9. Monte Arido Highlands Biogeographic Population Group

"Assessment at the group level indicates a priority for securing inland populations in southern Coast Ranges and Transverse Ranges, and a need to maintain not just the fluvial-anadromous life-history form, but also lagoon-anadromous and freshwater-resident forms in each population."

NOAA Fisheries Technical Recovery Team, Viability Criteria for the South-Central and Southern California, 2007

9.1 LOCATION AND PHYSICAL CHARACTERISTICS

The Monte Arido Highlands BPG region encompasses four medium to large coastal watersheds and eight sub-watersheds that drain the western half of the Transverse Range in southern San Luis Obispo, Santa Barbara, Ventura, and eastern Los Angeles counties.

Monte Arido Highlands Watersheds

The Santa Maria River is a relatively short coastal river formed by the confluence of two large interior watersheds: the Cuyama River and the Sisquoc River, which together drain most of the Sierra San Rafael, Sierra Madre, and Caliente mountain ranges.

Santa Maria River

The Santa Ynez River drains the south-facing slopes of the Sierra San Rafael and north-facing slopes of the Santa Ynez Mountains. The Ventura River drains the coastal slopes of the eastern end of the Santa Ynez Mountains and the western end of the Transverse Range. The Santa Clara River drains much of the western Transverse Range, including the northern slopes of the San Gabriel Mountains. The mainstems of the Santa Maria and Santa Ynez rivers are oriented east-to-west and discharge to the

Pacific Ocean in western Santa Barbara County, North of Point Conception. The Ventura and Santa Clara watersheds border the upper watersheds of the Santa Maria and Santa Ynez rivers, but their mainstems flow south and southwest into the Pacific Ocean in southern Ventura County (Figure 9-1).

Santa Ynez River

These watersheds are highly disparate in terms of slope, aspect, and size, but share one common feature: the interior portions are mountainous and include high peak elevations, ranging between 5,700 and 8,600 feet above sea level. Each of these watersheds flows across a coastal terrace, but the Santa Maria, Santa Ynez, and Santa Clara rivers traverse broad coastal plains before entering the Pacific Ocean. Overall, stream lengths tend to be very long, owing to high topographic relief in the interior watersheds. The Santa Maria River watershed (Cuyama River sub-watershed) extends the furthest inland—over 90 miles between the mouth and the limits of the upper watershed.

Ventura River

Average annual precipitation in the Santa Maria River and Santa Clara River watersheds is much lower than the other two because the former include extensive arid interior regions. Although rainfall amounts generally increase with elevation, such orographic (*i.e.*, lifting) effects are concentrated in the most coastal mountainous portions of these watersheds, and much of the interior portions lie in "rain shadows" of the coastal portions of the watersheds. For example, Old Man Mountain at 5,500 feet above sea level in the Ventura River watershed not only receives five to ten times the amount of precipitation that falls on lower coastal locations only a few miles away, but also receives much more rainfall than interior peaks of comparable elevation in this region. The drainages in these watersheds exhibit "flashy" flow patterns during and after storm events; peak winter and summer base flows can vary by several orders of magnitude.

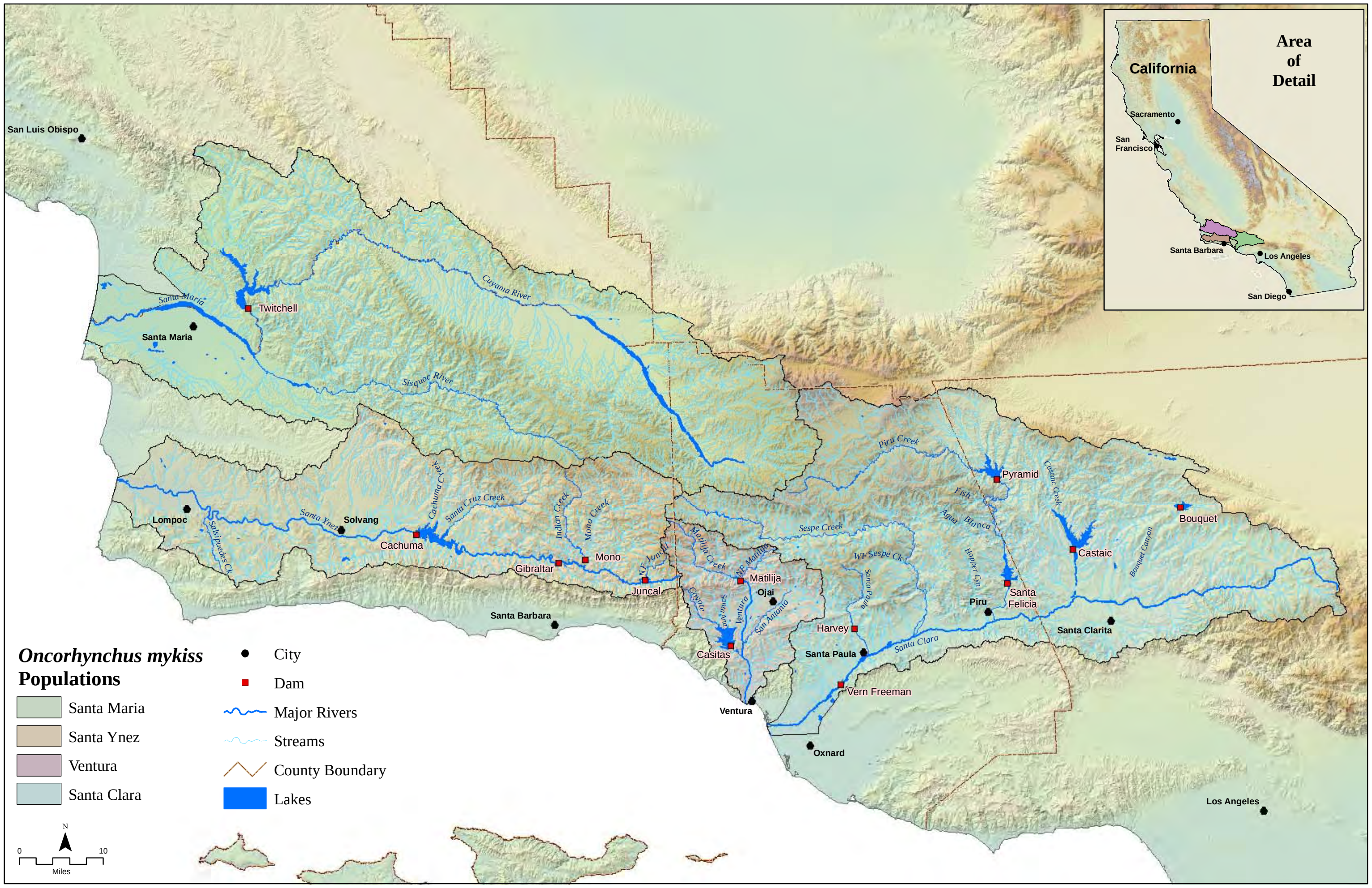


Figure 9-1. The Monte Arido Highlands BGP region. Thirteen populations/watersheds were analyzed in this region: three in the Santa Maria River watershed; one in the Santa Ynez River watershed, five in the Ventura River watershed, and four in the Santa Clara River watershed.

Santa Clara River

Extensive portions of the mainstems of all four major watersheds in the Monte Arido Highlands BPG region exhibit intermittent flows (with isolated pools) in summer because of a combination of strong seasonal variation in rainfall and anthropogenic factors. However, the tributaries in these watersheds exhibit perennial flow along significant reaches supported by groundwater and flow through fractured rock along geologic fault lines.

9.2 LAND USE

Table 9-1 summarizes land use and population density in Monte Arido Highlands BPG region. The coastal terrace and floodplains of these watersheds are subjected to the most intensive land use. The interiors are largely uninhabited and include several federally-designated wilderness areas within the Los Padres National Forest: San Rafael, Dick Smith, Matilija, Chumash, and Sespe. Additionally, there are two federally-designated Wild and Scenic rivers within the Los Padres National Forest: the Sisquoc River (Wild) in the Santa Maria River watershed, and Sespe Creek (Wild and Scenic) in the Santa Clara River watershed. A number of additional river and stream reaches have been evaluated and may be eligible for inclusion in the federal Wild and Scenic rivers program. Human population density increases steadily to the south, and averages about 129 persons per square mile over the BPG region. The Santa Maria River watershed has the lowest population density (66 persons/square mile), while the Santa Clara River watershed, which extends into northeastern Los Angeles County, has the highest population density (216 persons/square mile).

Ventura County Coastline

In most of these watersheds, the first land-use change was livestock ranching and dry farming, followed by irrigated row-crop agriculture. Urbanization followed this trend on the coastal plain, with current coastal population centers at Santa Maria, Lompoc, Buellton, Ventura, and Oxnard. More recently (decades ago), interior portions of the floodplain of the Santa Clara River that were converted to agriculture (primarily orchards), have experience strong urban growth and now include population centers at Santa Paula, Fillmore, and, most recently, the Santa Clarita-Castaic-Newhall area in Los Angeles County. The upper watersheds throughout this region are in the Los Padres and Angeles national forests; the coastal and middle watersheds are mostly privately owned. Semi-developed rural land, used for livestock ranching and orchard production covers extensive portions of the coastal and middle portions of these watersheds (Hunt & Associates 2008a, Kier Associates 2008b).

Table 9-1. Physical and Land-Use Characteristics of Major Watersheds in the Monte Arido Highlands BPG.

PHYSICAL CHARACTERISTICS					LAND USE				
WATERSHEDS (north to south)	**Area** (acres)[1]	**Area** (sq. miles)[1]	**Stream Length[2]** (miles)	**Ave. Ann. Rainfall[3]** (inches)	**Total Human Population[4]**	**Public Ownership***	**Urban Area[5]**	**Agriculture/ Barren[5]**	**Open Space[5]**
Santa Maria River**	1,187,491	1,855	2,941	17.2	123,043	49%	10%	3%	87%
Santa Ynez River	576,717	901	1,543	18.3	74,900	39%	7%	3%	90%
Ventura River	144,967	227	409	18.8	44,550	48%	6%	9%	85%
Santa Clara River	1,040,223	1,625	2,485	16.7	350,363	54%	6%	7%	87%
TOTAL or AVERAGE	**2,949,398**	**4,608**	**7,378**	**17.7**	**592,856**	**48%**	**7%**	**6%**	**87%**

[1] From: CDFFP CalWater 2.2 Watershed delineation, 1999 (www.ca.nrcs.usda.gov/features/calwater/)
[2] From: CDFG 1:1,000,000 Routed stream network, 2003 (www.calfish.org/)
[3] From: USGS Hydrologic landscape regions of the U.S., 2003 (1 km grid cells)
[4] From: CDFFP Census 2000 block data (migrated), 2003; preliminary analysis of the Census 2010 indicates the population in in the BPG has increased to 713,913
[5] From: CDFFP Multi-source land cover data (v02_2), 2002 (100 m grid cells) (http://frap.cdf.ca.gov/data/frapgisdata/select.asp)
** Includes National Forest Lands only; does not include State or County Parks or Military Reservations (from: http://old.casil.ucdavis.edu/casil/gis.ca.gov/teale/govtowna/)*
*** The Santa Maria River watershed includes the Cuyama River and Sisquoc River sub-watersheds*

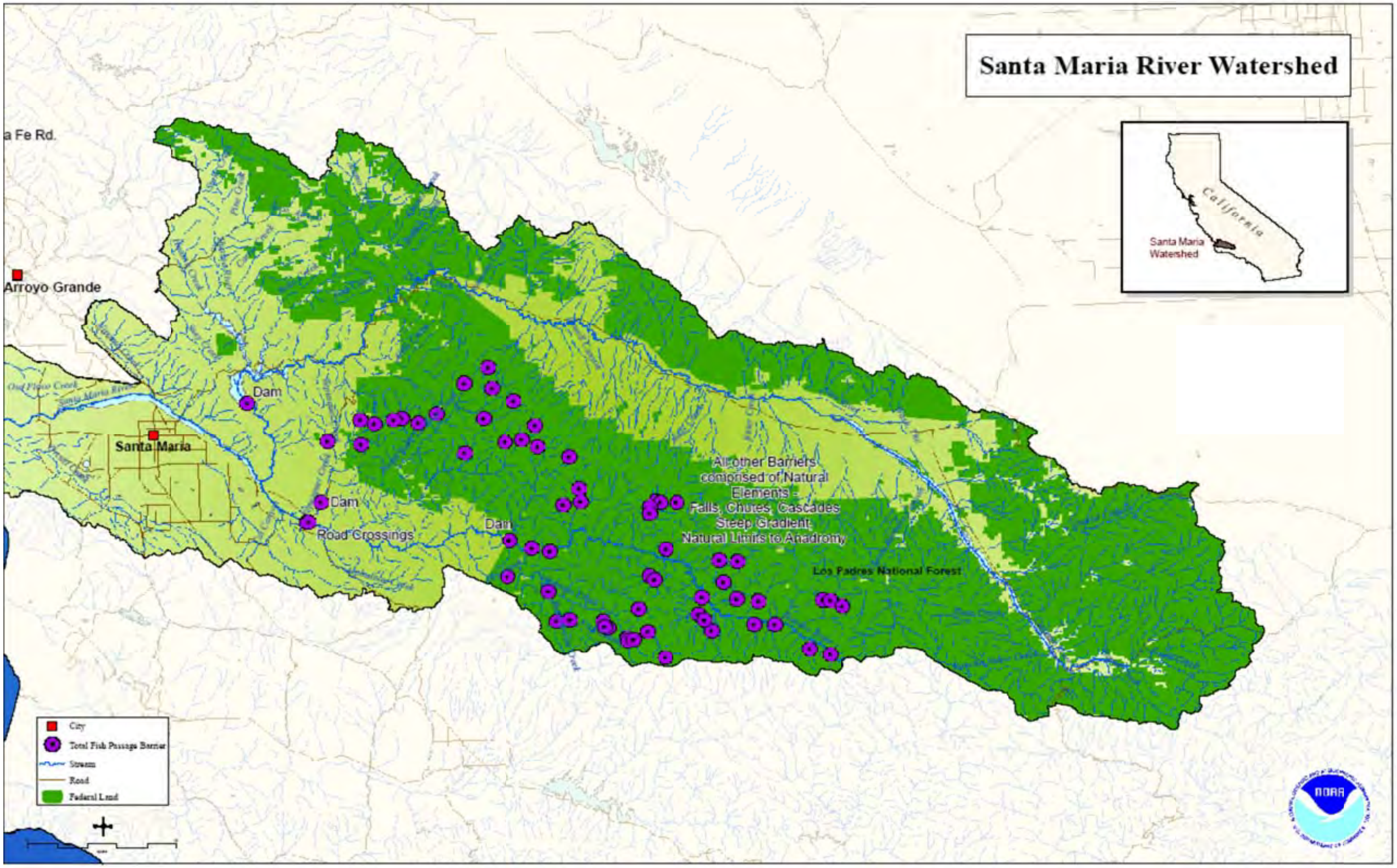


Figure 9-2. Santa Maria River Watershed.

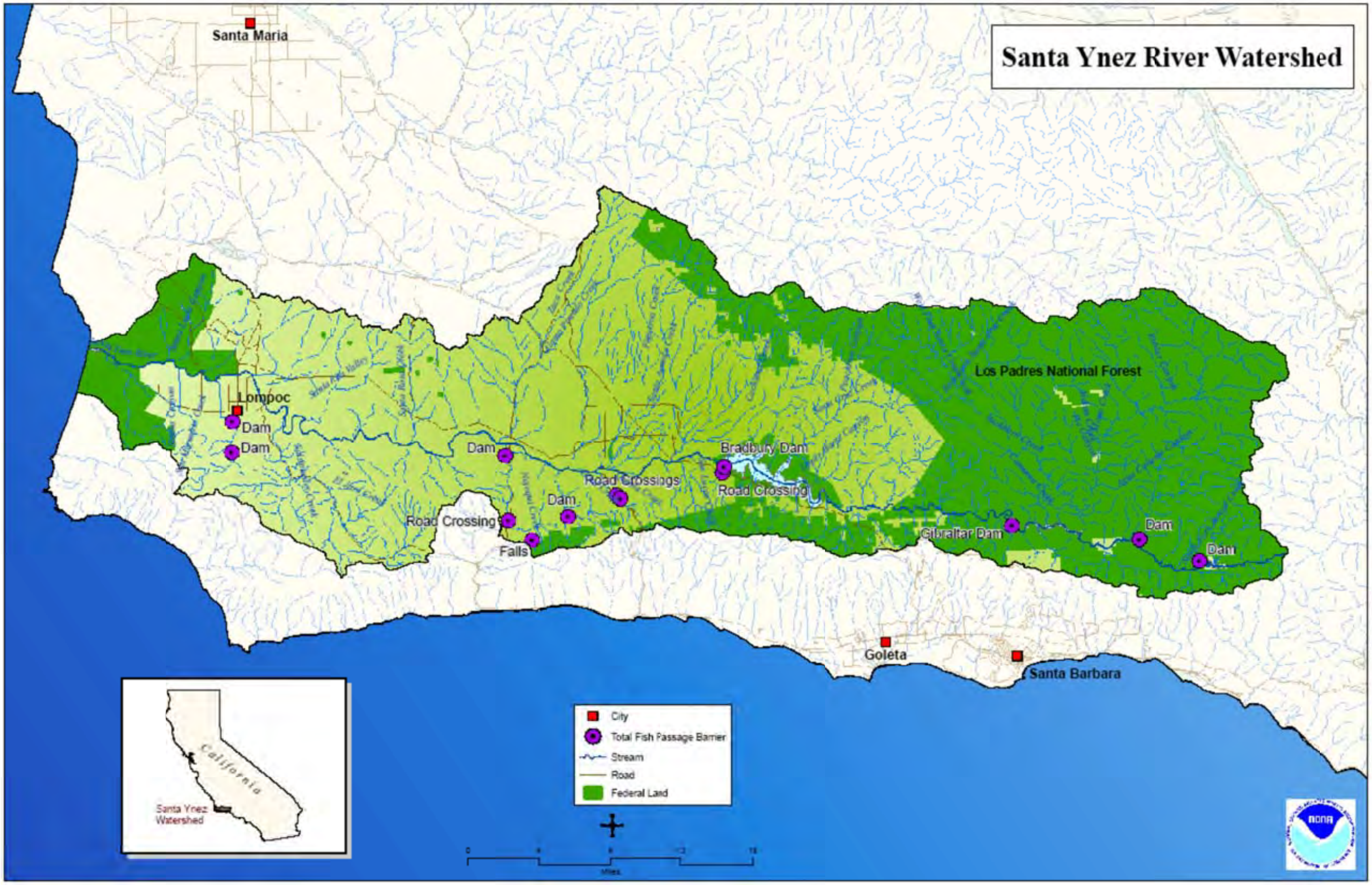


Figure 9-3. Santa Ynez River Watershed.

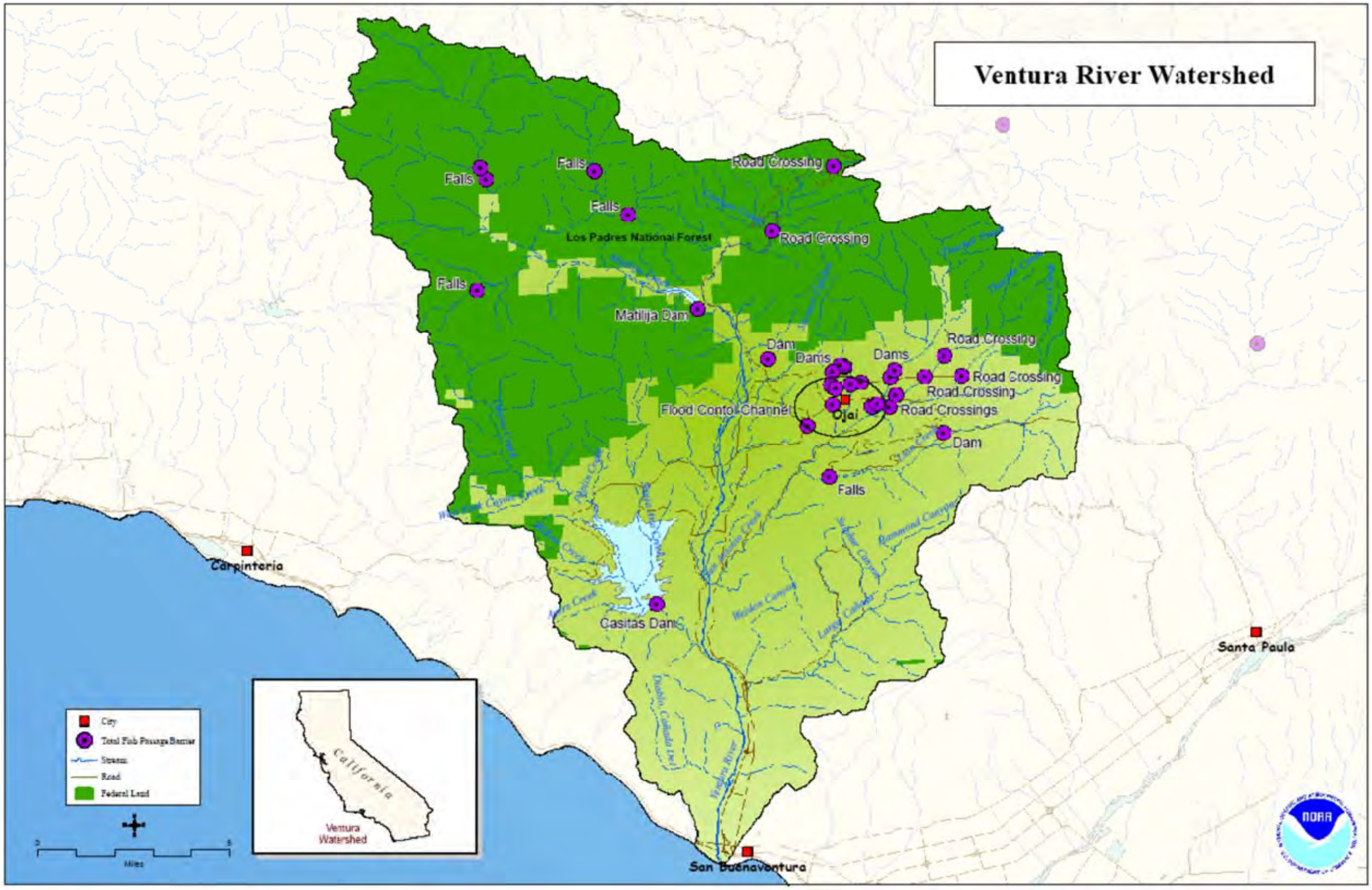


Figure 9-4. Ventura River Watershed.

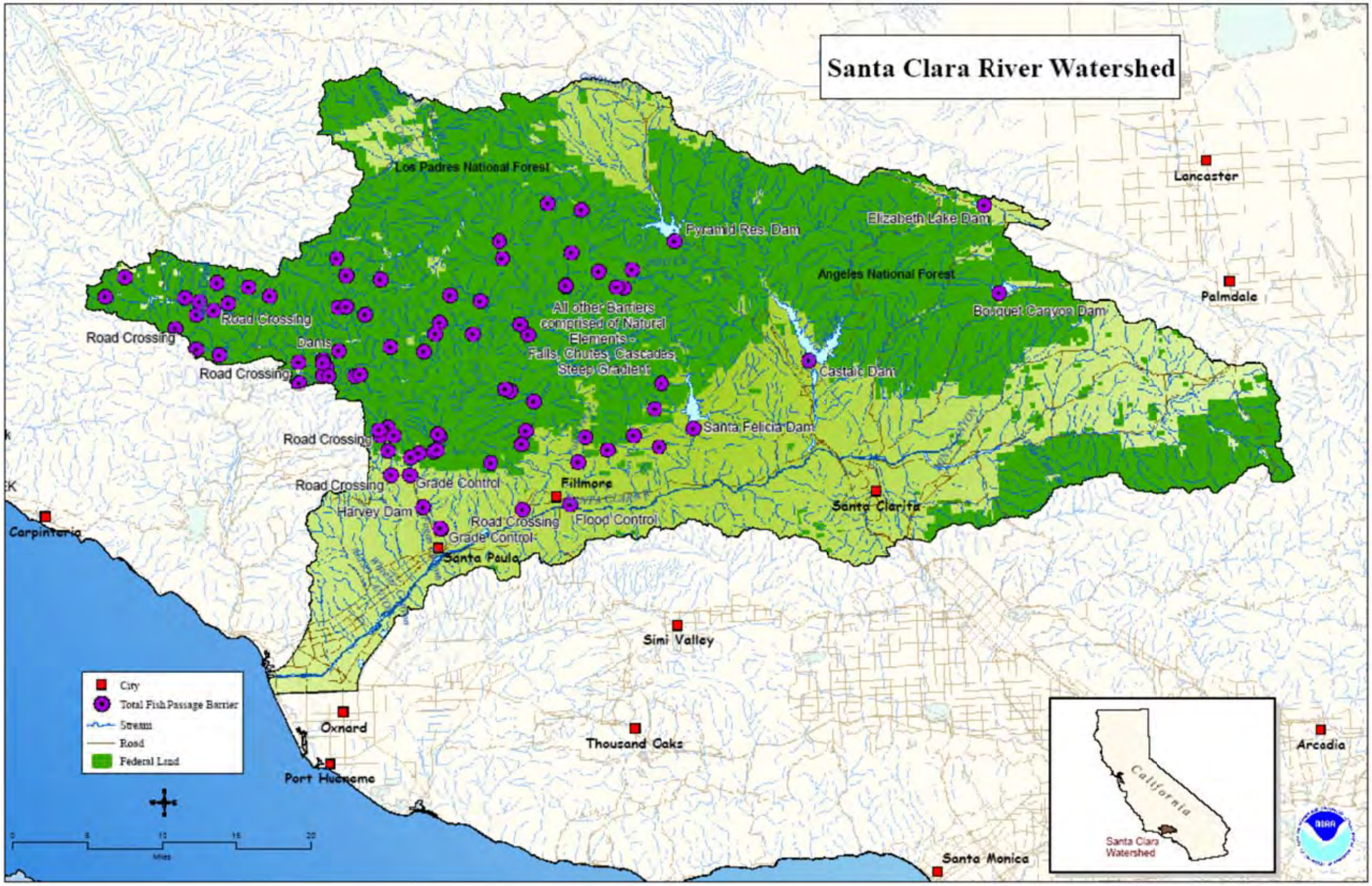


Figure 9-5. Santa Clara River Watershed.

Ventura River Valley Agriculture

Agricultural uses (orchard production, row crops, and livestock ranching), are important land uses that directly or indirectly impact watershed processes throughout these watersheds. Particularly in the lower Santa Maria, Santa Ynez, and Santa Clara River watersheds, transverse broad coastal watersheds or plains have mostly been converted to agriculture. The Santa Ynez River and the Ventura River watersheds have been transformed by a series of dams constructed to serve municipal water needs for the cities of Goleta, Santa Barbara, Montecito, Summerland, Carpinteria, and Ventura. A major diversion on the lower mainstem and three large dams in the upper watershed on Piru and Castaic creeks has similarly affected habitat and accessibility for anadromous *O. mykiss* in the Santa Clara River drainage. Municipal and agricultural water sources also include numerous groundwater wells located throughout the floodplains of these watersheds.

9.3 CURRENT WATERSHED CONDITIONS

Watershed conditions were assessed for the mainstems of the four major rivers and for nine sub-watersheds in the Monte Arido Highlands BPG region. The lower mainstem of most of the drainages in this BPG region offer fair to poor habitat conditions for anadromous *O. mykiss*. Some tributaries to the Santa Maria River (*e.g.*, Sisquoc River, Manzana Creek), Santa Ynez River (e.g., Cachuma, Indian, and Juncal Creeks), Ventura River (*e.g.*, upper Coyote and Santa Ana Creeks, Matilija Creek), and the Santa Clara River (*e.g.*, upper Santa Paula, Sespe Creek, Hopper, and upper Piru and Reyes Creeks) afford better habitat quality. Indicator ratings for the watersheds were typically downgraded during the threats assessment due to the presence of fish-passage barriers (see below).

Santa Ana Creek – Ventura River Tributary

Good-quality to excellent-quality habitat is generally found in the upper watersheds above these barriers, particularly in the Sisquoc River, Matilija Creek mainstem, North Fork Matilija Creek, San Antonio Creek, Santa Paula Creek, and Sespe Creek drainages.

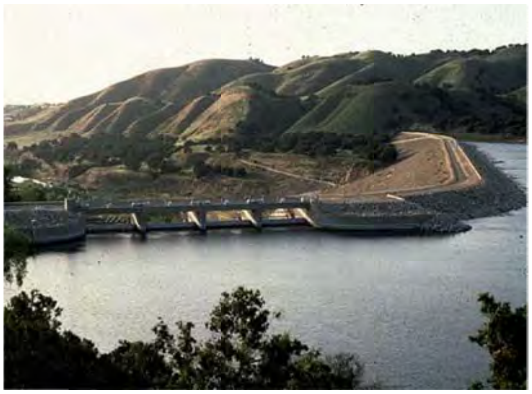
Sespe Creek – Santa Clara River Tributary

Sespe Creek probably supports the highest-quality and most extensive spawning and rearing habitat for anadromous *O. mykiss* in this BPG region, but is frequently isolated from the estuary and ocean by water management activities elsewhere in the watershed that reduce or eliminate surface flows along extensive reaches of the mainstem (Hunt & Associates 2008a, Kier Associates 2008b).

Twitchell Dam – Cuyama River

Twitchell Dam on the Cuyama River is located near the Sisquoc River confluence and blocks passage to the very large Cuyama River watershed, including several tributaries (*e.g.*, Pine Creek). Surface flows in the Cuyama River disappear for most of the year because of groundwater pumping throughout the arid Cuyama Valley to water row crops that have been extensively planted on the floodplain. Access to the equally large Sisquoc River watershed for anadromous *O. mykiss* is severely limited because Twitchell Dam is managed for aquifer recharge in the Santa Maria Valley with the aim of minimizing surface flows to the ocean. Consequently, the Santa Maria River, which is the access corridor for both the Cuyama and Sisquoc rivers, only flows to the ocean during high rainfall years. The substantial increase of impermeable surfaces as a result of urbanization (including roads) along the coastal terraces, and in the several of the inland valleys (*e.g.*, Ventura and Santa Clara) has altered the natural flow regimes of rivers and streams, particularly in the lower reaches, increasing the frequency and intensity of flood flows.

Estuarine habitats at the mouths of these watersheds in this BPG region have been reduced in size by 19 percent to 85 percent by the development of roads and railroads, urbanization, and development of recreational facilities. Historically, these estuaries were large and complex, with extensive distributary and backwater channels, encompassing thousands of acres. The remaining estuarine habitats are subject to constriction and isolation by development, surface runoff from roads and other impervious surfaces, as well as a reduction in the amount and quality of surface flows resulting from groundwater extraction. The occurrence of non-native invasive species in these highly regulated watersheds has spread and increased since this initial threats assessment, and will likely continue to do so unless recovery actions identified in this Recovery Plan are implemented. Bradbury Dam, Gibraltar Dam, and Juncal Dam on the middle and upper mainstem of the Santa Ynez River and the Mono Debris Watershed Dam on Mono Creek, an upper tributary the Santa Ynez River, block access to at least 70% of the highest quality spawning and rearing habitat within this watershed. There are also a number of smaller debris dams built on smaller tributaries within the major watersheds which remove sediment from the fluvial system and block the seasonal movement of fish. Union Pacific Railroad tracks traverse the mainstem of each of the rivers and streams near their mouths, which has damaged estuarine habitat and created additional passage impediments for anadromous *O. mykiss*.



Bradbury Dam – Santa Ynez River

Matilija Dam and Casitas Dam on the mainstem of Matilija Creek and Coyote Creek, respectively, have eliminated access to 90% of the highest quality spawning habitat in the Ventura River watershed. The planning and implementation of a project to remove Matilija Dam is underway. The Robles Diversion Dam on the mainstem has recently been retrofitted with a fish-passage facility, but operational limitations still limit pre-project fish passage below and above the facilities as a result of modification to downstream flows during the migration window and periodic malfunctions of the fish screening mechanism (Casitas Municipal Water District 2005, 2006, 2008, 2009, National Marine Fisheries Service 2003).

Matilija Dam – Matilija Creek

The Vern Freeman Diversion, Santa Felicia Dam and Pyramid Dam on Piru Creek effectively impeded or block fish passage to spawning and rearing habitat in the major tributaries of the Santa Clara River. The fish passage and flow restrictions associated with the Vern Freeman Diversion and Santa Felicia Dam has been addressed in two Biological Opinions issued by NMFS for the operation of these facilities (National Marine Fisheries Service 2008a, 2008b.) Additionally, the operation of these two dams restricts access to all of the major tributaries below Piru Creek by the reduction of surface flows (including magnitude and duration) in the mainstem of the Santa Clara River and to the estuary. Fish passage is further impacted by the operation of Castaic Dam on Castaic Creek, an upper tributary of the Santa Clara River. Additionally there are a number of smaller passage barriers that impede fish passage to important steelhead spawning and rearing tributaries such as Santa Paula, Sisar, Pole, and Hopper, Creeks (Francis 2010a, Kajtaniak 2008, Stoecker and Kelley 2005).

Santa Felicia Dam – Piru Creek

Agricultural and urban development has severely constrained floodplain connectivity between sections of the floodplains of the Santa Maria River, lower Sisquoc River, Santa Ynez River, Ventura River, Coyote Creek, San Antonio Creek, Santa Clara River, and lower Sespe Creek. Levees, channelization, and other flood control structures and activities, including related flood control activities (levee and vegetation management, *etc.*), constrict the floodplain and alter natural channel morphology (and affect sediment transport processes), which limits instream habitat diversity and riparian corridor structure.

Non-native species are a widespread threat source in the Monte Arido Highlands BPG. Most or all of the reservoirs formed by these dams support sport fishing that has intentionally or accidentally introduced non-native fishes that prey on or compete with *O. mykiss*. These species have moved out of the reservoirs into the mainstem and tributaries, including reaches above and below the dams and established reproducing populations (*e.g.*, crayfish, large and smallmouth bass, sunfish, bullhead catfish, carp, western mosquitofish, bullfrogs, *etc.*). Bullfrogs and carp are common throughout the mainstem of the Santa Ynez and Ventura rivers. The African clawed frog (*Xenopus laevis*), a significant predator of native amphibians and fish, infests much of the mainstem of the Santa Clara River from the estuary upstream to Fillmore, including large tributaries such as Santa Paula Creek and Hopper Canyon Creek. Additionally, the highly invasive non-native giant reed (*Arundo donax*) has displaced large areas of native riparian vegetation in the Ventura River and Santa Clara River watersheds, and continues to spread to other areas.

Because of the chaparral-dominated upland areas, fire is an important factor in slope erosion and sediment inputs to watersheds throughout this region. Increased fire frequency can increase slope erosion and sediment input to streams, resulting in long-term changes to substrate texture and embeddedness, water quality (*e.g.*, turbidity), and water temperature (loss of riparian canopy cover). The Sisquoc River, North Fork Matilija Creek, and Piru Creek watersheds were identified as potentially severely threatened by mass wasting of slopes and loss of riparian canopy cover due to fires that occurred in 2006 and 2007 that covered most of their watersheds, but substantial portions of each of these watersheds have burned in the past 50 years. All of the watersheds in this BPG region are naturally susceptible to wildfires, but have experienced larger and more intense fires because of the development and management of these watersheds (Hunt & Associates 2008a, Kier Associates 2008b).

