3	15	City of Novato, Marin County						0	Cost accounted for in above action step.
NvC-CCCS-1.1.2.2	Action Step	Estuary	Evaluate and implement, where feasible, programs to enhance native benthic flora and fauna (such as native bivalves) to reduce habitat related effects of non-native invasive species.	3	10	City of Novato, Marin County						0	Cost accounted for in above action step.
NvC-CCCS-1.1.2.3	Action Step	Estuary	Restore large areas of tidal marsh in diked and muted tidal marsh areas throughout the watershed.	3	15	City of Novato, Marin County						0	Cost accounted for in above action step.
NvC-CCCS-1.1.2.4	Action Step	Estuary	Use only native species in restoration, inspecting all live restoration and construction materials for aquatic invasive species and cleaning all equipment prior to and post restoration/construction.	3	15	City of Novato, Marin County, Marin RCD, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-1.1.2.5	Action Step	Estuary	Monitor all restoration projects to identify success of techniques. Also, when unsatisfactory results are identified, implement responses to address causes of poor results.	3	25	City of Novato, Marin County	27.60	27.60	27.60	27.60	27.60	138	Cost basd on fish/habitat restoration model at a rate of $137,833/project.
NvC-CCCS-1.1.3	Recovery Action	Estuary	Reduce toxicity and pollutants										
NvC-CCCS-1.1.3.1	Action Step	Estuary	Reduce and minimze habitat modification that has caused, is causing, or may cause impaired water quality affecting juveniles and adults.	2	15	City of Novato, Marin County, NBWD						0	Cost will be accounted through implementation of other action steps.
NvC-CCCS-1.1.3.2	Action Step	Estuary	Implement tidal restoration projects that help capture and provide treatment of upland runoff.	3	5	City of Novato, Marin County						0	Costs accounted for in previous actions related to tidal restoration.
NvC-CCCS-1.1.3.3	Action Step	Estuary	Plan and implement Total Maximum Daily Load plans for known pollutant impairments.	3	10	City of Novato, Marin County, RWQCB						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-1.1.3.4	Action Step	Estuary	Plan and implement structural solutions to reduce urban storm runoff pollutant loads.	3	15	City of Novato, Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Increase and enhance velocity refuge										
NvC-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Identify the floodplain activation flow which is the smallest flood pulse event that initiates substantial beneficial ecological processes when associated with floodplain inundation (Williams et al. 2009).	3	5	City of Novato, Marin County, Marin RCD, NBWD	79.00					79	Cost based on stream flow/precipitation model at a rate of $78,100/project.
NvC-CCCS-2.1.2	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
NvC-CCCS-2.1.2.1	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in modified channel areas.	2	5	City of Novato, Marin County, Marin RCD, NBWD	345.00					345	Cost based on riparian and wetland restoration model at a rate of $88,551 and $255,968/project, respectively.
NvC-CCCS-2.1.2.2	Action Step	Floodplain Connectivity	Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD, NMFS						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-2.1.2.3	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target velocity refuge for migrating salmonids.	3	15	City of Novato, Marin County, Marin RCD, NBWD	595	595	595			1,786	Cost based on treating 0.5 miles (assume 80 acres/mile) at a rate of $44,640/acre.
NvC-CCCS-2.1.2.4	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target winter rearing habitat for juvenile steelhead.	3	15	City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action step.
NvC-CCCS-3.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-3.1.1	Recovery Action	Hydrology	Improve passage flows										
NvC-CCCS-3.1.1.1	Action Step	Hydrology	Reduce impacts of impaired hydrology (reduced pulse-flows, magnitude, duration, and timing of freshets) that preclude adult and smolt passage over critical riffles and other nature obstacles.	1	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will depend on amount of water released from Stafford Lake and other factors.
NvC-CCCS-3.1.1.2	Action Step	Hydrology	Establish a comprehensive stream flow evaluation program to determine instream flow needs for steelhead.	3	5	CDFW, City of Novato, Marin County, NBWD	79.00					79	Cost based on stream flow/precipitation model at a rate of $78,100/project.
NvC-CCCS-3.1.2	Recovery Action	Hydrology	Improve flow conditions										
NvC-CCCS-3.1.2.1	Action Step	Hydrology	Increase the amount of available spawning and rearing habitat by improving instream flow conditions.	1	5	City of Novato, Marin County, NBWD, RWQCB						0	Costs will be attributed to implementation of other action steps.
NvC-CCCS-3.1.2.2	Action Step	Hydrology	Continue to implement strategies for efficient water use and conservation through the Urban Water Conservation Council and the Sonoma Marin Saving Water partnership.	3	5	City of Novato, Marin County, Marin RCD, NBWD, Sonoma County						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-3.1.2.3	Action Step	Hydrology	Develop and implement a water use plan ensuring base-flow sustainability.	3	5	City of Novato, Marin County, Marin RCD, NBWD						0	Action is considered In-Kind

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-3.1.2.4	Action Step	Hydrology	Require streamflow gaging devices to evaluate impairment to current streamflow conditions.	2	5	City of Novato, Marin County, NBWD	45.50					46	Initial cost based on installing a minimum of 3 stream flow gauges at a rate of $1,000/gauge. Cost does not account for data management or maintenance. Cost revised with information from NBWA, to $10,500 per gauge.
NvC-CCCS-3.1.2.5	Action Step	Hydrology	Implement conjunctive use of water for water projects whenever possible to maintain or restore steelhead habitat.	3	10	City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-3.1.2.6	Action Step	Hydrology	Encourage Marine Country Club to use and conserve treated waste water to irrigate.	2	20	Marin Country Club, Marin Municipal Water District, NBWD						TBD	
NvC-CCCS-5.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
NvC-CCCS-5.1.1.1	Action Step	Passage	Restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001).	3	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD	809					809	Cost based on adult escapement and juvenile migration model for 3 impassable barriers at a rate of $269,570/project. Three immpassible dams were identified in the 2008 Passage Assessment Database not counting Stafford Dam.
NvC-CCCS-5.1.1.2	Action Step	Passage	Evaluate the feasibility and benefit of providing passage (both adult immigration and adult/smolt emigration) to the stream reaches located upstream of Stafford Dam and the dams on the Marin Country Club property.	3	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD	250					250	Costs estimate for developing an feasibility analysis and report on providing passage at Stafford Dam.
NvC-CCCS-5.1.1.3	Action Step	Passage	If deemed feasible and beneficial, evaluate and prescribe volitional and non-volitional passage methodologies at Stafford Dam and the dams on the Marin Country Club property.	2	5	CDFW, City of Novato, Marin County, NBWD						0	Cost accounted for in above action steps.
NvC-CCCS-6.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-6.1.1	Recovery Action	Habitat Complexity	Improve large wood frequency										
NvC-CCCS-6.1.1.1	Action Step	Habitat Complexity	Increase wood frequency in spawning and rearing areas to the extent that a minimum of six key LWD pieces exists every 100 meters in 0-10 meters BFW streams.	2	10	City of Novato, Marin County, Marin RCD, NBWD	8.00	8.00				16	Cost based on treating 0.5 miles at a rate of $31,200/mile. Cost likely higher with increased engineering and oversight. Use of ELJ estimate is $124,800/ELJ.
NvC-CCCS-6.1.1.2	Action Step	Habitat Complexity	Identify and optimize the appropriate number of key LWD pieces throughout the watershed.	2	15	City of Novato, Marin County, NBWD	46.00	46.00	46.00			138	Cost based on fish/habitat restoration model at $137,833/project
NvC-CCCS-6.1.1.3	Action Step	Habitat Complexity	Develop strategies to optimize hydraulic diversity and habitat complexity when implementing/installing LWD structures.	3	10	City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
NvC-CCCS-6.1.1.4	Action Step	Habitat Complexity	Develop and install seasonal habitat rearing features that achieve optimal performance during spring/fall baseflow conditions throughout the watershed.	3	10	City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
NvC-CCCS-6.1.2	Recovery Action	Habitat Complexity	Improve frequency of primary pools										

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-6.1.2.1	Action Step	Habitat Complexity	Increase the number of primary pools to the extent that more than 40% of summer rearing pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams.)	3	15	City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action step.
NvC-CCCS-6.1.2.2	Action Step	Habitat Complexity	Enhance pool depth: increase depth, cover, and complexity using CDFW protocols (SCWLFA 2006).	3	10	City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action step.
NvC-CCCS-6.1.3	Recovery Action	Habitat Complexity	Improve shelter										
NvC-CCCS-6.1.3.1	Action Step	Habitat Complexity	Increase the number of pools that have a minimum shelter of 80 (See NMFS criteria).	3	15	City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action step.
NvC-CCCS-6.1.3.2	Action Step	Habitat Complexity	Evaluate, identify, and improve shelters in pools throughout the watershed.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action step.
NvC-CCCS-6.1.4	Recovery Action	Habitat Complexity	Improve pool/riffle/flatwater ratios (hydraulic diversity)										
NvC-CCCS-6.1.4.1	Action Step	Habitat Complexity	Evaluate, identify, and develop strategies that will encourage riffle habitat formation throughout the watershed.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action step.
NvC-CCCS-7.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-7.1.1	Recovery Action	Riparian	Improve canopy cover										
NvC-CCCS-7.1.1.1	Action Step	Riparian	Increase the average stream canopy cover within all current and potential spawning and rearing reaches to a minimum of 80%.	3	20	CDFW, Marin County, Marin RCD, NBWD	112.00	112.00	112.00	112.00		447	Cost based on treating 1.0 miles (assume 1 project/mile with 10 acres/mile) at a rate of $44,640/acre. This action step should be coordinated with similar action step to reduce cost and redundancy.
NvC-CCCS-7.1.1.2	Action Step	Riparian	Assess riparian canopy and impacts of exotic vegetation (e.g., Arundo donax, etc.), prioritize and develop riparian habitat reclamation and enhancement programs (CDFG 2004).	3	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action steps.
NvC-CCCS-7.1.1.3	Action Step	Riparian	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to land management activities (roads, cattle, flood control, etc.).	2	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-7.1.1.4	Action Step	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers.	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs for conservation easements vary.
NvC-CCCS-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality to reduce embeddedness										
NvC-CCCS-8.1.1.1	Action Step	Sediment	Increase the percentage of pool tail-out embeddness with values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) within all spawning reaches.	2	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	This action step is based on implementation of other action steps.

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-8.1.1.2	Action Step	Sediment	Evaluate, develop, and eventually implement spawning gravel augmentation programs in essential areas.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD, NMFS						TBD	Cost to be determined pending an assessment of features. Estimate for spawning gravel is $39.5/cu. yd.
NvC-CCCS-8.1.1.3	Action Step	Sediment	Add channel roughness (logs, boulders) in strategic locations to encourage spawning tailout formations and gravel sorting.	3	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD	16.00	16.00				32	Cost based on treating 1 mile (assume 1 project/mile) at a rate of $31,200/ mile. Cost likely higher with greater level of engineering and oversight. Use of ELJ is estimated at $124,800/ELJ.
NvC-CCCS-8.1.2	Recovery Action	Sediment	Improve gravel quantity and distribution for macro-invertebrate production (food)										
NvC-CCCS-8.1.2.1	Action Step	Sediment	Increase the percentage of gravel quality embeddedness to values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) in all current and potential juvenile salmonid summer and seasonal (fall/winter/spring) rearing areas.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost accounted for.
NvC-CCCS-8.1.2.2	Action Step	Sediment	Increase stream bed and bank stability using biotechnical materials (vegetation, plant fiber, and native wood and rock), where appropriate (SCWLFA 2006).	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost based on number and type of stream bed and bank stability to be used. Estimate for bioengineering methods range from $418/100' x 10' (WSDOT 2001).
NvC-CCCS-8.1.2.3	Action Step	Sediment	Re-mediate upland sources (prevent eroded soils form entering the stream system) (SCWLFA 2006).	3	10	City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
NvC-CCCS-8.1.2.4	Action Step	Sediment	Add channel roughness features (logs, large boulders) to trap cobbles in current and potential seasonal reaches.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in other action steps.
NvC-CCCS-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-10.1.1	Recovery Action	Water Quality	Reduce toxicity and pollutants										
NvC-CCCS-10.1.1.1	Action Step	Water Quality	Address water pollution from non-point sources within the watershed through outreach, education and enforcement.	2	10	CDFW, City of Novato, Marin County, NBWD, RWQCB	7.50	7.50				15	Cost based on installing continuous water quality stations at a rate of $5,000/station. Cost does not account for data management or maintenance.
NvC-CCCS-10.1.1.2	Action Step	Water Quality	Identify and remediate sources of pulses of water originating from human activities (e.g. flushing of swimming pools, etc.).	3	5	CDFW, City of Novato, Marin County, NBWD						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-10.1.1.3	Action Step	Water Quality	Identify nutrient loading sources causing poor water quality conditions for steelhead and implement strategies for remediating or avoiding future inputs of pollution to watershed streams.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs vary with monitoring effort and measures to be implemented.
NvC-CCCS-10.1.1.4	Action Step	Water Quality	Avoid, or at a minimum minimize, the use of commercial and industrial products (e.g., pesticides) with high potential for contamination of local waterways.	3	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-10.1.1.5	Action Step	Water Quality	Encourage the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-10.1.2	Recovery Action	Water Quality	Improve stream temperature conditions										

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-10.1.2.1	Action Step	Water Quality	Implement comprehensive evaluation and monitoring program to determine areas where poor riparian habitat is contributing to increased water temperatures limiting juvenile steelhead survival and aquatic habitat potential.	3	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs vary with monitoring effort and measures to be implemented.
NvC-CCCS-10.1.2.2	Action Step	Water Quality	Rehabilitate or restore riparian corridor conditions within all current and potential high value habitat summer rearing areas.	2	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Costs accounted for in previous actions related to riparian restoration.
NvC-CCCS-10.1.3	Recovery Action	Water Quality	Reduce turbidity and suspended sediment										
NvC-CCCS-10.1.3.1	Action Step	Water Quality	Where feasible, utilize native plants and bioengineering techniques to stabilize banks.	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-10.1.3.2	Action Step	Water Quality	Identify and implement strategies to reduce landslide hazard areas and other upslope sources of fine sediment (hillslope hollows, deep-seated landslides, etc.).	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
NvC-CCCS-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										
NvC-CCCS-11.1.1.1	Action Step	Viability	Conduct a comprehensive assessment of watershed processes (e.g., hydrology, geology, fluvial-geomorphology, water quality, and vegetation), instream habitat, and factors limiting steelhead production.	2	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost will vary with assessment methods and level of detail.
NvC-CCCS-11.1.1.2	Action Step	Viability	Continue and expand upon watershed and instream habitat assessments and population status monitoring; use new knowledge to adapt strategies.	2	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost will vary with assessment methods and level of detail.
NvC-CCCS-11.1.1.3	Action Step	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed.	2	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Costs for monitoring are covered under in the Monitoring Chapter as part of the Coastal Monitoring Plan
NvC-CCCS-11.1.1.4	Action Step	Viability	Conduct habitat surveys to monitor change in key habitat variables.	3	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Costs for monitoring are covered under in the Monitoring Chapter as part of the Coastal Monitoring Plan
NvC-CCCS-11.1.1.5	Action Step	Viability	Initiate smolt outmigration study and develop smolt abundance estimates.	2	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD, NMFS						0	Costs for monitoring are covered under in the Monitoring Chapter as part of the Coastal Monitoring Plan
NvC-CCCS-11.1.1.6	Action Step	Viability	Develop standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas.	3	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost will vary with assessment methods and level of detail.
NvC-CCCS-11.1.1.7	Action Step	Viability	Improve conditions for steelhead through supporting enforcement of environmental laws and regulations.	2	25	CDFW, City of Novato, Marin County, NBWD, NMFS OLE						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-12.1	**Objective**	**Agriculture**	**Address the present of threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-12.1.1	Recovery Action	Agriculture	Prevent or minimize impairment to habitat complexity (reduced large wood and/or shelter)										

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NvC-CCCS-12.1.1.1	Action Step	Agriculture	Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to provide future recruitment of large wood and other shelter components.	2	10	City of Novato, Marin County, NBWD						0	Costs captured in other recovery actions. See Riparian.
NvC-CCCS-12.1.1.2	Action Step	Agriculture	Avoid the removal of large wood and other shelter components from the stream system.	2	5	City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-12.1.2	Recovery Action	Agriculture	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										
NvC-CCCS-12.1.2.1	Action Step	Agriculture	Complete Farm Conservation Plans (through the SRCD, NRCS, Fish Friendly Farming program or other cooperative conservation programs) to reduce sediment sources and improve riparian habitat within the watershed.	3	5	City of Novato, Marin County, Marin RCD, Private Landowners						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-12.1.2.2	Action Step	Agriculture	Continue the use of cover crops in agriculture fields.	2	5	City of Novato, Marin County, Marin RCD, Private Landowners						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-12.1.2.3	Action Step	Agriculture	Encourage the NRCS, RCDs, and other appropriate organizations to increase the number of landowners participating in sediment reduction planning and implementation.	3	5	City of Novato, Marin County, Marin RCD, NMFS						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-12.1.2.4	Action Step	Agriculture	Assess the effectiveness of erosion control measures throughout the winter period.	2	5	City of Novato, Marin County, Marin RCD						0	Action is considered In-Kind
NvC-CCCS-12.1.3	Recovery Action	Agriculture	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
NvC-CCCS-12.1.3.1	Action Step	Agriculture	Maintain adequate stream corridor buffers to filter and prevent fine sediment input from entering streams of the watershed.	2	10	City of Novato, Marin County, Marin RCD, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-12.1.3.2	Action Step	Agriculture	Reduce discharge of chemical effluent and fertilizer related to agricultural practices.	3	10	City of Novato, Marin County, Marin RCD, Private Landowners						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-12.1.4	Recovery Action	Agriculture	Prevent or minimize impairment to water quality (impaired stream temperature)										
NvC-CCCS-12.1.4.1	Action Step	Agriculture	Minimize the amount of water used for agriculture to protect stream flow and temperatures.	2	10	City of Novato, Marin County, Marin RCD, Private Landowners						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-12.1.4.2	Action Step	Agriculture	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to agricultural activities.	2	10	City of Novato, Marin County, Marin RCD, Private Landowners						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-12.1.5	Recovery Action	Agriculture	Prevent or minimize alterations to riparian species composition and structure										
NvC-CCCS-12.1.5.1	Action Step	Agriculture	Re-establish native plant communities in riparian zones to increase stream canopy to a minimum of 80%.	3	15	City of Novato, Marin County, Marin RCD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
NvC-CCCS-12.1.5.2	Action Step	Agriculture	Develop and implement riparian setbacks/buffers that protect existing native riparian species composition and structure.	3	15	City of Novato, Marin County, Marin RCD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.

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NvC-CCCS-12.1.6	Recovery Action	Agriculture	Prevent or minimize impairment to stream hydrology (impaired water flow)										
NvC-CCCS-12.1.6.1	Action Step	Agriculture	Identify and eliminate depletion of summer base flows from unauthorized water uses.	2	5	City of Novato, Marin County, Marin RCD, NBWD						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-13.1	**Objective**	**Channel Modification**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
NvC-CCCS-13.1.1.1	Action Step	Channel Modification	Limit new development - flood control projects or other modifications facilitating new development (as opposed to protecting existing infrastructure) should be avoided.	3	25	City of Novato, Marin County						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-13.1.1.2	Action Step	Channel Modification	Prevent channel modification activities from causing future impediments to the creation, or blocking access to, off channel habitat used by salmonids as refuge and winter rearing habitat during high stream flows.	3	5	City of Novato, Marin County						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-13.1.2	Recovery Action	Channel Modification	Prevent or minimize impairment to habitat complexity (altered pool complexity and/or pool, riffle ratio)										
NvC-CCCS-13.1.2.1	Action Step	Channel Modification	All proposed flood control projects should include habitat protection, and/or alternatives that minimize impacts to salmon habitat.	1	15	City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-13.1.2.2	Action Step	Channel Modification	Ensure future retention and recruitment of large woody and root wads to rehabilitate existing stream complexity, pool frequency, and depth.	3	15	City of Novato, Marin County						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-13.1.2.3	Action Step	Channel Modification	Protect existing natural channel reaches from channelization and enhance winter refuge and seasonal habitat features where appropriate.	1	10	City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-13.1.3	Recovery Action	Channel Modification	Prevent or minimize impairment to habitat complexity (reduce large wood and/or shelter)										
NvC-CCCS-13.1.3.1	Action Step	Channel Modification	Identify locations where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to improve these conditions. Consider flow rates and discharges when designing LWD and shelter enhancement features.	3	5	City of Novato, Marin County, Marin RCD, NBWD	536					536	Cost based on 0.5 miles of flood channel at a rate of $1,070,400/mile.
NvC-CCCS-13.1.3.2	Action Step	Channel Modification	Incorporate velocity refuge habitat features in all future and existing engineered and modified channels.	2	10	City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost accounted for in above action steps.
NvC-CCCS-18.1	**Objective**	**Livestock**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-18.1.1	Recovery Action	Livestock	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)										
NvC-CCCS-18.1.1.1	Action Step	Livestock	Reduce impacts from livestock grazing.	2	20	City of Novato, Marin RCD, RWQCB						TBD	
NvC-CCCS-21.1	**Objective**	**Recreation**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-21.1.1	Recovery Action	Recreation	Prevent or minimize adverse alterations to riparian species composition and structure										
NvC-CCCS-21.1.1.1	Action Step	Recreation	Improve conditions for steelhead by increasing the beneficial effects, and decreasing the detrimental effects, of recreational areas and activities within the watershed.	3	10	CDFW, City of Novato, Marin County, NBWD						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-21.1.1.2	Action Step	Recreation	Encourage riparian restoration within recreational areas.	3	10	City of Novato, Marin County, Marin RCD, NBWD						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-21.1.1.3	Action Step	Recreation	Assess riparian canopy and impacts of exotic vegetation (e.g., Arundo donax, etc.), prioritize and develop riparian habitat reclamation and enhancement programs at recreational sites including park lands and Marin Country Club property.	3	5	City of Novato, Marin County, Marin RCD, NBWD							Costs covered under other recovery actions. See Riparian.
NvC-CCCS-21.1.1.4	Action Step	Recreation	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to land management activities (e.g. flood control, park or golf course landscaping, etc.).	3	25	City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-21.1.2	Recovery Action	Recreation	Prevent or minimize impairment to floodplain connectivity (impaired quality and extent)										
NvC-CCCS-21.1.2.1	Action Step	Recreation	Evaluate the effects of recreational facilities such as levees, bike/pedestrian trails, and road crossings that may constrain opportunities to expand channel width and/or reconnect floodplain at recreational sites including park lands and Marin Country Club property.	3	5	City of Novato, Marin County, NBWD	138.00					138	Cost based on fish/habitat restoration model at a rate of $137,833/project.
NvC-CCCS-21.1.2.2	Action Step	Recreation	Develop and implement a plan that remediates existing recreational facilities to allow for stream functions, and sites new facilities in such a way that their placement does not constrain channel width or floodplain connection.	3	10	City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
NvC-CCCS-21.1.3	Recovery Action	Recreation	Prevent or minimize impairment to passage and migration										
NvC-CCCS-21.1.3.1	Action Step	Recreation	Assess and restore passage at barriers associated with at recreational sites throughout the watershed.	3	5	City of Novato, Marin County, Marin RCD, NBWD							Costs covered under other recovery actions. See Passage.
NvC-CCCS-22.1	**Objective**	**Residential /Commercial Development**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-22.1.1	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to the estuary (impaired quality and extent)										
NvC-CCCS-22.1.1.1	Action Step	Residential /Commercial Development	Curtail further development in active wetlands through zoning restrictions, county master plans and other Federal, State, and county planning and regulatory processes, and land protection agreements.	3	25	California Coastal Conservancy, City of Novato, Marin County						0	Action is considered In-Kind
NvC-CCCS-22.1.1.2	Action Step	Residential /Commercial Development	Increase monitoring and enforcement of illegal bank or shoreline stabilization activities.	3	10	CDFW, City of Novato, Marin County, NBWD						0	Existing programs and outreach are considered In-Kind.

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-22.1.1.3	Action Step	Residential /Commercial Development	Promote native intertidal and subtidal vegetation through eradication and control of non-native species.	3	10	California Coastal Conservancy, City of Novato, Marin County, Marin RCD, NBWD	8.50	8.50				17	Cost based on treating 0.2 miles (assume 1 project/mile with 80 acres/mile) at a rate of $1,026/acre.
NvC-CCCS-22.1.2	Recovery Action	Residential /Commercial Development	Prevent or minimize increased landscape disturbance										
NvC-CCCS-22.1.2.1	Action Step	Residential /Commercial Development	Minimze new development, or road construction within floodplains, riparian areas, unstable soils or other sensitive areas.	3	25	City of Novato, Marin County						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-22.1.2.2	Action Step	Residential /Commercial Development	Conserve open space in relatively intact landscapes, protect floodplain areas and riparian corridors, and develop conservation easements.	3	25	City of Novato, Marin County, Private Landowners						TBD	Costs for conservation easements vary.
NvC-CCCS-22.1.3	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
NvC-CCCS-22.1.3.1	Action Step	Residential /Commercial Development	Prevent the future use of commercial and industrial products (e.g., pesticides) with high potential for contamination of local waterways.	3	15	CDFW, City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-22.1.3.2	Action Step	Residential /Commercial Development	Upgrade existing stormwater systems into a spatially distributed discharge network (rather than a few point discharges).	3	25	City of Novato, Marin County, NBWD						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-22.1.3.3	Action Step	Residential /Commercial Development	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining riparian vegetation, instream LWD, and LWD recruitment.	3	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-22.1.4	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
NvC-CCCS-22.1.4.1	Action Step	Residential /Commercial Development	Minimze new development within 100-year floodprone zones.	3	25	City of Novato, Marin County, NBWD						0	Action is considered In-Kind
NvC-CCCS-22.1.4.2	Action Step	Residential /Commercial Development	Rehabilitate areas where existing and dilapidated infrastructure impairs the quality of floodplain and winter rearing for habitat for steelhead within the watershed.	2	15	City of Novato, Marin County, Marin RCD, NBWD	585	585	585			1,756	Cost based on treating 0.5 miles (assume 1 project/mile with 80 acres/mile) at a rate of $44,640/acre.
NvC-CCCS-22.1.4.3	Action Step	Residential /Commercial Development	Recalculate 100-year flood interval that takes into consideration global climate change and rising sea levels.	3	15	City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-22.1.5	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to stream hydrology (impaired water flow)										
NvC-CCCS-22.1.5.1	Action Step	Residential /Commercial Development	Encourage and identify opportunities for on-site rain retention facilities.	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-22.1.5.2	Action Step	Residential /Commercial Development	Develop filter or buffer systems that reduce pollutants from entering streams and waterways.	3	15	City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost based on amount and type of filter or buffer system needed to improve conditions. Estimate for filter strip ranges from $32,000 - $84,000/system.
NvC-CCCS-22.1.6	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to hydrology (gravel scouring events)										
NvC-CCCS-22.1.6.1	Action Step	Residential /Commercial Development	Minimize impervious surfaces in new and development projects (SCWLFA 2006).	3	25	City of Novato, Marin County, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance										
NvC-CCCS-23.1.1.1	Action Step	Roads/Railroads	Decommission and or re-locate riparian roads upslope to achieve desirable riparian road density criteria (<0.1 to 0.4 Miles/Square Mile).	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD		144.00	144.00			288	Cost based on decommissioning 20 miles of road at a rate of $14,400/mile. Cost likely higher due to infrastucture..
NvC-CCCS-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration										
NvC-CCCS-23.1.2.1	Action Step	Roads/Railroads	Ensure all future new, repair, and replacement road/stream crossing provide unimpaired passage for all steelhead life stages.	3	25	Caltrans, CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-23.1.2.2	Action Step	Roads/Railroads	Conduct collaborative evaluations of priorities for treatment of road-related CCC steelhead passage barriers, such as the Fish Passage Forum.	3	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Cost will vary with assessment methods and level of detail.
NvC-CCCS-23.1.2.3	Action Step	Roads/Railroads	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001) and appropriate barrier databases when developing new or retrofitting existing road crossings.	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD, NMFS						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-23.1.2.4	Action Step	Roads/Railroads	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) must accommodate 100-year flow event and associated sediment transport.	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										
NvC-CCCS-23.1.3.1	Action Step	Roads/Railroads	Utilize best management practices for road construction, maintenance, management and decommissioning (e.g., Fishnet 4c County Roads Manual; Hagans & Weaver, 1994; Oregon Department of Transportation, 1999; Sommarstrom 2002).	3	25	City of Novato, Marin County, Marin RCD, NBWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-23.1.3.2	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.	3	25	Caltrans, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-23.1.3.3	Action Step	Roads/Railroads	Minimze the construction of new roads near high valve habitat areas or sensitive habitat areas.	3	25	Caltrans, CDFW, City of Novato, Marin County, NBWD						0	Action is considered In-Kind
NvC-CCCS-23.1.3.4	Action Step	Roads/Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	3	10	City of Novato, Marin County, Marin RCD, NBWD	149.00	149.00				298	Cost based on road inventory for 259 miles at a rate $1,148/mile
NvC-CCCS-23.1.4	Recovery Action	Roads/Railroads	Prevent or minimize impairment to stream hydrology (impaired water flow)										
NvC-CCCS-23.1.4.1	Action Step	Roads/Railroads	Conduct actions that hydrologically disconnect roads.	3	25	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation identified in road assessment.