Santa Maria River Estuary

The estuaries at the mouth of the Santa Maria River and Santa Ynez River are relatively physically intact, retaining 81% to 94% of their historic size, respectively, although both are impacted by agricultural and urban effluent discharge. The Ventura River estuary has been reduced by approximately 68% due to urban and agricultural encroachment (*e.g.*, Ventura County Fairgrounds, Emma Wood State Beach, Union Pacific Railroad Bridge, and Highway 101 Bridge). The Santa Clara River estuary has been reduced by approximately 85% due to agricultural and oil development, levee construction, and the development of the Ventura Marina and McGrath State Beach. Because estuaries are the gateway used by both immigrating adults and emigrating juveniles moving between the marine and freshwater environments, estuarine loss affects anadromous *O. mykiss* throughout the entire watershed. The remaining estuarine habitats are subject to degradation from urban, agricultural, and/or recreational development and loss of freshwater inflows. Surface flows diverted from the mainstem for urban and agricultural use adversely affect both water quality and the seasonal breaching pattern of the sandbar at the mouth of the estuary.

Despite widespread and varied habitat degradation to the coastal and middle mainstems of all four major river systems, native rainbow trout populations still inhabit the relatively high-quality habitat upstream of the dams in this region, and small numbers of steelhead attempt to enter and spawn in each of the watersheds of the Monte Arido Highlands BPG region when flow conditions are suitable.

9.4 THREATS AND THREAT SOURCES

Varying numbers and intensities of habitat impairments (sources of threats) were identified in the CAP Workbooks analyses, ranging from seven sources in the North Fork Matilija Creek watershed to 21 in the Cuyama River watershed. "High" and "Very High" sources of threats involving fish-passage barriers created by dams and lack of surface flows caused by groundwater extraction or surface flow diversions disproportionately impact habitat conditions in all of the watersheds in this BPG region. For example, Sespe Creek, which is relatively undisturbed and supports some of the best spawning habitat in the BPG region, is nevertheless threatened by urban development occurring downstream along the mainstem of the Santa Clara River watershed. This development includes water management activities, such as the Vern Freeman Diversion, that interrupt the connection between this sub-watershed, the mainstem, estuary, and ocean (Hunt & Associates 2008a, Kier Associates 2008b).

Fourteen anthropogenic activities ranked as the top sources of stress to steelhead within each watershed in the Monte Arido BPG and are strongly associated with urban and agricultural development (and the water diversion and consumption associated with them) (Table 9-2).

Table 9-2. Threat source rankings in each watershed in the Monte Arido Highlands BPG (see CAP Workbooks for details).

Threat Sources	**Monte Arido Highlands BPG Component Watersheds (north to south)**												
	Santa Maria River	Cuyama River	Sisquoc River	Santa Ynez River	Ventura River	Coyote Creek	Matilija Creek mainstem	North Fork Matilija Creek	San Antonio Creek	Santa Clara River*	Santa Paula Creek	Sespe Creek	Piru Creek
Dams and Surface Water Diversions	Red	Red	Red	Red	Red	Red	Red	Dark green	Dark green	Red	Red	Red	Red
Groundwater Extraction	Red	Red	Dark green	Red	Red	Red	Dark green	Dark green	Light green	Red	Red	Red	Dark green
Agricultural Development	Red	Red	Dark green	Red	Red	Dark green	Dark green	Dark green	Yellow	Red	Red	Red	Dark green
Urban Development	Light green	Red	Red	Light green	Red	Red	Light green	Dark green	Yellow	Red	Red	Red	Dark green
Recreational Facilities	Dark green	Dark green	Dark green	Red	Red	Red	Dark green	Light green	Light green	Light green	Light green	Dark green	Red
Non-Native Species	Light green	Dark green	Dark green	Red	Red	Red	Dark green	Dark green	Light green	Red	Yellow	Red	Red
Levees and Channelization	Red	Dark green	Red	Light green	Yellow	Dark green	Dark green	Dark green	Dark green	Light green	Red	Red	Dark green
Flood Control Maintenance	Light green	Red	Red	Yellow	Yellow	Light green	Dark green	Dark green	Yellow	Yellow	Red	Light green	Yellow
Wildfires	Dark green	Light green	Red	Red	Red	Yellow	Red	Red	Yellow	Yellow	Red	Red	Red
Mining and Quarrying	Yellow	Yellow	Yellow	Light green	Dark green	Dark green	Dark green	Red	Dark green	Yellow	Dark green	Dark green	Dark green
Roads	Dark green	Light green	Dark green	Light green	Light green	Dark green	Dark green	Red	Light green	Light green	Yellow	Dark green	Dark green
Urban Effluents	Light green	Dark green	Dark green	Light green	Yellow	Dark green	Dark green	Dark green	Yellow	Light green	Light green	Dark green	Dark green
Agricultural Effluents	Red	Light green	Dark green	Light green	Yellow	Dark green	Dark green	Dark green	Yellow	Yellow	Light green	Dark green	Light green
Culverts & Road Crossings	Dark green	Dark green	Dark green	Light green	Dark green	Dark green	Dark green	Light green	Light green	Dark green	Yellow	Dark green	Dark green

Key: *Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat (Threat cell colors represent threat rating from CAP Workbook)*

**Wildfires were not identified during the CAP Workbook analyses as one of the top five threats in several of these watersheds, but recent fires in coastal watersheds since 2007 could result in significant habitats impacts.*

9.5 SUMMARY

Dams, surface water diversions (including groundwater extraction) driven by agricultural and urban development on the major rivers of the Monte Arido Highlands BPG region (Santa Maria River, Santa Ynez River, Ventura River, and Santa Clara River) have had the most severe impacts on the steelhead populations in this BPG region, cutting off access to upstream spawning and rearing habitats and reducing both the magnitude and duration of flows, as well as altering the timing of flows necessary for immigration of adults and emigration of juveniles. Non-point sources of pollutants, including fine sediments and pesticides/herbicides, from agricultural, commercial, and residential development have also impacted steelhead habitats, particularly spawning and rearing habitats by degrading water quality and covering rocky cobble substrate important to steelhead reproduction and growth. Additionally, impacts associated with wildland fires, including fire-fighting measures to control or extinguish them, and the post-fire measures to repair damages incurred in fighting wildland fires, poses a potential threat to watersheds in this BPG. Table 9-3 summarizes the critical recovery actions needed within the Core 1 populations of this BPG.

Restoring conditions for steelhead passage, spawning, and/or rearing in these watersheds will require multiple, long-term, measures related to water management, recreation, and fish passage past large dams. Impediments to fish passage, stemming from the construction and operation of dams and groundwater extraction, or modification of channel morphology and adjacent riparian habitats through flood control, or other instream activities (such as sand gravel mining) should be further evaluated. Additionally loss of estuarine functions caused by filling and point and non-point water discharges from agriculture and other anthropogenic activities, should be further investigated.

Ventura River Steelhead – 1918.

The threat sources discussed in this section should be the focus of a variety of recovery actions to address specific risks to anadromous *O. mykiss* viability. Spatial and temporal data, for water temperature, pH, nutrients, *etc*., are not uniformly available, and should be further developed, along with general habitat typing assessments, to better identify natural as well as anthropogenic limiting factors. This type of data acquisition should be the subject of site-specific investigation in order to refine the primary recovery actions or to target additional recovery actions as part of any recovery strategy for the Monte Arido Highlands BPG. Tables 9-4 through 9-7, below, rank and describe proposed recovery actions for each sub-watershed in the Monte Arido BPG, including the estimated cost for implementing the actions in five year increments over the first 25 years, and where applicable extended out to 100 years, though many recovery actions can be achieved within a shorter period.

Table 9-3. Critical recovery actions for Core 1 populations within the Monte Arido Highlands BPG.

POPULATION	CRITICAL RECOVERY ACTION
Santa Maria River	Implement operating criteria to ensure the pattern and magnitude of water releases from Twitchell Dam provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Physically modify Twitchell Dam to allow steelhead natural rates of migration to upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and ocean.
Santa Ynez River	Implement operating criteria to ensure the pattern and magnitude of water releases from Bradbury, Gibraltar, and Juncal dams provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Physically modify Bradbury, Gibraltar, Mono, and Juncal dams to allow steelhead natural rates of migration of steelhead to upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean. Identify, protect, and where necessary restore estuarine and freshwater rearing habitats.
Ventura River	Implement operating criteria to ensure the pattern and magnitude of water releases, including bypass flows from diversions from Casitas, Matilija, and Robles Diversion dams provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Physically modify Casitas, Matilija, and Robles Diversion dams to allow steelhead natural rates of migration to upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
Santa Clara River	Implement operating criteria to ensure the pattern and magnitude of water releases, including bypass flows from diversions from Vern Freeman Diversion, Santa Felicia, Pyramid and Castaic dams provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Physically modify Vern Freeman Diversion, Harvey Diversion, Santa Felicia, and Pyramid dams, and the lower Santa Paula Creek flood control channel to allow steelhead natural rates of migration to upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.

Southern California Steelhead DPS Recovery Action Tables Identification Key, Monte Arido Highlands BPG (Tables 9-4 – 9-7).

Recovery Action Number Key: XXXX – SCS – 1.2	
XXXX	Watershed
SCS	Species Identifier – Southern California Steelhead
1	Threat Source
2	Action Identity Number
Action Rank	
A	Action addresses the first listing factor regarding the destruction or curtailment of the species' habitat
B	Action addresses one of the other four listing factors

XXXX ID Table	
SMM	Santa Maria Mainstem
CR	Cuyama River
Sis	Sisquoc River
SYR	Santa Ynez River
VenR	Ventura River
CC	Coyote Creek
MC	Matilija Creek
NFMC	North Fork Matilija Creek
SAC	San Antonio Creek
SCR	Santa Clara River
SP	Santa Paula
SesC	Sespe Creek
PC	Piru Creek

Threat Source Legend	
1	Agricultural Development
2	Agricultural Effluents
3	Culverts and Road Crossings
4	Dams and Surface Water Diversions
5	Flood Control Maintenance
6	Groundwater Extraction
7	Levees and Channelization
8	Mining and Quarrying
9	Non-Native Species
10	Recreational Facilities
11	Roads
12	Upslope/Upstream Activities
13	Urban Development
14	Urban Effluents
15	Wildfires

See Chapter 8, Table 8.1 for Detailed Description of Recovery Actions

Table 9-4. Southern California Steelhead DPS Recovery Action Table for Santa Maria River Sub-Watersheds (Monte Arido Highlands BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Santa Maria Mainstem												
SMM-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	BLM,CCC, NRCS,,CT, SCHR,EII,TCFT, SBC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
SMM-SCS-1.2	Develop and implement plan to minimize runoff from agricultural activities	USGS,CT, SCHR,EII,TCFT, SBC	Agricultural Effluent	1, 4	3B	20	128464	51783424	51783424	51783424	0	155478736
SMM-SCS-1.3	Manage livestock grazing to maintain or restore aquatic habitat functions	BLM,,CT, SCHR,EII,TCFT, SBC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520
SMM-SCS-1.4	Manage agricultural development and restore riparian zones	NRCS,USFS, CT,SCHR,EII, TCFT,SBC	Agricultural Development	1, 4	2B	20 – refer to regional costs	0	0	0	0	0	0
SMM-SCS-2.1	Develop and implement a plan to minimize runoff from agricultural activities	SWRCB,CT, SCHR,EII,TCFT, SBC	Agricultural Effluents	1, 4	2B	20 – refer to regional costs	0	0	0	0	0	0
SMM-SCS-3.1	Develop and implement a plan to remove or modify all fish passage barriers within the watershed (See	ACOE,BLM, USFS,DWR, CT,SCHR,EII, TCFT,SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20- refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	Steelhead Migration Assessment and Recovery Opportunities for the Sisquoc River, California 2003.)											
SMM-SCS-4.1	Develop and implement a water management plan dam operations	BOR, CDFG, CT,SCHR,EII, TCFT,SBC	Dams and Surface Water Diversions	1, 3, 4	1A	5	TBD	0	0	0	0	91850
SMM=SCS-4.2	Develop and implement water management plan for diversion operations	CDFG, CT, SCHR, EII, TCFT,SBC	Dams and Surface Water Diversions	1,3, 4	1A	5	91850	0	0	0	0	TBD
SMM-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, CDFG CT,SCHR,EII, TCFT,SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
SMM-SCS-5.2	Develop and implement flood control maintenance program	CCC,NMFS, CDFG,NMFS, CT,SCHR,EII, TCFT,SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
SMM-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,CT, SCHR,EII,TCFT, SBC	Groundwater Extraction	1, 4	1B	5	275550	0	0	0	0	275550
SMM-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,CDFG, CT,SCHR,EII, TCFT.SBC	Groundwater Extraction	1, 4	1B	10	254350	39775	0	0	0	294125

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMM-SCS-7.1	Develop and implement plan to vegetate levees and eliminate minimize herbicide use near levees	FEMA,USGS, ACOE,BLM, NMFS,CDFG, CT,SCHR,EII, TCFT,SBC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SMM-SCS-7.2	Develop and implement a plan to restore natural channel features	CCC,NMFS, CDFG,NMFS, CT,SCHR,EII, TCFT,SBC,SBC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
SMM-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS, CDFG,CDMG CT,SCHR,EII, TCFT,SBC	Mining and Quarrying	1, 4, 5	2B	5	68030	0	0	0	0	68030
SMM-SCS-9.1	Develop and implement a watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SMM-SCS-9.2	Develop and implement a non-native species monitoring program	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SMM-SCS-9.3	Develop and implement a public education program on non-native species impacts	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMM-SCS-10.1	Review and modify development and management plans for recreational areas and national forests	NRCS,CCC, CDFG,ACOE, CT,SCHR,EII, TCFT,SBC	Recreational Facilities	1, 2, 3, 4, 5	1B	ongoing -cost of doing business	0	0	0	0	0	0
SMM-SCS-10.2	Develop and implement a public education program on watershed processes	CDFG,CT, SCHR,EII,TCFT, SBC	Recreational Facilities	1,3,5	2B	20	76140	76140	76140	76140	0	304560
SMM-SCS-10.3	Review and modify development and management plans for recreational areas and national forests (Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS, CT, SCHR,EII,TCFT, SBC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SMM-SCS-11.1	Retrofit storm drains to filter runoff from roadways	NMFS,DOT, CT,SCHR,EII, TCFT,SBC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SMM-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	DOT,CT, SCHR,EII,TCFT, SBC	Roads	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMM-SCS-12.1	Develop and implement an estuary restoration and management plan for the Santa Maria River Estuary	CDFG,EPA, NFWF,NMFS, ACOE,FWS, CT,SCHR,EII, TCFT,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	13234570	0	0	0	0	13234570
SMM-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, CT,SCHR,EII, TCFT,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	62400	0	0	0	0	62400
SMM-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	BLM,CT, SCHR, EII,TCFT,SBC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
SMM-SCS-13.2	Retrofit storm drains in developed areas	NMFS,DOT, CT,SCHR,EII, TCFT,SBC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
SMM-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CT,SCHR,EII,TCFT, SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SMM-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.*, Santa Maria Wastewater Treatment Facility)	RWQCB,CT, SCHR,EII,TCFT, SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMM-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	CDFFP,BLM, USFS,LPFW, CT,SCHR, EII,TCFT,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Cuyama River												
CR-SCS-1.1	Develop and implement a watershed-wide sediment management plan	NRCS, USGS, NMFS, CDFG, CT,SCHR,EII, TCFT,SBC,VC	Agricultural Development	1, 4	3B	20	7440	2999040	2999040	2999040	0	9004560
CR-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, NMFS,CT, SCHR,EII, TCFT, SBC,VC	Agricultural Development	1, 4	3B	5	62400	0	0	0	0	62400
CR-SCS-1.3	Manage agricultural development and restore riparian zones	BLM,NMFS,CT, SCHR,EII, TCFT, SBC,VC	Agricultural Development	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0
CR-SCS-1.4	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, NMFS,CT, SCHR,EII, TCFT, SBC,VC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CR-SCS-2.1	Develop and implement a plan to minimize runoff from agricultural activities	NRCS, USFS,USGS, NMFS, CDFG, CT,SCHR,EII, TCFT,SBC,VC	Agricultural Effluents	1, 4	2B	20 – refer to regional costs	0	0	0	0	0	0
CR-SCS-3.1	Develop and implement a plan to remove or modify fish passage barriers in the watershed (See Steelhead Migration Assessment and Recovery Opportunities for the Sisquoc River, California, 2003)	NMFS, CDFG, USFS, ACOE,BLM, DWR, CT,SCHR,EII, TCFT,SBC,VC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 – refer to regional costs	0	0	0	0	0	0
CR-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, Twitchell Dam)	BOR,CDFG, NMFS, USFWS, USFS,DWR, CT,SCHR,EII, TCFT,SBC,VC	Dams and Surface Water Diversions	1, 3, 4	1A	20	TBD	TBD	TBD	TBD	TBD	TBD
CR-SCS-4.2	Develop and implement water management plan for dam operations (*e.g.*, Twitchell Dam)	BOR, CDFG, NMFS, USGS,CT, SCHR,EII, TCFT,SBC	Dams and Surface Water Diversions	1, 3, 4	1B	5	TBD	TBD	TBD	TBD	TBD	TBD
CR-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS,CT, SCHR,EII, TCFT, SBC,VC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CR-SCS-5.2	Develop and implement flood control maintenance program	CCC,NMFS, CDFG,CT, SCHR,EII, TCFT	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
CR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, CDFG, CT, SCHR,EII,TCFT, SBC,VC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
CR-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,NMFS, CDFG, CT, SCHR,EII,TCFT, SBC,VC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
CR-SCS-7.1	Develop and implement a plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,USGS, ACOE,BLM, NMFS,CDFG, CT,SCHR,EII, TCFT,SBC,VC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
CR-SCS-7.2	Develop and implement plan to restore natural channel features	CCC,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC,VC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
CR-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMGCT, SCHR,EII,TCFT, SBC,VC	Mining and Quarrying	1, 4, 5	3B	5	68030	0	0	0	0	68030
CR-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC,VC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CR-SCS-9.2	Develop and implement a non-native species monitoring program	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC,VC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
CR-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC,VC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
CR-SCS-10.1	Develop and implement a public education program on watershed processes	CDFG,CT, SCHR,EII, TCFT,SBC,VC	Recreational Facilities	1,3,5	2B	20	76140	76140	76140	76140	0	304560
CR-SCS-10.2	Review and modify development and management plans for recreational areas and national forests	USFS,USFWS, NMFS,CDFG, CDPR,BLM,CT, SCHR,EII,TCFT, SBC,VC	Recreational Facilities	1, 4	3B	5	62400	0	0	0	0	62400
CR-SCS-10.3	Review and modify development and management plans for recreational areas and national forests (Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,CDFG CDFFP,CT, SCHR,EII,TCFT, SBC,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CR-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	DOT, NMFS, CDOT,CDFG, CT,SCHR,EII, TCFT,SBC,VC	Roads	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0
CR-SCS-11.2	Retrofit storm drains to filter runoff from roadways	DOT, NMFS, CDOT,CDFG, CT,SCHR,EII, TCFT,SBC,VC	Roads	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0
CR-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, CDFG,CT, SCHR,EII, TCFT,SBC,VC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	312000	0	0	0	0	312000
CR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,CDFG, CT,SCHR,EII, TCFT,SBC,VC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
CR-SCS-13.2	Retrofit storm drains in developed areas	NMFS,DOT, CDFG,CT, SCHR,EII,TCFT	Urban Development	1, 4	3B	20	0	0	0	0	0	0
CR-SCS-14.1	Review California Regional Water Quality Control Board Region Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CT, SCHR,EII,TCFT, SBC,VC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CR-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.*, Cuyama Community Sanitation District Treatment Facility)	RWQCB, SWRCB,DOT, NMFS,CDFG, CDOT,CT, SCHR,EII,TCFT, SBC,VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
CR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, LPFW,CDFG, USGS,CT, SCHR,EII,TCFT, SBC,VC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sisquoc River												
Sis-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, NMFS,CDFG, CT,SCHR,EII, TCFT,SBC	Agricultural Development	1, 4	3B	5	62400	0	0	0	0	62400
Sis-SCS-1.2	Manage agricultural development and restore riparian zones	BLM,NMFS, CT,SCHR,EII, TCFT,SBC	Agricultural Development	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0
Sis-SCS-1.3	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS, BLM,NMFS, CDFG.CT, SCHR,EII,TCFT, SBC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520
Sis-SCS-2.1	Develop and implement a plan to minimize runoff from agricultural activities	NRCS,USFS, NMFS,SWRCB, CT,SCHR,EII, TCFT,SBC	Agricultural Effluents	1, 4	2B	20 – refer to regional costs	0	0	0	0	0	0
Sis-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed (See Steelhead Migration Assessment and Recovery Opportunities for the Sisquoc River, California 2003.)	NMFS,USFS, UACOE,BLM, USFS,CDOT,C DFG,DWR,CT, SCHR,EII,TCFT, SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 – refer to Santa Maria main-stem, costs are aggreg ated	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sis-SCS-4.1	Develop and implement water management plan for diversion operations	NRCS,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Dams and Surface Water Diversions	1, 3, 4	3B	5	91850	0	0	0	0	91850
Sis-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS,CT, SCHR,EII,TCFT, SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
Sis-SCS-5.2	Develop and implement flood control maintenance program	CCC,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
Sis-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
Sis-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,USFS,USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
Sis-SCS-7.1	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,ACOE, BLM,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
Sis-SCS-7.2	Develop and implement a plan to restore natural channel features	CCC,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($) FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sis-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMGCT, SCHR,EII,TCFT, SBC	Mining and Quarrying	1, 4, 5	3B	5	68030	0	0	0	0	68030
Sis-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	USFWS,USFS, NMFS,CDFG, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
Sis-SCS-9.2	Develop and implement a non-native species monitoring program	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
Sis-SCS-9.3	Develop and implement public education program on non-native species impacts	USFWS,USFS, NMFS,CDFG, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
Sis-SCS-10.1	Develop and implement public education program on watershed processes	USFS, USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,SBC	Recreational Facilities	1,2,3,4, 5	2B	20	76140	76140	76140	76140	0	304560
Sis-SCS-10.2	Review and modify development and management plans for recreational areas and national forests	USFS,USFWS, NMFS,BLM, CDPR,CDFG, CT,SCHR,EII, TCFT,SBC	Recreational Facilities	1, 2, 4	2B	5	62400	0	0	0	0	62400

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sis-SCS-10.3	Review and modify development and management plans for recreational areas and national forests (Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,CT,SCHR, EII,TCFT,SBC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
Sis-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	DOT,CT,SCHR, EII,TCFT,SBC	Roads	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0
Sis-SCS-11.2	Retrofit storm drains to filter runoff from roadways	NMFS,DOT, CT,SCHR,EII, TCFT,SBC	Roads	1, 4		20	32260	32260	32260	32260	0	129040
Sis-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, USFWS,NMFS, CT,SCHR,EII, TCFT,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	312000	0	0	0	0	312000
Sis-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDFG,CT, SCHR,EII,TCFT, SBC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
Sis-SCS-13.2	Retrofit storm drains in developed areas	NMFS,DOT, CT,SCHR,EII, TCFT,SBC	Urban Development	1, 4	3B	20	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sis-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CT, SCHR,EII,TCFT, SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
Sis-SCS-14.2	Review, assess and modify if necessary all NPDES wastewater discharge permits	RWQCB,CT, SCHR,EII,TCFT, SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
Sis-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,LPFW, CT,SCHR,EII, TCFT,SBC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 9-5. Southern California Steelhead DPS Recovery Action Table for Santa Ynez River Watershed (Monte Arido Highlands BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Santa Ynez River												
SYR-SCS-1.1	Develop adopt, and implement agricultural land-use planning policies and standards	NRCS, USGS,USFWS, NMFS,CT, SCHR,EII,TCFT, SBC	Agricultural Development	1, 4	2B	20	114800	46285184	46285184	46285184	0	138970352
SYR-SCS-1.2	Manage agricultural development and restore riparian zones	NRCS,BLM, NMFS,CDFG, CT,SCHR,EII, TCFT, SBC	Agricultural Development	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SYR-SCS-1.3	Manage livestock grazing to maintain or restore aquatic habitat functions	BLM,NMFS, CT,SCHR,EII, TCFT,SBC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520
SYR-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS, FEMA NMFS,SWRCB, CDFG,CT, SCHR,EII,TCFT, SBC	Agricultural Effluents	1, 4	2B	20 – refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SYR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed (See Steelhead Migration Assessment and Recovery Opportunities for the Santa Ynez River, California 2003; and Lower Santa Ynez River Fish Management Plan, 2009.)	USFS, NMFS, USFWS,ACOE, BLM,CDFG, DWR,CT, SCHR,EII,TCFT, SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20- refer to regional costs	0	0	0	0	0	0
SYR-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, Bradbury, Gibraltar, and Juncal dams)	BOR, NMFS, ACOE,BLM, USFS,CDFG, DWR,CT,SCHR, EII,TCFT,SBC	Dams and Surface Water Diversions	1, 3, 4	1A	20	TBD	TBD	TBD	TBD	TBD	TBD
SYR-SCS-4.2	Develop and implement water management plan for diversion operations	NRCS,NMFS, SWRCB,CDFG, CT,SCHR,EII, TCFT,SBC	Dams and Surface Water Diversions	1, 3, 4	1B	5	TBD	TBD	TBD	TBD	TBD	TBD
SYR-SCS-4.3	Develop and implement water management plan for dam operations (*e.g.*, Bradbury, Gibraltar, and Juncal dams)	BOR, SWRCB, NMFS,CDFG, USGS,CT, SCHR,EII,TCFT, SBC	Dams and Surface Water Diversions	1, 3, 4	1B	100	TBD	TBD	TBD	TBD	TBD	TBD

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SYR-SCS-5.1	Develop and implement flood control maintenance program	USCOE, RWQCB,NMF, CDFG,CT, SCHR,EII,TCFT, SBC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
SYR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, SWRCB,CDFG, CT,SCHR,EII, TCFT,SBC	Groundwater Extraction	1, 4	1B	5	275550	0	0	0	0	275550
SYR-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,CT, SCHR,EII,TCFT, SBC	Groundwater Extraction	1, 4	1B	10	254350	39775	0	0	0	294125
SYR-SCS-7.1	Develop and implement plan to restore natural channel features	CCC,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Levees and Channelization	1, 4	2B	20	4217625	4217625	4217625	4217625	0	16870500
SYR-SCS-7.2	Develop and implement a plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,USGS, ACOE,BLM, NMFS,CT, SCHR,EII,TCFT, SBC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
SYR-SCS-7.3	Develop and implement stream bank and riparian corridor restoration plan	NRCS, FEMA, USFS,USFWS, NMFS,ACOE, BLM,CT,SCHR, EII,TCFT,SBC	Levees and Channelization	1,4	2B	20	4717625	4717625	4717625	4717625		16870500
SYR-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMG,CT,SC HR,EII,TCFT, SBC	Mining and Quarrying	1, 4, 5	2B	5	68030	0	0	0	0	68030

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SYR-SCS-9.1	Develop and implement a watershed-wide plan to assess the impacts of non-native species and develop control measures	USFWS,USFS, NMFS,CDFG, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SYR-SCS-9.2	Develop and implement a non-native species monitoring program	CDFG,USFWS, USFS,NMFS, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SYR-SCS-9.3	Develop and implement a public education program on non-native species impacts	CDFG,USFWS, USFS,NMFS, CT,SCHR,EII, TCFT,SBC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SYR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* U.S. Forest Service Los Padres National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,CDFG, CT,AC, SCHR,EII, TCFT,SBC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SYR-SCS-10.2	Manage off-road recreational vehicle activity in riparian floodplain corridors	USFS,USFWS, NMFS,CDFG, SCHR,EII,TCFT, SBC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing -cost of doing business	0	0	0	0	0	0
SYR-SCS-10.3	Develop and implement public education program on watershed processes	CDFG,NMFS, CT,SCHR,EII, TCFT,SBC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SYR-SCS-11.1	Retrofit storm drains to filter runoff from roadways	NRCS,NMFS, DOT,CDOT, CDFG,CT, SCHR,EII,TCFT, SBC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
SYR-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	DOT,USFS, NMFS,CDOT, CDFG,CT, SCHR,EII,TCFT, SBC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SYR-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, CT,SCHR,EII, TCFT,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	312000	0	0	0	0	312000
SYR-SCS-12.2	Review and modify the Vandenberg Air Force Base Integrated Natural Resources Management Plan	USAF, USFWS, NMFS,CCC, CT,SCHR,EII, TCFT,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	CDB	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SYR-SCS-12.3	Develop and implement an estuary restoration and management plan	VAFB,NMFS, CCC, AC, BLM,USFS,CT, SCHR,EII,TCFT, SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	38133615	0	0	0	0	38133615
SYR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,BLM, RWQCB, CDFG,CT, SCHR,EII,TCFT, SBC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
SYR-SCS-13.2	Retrofit storm drains in developed areas	NMFS,DOT, CT,SCHR,EII, TCFT,SBC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
SYR-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,NMFS, CDFG,CT, SCHR,EII,TCFT, SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SYR-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.*, Lompoc Regional Wastewater Treatment Facility and Santa Ynez Band Wastewater Treatment Facility)	RWQCB,CDFG NMFS, CT, SCHR,EII,TCFT, SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SYR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,LPFW, CT,SCHR,EII, TCFT,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 9-6. Southern California Steelhead DPS Recovery Action Table for Ventura River Sub-Watersheds (Monte Arido Highlands BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Mainstem Ventura River												
VenR-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Development	1, 4	2B	20 – refer to regional costs	0	0	0	0	0	0
VenR-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Development	1, 4,	2B	5	47520	0	0	0	0	47520
VenR-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFWS,NMFS, CDFG,CT,SCHR,EII,TCFT, VC	Agricultural Development	1, 4	2B	2 – refer to regional costs	0	0	0	0	0	0
VenR-SCS-2.1	Develop and implement a plan to minimize runoff from agricultural activities	NRCS,NMFS,RWQCB, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
VenR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	USFS,USFWS, USDOT,NMFS, CDFG,CDOT DWR,CT, SCHR,EII,TCFT, VC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
VenR-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, Foster Park, Robles diversions)	BOR,NMFS, USFWS, SWRCB, CDFG,DWR, CT,SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1A	20	TBD	TBD	TBD	TBD	TBD	TBD
VenR-SCS-4.2	Develop and implement a water management plan for diversion operations (*e.g.*, Foster Park, Robles diversions, *etc*.)	BOR,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Dams and Surface Water Diversions	1, 3, 4	1B	5	TBD	TBD	TBD	TBD	TBD	TBD
VenR-SCS-4.3	Develop and implement a water management plan for dam operations (*e.g.*, Casitas and Matilija)	BOR,NMFS, USGS,CDFG, CT,SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1B	100	TBD	TBD	TBD	TBD	TBD	TBD
VenR-SCS-5.1	Develop and implement flood control maintenance program	NRCS,ACOE, USFWS,NMF, CCC,CDFG, CT,SCHR,EII, TCFT,VC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
VenR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Groundwater Extraction	1, 4	1A	5	275550	0	0	0	0	275550
VenR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Groundwater Extraction	1, 4	1A	10	254350	39775	0	0	0	294125

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
VenR-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USGS,ACOE,BLM, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
VenR-SCS-7.2	Develop and implement a plan to restore natural channel features	NRCS,USGS,USFWS, ACOE,BLM,NMFS,CCC, CDFG,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	2B	20	4217625	4217625	4217625	4217625	0	16870500
VenR-SCS-7.3	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,USGS, ACOE,BLM, NMFS,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
VenR-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMG,CT, SCHR,EII, TCFT,VC	Mining and Quarrying	1, 4, 5	3B	5	68030	0	0	0	0	68030
VenR-SCS-9.1	Develop and implement a non-native species monitoring program	CDFG,NMFS, CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
VenR-SCS-9.2	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,USFW, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
VenR-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,USFWS, NMFS,CT, SCHR,EII,TCFT, VC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
VenR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests	USFS,USFWS, NMFS,CDFG, CCC,NMFS, BLM,CT, SCHR,EII,TCFT, VC	Recreational Facilities	1, 2, 3, 4, 5	1B	ongoing - cost of doing business	0	0	0	0	0	0
VenR-SCS-10.2	Develop and implement a public education program on watershed processes	NRCS,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII, TCFT,VC	Recreational Facilities	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
VenR-SCS-10.3	Review and modify development and management plans for recreational areas and national forests (*e.g.*, U.S. Forest Service Los Padres National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria	USFS,USFWS, CDPR,CDFG, CT,SCHR,EII, TCFT,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
VenR-SCS-10.4	Review and modify development and management plans for recreational areas and national forests	USFS,USFWS, BLM,NMFS, CDFG,OVLC, CT,SCHR,EII, TCFT,VC	Recreational Facilities	1,2,3, 4,5	2B	5	62400	0	0	0	0	62400
VenR-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USDOT, USFWS, NRCS,NMFS, CDOT,CDFG, CT,SCHR,EII, TCFT,VC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
VenR-SCS-11.2	Retrofit storm drains to filter runoff from roadways	NRCS,NMFS,USDOT,USFS, USFWS,CDOT, CDFG,CT, SCHR,EII,TCFT, VC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
VenR-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, NMFS,USFWS, CT,SCHR,EII, TCFT,VC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	312000	0	0	0	0	312000
VenR-SCS-12.2	Develop and implement an estuary restoration and management plan	USFWS,NMFS, CDFG,CCC, AC,BLM,USFS, CT,SCHR,EII,TCFT,VC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	4606250	0	0	0	0	4606250
VenR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
VenR-SCS-13.2	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
VenR-SCS-13.3	Retrofit storm drains in developed areas	NMFS,USDOT, CDOT,CDFG, RWQCB, CT,SCHR,EII, TCFT,VC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
VenR-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, NMFS, SWRCB, CDFG,CT, SCHR,EII,TCFT, VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
VenR-SCS-14.2	Review, assess and modify if necessary all NPDES wastewater discharge permits (*e.g.*, Ojai Valley Sanitary District Wastewater Treatment Facility)	RWQCB, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
VenR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,NMFS, USGS,CDFG, LPFW,CT, SCHR,EII,TCFT, VC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($) FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Coyote Creek												
CC-SCS-1.1	Manage agricultural development and restore riparian zones	BLM,NMFS, CT,SCHR,EII, TCFT,VC	Agricultural Development	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
CC-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Agricultural Development	1, 4,	2B	5	47520	0	0	0	0	47520
CC-SCS-1.3	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Development	1, 4	2B	20	12400	4998400	4998400	4998400	0	15007600
CC-SCS-2.1	Develop and implement a plan to minimize runoff from agricultural activities	NRCS,SWRCB, RWQCB, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
CC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,BOR, CDFG,CDOT, CT,SCHR,EII, TCFT,VC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
CC-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, Casitas dam)	BOR,NMFS, USFWS, SWRCB,CDFG, DWR,CT,SCHR, EII,TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1A	20	TBD	TBD	TBD	TBD	TBD	TBD
CC-SCS-4.2	Develop and implement water management plan for dam operations (*e.g.*,	BOR,NMFS, USFWS, SWRCB,CDFG, CT,SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1A	5	TBD	TBD	TBD	TBD	TBD	TBD

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	Casitas dam)											
CC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,ACOE,NMFS, CDFG, CT,SCHR,EII, TCFT,VC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
CC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
CC-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
CC-SCS-7.1	Develop and implement plan to restore natural channel features	NRCS,NMFS, USFWS,CDFG, CT,SCHR,EII, TCFT,VC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
CC-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,NRCS, ACOE,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
CC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, USFWS,USFS, NMFS,CT, SCHR,EII,TCFT, VC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, NMFS,USFWS, USFS,CT,SCHR, EII,TCFT,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
CC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, NMFS,USFWS, USFS,CT,SCHR, EII,TCFT,VC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
CC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.* E.P. Foster Memorial Park, Casitas Recreational Area, Charles M. Teague Memorial Watershed, Los Padres National Forest, Ojai Ranger District)	BOR,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Recreational Facilities	1, 3,5	2B	20	76140	76140	76140	76140	0	304560
CC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	NRCS,USDOT, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	NMFS,USDOT, CDOT,CDFG, CT,SCHR,EII, TCFT,VC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
CC-SCS-13.1	Develop, adopt, and implement land-use planning policies and standards	NMFS,CCC, CDFG,CT, SCHR,EII,TCFT, VC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
CC-SCS-13.2	Develop, adopt, and implement urban land-use planning policies and standards	USDOT,NMFS, USFWS,CDFG, CT,SCHR,EII, TCFT,VC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
CC-SCS-13.3	Retrofit storm drains in developed areas	NMFS,USDOT, CDOT,CDFG, USFWS,CT, SCHR,EII,TCFT, VC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
CC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,CT, SCHR,EII,TCFT, VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
CC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits	SWRCB, RWQCB, NMFS CDFG,CT, SCHR,EII,TCFT, VC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,LPFW, CT,SCHR,EII, TCFT,VC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Matilija Creek												
MC-SCS-1.1	Develop, adopt and implement agricultural land-use planning policies and	NRCS,USFWS, NMFS,CDFG, RWQCB,CT, SCHR,EII,TCFT, VC	Agricultural Development	1, 4	2B	20	13640	5498240	5498240	5498240	0	16508360
MC-SCS-2.1	Manage agricultural development and restore riparian zones	NRCS,USFWS, NMFS,CDFG, RWQCB,CT, SCHR,EII,TCFT, VC	Agricultural Development	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
MC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 - refer to regional costs	0	0	0	0	0	0
MC-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, remove Matilija dam)	ACOE,BOR, NMFS,USFS, USFWS,CCC CDFG, RWQCB,MC, CT,SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1A	20	TBD	TBD	TBD	TBD	TBD	TBD
MC-SCS-4.2	Develop and implement water management plan for diversion operations	ACOE,BOR, NMFS,CDFG, SWRCB,CT,MC SCHR,EII,TCFT	Dams and Surface Water Diversions	1, 3, 4	1B	5	TBD	TBD	TBD	TBD	TBD	TBD
MC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, SWRCB,CDFG CT,SCHR,EII, TCFT,VC	Groundwater Extraction	1, 4	1B	5	275550	0	0	0	0	275550
MC-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, SWRCB,CDFG, CT,SCHR,EII, TCFT,VC	Groundwater Extraction	1, 4	1B	10	254350	39775	0	0	0	294125
MC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USFS,USFWS,USGS, ACOE, BLM,NMFS, CT,SCHR,EII, TCFT,VC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
MC-SCS-7.2	Develop and implement plan to restore natural channel features	CCC,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
MC-SCS-7.3	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,USGS, ACOE,BLM, NMFS,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
MC-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS, CDFG,CDMG CT,SCHR,EII, TCFT,VC	Mining and Quarrying	1, 4, 5	3B	5	68030	0	0	0	0	68030
MC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,NMFS, UFWS,USFS CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,NMFS, USFWS,USFS, CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
MC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,NMFS, USFWS,USFS, CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
MC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests	USFS,USFWS, NMFS,CDFG, MC,CT, SCHR,EII,TCFT, VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
MC-SCS-10.2	Manage off-road recreational vehicle activity in riparian floodplain corridors	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing -cost of doing business	0	0	0	0	0	0
MC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USDOT,CDOT, USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
MC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	USDOT,NMFS, CDOT,CDFG, RWQCB CT,SCHR,EII, TCFT,VC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,USFWS, CDFG,CT, SCHR,EII,TCFT, VC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
MC-SCS-13.2	Retrofit storm drains in developed areas	USDOT,NMFS, CDOT,CDFG, CT,SCHR,EII, TCFT,VC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
MC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, MC,CT,SCHR, EII,TCFT,VC	Urban Effluents	1, 4	2B	ongoing -cost of doing business	0	0	0	0	0	0
MC-SCS-14.2	Review, assess and modify residential and commercial wastewater septic treatment facilities	RWQCB, CDFG,NMFS, MC,CT,SCHR, EII,TCFT,VC	Urban Effluents	1, 4	2B	ongoing -cost of doing business	0	0	0	0	0	0
MC-SCS-14.3	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, CT,SCHR,EII, TCFT,VC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
MC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,CDFG, LPFW,CT, SCHR,EII,TCFT, VC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
North Fork Matilija Creek												
NFMC-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Agricultural Development	1, 4,	2B	5	47520	0	0	0	0	47520
NFMC-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Agricultural Development	1, 4	2B	0	0	0	0	0	0	0
NFMC-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFWS,USFWS,NMFS, SWRCB, REWQCB, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
NFMC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	USFS,USFWS,NMFS,CDFG,CT, SCHR,EII,TCFT, VC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
NFMC-SCS-4.1	Develop and implement water management plan for diversion operations	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	2B	5	91850	0	0	0	0	91850
NFMC-SCS-4.2	Provide fish passage around dams and diversions	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1A	5	91850	0	0	0		91850

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
NFMC-SCS-5.1	Develop and implement flood control maintenance program	USFS,USFWS, NMFS,CDFG, CDOT,CT, SCHR,EII,TCFT, VC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
NFMC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
NFMC-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,USFWS, USFS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
NFMC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	NMFS,USFWS, ACOE, CDFG, CT,SCHR,EII, TCFT,VC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
NFMC-SCS-7.2	Develop and implement plan to restore natural channel features	NMFS, USFWS,ACOE, CDFG,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
NFMC-SCS-8.1	Develop and implement plan to remove and maintain quarry and landslide debris from the channel	USGS,NMFS, USFS,USFWS, CDFG,CDMG, MC,CT, SCHR,EII,TCFT, VC	Mining and Quarrying	1, 4, 5	1A	5	68030	0	0	0	0	68030
NFMC-SCS-8.2	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMG,CT, SCHR,EII, TCFT,VC	Mining and Quarrying	1, 4, 5	2B	5	68030	0	0	0	0	68030

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
NFMC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
NFMC-SCS-9.2	Develop and implement non-native species monitoring program	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
NFMC-SCS-9.3	Develop and implement public education program on non-native species impacts	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
NFMC-SCS-10.1	Develop and implement public education program on watershed processes	CDFG,NMFS, CT,SCHR,EII, TCFT,VC	Recreational Facilities	1, 3,5	2B	20	76140	76140	76140	76140	0	304560
NFMC-SCS-10.2	Review and modify develop and management plans for recreational areas and national forests (*e.g.*, U.S. Forest Service Los Padres National Forest Land Management Plan, Southern California National Forest Vision, Forest	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	Strategy, and Design Criteria)											
NFMC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCF, VC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
NFMC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	CDOT,USFS, USFWS,NMFS, CDFG,CT,SCHR,EII, TCFT,VC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
NFMC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, USGS,NMFS, CDFG,LPFW, CT,SCHR,EII, TCFT,VC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Antonio Creek												
SAC-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Development	1,4	2B	5	62400	0	0	0	0	62400
SAC-SCS-1.2	Manage agricultural development and restore riparian zones	NRCS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Development	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SAC-SCS-1.3	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Development	1, 4,	2B	5	47520	0	0	0	0	47520
SAC-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,UWFWS, NMFS, RWQCB, CDFG,CT, SCHR,EII,TCFT, VC	Agricultural Effluents	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
SAC-SCS-2.2	Develop and implement plan to minimize runoff from agricultural activities	USSC,USFWS, NMFS,CDFG, SWRCB,CT, SCHR,EII,TCFT, VC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SAC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USFWS, CDOT,CDFG, CT,SCHR,EII, TCFT,VC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAC-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,USFWS, SWRCB,CDFG, CT,SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 4	1A	5	TBD	TBD	TBD	TBD	TBD	TBD
SAC-SCS-5.1	Develop and implement flood control maintenance program	NMFS,NRCS, CDFG,CT, SCHR,EII,TCFT, VC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
SAC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS,USFWS,CDFG,CT, SCHR,EII,TCFT, VC	Groundwater Extraction	1, 4	1B	5	275550	0	0	0	0	275550
SAC-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS,USFWS,CDFG,CT, SCHR,EII,TCFT	Groundwater Extraction	1, 4	1B	10	254350	39775	0	0	0	294125
SAC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	USGS,ACOE, BLM,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
SAC-SCS-7.2	Develop and implement plan to restore natural channel features	NRCS,ACOE,NMFS,CDFG, CT,SCHR,EII, TCFT,VC	Levees and Channelization	1, 4	2B	20	4217625	4217625	4217625	4217625	0	16870500
SAC-SCS-7.3	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,NRCS, NMFS,ACOE, CDFG,CT, SCHR,EII,TCFT, VC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAC-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,USFWS, NMFS,CT, SCHR,EII,TCFT, VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SAC-SCS-9.2	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,USFWS, NMFS,CT, SCHR,EII,TCFT, VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SAC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,USFWS, NMFS,CT, SCHR,EII,TCFT, VC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SAC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* Camp Comfort)	USFS,USFWS, NMFS,CDFG, NMFS,CT, SCHR,EII,TCFT, VC	Recreational Facilities	1, 3, 5	2B	ongoing – doing business	0	0	0	0	0	0
SAC-SCS-10.2	Develop, adopt, and implement recreational land-use planning policies	USFS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Recreational Facilities	1, 2, 3, 4, 5	2B	5	62400	0	0	0	0	62400
SAC-SCS-10.3	Develop and implement public education program on watershed processes	USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Recreational Facilities	1, 2, 3, 4	2B	5	62400	0	0	0	0	62400

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAC-SCS-11.1	Retrofit storm drains to filter runoff from roadways	CDOT,RWQC, CDFG,NMFS, USFWS,SCHR, EII,TCFT,VC	Road	1, 4	2B	20-regional costs	0	0	0		0	0
SAC-SCS-11.2	Manage roadways adjacent riparian corridor and restore abandoned roadways	CDOT,NRCSUS FWS,NMFS, CDFG,CT, SCHR,EII,TCFT, VC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SAC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,USFWS, CDFG,CT, SCHR,EII,TCFT, VC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
SAC-SCS-13.2	Retrofit storm drains in developed areas	CDOT,CDFG, NMFS,USFWS, CT,SCHR,EII, TCFT,VC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
SAC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB,CDF G SWRCB,NMFS, USFWS,CT, SCHR,EII,TCFT, VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SAC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, USFWS,CT, SCHR,EII,TCFT, VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SAC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,LPFW, CT,SCHR,EII, TCFT,VC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 9-7. Southern California Steelhead DPS Recovery Action Table for Santa Clara River Sub-Watersheds (Monte Arido Highlands BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Mainstem Santa Clara River												
SCR-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII, TCFT,VC,LAC	Agricultural Development	1, 4,	2B	20	62400	0	0	0	0	62400
SCR-SCS-1.2	Manage agricultural development and restore riparian zones	NRCS,USFWS,NMFS,BLM, CDFG,CT, SCHR,EII,TCFT, VC,LAC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
SCR-SCS-1.3	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USFWS,NMFS,BLM, CDFG,CT, SCHR,EII,TCFT, VC,LAC	Agricultural Development	1,4	2B	5	62400	0	0	0	0	62400
SCR-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFWS SWRCB, RWQCB, CDFG,CT, SCHR,EII,TCFT, VC,LAC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SCR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed (See Santa Clara River Steelhead Trout Assessment and Recovery Opportunities, 2005.)	NMFS,USFWS, ACOE,CDFG, DWR,CT,SCHR, EII,TCFT,VC, LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
SCR-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, Vern Freeman Diversion)	NMFS,BOR, ACOE, USFWS, SWRCB,CDFG, DWR,CT,SCHR, EII,TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1A	20	TBD	TBD	TBD	TBD	TBD	TBD
SCR-SCS-4.2	Develop and implement water management plan for diversion operations (*e.g.*, Vern Freeman Diversion)	NMFS,BOR, SWRCB,USGS, USFWS,CDFG, CT, SCHR,EII, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	1A	5	50440	0	0	0	0	50440
SCR-SCS-5.1	Develop and implement flood control maintenance program	USGS,USFWS, ACOE,BLM, NMFS,CDFG, CT,SCHR,EII, TCFT,VC,LAC	Flood Control Maintenance	1, 4	1B	100	0	0	0	0	0	0
SCR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, SWRB,CDFG, CT,SCHR,EII, TCFT,VC,LAC	Groundwater Extraction	1, 4	1A	5	275550	0	0	0	0	275550

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SCR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,SWRCB, NMFS,CDFG, CT, SCHR,EII, TCFT,VC,LAC	Groundwater Extraction	1, 4	1B	10	254350	39775	0	0	0	294125
SCR-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CCC,NMFS, CDFG,CT, SCHR,EII,TCFT, VC,LAC	Levees and Channelization	1, 4	1B	20	4217625	4217625	4217625	4217625	0	16870500
SCR-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,USGS, ACOE,BLM, NMFS,CT, SCHR,EII,TCFT, VC,LAC	Levees and Channelization	1, 4	1B	100	0	0	0	0	0	0
SCR-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMGCT, SCHR,EII,TCFT, VC,LAC	Mining and Quarrying	1, 4, 5	2B	5	68030	0	0	0	0	68030
SCR-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	USFS,USFWS, NMFS,CDFG, CDPR,CT, SCHR,EII,TCFT, VC,LAC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SCR-SCS-9.2	Develop and implement non-native species monitoring program	USFS,USFWS, NMFS,CDFG, CDPR,CT, SCHR,EII,TCFT, VC,LAC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SCR-SCS-9.3	Develop and implement public education program on non-native species impacts	USFS,UFWS,NMFS,CDFG, CDPR,CT, SCHR,EII, TCFT,VC,LAC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SCR-SCS-10.1	Review and modify development and management plans recreational areas and national forests	CCC,NMFS, BLM,CT, SCHR,EII, TCFT,VC,LAC	Recreational Facilities	1, 2, 3, 4, 5	1B	1	68030	0	0	0	0	68030
SCR-SCS-12.1	Develop and implement an estuary restoration and management plan	NMFS,USFS, USFWS,CCC, CDFG,FOSCR, CT, SCHR,EII, TCFT,VC,LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	156333 335	0	0	0	0	156333335
SCR-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, NMFS,CT, SCHR,EII,TCFT, VC,LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	312000	0	0	0	0	312000
SCR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, USGS,NMFS, CDFG,LPFW, CT,SCHR,EII, TCFT,VC,LAC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Santa Paula Creek												
SP-SCS-1.1	Manage Livestock grazing to maintain or restore aquatic habitat functions	NRCS,USFWS,NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Agricultural Development	1, 4	2B	20	12400	4998400	4998400	4998400	0	4998400
SP-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USFWS,NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
SP-SCS-1-3	Manage agricultural development and restore riparian zones	NRCS,USFWS,NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Agricultural Development	1, 4	2B	20	12400	4998400	4998400	4998400	0	4998400
SP-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,NMFS, USFWS, SWRCB, RWQCB,CDFG CT,SCHR,EII, TCFT,VC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SP-SCS-3.1	Develop and implement plant to remove or modify fish passage barriers within the watershed (See Santa Clara River Steelhead Trout Assessment and Recovery Opportunities, 2005.)	NMFS,USFS, USFWS,ACOE, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SP-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, Harvey Diversion)	NMFS,ACOE, USFWS,DWR, CT,SCHR,EII, TCFT,KSW,VC	Dams and Surface Water Diversions	1, 3, 4	1A	5	TBD	TBD	TBD	TBD	TBD	TBD
SP-SCS-4.2	Develop and implement water management plan for diversion operations	USGS,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Dams and Surface Water Diversions	1, 3, 4	1A	5	TBD	TBD	TBD	TBD	TBD	TBD
SP-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NRCS BLM,NMFS, USFWS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Flood Control Maintenance	1, 4	1B	100	0	0	0	0	0	0
SP-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, USFWS,CDFG, SWRCB,CT, SCHR,EII,TCFT, KSW,VC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
SP-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, USFWS,CDFG, SWRCB,CT, SCHR,EII,TCFT, KSW,VC	Groundwater Extraction	1, 4	2B	3	275550	0	0	0	0	275550
SP-SCS-7.1	Develop and implement plan to restore natural channel features	NMFS,NRCS, USFWS, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Levees and Channelization	1, 4	1B	20	4217625	4217625	4217625	4217625	0	16870500

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SP-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,NRCS, USGS,ACOE, BLM,NMFS, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Levees and Channelization	1, 4	1B	100	0	0	0	0	0	0
SP-SCS-7.3	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USGS, ACOE,BLM, NMFS,CDFG CT,SCHR,EII, TCFT,KSW,VC	Levees and Channelization	1, 4	1B	20	4217625	4217625	4217625	4217625	4217625	16870500
SP-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,USFS, USFWS,NMFS, CDFG,CT, SCHR,EII, TCFT,KSW,VC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SP-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,NMFS, USFWS,USFS, CT,SCHR,EII, TCFT,KSW,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SP-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,NMFS, USFS,USFWS, CT,SCHR,EII, TCFT,KSW,VC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SP-SCS-10.1	Review and modify development and management plans for	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	recreational areas and national forests (*e.g.*, Steckel Park)											
SP-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SP-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,USFWS, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
SP-SCS-13.2	Retrofit storm drains in developed areas	NMFS,CDOT, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
SP-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,CT, SCHR,EII,TCFT, KSW,VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SP-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB,CDFG NMFS,USFWS, CT,SCHR,EII, TCFT,KSW,VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SP-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan,	USFS,USFWS, NMFS,USGS, CDFG,LPFW, CT,SCHR,EII, TCFT,KSW,VC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sespe Creek												
SesC-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USFS, USFWS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Agricultural Development	1, 4	2B	20	62000	24992000	24992000	24992000	0	75038000
SesC-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,NMFS, USFS,USFWS, BLM,CDFG, RWQCB,CT, SCHR,EII,TCFT, KSW,VC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
SesC-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,NMFS, RWQCB, SWRCB,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SesC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed (See Santa Clara River Steelhead Trout Assessment and Recovery Opportunities, 2005.)	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 - refer to regional costs	0	0	0	0	0	0
SesC-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,USFWS,SWRCB,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Dams and Surface Water Diversions	1, 3, 4	1A	5	91850	0	0	0	0	91850
SESC-SCS-4.2	Provide fish passage around dams and diversions	NMFS,USFWS,SWRCB,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Dams and Surface Water Diversions	1, 3, 4	1A	5	91850	0	0	0	0	91850

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SesC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,NMFS, USFWS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
SesC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, SWRCB,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Groundwater Extraction	1, 4	1B	5	275550	0	0	0	0	275550
SesC-SCS-5.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, SWRCB,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Groundwater Extraction	1, 4	1B	10	254350	39775	0	0	0	294125
SesC-SCS-7.1	Develop and implement plan to restore natural channel features	NRCS,NMFS, USFWS,ACOE, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Levees and Channelization	1, 4	2B	20	4217625	4217625	4217625	4217625	0	16870500
SesC-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,NRCS, USGS,USFWS, ACOE,BLM, NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
SesC-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMGCT, SCHR,EII,TCFT, KSW,VC	Mining and Quarrying	1, 4, 5	2B	5	68030	0	0	0	0	68030
SesC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,USFS, USFWS,NMFS, CT,SCHR,EII, TCFT,KSW,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SesC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,NMFS, CT,SCHR,EII, TCFT,KSW,VC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SesC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,USFS, USFWS,NMFS, CT,SCHR,EII, TCFT,KSW,VC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SesC-SCS-10.1	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SesC-SCS-10.2	Review and modify development and management plans for recreational areas and national forests (*e.g.,* U.S. Forest Service Los Padres National Forest Land Management Plan Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,CDFG, CT,SCHR,EII, TCFT,KSW,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SesC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USFS,USFWS, NMFS,CDOT,CDFG,CT, SCHR,EII,TCFT, KSW,VC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SesC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	USFS,USFWS,NMFS,CDOT, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SesC-SCS-13.1	Develop and implement riparian restoration plan to replace artificial bank stabilization structures	NRCS,NMFS, FEMA,AOEC, BLM,CT, SCHR,EII,TCFT, KSW,VC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
SesC-SCS-13.2	Retrofit storm drains in developed areas	NMFS,CDOT, CDFG,CT, SCHR,EII,TCFT, KSW,VC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
SesC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,SCHR,EII, TCFT,KSW,VC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SesC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.*, Cuyama Community Sanitation District Treatment Facility)	RWQCB, CDFG,NMFS, USFS,USFWS, CT,SCHR,EII, TCFT,KSW,VC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
SesC-SCS-15.1	Develop and implement an integrated wildland fire and	USFS,USFWS, USGS,NMFS, CDFG,LPFW, CT,SCHR,EII,	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	hazardous fuels management plan	TCFT,KSW,VC										

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Piru Creek												
PC-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USFS, USFWS,NMFS, BLM,CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
PC-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USFS, USFWS,NMFS, BLM,CDFG,CT, SCHR,EII,TCFT, VC,LAC	Agricultural Development	1, 4	2B	5	47520	0	0	0	0	47520
PC-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,USFS, USFWS,NMFS, BLM,CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Agricultural Development	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
PC-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,NMFS, RWQCB,CT, SCHR,EII,TCFT, KSW,VC,LAC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
PC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed (See Santa Clara River Steelhead Trout Assessment and Recovery Opportunities, 2005.)	NMFS,USFS, USFWS,ACOE, BLM,CDFG, DWR,CTS,CHR, EII,TCFT,KSW, VC,LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
PC-SCS-4.1	Provide fish passage around dams and diversions (*e.g.,* Santa Felicia and Pyramid dams)	FERC,NMFS, USFS,USFWS, NMFS,DWR, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Dams and Surface Water Diversions	1, 3, 4	1A	10	TBD	TBD	TBD	TBD	TBD	TBD
PC-SCS-4.2	Develop and implement water management plan for dam operations	U FERC,NMFS, USFS,USFWS, NMFS,DWR, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Dams and Surface Water Diversions	1, 3, 4	1A	5	TBD	TBD	TBD	TBD	TBD	TBD
PC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,USGS, ACOE, BLM,NMFS, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Flood Control Maintenance	1, 4	1A	100	0	0	0	0	0	0
PC-SCS-5.2	Develop and implement flood control maintenance program	ACOE,USFWS, NMFS, CDFG, CT,SCHR,EII, TCFT,KSW,VC, LAC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
PC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,SWRCB, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
PC-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,SWRCB, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
PC-SCS-7.1	Develop and implement plan to vegetate levees and eliminate or minimize herbicide	FEMA,USGS, ACOE,BLM, NMFS,CT, SCHR,EII,TCFT, VC,LAC	Levees and Channelization	1, 4	1A	100	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	use near levees											
PC-SCS-7.2	Develop and implement plan to restore natural channel features	USGS,ACOE, BLM,NMFS, CT,SCHR,EII, TCFT,SW,VC, LAC	Levees and Channelization	1, 4	1B	20	4217625	4217625	4217625	4217625	0	16870500
PC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,NMFS, USFS,USFWS, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
PC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,NMFS, USFS,USFWS, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
PC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,NMFS, USFS,USFWS, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
PC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, U.S. Forest Service Los Padres National Forest Land Management Plan Southern California National Forest	USFS,USFWS, NMFS,CDFG, DWR,CT, SCHR,EII,TCFT, KSW,VC,LAC	Recreational Facilities	1, 2, 3, 4, 5		ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	Vision, Forest Strategy, and Design Criteria)											
PC-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,CDFG, DWR,CT, SCHR,EII,TCFT, VC,LAC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140		304560
PC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, USFS,USFWS, NMFS,CT, SCHR,EII,TCFT, KSW,VC,LAC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
PC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	NRCS,NMFS,CDOT,CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
PC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,USFWS, CDFG,CT, SCHR,EII,TCFT, KSW,VC,LAC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
PC-SCS-13.2	Retrofit storm drains in developed areas	CDOT,CDFG, NMFS,USFWS, CT,SCHR,EII, TCFT,KSW,VC, LAC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
PC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,NMFS, USFWS,CDFG, CT,SCHR,EII, TCFT,KSW,VC, LAC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
PC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, USFWS,CT, SCHR,EII,TCFT, KSW,VC,LAC	Urban Effluents	1, 4	33	ongoing - cost of doing business	0	0	0	0	0	0
PC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,LPFW, CT,SCHR,EII, TCFT,KSW,VC, LAC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

10. Conception Coast Biogeographic Population Group

"To the degree that trout are numerous and that they can give rise to anadromous fish, the viability of the steelhead population may be enhanced: by contributions to abundance and productivity, and by allowing the population to persist through multi-year droughts that interfere with steelhead migration from the ocean."

NOAA Fisheries Technical Recovery Team
Steelhead of the South-Central and Southern California Coast, 2006

10.1 LOCATION AND PHYSICAL CHARACTERISTICS

The Conception Coast BPG region encompasses eight small, coastal watersheds that drain a 50-mile long stretch of the south-facing slopes of the Santa Ynez Mountains in southern Santa Barbara County and extreme southwestern Ventura County (Figure 10-1). The Santa Ynez Mountains are an east-west trending spur of the Transverse Range that creates some of the steepest watersheds in any of the five BPG regions in the SCS Recovery Planning Area. Peak elevations reach 4,300 feet within a few miles of the Pacific Ocean. These watersheds are relatively homogeneous in slope, aspect, and size, with steep upper watersheds and lower watersheds that cut across a relatively narrow coastal terrace.

Conception Coast Watersheds

Stream lengths are relatively short in this BPG region. The Gaviota Creek watershed penetrates the furthest inland (about seven miles). Goleta Slough, the largest estuary in this BPG region, is formed by the confluence of several sub-watersheds: Tecolotito Creek, Los Carneros Creek, San Pedro Creek, Las Vegas Creek, Maria Ygnacio Creek, San Jose Creek, and Atascadero Creek. Of these, the latter three watersheds were evaluated using the CAP analyses. The majority of the watersheds within this BPG maintain perennial flow in their upper reaches, often in association with deep bed-rock pools, and supported by groundwater and flow

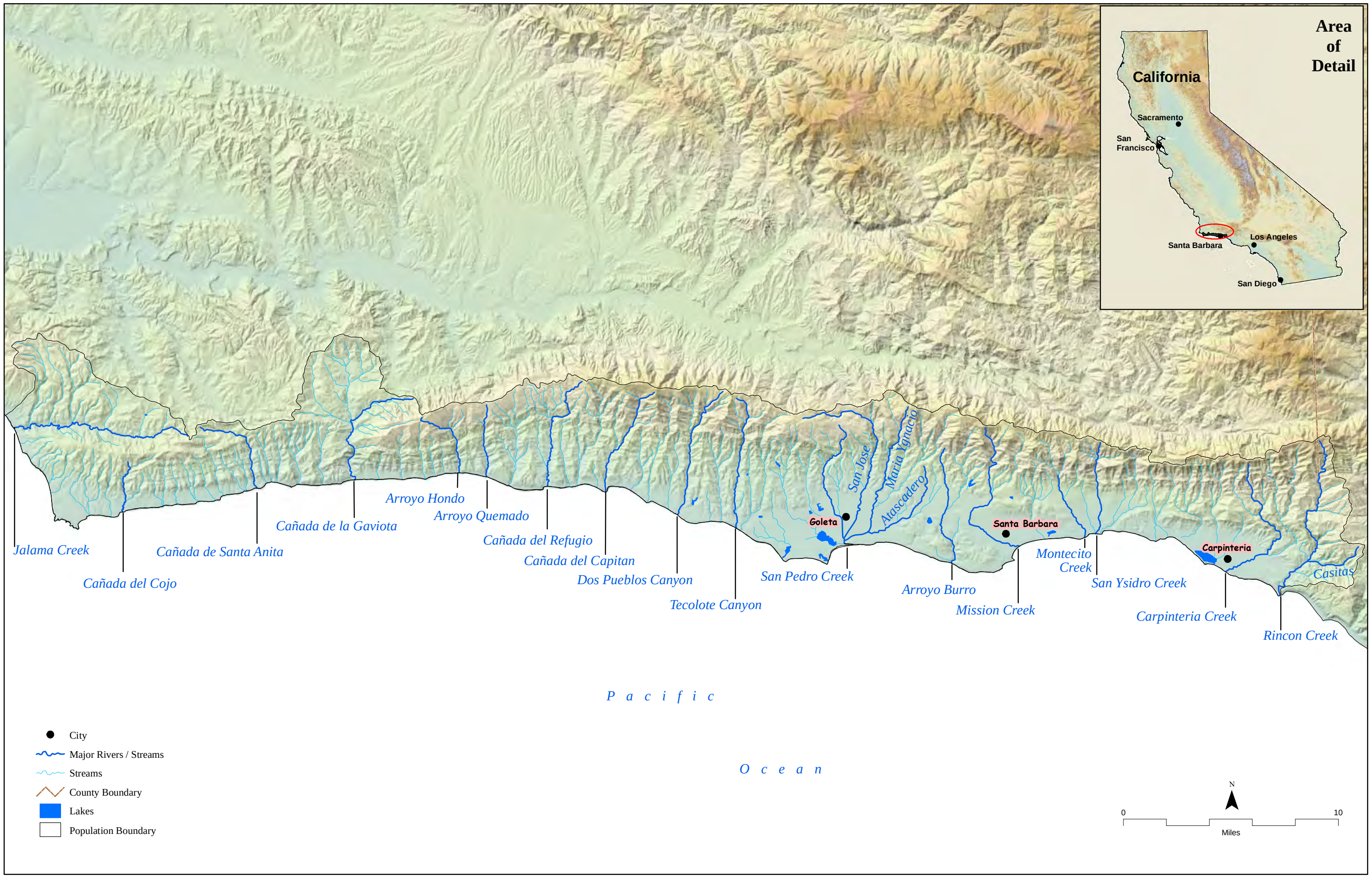


Figure 10-1. The Conception Coast BPG region. Ten populations/watersheds were analyzed in this region: Jalama, Santa Anita, Gaviota, Arroyo Hondo, Tecolote, Mission, Montecito, Carpinteria, and Rincon Creeks, and four sub-watersheds in the Goleta Slough watershed.

through fractured rock along geologic fault lines.

Maria Ygnacio Creek

The second largest estuary in this BPG region, Carpinteria Slough, is formed by a synclinal Watershed fed by Santa Monica Creek and several minor drainages that are not included in the basin covered in the Conception Coast BPG region.

Carpinteria Creek

Precipitation in this region increases strongly with increasing elevation. Rainfall amounts in the upper watersheds can be five to six times higher than on the coastal terrace of these watersheds during the same storm event, and the steep topography creates extremely "flashy" flows.

Gaviota Creek

In addition to the watersheds considered here, there are a number of smaller watersheds within this BPG (*e.g.*, San Antonio, Los Carneros, Glen Annie, and McCloy Creeks) which may also be used by steelhead when water conditions are favorable (Hunt & Associates 2008a, Kier Associates 2008b).

10.2 LAND USE

Table 10-1 summarizes land use and population density in this region. The coastal terrace and middle portions of these watersheds receive the most intensive land use. Human population density varies widely between the component watersheds, averaging about 605 persons per square mile over the entire BPG region. The western half of the BPG region has very low population density (1 - 59 persons/square mile), while the Goleta Slough and Mission Creek watersheds average 1,201 and 3,491 persons per square mile, respectively (see Table 10-1 for additional comparisons).

In most of the watersheds in this BPG region, the first land use change was livestock ranching and dry farming, followed by irrigated row-crop agriculture, particularly orchard crops such as avocados, lemons, and walnuts. Most recently, steeper slopes in the middle reaches of some watersheds have been developed with avocado and other orchard crops. Urbanization followed this trend on the coastal plain in the eastern half of this BPG region then moved up into the more mountainous portions of the watersheds as cities grew in size. The upper watersheds throughout this region are located within the Los Padres National Forest, whereas the coastal and middle watersheds are mostly privately owned. Semi-developed rural land and orchards cover extensive portions of the coastal and middle portions of the western watersheds. Most of the Arroyo Hondo watershed has recently been put under a conservation easement and is managed by the Land Trust of Santa Barbara County.

A number of coastal areas in this region have been developed as County and State Parks, including Jalama Beach County Park (Jalama Creek), Gaviota State Beach (Gaviota Creek), Refugio State Beach (Refugio Creek), El Capitan State Beach (El Capitan Creek), Goleta Beach County Park (mouth of Goleta Slough), Arroyo Burro Beach County Park (Arroyo Burro Creek), City of Santa Barbara beaches (east and west of mouth of Mission Creek), Carpinteria State Beach (Carpinteria Creek), and Rincon Beach County Park (Rincon Creek). Each of these parks is situated along lower reaches of these drainages, including the estuary.

Carpinteria Valley Agriculture

Agriculture (orchard cultivation and livestock ranching), are important land uses that directly or indirectly impact watershed processes throughout these watersheds. Most of the municipal water for Goleta, Santa Barbara, Montecito, Summerland, and Carpinteria is supplied by reservoirs on the middle and upper mainstem of the Santa Ynez River on the north side of the Santa Ynez Range. This municipal water source is supplemented by groundwater wells located throughout the coastal terrace. The ranches that support irrigated orchard crops in these watersheds also depend heavily on groundwater as their source for agricultural water. Some large ranches have diversions and dams on their property to create reservoirs for agricultural use (*e.g.*, Glen Annie Canyon, an unnamed tributary of Dos Pueblos Creek, and Gato Creek).

Some of these reservoirs support small populations of bullfrogs and non-native predatory fish (*e.g.*, Dos Pueblos Creek tributary reservoir), but the majority of the drainages in these watersheds are relatively free from these predators. Non-native crayfish and western mosquitofish, which may prey on *O. mykiss* eggs, occur in many urbanized drainages. Tecolotito Creek in the Goleta Slough watershed supports a reproducing population of African clawed frogs (*Xenopus laevis*), which may be a predator on certain *O. mykiss* life stages.

10.3 CURRENT WATERSHED CONDITIONS

Watershed conditions were assessed for ten watersheds in the Conception Coast BPG region. In general, instream, riparian, and floodplain conditions for steelhead in these watersheds offer fair to good habitat conditions for anadromous *O. mykiss*, although conditions vary widely within and between watersheds, depending on land uses. The upper watersheds consistently

Table 10-1. Physical and Land-Use Characteristics of Major Watersheds in the Conception Coast BPG region.