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-23.1.5	Recovery Action	Roads/Railroads	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
NvC-CCCS-23.1.5.1	Action Step	Roads/Railroads	Minimize new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific road management plan is created and implemented.	3	5	CDFW, City of Novato, Marin County, Marin RCD, NBWD						0	Action is considered In-Kind
NvC-CCCS-23.1.5.2	Action Step	Roads/Railroads	Evaluate existing roadways within 200 meters of the riparian corridor, and develop plans to decrease the ongoing impacts associated with these roads.	3	5	City of Novato, Marin County, Marin RCD, NBWD						0	Cost accounted for in above action step.
NvC-CCCS-25.1	**Objective**	**Water Diversion /Impoundment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
NvC-CCCS-25.1.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
NvC-CCCS-25.1.1.1	Action Step	Water Diversion /Impoundment	Implement passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).	2	10	CDFW, City of Novato, Marin County, NBWD						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-25.1.1.2	Action Step	Water Diversion /Impoundment	Identify and eliminate depletion of summer base flows from unauthorized water uses.	2	5	CDFW, City of Novato, Marin County, NBWD, SWRCB						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-25.1.1.3	Action Step	Water Diversion /Impoundment	Work with recovery partners to ensure that current and future water diversions (surface or groundwater) do not impair water quality conditions in summer or fall rearing reaches.	3	25	CDFW, City of Novato, Marin County, NBWD, RWQCB						0	Operations conducted normally or with minor modifications are considered In-Kind.
NvC-CCCS-25.1.1.4	Action Step	Water Diversion /Impoundment	Work with SWRCB and landowners to improve survival and migration opportunities for all lifestages.	3	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD, NMFS, Private Landowners, SWRCB						0	Existing programs and outreach are considered In-Kind.
NvC-CCCS-25.1.2	Recovery Action	Water Diversion /Impoundment	Prevent or minimize alterations to sediment transport (road conditions/density, dams etc.)										
NvC-CCCS-25.1.2.1	Action Step	Water Diversion /Impoundment	Implement actions that minimize adverse effects of dams and weirs.	3	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-25.1.2.2	Action Step	Water Diversion /Impoundment	Re-establish natural sediment delivery processes and implement sediment reduction activities where necessary.	3	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented.
NvC-CCCS-25.1.3	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to passage and migration										
NvC-CCCS-25.1.3.1	Action Step	Water Diversion /Impoundment	Adequately screen water diversions to prevent entrainment of all steelhead life stages in anadromus reaches.	2	15	CDFW, City of Novato, Marin County, Marin RCD, NBWD, NMFS						TBD	Costs will vary depending on methods implemented. Estimate for fish screens is $64,158/screen.
NvC-CCCS-25.2	**Objective**	**Water Diversion /Impoundment**	**Address the inadequacy of existing regulatory mechanisms**										

Novato Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
NvC-CCCS-25.2.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
NvC-CCCS-25.2.1.1	Action Step	Water Diversion /Impoundment	Assess, map, and install meters or stream gages on all water diversions (CDFG 2004).	3	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD	1.50	1.50				3	Cost based on installing a minimum of 3 stream flow gauges at a rate of $1,000/gauge. Cost does not account for data management or maintenance.
NvC-CCCS-25.2.1.2	Action Step	Water Diversion /Impoundment	Prevent and/or minimize the adverse effects of water diversion on salmonid habitat by establishing a more natural hydrograph, by-passing adequate downstream flows, regulating season of diversion, and promoting and implementing off-stream storage solutions (CDFG 2004).	2	10	CDFW, City of Novato, Marin County, Marin RCD, NBWD						TBD	Costs will vary depending on methods implemented.

San Francisquito Creek Population

CCC Steelhead Winter-Run

- Role within DPS: Potentially Independent Population
- Diversity Stratum: Coastal San Francisco Bay
- Spawner Density Target: 1,300 adults
- Current Intrinsic Potential: 35.6 IP-km

Steelhead Abundance and Distribution

The San Francisquito Creek watershed is located on the San Francisco Peninsula and includes portions of both San Mateo and Santa Clara counties. The watershed is approximately 45 square miles, extending from the ridge of the Santa Cruz Mountains and draining to San Francisco Bay. Much of the watershed lies in steep, mountainous areas, and the highest elevation in the watershed is approximately 2,200 feet. Major tributaries include Los Trancos Creek, Corte Madera Creek, West Union Creek, and Bear Creek (Leidy *et al.* 2005a). Recent analysis suggests perennial, well shaded reaches of the mainstem, and these tributaries likely supported coho salmon historically (Leidy *et al.* 2005b). Steelhead have been documented in the San Francisquito Creek watershed at various densities since the 1950s (Leidy *et al.* 2005b). Since there has not been consistent monitoring of the population in the watershed, data are not available to ascertain trends in abundance. However, recent monitoring indicates that steelhead persist in the San Francisquito system (Fong 1999; unpublished data). Rearing habitat is available in the mainstem of San Francisquito Creek, Los Trancos Creek, West Union Creek, Bear Creek, and their tributary streams (Leidy *et al.* 2005a). Current conditions, however, limit the ability of this system to support a viable steelhead population. Access to approximately 14 kilometers of potential habitat (IP-km) in the Corte Madera Creek sub-basin is blocked by Searsville Dam.

History of Land Use

Water storage and diversion, residential development, channelization, urban development, road construction, and flood levee construction are among the land uses that affect the watershed processes within the San Francisquito Creek system. Since the early 1900s, major portions of tidal wetlands near the mouth of San Francisquito Creek were diked and filled (SFEI 2009). Major re-routing of the lower reaches took place in the late 1920s, with levees constructed on both sides of the creek (SFEI 2009). The upper watershed consists primarily of low-density development and open space with mid to high quality habitat for steelhead spawning and rearing. The lower portion of the watershed, which encompasses relatively low gradient portions of the valley floor/Bay plain adjacent to San Francisco Bay, has been

extensively developed and is severely impacted by urbanization (Spence *et al.* 2008). On Corte Madera Creek, approximately 500 meters upstream of the confluence with San Francisquito Creek, Stanford University operates a 68-foot high dam in the watershed, Searsville Dam (SCVWD 2011). Searsville Dam was constructed in 1892 and is a complete barrier to the upstream migration of adult steelhead.

Current Resources and Land Management

San Francisquito Creek forms a portion of the boundary between San Mateo and Santa Clara Counties. The majority (80 percent) of the watershed is located in San Mateo County and includes the cities of Atherton, Menlo Park, Portola Valley, East Palo Alto, and Woodside (SCVWD 2011). The City of Palo Alto on lower San Francisquito Creek represents the northwestern area of Santa Clara County. The watershed is governed by these various county and municipal jurisdictions (San Francisquito Watershed Council 2005). The watershed also includes several parks, including the City of Palo Alto's Foothills Park, Huddart County Park, and Wunderlich County Park. In addition, the National Park Service manages the 1,232-acre Phleger Estates of the Golden Gate National Recreation Area, which includes a portion of West Union Creek. Several municipalities in the watershed and the SCVWD have stream maintenance programs that include bank stabilization, and the removal of garbage and debris from the stream channel.

Stanford University is the largest landowner in the watershed, occupying 8,000 acres spanning both counties. Stanford operates several water facilities in the watershed for the purpose of diverting and storing water for landscape irrigation and fire control. Water is diverted from Corte Madera Creek at Searsville Reservoir; from Los Trancos Creek at the Felt Lake Diversion; and from San Francisquito Creek at the San Francisquito Pump Station. Since its construction, Searsville Reservoir has lost approximately 80-90 percent of its water storage capacity to sediment accumulation and its current capacity is approximately 100-200 acre-feet of water. In 2008, Stanford submitted applications to NMFS and the U.S. Fish and Wildlife Service for ESA section 10(a)(1)(B) incidental take permits, and a draft Habitat Conservation Plan (HCP) was submitted in support of their applications. In December 2012, Stanford requested that NMFS suspend the processing of their application pending completion of the Searsville Dam alternatives study.

The San Francisquito Creek Joint Powers Authority (SFCJPA) is a government agency formed in 1999 by the cities of Palo Alto, Menlo Park and East Palo Alto, the Santa Clara Valley Water District, and San Mateo County Flood Control District. The SFCJPA utilizes a multi-jurisdictional approach to solve problems and implement projects that provide multiple

communities flood protection, environmental benefits, and recreational benefits. The SFCJPA also coordinates creek maintenance, emergency preparedness, and emergency response communication. In 2006, the Corps, with the SFCJPA as the Local Sponsor, initiated the San Francisquito Creek Feasibility Study to determine the feasibility of a federally funded project to reduce flood damages, restore ecosystems, and create recreational opportunities within the San Francisquito Creek watershed. Concurrent with the completion of the Feasibility Study, the SFCJPA is planning and designing capital projects with the goal of reducing the potential of flooding in the watershed.

There is substantial public interest in improving the habitat for steelhead in San Francisquito Creek and its tributaries. There have been several studies aimed at assessing and improving water quality and fisheries habitat in the watershed. In 2003, there was a review of local agency storm water management policies and practices (Harris and Kocher 2006). There have been studies of fish migration barriers (Smith and Harden 2001; Cleugh and McKnight 2002), factors limiting steelhead production (Jones and Stokes 2006), and sediment dynamics in the watershed (NHC and JSA 2004). In 2006, Harris and Kocher (2006) assessed the effectiveness of policies and practices in protecting steelhead and their habitats. In coordination with Stanford, NMFS assessed instream flow requirements for steelhead downstream of the Los Trancos and San Francisquito water diversions during 2005 (NMFS 2006). The results of this study were used to develop the bypass criteria for Stanford's Steelhead Habitat Enhancement Plan (SHEP). Additionally, there are several watershed groups active in the watershed: Acterra, Beyond Searsville Dam, and the San Francisquito Watershed Coalition (a project of Acterra). These groups conduct education, outreach and restoration activities in the greater San Francisquito watershed area. Stanford has completed several studies regarding Searsville Dam and is currently conducting the Searsville Alternatives Study to address the long-term future of the dam and reservoir.

Salmonid Viability and Watershed Conditions

The following key habitat attributes were rated "Poor" through the CAP process for steelhead: habitat complexity (large wood frequency and shelter rating); passage/migration (physical barriers); riparian vegetation (tree diameter, canopy cover, and species composition); water quality (toxicity and turbidity); estuary (quality and extent); viability (adult, juvenile and smolt density or abundance); landscape patterns (urbanization); and sediment transport (overall road density and streamside road density) (See San Francisquito Creek CAP Results). Recovery strategies will focus on improving these habitat attributes, restoring access to historical habitat in the Corte Madera Creek sub-basin, as well as those needed to ensure population viability and functioning watershed processes. Strategies that address other indicators may also be

developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed.

Current Conditions

The following discussion focuses on those conditions that rated Fair or Poor as a result of our CAP viability analysis. The San Francisquito Creek CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

Population and Habitat Conditions

Habitat Complexity: Large Wood & Shelter

Habitat Complexity: Large wood conditions have a rating of Poor for all life stages. Habitat Complexity: Shelter conditions have an overall rating of Fair. Channel modification is the primary threat contributing to this condition. Additional threats contributing significantly to this condition include Residential and Commercial Development, and Roads and Railroads.

Viability: Density, Abundance & Spatial Structure

Viability conditions have an overall rating of Poor. The threat contributing significantly to this condition is Water Diversion and Impoundments because Searsville Dam has blocked adults from access to approximately one third of the watershed since completion of the dam in 1892.

Sediment Transport: Road Density

Sediment Transport from road density conditions have a rating of Poor for Watershed Processes. Per watershed characterization, the San Francisquito Creek watershed has high road densities concentrated in the urbanized area downstream. Threats contributing significantly to this condition include Channel Modification, Roads and Railroads, and Water Diversion and Impoundments.

Landscape Patterns: Agriculture, Timber Harvest & Urbanization

Landscape Pattern: Urbanization conditions have a rating of Poor for Watershed Processes. Major landscape disturbance within the San Francisquito watershed is associated with urban development. Urbanization is concentrated in the lower watershed and approximately 30 percent of the entire watershed is developed as urban land uses (NMFS GIS 2009). Threats contributing significantly to this condition are Channel Modification, Residential and Commercial Development, and Roads and Railroads.

Passage/Migration: Mouth or Confluence & Physical Barriers

Passage/Migration conditions have a rating of Poor for adults and summer rearing juveniles. A primary limiting factor for steelhead in the San Francisquito Creek watershed is blocked access to freshwater habitat upstream of Searsville Dam. Additional impediments and barriers to steelhead movement and upstream passage occur throughout the watershed (Cleugh and McKnight 2002; Smith and Harden 2001; Stoecker 2002). Threats significantly contributing to this condition are Water Diversion and Impoundments and Residential Development.

Estuary: Quality & Extent

Estuary conditions have a rating of Poor for summer rearing and smolt lifestages. Opportunities for steelhead to utilize tidal marsh areas associated with lower San Francisquito Creek have been significantly reduced by Channel Modification. Limited access to tidal marsh areas prevents juvenile steelhead and smolts from utilizing productive brackish water areas adjacent to San Francisco Bay for feeding prior to outmigration.

Velocity Refuge: Floodplain Connectivity

Velocity conditions have a rating of Fair for adults and winter rearing juveniles. The floodplain limitations present in San Francisquito Creek are primarily due to urbanization and the associated effects of flood control. Threats contributing significantly to this condition are Channel Modification, Residential and Commercial Development, and Roads and Railroads.

Hydrology: Baseflow & Passage Flows

Hydrology conditions have a rating of Fair for adults, summer rearing juveniles, and eggs. Impairment to water flow in San Francisquito Creek is due to privately owned water diversions and stream-side wells. Naturally low stream flows in the watershed may also impair passage flows, especially for smolts (Smith 2013). Threats contributing significantly to this condition are Water Diversion and Impoundment.

Threats

The following discussion focuses on those threats that rate as High or Very High. Recovery strategies will focus on ameliorating High rated threats; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in San Francisquito Creek CAP Results.

Channel Modification

This threat rated as Very High overall and for watershed processes. It rated as High for adults, summer and winter rearing juveniles. Much of San Francisquito Creek, downstream of Highway 280, has been engineering for flood water conveyance (Menlo Park 1998, SFEI 2009). Channel modification, combined with other channel and landscape altering practices, has destroyed estuarine habitat, disconnected streams from their floodplains, created passage barriers, and constrained natural fluvial and geomorphic processes that create and maintain instream and riparian habitat that support viable steelhead populations.

Another significant source of channel modification is bank protection. Bank protection measures, such as concrete rubble, rock riprap, grouted gabion baskets and sacked concrete, have been placed at locations throughout the watershed by local jurisdictions, water agencies, and residential property owners to protect roads and houses. These types of structures reduce the biological and physical integrity of stream habitats by restricting riparian vegetation growth and lateral channel migration.

Residential and Commercial Development

This threat was rated as High for adults, summer and winter rearing juveniles, watershed processes, and High overall. This threat rated High due to its impact on woody debris recruitment, water quality, floodplain connectivity, hydrology, riparian species composition, and estuary quality and extent. The 2000 census estimated the population within the San Francisquito Creek watershed at 33,628 individuals; 52 percent of the watershed has a housing density higher than 1 unit per 20 acres (NMFS GIS 2009) with significant development located in the riparian zones of the mainstem San Francisquito and many of its tributaries. With 30 percent of the watershed in developed urban land uses (NMFS GIS 2009), major modifications to the historic hydrology and channel forms have occurred. Development in the watershed has replaced riparian and upland vegetation and significantly increased impermeable surface area in the watershed. Effects to instream conditions related to existing residential and commercial developments are anticipated to continue into the future. Once established, urban/suburban development is effectively irreversible.

As described above, the close proximity of development to San Francisquito Creek has created a risk of flooding in urban and residential areas in the watershed. Flood control measures to protect development in these reaches have resulted in an extensive amount of stream channel and tidal marsh modification. Future flood control efforts may result in further losses of riparian vegetation, channel modification, and barriers to fish passage.

Roads and Railroads

This threat was rated as High for adults, winter rearing juveniles, watershed processes, and High overall. The San Francisquito watershed is heavily developed with very high road densities in the urbanized lower reaches (NMFS GIS 2009). As a result, the paved road network impacts the stream with road-born pollutants (e.g., oils, urban runoff, etc.). Road densities are estimated at 5.5 miles of road per square mile of watershed area, and at 4.7 miles per square mile of riparian area (NMFS GIS 2009). Paved roads also represent a significant source of the total impervious surface within the watershed, and likely influence storm flow intensities.

Erosion rates in the watershed are high, due in part to local geology (San Francisquito Watershed Council 2005). Corte Madera and Los Trancos creeks are considered at high risk for landslides (SCVWD 2011). Inadequate road planning and maintenance of roads can lead to landslides, downslope instability, and road surface erosion in watersheds. A watershed sediment analysis of the San Francisquito Creek watershed concludes that unpaved road and trail erosion is ubiquitous throughout the Santa Cruz Mountains, but is particularly significant in upper Corte Madera Creek (San Mateo County), Alambique Creek (Woodside and San Mateo Parks), Bear Gulch and some of the upper tributaries to West Union Creek in Huddart Park (NHC & JSA 2004). High rates of erosion in these sub-watersheds appear to be linked to the high frequency of insufficient cross drains, improperly sized culverts, ditches, and cut banks.

Water Diversion and Impoundments

This threat was rated as High for adults, watershed processes, and overall. Several significant surface water diversions in the watershed are operated to protect stream flow conditions for steelhead. However, existing and future privately owned water diversions and stream-side wells have the potential to degrade habitat conditions by reducing stream flow levels during spawning, egg incubation, and summer juvenile rearing. The primary threat produced by existing water diversions is passage impediments and barriers at impoundment structures.

Searsville Dam on lower Corte Madera Creek is a complete barrier to the upstream migration of adult steelhead. It was built in 1892 and prevents steelhead from accessing one-third of the San Francisquito watershed. Based on the characteristics and current habitat conditions in Corte Madera, Dennis Martin, Alambique, Sausal, and Westridge creeks above Searsville Dam, steelhead likely spawned and reared historically in this portion of the San Francisquito Creek watershed. NMFS estimates approximately 14.3 IP-km of potential steelhead habitat upstream of Searsville Dam. Searsville Dam also captures sediment transported as bedload from Corte Madera, Sausal, and Alambique creeks in the reservoir (Jones & Stokes 2006). Gravel and cobble for steelhead spawning has been reduced in lower Corte Madera Creek (downstream of Searsville Dam), and, to a lesser degree, in San Francisquito Creek due to altered sediment

transport at Searsville Dam. In January 2011, Stanford announced the initiation of a process to study the long-term future of Searsville Dam and Reservoir.

Stanford also owns the non-operating Lagunita Diversion structure at river mile 7.5 in San Francisquito Creek. This water diversion facility was constructed in the late 1800s, and is no longer used by Stanford to divert water. In the mid-1950s, the CDFW installed a fish ladder on the structure, which has been modified several times since. However, the existing fish ladder on the Lagunita Diversion Dam does impede upstream steelhead migration and does not meet NMFS' fish passage guidelines (NMFS 2001). In 2006, Stanford studied potential steelhead passage improvements, and concluded that removing the existing fishway, concrete weir, and apron between the abutments and restoring the channel to a more natural configuration would best improve fish passage for adult and juvenile steelhead.

California Water Service operates a water diversion dam on Bear Gulch Creek (approximately 0.1 miles upstream of the Highway 84 crossing), often called the Upper Diversion Dam. This concrete dam is approximately 10 feet tall and topped with an additional 3 feet of wooden stoplogs. The dam is a complete barrier to upstream steelhead passage. California Water Service has developed conceptual plans for fish passage at this site which would restore access to approximately 3 kilometers of stream in Bear Gulch Creek.

Limiting Conditions, Lifestages, and Habitats

The adult, summer and winter rearing lifestages are most limited by current conditions and future threats in the San Francisquito watershed. Quality summer and winter rearing habitats are lacking in some areas for steelhead. Impaired quality and extent of complex habitat features, impaired water quantity, and landscape disturbances are the stresses most limiting recovery of steelhead in the San Francisquito watershed. Finally, the inability for fish to access upper watershed areas due to passage barriers at Searsville Dam and California Water Service's Upper Diversion Dam is another key limiting factor.

General Recovery Strategy

Increase Habitat Complexity and Floodplain Connectivity

Habitat complexity should be improved within poor quality reaches of San Francisquito Creek watershed. Adding large woody debris will improve the habitat complexity of existing pool habitats where shelter components are currently lacking. In other reaches, restoration efforts should include implementation of wood/boulder structures into degraded reaches to increase pool frequency and volume. Restoration efforts to create side channel areas and flood benches

would also increase habitat complexity. These complex elements will improve conditions for summer and winter rearing juveniles.

Improve Riparian Habitat

The mainstem of San Francisquito Creek would benefit from improved riparian composition and structure, which would increase stream shading, capture fine sediments, and improve large woody debris recruitment. Practices to improve riparian condition include native riparian planting and development and enforcement of riparian buffers.

Mitigate the Effects of Urban Development and Roads

Where the creek is incised and disconnected from its historic floodplain, inset floodplain terraces could be constructed where feasible. Reaches currently channelized should, to the extent feasible, be enhanced with constructed meanders and installation of wooden and rock aquatic habitat features. Existing problem roads and active erosion sites should be prioritized and addressed as part of a comprehensive sediment reduction plan for the San Francisquito watershed. Future road construction should utilize BMPs to prevent alteration of hydrologic processes, sediment transport, and fish passage, and avoid construction of roads within riparian zones.

Provide Fish Passage Above Existing Barriers

Developing and implementing a plan to provide steelhead passage at Searsville Dam and California Water Service's Upper Diversion Dam. Passage at Searsville Dam will restore access to approximately 14.3 IP-km of historic steelhead habitat and passage at the Upper Diversion Dam will restore access to approximately 3 km of high quality habitat. These areas above the currently impassable dams remain in relatively good condition for steelhead, and restoring passage is a key action for recovering the species in watershed. Improving passage at other existing partial barriers in the San Francisquito Creek watershed will also improve access to areas in the upper watershed that offer the best spawning and juvenile rearing habitat in the watershed. To fully address barriers in the watershed, a barrier assessment of the Corte Madera Creek subwatershed above Searsville Dam is needed, and where appropriate, removal or modification of barriers to provide steelhead passage is recommended or also needed.

Minimize Diversions and Diversion Effects

Diversions from direct diversions and possibly from near stream wells likely impact the summer rearing and egg incubation lifestages in portions of the watershed. Water diversions, which increase diurnal temperature fluctuations and reduce available rearing habitat, reduce the quantity of water in the wetted stream channel. Efforts to address diversions could include increased oversight by the SWRCB for permitted diversions and enforcement of applicable laws

for unpermitted diversions. Initial focus to minimize the adverse effects of diversions should be directed at West Union Creek tributary to Bear Creek. Water diversions at Searsville Reservoir by Stanford University influence the amount and timing of streamflow in lower Corte Madera Creek and the San Francisquito Creek mainstem. Efforts to coordinate diversion timing and sharing of water through conjunctive use agreements could also be developed to minimize impacts.

Improve the Quality and Extent of the Estuary

The estuary would benefit from rehabilitation and reclamation of tidal marsh habitat. Levee breaching and tidal channel creation in strategic locations would increase the amount of estuarine habitat available to steelhead.

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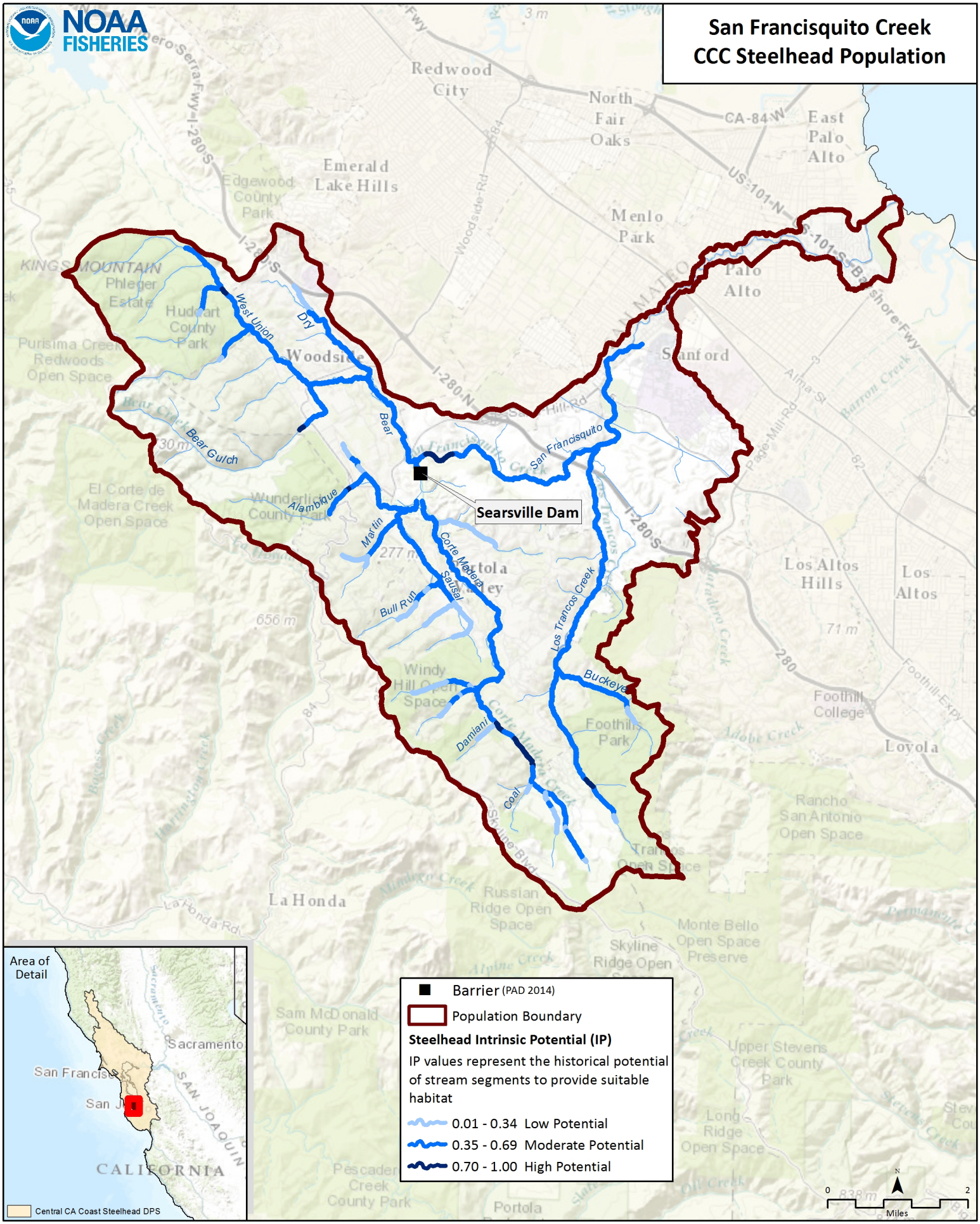
San Francisquito Creek
CCC Steelhead Population
NOAA FISHERIES
Searsville Dam
West Union
Dry
Bear
Bear Gulch
Alambique
Martin
Corte Madera
Sausal
Bull Run
San Francisquito
Los Trancos Creek
Buckeye
Damiani
Coal
Barrier (PAD 2014)
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
Area of Detail
Sacramento
San Francisco
San Jose
SAN JOAQUIN
CALIFORNIA
Central CA Coast Steelhead DPS
0
2
Miles
N

#	Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Measurement	Current Rating
1	Adults	Condition	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-km (>40% Pools; >20% Riffles)	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-km (>80 stream average)	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 50	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	31% Density rating "D" across IP-km	Poor

			Sediment	Quantity & Distribution of Spawning Gravels	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	50-80% Response Reach Connectivity	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<1 spawner per IP-km to < low risk spawner density per Spence (2008)	>1 spawner per IP-km to < low risk spawner density per Spence (2008)	low risk spawner density per Spence (2008)		<1 spawner per IP-km to < low risk spawner density per Spence (2008)	Poor
2	Eggs	Condition	Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Redd Scour	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol score = 42	Fair
			Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	<12% (0.85mm) and <30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	Fair
			Sediment	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
3	Summer Rearing Juveniles	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor

			Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Percent Primary Pools	<50% of streams/ IP-Km (>40% average primary pool frequency)	50% to 74% of streams/ IP-Km (>40% average primary pool frequency)	75% to 89% of streams/ IP-Km (>40% average primary pool frequency)	>90% of streams/ IP-Km (>40% average primary pool frequency)	75% to 89% of streams/ IP-km (>40% average primary pool frequency)	Good
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-km (>40% Pools; >20% Riffles)	Good
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-km (>80 stream average)	Fair
			Hydrology	Flow Conditions (Baseflow)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol score = 50	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	0.3 diversions/10 IP-km	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75% of IP-km to 90% of IP-km	Good
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair

			Riparian Vegetation	Canopy Cover	<50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	>90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	<50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	31% Density rating "D" across IP-km	Poor
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Water Quality	Temperature (MWMT)	<50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	>90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	Good
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<0.2 Fish/m^2	0.2 - 0.6 Fish/m^2	0.7 - 1.5 Fish/m^2	>1.5 Fish/m^2	<0.2 Fish/m^2	Poor
			Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	75-90% of Historical Range	Good

4	Winter Rearing Juveniles	Condition	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-km (>40% Pools; >20% Riffles)	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)		
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	31% Density rating "D" across IP-km	Poor
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	50-80% Response Reach Connectivity	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor

			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower		
5	Smolts	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-km (>80 stream average)	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	0.3 diversions/10 IP-km	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 50	Good
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75% of IP-km to 90% of IP-km	Good
			Smoltification	Temperature	<50% IP-Km (>6 and <14 C)	50-74% IP-Km (>6 and <14 C)	75-90% IP-Km (>6 and <14 C)	>90% IP-Km (>6 and <14 C)	75-90% IP-km (>6 and <14 C)	Good
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	<50% of streams/ IP-km maintains severity score of 3 or lower	Poor
		Size	Viability	Abundance	Smolt abundance which produces high risk spawner density per Spence (2008)	Smolt abundance which produces moderate risk spawner density per Spence (2008)	Smolt abundance to produce low risk spawner density per Spence (2008)		Smolt abundance which produces high risk spawner density per Spence (2008)	Poor

6	Watershed Processes	Landscape Context	Hydrology	Impervious Surfaces	>10% of Watershed in Impervious Surfaces	7-10% of Watershed in Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	<3% of Watershed in Impervious Surfaces	6.475% of Watershed in Impervious Surfaces	Fair
			Landscape Patterns	Agriculture	>30% of Watershed in Agriculture	20-30% of Watershed in Agriculture	10-19% of Watershed in Agriculture	<10% of Watershed in Agriculture	1% of Watershed in Agriculture	Very Good
			Landscape Patterns	Timber Harvest	>35% of Watershed in Timber Harvest	26-35% of Watershed in Timber Harvest	25-15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	Very Good
			Landscape Patterns	Urbanization	>20% of watershed >1 unit/20 acres	12-20% of watershed >1 unit/20 acres	8-11% of watershed >1 unit/20 acres	<8% of watershed >1 unit/20 acres	30% of watershed >1 unit/20 acres	Poor
			Riparian Vegetation	Species Composition	<25% Intact Historical Species Composition	25-50% Intact Historical Species Composition	51-74% Intact Historical Species Composition	>75% Intact Historical Species Composition	<25% Intact Historical Species Composition	Poor
			Sediment Transport	Road Density	>3 Miles/Square Mile	2.5 to 3 Miles/Square Mile	1.6 to 2.4 Miles/Square Mile	<1.6 Miles/Square Mile	5.5 Miles/Square Mile	Poor
			Sediment Transport	Streamside Road Density (100 m)	>1 Miles/Square Mile	0.5 to 1 Miles/Square Mile	0.1 to 0.4 Miles/Square Mile	<0.1 Miles/Square Mile	4.7 Miles/Square Mile	Poor

San Francisquito Creek CAP Threat Results

	Threats Across Targets	Adults	Eggs	Summer Rearing Juveniles	Winter Rearing Juveniles	Smolts	Watershed Processes	Overall Threat Rank
	Project-specific-threats	1	2	3	4	5	6	
1	Agriculture	Low	Low			Low	Medium	Low
2	Channel Modification	High	Low	High	High	Medium	Very High	Very High
3	Disease, Predation and Competition	Medium		Medium	High	Medium	Low	Medium
4	Hatcheries and Aquaculture							
5	Fire, Fuel Management and Fire Suppression			Low	Low	Low	Low	Low
6	Fishing and Collecting	Medium		Low		Low		Low
7	Livestock Farming and Ranching	Low	Low	Low	Low	Low	Medium	Low
8	Logging and Wood Harvesting							
9	Mining							
10	Recreational Areas and Activities	Low	Low	Medium	Medium	Low	Medium	Medium
11	Residential and Commercial Development	High	Low	High	High	Medium	High	High
12	Roads and Railroads	High	Low	Medium	High	Low	High	High
13	Severe Weather Patterns	Low		Medium		Low		Low
14	Water Diversion and Impoundments	High		Medium		Low	High	High
	Threat Status for Targets and Project	High	Low	High	High	Medium	Very High	Very High

San Francisquito Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SFC-CCCS-1.1	Objective	Estuary	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-1.1.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat										
SFC-CCCS-1.1.1.1	Action Step	Estuary	Restore lower San Francisquito Creek (including the fluvial-tidal interface) to a more functional tidal area.	2	20	NGOs, SFCJPA, Corps, USFWS, Cities, Counties, Caltrans						TBD	Gather data related to the historical structure and habitat characteristics of the fluval-tidal interface; use this data to develop actions aimed at restoring habitat and sediment transport through fluvial-tidal stream reaches. Implement actions deemed feasible and of high priority. Costs will be determined once an assessment of the existing and historica estuary-tidal interface has been conducted - see below recovery action.
SFC-CCCS-1.1.1.2	Action Step	Estuary	Develop an estuary rehabilitation and enhancement plan in efforts to reclaim historically tidal influenced areas of San Francisquito Creek.	2	10	CalTrans, Cities, Corps, Counties, Private Landowners	339.00					339	Cost based on estuary restoration modeling at a rate of $338,679/project.
SFC-CCCS-1.1.1.3	Action Step	Estuary	Implement rehabilitation and enhancement recommendations.	2	20	Cities, Counties, RCD						TBD	
SFC-CCCS-1.1.1.4	Action Step	Estuary	Investigate tidal circulation within potential tidal marsh restoration sites.	2	10	Cities, Counties, SFCJPA						0	Cost accounted for in above action step.
SFC-CCCS-1.1.1.5	Action Step	Estuary	Identify potential habitat features that will increase current and future estuary habitat values for rearing steelhead.	2	10	Cities, Counties						0	Cost accounted for in above action steps.
SFC-CCCS-1.1.1.6	Action Step	Estuary	Investigate water quality (D.O., temperature, salinity) conditions for rearing steelhead in potential tidal marsh rehabilitation sites.	2	10	Cities, Counties	7.50	7.50				15	Cost based on installing a minimum of 3 continuous water quality stations at a rate of $5,000/station. Cost does not account for data management or maintenance.
SFC-CCCS-1.1.1.7	Action Step	Estuary	Investigate potential prey items for rearing salmonids within current and potential estuary habitat zones.	2	10	Cities, Counties						0	Cost accounted for in above action step.
SFC-CCCS-2.1	Objective	Floodplain Connectivity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
SFC-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Create flood refuge habitat such as hydrologically connected floodplains with riparian areas, or removal or setback of levees where appropriate.	2	20	Cities, Corps, Counties, Private Landowners	536	536	536	536		2,143	Cost based on treating 0.6 miles (assume 1 project/mile in 25% high IP) at a rate of $44,640/acre.
SFC-CCCS-2.1.1.2	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in low gradient response reaches.	2	10	Cities, Corps, Counties, Private Landowners	44.50	44.50				89	Identify the floodplain activation flow - the smallest flood pulse event that initiates substantial beneficial ecological processes when associated with floodplain inundation. Cost based on riparian restoration model at a rate of $88,551/project.
SFC-CCCS-2.1.1.3	Action Step	Floodplain Connectivity	Implement managed retreat of current development and infrastructure from stream channels and floodplains where feasible.	3	100	Cities, Corps, Counties, FEMA						0	Action is considered In-Kind
SFC-CCCS-2.1.1.4	Action Step	Floodplain Connectivity	Target restoration and enhancement of habitats that will provide functioning habitat at flows intermediate between winter base flow and flood stage.	2	100	Cities, Counties, NPS, Private Landowners						0	Cost accounted for in above action steps.

San Francisquito Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SFC-CCCS-2.1.1.5	Action Step	Floodplain Connectivity	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	100	Cities, Corps, Counties						0	Cost accounted for in above action step.
SFC-CCCS-2.1.1.6	Action Step	Floodplain Connectivity	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	2	10	Cities, Counties, Private Landowners						0	Cost accounted for in above action step.
SFC-CCCS-3.1	Objective	Hydrology	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-3.1.1	Recovery Action	Hydrology	Improve flow conditions										
SFC-CCCS-3.1.1.1	Action Step	Hydrology	Stanford should evaluate the potential for water releases from Searsville Reservoir to enhance downstream steelhead rearing habitat during the dry season and confer with NMFS on the results of the evaluation.	1	10	CDFW, NMFS, Stanford University						TBD	
SFC-CCCS-5.1	Objective	Passage	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
SFC-CCCS-5.1.1.1	Action Step	Passage	Continue to identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001).	2	100	Caltrans, Cities, Counties, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-5.1.1.2	Action Step	Passage	Develop and implement a plan to provide steelhead passage at Searsville Dam. Passage at Searsville Dam will open a large percentage of the watershed to steelhead. Areas of the watershed above the dam remain in relatively good condition for steelhead and passage at the dam is a key action for recovering the species in San Francisquito Creek.	1	10	Stanford University						TBD	Stanford University is currently developing alternatives for the future of Searsville Dam. Passage for steelhead above the dam will ultimately depend on their final alternatives and whether or not the dam will remain. Costs for trap and truck over a 100 year span could exceed $25 million.
SFC-CCCS-5.1.1.3	Action Step	Passage	Modify the California Water Service diversion dam on Bear Gulch to ensure steelhead passage to the upper 3 km of high quality habitat.	2	5	California Water Services	750					750	Cost based on previous regional projects
SFC-CCCS-5.1.1.4	Action Step	Passage	Modify the culvert at Fox Hollow Road crossing on Bear Creek to ensure that steelhead passage is not impeded.	2	5	City of Woodside, County	640					640	Cost based on providing passage at a rate of $639,247/project.
SFC-CCCS-5.1.1.5	Action Step	Passage	Modify or remove the abandoned Lagunita Diversion Dam to ensure that steelhead passage (for adults and juveniles) is not impeded. This dam is downstream of most of the watersheds spawning and rearing habitat and impedes adult and juvenile migration at some flows.	1	5	Stanford University	640					640	Cost based on providing passage at a rate of $639,247/project.
SFC-CCCS-5.1.1.6	Action Step	Passage	Modify or remove abandoned flashboard dam and concrete-lined basin near the intersection of Los Trancos Road and Alpine Road on Los Trancos Creek to ensure that steelhead passage is not impeded.	2	5	City, County, Private Landowners	640					640	Cost based on providing passage at a rate of $639,247/project.
SFC-CCCS-5.1.1.7	Action Step	Passage	Modify the apron and culvert at the Highway 84 crossing on Bear Gulch to ensure that steelhead passage is not impeded.	2	5	Caltrans	640					640	Cost based on providing passage at a rate of $639,247/project.

San Francisquito Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SFC-CCCS-5.1.1.8	Action Step	Passage	Restore passage in other high priority areas of the San Francisquito Creek watershed as identified by watershed groups, CDFW, NMFS, the Counties of Santa Clara and San Mateo, Smith and Harden (2001) and existing fish passage databases.	1	10	Caltrans, Cities, Counties, Private Landowners						TBD	Cost based on the type and number of passage barriers. Cost estimate up to $1,278,495/project.
SFC-CCCS-6.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-6.1.1	Recovery Action	Habitat Complexity	Improve frequency of primary pools, LWD, and shelters										
SFC-CCCS-6.1.1.1	Action Step	Habitat Complexity	Increase wood frequency in spawning and rearing areas of the San Francisquito Creek watershed (particularly upper reaches and tributaries) to the extent that a minimum of 6-11 key LWD pieces exists every 100 meters.	2	20	Cities, Counties, NPS, Private Landowners	9.50	9.50	9.50	9.50		38	Cost based on treating 1.3 miles (assume 1 project/mile in 50% high IP) at a rate of $31,200/mile.
SFC-CCCS-6.1.1.2	Action Step	Habitat Complexity	Evaluate and prescribe complex habitat features within the watershed that will increase shelters for winter rearing juveniles.	2	20	Cities, Counties, Private Landowners	34.50	34.50	34.50	34.50		138	Cost based on fish/habitat restoration model at a rate of $137,833/project.
SFC-CCCS-6.1.1.3	Action Step	Habitat Complexity	Increase wood frequency in seasonal habitat and migratory reaches of the San Francisquito Creek watershed to the extent that a minimum of 4-6 key LWD pieces exists every 100 meters.	2	20	Cities, Counties, NPS, Private Landowners						0	Cost accounted for in above action step.
SFC-CCCS-6.1.1.4	Action Step	Habitat Complexity	Increase shelters to improve winter rearing conditions (particularly upper reaches and tributaries) within the San Francisquito Creek watershed.	2	20	Cities, Counties, NPS, Private Landowners						0	Cost accounted for in above action step.
SFC-CCCS-6.1.1.5	Action Step	Habitat Complexity	Increase the number of pools that have a minimum shelter of 80.	2	20	Cities, Counties, NPS, Private Landowners	9.50	9.50	9.50	9.50		38	Cost based on treating 1.3 miles (assume 1 project/mile in 50% high IP) at a rate of $31,200/mile. This action step should coincide with above action step.
SFC-CCCS-7.1	Objective	Riparian	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-7.1.1	Recovery Action	Riparian	Improve riparian condition										
SFC-CCCS-7.1.1.1	Action Step	Riparian	Increase tree diameter to a minimum of 70-79% density rating "D" across IP km for adult, summer and winter rearing lifestages.	2	20	Cities, Counties, Private Landowners						TBD	
SFC-CCCS-7.1.1.2	Action Step	Riparian	Increase the average stream canopy cover within summer rearing areas to a minimum of 80%.	2	20	Cities, Counties, Private Landowners	103.00	103.00	103.00	103.00		415	Cost based on treating 0.7 miles (assume 1 project/mile in 25% high Ip with 24 acres/mile) at a rate of $24,682/project.
SFC-CCCS-7.1.1.3	Action Step	Riparian	Implement riparian tree planting in spawning and rearing areas.	2	20	Cities, Counties, Private Landowners						0	Cost accounted for in above action step.
SFC-CCCS-7.1.1.4	Action Step	Riparian	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to land management activities (e.g. flood control, etc.).	3	100	Cities, Counties						0	Action is considered In-Kind
SFC-CCCS-7.1.1.5	Action Step	Riparian	Identify areas where non-native species are established.	2	10	Cities, Counties, Private Landowners						0	Cost for riparian restoration model accounted for in other action steps.

San Francisquito Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SFC-CCCS-7.1.1.6	Action Step	Riparian	Target areas lacking in canopy for revegetation projects.	3	100	Cities, Counties, Private Landowners						0	Cost accounted for in other action step.
SFC-CCCS-7.1.1.7	Action Step	Riparian	Identify all potential summer rearing areas within the San Francisquito Creek watershed where canopy cover is not meeting the minimum canopy criteria.	2	10	Cities, Counties, Private Landowners						0	Cost accounted for in other action steps.
SFC-CCCS-7.1.1.8	Action Step	Riparian	Institutionalize programs to purchase land/conservation easements to encourage the re-establishment of natural riparian communities.	2	50	Cities, Counties						0	Action is considered In-Kind
SFC-CCCS-7.1.1.9	Action Step	Riparian	Target non-native species for removal and revegetation with native species.	2	20	Cities, Counties, Private Landowners	4.25	4.25	4.25	4.25		17	Cost based on treating 0.2 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $1,036/ acre. Cost to replant areas accounted for in above action step.
SFC-CCCS-8.1	Objective	Sediment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality										
SFC-CCCS-8.1.1.1	Action Step	Sediment	Develop and implement a plan to improve coarse sediment conditions downstream of Searsville Dam.	2	20	Stanford University	34.50	34.50	34.50	34.50		138	Cost based on fish/habitat restoration model at a rate of $137,833/project. Cost for amount of coarse sediment to introduce is estimated at $40/cu.yd.
SFC-CCCS-10.1	Objective	Water Quality	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-10.1.1	Recovery Action	Water Quality	Improve stream water quality conditions										
SFC-CCCS-10.1.1.1	Action Step	Water Quality	Improve water quality for adults, summer and winter rearing juveniles and smolts by reducing exposure to toxins and pollutants in San Francisquito Creek.	2	20	Cities, Counties, Private Landowners, SWRCB						0	Cost are accounted for by existing water quality protection measures by city and county municipalities. Federal and state agencies must continue to support and encourage measures that will improve upon existing conditions where necessary.
SFC-CCCS-10.1.1.2	Action Step	Water Quality	Identify and remediate sources of pulses of water originating from human activities (e.g. flushing of swimming pools, etc.).	2	10	SWRCB	39.50	39.50				79	Cost based on hyrdologic model at a rate of $78,100/project.
SFC-CCCS-10.1.1.3	Action Step	Water Quality	Identify and develop solutions for point and non-point sources contributing to poor water quality and pollution.	2	20	Cities, Counties, Santa Clara Valley Water District, SWRCB						0	Action is considered In-Kind
SFC-CCCS-10.1.1.4	Action Step	Water Quality	Relocate equestrian facilities beyond the riparian corridor and provide alternative crossings (e.g. bridges) to restore in-stream habitat and reduce turbidity.	2	20	Private Landowners, Stanford University						TBD	Action is considered In-Kind
SFC-CCCS-10.1.1.5	Action Step	Water Quality	Control runoff from horses and livestock facilities.	2	100	Private Landowners, Stanford University						0	Action is considered In-Kind
SFC-CCCS-10.1.1.6	Action Step	Water Quality	Identify and remediate septic systems contributing to high nutrient loading.	2	20	Private Landowners, SWRCB						0	Action is considered In-Kind

San Francisquito Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SFC-CCCS-10.1.1.7	Action Step	Water Quality	Identify and remediate water quality issues associated with Searsville Reservoir releases and Searsville pipeline maintenance activities on San Francisquito and Corte Madera creeks downstream of Searsville Dam.	2	20	Stanford University						0	Action is considered In-Kind
SFC-CCCS-10.1.1.8	Action Step	Water Quality	Where feasible, utilize native plants and bioengineering techniques to stabilize banks.	3	100	Cities, Counties, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-11.1	Objective	Viability	Address other natural or manmade factors affecting the species' continued existence										
SFC-CCCS-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										
SFC-CCCS-11.1.1.1	Action Step	Viability	Utilize CDFW approved implementation, effectiveness, and validation monitoring protocols when assessing efficacy of restoration efforts.	3	100	Cities, Counties, NPS, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-11.1.1.2	Action Step	Viability	Develop and implement a monitoring program to evaluate the performance of recovery efforts.	2	10	CDFW, SWFSC, Counties, RCDs, Counties, NPS, Stanford University						0	Cost will be accounted for by monitoring conducted as part of the Coastal Monitoring Plan or by In-Kind monitoring by Stanford University or NPS.
SFC-CCCS-11.1.1.3	Action Step	Viability	Develop standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas. Encourage all major landowners to develop similar assessment methods.	2	5	Cities, Counties						0	Action is considered In-Kind
SFC-CCCS-13.1	Objective	Channel Modification	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment of floodplain connectivity										
SFC-CCCS-13.1.1.1	Action Step	Channel Modification	Review channel modification activities to prevent or minimize the creation, or blocking access to, off channel habitat used by salmonids as winter refuge and seasonal rearing habitat.	1	100	Cities, Counties, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-13.1.1.2	Action Step	Channel Modification	Incorporate features into flood control channels that enhance steelhead migration under high and low flow conditions.	1	10	Cities, Counties, SFCJPA						0	Action is considered In-Kind
SFC-CCCS-13.1.1.3	Action Step	Channel Modification	Evaluate design alternatives to rip-rap bank repairs and incorporate fish habitat features.	2	100	Cities, Counties, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-13.1.1.4	Action Step	Channel Modification	Discontinue the use of gabion baskets and undersized rock within the bankfull channel.	2	100	Cities, Counties, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-13.1.1.5	Action Step	Channel Modification	Develop Bank Stabilization and Floodplain Guidelines (similar to those developed for the Stanford HCP) for use by private and public entities.	3	20	Cities, Counties, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-13.1.2	Recovery Action	Channel Modification	Prevent or minimize impairment to instream habitat complexity										

San Francisquito Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SFC-CCCS-13.1.2.1	Action Step	Channel Modification	Develop stream maintenance plans that minimize impacts to salmonid habitat complexity features.	2	10	Cities, Counties, Private Landowners, Santa Clara Valley Water District						0	Action is considered In-Kind
SFC-CCCS-13.1.2.2	Action Step	Channel Modification	Encourage retention and recruitment of large woody debris to rehabilitate existing stream complexity, pool frequency, and depth.	2	100	Cities, Counties, SFCJPA						0	Action is considered In-Kind
SFC-CCCS-13.1.2.3	Action Step	Channel Modification	Identify locations where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to improve these conditions.	1	20	Cities, Counties, Private Landowners	172.00	172.00	172.00	172.00		689	
SFC-CCCS-13.1.2.4	Action Step	Channel Modification	Focus restoration efforts to increase capture of sediment by riparian vegetation.	2	100	Cities, Counties, Private Landowners, Santa Clara Valley Water District, Stanford University						0	Action is considered In-Kind
SFC-CCCS-13.1.2.5	Action Step	Channel Modification	Examine the feasibility of gravel and boulder augmentation, and implement if feasible.	2	20	Cities, Counties, Private Landowners						0	Cost accounted for in above action step.
SFC-CCCS-13.2	Objective	Channel Modification	Address the inadequacy of existing regulatory mechanisms										
SFC-CCCS-13.2.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity										
SFC-CCCS-13.2.1.1	Action Step	Channel Modification	Develop Bank Stabilization and Floodplain Guidelines (similar to those developed for the Stanford HCP) for use by private and public entities.	2	20	Counties, Federal, Public, Private, State						0	Action is considered In-Kind
SFC-CCCS-14.1	Objective	Disease/ Predation /Competition	Address disease or predation										
SFC-CCCS-14.1.1	Recovery Action	Disease/ Predation /Competition	Prevent or minimize reduced density, abundance, and diversity										
SFC-CCCS-14.1.1.1	Action Step	Disease/ Predation /Competition	Improve conditions for steelhead by decreasing the effects of exotic vegetation within the stream and riparian corridor (see Restoration- Riparian).	3	20	Cities, Counties, Private Landowners						0	Cost accounted for in other actions. See Riparian.
SFC-CCCS-22.1	Objective	Residential/ Commercial Development	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-22.1.1	Recovery Action	Residential/ Commercial Development	Prevent or minimize adverse alterations to riparian species composition and structure										
SFC-CCCS-22.1.1.1	Action Step	Residential/ Commercial Development	Work with local agencies and landowners to identify and eliminate sources of landscape disturbance.	2	20	Cities, Counties, Private Landowners						0	Action is considered In-Kind
SFC-CCCS-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										

San Francisquito Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SFC-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)										
SFC-CCCS-23.1.1.1	Action Step	Roads/Railroads	Conduct road and sediment reduction assessments to identify sediment-related and runoff-related problems and determine level of hydrologic connectivity. Address high and medium priority sediment delivery sites associated with roads and railroads.	2	10	Caltrans, Cities, Counties, NPS, Private Landowners	135.00	135.00				270	Cost based on road inventory of 235 miles of road at a rate of $1,148/mile.
SFC-CCCS-23.1.1.2	Action Step	Roads/Railroads	Conduct actions that hydrologically disconnect roads and trails.	2	20	CalTrans, Cities, Counties, Private Landowners						TBD	Cost based on amount of roads needing to be hydrologically disconnected.
SFC-CCCS-23.1.1.3	Action Step	Roads/Railroads	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Begin with a road survey focused on roads in spawning and rearing tributaries, followed by roads in other settings.	2	10	Cities, Counties						TBD	Cost for road inventory accounted for.
SFC-CCCS-23.1.1.4	Action Step	Roads/Railroads	Work with landowners to assess the effectiveness of erosion control measures throughout the winter period.	3	100	Cities, Counties						0	Action is considered In-Kind
SFC-CCCS-25.1	Objective	Water Diversion /Impoundment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SFC-CCCS-25.1.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
SFC-CCCS-25.1.1.1	Action Step	Water Diversion /Impoundment	Conduct rehabilitation activities that restore channels and floodplains to extend the duration of spring and summer stream flows.	1	20	Cities, Counties, Private Landowners						TBD	Cost accounted for in other action steps (e.g. see CHANNEL MODIFICATION).
SFC-CCCS-25.1.1.2	Action Step	Water Diversion /Impoundment	Develop and implement strategies that slow urban runoff during the spawning and migration season (slow it, spread it, sink it).	2	20	Cities, Counties, Private Landowners, Santa Clara Valley Water District						TBD	Cost based on amount of urban runoff to treat. Cost estimated for infiltration ponds to range between $12,000 to $35,000 per pond.
SFC-CCCS-25.1.1.3	Action Step	Water Diversion /Impoundment	Implement flow schedules developed for the Bear Gulch diversions to optimize steelhead spawning and rearing conditions.	1	10	California Water Service						0	Action is considered In-Kind
SFC-CCCS-25.1.1.4	Action Step	Water Diversion /Impoundment	Improve coordination between the agencies and others to address season of diversion, off-stream reservoirs, bypass flows protective of steelhead and their habitats and avoidance of adverse impacts caused by water diversion.	1	10	Counties, NMFS, SWRCB, Water Agencies						0	Action is considered In-Kind
SFC-CCCS-25.1.1.5	Action Step	Water Diversion /Impoundment	Work with local watershed groups and landowners to re-establish natural flow regime to improve adult migration to spawning habitats and smolt out migration to the ocean.	1	10	Landowners, RCD, SWRCB						0	Action is considered In-Kind
SFC-CCCS-25.1.1.6	Action Step	Water Diversion /Impoundment	Review and enforce water rights and bypass flows.	1	10	SWRCB						0	Action is considered In-Kind

Stevens Creek

CCC Steelhead Winter-Run

- Role within DPS: Independent Population
- Diversity Stratum: Coastal San Francisco Bay
- Spawner Density Target: 900 adults
- Current Intrinsic Potential: 22.7 IP-km

Steelhead Abundance and Distribution

The Stevens Creek watershed contains approximately 20 miles of perennial channel (NMFS GIS 2009); however, due to reservoir blockage, only approximately 8.1 stream miles remain accessible (NMFS GIS 2009), and of these 8.1 miles, only approximately 3.7 miles provide spawning and rearing habitat (Becker et al 2007). Systematic adult or juvenile fish surveys covering a substantial period of time have not been conducted within the Stevens Creek watershed, so accurately estimating past adult or juvenile fish abundance is difficult. Accounts and reports indicate the historic presence of a sustained steelhead run within Stevens Creek (Leidy et al. 2005); however, the potential of the watershed to support an anadromous run was dramatically reduced by construction of Stevens Creek Reservoir in 1935 (Leidy et al. 2005, Stillwater Sciences 2004). Yet, *O. mykiss* do persist in Stevens Creek, both above and below the reservoir (Leidy et al. 2005). It is generally thought to contain a reproducing steelhead population (SCBWMI 2001) and is one of the few remaining Santa Clara Valley region streams to contain a viable steelhead run (Santa Clara Valley Water District 2011 A).

Wetted channel sustaining *O. mykiss* downstream of the reservoir is maintained primarily via releases from Stevens Creek reservoir. Distribution downstream of the reservoir is limited by habitat, and during summer, seasonal drying downstream of Stevens Creek Dam likely severely limits or precludes smolt survival (Stillwater Sciences 2004). Upstream of the reservoir, density and distribution data are lacking; however, Leidy et al. (2005) note the presence of *O. mykiss* within mainstem reaches upstream of the reservoir. These above-reservoir reaches contain much of the naturally perennially wetted habitat in the watershed (Stillwater Sciences 2004), and anthropogenic habitat alterations within these reaches remain limited, suggesting that they could again be important to the support of an anadromous steelhead population if passage past Stevens Creek Dam were restored.

History of Land Use

Discussion of the progression of development and land use within the Stevens Creek watershed is available in Stillwater Sciences (2004) and SCBWMI (2001). In general, agricultural (orchard)

and light suburban development gradually transitioned to more intensive suburban and urban development as the primary land uses within the watershed. Presently, approximately 41% of the watershed by area is developed as urban land uses (NMFS GIS 2009). Most development is concentrated within the watershed area downstream of the reservoir (see *Residential and Commercial Development* below) where steelhead presently have access. This urbanization and Stevens Creek Reservoir have important effects on watershed processes, hydrology, passage, and instream habitat within the Stevens Creek system.

Current Resources and Land Management

By percentage, approximately 84 percent of the 31 square-mile Stevens Creek watershed is privately held, approximately 9 percent is a combination of local (city/county) parks and recreational holdings, and approximately 6 percent is in Federal holdings (NMFS GIS 2009).

Within the Santa Clara Valley, the Santa Clara Valley Water District (SCVWD) is the primary water resource agency (SCVWD 2011 B). Within Stevens Creek, SCVWD operates water conveyance infrastructure (including Stevens Creek reservoir), performs stewardship duties, and provides flood control services. Additionally, the SCVWD is in the process of drafting a Habitat Conservation Plan [the Three Creeks Habitat Conservation Plan (TC-HCP)], which will include Stevens Creek Reservoir. The schedule for finalizing and implementing the TC-HCP is uncertain at the time of this assessment; however, NMFS and SCVWD are involved in ongoing discussions directed towards the goal of creating a plan that will improve instream conditions for steelhead.

Resource management within the basin, including survey efforts and instream restoration efforts, is largely carried out by SCVWD. However, the California Department of Fish and Wildlife (CDFW) has been active in performing stream surveys, and several public interest groups, including Santa Clara Valley Audubon Society, CLEAN South Bay, Santa Clara County Creeks Coalition, and the California Nature Conservancy, are active in the watershed. For more information on the organizations active in Stevens Creek, see SCBWMI 2001, SCBWMI 2003, and SCBWMI 2011.

Salmonid Viability and Watershed Conditions

The following habitat attributes were rated "Poor" through the CAP process: Passage, migration, water quality, viability, estuary, lagoon, hydrology, landscape patterns, and sediment transport. Recovery strategies will typically focus on ameliorating these habitat indicators, although strategies that address other indicators may also be developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed.