	PHYSICAL CHARACTERISTICS					LAND USE			
WATERSHEDS (west to east)	**Area** (acres)[1]	**Area** (sq. miles)[1]	**Stream Length**[2] (miles)	**Ave. Ann. Rainfall**[3] (inches)	**Total Human Population**[4]	**Public Ownership***	**Urban Area**[5]	**Agriculture/ Barren**[5]	**Open Space**[5]
Jalama Creek	15800	25	45	17.4	59			< 1%	
Canada de Santa Anita	2067	3	5	17.4	16			< 1%	
Gaviota Creek	12912	20	39	17.5	40			1%	
Arroyo Hondo	2796	4	6	17.8	1			< 1%	
Tecolote Creek	3726	6	11	19	339			18%	
Goleta Slough**	30410	48	92	19.2	57,664			16%	
Mission Creek	7760	12	16	19.6	41,890			3%	
Montecito Creek	3970	6	11	19.5	2,453			< 1%	
Carpinteria Creek	10712	17	25	19.8	3,493			20%	
Rincon Creek	9422	15	25	19.3	324			23%	
TOTAL or AVERAGE	**213099**	**333**	**560*** **	**18.6**	**201,459*** **		**16%**	**8%**	**74%**

[1] *From: CDFFP CalWater 2.2 Watershed delineation, 1999 (www.ca.nrcs.usda.gov/features/calwater/)*
[2] *From: CDFG 1:1,000,000 Routed stream network, 2003 (www.calfish.org/)*
[3] *From: USGS Hydrologic landscape regions of the U.S., 2003 (1 km grid cells)*
[4] *From: CDFFP Census 2000 block data (migrated), 2003; preliminary analysis of Census 2010 indicates the population in component watersheds is 122,787*
[5] *From: CDFFP Multi-source land cover data (v02_2), 2002 (100 m grid cells) (http://frap.cdf.ca.gov/data/frapgisdata/select.asp)*
* *Includes National Forest Lands only; does not include State or County Parks or Military Reservations (from: http://old.casil.ucdavis.edu/casil/gis.ca.gov/teale/govtowna/)*
** Goleta Slough" includes analyses only for San Jose, San Pedro, Maria Ygnacio, and Atascadero creeks
**** Total for entire BPG region, not component watersheds*

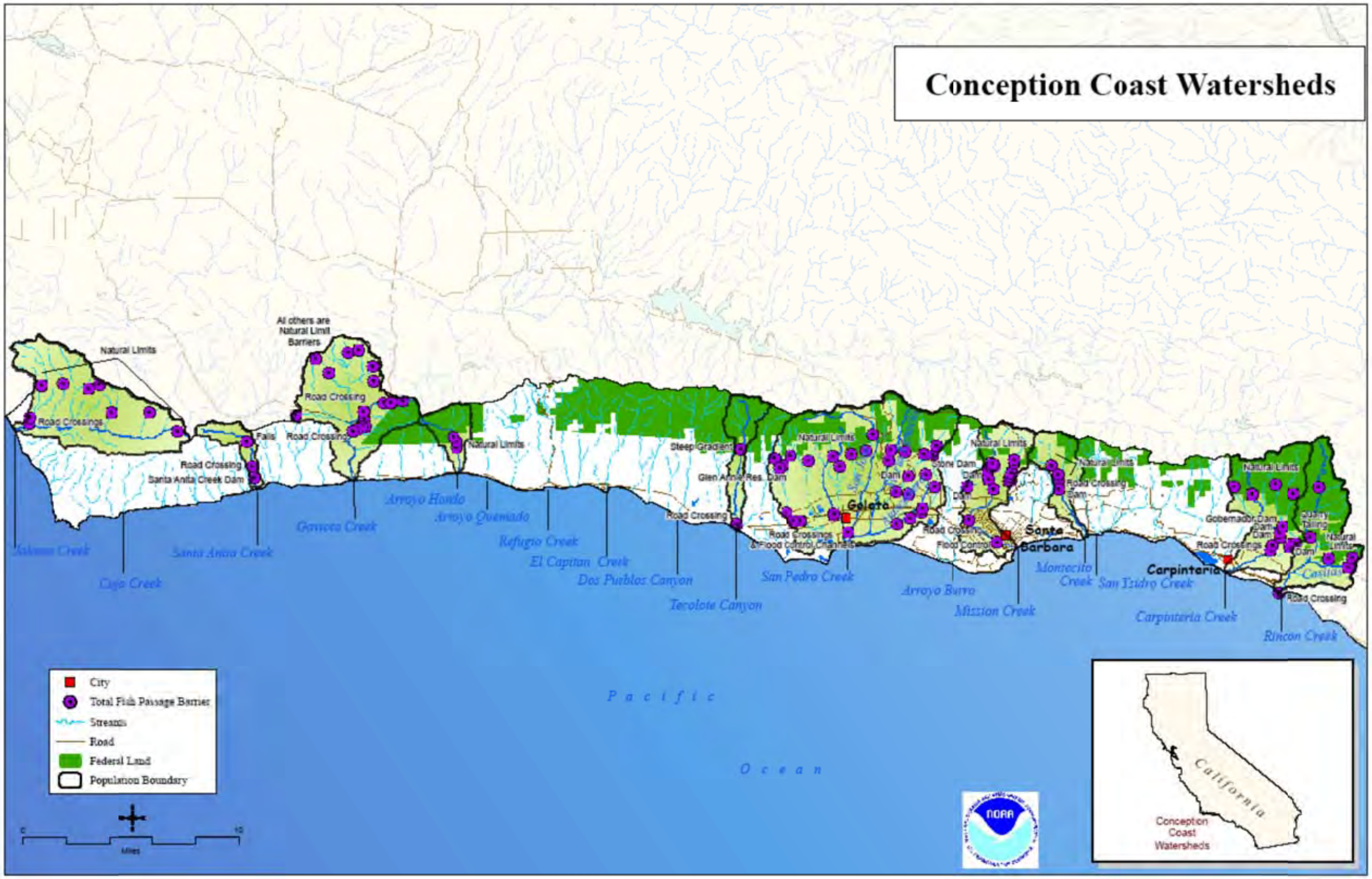


Figure 10-2. Conception Coast BPG Watersheds.

support good to excellent quality spawning and rearing habitat; however, conditions in each of these watersheds deteriorate downstream on the coastal plain. Highway 101 and the Union Pacific Railroad tracks and U.S. Highway 101 traverse the mainstem of each of these watersheds at or in close proximity to their mouths, which has damaged estuarine habitat and created passage impediments for anadromous *O. mykiss*.

Arroyo Hondo Creek Estuary

Agricultural activities, such as groundwater extraction, have reduced surface flows and degraded habitat conditions in the lower and middle portions of these watersheds. Urban development dominates the lower reaches of the Goleta Slough, Mission Creek, Montecito Creek, and Carpinteria Creek watersheds (Hunt & Associates 2008a, Kier Associates 2008b).

Rincon Creek

Most of these watersheds also exhibit high road densities. The Arroyo Hondo watershed provides the least disturbed conditions for steelhead in this BPG because of low-intensity land use and its inclusion in a natural reserve system managed by the Land Trust of Santa Barbara County. The Goleta Slough watershed (San Jose, San Pedro, Maria Ygnacio, and Atascadero creeks) and the Mission Creek and Rincon Creek watersheds exhibit the least favorable conditions; however, their upper watersheds sustain reproducing populations of non-anadromous *O. mykiss* and occasionally anadromous forms despite urbanization, channelization, channel maintenance, and other urban land uses throughout their lower reaches.

Mission Creek

The terrain of the Santa Ynez Mountains results in development on steep slopes, often accompanied by road cuts to provide access, thus affecting watershed processes such as erosion and sedimentation. Development has also occurred along narrow riparian corridors, which encourages bank stabilization, levee construction, and other flood control activities that physically constrain the ability of streams to maintain natural channel morphology and riparian vegetation.

Montecito Creek

The increase of impermeable surfaces as a result of urbanization (including roads) along the coastal terraces, and the development of agricultural homes on steep slopes, has altered the natural flow regime of streams, particularly in the lower reaches, increasing the frequency and intensity of flood flows.

Rincon Creek Estuary (Courtesy California Coastal Commission)

Estuarine habitats at the mouths of these watersheds in this BPG region have been reduced in size by 70 to 95 percent by the development of roads and railroads, urbanization, and development of recreational facilities. Historically, these estuaries were relatively small with two notable exceptions: Goleta Slough, formed by the confluence of several watersheds, and the estuary associated with Mission Creek, comprised extensive wetland habitats in this BPG region that encompassed thousands of acres. The remaining estuarine habitats are subject to constriction and isolation by development, surface runoff from roads and other impervious surfaces, as well as a reduction in the amount and quality of surface flows resulting from groundwater extraction.

10.4 THREATS AND THREAT SOURCES

Varying numbers and intensity of habitat impairments (sources of threats) were identified in the CAP Workbooks analyses, ranging from 10 in the Gaviota Creek and Arroyo Hondo watersheds to 17 in the Rincon Creek watershed. "Severe" and "Very Severe" sources of threats exist in all of the watersheds in this BPG region, but the Arroyo Hondo watershed has the least number and severity of threats for anadromous *O. mykiss*. Threat sources are concentrated in the middle and lower portions of the watersheds and are associated with urban and agricultural development. The number and severity of threats generally diminishes in the upper, undeveloped portion of these watersheds. Anadromous and non-anadromous *O. mykiss* spawn in the upper reaches of most, even in the degraded lower reaches, of some of these drainages, such as Maria Ygnacio, Mission, and Carpinteria creeks (Hunt & Associates 2008a, Kier Associates 2008b).

Thirteen anthropogenic activities, all strongly associated with urban and agricultural development, ranked as the top sources of stress to *O. mykiss* in the Conception Coast BPG watersheds (Table 10-2). Road density, including roads in close proximity to stream riparian zones, and passage barriers associated with transportation corridors, consistently ranked as "Severe" to "Very Severe" threat sources. Proximal stressors associated with increased road density, especially roads near the drainage, include increased non-point pollution, sedimentation, substrate embeddedness, floodplain encroachment and constriction, channel incision, and loss of channel structural complexity.

Increased road density also leads to increased frequency of road crossings, culverts, and other structures that can form passage barriers, preventing anadromous *O. mykiss* from accessing spawning and rearing habitat. As previously stated, Highway 101 and the Union Pacific Railroad tracks cross the mainstem of each of these watersheds near their mouths, in most cases through culverts. Highway 101 and the railroad tracks typically crossed these drainages by filling streambeds with earthen berms and forcing streams to flow through culverts of varying lengths. In some cases, construction of these transportation corridors reduced the extent of estuarine habitat. The Highway 101 culvert on Rincon Creek and a number of other creeks is an impassable barrier preventing anadromous *O. mykiss* from reaching spawning and rearing habitat and isolating formerly anadromous populations in the upper watershed.

Groundwater extraction for municipal and agricultural use also is a pervasive threat source among these watersheds. Widespread pumping of groundwater routinely eliminates surface flows and de-waters pools in portions of most of these drainages. The magnitude of loss of surface flows and the severity of passage barriers is exacerbated during years of below-average precipitation. Numerous diversions (*e.g.*, McCloy, Glen Annie, Carneros, San Pedro, Fremont, an unnamed tributary to San Jose, Maria Ygnacio, and San Antonio Creeks) and debris basins have further altered natural flow and sediment regimes, impeding access to and degrading spawning and rearing habitats, including estuarine habitats. These effects negatively impact multiple *O. mykiss* life stages (*e.g.*, development of eggs, alevins, fry, and parr).

Increasing urbanization of the Tecolote Creek, Goleta Slough, Mission Creek, Montecito Creek, and Carpinteria Creek watersheds creates a number of threat sources ranging from increased road density to floodplain encroachment and the heightened need for flood control structures, such as levees and channelization, and greater channel maintenance.

Six other threat sources are specific to one or two watersheds and have seriously degraded habitat conditions for steelhead there. For example, past quarrying activities in Rincon Creek have created a rock barrier that completely blocks upstream migration of anadromous *O. mykiss* and severely impedes downstream migration of resident non-anadromous *O. mykiss* above this barrier. Fire has recently burned much of the Gaviota Creek watershed and erosion of burned slopes in the watershed is a significant, though diminishing source of sediment. Recently non-native species of sunfish have been observed in upper Rattlesnake Creek, an important steelhead spawning and rearing tributary to Mission Creek. Gaviota State Beach campground was developed along the margins of the estuary at the mouth of the Gaviota Creek watershed and has substantially reduced the size and complexity of the estuary, degraded water quality, and created a severe passage impediment at a road crossing that provides access to Gaviota State Beach campground and Hollister Ranch. Jalama Creek and Canada de Santa Anita also have dams or other severe passage impediments on their mainstems and tributaries (Hunt & Associates 2008b, Kier Associates 2008b).

Table 10-2. Threat source rankings in component watersheds in the Conception Coast BPG region (see CAP Workbooks for individual watersheds for details).

Conception Coast BPG Component Watersheds (north to south)										
Threat Source	Jalama Creek	Canada de Santa Anita	Gaviota Creek	Arroyo Hondo	Tecolote Creek	Goleta Slough*	Mission Creek	Montecito Creek	Carpinteria Creek	Rincon Creek
Roads	Light green	Dark green	Red	Dark green	Light green	Red	Red	Red	Red	Red
Culverts & Crossings (passage barrier)	Light green	Red	Red	Light green	Red	Red	Red	Yellow	Red	Red
Groundwater Extraction	Dark green	Dark green	Dark green	Dark green	Red	Red	Red	Yellow	Red	Red
Levees and Channelization	Dark green	Dark green	Red	Dark green	Dark green	Yellow	Red	Red	Red	Light green
Urban Development	Dark green	Dark green	Dark green	Dark green	Dark green	Red	Red	Red	Red	Dark green
Wildfires	Light green	Dark green	Red	Light green	Light green	Light green	Yellow	Yellow	Yellow	Yellow
Recreational Facilities	Light green	Dark green	Red	Dark green	Light green	Yellow	Light green	Dark green	Yellow	Light green
Upslope/ Upstream Activities	Dark green	Dark green	Light green	Light green	Light green	Yellow	Yellow	Light green	Yellow	Yellow
Flood Control Maintenance	Dark green	Dark green	Light green	Dark green	Dark green	Red	Light green	Light green	Yellow	Yellow
Mining and Quarrying	Dark green	Dark green	Dark green	Dark green	Dark green	Dark green	Dark green	Dark green	Dark green	Red
Agricultural Development	Dark green	Dark green	Light green	Dark green	Red	Red	Dark green	Dark green	Red	Red
Dams and Surface Water Diversions	Yellow	Red	Dark green	Dark green	Dark green	Light green	Dark green	Light green	Yellow	Dark green

Key: *Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat (Threat cell colors represent threat rating from CAP Workbook)*

**Wildfires were not identified during the CAP Workbook analyses as one of the top five threats in several of these watersheds, but recent fires in coastal watersheds since 2007 could result in significant habitats impacts. A number of diversions to stream tributaries to the Goleta Slough Complex have been identified, along with recent reports of non-native species in several watersheds; these threats should be further evaluated, and if necessary, addressed to protect affected steelhead habitats.*

10.5 SUMMARY

Culverts and road crossings (along with other fish passage barriers such as small dams) are widespread throughout the Conception Coast BPG region, cutting off or severely reducing access to upstream spawning and rearing habitats for anadromous *O. mykiss*. Groundwater extraction and numerous small surface diversions have significantly altered flow regimes, particularly in the lower stream reaches, and thus adversely affected both upstream and downstream fish passage and spawning and rearing opportunities. Levees and channelization associated with urban encroachment have restricted or eliminated riparian habitat, and urban and agricultural development (particularly on steep slopes) has altered run-off patterns and increased erosion and sedimentation, particularly in lower stream reaches. Additionally, impacts associated with wildland fires, including fire-fighting measures to control or extinguish them, and the post-fire measures to repair damages incurred in fighting wildland fires, pose potential threats to watersheds in this BPG. Table 10-3 summarizes the critical recovery actions needed within the Core 1 populations of this BPG, including the estimated cost for implementing such actions in five year increments over the first 25 years, and where applicable extended out to 100 years, though most recovery actions can be achieved within a shorter period.

Restoring conditions for anadromous *O. mykiss* passage, spawning, and/or rearing in these watersheds will require multiple, long-term, measures related to water management, and barrier removal or improvements. Impediments to fish passage stemming from the construction and maintenance of roads and other transportation corridors, privately-owned dams and other passage barriers on some drainages, groundwater extraction, modification of channel morphology and adjacent riparian habitats for flood control, and other instream activities need to be further evaluated for this BPG. Additionally, the loss of estuarine functions caused by filling and pollution from point and non-point agricultural and other anthropogenic waste discharges need to be addressed further in this region.

Carpinteria Creek Steelhead –1942

The threat sources discussed in this section should be the focus of a variety of recovery actions to address addresses specific risks to anadromous *O. mykiss* viability. Spatial and temporal data, for water temperature, pH, nutrients, *etc*., are not uniformly available, and should be further developed, along with general habitat typing assessments, to better identify natural as well as anthropogenic limiting factors. This type of data acquisition should be the subject of site-specific investigation in order to refine the primary recovery actions or to target additional recovery actions as part of any recovery strategy for the This type of data acquisition should be the subject of site-specific investigation in order to refine the primary recovery actions or to target additional recovery actions as part of any recovery strategy for the Conception Coast.

Tables 9-4 through 9-13 below rank and describe proposed recovery actions for each sub-watershed in the Conception Coast BPG, including the estimated cost for implementing the actions in five year increments over the first 25 years, and where applicable extended out to 100 years, though many recovery actions can be achieved within a shorter period.

Table 10-3. Critical recovery actions for Core 1 populations within the Conception Coast BPG.

POPULATION	CRITICAL RECOVERY ACTION
Goleta Slough Complex	Modify road and railroad crossings and, remove or modify flood control channels and grade control structures to allow natural migration of steelhead to upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and the ocean. Identify, protect, and where necessary restore estuarine and freshwater rearing habitats. Develop restoration and management for the Goleta Slough Estuary to restore estuarine functions
Mission Creek	Halt the unnatural dry-season reduction in the amount and extent of surface water to restore natural or pre-impact over-summering habitat characteristics and condition for steelhead. Physically modify channelized reaches of lower Mission Creek, and upstream road crossings, to allow natural migration of steelhead to upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and the ocean. Identify, protect, and where necessary restore estuarine and freshwater rearing habitats. Develop restoration and management for the Mission Creek Estuary to restore estuarine functions.
Carpinteria Creek	Halt the unnatural dry-season reduction in the amount and extent of surface water to restore natural or pre-impact over-summering habitat characteristics and condition for steelhead. Physically modify upstream debris basins to allow natural migration of steelhead to upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and the ocean. Identify, protect, and where necessary restore estuarine and freshwater rearing habitats. Develop restoration and management for the Carpinteria Creek Estuary to restore estuarine functions.
Rincon Creek	Halt the unnatural dry-season reduction in the amount and extent of surface water to restore natural or pre-impact over-summering habitat characteristics and condition for steelhead. Physically modify Highway I and railroad culvert in lower Rincon Creek, and upstream road crossings to allow natural migration of steelhead to upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and the ocean. Identify, protect, and where necessary restore estuarine and freshwater rearing habitats. Develop restoration and management for the Rincon Creek Estuary to restore estuarine functions.

Southern California Steelhead DPS Recovery Action Tables Identification Key, Conception Coast BPG (Tables 10-4 – 10-13).

Recovery Action Number Key: XXXX – SCS – 1.2		XXXX ID Table		Threat Source Legend	
XXXX	Watershed	JC	Jalama Creek	1	Agricultural Development
SCS	Species Identifier – Southern California Steelhead	Sac	Santa Anita Creek	2	Agricultural Effluents
1	Threat Source	GC	Gaviota Creek	3	Culverts and Road Crossings
2	Action Identity Number	AHC	Arroyo Honda Creek	4	Dams and Surface Water Diversions
Action Rank		TC	Tecolote Creek	5	Flood Control Maintenance
A	Action addresses the first listing factor regarding the destruction or curtailment of the species' habitat	GS	Goleta Slough	6	Groundwater Extraction
B	Action addresses one of the other four listing factors	MisC	Mission Creek	7	Levees and Channelization
		MonC	Montecito Creek	8	Mining and Quarrying
		CarC	Carpinteria Creek	9	Non-Native Species
		RC	Rincon Creek	10	Recreational Facilities
				11	Roads
				12	Upslope/Upstream Activities
				13	Urban Development
				14	Urban Effluents
				15	Wildfires

See Chapter 8, Table 8.1 for Detailed Description of Recovery Actions

Table 10-4. Southern California Steelhead DPS Recovery Action Table for the Jalama Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Jalama Creek												
JC-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USGS, NMFS,USFWS, CDFG,CSCC CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4	3B	ongoing -cost of doing business	0	0	0	0	0	0
JC-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM,USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520
JC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USFWS, DWR,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 – refer to regional costs	0	0	0	0	0	0
JC-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, USFWS,CDFG CT,TCFT, SCHR,EII,SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
JC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,DWR, NMFS,CDFG, CT,TCFT,SCHR, EII, SBC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
JC-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,NMFS,USFWS,SWRCB, CDFG,CT, TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
JC-SCS-7.1	Develop and implement a stream bank and riparian corridor restoration plan	USGS,ACOE, BLM,NMFS, USFWS,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Levees and Channelization	1, 4	3B	10	10521940	10521940	0	0	0	21043880
JC-SCS-9.1	Develop and implement a watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,NMFS, USFWS,CSCC, CDFG,CT, TCFT,SCHR,EII, SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
JC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,NMFS, USFWS,CSCC, CDFG,CT, TCFT,SCHR,EII, SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
JC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,NMFS, USFWS,CSCC, CDFG,CT, TCFT, SCHR,EII, SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
JC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, CSCC,CT, TCFTS,CHR,EII, SBC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
JC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	CDOT,NMFS, USFWS.CDFG, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
JC-SCS-12.1	Develop and implement an estuary restoration and management plan	NMFS,USFWS, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	100500	0	0	0	0	100500
JC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, USFWS,CT,TCFT , SCHR,EII, SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
JC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CSCC,CDFG, CT,TCF,SCHR, EII,SBC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
JC-SCS-13.2	Retrofit storm drains in developed areas	CDOT,CSCC, CDFG,CT, TCFT, SCHR,EII, SBC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
JC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
JC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,CT,TCFT, SCHR,EII,SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
JC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS,N MFS,USGS, CDFG, CT,TCFT,LPFW SCHR,EII, SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-5. Southern California Steelhead DPS Recovery Action Table for the Canada de Santa Anita Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Santa Anita Creek												
Sac-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USGS, USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4	3B	ongoing –cost of doing business	0	0	0	0	0	0
Sac-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFWS,NMFS, CDFG,CT, TCFT, SCHR,EII, SBC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
Sac-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,NMFS, USFWS,CSCC, CDFG,CT, TCFT,SCHR,EII, SBC	Agricultural Development	1, 4	3B	20	6200	499840	499840	499840	499840	1505720
Sac-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE,U SFWS,BLM, DWR,CSCC, CDFG,CT, TCFT,SCHR,EII, SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
Sac-SCS-3.2	Provide fish passage around dams and diversions	NMFS,ACOE,U SFWS,BLM, DWR,CSCC, CDFG,CT, TCFT,SCHR,EII, SBC	Dams and Surface Water Diversions	1,4	1A	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sac-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
Sac-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, USFWS,DWR, CDFG,CT, TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
Sac-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, CDFG,DWR, CT,TCFT,SCHR, EII,SBC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
Sac-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USFWS,NMFS, USGS,ACOE, BLM,CSCC, CDFG,CT, TCFT, SCHR,EII, SBC	Levees and Channelization	1, 4	3B	10	10521940	10521940	0	0	0	21043880
Sac-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, NMFS,USFWS, CT,TCFT, SCHR,EII,SBC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
Sac-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCC, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sac-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, NMFS,USFWS CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
Sac-SCS-11.1	Develop and implement plan to remove or reduce approach-fill for railroad lines and road (*e.g.*, Union Pacific Railroad line and Hollister Ranch Road)	USDOT,USFWS, NMFS,CDOT, CSCC,CDFG, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
Sac-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CSCC, CDFG,CT,TCFS CHR,EII,SBC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
Sac-SCS-12.1	Develop and implement an estuary restoration and management plan	NMFS,USFWS, CSCC,CDFG, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	4628920	0	0	0	0	4628920
Sac-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, USFWS,NMFS, CT,TCFT, SCHR,EII,SBC	Upslope/ Upstream activities	1, 3, 4, 5	3B	5	62400	0	0	0	0	62400
Sac-SCS-13.1	Retrofit storm drains in developed areas	CDOT,CDFG,NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Development	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0
Sac-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1,4,5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sac-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,CT, TCFT,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-6. Southern California Steelhead DPS Recovery Action Table for the Gaviota Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Gaviota Creek												
GC-SCS-1.1	Manage agricultural development and restore riparian zones	NRCS,USGS, NMFS,USFWS, BLMCDFG,CSCC,CT,TCFT, SCHR,EII,SBC	Agricultural Development	1, 4	3B	20	48360	3898752	3898752	3898752	0	11744616
GC-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,NMFS, USFWS,BLM, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520
GC-SCS-1.3	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, NMFS,USFWS, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4	3B	5	62400	0	0	0	0	62400
GC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	CDOT,CDPR, CDFG,CSCC, USDOT,ACOE, BLM,USFWS, NMFS,CT,TCFT, SCHR,EII,SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
GC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,USGS, ACOE,BLM, NMFS,CDFG, CT,TCFT,SCHR, EII,SBC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
GC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, SWRCB,CDFG CT,TCFT,SCHR, EII,SBC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
GC-SCS-6.2	Develop and implement groundwater monitoring and monitoring program	USGS,SWRCB, CDFG,CT, TCFT,SCHR,EII	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
GC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USGS, ACOE,BLM, NMFS,CDFG,CSCC,CT,TCFT, SCHR,EII,SBC	Levees and Channelization	1, 4	2B	10	10521940	10521940	0	0	0	21043880
GC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, NMFS,CT,TCFT, SCHR,EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
GC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, NMFS,CT,TCFT, SCHR,EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
GC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, USFWS,NMFS, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
GC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways (*e.g.*, Gaviota State Beach/Hollister Ranch access road)	NRCS,USDOT, CDOT,ACOE, BLM,CDFG,CT, TCFT, SCHR,EII, SBC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
GC-SCS-11.2	Retrofit storm drains to filter runoff from roadways (*e.g.*, U.S. Highway 101)	USDOT,NMFS, USFWS,CDOT, CDFG,CT, TCFT, SCHR,EII, SBC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
GC-SCS-12.1	Develop and implement estuary restoration and management plan	CSCS,CDFG, NMFS,BLM, USFWS,CT, TCFT,SCHR,EII, SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	911200	0	0	0	0	911200
GC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, CDFG,CT, TCFT, SCHR,EII, SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
GC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,BLM, USFWS,CDFG, CCC,CT,TCFT, SCHR,EII,SBC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
GC-SCS-13.2	Retrofit storm drains in developed areas	USDOT,NMFS, CDOT,CDFG, CT,TCFT,SCHR, EII,SBC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
GC-SCS-13.3	Develop and implement riparian restoration plan to replace artificial bank stabilization structures	NMFS,USFWS, USDOT,CDFG, CSCC,CDPR, TCFT,SCHR,EII, SBC	Urban Development	1, 4	2B	10	10521940	10521940	0	0	0	21043880
GC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
GC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
GC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, USGS,CDFG, CT,TCF,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-7. Southern California Steelhead DPS Recovery Action Table for the Arroyo Hondo Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Arroyo Hondo												
AHC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USFWS,BLM, USFS,DWR,CDFG,CSCC,CT, TCFT,SCHR,EII	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
AHC-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, CDFG,CT,TCF, SCHR,EII, SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
AHC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,NMFS, USFWS,CSCC, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
AHC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,NMFS, USFWS,CSCC, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
AHC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,NMFS, USFWS,CSCC, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
AHC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways.	USDOT,CDOT, NRCS,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
AHC-SCS-11.2	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads (*e.g.,* U.S. Highway 1, Union Pacific Railroad)	USDOT,NMFS, USFWS,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
AHC-SCS-11.3	Retrofit storm drains to filter runoff from roadways	USDOT,NMFS, CDOT,CDFG, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
AHC-SCS-12.1	Develop and implement estuary restoration and management plan	NMFS,USFWS, CSCC,CDFG, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	67000	0	0	0	0	67000
AHC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
AHC-SCS-13.1	Retrofit storm drains in developed areas	CDOT,CDFG, NMFS,CT,TCFT, SCHR,EII,SBC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
AHC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
AHC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Urban Effluents	1, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
AHC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,CT, TCFT,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-8. Southern California Steelhead DPS Recovery Action Table for the Tecolote Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Tecolote Creek												
TC-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFWS,NMFS, CDFG,CSCC, CT,TCF,SCHR, EII,SBC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
TC-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USFWS,USFS,BLM, NMFS,CDFG, CT,TCFT, SCHR,EII,SBC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520
TC-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFWS,NMFS, CDFG,CT, TCFT,SCHR,EII, SBC	Agricultural Development	1, 4,		10 - refer to regional costs	0	0	0	0	0	0
TC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USFWS, ACOE,BLM, USFS,CDFG, CSCC,DWR, CT,TCFT,SCHR, EII,SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
TC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,USGS, ACOE,BLM, NMFS,CDFG, CT,TCFT,SCHR, EII,SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
TC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,DWR, NMFS,CDFG, CT,TCFT,SCHR, EII,SBC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
TC-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,DWR, SWRCB,CDFG, CT,TCFT,SCHR, EII,SBC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TC-SCS-7.2	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USGS, ACOE,USFWS, BLM,NMFS, CDFG,CT, TCFT,SCHR,EII, SBC	Levees and Channelization	1, 4	3B	10	10521940	10521940	0	0	0	21043880
TC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,USFWS, NMFS,CSCC, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
TC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,UNMFS, USFWS,CSCC, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
TC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,NMFS, USFWS,CSCC, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
TC-SCS-11.1	Retrofit storm drains to filter runoff from roadways	USDOT,NMFS, USFWS,CDOT, CDFG,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
TC-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	NRCS,NMFS, USFWS,CDOT, CDFG,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	3B	20 – refer to regional costs	0	0	0	0		0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TC-SCS-11.3	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads (*e.g.,* U.S. Highway 101, Union Pacific Railroad)	USDOT,USFWS, NMFS,CDOT, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	3B	ongoing - costs of doing business	0	0	0	0	0	0
TC-SCS-12.1	Develop and implement an estuary restoration and management plan	CSCC,CDFG, NMFS,USFWS, BLM,CT,TCFT, SCHR,EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	268000	0	0	0	0	268000
TC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
TC-SCS-13.2	Retrofit storm drains in developed areas	USDOT,NMFS, USFWS,CDOT, CDFG,CT, TCFT, SCHR,EII, SBC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
TC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
TC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Urban Effluents	1, 4,5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan,	USFS,USFWS, NMFS,USGS, CDFG,CT, TCFT,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-9. Southern California Steelhead DPS Recovery Action Table for the Goleta Slough Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Goleta Slough												
GS-SCS-1.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USGS, USFWS,NMFS, CDFG,CT, TCFT,SCHR,EII, SBC	Agricultural Effluents	1, 4	2B	20	114080	9197056	9197056	9197056	0	27705248
GS-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
GS-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4,	2B	10 - refer to regional costs	0	0	0	0	0	0
GS-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, BLM,USFS, DWR,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
GS-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,ACOE, BLM,USFS, DWR,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Dams and surface water diversions	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
GS-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
GS-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, USFWS,DWR, CDFG,CT, TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
GS-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,DWR, NMFS,USFWS, CT,CDFG TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
GS-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	USGS,ACOE, BLM,NMFS, CT,TCFT,SCHR, EII,SBC	Levees and Channelization	1, 4	2B	10	10521940	10521940	0	0	0	21043880
GS-SCS-7.2	Develop and implement plan to restore natural channel features	CSCC,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Levees and Channelization	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
GS-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
GS-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCC, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
GS-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
GS-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USDOT,USFWS, NMFS,CDOT, CDFG,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
GS-SCS-11.2	Retrofit storm drains to filter runoff from roadways	USDOT,USFWS, NMFS,CDOT, CDFG,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
GS-SCS-12.1	Develop and implement an estuary restoration and management plan	CDFG,CSCC, NMFS,USFWS, BLM,CT,TCFT, SCHR,EII, SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	53383870	0	0	0	0	53383870
GS-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	62400	0	0	0	0	62400
GS-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NRCS,NMFS, USFWS,BLM, CDFG,CT, TCFT, SCHR,EII, SBC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
GS-SCS-13.2	Retrofit storm drains in developed areas	USDOT,NMFS, USFWS,CDOT, CDFG,CT, TCFT, SCHR,EII, SBC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
GS-SCS-13.3	Develop and implement riparian restoration plan to replace artificial bank stabilization structures	ACOE,BLM, USFWS,NMFS, CSCC,CDFG, DWR,CT,TCFT, SCHR,EII,SBC	Urban Development	1, 4	2B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
GS-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Goleta Sanitary District Wastewater Treatment Facility)	RWQCB, CDFG,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
GS-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
GS-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,CT, TCFT,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-10. Southern California Steelhead DPS Recovery Action Table for the Mission Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Mission Creek												
MisC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, BLM,USFWS, USFS,DWR, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
MisC-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,ACOE, BLM,USFWS, USFS,DWR, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Dams and surface water diversions	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
MisC-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
MisC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,DWR, SWRCB,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
MisC-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,DWR,SW RCB,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
MisC-SCS-7.1	Develop and implement a stream bank and riparian corridor restoration plan	NMFS,USFWS, USGS,ACOE, BLM,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Levees and Channelization	1, 4	3B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MisC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MisC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCSS, USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MisC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
MisC-SCS-11.1	Retrofit storm drains to filter runoff from roadways	USDOT,NMFS, CDOT,CDFG, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
MisC-SCS-11.2	Manage roadways adjacent riparian corridor and restore abandoned roadways	USDOT,USFWS, NRCS,NMFS, CDOT,CDFG, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
MisC-SCS-12.1	Develop and implement an estuary restoration and management plan	CSCC,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	1340000	0	0	0	0	1340000

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MisC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
MisC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NMFS,USFWS, BLM,CCC, CDFG,CT,TCFT SCHR,EII,SBC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
MisC-SCS-13.2	Retrofit storm drains in developed areas	USDOT,USFWS, NMFS,CDOT, CDFG,CT, TCFT, SCHR,EII, SBC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
MisC-SCS-13.3	Develop and implement public education program on watershed processes	NRCS,NMFS, USFWS,USFS, CDFG, CT, TCFT, SCHR,EII, SBC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing -cost of doing business	0	0	0	0	0	0
MisC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* El Estero Wastewater Treatment Facility)	RWQCB, CDFG,SWRCB, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
MisC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, CDFG,SWRCB, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MisC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, BLM,CDFG,CT, TCFT,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-11. Southern California Steelhead DPS Recovery Action Table for the Montecito Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Montecito Creek												
MonC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USFWS, ACOE,BLM, CSCC,CDFG, DWR,CT,TCFT, SCHR,EII, SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
MonC-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,USFWS, ACOE,BLM, CSCC,CDFG, DWR,CT,TCFT, SCHR,EII, SBC	Dams and surface water diversions	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
MonC-SCS-5.1	Develop and implement flood control maintenance program	USGS,NRCS, ACOE,BLM, NMFS,CDFG, CT,TCFTS,CHR, EII,SBC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
MonC-SCS-6.1	Conduct groundwater extraction analysis assessment	USGS,DWR, SWRCB,CDFG, NMFS,CT, TCFT,SCHR,EII	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
MonC-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,DWR, SWRCB,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
MonC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CSCC,CDFG, USFWS,USGS, ACOE,BLM, NMFS,CT,TCFT, SCHR,EII,SBC	Levees and Channelization	1, 4	3B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MonC-SCS-7.2	Develop and implement plan to restore natural channel features	NRCS,USFWS,NMFS,CSCC,CDFG,CT,TCFT, SCHR,EII,SBC	Levees and Channelization	1,4	3B	10	10521940	10521940	0	0	0	21043880
MonC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,CT,TCFT, SCHR,EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MonC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,CT,TCFT, SCHR,EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MonC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,CT,TCFT, SCHR,EII,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
MonC-SCS-11.1	Manage roadways adjacent riparian corridor and restore abandoned roadways	USDOT,USFW, NMFS,CDOT, CDFG,CSCC, CT,TCF,SCHR, EII,SBC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
MonC-SCS-11.2	Develop and implement plan to remove or reduce approach-fill railroad lines and roads	USDOT,NMFS, USFWS,CDGS, CSCC,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MonC-SCS-11.3	Retrofit storm drains to filter runoff from roadways	USDOT,USFW, NMFS,CDFG, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
MonC-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
MonC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CCC,CDFG, USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
MonC-SCS-13.2	Retrofit storm drains in developed areas	USDOT,USFWS, NMFS,CDOT, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
MonC-SCS-13.3	Develop and implement a riparian restoration plan that replace artificial bank stabilization structures	NRCS,USFWS,N MFS,CDFG, CSCC,CT, TCFT, SCHR,EII, SBC	Urban Development	1, 4	3B	10	10521940	10521940	0	0	0	21043880
MonC-SCS-14.1	Review, assess and modify if necessary all NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
MonC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MonC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,CT, TCFT,LPFW,SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-12. Southern California Steelhead DPS Recovery Action Table for the Carpinteria Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Carpinteria Creek												
CarC-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFWS,NMFS, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
CarC-SCS-1.2	Manage agricultural development and restore riparian zone	NRCS,BLM, USFWS,NMFS, CDG,CSCC, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4,	2B	10 - refer to regional costs	0	0	0	0	0	0
CarC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USFWS,BLM, USFS,DWR, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
CarC-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,ACOE, USFWS,BLM, USFS,DWR, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Dams and surface water diversions	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
CarC-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
CarC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,DWR, SWRCB,NMFS, USFWS,CDFG, CT,TCFT,SCHR, EII,SBC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CarC-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,DWR, SWRCB,NMFS, CDFG,CT, TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
CarC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USGS, ACOE, BLM,NMFS, CSCC,CDFG, CT,TCFT,SCHR, EII,SBC	Levees and Channelization	1, 4	2B	10	10521940	10521940	0	0	0	21043880
CarC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,NMFS, USFWS,USFS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
CarC-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,NMFS, USFWS,USFS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
CarC-SCS-9.3	Develop and implement non-native species monitoring program	CDFG,CPPR, CSCC,NMFS, USFWS,USFS, CT,TCFT,SCHR, EII,SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
CarC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USDOT,USFWS, NMFS,CDFG, CDOT,CSCC, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($) FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CarC-SCS-11.2	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads	USDOT,NMFS, USFWS,CDFG, CSCC,CT, TCFT, SCHR,EII, SBC	Roads	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
CarC-SCS-11.3	Retrofit storm drains to filter runoff from roadways	USDOT,USFWS, NMFS,CDOT, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
CarC-SCS-12.1	Develop and implement an estuary restoration and management plan	CDPR,CDFG, CSCC,NMFS, USFWS,BLM, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	59630000	0	0	0	0	59630000
CarC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	62400	0	0	0	0	62400
CarC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CSCC,CDFG, NMFS,USFWS, CT,TCFT, SCHR,EII,SBC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
CarC-SCS-13.2	Retrofit storm drains in developed areas	CDOT,CDFG, CSCC,NMFS, USFWS,USDOT, CT,TCFT,SCHR, EII,SBC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
CarC-SCS-13.3	Develop and implement riparian restoration plan replace artificial bank stabilization structures	NRCS,NMFS, USFWS,CDFG, CSCC,CT, TCFT, SCHR,EII, SBC	Urban Development	1, 4	2B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
CarC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.*, Carpinteria Sanitary District Wastewater Treatment Facility)	RWQCB, CDFG,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
CarC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify stormwater permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
CarC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDFG,CT, TCFT,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 10-13. Southern California Steelhead DPS Recovery Action Table for the Rincon Creek Watershed (Conception Coast BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Rincon Creek												
RC-SCS-1.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USGS, USFWS,NMFS, CDFG,CSCC CT,TCFT,SCHR, EII,SBC	Agricultural Effluents	1, 4	2B	20	31000	2499200	2499200	2499200	0	7528600
RC-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFWS,NMFS, CDFG,CT, TCFT,SCHR,EII, SBC	Agricultural Development	1, 4	2B	5	62400	0	0	0	0	62400
RC-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFWS,NMFS, CT,TCFT,SCHR, EII,SBC	Agricultural Development	1, 4,	2B	10 - refer to regional costs	0	0	0	0	0	0
RC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USFWS, ACOE,BLM, USFS,DWR, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
RC-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,USFWS, ACOE,BLM, USFS,DWR, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Dams and surface water diversions	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
RC-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, NMFS,CDFG, CT,TCFT,SCHR, EII,SBC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
RC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,DWR, SWRCB,NMFS, USFWS,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
RC-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,DWR, SWRCB,NMFS, USFWS,CDFG CT,TCFT,SCHR, EII,SBC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
RC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	NRCS,USGS, ACOE,BLM, NMFS,CDFG, CT,TCFT,SCHR, EII,SBC	Levees and Channelization	1, 4	2B	10	10521940	10521940	0	0	0	21043880
RC-SCS-8.1	Develop and implement plan to remove quarry and landslide debris from the channel	CDMG,CDFG, CSCC,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Mining and Quarrying	1, 4, 5	2B	5	68030	0	0	0	0	68030
RC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
RC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,NMFS, CT,USFWS, TCFT,SCHR,EII, SBC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
RC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,NMFS, USFWS,CT, TCFT,SCHR,EII, SBC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
RC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USDOT,NRCS, NMFS,USFWS, CDOT,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
RC-SCS-11.2	Develop and implement a plan to remove or reduce approach-fill for railroad lines and roads	USDOT,NMFS, USFWS,CDFG, CSCC,CT, TCFT,SCHR,EII, SBC	Roads	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
RC-SCS-11.3	Retrofit storm drains to filter runoff from roadways	USDOT,NMFS, USFWS,CDOT, CDFG,CSCC, CT,TCFT,SCHR, EII,SBC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
RC-SCS-12.1	Develop and implement an estuary restoration and management plan	USDOT,NMFS, BLM,USFWS, CDOT,CDPR, CDFG,CT, TCFT,SCHR,EII, SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	1340000	0	0	0	0	1340000

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
RC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	62400	0	0	0	0	62400
RC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	NRCS,NMFS, USFWS,BLM, CDOT,CDFG, CT,TCFT,SCHR, EII,SBC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
RC-SCS-13.2	Develop and implement riparian restoration plan to replace artificial bank stabilization structures	NRCS,USFWS,NUMFS,CDFG,CSCC,CT, TCFT,SCHR,EII, SBC	Urban Development	1, 4	2B	10	10521940	10521940	0	0	0	21043880
RC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Carpinteria Sanitary District Wastewater Treatment Facility)	RWQCB, USFWS,NMFS, CDFG,CT, TCFT,SCHR,EII, SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
RC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, NMFS,USFWS, CT,TCFT,SCHR, EII,SBC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
RC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, USGS,NMFS, CDFG,CT, TCFT,LPFW, SCHR,EII,SBC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

11. Santa Monica Mountains Biogeographic Population Group

"Dispersal connectivity and genetic diversity may be aided by also including smaller 'non-core' populations that serve as stepping stones for dispersal. However, the core populations are fundamental."

NOAA Fisheries Technical Recovery Team
Viability Criteria for South-Central and Southern California Steelhead, 2007

11.1 LOCATION AND PHYSICAL CHARACTERISTICS

The Santa Monica Mountains BPG region consists of five coastal watersheds located in southern Ventura and western Los Angeles counties. These watersheds drain the east-west oriented coastal Santa Monica Mountains. These mountains are composed of recently uplifted marine and volcanic formations that extend approximately 32 miles from the Oxnard Plain in the west to the Los Angeles Watershed in the east. With the exception of Malibu Creek, these watersheds are relatively small and do not extend inland beyond the Santa Monica Mountains. The watersheds, from west to east, are Big Sycamore Canyon Creek, Arroyo Sequit, Malibu Creek, Las Flores Canyon Creek, and Topanga Canyon Creek (Figure 11-1). The Santa Monica Mountains BPG region is similar to the Conception Coast BPG region in that it is comprised of a series of short, nearly parallel streams that drain steep south-facing slopes, with an average elevation of less than 2,500 feet (Hunt & Associates 2008a, Kier Associates 2008b).

Santa Monica Mountains

The annual seasonal rainfall in the watersheds of this BPG region is approximately 18 inches, although rainfall is lower along the coast and increases with increasing elevation in the upper reaches of the watersheds. Malibu Creek is the largest of the five watersheds, encompassing approximately 110 square miles and, unlike other coastal streams in the Conception Coast BPG region, penetrates through a break in the Santa Monica Mountains to

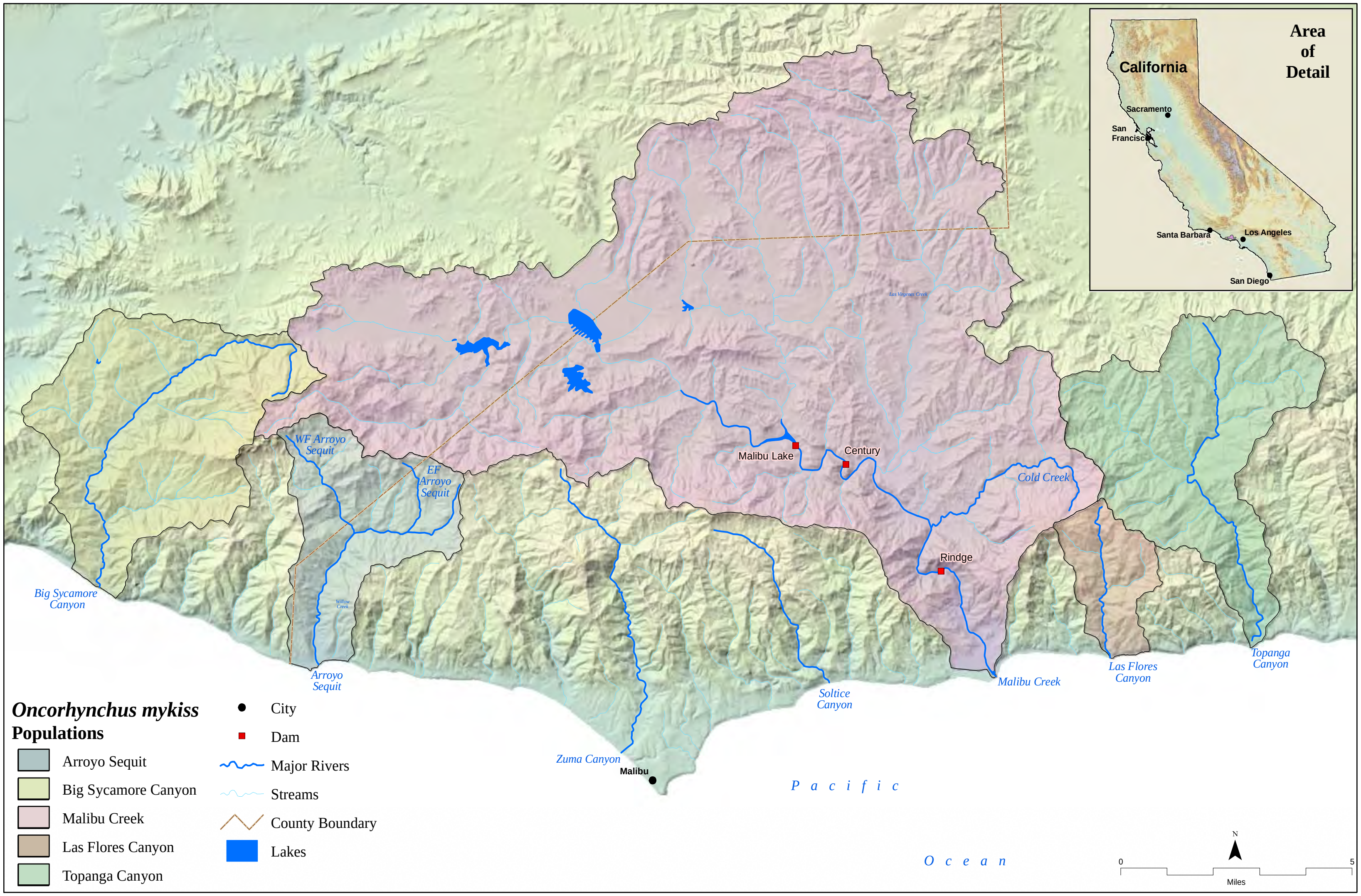
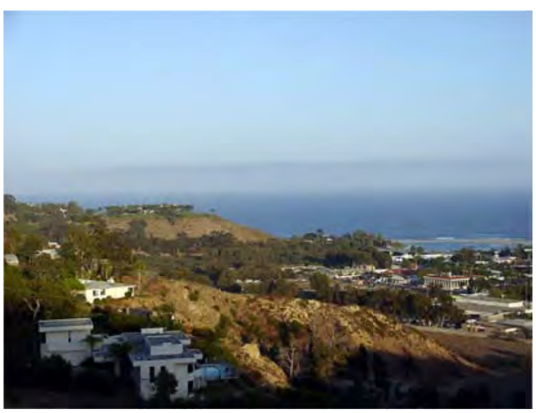


Figure 11-1. The Santa Monica Mountains BPG region. Five populations/watersheds were analyzed in this region: Arroyo Sequit, Big Sycamore Canyon, Malibu Creek, Las Flores Canyon, and Topanga Canyon.

drain a portion of its north-facing slopes and the south-facing slopes of the Simi Hills. Calleguas Creek and the Los Angeles River drain the remainder of the northern slopes of the Santa Monica Mountains. In addition to the major watersheds considered here, there are a number of smaller watersheds within this BPG (*e.g.*, Trancas, Zuma, Solstice, and Las Flores Canyon) which may also be used by steelhead when water conditions are favorable.

11.2 LAND USE

Table 11-1 summarizes land use and population density in Santa Monica Mountains BPG region. A significant portion of the Santa Monica Mountains BPG region is undeveloped, portions are publicly held as part of the Santa Monica Mountains National Recreation Area, seven state parks and beaches (Point Mugu State Park, Malibu Creek State Park, Leo Carrillo State Beach, Topanga State Park, R. H. Meyer Memorial State Beach, Dan Blocker State Beach, and Will Rogers State Park), and several local parks and beaches, including Zuma County Beach, Solstice Canyon Park, and Trancas Canyon Park. As a result of the relatively large amount of public land in proximity to a large urban area (Los Angeles Basin) recreational facilities receive intensive use.



Malibu Coastal Development

Development within these watersheds is principally residential, with some commercial and recreational development concentrated near the mouths of several of the streams. The Malibu Creek and Topanga Canyon Creek watersheds support the highest human population densities. Watersheds in the western portion of the Santa Monica Mountains generally have less development and significantly more area in public ownership than watersheds in the eastern half of the range. Human population density and private land ownership increases in the Santa Monica Mountains from west to east with increasing proximity to the Los Angeles Watershed. Agricultural conversion of watershed lands is generally light throughout the BPG region (Hunt & Associates 2008a, Kier Associates 2008b).

11.3 CURRENT WATERSHED CONDITIONS

Watershed conditions were assessed for the five major drainages in the Santa Monica Mountains BPG region. The mainstem and major tributaries of most of the drainages in this BPG region offer fair to good habitat conditions for anadromous *O. mykiss*. Existing habitat quality was rated as "Fair" in the Big Sycamore Canyon, Arroyo Sequit, Malibu Creek, and Las Flores Canyon watersheds, and "Good" in the Topanga Canyon Creek watershed. Existing conditions within the Topanga Canyon Creek watershed are relatively good, despite having the second highest human population density in this BPG region (Table 11-1). For example, Topanga Canyon Creek is characterized by perennial flows, high-quality instream and riparian conditions, an absence of non-native predators, and migration barriers, if present, are seasonally passable. However, the natural seasonal flow regime of Malibu Creek has been substantially altered by the waste discharge

Table 11-1. Physical and Land-Use Characteristics of Major Watersheds in the Santa Monica Mountains BPG region.

PHYSICAL CHARACTERISTICS						LAND USE			
WATERSHEDS (west to east)	**Area** (acres)[1]	**Area** (sq. miles)[1]	**Stream Length**[2] (miles)	**Ave. Ann. Rainfall**[3] (inches)	**Total Human Population**[4]	**Public Ownership***	**Urban Area**[5]	**Agriculture/ Barren**[5]	**Open Space**[5]
Big Sycamore Canyon Creek	13,649	21	32	17.9	27	76%	< 1%	< 1%	99%
Arroyo Sequit	7,572	12	17	17.9	370	43%	3%	1%	96%
Malibu Creek	70,726	110	161	18.0	74,585	32%	23%	2%	75%
Las Flores Canyon Creek	2,908	5	6	18.5	1,144	5%	15%	< 1%	85%
Topanga Canyon Creek	12,616	20	30	17.9	5,561	72%	15%	< 1%	85%
TOTAL or AVERAGE	**107,471**	**168**	**246**	**18.0**	**81,687**	**---**	**18%**	**1%**	**81%**

[1] From: CDFFP CalWater 2.2 Watershed delineation, 1999 (www.ca.nrcs.usda.gov/features/calwater/)
[2] From: CDFG 1:1,000,000 Routed stream network, 2003 (www.calfish.org/)
[3] From: USGS Hydrologic landscape regions of the U.S., 2003 (1 km grid cells)
[4] From: CDFFP Census 2000 block data (migrated), 2003; preliminary analysis of Census 2010 indicates the population in the BPG has increased to 99,243
[5] From: CDFFP Multi-source land cover data (v02_2), 2002 (100 m grid cells) (http://frap.cdf.ca.gov/data/frapgisdata/select.asp)
** Includes National Recreation Areas, State Parks, and County (from: http://old.casil.ucdavis.edu/casil/gis.ca.gov/teale/govtowna/)*

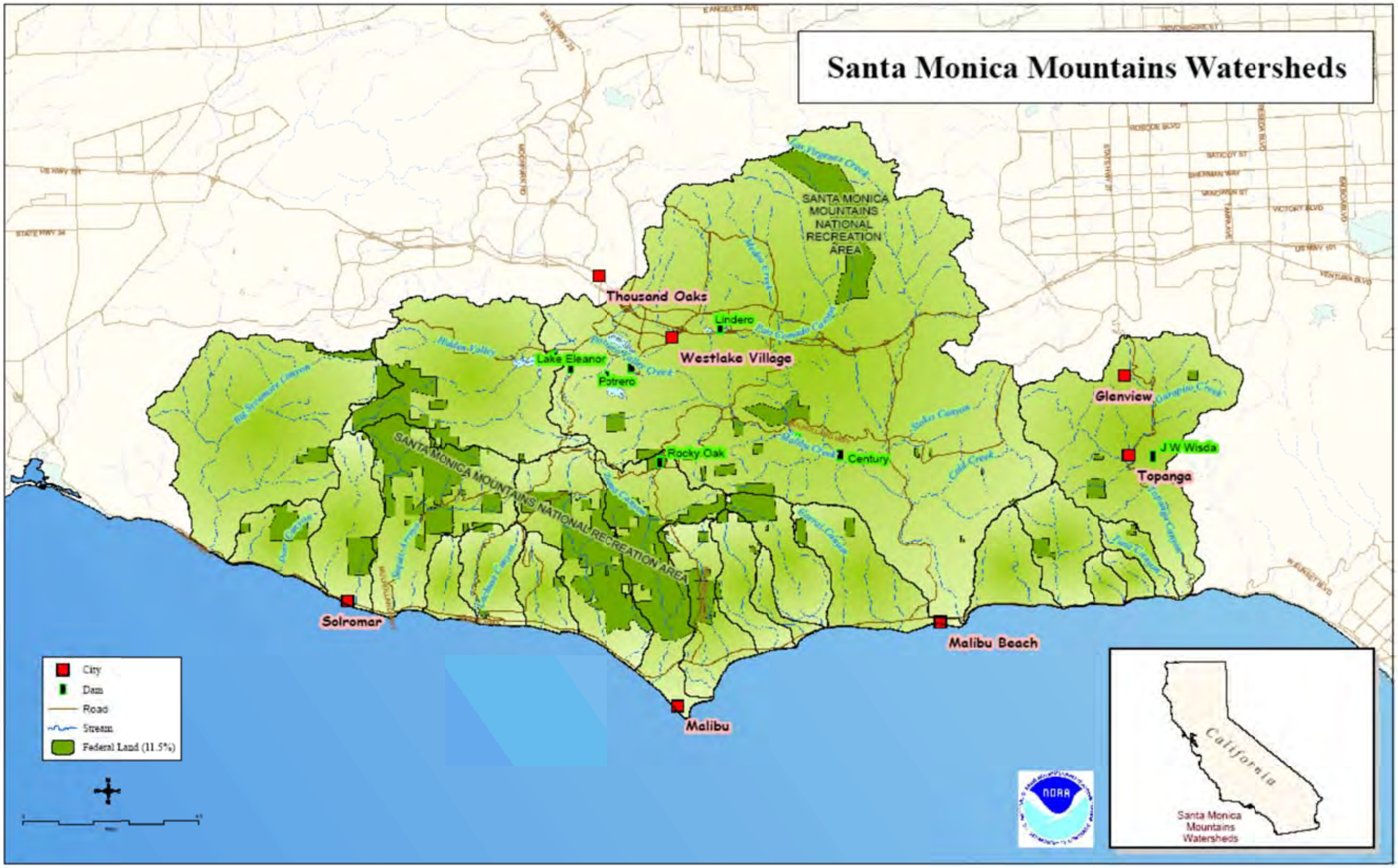


Figure 11-2. Santa Monica Mountains Watersheds.

of the Las Virgenes Municipal Water District Tapia wastewater treatment plan (Hunt & Associates 2008a, Kier Associates 2008b).

Arroyo Sequit Creek

Because of the proximity of the Santa Monica Mountains to large urban areas, there is significant pressure to develop and maintain recreational facilities. Each of the watersheds in the Santa Monica Mountains BPG region supports one or more coastal and inland campgrounds and other high-use recreational facilities. This is particularly the case in the Big Sycamore Creek, Arroyo Sequit, and Malibu Creek watersheds, where large portions of the watersheds are publicly owned. Recreational activities are recurring sources of direct and indirect threats to anadromous *O. mykiss* including roadway stream crossings in and around campgrounds that pose physical barriers to upstream and/or downstream movement migration, introduction of non-native plants and animals, disturbance to stream banks and instream habitats, and even redds potentially by foot traffic and off-road vehicles, loss of or disturbance to riparian corridors around campgrounds, and constriction of the floodplain. The type and number of threats posed by recreational facilities varies significantly between watersheds, from single locations such a road crossing on Arroyo Sequit, to multiple sites, such as numerous floodplain campgrounds or multiple stream crossings in the Malibu Creek watershed.

Rindge Dam – Malibu Creek

The Malibu Creek watershed is highly constrained by two major dams: the Rindge Dam and the Malibu Lake Dam. The former structure is located approximately two stream miles upstream of the lagoon and blocks access to over 90% of the anadromous *O. mykiss* spawning and rearing habitat within Malibu Creek. Rindge Dam also has isolated native *O. mykiss* that would otherwise exhibit an anadromous life-history, and prevents the repeated re-colonization of upstream habitats that may experience temporary extirpations as a result of natural stochastic processes, such as wildfires, droughts, and landslides. These dams have numerous effects on physical, hydrological, and habitat characteristics of the middle and lower reaches of the Malibu Creek. Dams also create and maintain favorable habitat conditions for several species of non-native fishes and bullfrogs, which may affect one or more life history stages of *O. mykiss* either directly (*e.g.*, predation) or indirectly (*e.g.*, competition for food). Non-native crayfish, snails, fishes, and bullfrogs are particularly abundant in the Malibu Creek and Las Flores Canyon Creek watersheds.

Malibu Creek

The terrain of the Santa Monica Mountains results in development on steep slopes, often accompanied by road cuts to provide access, thus affecting watershed processes such as erosion and sedimentation. Development has also occurred along narrow riparian corridors, which encourages bank stabilization, levee construction, and other flood control activities, and physically constrains the ability of streams to maintain natural channel morphology and riparian vegetation.

Increased residential development, including high road densities, has significantly altered natural fire regimes in the Santa Monica Mountains BPG region because it has allowed human access to almost all portions of the component watersheds. Fires have consumed 71% to 100% of the Big Sycamore Canyon Creek, Arroyo Sequit, Malibu Creek, and Las Flores Canyon Creek watersheds within the past 25 years, including recent fires in 2007. Approximately 32% of the Topanga Canyon Creek watershed has burned in the last 25 years (Hunt & Associates, Kier Associates 2008b). While the natural fire-cycle is an important source of sediments essential to support productive spawning and rearing habitat, artificially increased fire frequency can increase slope erosion and sediment inputs to streams, resulting in long-term changes to substrate composition and embeddedness, water quality (*e.g.*, turbidity), and water temperature (*e.g.*, loss of riparian canopy cover). Anadromous *O. mykiss* in each of the watersheds in the Santa Monica Mountains BPG region have been subjected to such secondary fire effects. The increase of impermeable surfaces as a result of urbanization (including roads) along the coastal terrace, and the development of homes on steep slopes (*e.g.*, Malibu, Las Flores, and Topanga Canyons), has altered the natural flow regime of streams, particularly in the lower reaches, increasing the frequency and intensity of flood flows (Hunt & Associates 2008a, Kier Associates).

Topanga Creek

Estuarine habitat loss in the component watersheds of the Santa Monica Mountains BPG region ranges from 66% to 97%. Malibu Creek formerly had the largest estuary of any watershed in the BPG region and still has the highest amount of remaining estuarine habitat (34%), but its estuarine functions have been significantly impaired by upstream waste discharges from point and non-point sources, and the alteration of the natural hydrologic and sediment transport regimes by a series of upstream dams (Hunt & Associates 2008a, Kier Associates 2008b).

Big Sycamore Canyon Estuary

The estuaries of Big Sycamore Canyon, Arroyo Sequit, Los Flores Canyon, and Topanga Canyon Creek have suffered the largest loss of areal extent, and are highly impacted by Highway 1, commercial development, and recreational activities. Road construction, bridges, levees, floodplain encroachment by residential and commercial development (*e.g.*, the City of Malibu and Malibu Colony in Malibu Creek) have significantly reduced estuarine habitat in almost watersheds in this BPG region. Other estuarine habitats such as those of Big Sycamore and Las Flores Canyon have been almost completely lost due to transportation, recreation, and commercial development.

11.4 THREATS AND THREAT SOURCES

The relatively high population and development pressures along the coastal portions of the Santa Monica Mountains, coupled with the proximity to the densely populated Los Angeles Watershed, create a series of recurring, severe to very severe threats to the persistence of anadromous *O. mykiss* in each of the component watersheds in this BPG region. The number of threat sources used by the CAP Workbooks in determining threat status for the Santa Monica Mountains BPG watersheds varied from eight in the Big Sycamore Canyon Creek watershed to 16 in the Malibu Creek watershed.

Ten anthropogenic activities ranked as the top sources of stress to anadromous *O. mykiss* in the Santa Monica Mountains BPG (Table 11-2). Each watershed has a unique combination of threats; however, recurring threats among most or all of the watersheds include: high road density, including roads in close proximity to riparian corridors, impacts from recreational facilities, and barriers to migration at culverts and roadway stream crossings. Other threats are unique to particular watersheds, such as the Rindge and Malibu Lake dams on Malibu Creek (Hunt & Associates 2008a, Kier Associates 2008b).

Table 11-2. Threat source rankings in the component watersheds of the Santa Monica Mountains BPG region (see CAP Workbook for details).

Santa Monica Mountains BPG Component Watersheds (west to east)					
Threat Sources	Big Sycamore Canyon Creek	Arroyo Sequit	Malibu Creek	Las Flores Canyon Creek	Topanga Canyon Creek
Roads					
Recreational Facilities					
Culverts and Road Crossings					
Wildfires*					
Urban Development					
Levees and Channelization					
Dams and Surface Water Diversions					
Non-Native Species					
Upslope/Upstream Development					
Urban Effluents					

Key: *Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat (Threat cell colors represent threat rating from CAP Workbook)*

**Wildfires were not identified during the CAP Workbook analyses as one of the top five threats in several of these watersheds, but recent fires in coastal watersheds since 2007 could result in significant habitats impacts.*

11.5 SUMMARY

Road density is high throughout the Santa Monica Mountains BPG region, both on private and public lands. Road density, particularly roads within or close to riparian corridors are affecting each of these watersheds by contributing to the source of non-point pollutants (*e.g*., oil, grease, copper from breaking systems, *etc*.), altering surface runoff patterns and stream hydrographs, and encroaching on floodplains and decreasing floodplain connectivity. Such road density creates the need for bank stabilization and levee construction to protect development, which in turn provides conduits for sediment, pollutant, and bacterial inputs to the watercourse. In other cases, road crossings create barriers to upstream and downstream movement of adult and juvenile anadromous *O. mykiss*. Additionally, impacts associated with wildland fires, including fire-fighting measures to control or extinguish them, and the post-fire measures to repair damages incurred in fighting wildland fires, poses a potential threat to watersheds in this BPG. Table 11-3 summarizes the critical recovery actions needed within the Core 1 populations of this BPG.

Restoring conditions for anadromous *O. mykiss* passage, spawning, and/or rearing in these watersheds will require multiple, long-term, measures related to water management, recreation, and fish passage. Impediments to fish passage stemming from the construction and maintenance of roads and other transportation corridors, dams and other passage barriers, groundwater extraction, and modification of channel morphology and adjacent riparian habitats by flood control measures need to be further evaluated for this BPG. Additionally, the loss of estuarine functions caused by filling and pollution from point and non-point agricultural and other anthropogenic waste discharges need to be addressed further in this region.

Malibu Creek Steelhead – 1946.

The threat sources discussed in this section should be the focus of a variety of recovery actions to address addresses specific risks to anadromous *O. mykiss* viability. Spatial and temporal data, for water temperature, pH, nutrients, *etc*., are not uniformly available, and should be further developed, along with general habitat typing assessments, to better identify natural as well as anthropogenic limiting factors. This type of data acquisition should be the subject of site-specific investigation in order to refine the primary recovery actions or to target additional recovery actions as part of any recovery strategy for the Santa Monica Mountains BPG. Tables 11-4 through 11-8 below rank and describe proposed recovery actions for each sub-watershed in the Santa Monica Mountains BPG, including the estimated cost for implementing the actions in five year increments over the first 25 years, and where applicable extended out to 100 years, though many recovery actions can be achieved within a shorter period.

Table 11-3. Critical recovery actions for Core 1 populations within the Santa Monica Mountains BPG.

POPULATION	CRITICAL RECOVERY ACTION
Malibu Creek	Remove Rindge and Malibu dams, and physically modify road crossings, to allow natural migration of steelhead to upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and the ocean. Identify, protect, and restore estuarine and freshwater rearing habitats functions.
Topanga Creek	Develop and implement plan to replace the U.S. 101 culvert over Topanga Creek with a full span bridge to remove fill from the Topanga Creek Estuary, and allow natural migration to upstream spawning and rearing and passage of smolts and kelts downstream to the estuary and the ocean habitat, Develop and implement a restoration and management plan for the Topanga Creek Estuary.

Southern California Steelhead DPS Recovery Action Tables Identification Key, Santa Monica Mountains BPG (Tables 11-4 – 11-8).