Current Conditions

The following discussion focuses on those conditions that were rated Fair or Poor as a result of our CAP viability analysis. The Stevens Creek CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

Population and Habitat Conditions

Water Quality: Turbidity or Toxicity

Water quality is limiting steelhead survival in Stevens Creek. The United States Environmental Protection Agency (US EPA) list of assessed waters includes Stevens Creek as a threatened waterbody for the 2004 assessment and an impaired water body for the 2006 assessment (US EPA 2011a). Causes of water quality impairment for Stevens Creek include debris and pesticides, toxicity, mercury, and PCBs (US EPA 2011B, US EPA 2011C, and US EPA 2011 D). Support of several water quality attainment measures are currently threatened, including: aquatic life support, cold freshwater habitat, fish consumption, migration of aquatic organisms, municipal and domestic supply, overall use support, spawning, reproduction, and/or early development, warm freshwater habitat, and wildlife habitat (US EPA 2011b). These limitations likely affect steelhead distribution and survival.

Turbidity data within the Stevens Creek watershed is not available. However, Stillwater Sciences (2004) notes observations of turbid water exiting the reservoir and presence of silty deposits downstream of the reservoir. Stillwater Sciences (2004) considers turbidity a potential contributor to limiting factors, and recommends turbidity monitoring. Threats contributing significantly to this condition include: Roads and Railroads.

Viability: Density, Abundance & Spatial Structure

Li (2000) electrofished approximately 750 linear feet of channel downstream of the reservoir, and encountered 487 *O. mykiss* (multiple year classes). Fall electrofishing surveys performed in 2010, 2013, and 2014 encountered juvenile steelhead densities ranging between 0.00- and 0.51 fish per linear foot (fish/lin-ft) in 2010 (Abel 2011), 0.02- and 0.17 fish/lin-ft in 2013 (Leicester and Smith 2014a), and 0.00-0.02 fish/lin-ft in 2014 (Leicester and Smith 2014b).

In general, within the reach downstream of the reservoir, habitat suitability decreases with increasing distance downstream. Higher quality habitat has been observed in some downstream reaches in some years; however, habitat quality may vary between years and be affected by reservoir releases and water-year type. For example, a restoration reach at the Blackberry Farm Site was observed in 2010 to have improved water clarity and substrate (Smith 2011), and

relatively high juvenile steelhead densities (0.51 fish/lin-ft as reported by Abel 2011), and growth as compared to other areas surveyed in the watershed (Leicester and Smith 2014, Abel 2011, and Smith 2011). However, this same reach was observed to have decreased fish densities in 2013 (Leicester and Smith 2014a) and 2014 (Leicester and Smith 2014b), and was noted to be impaired by sediments discharged from turbid reservoir releases in 2013 and previous years (Leicester and Smith 2014b). Seasonal drying downstream of Stevens Creek Dam likely limits the success of smolt outmigration in some years (Stillwater Sciences 2004), and the presence of significant barriers likely limit abundance and distribution of all lifestages by blocking adult migration, limiting smolt outmigration, and constraining up- and down-channel movement of juveniles (further discussion on barriers is provided below in *Impaired Passage & Migration*). Further, steelhead density and distribution information for Stevens Creek is limited: smolt emigration and adult return data are not available, and although *O. mykiss* are known to persist above the reservoir, densities within above-reservoir reaches are not well known. Threats contributing significantly to this condition include: Channel Modification; and Water Diversions and Impoundments.

Habitat Complexity: Percent Primary Pools & Pool/Riffle/Flatwater Ratios

There are limited data available regarding the distribution of pool/riffle ratios and pool complexity within the Stevens Creek system. Pool/run (flatwater)/riffle ratios (Entrix 2000) and habitat (Stillwater Sciences 2004) assessment for the reaches downstream of the reservoir indicate suboptimal pool/riffle/flatwater ratios within Stevens Creek. Also, Stillwater Sciences (2004) noted that multiple factors have altered channel morphology downstream of the reservoir, substantially diminishing rearing habitat. These metrics are indicative of impaired stream function, an effect likely associated with reservoir-related hydrology alterations and the high concentrations of development within the watershed (see *Residential and Commercial Development* below).

Above-reservoir data are limited, but considering that these reaches continue to support *O. mykiss* (Leidy et al. 2005) and that above-reservoir development is relatively limited, NMFS suspects they contain suitable habitat to support steelhead. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Water Diversions and Impoundments.

Hydrology: Baseflow & Passage Flows

Primary factors affecting hydrology in Stevens Creek include reservoir-related flow regulation and effects related to urbanization (e.g., channelization, increased impervious surfaces, and flood control projects). The magnitude, frequency, and duration of instream flows in Stevens Creek have been affected by urbanization and flow regulation, likely affecting adult steelhead attraction

and passage, redd scour, predation of juveniles, and smolt outmigration (Stillwater Sciences 2004). Seasonal drying is a limiting factor within the downstream reaches of Stevens Creek, a historically intermittent stream. Current reservoir operations provide flows that extend the summer rearing habitat to reaches downstream of historic limits. The Fisheries and Aquatic Habitat Collaborative Effort developed a reservoir operation approach to implement flows to maintain a cold water management zone downstream of the reservoir (Santa Clara Valley Water District *et al*. 2003). However, the extension of rearing habitat downstream of the reservoir does not offset reservoir blockage and its effects, which preclude access to upstream rearing habitat (Stillwater Sciences 2004). Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; Roads and Railroads; and Water Diversions and Impoundments.

Passage/Migration: Mouth or Confluence & Physical Barriers

Stevens Creek Reservoir blocks passage to approximately 56 percent of the historic steelhead habitat in the watershed (NMFS GIS 2011), eliminates access to historically important spawning and rearing reaches, and is thought to be a primary contributor to the decline of the steelhead run in Stevens Creek (Stillwater Sciences 2004, Leidy et al. 2005). Numerous partial barriers below the reservoir (Santa Clara Valley Water District 2010, NMFS GIS 2010, Stillwater Sciences 2004, Cleugh and Mcknight 2002) and impaired hydrology (Stillwater Sciences 2004) affect both adult and juvenile movement throughout the remaining accessible habitat. Additionally, smolt outmigration may be limited by flow availability in dry years (Stillwater Sciences 2004). Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; Recreation; Roads and Railroads; and Water Diversions and Impoundments.

Velocity Refuge: Floodplain Connectivity

The floodplain limitations present today in the Stevens Creek system downstream of the reservoir are primarily due to urbanization and the resulting effects of altered hydrology, and channel confinement. Connectivity between stream channel and floodplain habitat may improve in some locations within the Stevens Creek system through future restoration efforts. Similarly, the installation of bank stabilization projects that remediate outdated methods and incorporate methods that allow for steam functions, such as the restoration projects at the Blackberry Farm site (City of Cupertino 2010, NMFS 2008, NMFS 2013), may improve floodplain connectivity. However, because floodplain connectivity has been irretrievably lost in many cases due to urbanization and bank stabilization, the overall degraded condition is expected to persist throughout much of the system. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Water Diversions and Impoundments.

Sediment Transport: Road Density

Within the CAP workbook, road density is used to indicate the degree of sediment transport alteration within the watershed. Per watershed characterization, the Stevens Creek system has high road densities concentrated within the urbanized area downstream of the reservoir (NMFS GIS 2009); suggesting altered drainage networks, streamflow and sediment transport and storage regimes, and accelerated erosion processes. Coarse substrate embeddedness and the lack of cobble and boulder aggregations potentially limit overwintering habitat availability and quality in Stevens Creek (Stillwater Sciences 2004). Altered flow patterns and channel alterations, together with reduced sediment supply downstream of the dam and fine sediment input both above and below the reservoir, likely contribute to this condition (Stillwater Sciences 2004). Upstream of Stevens Creek Reservoir, alterations to sediment transport processes are likely minimal. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; Roads and Railroads; and Water Diversions and Impoundments.

Landscape Patterns: Agriculture, Timber Harvest & Urbanization

Major landscape disturbance within the Stevens Creek system is associated with urban development; 41percent of the entire Stevens Creek watershed is developed as urban land uses (NMFS GIS 2009). Urbanization is concentrated within the watershed area downstream of Stevens Creek Dam (see *Residential and Commercial Development*, below). Due to blockage by Stevens Creek Reservoir, the current spatial extent of urbanization traces the current steelhead distribution within the Stevens Creek watersheds, suggesting that steelhead are likely affected to a high degree by altered watershed processes resulting from these landscaped disturbances. Threats contributing significantly to this condition include: Residential and Commercial Development; Roads and Railroads; and Water Diversions and Impoundments.

Instream Habitat Complexity: Reduced Large Wood and/or Shelter

Downstream of Stevens Creek Reservoir, large wood is limiting (Entrix 2000). Although a relatively large amount of woody debris exists within the upper two miles of the below-reservoir reach (Stillwater Sciences 2004), many reaches downstream of the reservoir have been armored and channelized to minimize flood risk and bank erosion. Adequate instream shelter is limited throughout much of the below-reservoir reaches. Having a large urban interface between the stream environment and upslope areas that traditionally supply LWD likely impairs wood recruitment to the stream, translating into reduced shelter and instream habitat values. In Stevens Creek, this lack of large wood that results in fewer deep pools, reduced holding habitat, and reduced spawning gravels may affect adults (Stillwater Sciences 2004). Additionally, LWD limitations may affect rearing juveniles by decreasing shelter and overwintering habitat

(Stillwater Sciences 2004). Juvenile steelhead within these reaches most likely experience reduced summer survival and growth due to poor LWD volume and shelter conditions. Channel restorations incorporating instream habitat features, such as the restoration projects at the Blackberry Farm site (City of Cupertino 2010, NMFS 2008, NMFS 2013), may help to increase large wood frequency and improve instream shelter within Stevens Creek. However, because the stream functions that maintain instream habitat complexity are highly compromised, ongoing restoration may be necessary to improve and maintain instream habitat function. Threats contributing significantly to this condition include: Channel Modification; Residential and Commercial Development; and Water Diversions and Impoundments.

Threats

The following discussion focuses on those threats that were rated as High or Very High. Recovery strategies will likely focus on ameliorating High rated threats; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in Stevens Creek CAP Results

Channel Modification

Much of Stevens Creek, especially the downstream most reaches, has been channelized. Channel modification, combined with other channel and landscape altering practices, has destroyed estuarine habitat, disconnected streams from their floodplains, and limited stream functions necessary to maintain instream and riparian habitat essential to supporting a robust steelhead population.

Residential and Commercial Development

The 2010 census estimated the population within the Stevens Creek area at over 52,320 individuals; 27% of the watershed has a housing density higher than 1 unit per 20 acres, and 41% of the watershed area is developed as urban land uses (NMFS GIS 2015). Development is concentrated within the watershed area downstream of the reservoir; 89% of watershed area downstream of the reservoir is developed as urban (NMFS GIS 2011). The high level of urban development has increased the impervious area within the watershed, greatly impacting hydrology as well as the pollutant level within the aquatic environment, and impairing instream conditions (passage, instream habitat, hydrology, and floodplain connection) necessary for the support of a robust steelhead population. Due to blockage by Stevens Creek Dam, the current spatial extent of this urbanization traces the current steelhead distribution in Stevens Creek, suggesting that steelhead are likely affected to a high degree.

Roads and Railroads

Road networks within the Stevens Creek watershed are largely paved systems associated with urban development. As a result, much of the impact resulting from the roads within the Steven Creek watershed relates to road-born pollution (e.g., oils, urban runoff, etc.) and their direct delivery into the aquatic system. Furthermore, the Stevens Creek system has a relatively high concentration of roads within riparian zones (3.9 miles of roads per square mile of 100 meter riparian buffer) (NMFS GIS 2009); paved roads represent a significant source of the total impervious surface within the basin, and likely influence storm flow intensity and duration during winter.

Water Diversion and Impoundments

Stevens Creek is highly affected by water operations at Stevens Creek Reservoir. These water management operations affect all lifestages within the Stevens Creek system by blocking passage, limiting migration periods, and altering hydrology and instream habitat. Stevens Creek Reservoir affects the hydrology and habitat quality downstream of the dam. Water diversions downstream of the reservoir may affect instream habitat and result in stranding of juvenile *O. mykiss*. Winter storm flow of up to 1,500 cubic feet per second is diverted into Stevens Creek from neighboring Permanente Creek (Stillwater Sciences 2004); however, the effect of the diversion on stream functions and the steelhead population within Stevens Creek is not well known.

Recreational Areas and Activities

Recreational areas and activities likely have little effect on steelhead or steelhead habitat within Stevens Creek watershed, and in general, provide protections for the creek and its associated habitats that support steelhead. However, Stillwater Sciences (2004) note that heavy recreational use within some tributaries may result in increased steelhead mortality. Also, because riparian trail and park areas are often sited within the floodplain, some recreational areas may potentially affect riparian habitat, floodplain connection, and instream habitat maintenance.

Limiting Conditions, Lifestages, and Habitats

Threat and condition analysis within the CAP workbook suggests that all lifestages except eggs are limited by conditions within Stevens Creek. Primary factors contributing to habitat limitations and limiting steelhead abundance within the Stevens Creek watershed are extensive watershed development for urban, suburban, and commercial land uses, and municipal water system development. The reservoir is a complete barrier to migration, and downstream of the reservoir, numerous partial barriers exist, affecting movement of adults and juveniles. Extensive watershed development and stream channel alteration have affected watershed functions and stream habitat to such a degree that successful anadromy within Stevens Creek is in question. Restoration actions should target addressing these issues within high potential stream reaches,

and should consider passage above Stevens Creek Dam in order to provide access to important above-reservoir reaches.

General Recovery Strategy

Passage Downstream of Reservoirs

Passage improvement is of the highest priority in the Stevens Creek system. Passage barriers downstream of Stevens Creek Dam should be systematically and opportunistically remediated. Concrete flood control channels with long distances of flat, concrete channel bed, and grade control structures in the lower reaches of Stevens Creek impair upstream passage.

Passage Above the Reservoir

The stream habitat located above the reservoir was historically important in supporting a steelhead population within the Stevens Creek system. The habitat and function of these currently inaccessible reaches cannot be effectively replaced through enhancement of downstream reaches due to natural differences in gradient and hydrology between the below- and above-reservoir reaches, and the effects of anthropogenic landscape alteration (e.g., urbanization and floodplain development) within the below-reservoir reaches. Steelhead occupancy in reaches upstream of the reservoir would increase population viability and increase population resiliency in the event of drought or other factors affecting flow or habitat conditions downstream of Stevens Creek Dam. Thus, the reservoir should be assessed for passage options, and volitional passage facilities that coordinate with ongoing reservoir operations or other biologically sound passage programs should be implemented.

Reservoir Operation to Benefit All Lifestages of Steelhead

Stevens Creek Reservoir should be operated in such a manner as to benefit all lifestages of steelhead within Stevens Creek. Considerations should include, but not be limited to, water temperature, flow velocity, ramping rates (as necessary to prevent scour of eggs, or displacement or stranding of juveniles), sediment transport, channel maintenance, instream habitat maintenance, and adult and smolt migratory cues.

Minimize Diversions and Diversion Effects Downstream of the Reservoir

The effects of diversion operations downstream of the reservoir should be evaluated. If operations are found to be detrimental to steelhead or their habitat (e.g., flow reductions, small fish entrainment), these operations should be either curtailed or re-operated to benefit all lifestages of steelhead. On-channel water intakes should be screened to prevent entrainment of fry and juvenile steelhead.

Side Channel and Floodplain Reconnection

Where not limited by existing development, efforts should be made to reconnect floodplain habitat and increase channel complexity by reconnecting side channel habitat with the active stream channel. When possible, existing development should be retrofitted to restore connectivity between streams and adjacent floodplain and flood bench habitat, and to allow for natural channel functions.

Improve Sediment Transport

Efforts should be made to locate and address sources of suspended sediment (turbidity) conveyed to the reservoir. Restoration efforts should focus on providing channel maintenance/forming flows necessary to mobilize bedload material throughout Stevens Creek downstream of the reservoir, providing suitable gravel material from upstream sources, and removing/remediating structures and areas of the stream that impair sediment transport processes.

Increase Instream Habitat and Cover and Increase Instream Channel Complexity

Instream habitat and cover should be improved within the Stevens Creek system downstream of the reservoir. Methods may include placing large woody debris, rock weirs, and boulders within affected reaches. All structures should be designed to function within the known range of flows at any given project site in order to provide for the needs of all steelhead lifestages.

Increase Instream Shelter Ratings and Pool Volume

Shelter ratings are Low within much of Stevens Creek downstream of the reservoir largely due to an absence of LWD and limited channel complexity. Where applicable, restoration efforts should incorporate instream wood/boulder structures into degraded reaches to improve habitat complexity and shelter availability.

Improve Water Quality

Efforts should be made to improve water quality throughout the Stevens Creek system. In particular, efforts should focus on limiting or treating urban runoff and limiting input of debris, pesticides, toxicity, mercury, and PCBs.

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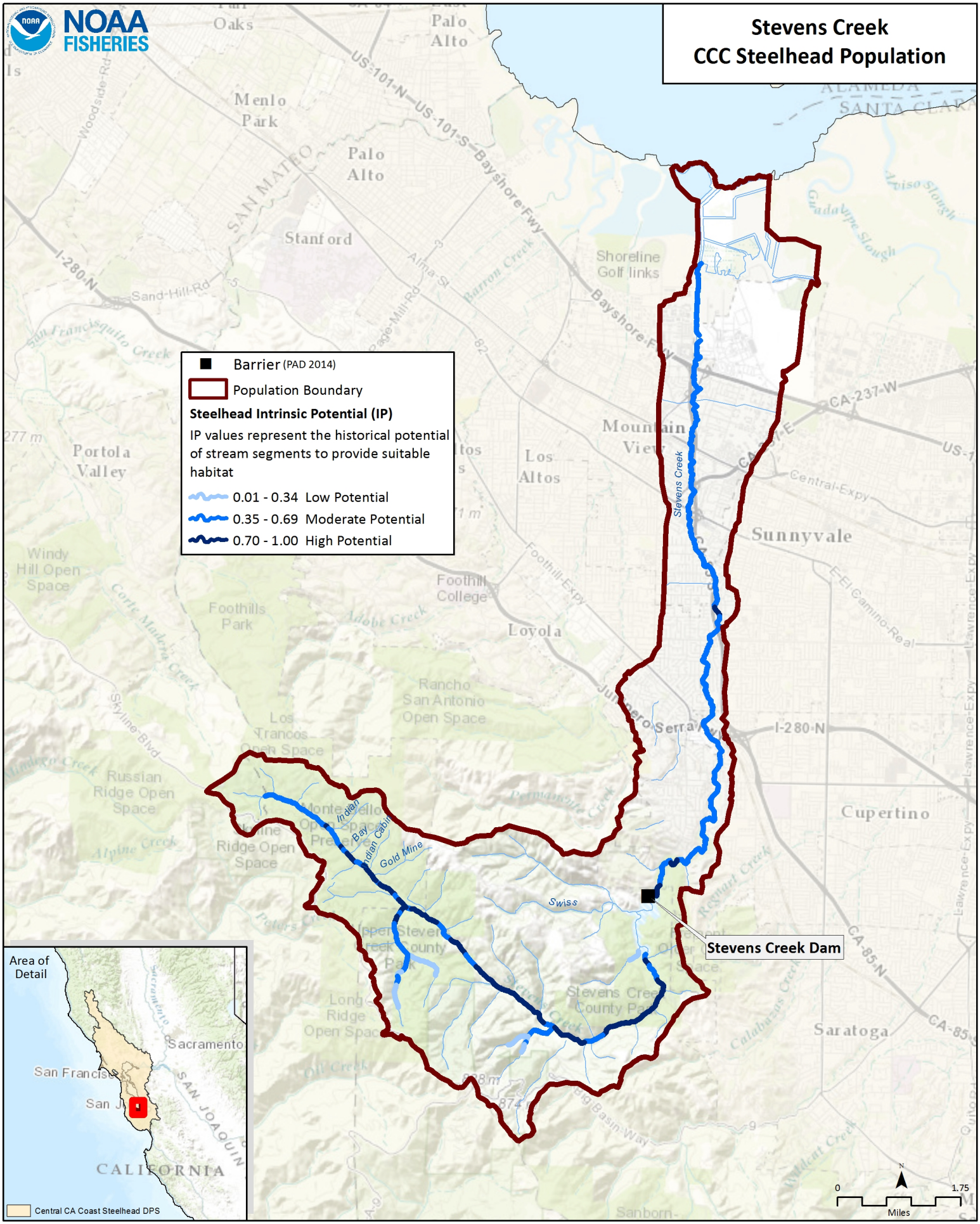
Stevens Creek
CCC Steelhead Population
NOAA FISHERIES
Barrier (PAD 2014)
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
Stevens Creek Dam
Stevens Creek
Indian
Bay
Indian Cabin
Gold Mine
Swiss
Area of Detail
Sacramento
San Francisco
San Jose
SAN JOAQUIN
CALIFORNIA
Central CA Coast Steelhead DPS
0
1.75
Miles
N
Menlo Park
Palo Alto
Stanford
Portola Valley
Los Altos
Mountain View
Sunnyvale
Cupertino
Saratoga
Loyola
Foothill College
Shoreline Golf links
Windy Hill Open Space
Foothills Park
Rancho San Antonio Open Space
Los Trancos Open Space
Russian Ridge Open Space
Long Ridge Open Space
Stevens Creek County Park
Bayshore Fwy
US-101-N
US-101-S
I-280-N
CA-237-W
Central Expy
El Camino Real
Foothill Expy
Junipero Serra
CA-85-N
Lawrence Expy
Sand Hill Rd
Woodside Rd
Page Mill Rd
Alma St
Barron Creek
Adobe Creek
Corte Madera Creek
Skyline Blvd
Alpine Creek
Permanente Creek
Regnart Creek
Calabazas Creek
Wildcat Creek
Big Basin Way
Guadalupe Slough
Alviso Slough
San Francisquito Creek
Sanborn

#	Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Measurement	Current Rating
1	Adults	Condition	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	Fair
			Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-km (>40% Pools; >20% Riffles)	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-km (>80 stream average)	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75% of IP-km to 90% of IP-km	Good
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	70-79% Density rating "D" across IP-km	Fair

			Sediment	Quantity & Distribution of Spawning Gravels	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	50-80% Response Reach Connectivity	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<1 spawner per IP-km to < low risk spawner density per Spence (2008)	>1 spawner per IP-km to < low risk spawner density per Spence (2008)	low risk spawner density per Spence (2008)		<1 spawner per IP-km to < low risk spawner density per Spence (2008)	Poor
2	Eggs	Condition	Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 35-50	Good
			Hydrology	Redd Scour	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 35-50	Good
			Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	<12% (0.85mm) and <30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	Fair
			Sediment	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
3	Summer Rearing Juveniles	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor

			Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	Fair
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Percent Primary Pools	<50% of streams/ IP-Km (>40% average primary pool frequency)	50% to 74% of streams/ IP-Km (>40% average primary pool frequency)	75% to 89% of streams/ IP-Km (>40% average primary pool frequency)	>90% of streams/ IP-Km (>40% average primary pool frequency)	50% to 74% of streams/ IP-km (>40% average primary pool frequency)	Fair
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-km (>40% Pools; >20% Riffles)	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-km (>80 stream average)	Fair
			Hydrology	Flow Conditions (Baseflow)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score >75	Poor
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	1.1 - 5 Diversions/10 IP-km	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75% of IP-km to 90% of IP-km	Good
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor

			Riparian Vegetation	Canopy Cover	<50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	>90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps)	75% to 90% of streams/ IP-km (>70% average stream canopy; >85% where coho IP overlaps)	Good
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	70-79% Density rating "D" across IP-km	Fair
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Water Quality	Temperature (MWMT)	<50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	>90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<0.2 Fish/m^2	0.2 - 0.6 Fish/m^2	0.7 - 1.5 Fish/m^2	>1.5 Fish/m^2	<0.2 Fish/m^2	Poor
			Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	<50% of Historical Range	Poor

4	Winter Rearing Juveniles	Condition	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	Fair
			Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)	>90% of streams/ IP-Km (>40% Pools; >20% Riffles)	50% to 74% of streams/ IP-km (>40% Pools; >20% Riffles)	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)		
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km or <16 IP-km accessible*	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km		
			Riparian Vegetation	Tree Diameter (South of SF Bay)	≤69% Density rating "D" across IP-km	70-79% Density rating "D" across IP-km	≥80% Density rating "D" across IP-km	Not Defined	70-79% Density rating "D" across IP-km	Fair
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	50-80% Response Reach Connectivity	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor

			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower		
5	Smolts	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired/non-functional	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-km (>80 stream average)	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	1.1 - 5 Diversions/10 IP-km	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75% of IP-km to 90% of IP-km	Good
			Smoltification	Temperature	<50% IP-Km (>6 and <14 C)	50-74% IP-Km (>6 and <14 C)	75-90% IP-Km (>6 and <14 C)	>90% IP-Km (>6 and <14 C)	>90% IP-km (>6 and <14 C)	Very Good
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Acute	Poor
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Abundance	Smolt abundance which produces high risk spawner density per Spence (2008)	Smolt abundance which produces moderate risk spawner density per Spence (2008)	Smolt abundance to produce low risk spawner density per Spence (2008)		Smolt abundance which produces high risk spawner density per Spence (2008)	Poor

6	Watershed Processes	Landscape Context	Hydrology	Impervious Surfaces	>10% of Watershed in Impervious Surfaces	7-10% of Watershed in Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	<3% of Watershed in Impervious Surfaces	17.25% of Watershed in Impervious Surfaces	Poor
			Landscape Patterns	Agriculture	>30% of Watershed in Agriculture	20-30% of Watershed in Agriculture	10-19% of Watershed in Agriculture	<10% of Watershed in Agriculture	1.1% of Watershed in Agriculture	Very Good
			Landscape Patterns	Timber Harvest	>35% of Watershed in Timber Harvest	26-35% of Watershed in Timber Harvest	25-15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	0% of Watershed in Timber Harvest	Very Good
			Landscape Patterns	Urbanization	>20% of watershed >1 unit/20 acres	12-20% of watershed >1 unit/20 acres	8-11% of watershed >1 unit/20 acres	<8% of watershed >1 unit/20 acres	>20% of watershed >1 unit/20 acres	Poor
			Riparian Vegetation	Species Composition	<25% Intact Historical Species Composition	25-50% Intact Historical Species Composition	51-74% Intact Historical Species Composition	>75% Intact Historical Species Composition	25-50% Intact Historical Species Composition	Fair
			Sediment Transport	Road Density	>3 Miles/Square Mile	2.5 to 3 Miles/Square Mile	1.6 to 2.4 Miles/Square Mile	<1.6 Miles/Square Mile	>3 Miles/Square Mile	Poor
			Sediment Transport	Streamside Road Density (100 m)	>1 Miles/Square Mile	0.5 to 1 Miles/Square Mile	0.1 to 0.4 Miles/Square Mile	<0.1 Miles/Square Mile	>1 Miles/Square Mile	Poor

Stevens Creek CAP Threat Results

	Threats Across Targets	Adults	Eggs	Summer Rearing Juveniles	Winter Rearing Juveniles	Smolts	Watershed Processes	Overall Threat Rank
	Project-specific-threats	1	2	3	4	5	6	
1	Agriculture	Low		Low	Low	Low		Low
2	Channel Modification	Very High	Low	Very High	Very High	Very High	High	Very High
3	Disease, Predation and Competition	Low		Low	Low	Medium	Low	Low
4	Hatcheries and Aquaculture							
5	Fire, Fuel Management and Fire Suppression							
6	Fishing and Collecting	Low		Low		Low		Low
7	Livestock Farming and Ranching	Low		Low	Low	Low		Low
8	Logging and Wood Harvesting							
9	Mining	Medium		Medium	Medium	Medium	Low	Medium
10	Recreational Areas and Activities	High		High	High	High	Low	High
11	Residential and Commercial Development	High	Low	Very High	Very High	Very High	Very High	Very High
12	Roads and Railroads	Very High	Low	Very High	Very High	Very High	Very High	Very High
13	Severe Weather Patterns	Medium	Low	Medium	Medium	Medium	Low	Medium
14	Water Diversion and Impoundments	Very High	Low	Very High	Very High	Very High	Very High	Very High
	Threat Status for Targets and Project	Very High	Low	Very High	Very High	Very High	Very High	Very High

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-1.1	Objective	Estuary	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-1.1.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat										
StC-CCCS-1.1.1.1	Action Step	Estuary	Evaluate the estuary to determine the degree to which ecological conditions can be enhanced; identify key limiting factors, and develop and implement a plan to remedy these limiting factors.	3	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District, USFWS	118.79	118.79				238	NMFS 2008, pg. 58
StC-CCCS-1.1.1.2	Action Step	Estuary	Restore and enhance estuarine habitat; improve complex habitat features; provide fully functioning habitat (CDFG 2004).	3	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District, USFWS	123.00	123.00				246	Cost based on treating 5 acres (assume 10% of total estuarine acres) at a rate of $49,200/acre.
StC-CCCS-2.1	Objective	Floodplain Connectivity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
StC-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Develop and implement plans to provide seasonally appropriate flows from Stevens Creek Dam necessary to activate the floodplain (see Restoration-Habitat Complexity, Restoration- Hydrology, Threat-Water Diversion/Impoundment).	2	5	Santa Clara Valley Water District						0	Costs accounted for in subsequent actions related to habitat complexity, hydrology, and water diversion/impoundment.
StC-CCCS-2.1.1.2	Action Step	Floodplain Connectivity	Assess floodplain conditions within Stevens Creek. Develop and implement plans to maintain floodplain connection where existing, and reconnect disconnected floodplain habitat where feasible (see Restoration- Habitat Complexity, and Restoration-Riparian).	2	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	172.50	172.50				345	Cost based on riparian and wetland restoration model at a rate of $88,551 and $255,968/project, respectively. Cost will vary with amount of watershed area assessed and extent of floodplain connection restoration efforts. Moderate estimate is $29,070 /acre of earthmoving (NMFS2008, pg 26).
StC-CCCS-2.1.1.3	Action Step	Floodplain Connectivity	During winter and spring, implement periodic large pulse "maintenance" flows at the full capacity of the Stevens Creek Reservoir Dam outlet works to provide stream channel maintenance flows. When possible, time these flows so that they coincide with natural rainfall events.	2	10	Santa Clara Valley Water District						0	Action is considered In-Kind

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-3.1	Objective	Hydrology	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-3.1.1	Recovery Action	Hydrology	Improve flow conditions										
StC-CCCS-3.1.1.1	Action Step	Hydrology	Avoid and/or minimize the adverse effects of water diversion and storage on steelhead by maintaining a more natural hydrograph, and providing flows to benefit all life stages of steelhead.	2	5	Santa Clara Valley Water District, SWRCB						TBD	Costs will vary depending on methods implemented.
StC-CCCS-3.1.1.2	Action Step	Hydrology	Establish and implement a comprehensive stream flow program to improve survival at all life stages by improving the spatial and temporal pattern of surface flows throughout spawning, rearing, and migration areas (see Objectives, Actions, and Action Steps within: Threat- Water Diversion/Impoundment, Restoration- Floodplain Connectivity, Restoration- Habitat Complexity, Threat- Channel Modification, and Threat- Residential/Commercial Development).	1	10	Santa Clara Valley Water District						TBD	Cost will be dependent upon amount of water required, and extent of the program.
StC-CCCS-5.1	Objective	Passage	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
StC-CCCS-5.1.1.1	Action Step	Passage	Improve and maintain exiting fish passage structures within below reservoir facilities (i.e., fish ladders); identify and remedy problem culverts, crossings, grade control structures, diversions, etc. in the Stevens Creek watershed; remove defunct facilities.	2	15	Caltrans, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented.
StC-CCCS-5.1.1.2	Action Step	Passage	Expedite projects providing improved steelhead passage and stable channel conditions. See the California Department of Fish and Game barrier survey report (Cleugh and McKnight 2002), coordinate with Santa Clara Valley Water District, and perform more current surveys as needed.	1	5	Caltrans, CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	1,392					1,392	Estimate of $278,409/project within suburban setting used (CDFG 2004, pg I-16), and an estimte of 5 barriers to be improved/removed. Passage improvement is of the highest priority - expedite.
StC-CCCS-5.1.1.3	Action Step	Passage	Evaluate existing above-reservoir habitat for its ability to support steelhead.	1	5	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	112.52					113	Cost estimate from: Steelhead Abundance/Distribution project type (NMFS 2008, pg 58). Cost is approximate. Support and expedite projects that contribute to above-reservoir passage investigation/implementation.