Recovery Action Number Key: XXXX – SCS – 1.2		XXXX ID Table		Threat Source Legend	
XXXX	Watershed	BSC	Big Sycamore Canyon	1	Agricultural Development
SCS	Species Identifier – Southern California Steelhead	ASC	Arroyo Sequit Creek	2	Agricultural Effluents
1	Threat Source	MalC	Malibu Creek	3	Culverts and Road Crossings
2	Action Identity Number	LFC	Las Flores Canyon Creek	4	Dams and Surface Water Diversions
Action Rank		TopC	Topanga Canyon	5	Flood Control Maintenance
A	Action addresses the first listing factor regarding the destruction or curtailment of the species' habitat			6	Groundwater Extraction
B	Action addresses one of the other four listing factors			7	Levees and Channelization
				8	Mining and Quarrying
				9	Non-Native Species
				10	Recreational Facilities
				11	Roads
				12	Upslope/Upstream Activities
				13	Urban Development
				14	Urban Effluents
				15	Wildfires

See Chapter 8, Table 8.1 for Detailed Description of Recovery Actions

Table 11-4. Southern California Steelhead DPS Recovery Action Table for the Big Sycamore Canyon Creek Watershed (Santa Monica Mountains BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Big Sycamore Canyon Creek												
BSC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,CDOT, ACOE, SMMC, SMMRCD, CDFG, CSCC,CT, TCFT,TU,VC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
BSC-SCS-4.2	Develop and implement water management plan for diversion operations	CDPR,CDFG, NMFS,CT,TU, TCFT,VC	Dams and Surface Water Diversions	1, 3, 4	3B	3	275550	0	0	0	0	275550
BSC-SCS-5.1	Develop and implement flood control maintenance program	CDPR,SMMC, SMMRCD, CDFG,NMFS, CT,TU,TCFT,VC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
BSC-SCS-7.1	Develop and implement a stream bank and riparian corridor restoration plan	CDPR,SMMC, SMMRCD, CDFG, CSCC, NMFS,CT,TU,TCFT,VC	Levees and Channelization	1, 4	3B	10	10521940	10521940	0	0	0	21043880
BSC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR SMMC, SMMRCD, NMFS,CT,TU, TCFT,VC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
BSC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,SMMC, SMMRCD, NMFS,CT,TU, TCFT,VC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
BSC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,SMMC, SMMRCD, NMFS,CT,TU, TCFT,VC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
BSC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* Point Mugu State Park, Santa Monica National Recreational Area General Management Plan)	CDPR,CDFG, SMMC, SMMRCD, NMFS,USFWS, CT,TU,TCFT,VC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing -cost of doing business	0	0	0	0	0	0
BSC-SCS-10.2	Develop and implement public education program on watershed processes	CDPR,CDFG, CSCC,USFWS, NMFS,SMMC, SMMRCD, CT,TU,TCFT,VC	Recreational Facilities	1, 2, 3, 4, 5	3B	20	76140	76140	76140	76140	0	304560
BSC-SCS-10.3	Review and modify development and management plans for recreational areas and national forests	CDPR,CDFG, USFWS,NMFS, SMMC, SMMRCD, CT,TU,TCFT,VC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
BSC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, SMMC, SMMRCD,CT, TUC,TCFT,VC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
BSC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	CDOT,CDPR, CDFG,SMMC, SMMRCD,CT, TU,TCFT,VC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
BSC-SCS-11.3	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads	CDOT,CDPR, CDFG,SMMC, SMMRCD,CT, TU,TCFT,VC	Roads	1,4	3B	20 - refer to regional costs	0	0	0	0	0	0
BSC-SCS-12.1	Develop and implement an estuary restoration and management plan	CDPR,CDFG, CDOT, CSCC, SMMC, SMRCD,NMFS, USFWS,CT, TCFT,TU,VC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	8881455	0	0	0	0	8881455
BSC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, SMMC,CDPR, SMMRCD, NMFS,CT,TRCF, TU,VC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	62400	0	0	0	0	62400
BSC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	BLM,CT,TUC, SDT,VC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
BSC-SCS-13.2	Retrofit storm drains in developed areas	NMFS,DOT, CT,TUC,SDT, VC	Urban Development	1, 4	3B	20	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
BSC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, CDPR,SMMC, SMMRCD,CT, TU,TCFT,VC	Urban Effluents	1, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
BSC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,USFWS, NMFS,SMMC, SMMRCD,CT, TU,TCFT,VC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
BSC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan,	USFS,USFWS, USGS,NMFS, CDF,CDFG, SMMC, SMMRCD,CT, TCFT,TU,VC	Wildfires	1, 4, 5	1A	100 - refer to regional costs	0	0	0	0	0	0

Table 11-5. Southern California Steelhead DPS Recovery Action Table for the Arroyo Sequit Creek Watershed (Santa Monica Mountains BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Arroyo Sequit Creek												
ASC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	CDPR,SMMC, SMMRCD, CDFG,CSCC, CDOT,USFWS, NMFS,CT,TU, TCFT,VC,LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
ASC-SCS-4.1	Provide fish passage around dams and diversion (*e.g.*, small, non-functional water impoundments on the east and west forks of Arroyo Sequit)	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USFWS,CT,TU, TCFT,VC,LAC	Dams and Surface Water Diversions	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
ASC-SCS-4.2	Develop and implement water management plan for diversion operations	CDPR,SMMC, SMMRCD, CDFG,NMFS, USFWS,CT, TCFT,VC,LAC	Dams and Surface Water Diversions	1, 3, 4	1B	5	275550	0	0	0	0	275550
ASC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,USGS, NMFS,SMMC, SMMRCD, CDPR,CDFG, CT,TU,TCFT, VC,LAC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
ASC-SCS-7.1	Develop and implement a stream bank and riparian corridor restoration plan	CDPR,CDFG, CSCC,SMMC, SMMRCD, NMFS,CT,TU, TCFT,VC,LAC	Levees and Channelization	1, 4	2B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
ASC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,TCFT, VC,LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
ASC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,TCFT, VC,LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
ASC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,TCFT, VC,LAC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
ASC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, Leo Carrillo State Park)	CDPR,SMMC, SMRCD,CDFG, NMFS,CT,TU, TCFT,VC,LAC	Recreational Facilities	1, 2, 3, 4, 5	2B	1	68030	0	0	0	0	68030
ASC-SCS-10.2	Develop and implement a public education program on watershed processes	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USGS,CT,TU, TCFT,VC,LAC	Recreational Facilities	1, 2, 3, 4, 5	3B	20	76140	76140	76140	76140	0	304560
ASC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDPR, CDFG,SMMC, SMMRCD, NMFS,USFWS, CT,TU,TCFT, VC,LAC	Roads	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
ASC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, TCFT,VC,LAC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
ASC-SCS-11.3	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, TCFT,VC,LAC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
ASC-SCS-12.1	Develop and implement an estuary restoration and management	CDPR,CDFG, CDOT,CSCC, SMMC, SMMRCD, NMFS,CT,TCFT, VC,LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	670000	0	0	0	0	670000
ASC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, SMMC, SMMRCD, NMFS,CT,TU, TCFT,VC,LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	62400	0	0	0	0	62400
ASC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	SMMC SMMRCD, CDFG,NMFS, CT,TU,TCFT, VC,LAC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
ASC-SCS-13.2	Retrofit storm drains in developed areas	CDOT,SMMC, SMMRCD, CDFG,USFWS, NMFS,CT,TU, TCFT,VC,LAC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
ASC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, CDPR,NMFS, USFWS,CT,TU, TCFT,VC,LAC	Urban Effluents	1, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
ASC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,CDPR, USFWS,NMFS, CT,TU,TCFT, VC,LAC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
ASC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	CDF,CDPR, SMMC, SMMRCD, USFWS,USGS, NMFS,CT,TU, TCFT,VC,LAC	Wildfires	1, 4, 5	1A	100 - refer to regional costs	0	0	0	0	0	0

Table 11-6. Southern California Steelhead DPS Recovery Action Table for the Malibu Creek Watershed (Santa Monica Mountains BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Malibu Creek												
MalC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	CDPR,SMMC, SMMRCD, CDFG,CSCC CDOT,USFWS, NMFS,CT,TU, LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
MalC-SCS-4.1	Provide fish passage around dams and diversions (*e.g.*, remove or physically modify Rindge and Malibu dams)	CDPR,SMMC, SMMRCD, CDFG,CSCC USFWS,NMFS, ACOE,CT,TU, LAC	Dams and Surface Water Diversions	1, 3, 4	1A	10	TBD	TBD	TBD	TBD	TBD	TBD
MalC-SCS-4.2	Develop and implement water management plan for dam operations	SMMC, SMMRCD, CDFG,USFWS, NMFS,ACOE, CT,TU,LAC	Dams and Surface Water Diversions	1, 3, 4	1B	5	275550	0	0	0	0	275550
MalC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,USGS, NMFS,SMMC, SMMRCD, CDPR,CDFG, CT,TU,TU,LAC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
MalC-SCS-7.2	Develop and implement stream bank and riparian corridor restoration plan	CDPR,CDFG, CSCC,SMMC, SMMRCD, NMFS,CT,TU, LAC	Levees and Channelization	1, 4	2B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MalC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MalC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MalC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCCC, SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
MalC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, Malibu State Park)	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USGS,CT,TU, LAC	Recreational Facilities	1, 2, 3, 4, 5	2B	1	68030	0	0	0	0	68030
MalC-SCS-10.2	Develop and implement public education program on watershed processes	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USGS,CT,TU, LAC	Recreational Facilities	1, 2, 3, 4, 5	3B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MalC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, LAC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
MalC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, LAC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
MalC-SCS-12.1	Develop and implement an estuary restoration and management plan	CDPR,CDFG, CDOT, CSCCC, SMMC, SMMR,CD, NMFS,CT,TU, LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	4958000	0	0	0	0	4958000
MalC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, SMMC, SMMRCD, NMFS,CT,TU, LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	62400	0	0	0	0	62400
MalC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	SMMC SMMRCD, CDFG,NMFS, CT,TU,LAC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
MalC-SCS-13.2	Retrofit storm drains in developed areas	SMMC SMMRCD, CDFG,NMFS, CT,TU,LAC	Urban Development	1, 4	3B	20	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MalC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Las Virgenes Municipal Water District Wastewater Treatment Facility)	RWQCB, CDFG,CDPR, USFWS,NMFS, CT,TU,LAC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
MalC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB, CDFG,CDPR, USFWS,NMFS, CT,TU,LAC	Urban Effluents	1, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
MalC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	CDF,SMMC, SMMRCD, CDFG,USFWS, NMFS,USGS, CT,TU,LAC	Wildfires	1, 4, 5	1A	100 - refer to regional costs	0	0	0	0	0	0

Table 11-7. Southern California Steelhead DPS Recovery Action Table for the Las Flores Canyon Creek Watershed (Santa Monica Mountains BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Las Flores Canyon Creek												
LFC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	CDPR,SMMC, SMMRCD, CDFG,CSCC, CDOT,USFWS, NMFS,CT,TU, LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 - refer to regional costs	0	0	0	0	0	0
LFC-SCS-4.1	Provide fish passage around dams and diversions	CDPR,SMMC, SMMRCD, CDFG,CSCC, CDOT,USFWS, NMFS,CT,TU, LAC	Dams and Surface Water Diversions	1, 3, 4	3A	20 - refer to regional costs	0	0	0	0	0	0
LFC-SCS-4.2	Develop and implement water management plan for diversion operations	CDPR,SMMC, SMMRCD, CDFG, CDOT,USFWS, NMFS,CT,TU, LAC	Dams and Surface Water Diversions	1, 3, 4	3B	5	275550	0	0	0	0	275550
LFC-SCS-5.1	Develop and implement flood control maintenance program	NRCS,USGS, NMFS,SMMC, SMMRCD, CDPR,CDFG, CT,TU,TU,LAC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
LFC-SCS-7.2	Develop and implement stream bank and riparian corridor restoration plan	CDPR,CDFG, CSCC,SMMC, SMMRCD, NMFS,CT,TU, LAC	Levees and Channelization	1, 4	3B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LFC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
LFC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
LFC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CDOT,CSCC, SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
LFC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, Santa Monica Mountains National Recreation Area General Management Plan)	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USGS,CT,TU, LAC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing -costs of doing business	0	0	0	0	0	0
LFC-SCS-10.2	Develop and implement public education program on watershed processes	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USGS,CT,TU, LAC	Recreational Facilities	1, 2, 3, 4, 5	3B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LFC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, LAC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
LFC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT, TU,LAC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
LFC-SCS-11.3	Develop and implement plan to remove or reduce approach-fill for railroad lines and road	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, LAC	Roads	1,4	3B	20 - refer to regional costs	0	0	0	0	0	0
LFC-SCS-12.1	Develop and implement an estuary restoration and management plan	CDFG,CSCC, SMMC, SMMRCD, NMFS,CT, TU ,LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	67000	0	0	0	0	67000
LFC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, SMMC, SMMRCD, NMFS,CT,TU, LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
LFC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	SMMC SMMRCD, CDFG NMFS,CT,TU, LAC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
LFC-SCS-13.2	Retrofit storm drains in developed areas	SMMC SMMRCD, CDFG,NMFS, CT,TU,LAC	Urban Development	1, 4	3B	20	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LFC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.*, Las Virgenes Municipal Water District Wastewater Treatment Facility)	RWQCB, CDFG,CDPR, USFWS,NMFS, CT,TU,LAC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
LFC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB, CDFG,CDPR, USFWS,NMFS, CT,TU,LAC	Urban Effluents	1, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
LFC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	CDF,SMMC, SMMRCD, CDFG,USFWS, NMFS,USGS, CT,TU,LAC	Wildfires	1, 4, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Table 11-8. Southern California Steelhead DPS Recovery Action Table for the Topanga Canyon Creek Watershed (Santa Monica Mountains BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Topanga Canyon Creek												
TopC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	CDPR,SMMC, SMMRCD, CDFG,CSCC, CDOT,USFWS, NMFS,CT,TU, LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
TopC-SCS-4.1	Provide fish passage around dams and diversions	CDPR,SMMC, SMMRCD, CDFG,CSCC, USFWS,NMFS, CT,TU,LAC	Dams and Surface Water Diversions	1, 3, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
TopC-SCS-4.2	Develop and implement water management plan for diversion operations	CDPR,SMMC, SMMRCD, CDFG,CSCC, USFWS,NMFS, CT,TU,LAC	Dams and Surface Water Diversions	1, 3, 4	2B	5	275550	0	0	0	0	275550
TopC-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, CT,TU,LAC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
TopC-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CDFG,CDPR, CDOT,CSCC, SMMC, SMMRCD, NMFS,CT,TU, LAC	Levees and Channelization	1, 4	2B	10	10521940	10521940	0	0	0	21043880

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TopC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
TopC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC, SMMC, SMMRCD, USFWS,NMFS, CT,TU	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
TopC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,SMMC, SMMRCD, USFWS,NMFS, CT,TU,LAC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
TopC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, Topanga State Park, Santa Monica Mountains National Recreation Area General Management Plan)	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USGS,CT,TU, LAC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing -cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TopC-SCS-10.2	Develop and implement public education program on watershed processes	SMMC, SMMRCD, CDPR,CDFG, CSCC,NMFS, USGS,CT,TU, LAC	Recreational Facilities	1, 2, 3, 4, 5	3B	20	76140	76140	76140	76140	0	304560
TopC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, LAC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
TopC-SCS-11.2	Retrofit storm drains to filter runoff from roadways	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, LAC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
TopC-SCS-11.3	Develop and implement plan to remove or reduce approach-fill for railroad lines and road	CDOT,CDPR, RWQCB, CDFG,SMMC, SMMRCD, NMFS,CT,TU, LAC	Roads	1,4	2B	20-refer to regional costs	0	0	0	0	0	0
TopC-SCS-12.1	Develop and implement an estuary restoration and management plan	CDFG,CDPR, CDOT,CSCC, SMMC, SMMRCD, NMFS,CT,TU, LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	201000	0	0	0	0	201000
TopC-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, SMMC, SMMRCD, NMFS,CT,TU, LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2A	5	62400	0	0	0	0	62400

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TopC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	SMMC SMMRCD, CDFG,NMFS, CT,TU,LAC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
TopC-SCS-13.2	Retrofit storm drains in developed areas	SMMC SMMRCD, CDFG,CDOT, NMFS,CT,TU, LAC	Urban Development	1, 4	2B	20	0	0	0	0	0	0
TopC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,CDPR, USFWS,NMFS, CT,TU,LAC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
TopC-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, CDPR,USFWS, NMFS,CT,TU, LAC	Urban Effluents	1, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
TopC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	CDF,SMMC, SMMRCD, CDFG,USFWS, NMFS,USGS, CT,TU,LAC	Wildfires	1, 4, 5	1A	100 - refer to regional costs	0	0	0	0	0	0

12. Mojave Rim Biogeographic Population Group

"The motivation to consider steelhead recovery from a broad perspective stems from the realization that there is no meaningful way to discuss the science of steelhead recovery without fully embracing its many intricate connections with the human population of the region and the climatic changes now underway."

Dr. David A. Boughton, Chair, NOAA Fisheries South-Central/Southern California Steelhead Technical Recovery Team, 2010

12.1 LOCATION AND PHYSICAL CHARACTERISTICS

The Mojave Rim BPG region encompasses three large coastal watersheds that drain the northern slopes of the Santa Monica Mountains and the coastal slopes of the San Gabriel and San Bernardino mountains in southern Los Angeles County, southwestern San Bernardino, and western Riverside and Orange counties: the Los Angeles River, San Gabriel River, and the Santa Ana River (Figure 12-1). Major tributaries in these drainages include: Arroyo Seco in the Los Angeles River watershed; the East and West forks of the San Gabriel River, and Mill, Lytle, and Fish creeks in the upper Santa Ana River watershed. The upper portions of each of these watersheds include steep, mountainous terrain and the lower watersheds cut across the Los Angeles Watershed—an extensive coastal plain. The Los Angeles, San Gabriel, and Santa Ana rivers have not always discharged to the Pacific Ocean at their current locations, but sometimes migrated across the Los Angeles Watershed and discharged as far west as Ballona Creek and as far east as present-day Huntington Beach. The Los Angeles, San Gabriel, and Santa Ana rivers currently discharge to the Pacific Ocean within 20 miles of each other in southern Los Angeles and northern Orange counties. The component watersheds are large, extending up to 83 miles inland in the case of the Santa Ana River watershed (Figure 12-4).

Los Angeles Basin

Average annual precipitation in these three watersheds is higher than that of the two adjacent BPG regions (*i.e.*, the Santa Monica

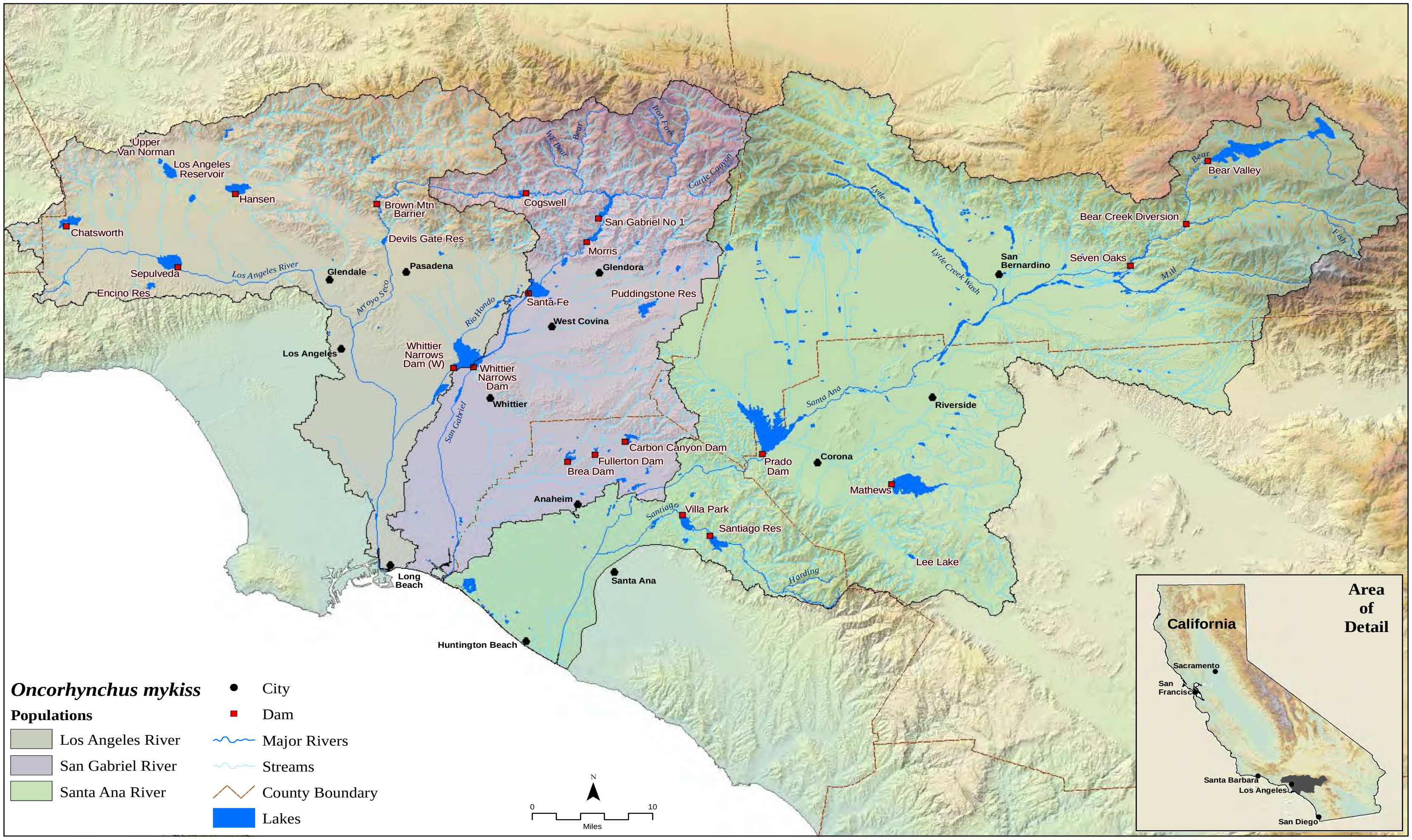


Figure 12-1. The Mojave Rim BPG region. Eight *O. mykiss* populations/watersheds were analyzed in this region: two in the Los Angeles River watershed; three in the San Gabriel River watershed, and three in the Santa Ana River watershed.

Mountains and Santa Catalina Gulf Coast) because the upper watersheds include the San Gabriel and San Bernardino mountain ranges, whose upper elevations receive high annual rainfall and snowfall (Table 12-1). Rainfall along the coastal terrace portion of each of these watersheds is significantly lower than in the mountainous portions. Many of the mainstem rivers and tributaries in the Mojave Rim BPG region flow across the relatively flat Los Angeles Watershed, with comparatively few small tributaries for watersheds of their size. As a result, the overall stream length in these watersheds is less than that in other BPG regions of comparable size (Hunt & Associates 2008a, Kier Associates 2008b).

12.2 LAND USE

Table 12-1 summarizes land use and population density in this region. This BPG region encompasses the second-largest metropolitan area in the United States. Human population density here is the highest of any of the five BPG regions, averaging 2,964 persons per square mile. Population centers are mostly concentrated in the Los Angeles River watershed (5,237 persons per square mile), but the interior portions of the Santa Ana River watershed also have densely developed metropolitan areas.

Urban Transportation and Flood Control

There are at least 20 dams on the mainstem and/or major tributaries of each of the three drainages in this BPG that are large enough to be regulated by the California Department of Water Resources and/or Department of Defense (also see Figure 12-1 for distribution and size of reservoirs). These dams are owned and operated by federal, state, public utility, local government, or private interests for irrigation, flood control and storm water management, recreation, municipal water supply, fire protection, farm ponds, or some combination of these purposes. Most of the reservoirs and lakes in this region receive high recreational use and many are sources of non-native crayfish, fishes, and bullfrogs, and other non-native species that prey on or compete with *O. mykiss* for food and habitat space.

Angeles National Forest

Public land ownership is concentrated in the upper portions of these watersheds, mostly within the Angeles National Forest, San Bernardino National Forest, and the northern portion of Cleveland National Forest. These three National Forests encompass several federally-designated wilderness areas: the San Gabriel and Sheep Mountain Wilderness Areas (Angeles National Forest), San Gorgonio, Cucamonga, San Jacinto, Santa Rosa, and Big Horn Mountain Wilderness Areas (San Bernardino National Forest). Additionally, several rivers have been evaluated for inclusion in the federally-designated Wild and Scenic River system: Little Rock Creek, North and South forks of the San Gabriel River (tributaries to the San Gabriel River), and Middle Fork Lytle Creek, Bear Creek, and Siberia Creek (tributaries to the Santa Ana River). Agriculture (row crop, orchard cultivation, and livestock ranching), used to be important land uses throughout the flatter portions of these watersheds, but have largely been displaced by urban development (Hunt & Associates 2008a, Kier Associates 2008b).

12.3 CURRENT WATERSHED CONDITIONS

Watershed conditions were assessed for eight watersheds and sub-watersheds in the Mojave Rim BPG region. In general, instream, riparian, and floodplain conditions for anadromous *O. mykiss* are poor in this BPG region, reflecting pervasive urban conversion of watershed lands, particularly along the mainstems of these drainages, but also in the upper sub-watersheds of the Santa Ana River watershed. The upper watersheds of the San Gabriel River watershed (East and West forks) still provide good to very good habitat conditions for resident *O. mykiss*, but these fish are isolated from the anadromous component of the population found in the mainstem (Hunt & Associates 2008a, Kier Associates 2008b).

The mainstems of the Los Angeles and Santa Ana rivers provide little suitable spawning or rearing habitat for anadromous *O. mykiss* because of fish-passage barriers, channelization and flood control activities, loss of surface flows, and impaired water quality. However, several of the tributaries to these major rivers contain suitable habitat for steelhead. Los Angeles River tributaries include Arroyo Seco, Mill, and Alder Creeks. Santa Ana River tributaries include Harding Canyon, Coldwater Canyon, and San Antonio Creeks.

East Fork San Gabriel River

San Gabriel River tributaries include Bear, Salilier, and Prairie Creeks and the East and West Forks. The East and West forks of the San Gabriel River watershed, above Morris, San Gabriel, and Cogswell dams and their reservoirs, are mostly in public ownership (Angeles National Forest and Cleveland National Forest) and these reaches provide relatively good habitat conditions. Both the East and West Forks of the Sana Gabriel River support reproducing populations of non-anadromous *O. mykiss* that are isolated from their anadromous counterparts downstream of the dams.

Morris Dam – San Gabriel River

Table 12-1. Physical and Land Use Characteristics of Major Watersheds in the Mojave Rim BPG region.

PHYSICAL CHARACTERISTICS						LAND USE			
WATERSHEDS (north to south)	**Area** (acres)[1]	**Area** (sq. miles)[1]	**Stream Length**[2] (miles)	**Ave. Ann. Rainfall**[3] (inches)	**Total Human Population**[4]	**Public Ownership***	**Urban Area**[5]	**Agriculture/ Barren**[5]	**Open Space**[5]
Los Angeles River	535,923	837	766	19.1	4,383,260	25%	61%	1%	38%
San Gabriel River	463,167	723	784	19.8	2,417,034	35%	53%	2%	46%
Santa Ana River	1,141,195	1,783	2,074	17.3	3,109937	29%	37%	8%	55%
TOTAL or AVERAGE	**2,140,285**	**3,343**	**3,624**	**18.7**	**9,910,231**	**30%**	**50%**	**4%**	**46%**

[1] *From: CDFFP CalWater 2.2 Watershed delineation, 1999 (www.ca.nrcs.usda.gov/features/calwater/)*
[2] *From: CDFG 1:1,000,000 Routed stream network, 2003 (www.calfish.org/)*
[3] *From: USGS Hydrologic landscape regions of the U.S., 2003 (1 km grid cells)*
[4] *From: CDFFP Census 2000 block data (migrated), 2003; preliminary analysis of Census 2010 indicates the population in the BPG has increased to10, 561,011*
[5] *From: CDFFP Multi-source land cover data (v02_2), 2002 (100 m grid cells) (http://frap.cdf.ca.gov/data/frapgisdata/select.asp)*
* *National Forest Lands only; Military Reservations or State and County Parks not included*

Figure 12-2. The Los Angeles River Watershed.

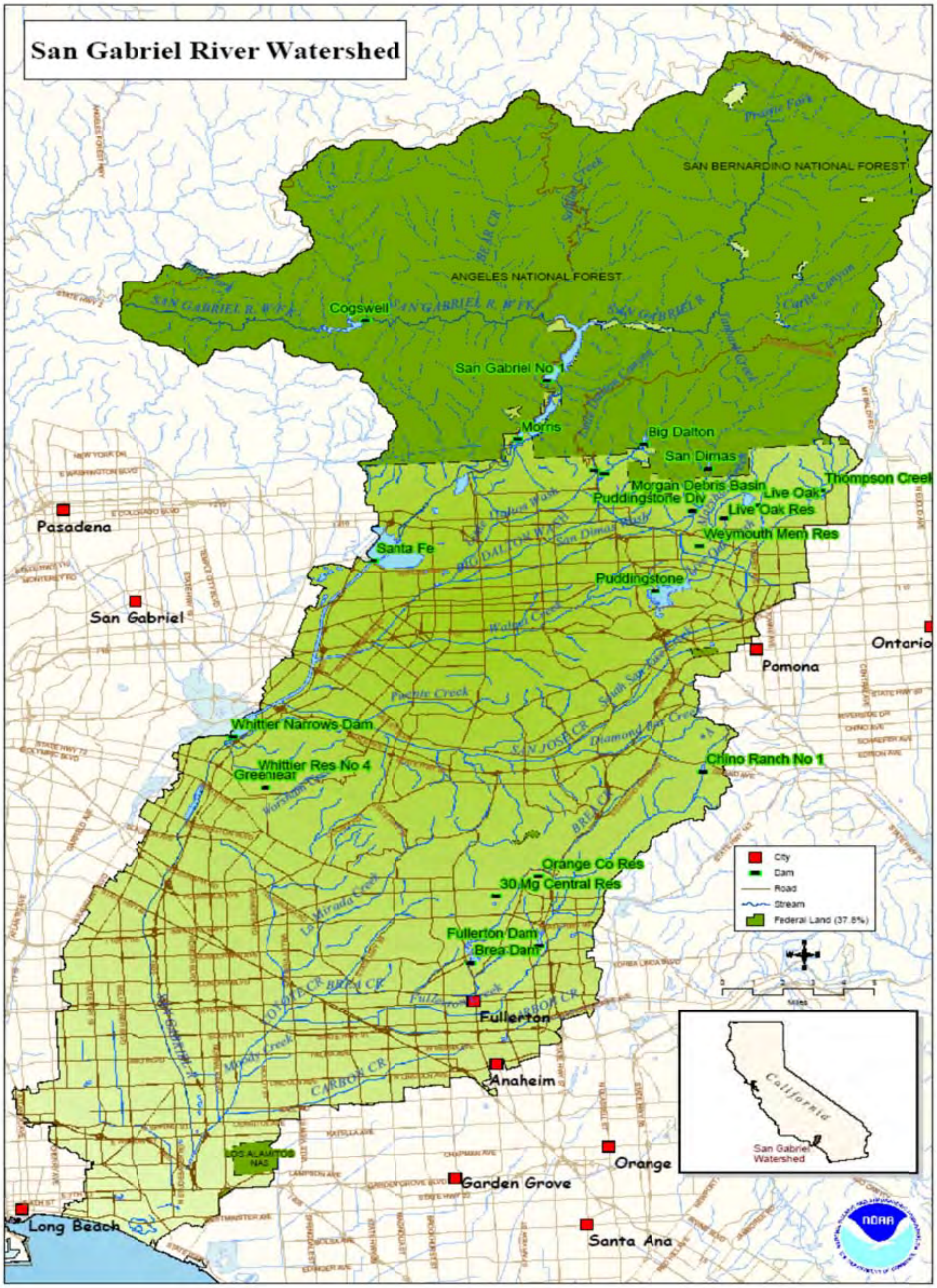


Figure 12-3. The San Gabriel River Watershed.

Figure 12-4. The Santa Ana River Watershed.

Urban and agricultural conversion of coastal and middle reaches of three major watersheds in this BPG has created a number of severe stressors on anadromous *O. mykiss*. High road density throughout the floodplains has constricted the mainstems of these rivers to narrow channels, increased sediment and non-point pollutant inputs, and degraded rearing and spawning habitats (including estuaries). Nutrient and coliform bacteria-loading from agricultural and wastewater treatment effluents degrades water quality in most of these drainages (Hunt and Associates 2008a). In urban areas, channelization, levee construction, and other flood control activities have completely removed instream and riparian habitat from extensive reaches of the mainstems of the lower Los Angeles River, Santa Ana River, and San Gabriel River. The increase of impermeable surfaces as a result of urbanization (including roads) within the interior valleys, and on the coastal plain, has altered the natural flow regime of streams, particularly in the lower reaches, increasing the frequency and intensity of flood flows.

San Gabriel Dam – San Gabriel River

Other significant threat sources in the Mojave Rim BPG region are recreational facilities, wildfire, and the loss of extensive estuarine habitat. Most watersheds receive very high recreational use because of their proximity to large urban areas. Trash, foot traffic, and off-road vehicle traffic have significantly affected instream and riparian habitats along extensive reaches of the upper watersheds. Fires have burned 21% and 26% of the San Gabriel River and Santa Ana River watersheds, respectively, in the past 25 years and may be significant, widespread, and long-term sources of sedimentation, turbidity, substrate embeddedness, and loss of riparian canopy cover. The historically extensive estuaries that formed at the mouths of the Los Angeles River, San Gabriel River, and Santa Ana River have been all but eliminated by urban and commercial development (Hunt & Associates 2008a, Kier Associates and National Marine Fisheries Service 2008b).

Santa Ana River Estuary

Estuarine habitats at the mouths of these watersheds in this BPG region have been reduced in size by 98 – 100% by the development of harbors, roads and railroads, urbanization. Historically, these estuaries were extensive, formed by the confluence of several watersheds, encompassing thousands of acres. The remaining estuarine habitats are subject to constriction and isolation by development, surface runoff from roads and other impervious surfaces, as well as a reduction in the amount and quality of surface flows resulting from groundwater extraction.

Despite widespread habitat degradation to the coastal and middle mainstems in these watersheds, native non-anadromous *O.*

mykiss populations still persist upstream of the dams in this BPG region and small numbers of anadromous *O. mykiss* attempt to enter and spawn in each of the watersheds when flow conditions are suitable.

New and Old Prado Dams – Santa Ana River

12.4 THREATS AND THREAT SOURCES

Habitat impairments were rated as severe to very severe in five of the eight watersheds and sub-watersheds in this BPG region because of the very high human population densities. Ten anthropogenic activities ranked as the top sources of stresses to steelhead and their habitat in the Mojave Rim BPG (Table 12-2). These sources of threats focus on water management activities to serve municipal uses (dams, surface water diversions, and groundwater extraction). Dams and surface water diversions in this BPG region have been constructed to serve mostly urban purposes. These dams have numerous impacts on physical, hydrological, and habitat characteristics of the middle and lower reaches of mainstem rivers in this region. Dams also create and maintain favorable habitat conditions for several species of non-native fishes and bullfrogs that may affect one or more life history stages of *O. mykiss* either directly (*e.g.,* predation) or indirectly (*e.g.,* competition for food). Non-native fishes, crayfish, and/or amphibians occur in the mainstems of the Los Angeles River, San Gabriel River, and Santa Ana River, as well as in most or all of the major tributaries. Water management practices and facilities have significantly altered natural sediment and hydrological processes in these watersheds. Widespread pumping of groundwater from aquifers throughout the region routinely eliminates surface flows in portions of most of these drainages. The magnitude of such losses of surface flows is greater during years of below-average precipitation. Another major indirect impact of dam construction and operation on the mainstem of the San Gabriel River is the periodic sluicing of sediments accumulated behind these dams, which severely degrades instream and riparian habitat quality for downstream of these structures (Hunts & Associates 2008a, Kier Associates 2008b).

Table 12-2. Threat source rankings in the Mojave Rim BPG (see CAP Workbooks for individual watersheds for details).

Mojave Rim BPG Component Watersheds								
Threat Sources	Los Angeles River mainstem	Arroyo Seco	San Gabriel River mainstem	West Fork San Gabriel River	East Fork San Gabriel River	Santa Ana River mainstem	Lytle Creek	Mill Creek
Dams and Surface Water Diversions	Red	Yellow	Red	Red	Red	Red	Dark green	Red
Flood Control Maintenance	Red	Red	Red	Dark green	Dark green	Red	Red	Dark green
Groundwater Extraction	Red	Yellow	Dark green	Dark green	Dark green	Red	Red	Red
Levees and Channelization	Red	Red	Red	Dark green	Dark green	Red	Red	Dark green
Urban Development	Red	Red	Red	Dark green	Dark green	Red	Red	Dark green
Recreational Facilities	Dark green	Dark green	Dark green	Dark green	Dark green		Dark green	Dark green
Culverts and Road Crossings	Yellow	Light green	Red	Dark green	Dark green		Dark green	Dark green
Agricultural Development	Dark green	Dark green	Dark green	Dark green	Dark green		Dark green	Dark green
Upslope/Upstream Development	Yellow	Yellow	Yellow	Dark green	Dark green		Yellow	Yellow
Wildfires*	Dark green	Dark green	Red	Red	Red	Red	Red	Red

Key: *Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat (Threat cell colors represent threat rating from CAP Workbook)*

** Wildfires as a source of threats to steelhead habitat is not reflected in the top five threat sources in the CAP summary for these watersheds (see CAP workbooks), but is included here because of the extent and severity of recent (2005-2007) wildfires in this region; additionally, the presence of non-native species is not reflected in the CAP workbook, but non-native species is a potential threat in this BPG because of the potential for anthropogenic introduction.*

12.5 SUMMARY

Dams and water diversions (including groundwater extraction) along with flood control structures on the major rivers of the Mojave Rim BPG (Los Angeles River, San Gabriel River, and Santa Ana River) have had the most serve impacts on the anadromous *O. mykiss* populations in this BPG region by cutting off access to upstream spawning and rearing habitats and altering the magnitude, duration, and timing of flows necessary for immigration of adults and emigration of juveniles. Dams and surface water diversions in this BPG region have been constructed to serve mostly urban purposes. This BPG region encompasses the second-largest metropolitan area in the United States and human population density here is the highest of any of the five BPG regions. Such widespread urbanization has created a number of severe stressors for steelhead. Additionally, impacts associated with wildland fires, including fire-fighting measures to control or extinguish them, and the post-fire measures to repair damages incurred in fighting wildland fires, poses a potential threat to watersheds in this BPG. Table 12-3 summarizes the critical recovery actions needed within the Core 1 populations of this BPG.

Restoring conditions for anadromous *O. mykiss* passage, spawning, and rearing in the Mojave Rim BPG region will require multiple, long-term, measures related to water management, recreation, and urban development. A fish passage barrier inventory and assessment should be conducted for each of the major watersheds. Impediments to fish passage stemming from the construction and operation of dams, groundwater extraction, and channel modification, and the loss of instream and adjacent riparian habitats by flood control measures need to be further evaluated for this BPG region. Additionally, the loss of estuarine functions caused by filling and pollution from point and non-point agricultural and urban waste discharges need to be addressed further in this region.

Los Angeles River Steelhead –1940.

Threat sources discussed in this section should be the focus of a variety of recovery actions to address specific stresses on anadromous *O. mykiss* viability. Spatial and temporal data, for water temperature, pH, nutrients, *etc*., are not uniformly available, and should be further developed, along with general habitat typing assessments, to better identify natural as well as anthropogenic limiting factors. This type of data acquisition should be the subject of site-specific investigations in order to refine the primary recovery actions or to target additional recovery actions as part of any recovery strategy for the Mojave Rim BPG. Tables 12-4 through 12-6 below rank and describe proposed recovery actions for each sub-watershed in the Mojave Rim BPG, including the estimated cost for implementing the actions in five year increments over the first 25 years, and where applicable extended out to 100 years, though many recovery actions can be achieved within a shorter period.

Table 12-3. Critical recovery actions for Core 1 populations within the Mojave Rim BPG.

POPULATION	CRITICAL RECOVERY ACTION
San Gabriel River	Implement operating criteria to ensure the pattern and magnitude of groundwater extractions and water releases from Morris, San Gabriel, and Cogswell dams provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Physically modify Morris, San Gabriel, Cogswell, and Santa Fe dams, and road, highway, and railway crossings to allow natural rates of migration of steelhead to upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.

Southern California Steelhead DPS Recovery Action Tables Identification Key, Mojave Rim BPG (Tables 12-4 – 12-6).

Recovery Action Number Key: XXXX – SCS – 1.2		XXXX ID Table		Threat Source Legend	
XXXX	Watershed	LAM	Los Angeles River Mainstem	1	Agricultural Development
SCS	Species Identifier – Southern California Steelhead	AS	Arroyo Seco	2	Agricultural Effluents
1	Threat Source	SG	San Gabriel River	3	Culverts and Road Crossings
2	Action Identity Number	WSG	West Fork San Gabriel	4	Dams and Surface Water Diversions
Action Rank		ESG	East Fork San Gabriel	5	Flood Control Maintenance
A	Action addresses the first listing factor regarding the destruction or curtailment of the species' habitat	SAM	Santa Ana River Mainstem	6	Groundwater Extraction
B	Action addresses one of the other four listing factors	LC	Lytle Creek	7	Levees and Channelization
		MilC	Mill Creek	8	Mining and Quarrying
				9	Non-Native Species
				10	Recreational Facilities
				11	Roads
				12	Upslope/Upstream Activities
				13	Urban Development
				14	Urban Effluents
				15	Wildfires

See Chapter 8, Table 8.1 for Detailed Description of Recovery Actions

Table 12-4. Southern California Steelhead DPS Recovery Action Table for the Los Angeles River Watershed (Mojave Rim BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Los Angeles River Mainstem												
LAM-SCS-3.2	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT,MWDSC DWR,FOLAR, CT,TU,LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
LAM-SCS-4.1	Provide fish passage around dams and diversions	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT,MWDSC DWR,FOLAR, CT,TU,LAC	Dams and Surface Water Diversions	1, 3, 4	1B	20	TBD	TBD	TBD	TBD	TBD	TBD
LAM-SCS-4.2	Develop and implement a water management plan for dam operations (*e.g.*, Whittier Narrows, Sepulveda, and Lower San Fernando dams)	NMFS,ACOE, USGS,USFWS, CDFG,CSCC, CDOT,MWDSC DWR,FOLAR, CT,TU,LAC	Dams and Surface Water Diversions	1, 3, 4	1B	20	TBD	TBD	TBD	TBD	TBD	TBD
LAM-SCS-3/4.3	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT, MWDSC,DWR, FOLAR,CT,TU	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	2B	5	96692	0	0	0	0	96692

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LAM-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USFWS,CDFG, CSCC,FOLAR, CT,TU,LAC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
LAM-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,DWR, SWRCB, MWDSC, NMFS,FOLAR, CT,TU,LAC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
LAM-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,DWR, SWRCB, MWDSC, NMFS,FOLAR, CT,TU,LAC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
LAM-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	ACOE,NMFS, USFWS,CDFG, CSCC,FOLAR, CT,TU,LAC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
LAM-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,ACOE, NMFS,USFWS, CDFG,CSCC, FOLAR,CT,TU, LAC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
LAM-SCS-7.3	Develop and implement plan to restore natural channel features	ACOE,NMFS, USFWS,CDFG, CSCC,FOLAR, CT,TU,LAC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
LAM-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CSCC, NMFS,USFWS FOLAR,CT,TU, LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LAM-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CSCC, NMFS,USFWS FOLAR,CT,TU, LAC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
LAM-SCS-9.3	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, NMFS,USFWS FOLAR,CT,TU, LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
LAM-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, Los Angeles River Revitalization Master Plan, U.S. Forest Service Angeles National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	CDFG,CSCC, NMFS,USFWS FOLAR,CT,TU, LAC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing -cost of doing business	0	0	0	0	0	0
LAM-SCS-10.2	Develop and implement public education program on watershed processes	CDFG,CSCC, NMFS,USFWS FOLAR,CT,TU, LAC	Recreational Facilities	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LAM-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USDOT,NMFS, CDOT,FOLARCT,TU,LAC	Roads	1, 4	3B	On-going cost of doing business	0	0	0	0	0	0
LAM-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, NMFS,USFWS, FOLAR,CT,TU, LAC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
LAM-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDFG,CSCC, NMFS,USFWS, FOLAR,CT,TU, LAC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
LAM-SCS-13.2	Retrofit storm drains in developed areas	USDOT,NMFS, CDOT,FOLARCT,TU,LAC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
LAM-SCS-13.3	Develop and implement riparian restoration plan to replace artificial bank stabilization structures	ACOE,NMFSUSFWS,CDFG, CSCC,FOLAR, CT,TU,LAC	Urban Development	1, 4	3B	10	10521940	10521940	0	0	0	21043880
LAM-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,NMFS, USFWS,CDFG, FOLAR,CT,TU, LAC	Urban Effluents	1, 4, 5	3B	On-going cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LAM-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Whittier Narrows Water Reclamation Facility, D.C. Tillman Water Reclamation Facility and Hyperion Wastewater Treatment Facility)	RWQCB,CDFG USFWS,NMFS, FOLAR,CT,TU, LAC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
LAM-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG FOLAR,CT,TU, LAC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Arroyo Seco												
AS-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, NMFS,CDFG, FOLAR,CT,TU, LAC	Agricultural Development	1, 4	3B	5	62400	0	0	0	0	62400
AS-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, NMFS,CDFG, FOLAR,CT,TU, LAC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
AS-SCS-1.3	Manage agricultural development and restore riparian zone	NRCS,BLM, NMFS,CDFG, FOLAR,CT,TU, LAC	Agricultural Development	1, 4	3B	10 - refer to regional costs	0	0	0	0	0	0
AS-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT,DWR, FOLAR CT,TU,LAC	Culverts and Road Crossings (Passage Barriers)	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
AS-SCS-4.1	Provide fish passage around dams and diversions	NMFS,ACOE, USFWS,CDFG, CSCC,CDOT, MWDSCDWR, FOLAR,CT,TU, LAC	Dams and Surface Water Diversions	1,3,4	2B	20 - refer to regional costs	0	0	0	0	0	0
AS-SCS-4.2	Develop and implement water management plan for diversion operations	NMFS,ACOE, USFWS,CDFG, CSCC, MWDSC,DWR, FOLAR,CT,TU, LAC	Dams and Surface Water Diversions	1, 3, 4	3B	5	91850	0	0	0	0	91850
AS-SCS-4.3	Develop and implement water management plan for dam operations	NMFS,ACOE, USFWS,CDFG, CSCC,CDOT, MWDSCDWR,	Dams and Surface Water Diversions	1, 3, 4	3B	5	91850	0	0	0	0	91850

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
		FOLAR,CT,TU, LAC										
AS-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS CDFG,CSCC, CDOT,FOLAR CT,TU,LAC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	2B	1	96692	0	0	0	0	96692
AS-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, CDFG,FOLAR, CT,TU,LAC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
AS-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, USFWS,DWR, SWRCB, MWDSC, FOLAR,CT,TU, LAC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
AS-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, USFWS,DWR, CDFG,SWRCB, MWDSC, FOLAR,CT,TU, LAC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
AS-SCS-7.1	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA, ACOE,NMFS, USFWS,CDFG, CSCC,FOLAR, CT,TU,LAC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
AS-SCS-7.2	Develop and implement plan to restore natural channel features	ACOE,NMFS, USFWS,CDFG, CSCC,FOLAR, CT,TU,LAC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
AS-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,NMFS, FOLAR,CT,TU, LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
AS-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,NMFS, FOLAR,CT,TU, LAC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
AS-SCS-9.3	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,NMFS, FOLAR,CT,TU, LAC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
AS-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, Arroyo Seco Master Plan (Hahanonga Watershed Park Master Plan, Central Arroyo Master Plan, Lower Arroyo Master Plan, Design Guidelines for the Arroyo Seco)	CDFG,CSCC, USFWS,NMFS, BLM,FOLAR, CT,TU,LAC	Recreational Facilities	1, 2, 3, 4, 5	3B	1	68030	0	0	0	0	68030

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
AS-SCS-10.2	Develop and implement public education program on watershed processes	CDFG,NMFS, USFWS,USFS, FOLAR, CT,TU,LAC	Recreational Facilities	1,3,5	3B	20	76140	76140	76140	76140	0	304560
AS-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDFG,CSCC, NMFS,USFWS, FOLAR,CT,TU	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
AS-SCS-13.2	Retrofit storm drains in developed areas	USDOT,NMFS, CDOT,CDFG, FOLAR,CT,TU, LAC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
AS-SCS-13.3	Develop and implement riparian restoration plan to replace artificial bank stabilization structures	AOEC,NMFS, CDFG,CSCC, FOLAR,CT,TU, LAC	Urban Development	1, 4	3B	10	10521940	10521940	0	0	0	21043880
AS-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, FOLAR,CT,TU, LAC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
AS-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,NMFS, USFWS,FOLAR, CT,TU,LAC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
AS-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG, FOLAR CT,TU,LAC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 12-5. Southern California Steelhead DPS Recovery Action Matrix for the San Gabriel River Watershed (Mojave Rim BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Gabriel River Mainstem												
SG-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,CT,TU, SGMRC,LAC, SBRC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
SG-SCS-1.2	Manage agricultural development and restore riparian zones	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB, CSCC,CT,TU, SGMRC,LAC, SBRC	Agricultural Development	1, 4	3B	10 - refer to regional costs	0	0	0	0	0	0
SG-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,BLM, NMFS,CDFG, RWQCB, CT,TU,SGMRC, LAC,SBRC	Agricultural Effluents	1, 4	3B	20	99200	7997440	7997440	7997440	0	24091520
SG-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, USFS,CDFG,CSCC,CDOT, DWR,CT,TU, SGMRC,LAC, SBRC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
SG-SCS-4.1	Develop and implement a water management plan for diversion operations	NMFS,ACOE, USFWS,CDFG, CSCC, MWDSC,DWR, CT,TU,SGMRC, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	1A	10	TBD	TBD	TBD	TBD	TBD	TBD

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SG-SCS-4.2	Develop and implement water management plan for dam operations (*e.g.,* Santa Fe, Morris, and San Gabriel dams)	NMFS,ACOE, USFWS,CDFG, CSCC, MWDSC,DWR, CT,TU,SGMRC, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	1A	10	TBD	TBD	TBD	TBD	TBD	TBD
SG-SCS-4.3	Provide fish passage around dams and diversions (*e.g.,* Santa Fe, Morris, and San Gabriel dams	NMFS,ACOE, USFWS,CDFG, CSCC, MWDSC,DWR, CT,TU,SGMRC, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	1A	10	TBD	TBD	TBD	TBD	TBD	TBD
SG-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS CDFG,CSCC, CDOT,CT,TU, SGMRC, LAC,SBRC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96692	0	0	0	0	96692
SG-SCS-5.1	Develop and implement flood control maintenance program	USGS,ACOE, BLM,NMFS, SGRMC,CT,TU, LAC,SBRC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
SG-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SGRMC, LAC,SBRC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
SG-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC, CT,TU,SGRMC, LAC,SBRC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SG-SCS-7.1	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA, NRCS,ACOE, BLM,NMFS, CDFG,CSCC, SGRMC,CT,TU, LAC,SBRC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SG-SCS-7.2	Develop and implement plan to restore natural channel features	NRCS,ACOE, BLM,NMFS, CDFG,CSCC, SGRMC,CT,TU, LAC,SBRC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
SG-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SG-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
SG-SCS-9.3	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SG-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* San Gabriel River Corridor Plan, U.S.	USFS,USFWS, NMFS,BLM, CDFG, SGRMC,CT,TU, LAC,SBRC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	Forest Service Angeles National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria											
SG-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SGRMC,CT,TU, LAC,SBRC	Recreational Facilities	1,3,5	3B	20	76140	76140	76140	76140	0	304560
SG-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB, CSCC,CT,TU, SGMRC,LAC, SBRC	Roads	1, 4	3B	on-going cost of doing business	0	0	0	0	0	0
SG-SCS-12.1	Develop and implement an estuary restoration and management plan	CDFG,CSCC, USFWS,NMFS, SGRMC,CT,TU, LAC,SBRC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	56615000	0	0	0	0	56615000
SG-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, NMFS,USFWS, SGRMC,CT,TU, LAC,SBRC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
SG-SCS-13.1	Develop, adopt and implement urban land-use planning policies and standards	CDFG, RWQCB, CDOT,USFWS, NMFS,SGRMC, CT,TU,LAC, SBRC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SG-SCS-13.2	Retrofit storm drains in developed areas	USDOT,NMFS, USFWS,CDOT, SGRMC,CT,TU, LAC,SBRC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
SG-SCS-13.3	Develop and implement riparian restoration plan replace artificial bank stabilization structures	NMFS,CDFG, CT,TU,LAC, SBRC	Urban Development	1, 4	3B	10	10521940	10521940	0	0	0	21043880
SG-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDOT USFWS,NMFS, SGRMC,CT,TU, LAC,SBRC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
SG-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, USFWS,NMFS, SGRMC,CT,TU, LAC,SBRC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
SG-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG, SGRMC,CT,TU, LAC,SBRC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
West Fork San Gabriel River												
WSG-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,CT,TU, SGRMC,LAC, SBRC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
WSG-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,CT,TU, SGRMC,LAC, SBRC	Agricultural Development	1, 4	3B	5	62400	0	0	0	0	62400
WSG-SCS-1.3	Manage agricultural development and restore riparian zones	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,CT,TU, SGRMC,LAC, SBRC	Agricultural Development	1, 4	3B	10 - refer to regional costs	0	0	0	0	0	0
WSG-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,BLM, NMFS,CDFG, RWQCB,CT,TU, SGRMC,LAC, SBRC	Agricultural Effluents	1, 4	3B	20 – include d in San Gabriel Main-stem	0	0	0	0	0	0
WSG-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, USFS,CDFG, CSCC,CDOT, DWR,CT,TU, LAC,SBRC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
WSG-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, SGRMC,CT,TU, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	3B	5	91850	0	0	0	0	91850

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
WSG-SCS-4.2	Develop and implement an water management plan for dam operations (*e.g.*, Cogswell Dam) in the West Fork of the San Gabriel River	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, SGRMC,CT,TU, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	3B	5	91850	0	0	0	0	91850
WSG-SCS-4.3	Provide fish passage around dams and diversions	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, SGRMC,CT,TU, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	1A	10	TBD	TBD	TBD	TBD	TBD	TBD
WSG-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS CDFG,CSCC, CDOT,CT,TU, LAC,SBRC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	1	96692	0	0	0	0	96692
WSG-SCS-6.1	Conduct groundwater extraction analysis assessment	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SGRMC, LAC,SBRC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
WSG-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SGRMC, LAC,SBRC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
WSG-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
WSG-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
WSG-SCS-9.3	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
WSG-SCS-10.1	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SGRMC,CT,TU, LAC,SBRC	Recreational Facilities	1,3,5	3B	20	76140	76140	76140	76140	0	304560
WSG-SCS-10.2	Review and modify development and management plants for recreational areas and national forests (*e.g.,* U.S. Forest Service Angeles National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SGRMC,CT,TU, LAC,SBRC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
WSG-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SGRMC,CT,TU, LAC,SBRC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
WSG-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,USFWS, NMFS,SGRMC, CT,TU,LAC, SBRC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
WSG-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG, SGRMC,CT,TU, LAC,SBRC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
East Fork San Gabriel River												
ESG-SCS-1.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,BLM, NMFS,CDFG, RWQCB,CT,TU, SGRMC,LAC, SBRC	Agricultural Development	1, 4	3B	20- Include d in San Gabriel Main-stem	0	0	0	0	0	0
ESG-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,CT,TU, SGRMC,LAC, SBRC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
ESG-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, USFS,CDFG,CS CC,CDOT, DWR,SGRMC, CT,TU,LAC, SBRC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
ESG-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, CT,TU,SGRMC, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	1A	5	91850	0	0	0	0	91850
ESG-SCS-4.2	Provide fish passage around dams and diversions	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, CT,TU,SGRMC, LAC,SBRC	Dams and Surface Water Diversions	1, 3, 4	1A	10	TBD	TBD	TBD	TBD	TBD	TBD
ESG-SCS-3/4.3	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS CDFG,CSCC, CDOT, SGRMC,CT,TU, LAC,SBRC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	1	96692	0	0	0	0	96692

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
ESG-SCS-5.1	Develop and implement flood control maintenance plan	USFS,USFWS, NMFS,CDFG, CT,TU,SGRMC, LAC,SBRC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
ESG-SCS-6.1	Conduct groundwater analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SGRMC, LAC,SBRC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
ESG-SCS-6.2	Develop and implement groundwater monitoring program	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SGRMC, LAC,SBRC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
ESG-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
ESG-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
ESG-SCS-9.3	Develop and implement plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,SGRMC, CT,TU,LAC, SBRC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
ESG-SCS-10.1	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SGRMC,CT,TU, LAC,SBRC	Recreational Facilities	1,3,5	3B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
ESG-SCS-10.2	Review and modify development and management plans for recreation areas and national forests (*e.g.,* U.S. Forest San Bernardino National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SGRMC,CT,TU, LAC,SBRC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
ESG-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SGRMC,CT,TU, LAC,SBRC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
ESG-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB,CDF, USFWS,NMFS, SGRMC,CT,TU, LAC,SBRC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
ESG-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG, SGRMC,CT,TU, LAC,SBRC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 12-6. Southern California Steelhead DPS Recovery Action Matrix for the Santa Ana River Watershed (Mojave Rim BPG).

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Santa Ana River Mainstem												
SAM-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,CT,TU, SARWA,LAC, OC,RC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
SAM-SCS-1.2	Manage agricultural development and restore riparian zones	USCSS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,CT,TU, SARWA,LAC, OC,RC	Agricultural Development	1, 4	3B	10 - refer to regional costs	0	0	0	0	0	0
SAM-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, USFS,CDFG,CS CC,CDOT, DWR,CT,TU, SARWA,LAC OC,RC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
SAM-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, CT,TU,SARWA, LAC, OC,RC	Dams and Surface Water Diversions	1, 3, 4	2A	5	91850	0	0	0	0	91850
SAM-SCS-4.2	Develop and implement water management plan for dam operations (*e.g.*, Prado and Seven Oaks Dams)	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, CT,TU,SARWA, LAC,OC,RC	Dams and Surface Water Diversions	1, 3, 4	2A	5	91850	0	0	0	0	91850

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAM-SCS-4.3	Provide fish passage around dams and diversions (*e.g.,* Prado, New Prado, Seven Oaks, and Bear Valley dams)	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, CT,TU,SARWA, LAC,OC,RC	Dams and Surface Water Diversions	1, 3, 4	3B	10	TBD	TBD	TBD	TBD	TBD	TBD
SAM-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS CDFG,CSCC, CDOT,CT,TU, SARWA,LAC, OC,RC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	1	96692	0	0	0	0	96692
SAM-SCS-5.1	Develop and implement flood control maintenance program	USFS,USFWS, NMFS,CDFG, CT,TU,SARWA, LAC,OC,RC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
SAM-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SARWA, LAC,OC,RC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
SAM-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SARWA, LAC,OC,RC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
SAM-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	USGS,ACOE, BLM,NMFS, CT,TU,SARWA, LAC,OC,RC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAM-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA, USGS,ACOE, BLM,NMFS, CT,TU,SARWA, LAC,OC,RC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SAM-SCS-7.3	Develop and implement plan to restore natural channel features	CCC,NMFS, CDFG,CT, TU,SARWA, LAC,OC,RC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
SAM-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SAM-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
SAM-SCS-9.3	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAM-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, San Bernardino National Recreational Trail Master Plan, U.S. Forest San Bernardino National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,BLM, CDFG,CSCC, CT,TU,SARWA, LAC,OC,RC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
SAM-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CSCC, CT,TU,SARWA, LAC,OC,RC	Recreational Facilities	1,3,5	3B	20	76140	76140	76140	76140	0	304560
SAM-SCS-10.3	Manage off-road recreational vehicle activity in riparian floodplain corridors	USFS,USFWS, NMFS,BLM, CDFG,CSCC, CT,TU,SARWA, LAC,OC,RC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
SAM-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDFG, RWQCB, CDOT,USFWS, NMFS,CT,TU SARWA,LAC, OC,RC	Roads	1, 4	3B	20	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAM-SCS-12.1	Develop and implement an estuary restoration and management plan	CDFG,CSCC, USFWS,NMFS, CT,TU,SARWA, LAC,OC,RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	201000	0	0	0	0	201000
SAM-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDFG, RWQCB, CDOT,USFWS, NMFS,CT,TU, SARWA,LAC, OC,RC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
SAM-SCS-13.2	Retrofit storm drains in developed areas	CDFG, RWQCB, CDOT,USFWS, NMFS,CT,TU SARWA,LAC, OC,RC	Urban Development	1, 4	3B	20	0	0	0	0	0	0
SAM-SCS-13.3	Develop and implement riparian restoration plan to replace artificial bank stabilization structures	CDFG, RWQCB, CDOT,USFWS, NMFS,CT,TU, SARWA,LAC, OC,RC	Urban Development	1, 4	3B	10	10521940	10521940	0	0	0	21043880
SAM-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, CT,TU.SARWA, LAC,OC,RC	Urban Effluents	1, 4	3B	ongoing -cost of doing business	0	0	0	0	0	0
SAM-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,USFWS, NMFS,CT,TU, SARWA,LAC, OC,RC	Urban Effluents	1, 4	3B	ongoing -cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SAM-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG CT,TU,SARWA, LAC,OC,RC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Lytle Creek												
LC-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	BLM,NMFS, CT,TU,SARWA, LAC,OC,RC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
LC-SCS-1.2	Develop, adopt and implement agricultural land-use planning policies and standards	CDFG,NMFS, CT,TU,SARWA, LAC,OC,RC	Agricultural Development	1, 4	3B	10 - refer to regional costs	0	0	0	0	0	0
LC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, USFS,CDFG, CSCC,CDOT, DWR,CT,TU, SARWA,LAC, OC,RC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
LC-SCS-4.1	Develop and implement a water management plan for diversion operations	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, CT,TU, SARWA,LAC, OC,RC	Dams and Surface Water Diversions	1, 3, 4	2A	5	91850	0	0	0	0	91850
LC-SCS-4.2	Provide fish passage around dams and diversions	NMFS,ACOE, USDOT,USFWS, USFS,CDFG, CSCC,CDOT, DWR,CT,TU, SARWA,LAC, OC,RC	Dams and Surface Water Diversions	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
LC-SCS-3/4.3	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS CDFG,CSCC, CDOT,CT,TU, SARWA,LAC,	Dams and Surface Water Diversions, Culverts and Road Crossings	1, 4	3B	5	96692	0	0	0	0	96692

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
		OC,RC	(Passage Barriers)									
LC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SARWA, LAC,OC,RC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550
LC-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC, CT,TU,SARWA, LAC,OC,RC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
LC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
LC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
LC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
LC-SCS-10.1	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CSCC, CT,TU,SARWA, LAC,OC,RC	Recreational Facilities	1,3,5	3B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LC-SCS-10.2	Review and modify development and management plans for recreational areas and national forests (e.g., U.S. Forest San Bernardino National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,BLM, CDFG,CSCC, CT,TU,SARWA, LAC,OC,RC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
LC-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,CDFG, NMFS,USFWS CT,TU,SARWA, LAC,OC,RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
LC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, CT,TU.SARWA, LAC,OC,RC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
LC-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDFG,USFWS, NMFS,CT,TU.SA RWA,LAC,OC, RC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
LC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG CT,TU,SARWA, LAC,OC,RC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Mill Creek												
MilC-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	BLM,NMFS, CT,TU,SARWA, LAC,OC,RC	Agricultural Development	1, 4	3B	5	47520	0	0	0	0	47520
MilC-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, USFS,CDFG,CS CC,CDOT, DWR,CT,TU, SARWA,LAC, OC,RC	Culverts and Road Crossings (Passage Barriers)	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
MilC-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,ACOE, USFWS,USFS, CDFG,CSCC, MWDSC,DWR, CT,TU, SARWA	Dams and Surface Water Diversions	1, 3, 4	2A	5	91850	0	0	0	0	91850
MilC-SCS-4.2	Provide fish passage around dams and diversions	NMFS,ACOE, USDOT,USFWS, USFS,CDFG,CS CC,CDOT, DWR,CT,TU, SARWA,LAC, OC,RC	Dams and Surface Water Diversions	1, 4	2A	20 - refer to regional costs	0	0	0	0	0	0
MilC-SCS-3/4.3	Conduct watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS CDFG,CSCC, CDOT,CT,TU, SARWA,LAC, OC,RC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	2A	1	96692	0	0	0	0	96692
MilC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC, CT,TU,SARWA, LAC,OC,RC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
MilC-SCS-6.2	Develop and implement groundwater monitoring program	USGS,NMFS, DWR,CDFG, MWDSC,CT, TU,SARWA, LAC,OC,RC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
MilC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MilC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
MilC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,CT,TU SARWA,LAC, OC,RC	Non-Native Species	1, 3, 5	3B	20	76140	76140	76140	76140	0	304560
MilC-SCS-10.1	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CSCC, CT,TU,SARWA, LAC,OC,RC	Recreational Facilities	1,3,5	3B	20	76140	76140	76140	76140	0	304560
MilC-SCS-10.2	Review and modify development and management plans for recreational areas and national (*e.g.,* U.S. Forest San Bernardino National Forest Land	USFS,USFWS, NMFS,BLM, CDFG,CSCC, CT,TU,SARWA, LAC,OC,RC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)											
MilC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, CT,TU.SARWA, LAC,OC,RC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
MilC-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, CT,TU.SARWA, LAC,OC,RC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
MilC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG CT,TU,SARWA, LAC,OC,RC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

13. Santa Catalina Gulf Coast Biogeographic Population Group

"[D]espite the current rarity of the anadromous form in this region, there appears to be time and opportunity to restore it to many creeks and rivers, by providing the existing O. mykiss populations the opportunity to once again express the anadromous life-history."

Dr. David A. Boughton, Chair, NOAA Fisheries South-Central/Southern California Steelhead Technical Recovery Team, 2010

13.1 LOCATION AND PHYSICAL CHARACTERISTICS

The Santa Catalina Gulf Coast BPG region encompasses ten coastal watersheds of moderate size that drain the western slopes of the Santa Ana Mountains and Peninsular Range in southwestern Orange and Riverside counties southward through San Diego County to the United States-Mexico border (Figure 13-1). The upper portions of almost all of these watersheds include steep, mountainous regions and the lower watersheds cut across coastal terraces. Two watersheds, the Sweetwater River and Otay River, drain into San Diego Bay; the other eight watersheds drain directly into the Pacific Ocean. The component watersheds vary greatly in size (*e.g.*, the San Luis Rey River watershed is twelve times the size of the San Onofre Creek watershed). In addition to the major watersheds considered here, there are a number of smaller watersheds within this BPG (*e.g.*, Aliso, Escondido, Los Penasquitos, and Rose Canyon Creeks) which may also be used by steelhead when water conditions are favorable.

Santa Ana Mountains

Average annual precipitation in this region is relatively low and is spatially variable (Table 13-1). The coastal terrace portion of each of these watersheds receives significantly less rainfall that the interior montaine portions. For example, the average annual total precipitation for the City of San Diego is about 9.9 inches, approximately half the average for the San Diego River watershed as a whole. Because of low rainfall, many of the drainages in this BPG

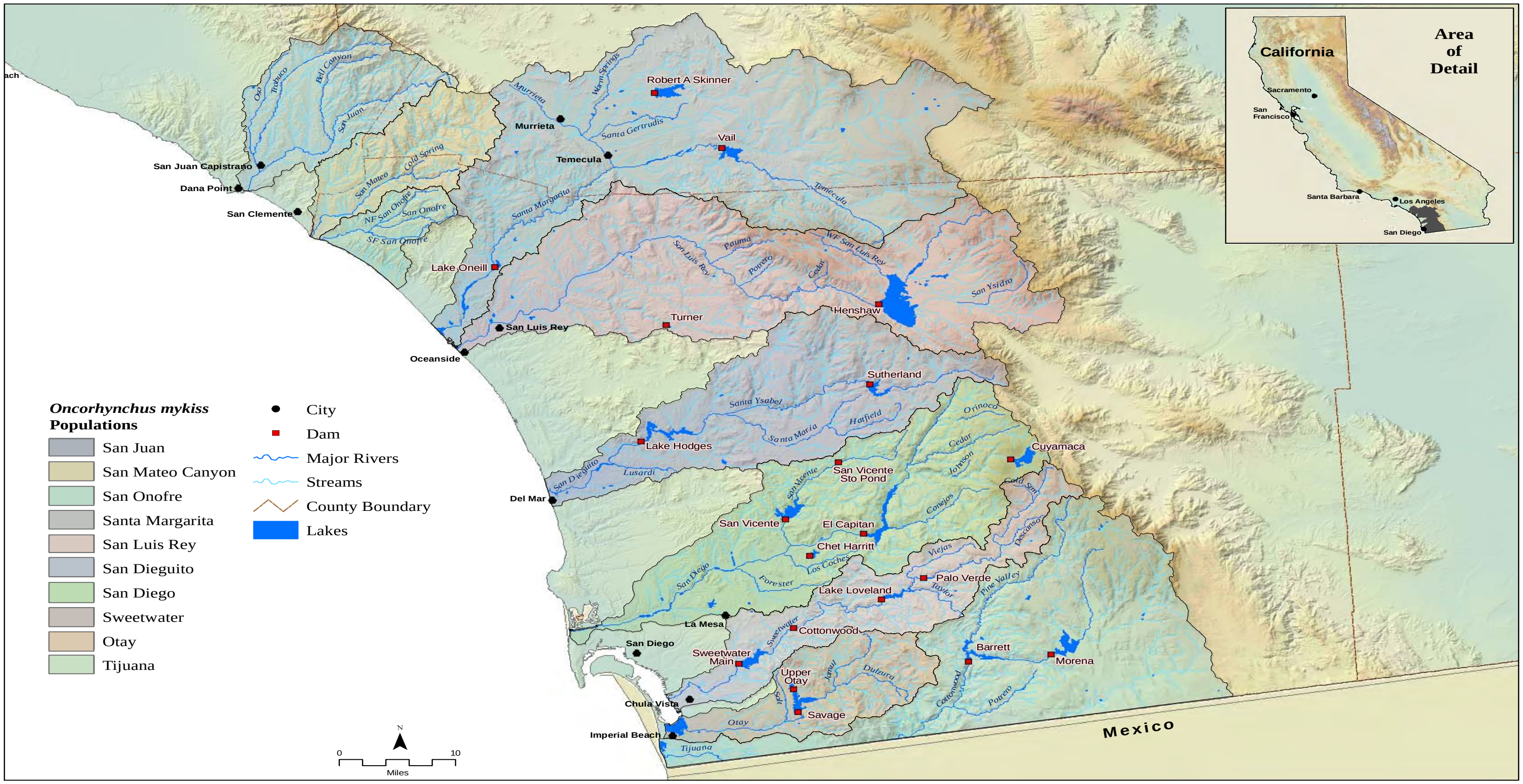


Figure 13-1. The Santa Catalina Gulf Coast BPG region. Ten steelhead populations/watersheds were analyzed in this region: San Juan, Sana Mateo, San Onofre Creek, and Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tijuana Rivers.

Table 13-1. Physical and Land Use Characteristics of Major Watersheds in the Santa Catalina Gulf Coast BPG region.

PHYSICAL CHARACTERISTICS						LAND USE			
WATERSHEDS (north to south)	**Area** (acres)[1]	**Area** (sq. miles)[1]	**Stream Length**[2] (miles)	**Ave. Ann. Rainfall**[3] (inches)	**Total Human Population**[4]	**Public Ownership***	**Urban Area**[5]	**Agriculture/ Barren**[5]	**Open Space**[5]
San Juan Creek	113,977	178	280	12.5	191,997	37%	23%	7%	70%
San Mateo Creek	85,964	134	200	13.3	4,011	48%	3%	2%	95%
San Onofre Creek	37,617	59	86	14.0	4,981	---	6%	< 1%	94%
Santa Margarita River	472,633	738	949	15.6	181,376	10%	10%	13%	77%
San Luis Rey River	367,329	574	749	17.8	147,782	11%	8%	19%	73%
San Dieguito River	223,155	349	432	18.3	129,475	11%	18%	10%	72%
San Diego River	281,059	439	537	18.0	500,469	17%	26%	2%	72%
Sweetwater River	142,511	223	271	17.7	249,589	15%	27%	1%	72%
Otay River	93,504	146	256	16.7	122,342	---	16%	9%	75%
Tijuana River	301,649	471	475	17.3	75,117 (US Only)	38%	5%	2%	93%
TOTAL or AVERAGE	**2,119,398**	**3,311**	**4,235**	**16.1**	**1,607,140**	**---**	**14%**	**7%**	**79%**

[1] *From: CDFFP CalWater 2.2 Watershed delineation, 1999 (www.ca.nrcs.usda.gov/features/calwater/)*
[2] *From: CDFG 1:1,000,000 Routed stream network, 2003 (www.calfish.org/)*
[3] *From: USGS Hydrologic landscape regions of the U.S., 2003 (1 km grid cells)*
[4] *From: CDFFP Census 2000 block data (migrated), 2003; preliminary analysis of Census 2010 indicates the population in the BPG has increased to 2,022,805*
[5] *From: CDFFP Multi-source land cover data (v02_2), 2002 (100 m grid cells) (http://frap.cdf.ca.gov/data/frapgisdata/select.asp)*
* *Includes National Forest Lands only; does not include State or County Parks or Military Reservations (from: http://old.casil.ucdavis.edu/casil/gis.ca.gov/teale/govtowna/)*

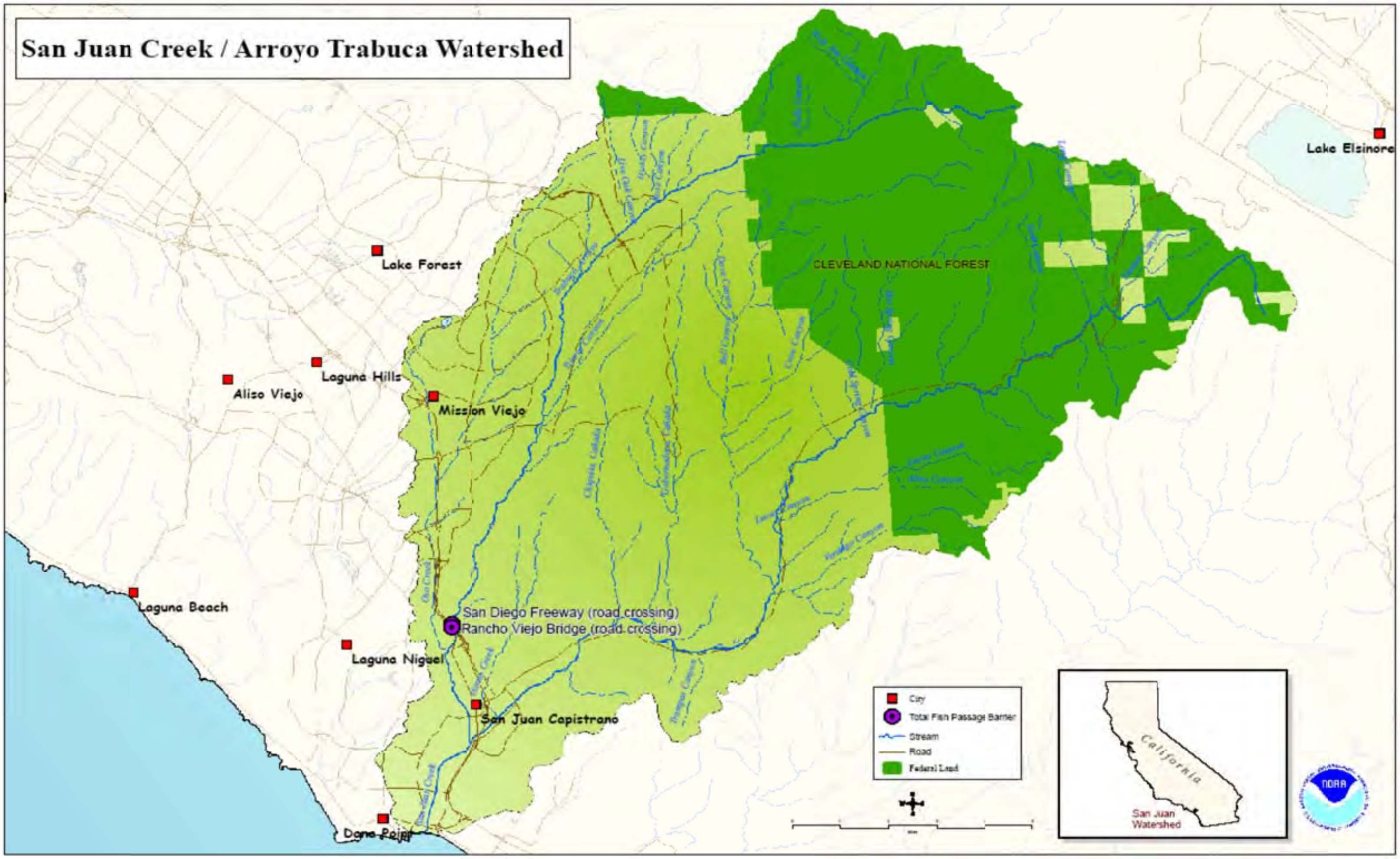


Figure 13-2. The San Juan Creek / Arroyo Trabuco Watershed.