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-5.1.1.4	Action Step	Passage	Perform a passage feasibility study specific to Stevens Creek Reservoir. See HDR's field report prepared for the Santa Clara Valley Water District (HDR 2010) for initial reconnaissance efforts. Include water system uses and reservoir operations in this assessment. Include both adult immigration and adult/smolt emigration passage requirements.	1	5	Santa Clara Valley Water District						TBD	Consider both volitional and non-volitional passage methods in the assessment.
StC-CCCS-5.1.1.5	Action Step	Passage	Implement feasible, biologically sound passage program(s) that are coupled with the reservoir flow plans and operations necessary to facilitate long-term implementation.	2	10	Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented.
StC-CCCS-5.1.1.6	Action Step	Passage	Expeditiously implement the most feasible and biologically beneficial passage program.	1	10	Caltrans, Santa Clara Valley Water District	12,500	12,500				25,000	Using cost estimates from a draft fish passage assessment performed by HDR engineering Inc. (2009) for Los Padres Dam: cost estimates range depending on methodology. For this estimate: 15 million for ladder installation (trap and haul less) 10 million for 100 years of operation (trap and haul similar).
StC-CCCS-5.1.1.7	Action Step	Passage	Acquire funding necessary to ensure the long-term operations, and future improvement of this passage program.	1	10	Caltrans, CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-6.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-6.1.1	Recovery Action	Habitat Complexity	Improve frequency of primary pools, LWD, and shelters										
StC-CCCS-6.1.1.1	Action Step	Habitat Complexity	Identify locations where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to improve these conditions. Consider flow rates and discharges when designing LWD and shelter enhancement features.	3	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	69.00	69.00				138	Cost based on fish/habitat restoration model at a rate of $137,833/project.
StC-CCCS-6.1.1.2	Action Step	Habitat Complexity	Focus initial efforts within the "Cold Water Management Zone" downstream of Stevens Creek Dam (see Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	2	10	Santa Clara Valley Water District						0	Costs accounted for in previous actions related to habitat complexity.
StC-CCCS-6.1.1.3	Action Step	Habitat Complexity	Perform pre- and post-project monitoring to assess steelhead use within improved reaches.	3	15	CDFW, Santa Clara Valley Water District	22.33	22.33	22.33			67	Cost based on steelhead juvenile surveys for Coastal SF Bay at a rate $4,460/year.
StC-CCCS-6.2	Objective	Habitat Complexity	Address the inadequacy of existing regulatory mechanisms										

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-6.2.1	Recovery Action	Habitat Complexity	Improve frequency of primary pools, LWD, and shelters										
StC-CCCS-6.2.1.1	Action Step	Habitat Complexity	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining riparian vegetation, instream LWD, and LWD recruitment.	3	15	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	25.38	25.38	25.38			76	Estimate from General Education and Outreach cost: $76,136/program (CDFG, 2004 pg I.42)
StC-CCCS-7.1	Objective	Riparian	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-7.1.1	Recovery Action	Riparian	Improve riparian conditions										
StC-CCCS-7.1.1.1	Action Step	Riparian	Identify reaches dominated by exotic vegetation, and develop and implement site specific plans to restore these reaches.	3	25	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	5.00	5.00	5.00	5.00	5.00	25	Cost based on treating 0.3 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $1,015/acre.
StC-CCCS-7.1.1.2	Action Step	Riparian	Identify reaches suffering from riparian encroachment, and develop and implement site specific plans to restore and maintain these reaches. Consider thinning of dense native riparian vegetation as necessary to better allow healthy species- and age- composition.	3	5	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	89.00					89	Cost based on riparian restoration model at a rate of $88,551/project.
StC-CCCS-7.1.1.3	Action Step	Riparian	Develop and implement flow schedules from reservoirs necessary to maintain healthy riparian conditions (see Objective, Actions, and Action Steps within: Restoration- Hydrology).	3	25	Santa Clara Valley Water District						0	Costs accounted for in previous actions related to hydrology.
StC-CCCS-8.1	Objective	Sediment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality										

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-8.1.1.1	Action Step	Sediment	Improve spawning and foraging conditions for steelhead in the Stevens Creek system downstream of Stevens Creek Dam by decreasing sedimentation, and improving instream gravel quantity and quality.	2	15	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
StC-CCCS-8.1.1.2	Action Step	Sediment	Identify sources of sedimentation, and develop and implement a plan to address these sources; include the effects of historic and ongoing gravel mining operations, water system operations (hydrograph alterations), and urban development in this assessment..	3	5	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	77.00					77	Cost based on erosion assessment of 25% of total watershed acres at a rate of $15.14/acre.
StC-CCCS-8.1.1.3	Action Step	Sediment	Provide flows and instream conditions necessary to provide mobilization and maintenance of gravels.	3	5	Santa Clara Valley Water District						0	Costs accounted for in previous actions related to hydrology.
StC-CCCS-8.1.1.4	Action Step	Sediment	Perform reach restoration to facilitate gravel "maintenance". Include methods such as instream restoration and a gravel placement program. Include flow schedules necessary for mobilization and "maintenance" of gravel quantity and quality suitable for steelhead.	1	5	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	843	843	843	843	843	4,218	Estimate is for one mile of lagre scale reach restoration (NMFS 2008, pg 27) - cost will vary depending on extent of restoration efforts, and methodologies employed.
StC-CCCS-10.1	Objective	Water Quality	Address the present or threatened destruction, modification, or curtailment of the species range or habitat										
StC-CCCS-10.1.1	Recovery Action	Water Quality	Improve instream temperature conditions										
StC-CCCS-10.1.1.1	Action Step	Water Quality	Maintain suitable temperatures downstream of Stevens Creek Dam (see the reservoir rule curves that provide for maintenance of a "cold water management zone" downstream of Stevens Creek Dam - Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	2	25	County of Santa Clara, Santa Clara Valley Water District						TBD	Costs accounted for in previous actions related to water diversion.

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-10.1.1.2	Action Step	Water Quality	Evaluate the effects of groundwater recharge facilities, on stream temperature. Develop and implement a plan to address any effects. Include methods to address warming of stream water within restoration plans for these reaches.	2	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Costs will vary depending on methods implemented and extent of rehabilitation.
StC-CCCS-10.1.2	Recovery Action	Water Quality	Improve stream water quality conditions										
StC-CCCS-10.1.2.1	Action Step	Water Quality	Evaluate point and non-point sources contributing to poor water quality, including sources contributing debris, pesticides, and sediment (turbidity); develop and implement a plan to address these sources.	3	10	City of Cupertino, City of Los Altos, City of Mountain View, City of San Jose, City of Sunnyvale, County of Santa Clara, SCVURPPP	7.50	7.50				15	Cost based on installing a minimum of 3 continuous water quality monitoring stations at a rate of $5,000/station. Cost does not account for data management or maintenance.
StC-CCCS-10.1.2.2	Action Step	Water Quality	Avoid, or at a minimum minimize, the use of commercial and industrial products (e.g. pesticides) with high potential for contamination of local waterways.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District, USEPA						0	Action is considered In-Kind
StC-CCCS-10.1.2.3	Action Step	Water Quality	Encourage the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of San Jose, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-11.1	Objective	Viability	Address the inadequacy of existing regulatory mechanisms										
StC-CCCS-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-11.1.1.1	Action Step	Viability	Support (fund) the hiring and retention of dedicated environmental law enforcement personnel (i.e., CDFW wardens; park rangers, federal service enforcement agents, etc.).	3	25	CDFW, CDFW Law Enforcement, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, NMFS OLE, Santa Clara Valley Water District	11.21	11.21	11.21	11.21	11.21	56	Cost estimate for Fish and Game Warden from Bureau of Labor Statistics 2009.
StC-CCCS-11.2	Objective	Viability	Address other natural or manmade factors affecting the species' continued existence										
StC-CCCS-11.2.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										
StC-CCCS-11.2.1.2	Action Step	Viability	Implement a monitoring program to evaluate the performance (population response) of recovery efforts. Coordinate with CDFW Coastal Monitoring Program.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Costs for monitoring population status and trends are covered under the Coastal Monitoring Plan - See Monitoring Chapter.
StC-CCCS-11.2.1.3	Action Step	Viability	Implement standardized assessment protocols (i.e., CDFW habitat assessment protocols) to ensure ESU-wide consistency.	3	25	Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-11.2.1.4	Action Step	Viability	Perform standardized adult upmigration surveys. Include assessment above significant below-reservoir barriers.	2	25	Santa Clara Valley Water District	10.09	10.09	10.09	10.09	10.09	50	Monitoring estimate for: Production, Run timing, and Size monitoring (NMFS 2008, pg 58)
StC-CCCS-11.2.1.5	Action Step	Viability	Perform standardized adult spawning (redd) surveys.	2	25	Santa Clara Valley Water District						0	Costs for monitoring population status and trends are covered under the Coastal Monitoring Plan - See Monitoring Chapter.
StC-CCCS-11.2.1.6	Action Step	Viability	Perform standardized smolt outmigration surveys.	2	25	Santa Clara Valley Water District						0	Costs for monitoring population status and trends are covered under the Coastal Monitoring Plan - See Monitoring Chapter.
StC-CCCS-11.2.1.7	Action Step	Viability	Perform standardized juvenile rearing surveys.	2	25	Santa Clara Valley Water District						0	Costs for monitoring population status and trends are covered under the Coastal Monitoring Plan - See Monitoring Chapter.
StC-CCCS-11.2.1.8	Action Step	Viability	Monitor population status for response to recovery actions, habitat improvements, and recovery action implementation - adjust population and life stage monitoring efforts to reflect new habitat improvements and accessible habitat expansions; use this information to adapt recovery strategies.	2	25	City of San Jose, County of Santa Clara, Santa Clara Valley Water District						0	Cost accounted as part of other monitoring components in above action steps.
StC-CCCS-13.1	Objective	Channel Modification	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity										

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-13.1.1.1	Action Step	Channel Modification	Where feasible, implement alternatives to bank hardening; utilize bioengineering.	2	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost based on number and type of stream bed and bank stability to be used. Estimate for bioengineering methods range from $418/100' x 10' (WSDOT 2001).
StC-CCCS-13.1.1.2	Action Step	Channel Modification	All proposed levees should be designed to account for minimal maintenance associated with an intact and functioning riparian zone.	2	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented.
StC-CCCS-13.1.1.3	Action Step	Channel Modification	When levees are utilized, design to allow maintenance of an intact and functioning riparian zone where feasible.	2	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-13.1.1.4	Action Step	Channel Modification	Where riprap and other bank hardening is necessary, integrate other habitat-forming features – including large woody debris and riparian plantings and other methodologies to minimize habitat alteration effects.	2	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-13.1.1.5	Action Step	Channel Modification	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Identify and target remediation of watershed process disruption as an overall priority.	2	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-13.1.1.6	Action Step	Channel Modification	Evaluate existing and future stream crossings to identify threats to natural hydrologic processes. Replace or retrofit crossings to achieve more natural conditions, and improved passage and stream function.	3	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	See cost estimates within PASSAGE
StC-CCCS-13.2	Objective	Channel Modification	Address the inadequacy of existing regulatory mechanisms										
StC-CCCS-13.2.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity										
StC-CCCS-13.2.1.1	Action Step	Channel Modification	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (CDFG 2004).	3	15	City of Cupertino, City of Los Altos, City of Mountain View, City of San Jose, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-13.2.1.2	Action Step	Channel Modification	Counties and municipalities should adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara						0	Action is considered In-Kind
StC-CCCS-13.2.1.3	Action Step	Channel Modification	Avoid or minimize the effects from flood control projects on salmonid habitat.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara						0	Action is considered In-Kind
StC-CCCS-14.1	Objective	Disease /Predation /Competition	Address disease or predation										
StC-CCCS-14.1.1	Recovery Action	Disease /Predation /Competition	Prevent or minimize reduced density, abundance, and diversity										

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-14.1.1.1	Action Step	Disease /Predation /Competition	Identify locations within the watershed that support exotic piscivorous fish species, and develop and implement a plan to decrease the effects of predation by these species. Consider provision of instream habitat and cover that provides refuge for salmonids, and/or the elimination of instream conditions that support and favor exotic species.	2	25	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost based on amount of exotic piscivorous fish species to be removed. Cost for pikeminnow eradication estimated at $9.38/fish.
StC-CCCS-21.1	Objective	Recreation	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-21.1.1	Recovery Action	Recreation	Prevent or minimize impairment to floodplain connectivity (impaired quality and extent)										
StC-CCCS-21.1.1.1	Action Step	Recreation	Evaluate the effects of recreational facilities such as bike/pedestrian trails, and road crossings that may constrain opportunities to expand channel width and/or reconnect floodplain.	3	5	CDFW, City of Cupertino, City of Los Altos, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost will vary with assessment methods and level of detail.
StC-CCCS-21.1.1.2	Action Step	Recreation	Develop and implement a plan that remediates existing recreational facilities to allow for stream functions, and sites new facilities in such a way that their placement does not constrain channel width or floodplain connection (see FLOODPLAIN CONNECTIVITY	2	10	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Costs accounted for in previous actions related to floodplain connectivity.
StC-CCCS-21.1.2	Recovery Action	Recreation	Prevent or minimize adverse alterations to riparian species composition and structure										
StC-CCCS-21.1.2.1	Action Step	Recreation	Encourage acquisition and protection of riparian corridors and stream areas, and incorporate these areas into existing or new protected areas.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Private Landowners, Santa Clara Valley Water District, State Parks						0	Action is considered In-Kind
StC-CCCS-22.1	Objective	Residential /Commercial Development	Address the present or threatened destruction, modification, or curtailment of habitat or range										
StC-CCCS-22.1.1	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to watershed hydrology										

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-22.1.1.1	Action Step	Residential /Commercial Development	Improve conditions for steelhead by reducing the density of existing residential and commercial development where feasible, and remediating existing development contributing to poor stream conditions.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
StC-CCCS-22.1.1.2	Action Step	Residential /Commercial Development	Upgrade existing stormwater systems into a spatially distributed discharge network (rather than a few point discharges).	2	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Cost based on amount of existing system needing to be upgraded. Cost estimated at $11,065/storm drain.
StC-CCCS-22.1.1.3	Action Step	Residential /Commercial Development	Maintain intact and properly functioning riparian buffers to filter and prevent fine sediment input from entering streams.	2	15	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-22.1.1.5	Action Step	Residential /Commercial Development	Improve steelhead survival by minimizing the input of sediment or toxic compounds originating from commercial or residential development.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
StC-CCCS-22.1.1.6	Action Step	Residential /Commercial Development	Disperse discharge from new or upgraded commercial and residential areas into a spatially distributed network rather than a few point discharges.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented.

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Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-22.1.1.7	Action Step	Residential /Commercial Development	County and local codes should require spatially distributed storm drain networks and runoff controls from new developments. General code provisions to develop retrofit conversion of impervious surface to pervious or on-site runoff infiltration during redevelopment should be developed.	3	5	Cities, Counties, RWQCB, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-22.2	Objective	Residential /Commercial Development	Address the inadequacy of existing regulatory mechanisms										
StC-CCCS-22.2.1	Recovery Action	Residential /Commercial Development	Prevent or minimize impairment to watershed hydrology										
StC-CCCS-22.2.1.1	Action Step	Residential /Commercial Development	New development should minimize storm-water runoff, changes in duration, or magnitude of peak flow.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-22.2.1.2	Action Step	Residential /Commercial Development	Design new development to allow streams to meander in historical patterns; protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-22.2.1.3	Action Step	Residential /Commercial Development	Design new developments to avoid unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to a steelhead watercourse.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-22.2.1.4	Action Step	Residential /Commercial Development	Minimize new development within riparian zones and the 100 year floodprone zones.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara						0	Action is considered In-Kind

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-22.2.1.5	Action Step	Residential /Commercial Development	Institutionalize programs to purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities. Restore uplands for watershed processes; restore stream channel and floodplain for steelhead use.	3	25	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, NMFS, Santa Clara Valley Water District						TBD	Costs for conservation easements vary.
StC-CCCS-22.2.1.6	Action Step	Residential /Commercial Development	Minimize future development in floodplains or off channel habitats.	3	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-22.2.1.7	Action Step	Residential /Commercial Development	Encourage infill and high density developments over dispersal of low density rural residential development.	3	25	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)										
StC-CCCS-23.1.1.1	Action Step	Roads/Railroads	Design new roads that minimize impacts to riparian areas and are hydrologically disconnected from the stream network.	3	25	Caltrans, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-23.1.1.2	Action Step	Roads/Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	3	25	Caltrans, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented and should be identified from road assessment.
StC-CCCS-23.1.1.3	Action Step	Roads/Railroads	Conduct actions that hydrologically disconnect roads.	3	25	Caltrans, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						TBD	Costs will vary depending on methods implemented.
StC-CCCS-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration										
StC-CCCS-23.1.2.1	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.	3	25	Caltrans, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1	Objective	Water Diversion /Impoundment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
StC-CCCS-25.1.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
StC-CCCS-25.1.1.1	Action Step	Water Diversion /Impoundment	Focus initial efforts within the "cold water management zone" (see Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement) downstream of Stevens Creek Dam.	1	10	Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.2	Action Step	Water Diversion /Impoundment	During winter and spring implement moderate winter baseflows to provide adequate water depths necessary for upstream and downstream migration between Stevens Creek Dam and the San Francisco Bay (see Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	1	10	Santa Clara Valley Water District						0	Action is considered In-Kind

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-25.1.1.3	Action Step	Water Diversion /Impoundment	During winter and spring implement periodic migrant attractant flows necessary to attract adult fish upstream, and encourage outmigration of smolts (see Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	1	10	Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.4	Action Step	Water Diversion /Impoundment	During winter and spring, implement periodic large pulse "maintenance" flows at the full capacity of the Stevens Creek Dam outlet works to provide stream channel maintenance flows. When possible, time these flows so that they are coincident with natural rainfall events.	1	10	Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.5	Action Step	Water Diversion /Impoundment	During summer and fall, maintain cool water temperatures (18 degrees C or less) throughout as much of the "cold water management zone" as possible (see Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement).	1	10	Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.6	Action Step	Water Diversion /Impoundment	During summer and fall, manage release rates so that depths and velocities favoring fry and juvenile steelhead are provided.	1	10	Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.7	Action Step	Water Diversion /Impoundment	Ramp all reservoir releases (flood maintenance releases, fisheries passage releases, summer baseflow, and other planned releases) to Stevens Creek below Stevens Creek Dam as necessary to minimize deleterious effects of flow increases/decreases. See ramping rate criteria presented in Appendix E of the May 2003 Fisheries and Aquatic Habitat Collaborative Effort Draft Settlement Agreement.	1	10	Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.8	Action Step	Water Diversion /Impoundment	Design and install instream habitat enhancement projects to optimize habitat attributes associated with rearing and migration.	2	5	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District	88.00					88	Cost based on treating 2.8 miles (assume 1 project/mile in 50% high IP) at a rate of $31,200/mile. Cost significantly higher for greater level of engineering and oversight. For example, the estimate for ELJ is $124,800/ELJ.
StC-CCCS-25.1.1.9	Action Step	Water Diversion /Impoundment	Install instream habitat enhancement features designed to increase the quantity and quality of fry and juvenile steelhead habitat by creating habitats with depth, velocity, and cover components that favor these life stages.	1	10	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Cost accounted for in above action step.

Stevens Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
StC-CCCS-25.1.1.10	Action Step	Water Diversion /Impoundment	Design all habitat enhancements to function within the anticipated range of flows.	1	25	CDFW, City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.11	Action Step	Water Diversion /Impoundment	Perform a detailed study assessing the degree to which imported water is used within Stevens Creek and its effects on the steelhead population	2	10	Santa Clara Valley Water District	79					79	Cost based on stream flow/precipitation model at a rate of $78,100/project.
StC-CCCS-25.1.1.12	Action Step	Water Diversion /Impoundment	Minimize the negative effects of diversion facilities on salmonid habitat.	2	25	City of Cupertino, City of Los Altos, City of Mountain View, City of Sunnyvale, County of Santa Clara, Santa Clara Valley Water District						0	Action is considered In-Kind
StC-CCCS-25.1.1.13	Action Step	Water Diversion /Impoundment	Allow all "fisheries flows" (baseflows, and passage, attractant, and channel maintenance flows) to bypass or flow through diversion facilities.	1	25	Santa Clara Valley Water District						0	Action is considered In-Kind

CCC Steelhead DPS Rapid Assessment Profile: Coastal San Francisco Bay Diversity Stratum Populations

Miller Creek

- Role within DPS: Dependent
- Spawner Abundance Target: 53-107 adults
- Current Intrinsic Potential: 9.1 IP-km

Arroyo Corte Madera del Presidio

- Role within DPS: Dependent
- Spawner Abundance Target: 39-80 adults
- Current Intrinsic Potential: 6.8 IP-km

San Mateo Creek

- Role within DPS: Potentially Independent Population
- Spawner Density Target: 38-78 adults
- Current Intrinsic Potential: 6.7 IP-km

Steelhead Abundance and Distribution

Historic abundance data are generally lacking for this diversity strata (Spence *et al.* 2008 and 2012), and systematic population density studies have not been performed; however, available information indicates that the current distribution and abundance of steelhead in these watersheds are much reduced from historic conditions (Leidy *et al.* 2005, Spence *et al.* 2008 and 2012). In a 2010 snorkle survey in Arroyo Corte Madera del Presidio, 10 of 12 locations surveyed had steelhead present in low numbers (Rodoni 2010). Steelhead continue to enter the system and reproduce successfully (Leidy et al 2005). Steelhead were present historically in San Mateo Creek, and small numbers may use the area below Crystal Springs Reservoir (Leidy et al. 2005). Miller Creek supports multiple age classes of steelhead found in fairly recent sampling (Leidy et al. 2005).

History of Land Use, Land Management and Current Resources

Prior to the late 1840s, landscape modifications within the San Francisco Bay region were small and localized, but accelerated thereafter, resulting in the highly modified conditions seen today (Goals Project 1999). Land use activities associated with urban, industrial, and agricultural development (i.e., diking, draining, and filling of wetlands and tidally-influenced areas; construction of salt ponds, roads, bridges, and airports; marina, commercial, industrial, and

residential developments) have altered aquatic habitat quality in the Bay Area and contributed to population declines for species (including listed salmonids) that rely upon bay lands for feeding or breeding (Goals Project 1999). Within the Coastal San Francisco Bay stratum, this history of land development has resulted in most streams being characterized by highly modified watershed conditions reflective of urban and industrial development, and water-allocation operations (e.g., reservoirs, diversions and associated infrastructure). While all three creeks are characterized by similar land use histories, and reflect the general land use distribution containing significant areas in urban development, Miller Creek and Arroyo Corte Madera del Presidio differ from San Mateo Creek and from most other streams in the Interior and Coastal San Francisco Bay strata in that they lack a large reservoir (Rich 1995).

Current Resources and Land Management

Numerous private, and local, state, and Federal government entities are responsible for land and resource management within the watersheds of the Coastal San Francisco Bay Stratum. Regulated activities include, but are not limited to: resource extraction, infrastructure maintenance, development, restoration and resource management, shipping, commercial and recreational fishing, and recreation.

Resource management in Miller Creek includes local property owners, County of Marin, the communities of Marinwood and Lucas Valley, and others. Resource management in San Mateo Creek includes local property owners, the City of San Mateo, the Town of Hillsborough, County of San Mateo, San Francisco Public Utilities Commission (SFPUC), and others. Resource management in Arroyo Corte Madera del Presidio includes local property owners, County of Marin, and the town of Mill Valley.

Salmonid Viability and Watershed Conditions

Current Conditions

The following discussion focuses on those conditions that were rated Fair or Poor as a result of our Rapid Assessment viability analysis. The results are provided below. Recovery strategies will focus on improving these conditions.

Riparian Vegetation: Composition, Cover & Tree Diameter

This attribute was rated as Poor for its effect on summer rearing juveniles. Tree canopy cover throughout the urbanized reaches is typically Fair to Poor. These conditions likely result in elevated summer water temperature, high embeddeness levels, prevalent stream bank erosion, and limited LWD recruitment for rearing salmonids. Threats contributing to this condition

include: Residential and Commercial Development, Channel Modification, and Disease/Predation/Competition.

Estuary: Quality & Extent

This attribute was rated as Poor for its effects on adult, summer rearing juveniles, and smolt lifestages; and as Fair for its effect on winter rearing juveniles. Smolts depend on a functional estuary to complete the physiological process of transition from freshwater to sea water. The tidally influenced reaches of San Francisco Bay tributaries are highly altered and lack historic complexity (Goals Project 1999). Tidal reaches of all three creeks are highly altered, highly urbanized, and have been filled and channelized (NMFS 2009, 2011). Additionally, they lack estuarine complexity beneficial to juveniles and smolts. Threats contributing to this condition include Channel Modification, Residential and Commercial Development, and Roads and Railroads.

Velocity Refuge: Floodplain Connectivity

This attribute was rated as Poor for its effect on winter rearing juveniles, and as Fair for its effect on adults. Due to the highly urbanized conditions found in the lower reaches of both Miller and San Mateo creeks (NMFS 2009, 2011), engineered channel modifications and floodplain disconnection are prevalent throughout these streams. Threats contributing to this condition include Residential and Commercial Development, Channel Modification, Roads and Railroads, and Water Diversion and Impoundments.

Hydrology: Redd Scour

This attribute was rated as Fair for its effect on the egg lifestage. Gravel scouring events have the potential to destroy or degrade spawning and rearing habitat. However, it is not known if adverse scouring events are a significant cause of egg mortality throughout these creeks. Additionally, on San Mateo Creek, accessible reaches downstream of Crystal Springs Reservoir are not usually subjected to flashy storm water runoff events due to flow regulation by the reservoir. Modifications to operations of the Lower Crystal Springs Dam to better address steelhead needs downstream of the dam have been prescribed (NMFS 2010), and will commence in the near future (anticipated in summer 2014). Threats contributing to this condition include Residential and Commercial Development, Roads and Railroads, and Water Diversions and Impoundments.

Hydrology: Baseflow & Passage Flows

This attribute was rated as Fair for its effect on eggs and summer rearing juveniles, and as Poor for its effect on adults and smolts. Flow alteration associated with reservoir discharges and altered hydrology within urbanized watershed areas impairs instream hydrology; limiting the

maintenance of instream habitat and substrate, and potentially resulting in flows and temperatures insufficient to support steelhead. Current reservoir operations at Crystal Springs Reservoir on San Mateo Creek impair stream flow; altering discharge timing and volumes. These hydrograph alterations likely affect adult passage by muting attractant flows and curtailing passage opportunities at some partial, but significant, migratory barriers, and reducing the quality and quantity of juvenile rearing habitat. However, as discussed above, future flows supporting steelhead will be implemented by SFPUC; thus, the effects of the reservoir on this condition are expected to be reduced in the future. Threats contributing significantly to this condition include Channel Modification, Severe Weather Patterns, and Water Diversions and Impoundments.

Passage/Migration: Mouth or Confluence & Physical Barriers

This attribute was rated as Poor for its effect on adults, winter rearing and summer rearing juveniles, and smolts. Significant complete and partial passage barriers exist on both Miller and San Mateo creeks. Since the late 1800s, access to 80 percent of the San Mateo Creek watershed has been precluded by Crystal Springs Reservoir (NMFS 2009, Spence *et al.* 2008). Additionally, within accessible reaches on San Mateo and Miller creeks, passage is typically impaired by partial passage barriers or barriers of unknown status (Cleugh and Mcknight 2002; National Oceanic and Atmospheric Administration [NOAA] 2013). These barriers impede or preclude access to important spawning and rearing habitat, and according to Spence *et al.* (2008) contributing to the likely lack of viability of populations in the stratum. The threats contributing significantly to this condition include Residential and Commercial Development, Channel Modification, Roads and Railroads, Water Diversion and Impoundments, and Agriculture.

Habitat Complexity: Percent Primary Pools & Pool/Riffle/Flatwater Ratios

This attribute was rated as Poor for its effect on adults, and winter rearing and summer rearing juveniles. Instream habitat features and channel complexity necessary to support all lifestages are typically impaired. As indicated by the poor pool frequency and pool/riffle ratios, the highly modified channel conditions in these watersheds constrain habitat complexity necessary for the support of steelhead. Threats contributing to this condition include Residential and Commercial Development, Channel Modification, Roads and Railroads, and Water Diversion and Impoundments

Habitat Complexity: Large Wood & Shelter

This attribute was rated as Poor for its effect on adult, winter rearing and summer rearing juveniles, and smolt lifestages. The highly modified channel conditions in these watersheds constrain habitat complexity, including large woody debris and other complex features necessary for the support of steelhead. Threats contributing to this condition include Residential and

Commercial Development, Channel Modification, Roads and Railroads, and Water Diversion and Impoundments.

Sediment: Gravel Quality & Distribution of Spawning Gravels

This attribute was rated as Poor for its effect on adults, eggs, and winter rearing and summer rearing juvenile lifestages. Sediment transport, and thereby instream substrate invertebrate food resources and spawning habitat, is affected by development and management of the streams in this stratum. Urbanization and flood control projects in the lower reaches of both streams likely result in accumulation of fines that can also impair substrate quality. Also, on San Mateo Creek, Crystal Springs Reservoir intercepts nearly all of the sediment from the upper watershed. This reduces coarse sediments, resulting in erosion, incision, and other changes to the streambed and banks downstream of the dam. Threats contributing significantly to this condition include Residential and Commercial Development, Channel Modification, Roads and Railroads, and Water Diversion and Impoundments.

Viability: Density, Abundance & Spatial Structure

As in watersheds elsewhere in the Coastal San Francisco Bay Stratum, steelhead are present in low numbers. Available information (Leidy *et al.* 2005; Spence *et al.* 2008, 2012) indicates that the current distribution and abundance of steelhead in these watersheds are much reduced from historic conditions. Both Miller Creek and San Mateo Creek have been evaluated by NMFS' Technical Recovery Team for the North-Central California Coast Recovery Domain (TRT) (Spence *et al.* 2008 and 2012). The TRT (Spence *et al.* 2008 and 20102) classified San Mateo Creek as being at high risk of extinction and Miller Creek as data deficient, though Spence et al. (2008) notes that Miller Creek and others identified as data deficient may be at high risk of extinction. In a 2010 snorkle survey in Arroyo Corete Madera del Presidio, 10 of 12 locations surveyed had steelhead present in low numbers (Rodoni 2010). Threats contributing significantly to this condition include Water Diversions and Impoundments, and Disease, Predation and Competition.

Water Quality: Temperature

This attribute was rated as Fair for its effect on summer rearing juveniles and smolts. In the lower reaches of these watersheds, temperatures are more likely to be suboptimal, particularly for summer rearing lifestages. As noted above for Hydrology: Impaired Water Flow, impaired flows limit steelhead survival and reproduction in the accessible reaches of San Mateo Creek; as a result, water temperatures are likely elevated. Threats contributing significantly to this condition include Residential and Commercial Development, Channel Modification, Roads and Railroads, and Water Diversion and Impoundments.

Water Quality: Turbidity & Toxicity

This condition was rated as Poor for its effect on adults, summer rearing juveniles, winter rearing juveniles, and smolts. Likely due to the high density of urbanization within these watersheds, water quality within much of the accessible reaches is degraded and likely limiting for steelhead. Water quality for all three creeks is impaired (EPA 2013a, 2013b, 2013c, 2014). According to EPA (2013a) diazinon is a cause of impairment in Miller Creek, and probable sources in this watershed include urban runoff and storm sewers. Causes of impairment in San Mateo Creek include diazanon and trash (EPA 2013b) and sediment toxicity (EPA 2013c). In San Mateo Creek, probable sources of sediment toxicity are unknown (EPA 2013c), and probable sources of diazinon and trash impairments are illegal dumping and urban runoff/storm sewers (EPA 2013b). In Arroyo Corte Madera del Presidio, diazinon, pesticides, and urban runoff are sources of impairment (EPA 2014). Threats contributing to this condition include Residential and Commercial Development and Roads and Railroads.

Threats

The following discussion focuses on those threats that rate as a primary or secondary concern (See Coastal San Francisco Bay Diversity Stratum Rapid Assessment Threats Results). Recovery strategies will focus on ameliorating High threats; however, some strategies may address other threat categories when the strategy is essential to recovery efforts.

Agriculture

Neither Arroyo Corte Madera del Presidio nor San Mateo Creek have land in agricultural production (NMFS 2009), and Miller Creek has three percent of the watershed area mapped as agriculture (NMFS 2011). Thus, the effect of agriculture is expected to be limited to the Miller Creek watershed.

Channel Modification

Engineered stream flood control channels occur in accessible reaches of these watersheds, and are most prevalent within the lower, more heavily urbanized sections. As a result, this threat is rated High. Engineered channels typically lack habitat features found within natural stream channels, and often impede upstream steelhead migration by creating either physical or hydraulic barriers. Channel modification within these streams, combined with other channel and landscape altering practices, has destroyed estuarine habitat, disconnected streams from their floodplains, and constrained natural fluvial and geomorphic processes necessary to create and maintain habitats that support viable steelhead populations.

In San Mateo Creek, channel modification has reduced the amount of channel diversity and complexity. Accessible portions of San Mateo Creek have been significantly modified by

suburban and urban development. The lower four miles of San Mateo Creek consist of unvegetated and heavily armored stream banks with development encroaching on the floodplains. Similarly, portions of both Arroyo Corte Madera del Presidio and Miller Creek within urban and suburban areas are affected by channel modification; impairing riparian and instream conditions.

Residential and Commercial Development

Significant high density development is primarily located in the currently accessible reaches of these watersheds. Miller Creek has 25% of the watershed area in urban development (NMFS 2011), and San Mateo Creek has 18% of the watershed area in urban development (NMFS 2009). Additionally, passage impediments largely restrict steelhead distribution to urbanized reaches especially in San Mateo Creek where Crystal Springs Reservoir blocks access to undeveloped areas in the upper watershed (NMFS 2009, 2011), exacerbating the effects of urban development on these populations. Portions of Miller Creek upstream of suburban development contain intact riparian areas; however, within developed areas, roads and development encroach into riparian areas, and bank erosion is widespread. Urbanization, ditching, and the construction of storm drains have concentrated storm runoff, resulting in channel incision, bank failures, loss of riparian, sediment accumulation, and at culverts and road crossings partial sediment barriers (nbwatershed.org 2013). Development has generally constrained floodplains and reduced riparian cover, and bank stabilization and flood-control measures have resulted in channelization of stream courses. Major modifications to the historic hydrology and channel forms have occurred in these reaches. Future development within riparian and near stream areas is expected to be limited; however, the existing urban footprint is unlikely to diminish, and within undeveloped accessible reaches, such as in Miller Creek, future development could potentially exacerbate existing limiting conditions.

Roads and Railroads

Road density in these watersheds is relatively low; however, road density within the riparian area is high[1], indicating the likelihood for roadways to impair stream, riparian, and floodplain habitats. Additionally, in San Mateo Creek, steelhead distribution is primarily limited to urbanized reaches (NMFS 2009) where roadway effects are most prevalent. Additionally, roadways outside of the urbanized reaches may also contribute to poor instream and floodplain conditions. Without road decommissioning projects, this threat is likely to continue in the future.

Severe Weather Patterns

[1] Miles of roads per square mile of riparian buffer (buffer is 100 meters on either side of the stream centerline) is 5.9 for Miller Creek (NMFS 2011), and 4.1 for San Mateo Creek (NMFS 2009).

This threat was rated as a Medium to Low threat. Drought could seriously degrade water flow and temperatures available to steelhead in the lower reaches. Extreme flood events could result in major input of sediment from upslope locations. Additionally, with global climate change expected to result in increased frequency of severe storms (Aumann, Ruzmaikin and Teixeira 2008) and increased flooding in the San Francisco Bay area (Knowles 2009, 2010; Cloern, Knowles, Brown, Cayan, Dettinger, *et al.* 2011), there is the potential that existing stormwater conveyance infrastructure will be inadequate to convey storm flows. Implications are that future flood events will affect streams in the San Francisco Bay area, affecting infrastructure, human health and safety, and environmental resources (including steelhead habitat). Such impacts are a potential concern in both San Mateo and Miller creeks; however, compared to San Mateo Creek and other similarly highly developed watersheds, the Miller Creek watershed retains much of its rural character in tidal portions of the watershed. As a result of this relatively less developed condition, the threat of flooding impacts may be less in Miller Creek than those observed in other more highly developed San Francisco Bay streams.

Water Diversion and Impoundments

Water diversions and impoundments were rated as a High threat. This is primarily due to the Crystal Springs Reservoir located on San Mateo Creek since there are no known large diversions or impoundments located in the Miller Creek watershed. Operation of the Crystal Springs Reservoir by the SFPUC over the past 125 years has significantly altered steelhead habitat in reaches of San Mateo Creek downstream of reservoir. The lack of winter high flow events has resulted in the accumulation of fine sediment, encroachment of riparian vegetation, and simplification of channel form; impairing instream, floodplain and riparian habitat necessary for the support of steelhead.

Limiting Conditions, Lifestages, and Habitats

Threat and current condition analysis suggests that extensive watershed development for urban, suburban, and commercial land uses are likely limiting factors affecting steelhead abundance within both Miller and San Mateo creeks, and within San Mateo Creek, passage and instream flow and habitat are impaired by the effects of Crystal Springs Reservoir. Combined, the effects of development (e.g., urban, suburban, and associated infrastructure) and water allocation facilities and operations, impair stream functions and habitat, and limit all lifestages of steelhead within these creeks. Restoration actions in both creeks should target these issues within high potential stream reaches, improve passage within accessible reaches, and in San Mateo creek consider passage above Crystal Springs Reservoir in order to provide access to important upper watershed reaches.

General Recovery Strategy

Improve Passage

Passage impediments should be systematically remediated. Priorities should focus on those that occur low in the system.

Reservoir Reoperation to Benefit All Lifestages of Steelhead

Crystal Springs Reservoir should be operated according to the criteria developed during consultation with NMFS (NMFS 2010).

Passage at Reservoirs

Crystal Springs Reservoir on San Mateo Creek acts as a complete passage barrier that blocks access to approximately 80 percent of habitat in the upper watershed. These upper watershed reaches were historically important for the steelhead populations in this watershed, at least in the main channel along the San Andreas fault. The habitat and function of the reservoir reaches cannot be effectively replaced through enhancement of downstream reaches. Thus, to address the effects of upstream passage blockage, studies to evaluate the potential biological benefits and technical feasibility of a steelhead passage program should be performed, and if deemed technically feasible and biologically beneficial, a passage program to restore anadromy to the upper watershed should be implemented.

Increase Habitat Complexity

Habitat complexity should be improved throughout the impaired reaches in these watersheds. All structures should be designed to function within an established range of flows to optimize habitat conditions for all steelhead lifestages.

Side Channel and Floodplain Reconnection

Where not limited by existing development, efforts should be made to reconnect floodplain habitat and increase channel complexity by reconnecting side channel habitat with the active stream channel. When possible, existing development should be retrofitted to restore access to floodplain and flood bench habitat, and to allow for natural channel functions.

Increase Estuary Habitat

Efforts to increase estuarine habitat should be maintained, where present, and should be expanded and implemented where needed elsewhere throughout the stratum. Projects should

include efforts to improve tidal and subtidal habitat complexity and should consider the needs of rearing and emigrating salmonids.

Improve Riparian Composition

Many of the reaches within the urbanized areas would benefit from improved riparian composition and structure, which would improve LWD recruitment, and increase instream shelter for juvenile fish. General practices to improve riparian condition include exotic vegetation removal, riparian planting and maintenance, and implementing channel maintenance flows necessary to support a riparian corridor that is diverse in species and age structure.

Improve Sediment Transport and Address Upslope and Instream Sources of Excess Sediment

Restoration efforts should consider improving substrate conditions throughout channelized reaches. In San Mateo Creek, restoration efforts should focus on providing channel maintenance/forming flows downstream of the reservoir as necessary to mobilize bedload material, and provide suitable gravel material from upstream sources.

Improve Water Quality

Efforts should be made to improve water quality. In particular, efforts should focus on limiting or treating urban runoff to decrease diazinon, trash, and toxic sediments.

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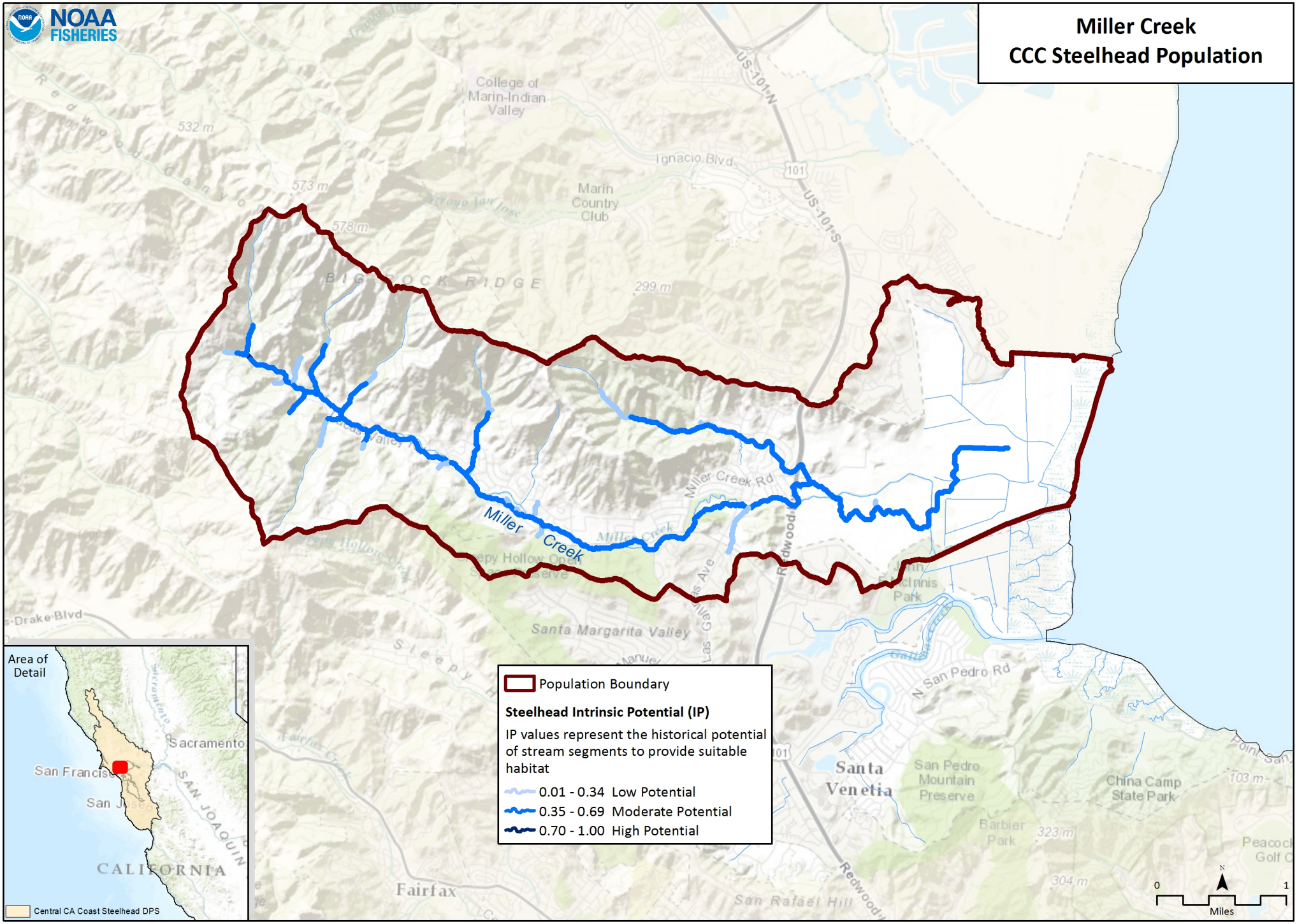
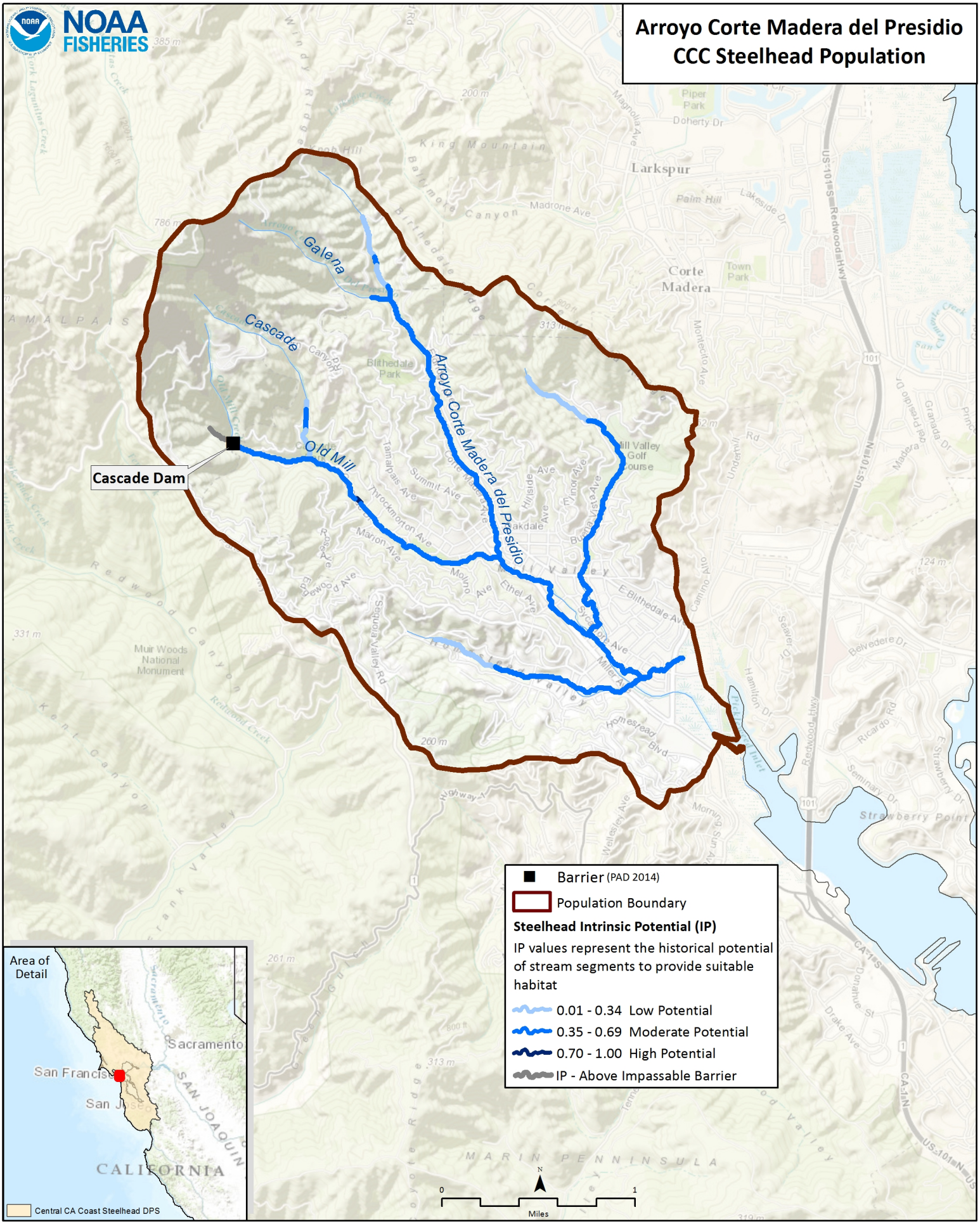
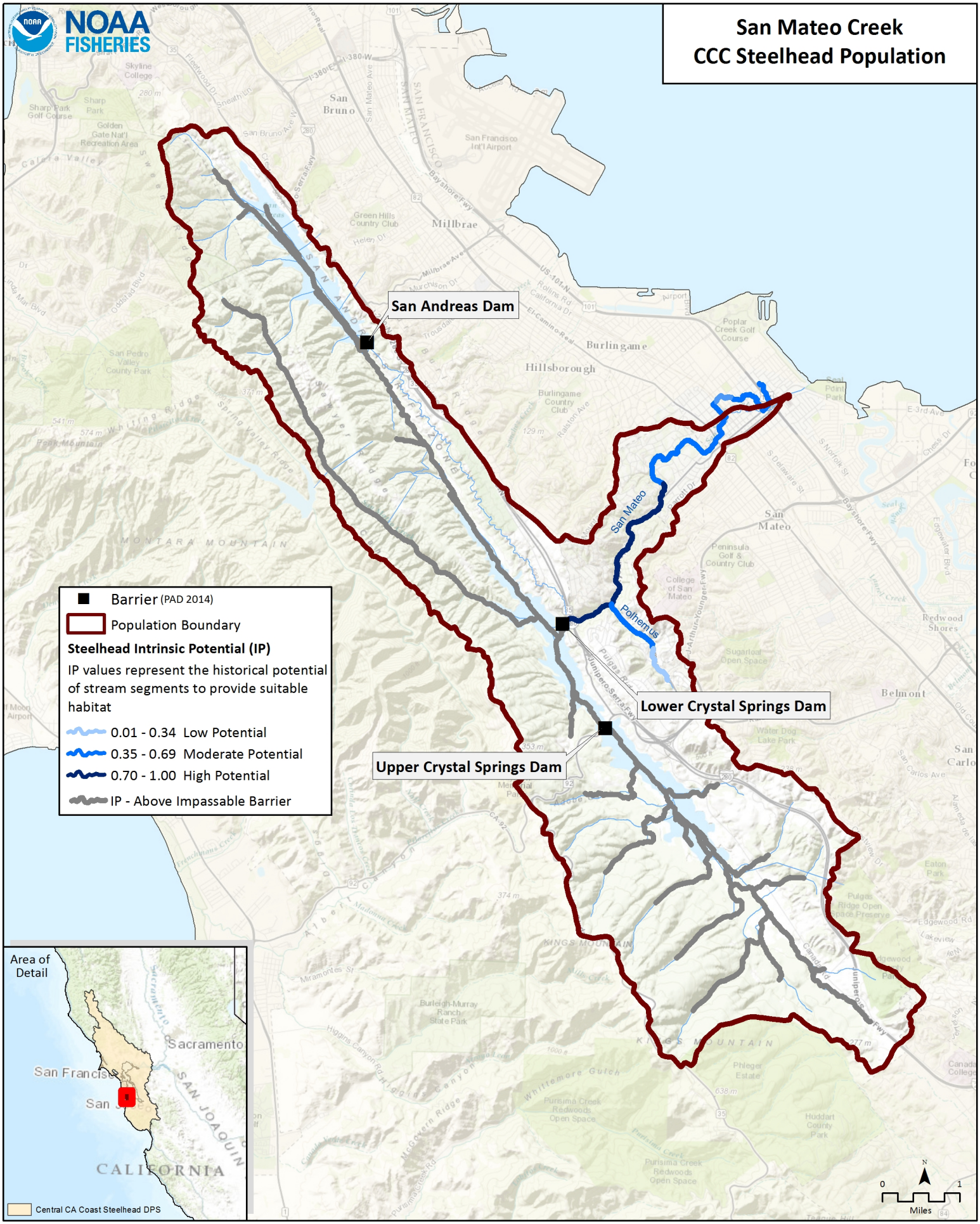

NOAA FISHERIES
Miller Creek
CCC Steelhead Population
College of Marin-Indian Valley
Marin Country Club
Ignacio Blvd
US-101-N
US-101-S
101
532 m
573 m
578 m
299 m
BIG ROCK RIDGE
Miller Creek Rd
Miller Creek
Redwood
Drake Blvd
Santa Margarita Valley
Sleepy Hollow Creek
Las Gallinas Ave
Fairfax Creek
Fairfax
San Rafael Hill
Santa Venetia
San Pedro Mountain Preserve
N San Pedro Rd
China Camp State Park
Barbier Park
323 m
304 m
103 m
Point San
Peacock Golf C
Area of Detail
Sacramento
San Francisco
San Jose
SAN JOAQUIN
CALIFORNIA
Central CA Coast Steelhead DPS
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
0
1
Miles
N


Arroyo Corte Madera del Presidio
CCC Steelhead Population
NOAA FISHERIES
Galena
Cascade
Old Mill
Arroyo Corte Madera del Presidio
Cascade Dam
Larkspur
Corte Madera
Muir Woods National Monument
Barrier (PAD 2014)
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
IP - Above Impassable Barrier
Area of Detail
Sacramento
San Francisco
San Jose
CALIFORNIA
Central CA Coast Steelhead DPS
0
1
Miles


San Mateo Creek
CCC Steelhead Population
NOAA FISHERIES
San Andreas Dam
Lower Crystal Springs Dam
Upper Crystal Springs Dam
San Mateo
Polhemus
Barrier (PAD 2014)
Population Boundary
Steelhead Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
IP - Above Impassable Barrier
Area of Detail
Sacramento
San Francisco
CALIFORNIA
Central CA Coast Steelhead DPS
0
1
Miles
N

CCC Steelhead DPS: Coastal San Francisco Bay Diversity Stratum (San Mateo/Miller/Arroyo Corte Madera del Presidio)						
Habitat & Population Condition Scores By Life Stage: VG = Very Good G = Good F = Fair P = Poor		Steelhead Life History Stages				
		Adults	Eggs	Summer-Rearing Juveniles	Winter-Rearing Juveniles	Smolts
Stresses: Key Attribute: Indicators	Riparian Vegetation: Composition, Cover & Tree Diameter			P		
	Estuary: Quality & Extent	P		P	F	P
	Velocity Refuge: Floodplain Connectivity	F			P	
	Hydrology: Redd Scour		F			
	Hydrology: Baseflow & Passage Flows	P	F	F		P
	Passage/Migration: Mouth or Confluence & Physical Barriers	P		P	P	P
	Habitat Complexity: Percent Primary Pools & Pool/Riffle/Flatwater Ratios	P		P	P	
	Habitat Complexity: Large Wood & Shelter	P		P	P	P
	Sediment: Gravel Quality & Distribution of Spawning Gravels	P	P	P	P	
	Viability: Density, Abundance & Spatial Structure	P		P		P
	Water Quality: Temperature			F		F
	Water Quality: Turbidity & Toxicity	P		P	P	P

CCC Steelhead DPS: Coastal San Francisco Bay Diversity Stratum (San Mateo/Miller/Arroyo Corte Madera del Presidio)

Threat Scores
L: Low
M: Medium
H: High

Threats - Sources of Stress	Stresses: Altered Riparian Species: Composition & Structure	Estuary: Impaired Quality & Extent	Floodplain Connectivity: Impaired Quality & Extent	Hydrology: Gravel Scouring Events	Hydrology: Impaired Water Flow	Impaired Passage & Migration	Instream Habitat Complexity: Altered Pool Complexity and/or Pool/Riffle Ratio	Instream Habitat Complexity: Reduced Large Wood and/or Shelter	Instream Substrate/Food Productivity: Impaired Gravel Quality & Quantity	Reduced Density, Abundance & Diversity	Water Quality: Impaired Instream Temperatures	Water Quality: Increased Turbidity or Toxicity
Agriculture	H	H	H	L		L	M	M	M		L	M
Channel Modification	H	H	H	H	H	H	H	H	H		H	H
Disease, Predation, and Competition	M	M	L			L	M	M		H	L	L
Fire, Fuel Management, and Fire Suppression	M	L	M	L		L	L	L	L		L	L
Livestock Farming and Ranching	M	L	M	L		L	M	M	M		L	M
Logging and Wood Harvesting	L	L	L	L		L	L	L	L		L	L
Mining	L	L	L	L		L	L	L	L		L	L
Recreational Areas and Activities	M	M	M	L		L	L	L	L		L	L
Residential and Commercial Development	H	H	H	H		H	H	H	H		H	H
Roads and Railroads	H	H	L	H		H	H	H	H		H	H
Severe Weather Patterns	M	H	M	M	H	M	M	M	M		M	M
Water Diversions and Impoundments	H	H	H	H	H	H	H	H	H	H	H	L
Fishing and Collecting										M		
Hatcheries and Aquaculture										L	L	L

Miller Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
MiC-CCCS-1.1	Objective	Estuary	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-1.1.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat										
MiC-CCCS-1.1.1.1	Action Step	Estuary	Develop an estuary rehabilitation and enhancement plan in efforts to reclaim historically tidal influenced areas.	2	10	Marin County, Marinwood	250.00					250	Cost estimate for the development of an estuary rehabilitation and enhancement plan.
MiC-CCCS-1.1.1.2	Action Step	Estuary	Identify potential habitat features that will increase current and future estuary habitat values for rearing steelhead.	2	10	Marin County, Marinwood						TBD	Cost accounted for in above action step.
MiC-CCCS-1.1.1.3	Action Step	Estuary	Investigate water quality (D.O., temperature, salinity) conditions for rearing steelhead in potential tidal marsh rehabilitation sites.	2	10	Marin County, Marinwood	7.50	7.50				15	Cost based on a minimum of 3 continuous monitoring stations at a rate of $5,000/station. Cost does not include data management or maintenance.
MiC-CCCS-1.1.1.4	Action Step	Estuary	Increase the inner estuary hydrodynamics that have been altered by levees, dikes, culverts, and tide gates.	2	10	Marin County, Marinwood	96.00	96.00				192	Cost based on treating 10% of total estuarine acres at a rate of $49,200/acre.
MiC-CCCS-2.1	Objective	Floodplain Connectivity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
MiC-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in low gradient response reaches.	2	10	Marin County, Marinwood	44.50	44.50				89	Cost based on riparian restoration monitoring at a rate of $88,551/project.
MiC-CCCS-2.1.1.2	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target velocity refuge for migrating salmonids.	2	10	Marin County, Marinwood	446.50	446.50				893	Cost based on treating 0.25 miles (assume 1 project/mile in 25% high IP with 80 acres/mile) at a rate of $44,640/acre.
MiC-CCCS-5.1	Objective	Passage	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
MiC-CCCS-5.1.1.1	Action Step	Passage	Utilize vegetation methods and bio-techniques to establish a low flow channel throughout the flood control channel. Incorporate features that create velocity refuge during high flow events for immigrating adults.	2	5	Marin County, Marinwood						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-5.1.1.2	Action Step	Passage	Modify or remove passage impediments.	1	5	Marin County, Marinwood	640					640	Cost based on providing passage at one partial barrier at a rate of $639,247/project.
MiC-CCCS-6.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-6.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency										
MiC-CCCS-6.1.1.1	Action Step	Habitat Complexity	Evaluate and prescribe an appropriate number of key LWD pieces to enhance summer rearing conditions in potential steelhead spawning and rearing areas throughout the watershed.	2	10	Marin County, Marinwood	16.00	16.00				32	Cost based on treating 1 mile (assume 1 project/mile in 50% high IP) at a rate of $31,200/mile.
MiC-CCCS-6.1.2	Recovery Action	Habitat Complexity	Increase frequency of primary pools										
MiC-CCCS-6.1.2.1	Action Step	Habitat Complexity	Evaluate and prescribe habitat features that will increase primary pool depth and frequency for winter and summer rearing juveniles, and quality stagging pools for migrating/staging adults.	2	10	Marin County, Marinwood						0	Cost accounted for in above action step.
MiC-CCCS-6.1.3	Recovery Action	Habitat Complexity	Improve shelter										

Miller Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
MiC-CCCS-6.1.3.1	Action Step	Habitat Complexity	Increase shelter and habitat complexity features that improve survival of emigrating juvenile and adult steelhead; include efforts in areas such as flood control channels that lack habitat complexity.	2	10	Marin County, Marinwood						0	Cost accounted for in above action step.
MiC-CCCS-7.1	Objective	Riparian	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-7.1.1	Recovery Action	Riparian	Improve canopy cover										
MiC-CCCS-7.1.1.1	Action Step	Riparian	Identify areas where canopy cover is impaired, and prescribe and implement measures to improve riparian habitat.	2	10	Marin County, Marinwood	40.00	40.00				80	Cost based on treating 0.04 miles (assume 1 project/mile in 55% high IP with 80 acres/mile) at a rate of $24,862/acre.
MiC-CCCS-7.1.1.2	Action Step	Riparian	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to land management activities.	2	10	Marin County, Marinwood						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-8.1	Objective	Sediment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality to reduce embeddedness										
MiC-CCCS-8.1.1.1	Action Step	Sediment	Evaluate, design, and implement gravel quality and quantity strategies to the extent that the maximum amount of spawning and incubation habitat is achieved.	2	10	Marin County, Marinwood	0.70	0.70				1	Cost based on treating 0.04 miles (assume 1 project/mile in 5% high IP) at a rate of $139/cu. yd.
MiC-CCCS-8.1.1.2	Action Step	Sediment	Add channel roughness (logs, boulders) in strategic locations to encourage spawning tailout formations and gravel sorting.	2	10	Marin County, Marinwood						0	Cost accounted for in other action steps.
MiC-CCCS-10.1	Objective	Water Quality	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-10.1.1	Recovery Action	Water Quality	Improve instream temperature conditions										
MiC-CCCS-10.1.1.1	Action Step	Water Quality	Identify if water temperatures are limiting steelhead viability in Miller Creek and, if found to be limiting, develop and implement measures to reduce water temperatures where needed.	2	10	Marin County, Marinwood						2	Cost based on installing a minimum of 3 stream temperature gauges at a rate of $500/gauge. Cost does not account for data management or maintenance.
MiC-CCCS-10.1.2	Recovery Action	Water Quality	Reduce toxicity and pollutants										
MiC-CCCS-10.1.2.1	Action Step	Water Quality	Identify and provide solutions for point and non-point sources contributing to poor water quality and pollution.	2	5	Marin County, Marinwood						0	These actions are considered normal duties of local (city and county) agencies. Federal and state agencies should continue to encourage improvements in water quality and the expansion of additional studies.
MiC-CCCS-12.1	Objective	Agriculture	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-12.1.1	Recovery Action	Agriculture	Prevent or minimize impairment to floodplain connectivity (impaired quality and extent)										
MiC-CCCS-12.1.1.1	Action Step	Agriculture	Conserve open space in contiguous landscapes, protect floodplain areas and riparian corridors, and develop conservation easements.	3	10	Marin County						0	Action is considered In-Kind
MiC-CCCS-12.1.2	Recovery Action	Agriculture	Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
MiC-CCCS-12.1.2.1	Action Step	Agriculture	Address sources from agricultural activities that deliver sediment and runoff to stream channels.	2	10	Marin County						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-13.1	Objective	Channel Modification	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										

Miller Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
MiC-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
MiC-CCCS-13.1.1.1	Action Step	Channel Modification	Protect all existing areas that provide winter refuge and seasonal habitat for juvenile steelhead from channelization.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.1.2	Action Step	Channel Modification	Ensure that all existing channel designed for flood conveyance incorporate features that enhance steelhead migration under high and low flow conditions.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.1.3	Action Step	Channel Modification	Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.1.4	Action Step	Channel Modification	Evaluate design alternatives to rip-rap bank repairs and incorporate fish habitat features.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.2	Recovery Action	Channel Modification	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity										
MiC-CCCS-13.1.2.1	Action Step	Channel Modification	Conduct rehabilitation activities that reconnect channels to floodplains.	2	10	Marin County, Marinwood						0	Cost accounted for in other recovery actions. See Floodplain Connectivity.
MiC-CCCS-13.1.2.2	Action Step	Channel Modification	Develop and implement strategies that slow urban runoff during the spawning and migration season (slow it, spread it, sink it).	2	10	Marin County, Marinwood						TBD	Cost based on feasible methods to slow urban runoff. Practices could include flood retention basins, bypass channels, or vegetated swales.
MiC-CCCS-13.1.3	Recovery Action	Channel Modification	Prevent or minimize impairment to passage and migration										
MiC-CCCS-13.1.3.1	Action Step	Channel Modification	Ensure that existing engineered and modified channels incorporate features that enhance steelhead migration under high and low flow conditions.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.3.2	Action Step	Channel Modification	Incorporate velocity refuge features in all existing engineered and modified channels.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.3.3	Action Step	Channel Modification	Install features that provides shelter for emigrating juvenile salmonids - focus efforts on areas, such as flood control channels, where shelter is most limited.	2	10	Marin County, Marinwood	268.00	268.00				536	Cost based on treating 0.5 miles at a rate of $1,07,400/mile.
MiC-CCCS-13.1.3.4	Action Step	Channel Modification	Prevent or minimize any future channel modification in potentially high value seasonal habitat and migration (staging) areas.	3	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.4	Recovery Action	Channel Modification	Prevent or minimize impairment to habitat complexity (reduced large wood and/or shelter)										
MiC-CCCS-13.1.4.1	Action Step	Channel Modification	Identify locations where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to provided shelter and velocity refuge for migrating and rearing steelhead.	2	10	Marin County, Marinwood	69.00	69.00				138	Cost based on fish/habitat restoration monitoring at a rate of $137,833/project.
MiC-CCCS-13.1.4.2	Action Step	Channel Modification	Encourage retention and recruitment of large woody debris to rehabilitate existing stream complexity, pool frequency, and depth.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-13.1.4.3	Action Step	Channel Modification	Prevent the removal of habitat forming structures (LWD, boulders, vegetation, etc.) in all natural waterways.	2	10	Marin County, Marinwood						0	Action is considered In-Kind
MiC-CCCS-22.1	Objective	Residential/Commercial Development	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-22.1.1	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
MiC-CCCS-22.1.1.1	Action Step	Residential/Commercial Development	Design new development to allow streams to meander in historical patterns; protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.	3	10	Marinwood						0	Action is considered In-Kind

Miller Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
MiC-CCCS-22.1.1.2	Action Step	Residential/Commercial Development	Avoid or minimize new development within riparian zones and the 100 year floodprone zones.	3	10	Marinwood						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-22.1.1.3	Action Step	Residential/Commercial Development	Minimize future development in floodplains or off channel habitats.	2	10	Marinwood						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-22.1.2	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
MiC-CCCS-22.1.2.1	Action Step	Residential/Commercial Development	Develop filter or buffer systems that reduce pollutants from entering streams and waterways of Miller Creek.	2	10	Marinwood						TBD	Cost based on amount of filter or buffer system needed. Cost can range widely depending upon feasible solution. A infiltration pond is estimated to cost between $11,881 to $35,125/pond.
MiC-CCCS-22.1.2.2	Action Step	Residential/Commercial Development	Implement education programs and install signs to promote public awareness of salmon and steelhead and their habitats within the Miller Creek watershed.	3	5	Marinwood	5.00					5	Cost based on installing 5 signs at a rate of $1,000/sign.
MiC-CCCS-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
MiC-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										
MiC-CCCS-23.1.1.1	Action Step	Roads/Railroads	Address high and medium priority sediment delivery sites associated with roads and railroads.	2	10	Marin County, Marinwood	78.50	78.50				157	Cost based on developing a road inventory for 136 miles of road at a rate of $1,148/mile.
MiC-CCCS-23.1.1.2	Action Step	Roads/Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	2	10	Marin County, Marinwood						TBD	Cost based on amount of sediment delivered from road network. Completion of a road inventory should identify sources of sediment and actions to reduce sediment delivery.
MiC-CCCS-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to stream hydrology (impaired water flow)										
MiC-CCCS-23.1.2.1	Action Step	Roads/Railroads	Conduct actions that hydrologically disconnect roads.	2	10	Marin County, Marinwood						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-23.1.2.2	Action Step	Roads/Railroads	Prevent or minimize the construction of new roads near high value habitat areas or sensitive habitat areas.	3	10	Marin County, Marinwood						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration										
MiC-CCCS-23.1.3.1	Action Step	Roads/Railroads	Ensure that all future road/stream crossing provide passage for all steelhead life stages.	3	10	Marin County, Marinwood						0	Existing programs and outreach are considered In-Kind.
MiC-CCCS-23.1.3.2	Action Step	Roads/Railroads	Identify and remedy all road/stream crossings that impair or prevent steelhead migration.	1	10	Marin County, Marinwood	1,279	1,279				2,557	Cost based on providing passage at 4 stream crossings at a rate of $639,247/project.

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-1.1	Objective	Estuary	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-1.1.1	Recovery Action	Estuary	Increase the quality and extent of estuarine habitat										
ACMP-CCCS-1.1.1.1	Action Step	Estuary	Develop and implement estuary rehabilitation and enhancement strategies.	3	10	Marin County, Marin RCD, MMWD	443.00	443.00				886	Cost based on treating 18 acres of estuarine habitat (assume 10% of total estuarine habitat) at a rate of $49,200/acre
ACMP-CCCS-1.1.2	Recovery Action	Estuary	Increase and enhance habitat complexity features										
ACMP-CCCS-1.1.2.1	Action Step	Estuary	Evaluate, and if feasible implement restoration projects that integrate upland and intertidal habitats.	3	10	Marin County, MMWD						TBD	Cost accounted for in above action step.
ACMP-CCCS-1.1.2.2	Action Step	Estuary	Evaluate and implement, where feasible, programs to enhance native benthic flora and fauna (such as native bivalves) to reduce habitat related effects of non-native invasive species.	3	15	Marin County, MMWD						TBD	Cost accounted for in above action step.
ACMP-CCCS-1.1.2.3	Action Step	Estuary	Evaluate and implement, where feasible, programs to enhance native riparian and wetland flora to reduce habitat related effects of past or present land-uses.	3	15	Marin County, Marin RCD, MMWD						TBD	Cost accounted for in above action step.
ACMP-CCCS-1.1.2.4	Action Step	Estuary	Use only native plant species in restoration, inspecting all live restoration and construction materials for aquatic invasive species and cleaning all equipment prior to and post restoration/construction.	2	15	FHWA, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
ACMP-CCCS-1.1.2.5	Action Step	Estuary	Monitor all restoration projects to identify success of techniques. Also, when unsatisfactory results are identified, implement responses to address causes of poor results.	3	25	FHWA, Marin County, Marin RCD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-1.1.3	Recovery Action	Estuary	Reduce toxicity and pollutants										
ACMP-CCCS-1.1.3.1	Action Step	Estuary	Evaluate water quality conditions (salinity, dissolved oxygen, temperature) in potential steelhead estuary rearing areas.	3	10	Marin County, MMWD	7.50	7.50				15	Cost based on installing a minimum of 3 continuous water quality stations at a rate of $5,000/station.
ACMP-CCCS-1.1.3.2	Action Step	Estuary	Implement tidal restoration projects that help capture and provide treatment of upland runoff.	3	25	Marin County, Marin RCD, MMWD						TBD	Cost accounted for through implementation of other action steps.
ACMP-CCCS-1.1.3.3	Action Step	Estuary	Plan and implement Total Maximum Daily Load plans for known pollutant impairments.	3	10	Marin County, MMWD, SWRCB, US EPA						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-1.1.3.4	Action Step	Estuary	Plan and implement structural solutions to reduce urban storm runoff pollutant loads.	3	25	FHWA, Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD						TBD	
ACMP-CCCS-2.1	Objective	Floodplain Connectivity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in modified channel areas.	3	5	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	50.00					50	Cost based on best professional judgement.
ACMP-CCCS-2.1.1.2	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in low gradient response reaches.	3	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	50.00					50	Cost based on best professional judgement.
ACMP-CCCS-2.1.1.3	Action Step	Floodplain Connectivity	Evaluate undeveloped and developed floodplain areas in efforts to identify rehabilitation and habitat enhancement sites with emphasis on increasing floodplain habitat.	3	10	Marin County, Marin RCD, MMWD						TBD	Cost accounted for in above action steps.
ACMP-CCCS-2.1.1.4	Action Step	Floodplain Connectivity	Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.	3	15	Marin County, Marin RCD, MMWD, Private Landowners						0	Existing programs and outreach are considered In-Kind. Costs for conservation easements vary.
ACMP-CCCS-2.1.1.5	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target velocity refuge for migrating salmonids.	2	25	Marin County, Marin RCD, MMWD						TBD	Cost accounted for in above action step.
ACMP-CCCS-2.1.1.6	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target winter rearing habitat for juvenile steelhead.	3	15	Marin County, Marin RCD, MMWD						TBD	Cost accounted for in above action step.
ACMP-CCCS-3.1	Objective	Hydrology	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-3.1.1	Recovery Action	Hydrology	Improve passage flows										
ACMP-CCCS-3.1.1.1	Action Step	Hydrology	Reduce impacts of impaired hydrology (reduced pulse-flows, magnitude, duration, and timing of freshets) that preclude adult and smolt passage over critical riffles and other nature obstacles.	1	5	Cities, Marin County, MMWD						TBD	Costs based on implementing other action steps (e.g. off-channel storage, irrigation efficiency, etc.)
ACMP-CCCS-3.1.1.2	Action Step	Hydrology	Establish a comprehensive stream flow evaluation program to determine instream flow needs for steelhead.	3	10	Marin County, MMWD	39.50	39.50				79	Cost based on stream flow/precipitation model at a rate of $78,100/project
ACMP-CCCS-3.1.1.3	Action Step	Hydrology	Protect the natural hydrograph during the steelhead migration season (November thru June).	1	5	Cities, Marin County, MMWD						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-3.1.2	Recovery Action	Hydrology	Improve flow conditions										
ACMP-CCCS-3.1.2.1	Action Step	Hydrology	Identify and maximize opportunities for aquifer recharge.	3	25	Marin County, MMWD, Private Landowners						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-3.1.2.2	Action Step	Hydrology	Develop and implement strategies for efficient water use.	3	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD, Private Landowners						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-3.1.2.3	Action Step	Hydrology	Develop and implement a water use plan ensuring base-flow sustainability.	3	10	Marin County, MMWD						TBD	
ACMP-CCCS-3.1.2.4	Action Step	Hydrology	Require streamflow gaging devices to evaluate impairment to current streamflow conditions.	2	5	Marin County, Marin RCD, MMWD	3.00					3	Cost based on installing a minimum of 3 streamflow gauges at a rate of $1,000/gauge. Cost does not account for data management or maintenance.

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-3.1.2.5	Action Step	Hydrology	Implement conjunctive use of water for water projects whenever possible to maintain or restore steelhead habitat.	2	5	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-5.1	Objective	Passage	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
ACMP-CCCS-5.1.1.1	Action Step	Passage	Continue to identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001).	1	5	Cities, Marin County, Marin RCD, MMWD, NMFS						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-6.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-6.1.1	Recovery Action	Habitat Complexity	Improve large wood frequency										
ACMP-CCCS-6.1.1.1	Action Step	Habitat Complexity	Increase wood frequency in spawning and rearing areas to the extent that a minimum of six key LWD pieces exists every 100 meters in 0-10 meters BFW streams.	2	15	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	5.33	5.33	5.33			16	Cost based on treating 0.5 miles at a rate of $31,200/mile. Cost likely higher if greater level of engineering and oversight is needed.
ACMP-CCCS-6.1.1.2	Action Step	Habitat Complexity	Develop strategies to optimize hydraulic diversity and habitat complexity when implementing/installing LWD structures.	3	10	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	8.00	8.00				16	Cost based on treating 0.5 miles at a rate of $31,200/mile. Cost likely higher if greater level of engineering and oversight is needed.
ACMP-CCCS-6.1.1.3	Action Step	Habitat Complexity	Develop and install seasonal habitat rearing features that achieve optimal performance during spring/fall baseflow conditions throughout the watershed.	3	15	Friends of Corte Madera Creek, Marin County, Marin RCD, MMWD	5.33	5.33	5.33			16	Cost based on treating 0.5 miles at a rate of $31,200/mile. Cost likely higher if greater level of engineering and oversight is needed.
ACMP-CCCS-6.1.2	Recovery Action	Habitat Complexity	Improve frequency of primary pools										
ACMP-CCCS-6.1.2.1	Action Step	Habitat Complexity	Increase the number of primary pools to the extent that more than 40% of summer rearing pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams.)	2	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-6.1.2.2	Action Step	Habitat Complexity	Evaluate, develop, and implement strategies to increase primary pool frequency in high priority reaches throughout the watershed.	3	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-6.1.3	Recovery Action	Habitat Complexity	Improve shelter rating										
ACMP-CCCS-6.1.3.1	Action Step	Habitat Complexity	Increase the number of pools that have a minimum shelter of 80 (See NMFS criteria).	3	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-6.1.3.2	Action Step	Habitat Complexity	Evaluate, identify, and improve shelters in pools throughout the watershed.	3	15	Marin County, Marin RCD, MMWD						0	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-6.1.4	Recovery Action	Habitat Complexity	Improve pool/riffle/flatwater ratios (hydraulic diversity)										
ACMP-CCCS-6.1.4.1	Action Step	Habitat Complexity	Evaluate, identify, and develop strategies that will encourage riffle habitat formation throughout the watershed.	3	10	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-7.1	Objective	Riparian	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-7.1.1	Recovery Action	Riparian	Improve canopy cover										
ACMP-CCCS-7.1.1.1	Action Step	Riparian	Increase the average stream canopy cover within all current and potential spawning and rearing reaches to a minimum of 80%.	2	10	Marin County, Marin RCD, MMWD	49.00	49.00				99	Cost based on treating 0.2 miles (assume 1 project/mile in 5% high IP with 20 acres/mile treated) at a rate of $24,682/acre
ACMP-CCCS-7.1.1.2	Action Step	Riparian	Increase the stream canopy by planting appropriate native riparian trees and shrubs along the stream where shade canopy is not at acceptable levels. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.	2	25	Marin County, Marin RCD, MMWD						TBD	Cost accounted for in above action steps.
ACMP-CCCS-7.1.1.3	Action Step	Riparian	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to land management activities (roads, cattle, flood control, etc.).	2	25	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-7.1.1.4	Action Step	Riparian	Evaluate, design, and implement strategies to rehabilitate native riparian communities and encourage large long standing trees.	3	10	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-7.1.1.5	Action Step	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers.	3	25	Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-8.1	Objective	Sediment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality to reduce embeddedness										
ACMP-CCCS-8.1.1.1	Action Step	Sediment	Increase the percentage of pool tail-out embeddness with values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) within all spawning reaches.	2	15	Marin County, MMWD						TBD	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-8.1.1.2	Action Step	Sediment	Evaluate. develop, and implement spawning gravel augmentation programs in essential areas.	3	15	CDFW, Marin County, Marin RCD, MMWD	0.67	0.67	0.67			2	Cost based on treating 0.5 miles (assume 1 project/mile in 5% high IP with 100 cu. yds.mile) at a rate of $39.52/cu. yd.
ACMP-CCCS-8.1.1.3	Action Step	Sediment	Add channel roughness (logs, boulders) in strategic locations to encourage spawning tailout formations and gravel sorting.	2	15	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-8.1.2	Recovery Action	Sediment	Improve gravel quantity and distribution for macro-invertebrate production (food)										
ACMP-CCCS-8.1.2.1	Action Step	Sediment	Increase the percentage of gravel quality embeddedness to values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) in all current and potential juvenile salmonid summer and seasonal (fall/winter/spring) rearing areas.	2	15	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-8.1.2.2	Action Step	Sediment	Increase stream bed and bank stability using biotechnical materials (vegetation, plant fiber, and native wood and rock), where appropriate.	2	15	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs accounted for in previous actions related to habitat complexity.
ACMP-CCCS-8.1.2.3	Action Step	Sediment	Re-mediate upland sources (prevent eroded soils form entering the stream system).	3	20	Caltrans, CDFW, FHWA, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
ACMP-CCCS-8.1.2.4	Action Step	Sediment	Add channel roughness features (logs, large boulders) to trap cobbles in current and potential seasonal reaches.	2	15	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs accounted for in previous actions related to habitat complexity.

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-10.1	Objective	Water Quality	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-10.1.1	Recovery Action	Water Quality	Reduce toxicity and pollutants										
ACMP-CCCS-10.1.1.1	Action Step	Water Quality	Address water pollution from non-point sources within the watershed through outreach, education and enforcement.	3	10	CDFW, Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-10.1.1.2	Action Step	Water Quality	Identify nutrient loading sources causing poor water quality conditions for steelhead and implement strategies for remediating or avoiding future inputs of pollution to watershed streams.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
ACMP-CCCS-10.1.1.3	Action Step	Water Quality	Avoid, or at a minimum minimize, the use of commercial and industrial products (e.g., pesticides) with high potential for contamination of local waterways.	2	10	CDFW, Marin County, Marin RCD, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-10.1.1.4	Action Step	Water Quality	Control urban runoff.	3	25	Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-10.1.1.5	Action Step	Water Quality	Encourage the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	3	25	Caltrans, CDFW, Marin County, Marin RCD, MMWD, NMFS						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-10.1.1.6	Action Step	Water Quality	Identify and fix septic systems contributing to high nutrient loading.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
ACMP-CCCS-10.1.2	Recovery Action	Water Quality	Improve stream temperature conditions										
ACMP-CCCS-10.1.2.1	Action Step	Water Quality	Implement comprehensive evaluation and monitoring program to determine areas where poor riparian habitat is contributing to increased water temperatures limiting juvenile steelhead survival and aquatic habitat potential.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs accounted for in previous actions related to riparian.
ACMP-CCCS-10.1.2.2	Action Step	Water Quality	Rehabilitate or restore riparian corridor conditions within all current and potential high value habitat summer rearing areas.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs accounted for in previous actions related to riparian.
ACMP-CCCS-10.1.2.3	Action Step	Water Quality	Develop and implement appropriate tree plantings strategies in efforts to rehabilitate summer rearing habitat for juvenile steelhead.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs accounted for in previous actions related to riparian.
ACMP-CCCS-10.1.3	Recovery Action	Water Quality	Reduce turbidity and suspended sediment										
ACMP-CCCS-10.1.3.1	Action Step	Water Quality	Identify and remediate unstable banks and other sediment sources.	3	15	Caltrans, CDFW, FHWA, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
ACMP-CCCS-10.1.3.2	Action Step	Water Quality	Where feasible, utilize native plants and bioengineering techniques to stabilize banks.	3	25	CDFW, Marin County, Marin RCD, MMWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
ACMP-CCCS-10.1.3.3	Action Step	Water Quality	Identify and implement strategies to reduce landslide hazard areas and other upslope sources of fine sediment (hillslope hollows, deep-seated landslides, etc.).	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
ACMP-CCCS-11.1	Objective	Viability	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity based on the biological recovery criteria										
ACMP-CCCS-11.1.1.1	Action Step	Viability	Conduct a comprehensive assessment of watershed processes (e.g., hydrology, geology, fluvial-geomorphology, water quality, and vegetation), instream habitat, and factors limiting steelhead production.	3	10	CDFW, Marin County, Marin RCD, MMWD						TBD	Cost will vary with assessment methods and level of detail.
ACMP-CCCS-11.1.1.2	Action Step	Viability	Continue and expand upon watershed and instream habitat assessments and population status monitoring; use new knowledge to adapt strategies.	3	15	CDFW, Marin County, Marin RCD, MMWD	46.00	46.00	46.00			138	Cost based on fish/habitat restoration model at a rate of $137,833/project.
ACMP-CCCS-11.1.1.3	Action Step	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed.	3	25	CDFW, Marin County, Marin RCD, MMWD							Costs for adults spawner surveys are covered in the Monitoring Chapter.
ACMP-CCCS-11.1.1.4	Action Step	Viability	Conduct habitat surveys to monitor change in key habitat variables.	3	25	CDFW, Marin County, Marin RCD, MMWD						TBD	Cost for conducting standarized habitat assessments will be developed for the Coastal Monitoring Plan.
ACMP-CCCS-11.1.1.5	Action Step	Viability	Initiate smolt outmigration study and develop smolt abundance estimates.	2	10	CDFW, Marin County, Marin RCD, MMWD							Costs for smolt outmigration studies are covered in the Monitoring Chapter.
ACMP-CCCS-11.1.1.6	Action Step	Viability	Improve conditions for steelhead through supporting enforcement of environmental laws and regulations.	3	25	CDFW, Marin County, Marin RCD, MMWD, NMFS OLE						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-13.1	Objective	Channel Modification	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
ACMP-CCCS-13.1.1.1	Action Step	Channel Modification	Flood control projects or other modifications facilitating new development (as opposed to protecting existing infrastructure) should be avoided.	3	25	Marin County, MMWD						0	Action is considered In-Kind
ACMP-CCCS-13.1.1.2	Action Step	Channel Modification	Review channel modification activities to prevent or minimize future impediments from blocking access to off channel habitat used by salmonids as refuge and winter rearing habitat during high stream flows.	2	25	Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-13.1.2	Recovery Action	Channel Modification	Prevent or minimize impairment to habitat complexity (altered pool complexity and/or pool, riffle ratio)										
ACMP-CCCS-13.1.2.1	Action Step	Channel Modification	All proposed flood control projects should include habitat protection, and/or features to create salmonid habitat diversity.	2	10	Marin County, Marin RCD, MMWD	134	134				267	Cost based on treating 0.25 miles (assume 1 project/mile in 25% of flood control channele) at a rate of $1,070,400/mile.
ACMP-CCCS-13.1.2.2	Action Step	Channel Modification	Ensure future retention and recruitment of large woody debris and root wads to rehabilitate existing stream complexity, pool frequency, and depth.	3	15	Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-13.1.2.3	Action Step	Channel Modification	Protect existing natural channel reaches from channelization and enhance winter refuge and seasonal habitat features where appropriate.	2	15	Marin County, MMWD						TBD	
ACMP-CCCS-13.1.3	Recovery Action	Channel Modification	Prevent or minimize impairment to habitat complexity (reduce large wood and/or shelter)										
ACMP-CCCS-13.1.3.1	Action Step	Channel Modification	All proposed levees should be designed to account for minimal maintenance associated with an intact and functioning riparian zone.	3	25	Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-13.1.3.2	Action Step	Channel Modification	Identify locations where channel modification, including existing flood control projects, has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to improve these conditions. Consider flow rates and discharges when designing LWD and shelter enhancement features.	2	15	Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented and extent of rehabilitation.
ACMP-CCCS-13.1.3.3	Action Step	Channel Modification	Incorporate velocity refuge habitat features in all future and existing engineered and modified channels.	2	20	Marin County, Marin RCD, MMWD						TBD	Cost accounted for in above action step.
ACMP-CCCS-13.1.3.4	Action Step	Channel Modification	Prevent any future removal of habitat forming structures (LWD, boulders, vegetation, etc.) in natural waterways.	3	15	Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-13.1.4	Recovery Action	Channel Modification	Prevent or minimize impairment to stream hydrology (impaired water flow)										
ACMP-CCCS-13.1.4.1	Action Step	Channel Modification	Conduct rehabilitation activities that restore channels, floodplains and meadows to extend the duration of the summer flow and provide refuge from high winter flows.	2	15	Marin County, Marin RCD, MMWD						TBD	Cost accounted for in above action step.
ACMP-CCCS-18.1	Objective	Livestock	Address the present of threatened destruction, modification or curtailment of the species habitat or range										
ACMP-CCCS-18.1.1	Recovery Action	Livestock	Prevent or minimize impairment to habitat complexity (reduced large wood and/or shelter)										
ACMP-CCCS-18.1.1.1	Action Step	Livestock	Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to provide future recruitment of large wood and other shelter components.	3	10	Marin County, Marin RCD, MMWD, Private Landowners	197.50	197.50				395	Cost based on treating 0.2 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $24,682/acre.
ACMP-CCCS-18.1.2	Recovery Action	Livestock	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										
ACMP-CCCS-18.1.2.1	Action Step	Livestock	Maintain adequate stream corridor buffers to filter and prevent fine sediment input from entering streams of the watershed.	2	25	Marin County, Marin RCD, MMWD, Private Landowners						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-18.1.2.2	Action Step	Livestock	Encourage the NRCS, RCDs, and other appropriate organizations to increase the number of landowners participating in sediment reduction planning and implementation.	3	15	Marin County, Marin RCD, MMWD, NMFS						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-18.1.3	Recovery Action	Livestock	Prevent or minimize alterations to riparian species composition and structure										
ACMP-CCCS-18.1.3.1	Action Step	Livestock	Re-establish native plant communities in riparian zones to increase stream canopy to a minimum of 80%.	3	25	Marin County, Marin RCD, MMWD						0	Cost accounted for in above action step.
ACMP-CCCS-18.1.3.2	Action Step	Livestock	Develop and implement riparian setbacks/buffers that protect existing native riparian species composition and structure.	3	10	Marin County, MMWD						TBD	
ACMP-CCCS-22.1	Objective	Residential/Commercial Development	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-22.1.1	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to the estuary (impaired quality and extent)										

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-22.1.1.1	Action Step	Residential/Commercial Development	Reduce and minimze habitat modification that has caused, is causing, or may cause impaired habitat conditions affecting juveniles by minimizing adverse effects of future development in and around the bay. When development is planned, implement projects that incorporate elements to protect and enhance habitat.	3	25	Marin County, MMWD						TBD	
ACMP-CCCS-22.1.1.2	Action Step	Residential/Commercial Development	Curtail further development in active wetlands through zoning restrictions, county master plans and other Federal, State, and county planning and regulatory processes, and land protection agreements.	3	25	Marin County, USACE, USEPA						0	Action is considered In-Kind
ACMP-CCCS-22.1.1.3	Action Step	Residential/Commercial Development	Increase monitoring and enforcement of illegal bank or shoreline stabilization activities.	2	15	CDFW, Marin County, MMWD, NMFS OLE						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-22.1.1.4	Action Step	Residential/Commercial Development	Promote native intertidal and subtidal vegetation through eradication and control of non-native species.	3	5	Marin County, Marin RCD, MMWD	42.00					42	Cost based on treating 0.5 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $1,036/acre.
ACMP-CCCS-22.1.2	Recovery Action	Residential/Commercial Development	Prevent or minimize increased landscape disturbance										
ACMP-CCCS-22.1.2.1	Action Step	Residential/Commercial Development	Avoid or minimize new development, or road construction within floodplains, riparian areas, unstable soils or other sensitive areas.	3	25	FHWA, Marin County						0	Action is considered In-Kind
ACMP-CCCS-22.1.2.2	Action Step	Residential/Commercial Development	Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements.	3	15	Marin County, MMWD						TBD	Costs will vary depending on methods implemented. Costs for conservation easements vary.
ACMP-CCCS-22.1.3	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ACMP-CCCS-22.1.3.1	Action Step	Residential/Commercial Development	Minimize the future use of commercial and industrial products (e.g., pesticides) with high potential for contamination of local waterways.	3	25	Marin County, Marin RCD, MMWD, SWRCB						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-22.1.3.2	Action Step	Residential/Commercial Development	Upgrade existing stormwater systems into a spatially distributed discharge network (rather than a few point discharges).	3	15	FHWA, Marin County, MMWD						TBD	
ACMP-CCCS-22.1.4	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
ACMP-CCCS-22.1.4.1	Action Step	Residential/Commercial Development	Minimize new development within 100-year floodprone zones.	3	25	Marin County, MMWD						0	Action is considered In-Kind
ACMP-CCCS-22.1.4.2	Action Step	Residential/Commercial Development	Rehabilitate areas where existing and dilapidated infrastructure impairs the quality of floodplain and winter rearing for habitat for steelhead within the watershed.	2	15	Marin County, Marin RCD, MMWD	238.33	238.33	238.33			715	Cost based on treating 0.2 miles (assume 1 project/mile in 5% high IP with 80 acres/mile) at a rate of $44,640/acre.
ACMP-CCCS-22.1.4.3	Action Step	Residential/Commercial Development	Recalculate 100-year flood interval that takes into consideration global climate change and rising sea levels.	3	10	FHWA, Marin County, Marin RCD, MMWD	39.50	39.50				0	Action is considered In-Kind
ACMP-CCCS-22.1.5	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to stream hydrology (impaired water flow)										
ACMP-CCCS-22.1.5.1	Action Step	Residential/Commercial Development	Encourage and identify opportunities for on-site rain retention facilities.	2	15	Marin County, Marin RCD, MMWD, NMFS						TBD	Costs will vary depending on methods implemented.

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-22.1.5.2	Action Step	Residential/Commercial Development	Develop filter or buffer systems that reduce pollutants from entering streams and waterways.	3	10	Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented. Estimate for filter or buffer strip system range from $11464 to $29,039/filter for a 25 ft. wide grass filter.
ACMP-CCCS-22.2	Objective	Residential/Commercial Development	Address the inadequacy of existing regulatory mechanisms										
ACMP-CCCS-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance										
ACMP-CCCS-23.1.1.1	Action Step	Roads/Railroads	Decommission and or re-locate riparian roads upslope to achieve desirable riparian road density criteria (<0.1 to 0.4 Miles/Square Mile).	2	10	Caltrans, FHWA, Marin County	17.50	17.50				35	Cost based on decommissioning 2.4 miles of riparian road network at a rate of $14,440/mile. Cost will be significantly higher if riparian roads are part of urban/suburban infrastructure.
ACMP-CCCS-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration										
ACMP-CCCS-23.1.2.1	Action Step	Roads/Railroads	Ensure all future new, repair, and replacement road/stream crossing provide unimpaired passage for all steelhead life stages.	2	10	Caltrans, FHWA, Marin County						0	Action is considered In-Kind
ACMP-CCCS-23.1.2.2	Action Step	Roads/Railroads	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001) and appropriate barrier databases when developing new or retrofitting existing road crossings.	2	5	Caltrans, FHWA, Marin County, NMFS						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-23.1.2.3	Action Step	Roads/Railroads	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) must accommodate 100-year flow event and associated sediment transport.	3	10	Caltrans, FHWA, Marin County						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										
ACMP-CCCS-23.1.3.1	Action Step	Roads/Railroads	Utilize best management practices for road construction, maintenance, management and decommissioning (e.g., Fishnet 4c County Roads Manual; Hagans & Weaver, 1994; Oregon Department of Transportation, 1999; Sommarstrom 2002).	2	25	Caltrans, FHWA, Marin County						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-23.1.3.2	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.	3	25	Caltrans, FHWA, Marin County						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-23.1.3.3	Action Step	Roads/Railroads	Minimze the construction of new roads near high valve habitat areas or sensitive habitat areas.	3	25	Caltrans, FHWA, Marin County						0	
ACMP-CCCS-23.1.3.4	Action Step	Roads/Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	3	25	Caltrans, FHWA, Marin County						TBD	
ACMP-CCCS-23.1.4	Recovery Action	Roads/Railroads	Prevent or minimize impairment to stream hydrology (impaired water flow)										
ACMP-CCCS-23.1.4.1	Action Step	Roads/Railroads	Conduct actions that hydrologically disconnect roads.	3	25	Caltrans, FHWA, Marin County, Marin RCD, Private Landowners						TBD	Cost based on number and type of methods used to hydrologically disconnect roads.

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-23.1.5	Recovery Action	Roads/Railroads	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
ACMP-CCCS-23.1.5.1	Action Step	Roads/Railroads	Establish a moratorium on new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific road management plan is created and implemented.	3	25	Caltrans, FHWA, Marin County						0	Action is considered In-Kind
ACMP-CCCS-23.1.5.2	Action Step	Roads/Railroads	Evaluate existing roadways within 200 meters of the riparian corridor, and develop plans to decrease the ongoing impacts associated with these roads.	3	10	Caltrans, FHWA, Marin County						TBD	Cost accounted for in other action steps.
ACMP-CCCS-23.1.5.3	Action Step	Roads/Railroads	Reduce road densities by at least 10 percent over the next 10 years, prioritizing high risk areas.	3	10	Caltrans, FHWA, Marin County	159.00	159.00				318	Cost based on decommissioning 22 miles of road network at a rate of $14,440/mile.
ACMP-CCCS-25.1	Objective	Water Diversion/ Impoundment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ACMP-CCCS-25.1.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
ACMP-CCCS-25.1.1.1	Action Step	Water Diversion/ Impoundment	Identify and eliminate depletion of summer base flows from unauthorized water uses.	2	10	CDFW, Marin County, Marin RCD, MMWD, SWRCB						0	Operations conducted normally or with minor modifications are considered In-Kind.
ACMP-CCCS-25.1.1.2	Action Step	Water Diversion/ Impoundment	Continue to prohibit new or increased surface water diversions for existing permit holders.	3	25	CDFW, Marin County, MMWD, SWRCB						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-25.1.1.3	Action Step	Water Diversion/ Impoundment	Work with partners to ensure that current and future water diversions (surface or groundwater) do not impair water quality conditions in summer or fall rearing reaches.	2	25	CDFW, Marin County, Marin RCD, MMWD						0	Operations conducted normally or with minor modifications are considered In-Kind.
ACMP-CCCS-25.1.1.4	Action Step	Water Diversion/ Impoundment	Work with SWRCB and landowners to improve survival and migration opportunities for all lifestages.	2	25	Marin County, Marin RCD, MMWD, Private Landowners, SWRCB						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-25.1.2	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize alterations to sediment transport (road conditions/density, dams etc.)										
ACMP-CCCS-25.1.2.1	Action Step	Water Diversion/ Impoundment	Implement actions that minimize adverse effects of dams and weirs.	2	15	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-25.1.2.2	Action Step	Water Diversion/ Impoundment	Re-establish natural sediment delivery processes and implement sediment reduction activities where necessary.	3	15	CDFW, Marin County, Marin RCD, MMWD						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-25.1.3	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to passage and migration										
ACMP-CCCS-25.1.3.1	Action Step	Water Diversion/ Impoundment	Work with partners to ensure that all current and future water diversions (surface or groundwater) do not impair migration patterns of all steelhead life history stages.	2	25	CDFW, Marin County, MMWD						0	Existing programs and outreach are considered In-Kind.
ACMP-CCCS-25.1.3.2	Action Step	Water Diversion/ Impoundment	Adequately screen water diversions to prevent entrainment of all steelhead life stages.	3	15	CDFW, Marin County, Marin RCD, MMWD, NMFS						TBD	Costs will vary depending on methods implemented and number of diversions to be screened.
ACMP-CCCS-25.2	Objective	Water Diversion/ Impoundment	Address the inadequacy of existing regulatory mechanisms										

Arroyo de Corte Madera del Presidio, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ACMP-CCCS-25.2.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
ACMP-CCCS-25.2.1.1	Action Step	Water Diversion/ Impoundment	Allow all "fisheries flows" (baseflows, and passage, attractant, and channel maintenance flows) to bypass or flow through diversion facilities.	1	5	CDFW, Marin County, MMWD, NMFS						0	Operations conducted normally or with minor modifications are considered In-Kind.
ACMP-CCCS-25.2.1.2	Action Step	Water Diversion/ Impoundment	Assess, map, and install stream gages on all water diversions (CDFG 2004).	3	5	CDFW, Marin County, Marin RCD, MMWD, NMFS						TBD	Costs will vary depending on methods implemented.
ACMP-CCCS-25.2.1.3	Action Step	Water Diversion/ Impoundment	Prevent and/or minimize the adverse effects of water diversion on salmonid habitat by establishing a more natural hydrograph, by-passing adequate downstream flows, regulating season of diversion, and promoting and implementing off-stream storage solutions (CDFG 2004).	1	5	CDFW, Marin County, Marin RCD, MMWD, NMFS, SWRCB						0	Operations conducted normally or with minor modifications are considered In-Kind.

San Mateo Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SMatC-CCCS-1.1	Objective	Estuary	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-1.1.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat										
SMatC-CCCS-1.1.1.1	Action Step	Estuary	Develop an estuary assessment and enhancement plan that would look to identify any historically tidal influenced areas that may be restored in the future.	2	10	City of San Mateo, County of San Mateo	150					150	Cost estimate for the development of an estuary assessment and enhancement plan for the mouth of San Mateo Creek.
SMatC-CCCS-1.1.1.2	Action Step	Estuary	Identify potential habitat features that will increase current and future estuary habitat values for rearing steelhead.	2	10	City of San Mateo, County of San Mateo						0	Cost accounted for in above action step.
SMatC-CCCS-1.1.1.3	Action Step	Estuary	Investigate water quality (D.O., temperature, salinity) conditions for rearing steelhead in potential tidal marsh rehabilitation sites.	2	10	City of San Mateo, County of San Mateo	7.50	7.50				15	Cost based on installing 3 continuous monitoring stations at a rate of $5,000/station.
SMatC-CCCS-2.1	Objective	Floodplain Connectivity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
SMatC-CCCS-2.1.1.1	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target velocity refuge for migrating salmonids.	2	10	City of San Mateo, County of San Mateo	223	223				447	Cost based on treating 1 mile (assume 1 project/mile in 25% high IP and 10 acres per mile) at a rate of $44,640/acre. Cost could be reduced if combined with other action steps.
SMatC-CCCS-2.1.1.2	Action Step	Floodplain Connectivity	Design and implement floodplain rehabilitation projects that target winter rearing habitat for juvenile steelhead.	2	10	City of San Mateo, County of San Mateo						0	Cost accounted for in above action step.
SMatC-CCCS-3.1	Objective	Hydrology	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-3.1.1	Recovery Action	Hydrology	Improve flow conditions										
SMatC-CCCS-3.1.1.1	Action Step	Hydrology	Reduce impacts of impaired hydrology (reduced pulse-flows, magnitude, duration, and timing of freshets) that preclude adult and smolt passage over critical riffles and other nature obstacles.	1	20	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-3.1.1.2	Action Step	Hydrology	Identify and implement flow requirements that support adult and juvenile steelhead migration downstream of Crystal Springs Reservoir.	1	5	SFPUC	79.00					79	Cost based on hydrologic model at a rate of $78,100/project.
SMatC-CCCS-3.1.1.3	Action Step	Hydrology	Identify flow requirements that protect emigrating juvenile and adults steelhead (kelts).	1	20	SFPUC						0	Cost accounted for in above action step.
SMatC-CCCS-3.1.1.4	Action Step	Hydrology	Implement spawning and rearing habitat curves downstream of Crystal Springs Reservoir .	1	50	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-3.1.1.5	Action Step	Hydrology	Implement flow schedules that optimize steelhead spawning and rearing conditions downstream of Crystal Springs Reservoir.	1	20	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-5.1	Objective	Passage	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
SMatC-CCCS-5.1.1.1	Action Step	Passage	Evaluate and if deemed biologically beneficial, and technically feasible, prescribe and implement passage methodologies for Crystal Springs reservoir.	1	5	SFPUC						TBD	

San Mateo Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SMatC-CCCS-5.1.1.2	Action Step	Passage	Develop and implement a reservoir bypass flows that protect migrating steelhead through flood control channels.	1	5	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-5.1.1.3	Action Step	Passage	Improve passage conditions at known barriers downstream of Crystal Springs Reservoir.	1	5	SFPUC	640					640	Cost based on treating 1 known partial impediment at a rate of $639,247/project. Cost may actually be less due to need for only minor improvements at this site.
SMatC-CCCS-6.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-6.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency										
SMatC-CCCS-6.1.1.1	Action Step	Habitat Complexity	Evaluate and prescribe an appropriate number of key LWD pieces to enhance summer rearing conditions in potential steelhead spawning and rearing areas throughout the watershed.	2	10	City of San Mateo, County of San Mateo, SFPUC, Town of Hillsborough	69.00	69.00				138	Cost based on fish/habitat restoration model at a rate of $137,833/project. Cost could be reduced if combined with other action steps.
SMatC-CCCS-6.1.2	Recovery Action	Habitat Complexity	Increase frequency of primary pools										
SMatC-CCCS-6.1.2.1	Action Step	Habitat Complexity	Evaluate and prescribe habitat features that will increase primary pool depth and frequency for winter and summer rearing juveniles, and quality stagging pools for migrating/staging adults.	2	10	City of San Mateo, County of San Mateo, SFPUC, Town of Hillsborough						0	Cost accounted for in above action step.
SMatC-CCCS-6.1.3	Recovery Action	Habitat Complexity	Improve shelter										
SMatC-CCCS-6.1.3.1	Action Step	Habitat Complexity	Increase shelter and habitat complexity features that improve survival of emigrating juvenile and adult steelhead; include efforts in areas such as flood control channels that lack habitat complexity.	2	10	City of San Mateo, County of San Mateo, SFPUC, Town of Hillsborough						0	Cost accounted for in above action step.
SMatC-CCCS-7.1	Objective	Riparian	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-7.1.1	Recovery Action	Riparian	Improve canopy cover										
SMatC-CCCS-7.1.1.1	Action Step	Riparian	Identify areas in the lower reaches (within approximately downstream-most 1.5-2 miles of San Mateo Creek) where canopy cover is not meeting the minimum canopy criteria, and prescribe and implement measures to improve riparian habitat.	2	10	City of San Mateo, County of San Mateo, SFPUC	62.00	62.00				124	Cost based on treating 0.5 miles (assume minimum of 10 acres/mile) at a rate of $24,682/acre.
SMatC-CCCS-7.1.1.2	Action Step	Riparian	Ensure that mature trees within the steam riparian corridor are not disturbed or lost due to land management activities (roads, cattle, flood control, etc.).	2	10	City of San Mateo, County of San Mateo, SFPUC						0	Action is considered In-Kind
SMatC-CCCS-8.1	Objective	Sediment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-8.1.1	Recovery Action	Sediment	Improve instream gravel quality to reduce embeddedness										
SMatC-CCCS-8.1.1.1	Action Step	Sediment	Evaluate, design, and implement gravel quality and quantity strategies to the extent that the maximum amount of spawning and incubation habitat is achieved.	2	10	City of San Mateo, County of San Mateo	69.00	69.00				138	Cost based on fish/habitat restoration model at a rate of $137,833/project. Cost for gravel augmentation estimated at $37/cu. yd.
SMatC-CCCS-8.1.1.2	Action Step	Sediment	Add channel roughness (logs, boulders) in strategic locations to encourage spawning tailout formations and gravel sorting.	2	10	City of San Mateo, County of San Mateo						0	Cost accounted for in other action steps.

San Mateo Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SMatC-CCCS-10.1	Objective	Water Quality	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-10.1.1	Recovery Action	Water Quality	Improve instream temperature conditions										
SMatC-CCCS-10.1.1.1	Action Step	Water Quality	Identify if water temperatures are limiting steelhead viability in San Mateo Creek and, if found to be limiting, develop and implement measures to reduce water temperatures where needed.	2	10	City of San Mateo, County of San Mateo, SFPUC	1.25	1.25				3	Cost based on installing 5 stream temperature gauges at a rate of $500/gauge.
SMatC-CCCS-10.1.2	Recovery Action	Water Quality	Reduce toxicity and pollutants										
SMatC-CCCS-10.1.2.1	Action Step	Water Quality	Identify and provide solutions for point and non-point sources contributing to poor water quality and pollution.	2	10	City of San Mateo, County of San Mateo, SFPUC	7.50	7.50				15	Cost based on a minimum of 3 continuous monitoring stations at a rate of $5,000/station.
SMatC-CCCS-13.1	Objective	Channel Modification	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
SMatC-CCCS-13.1.1.1	Action Step	Channel Modification	Protect all existing areas that provide winter refuge and seasonal habitat for juvenile steelhead from channelization.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.1.2	Action Step	Channel Modification	Ensure that all existing channel designed for flood conveyance incorporate features that enhance steelhead migration under high and low flow conditions.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.1.3	Action Step	Channel Modification	Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.1.4	Action Step	Channel Modification	Evaluate design alternatives to rip-rap bank repairs and incorporate fish habitat features.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.1.5	Action Step	Channel Modification	Conserve open space in contiguous landscapes, protect floodplain areas and riparian corridors, and develop conservation easements.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.2	Recovery Action	Channel Modification	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity										
SMatC-CCCS-13.1.2.1	Action Step	Channel Modification	Conduct rehabilitation activities that reconnect channels to floodplains.	2	10	City of San Mateo, County of San Mateo						0	Cost accounted for in other recovery actions. See Floodplain Connectivity.
SMatC-CCCS-13.1.2.2	Action Step	Channel Modification	Develop and implement strategies that slow urban runoff during the spawning and migration season (slow it, spread it, sink it).	2	10	City of San Mateo, County of San Mateo						TBD	Cost based on amount of urban runoff contributing to poor habitat conditions. Cost for infiltration ponds estimated between $12,000 to $35,000/pond.
SMatC-CCCS-13.1.3	Recovery Action	Channel Modification	Prevent or minimize impairment to passage and migration										
SMatC-CCCS-13.1.3.1	Action Step	Channel Modification	Ensure that existing engineered and modified channels incorporate features that enhance steelhead migration under high and low flow conditions.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.3.2	Action Step	Channel Modification	Incorporate velocity refuge features in all existing engineered and modified channels.	2	10	City of San Mateo, County of San Mateo						TBD	Cost accounted for in action step below.

San Mateo Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SMatC-CCCS-13.1.3.3	Action Step	Channel Modification	Install features that provides shelter for emigrating juvenile salmonids - focus efforts on areas, such as flood control channels, where shelter is most limited.	2	10	City of San Mateo, County of San Mateo	268	268				536	Cost based on treating 0.5 miles (assume 1 project) at a rate of $1,070,400/mile.
SMatC-CCCS-13.1.3.4	Action Step	Channel Modification	Prevent or minimize any future channel modification in potentially high value seasonal habitat and migration (staging) areas.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.4	Recovery Action	Channel Modification	Prevent or minimize impairment to instream habitat complexity										
SMatC-CCCS-13.1.4.1	Action Step	Channel Modification	Identify locations where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, and develop and implement site specific plans to provided shelter and velocity refuge for migrating and rearing steelhead.	2	10	City of San Mateo, County of San Mateo	69.00	69.00				138	Cost based on fish/habitat restoration model at a rate of $137,833/project.
SMatC-CCCS-13.1.4.2	Action Step	Channel Modification	Encourage retention and recruitment of large woody debris to rehabilitate existing stream complexity, pool frequency, and depth.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-13.1.4.3	Action Step	Channel Modification	Prevent the removal of habitat forming structures (LWD, boulders, vegetation, etc.) in all natural waterways.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-22.1	Objective	Residential/ Commercial Development	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-22.1.1	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to floodplain connectivity (impaired quality & extent)										
SMatC-CCCS-22.1.1.1	Action Step	Residential/ Commercial Development	Design new development to allow streams to meander in historical patterns; protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-22.1.1.2	Action Step	Residential/ Commercial Development	Avoid or minimize new development within riparian zones and the 100 year floodprone zones.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-22.1.1.3	Action Step	Residential/ Commercial Development	Minimize future development in floodplains or off channel habitats.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-22.1.2	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
SMatC-CCCS-22.1.2.1	Action Step	Residential/ Commercial Development	Develop filter or buffer systems that reduce pollutants from entering streams and waterways of San Mateo Creek.	2	10	City of San Mateo, County of San Mateo						TBD	Cost based on amount of filter or buffer system needed. Cost estimate for a 25-ft wide filter strip ranges between $9,000 to $23,000
SMatC-CCCS-22.1.2.2	Action Step	Residential/ Commercial Development	Implement education programs and install signs to promote public awareness of salmon and steelhead and their habitats within the San Mateo Creek watershed.	3	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)										
SMatC-CCCS-23.1.1.1	Action Step	Roads/Railroads	Address high and medium priority sediment delivery sites associated with roads and railroads.	2	10	City of San Mateo, County of San Mateo	86.50	86.50				173	Cost based on road inventory for 150 miles of road at a rate of $1,148/mile.
SMatC-CCCS-23.1.1.2	Action Step	Roads/Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	2	10	City of San Mateo, County of San Mateo						TBD	Cost based on amount of road network delivering sediment to streams.

San Mateo Creek, Central California Coast Steelhead (Coastal San Francisco Bay) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SMatC-CCCS-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to stream hydrology (impaired water flow)										
SMatC-CCCS-23.1.2.1	Action Step	Roads/Railroads	Conduct actions that hydrologically disconnect roads.	2	10	City of San Mateo, County of San Mateo						TBD	Cost based on amount of road network needing to be hydrologically disconnected.
SMatC-CCCS-23.1.2.2	Action Step	Roads/Railroads	Prevent or minimize construction of new roads near high value habitat areas or sensitive habitat areas.	2	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration										
SMatC-CCCS-23.1.3.1	Action Step	Roads/Railroads	Ensure that all future road/stream crossing provide passage for all steelhead life stages.	1	10	City of San Mateo, County of San Mateo						0	Action is considered In-Kind
SMatC-CCCS-23.1.3.2	Action Step	Roads/Railroads	Identify and remedy all road/stream crossings that impair or prevent steelhead migration.	1	5	City of San Mateo, County of San Mateo						0	Cost accounted for in above recovery actions. See Passage.
SMatC-CCCS-25.1	Objective	Water Diversion /Impoundment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
SMatC-CCCS-25.1.1	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to passage and migration										
SMatC-CCCS-25.1.1.1	Action Step	Water Diversion /Impoundment	Design all habitat enhancements to function within the anticipated range of flows.	2	5	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-25.1.1.2	Action Step	Water Diversion /Impoundment	Install instream habitat enhancement features designed to increase the quantity and quality of fry and juvenile steelhead habitat by creating habitats with depth, velocity, and cover components that favor these life stages.	2	5	SFPUC						0	Cost accounted for in other action steps.
SMatC-CCCS-25.1.2	Recovery Action	Water Diversion /Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)										
SMatC-CCCS-25.1.2.1	Action Step	Water Diversion /Impoundment	During winter and spring implement moderate winter baseflows downstream of all reservoirs to provide adequate water depths necessary for upstream and downstream migration.	1	25	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-25.1.2.2	Action Step	Water Diversion /Impoundment	During winter and spring implement periodic migrant attractant flows necessary to attract adult fish upstream, and encourage outmigration of smolts.	1	5	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-25.1.2.3	Action Step	Water Diversion /Impoundment	To provide stream channel maintenance flows, during winter and spring, implement periodic large pulse "maintenance" flows from reservoirs. When possible, time these flows so that they coincide with natural rainfall events.	1	5	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-25.1.2.4	Action Step	Water Diversion /Impoundment	During summer and fall, manage release rates so that depths and velocities favoring fry and juvenile steelhead are provided.	1	5	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-25.1.2.5	Action Step	Water Diversion /Impoundment	Ramp all reservoir releases (flood maintenance releases, fisheries passage releases, summer baseflow, and other planned releases) as necessary to minimize deleterious effects of flow increases/decreases.	1	5	SFPUC						0	Action is considered In-Kind
SMatC-CCCS-25.1.2.6	Action Step	Water Diversion /Impoundment	Establish and implement a comprehensive stream flow program to improve survival at all life stages by improving the spatial and temporal pattern of surface flows throughout spawning, rearing, and migration areas.	1	5	SFPUC						0	Action is considered In-Kind