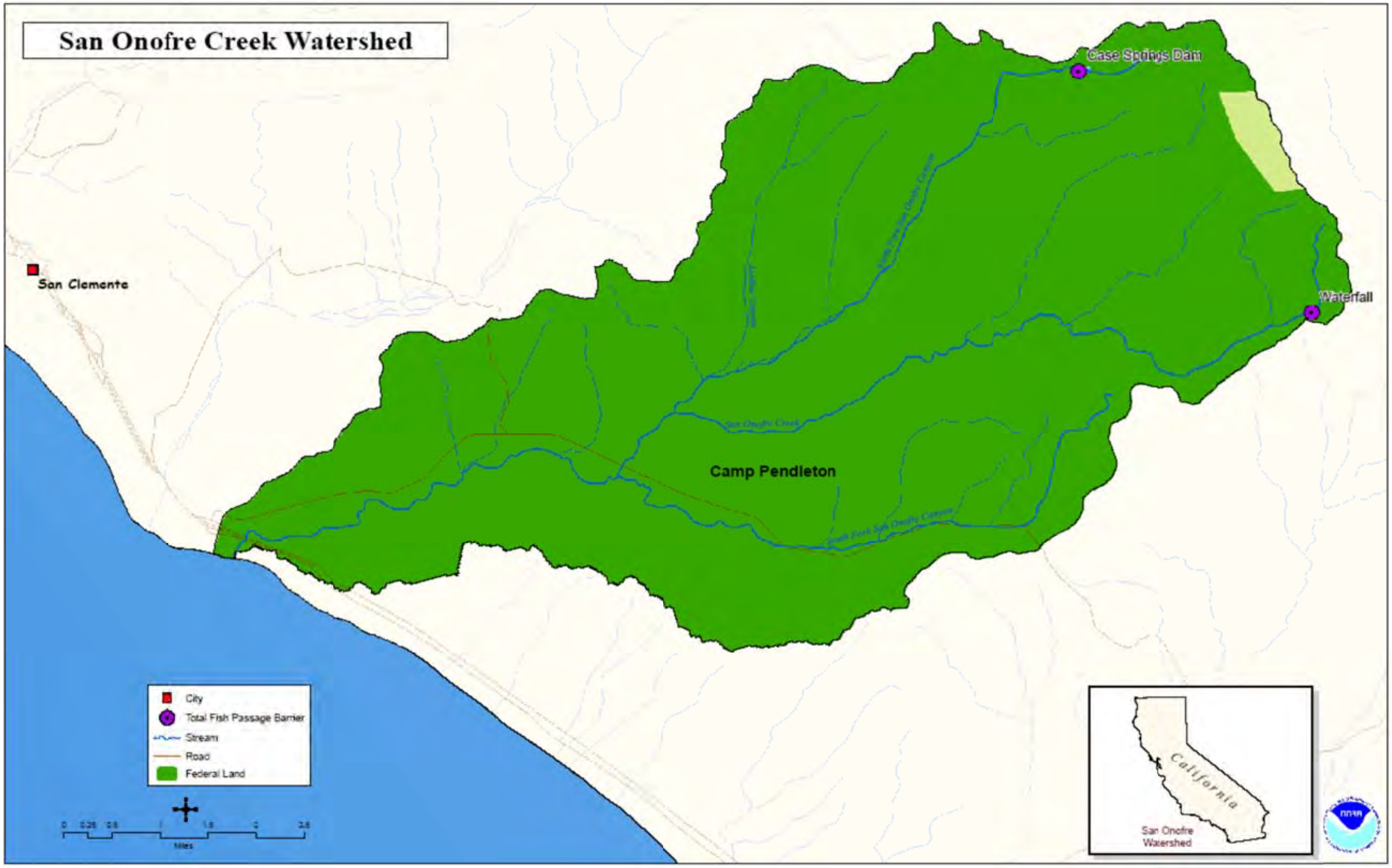


Figure 13-3. The San Onofre Creek Watershed.

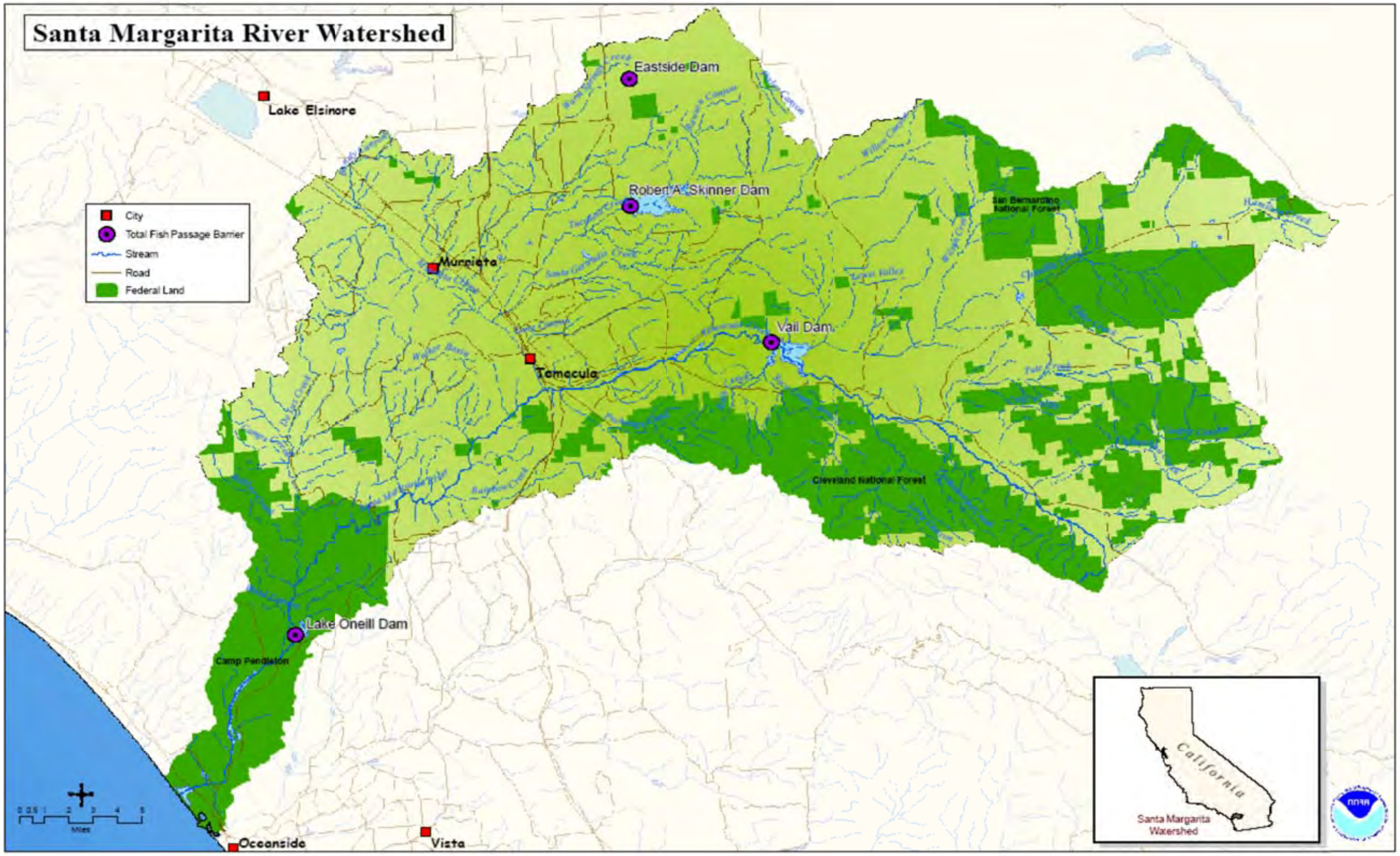


Figure 13-4. The Santa Margarita River Watershed.

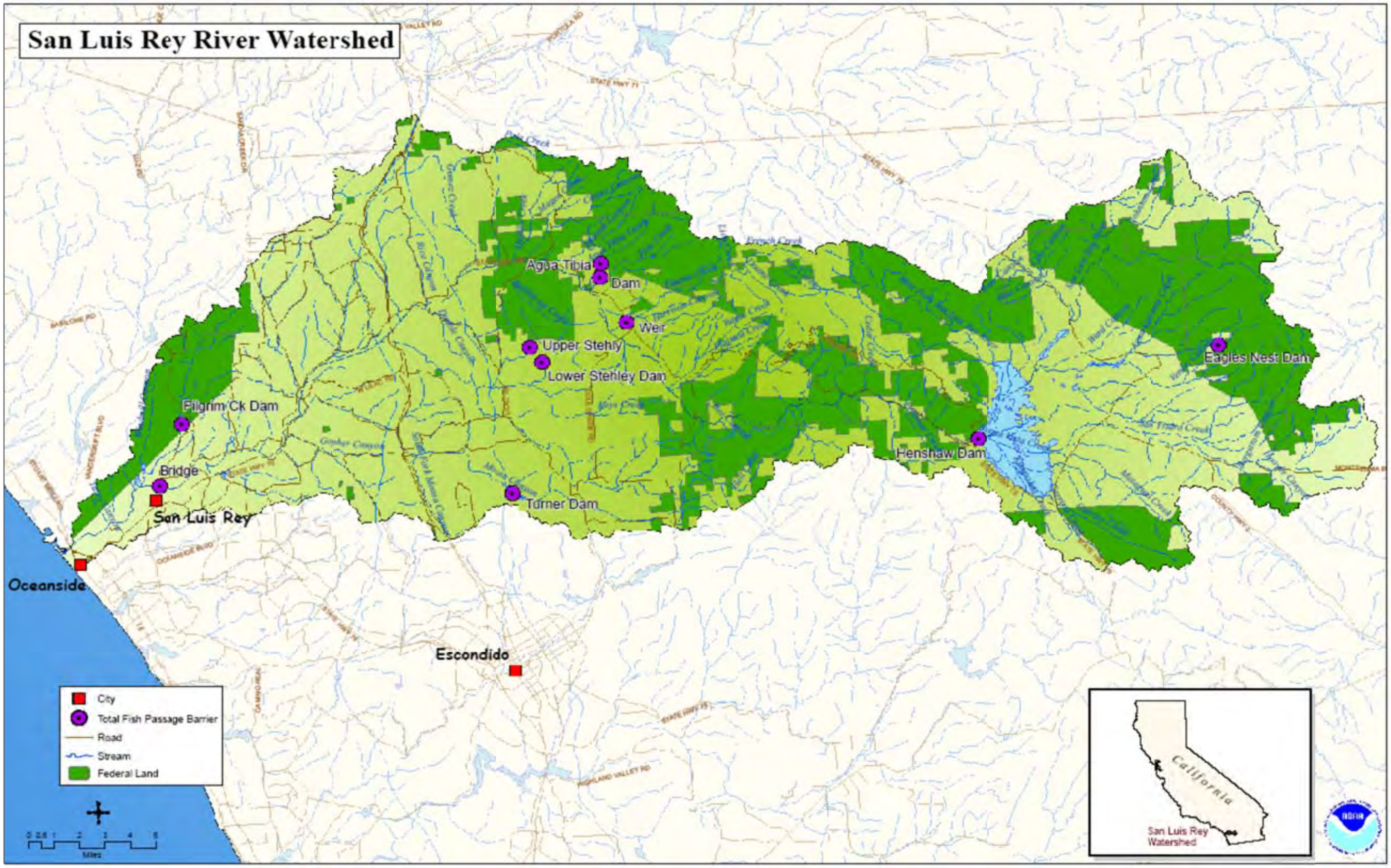


Figure 13-5. The San Luis Rey River Watershed.

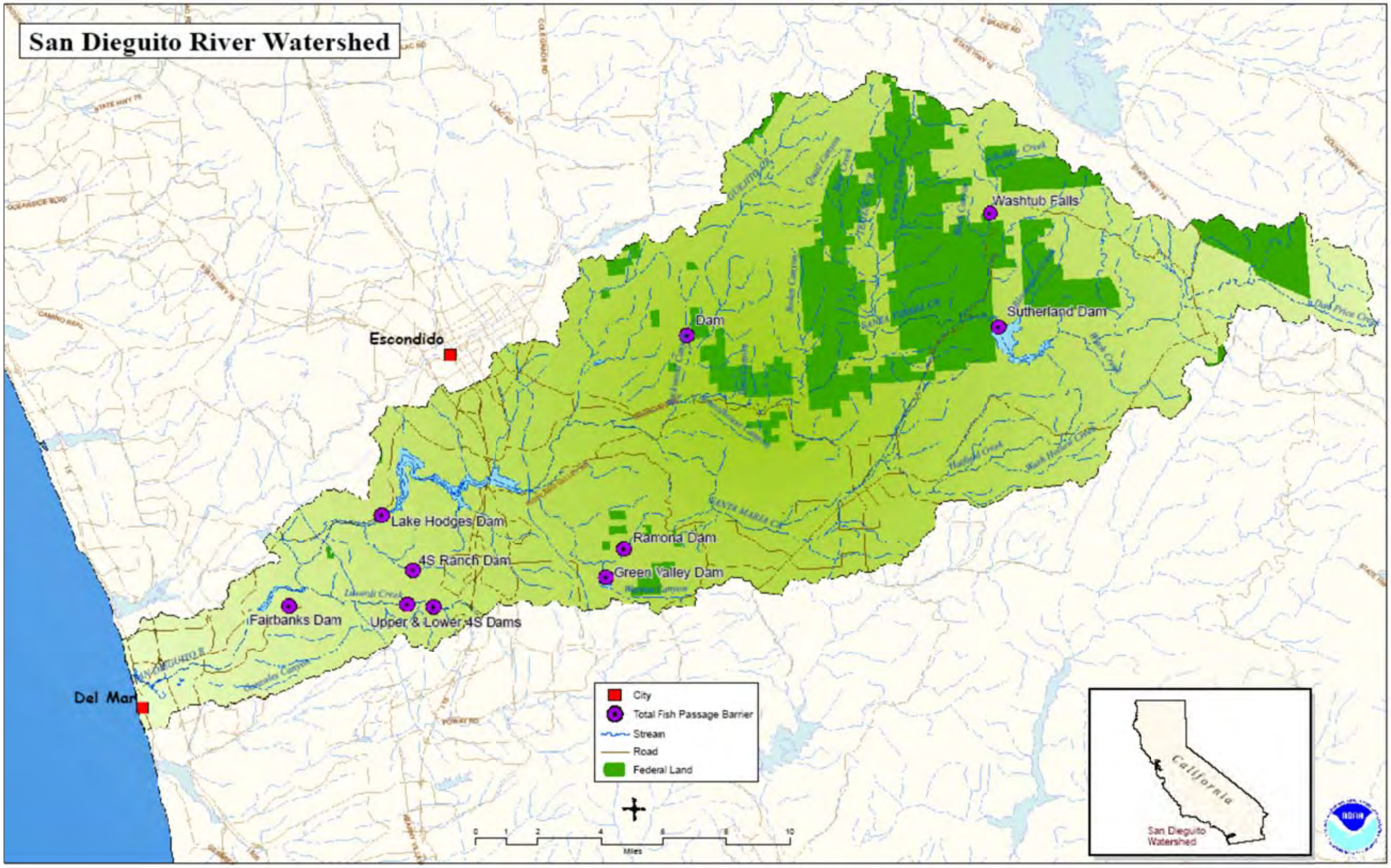


Figure 13-6. The San Dieguito River Watershed.

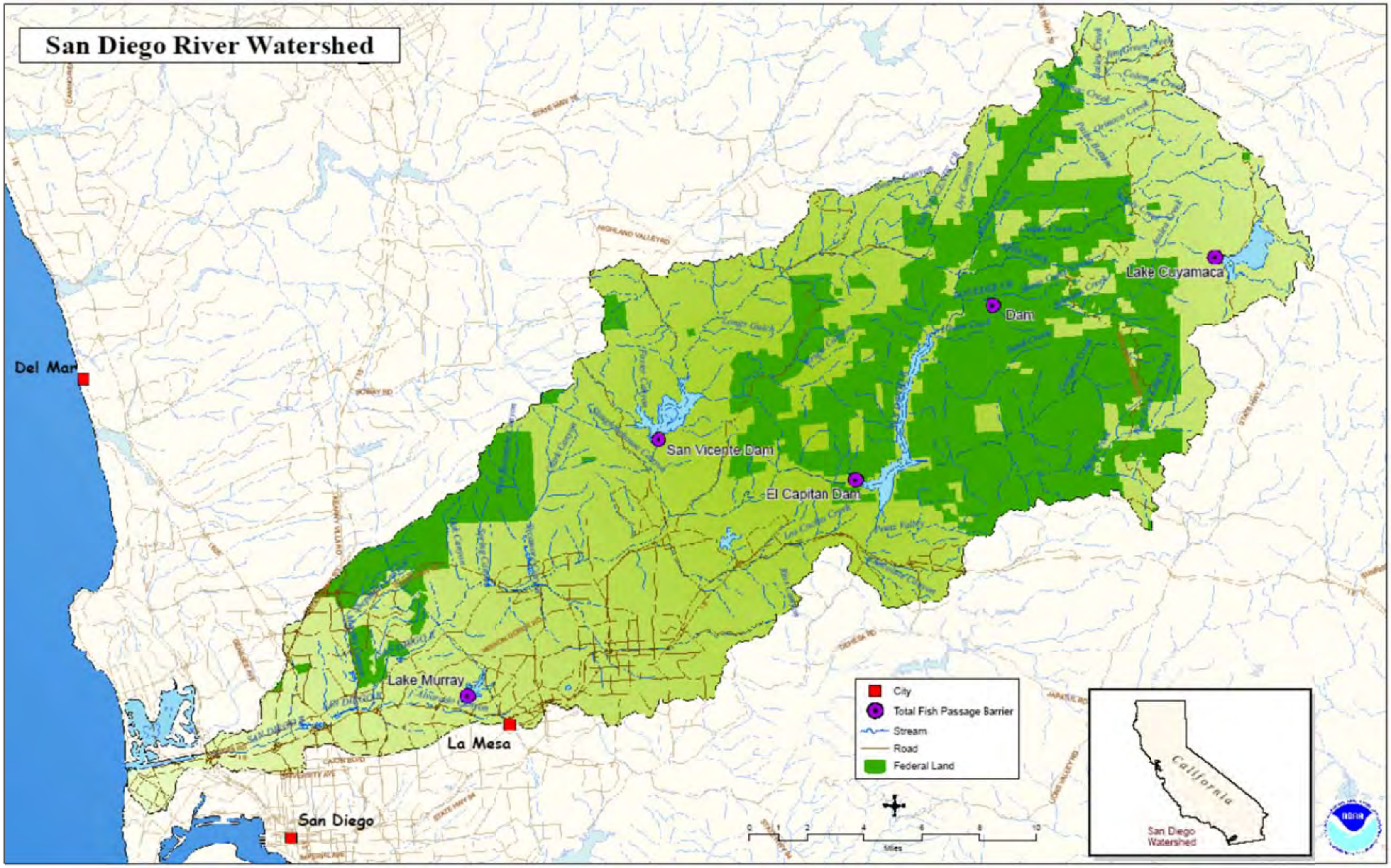


Figure 13-7. The San Diego River Watershed.

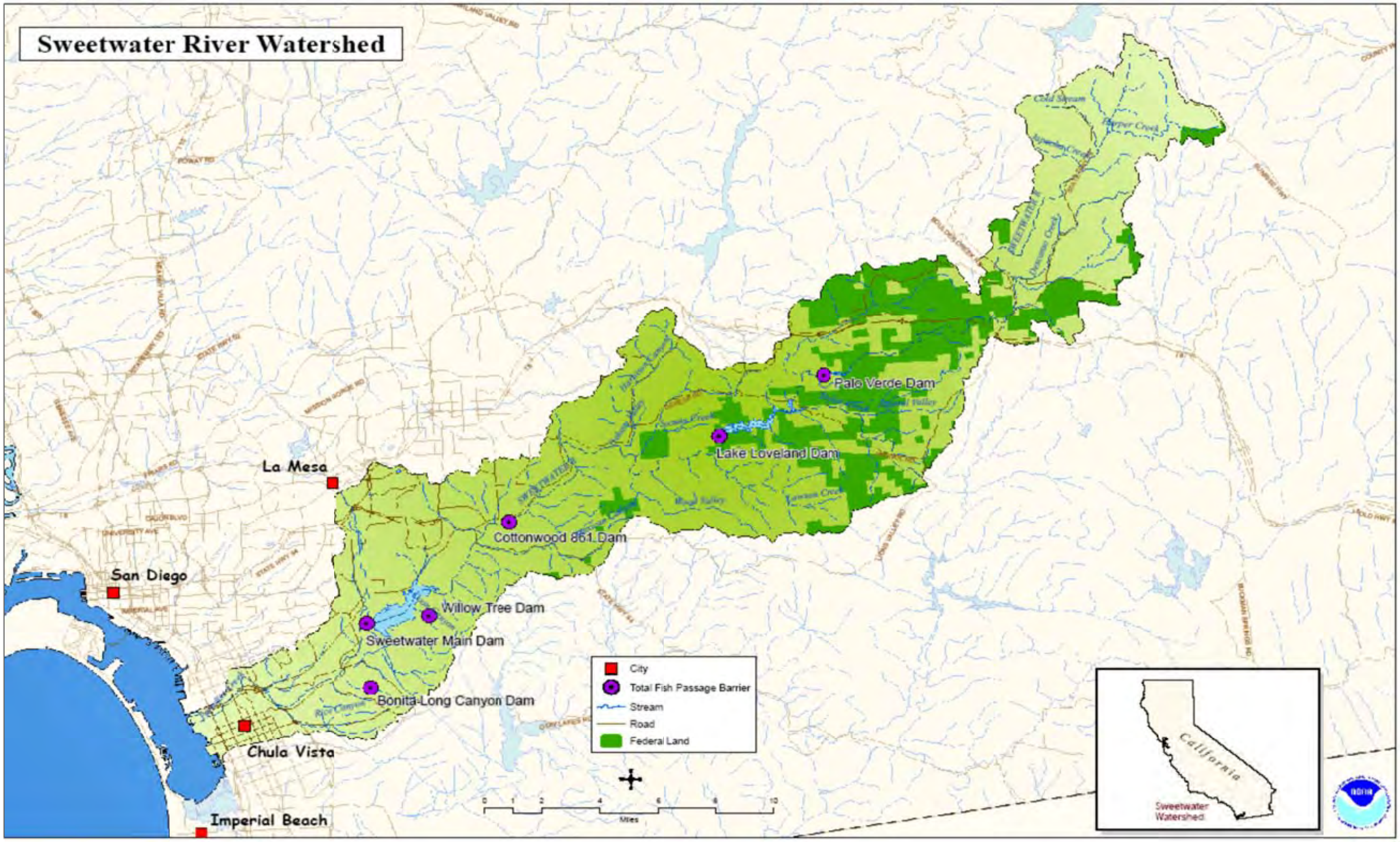


Figure 13-8. The Sweetwater River Watershed.

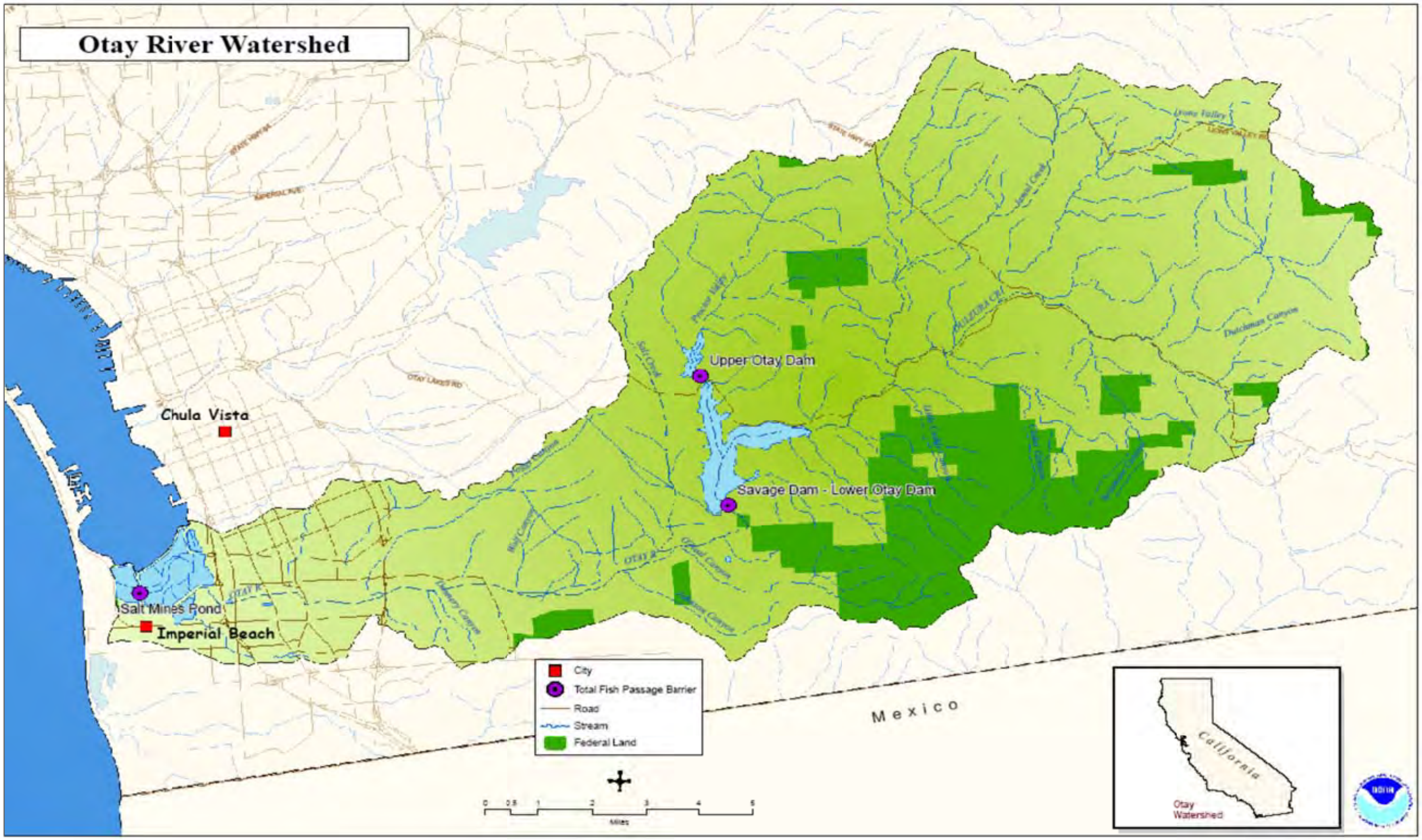


Figure 13-9. The Otay River Watershed.

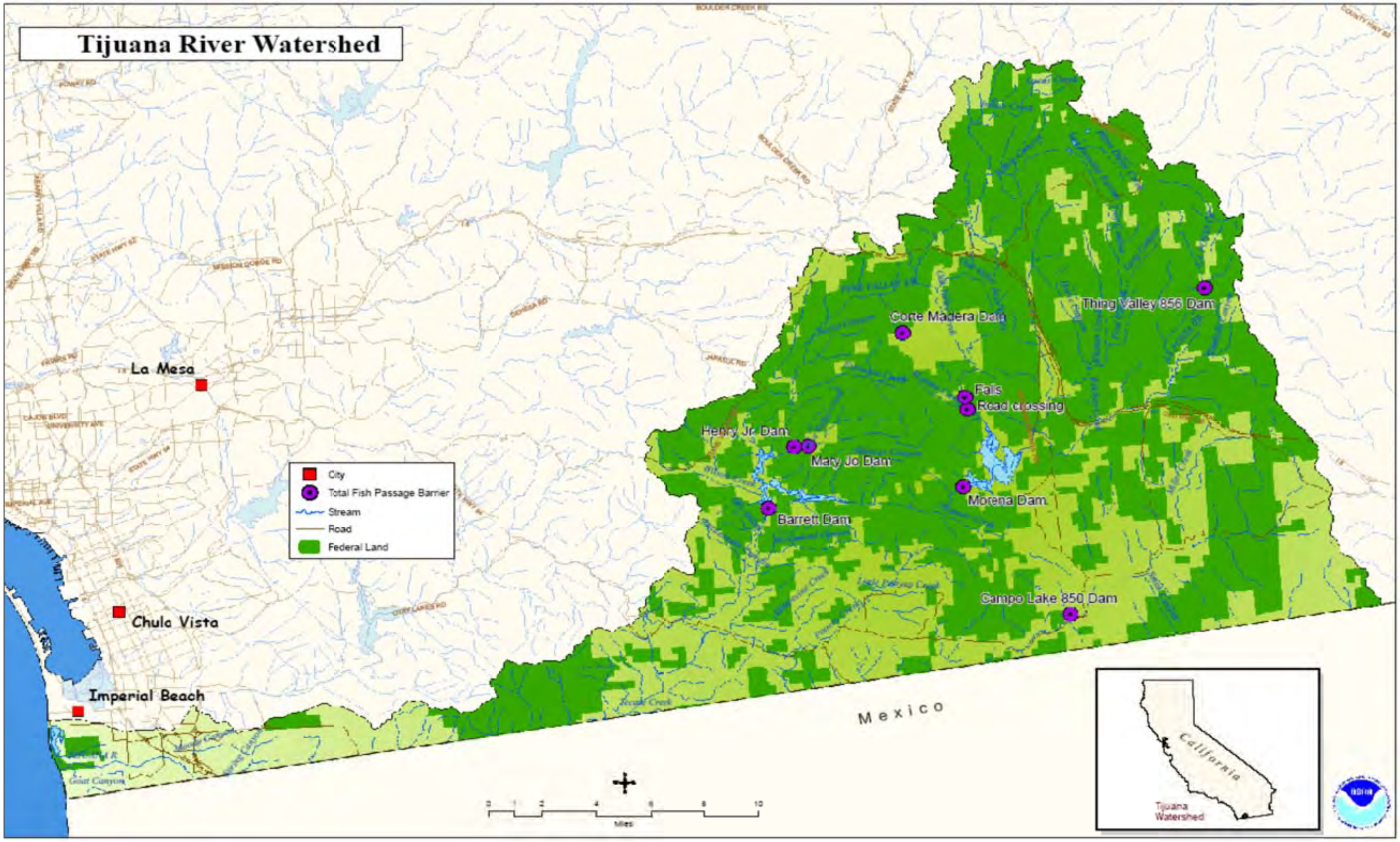


Figure 13-10. The Tijuana River Watershed.

are naturally seasonal or have extensive dry reaches during years of below-average precipitation. Stream length increases substantially in the interior portions of these watersheds because of the highly dissected terrain. Numerous tributaries contribute to the large total stream length for this region (Hunt & Associates 2008a, Kier Associates 2008b).

San Dieguito River

13.2 LAND USE

Table 13-1 summarizes land use and human population density in this region. Population density varies widely between the component watersheds, but overall population density is the second highest among the five BPG regions, averaging 485 persons per square mile. Population centers are concentrated on the coastal terrace portion of these watersheds, especially around San Diego Bay, which comprises one of the largest urban areas in the United States.

Comparatively, the San Mateo Creek and portions of the Santa Margarita River and San Onofre Creek watersheds have very low population densities compared to the other watersheds (averaging less than 30 and 84 persons per square mile, respectively). Average population densities in the San Diego River and Sweetwater River watersheds, which encompass the greater San Diego urban area, average over 1,100 persons per square mile.

Flood Control—San Juan/Arroyo Trabuco Creeks

In most of these watersheds, the first land use changes involved cattle ranching, followed by row-crop agriculture (primarily orchard crops), which was followed by increasing urbanization, particularly on the coastal terraces. More recently, the upper watersheds of the Santa Margarita River and the San Luis Rey River have experienced rapid urban growth. Semi-developed rural land and orchards cover extensive portions of the coastal and middle portions of these watersheds. Public ownership of land (mostly in Cleveland National Forest lands) is largely concentrated in the interior, higher-elevation portions of these watersheds and includes several federally designated wilderness areas: the Agua Tibia, San Mateo, Pine Creek, and Hauser Wilderness Areas. Portions of several watersheds have also been evaluated for inclusion in the Federal system of Wild and Scenic Rivers: upper San Luis Rey River; Cottonwood Creek (tributary to the Tijuana River), upper San Mateo Creek, and Devil's Canyon (tributary to San Mateo Creek).

The San Juan River/Trabuco Creek watershed contains large county parks (*e.g.*, Caspers Regional Park) that cover much of the upper watersheds of these drainages. The U.S. Marine Corps Base Camp Pendleton covers the coastal and middle portions of the San Mateo Creek, San Onofre Creek, and Santa Margarita River watersheds. However, public ownership constitutes a minority of overall land ownership in this BPG region, especially in the coastal and middle portions of these watersheds.

Sweetwater River

Agriculture (row crop and orchard cultivation and livestock ranching), are important land uses that directly or indirectly impact watershed processes throughout these watersheds. A major consequence of agricultural and urban growth in this region is reservoir development. There are at least 20 major dams in this region that are large enough to be regulated by the California Department of Water Resources and/or the Department of Defense (Figure 4-13). These dams are owned and operated by federal, state, public utility, local government, or private interests for irrigation, flood control and storm water management, recreation, municipal water supply, fire protection, farm ponds, or a combination of these purposes. Three of these dams create enlarged pre-exiting natural lakes: Lake Henshaw in the San Luis Rey River watershed, Vail Lake in the Santa Margarita River watershed, and Cuyamaca Lake in the San Diego River watershed. None of these facilities have incorporated fish passage provisions, including downstream flow provisions, into their operation. Most of the reservoirs and lakes in this region receive high recreational use and many are sources of non-native crayfish, fishes, and bullfrogs, and other non-native fish species that can prey on or compete with *O. mykiss* for food and habitat (Hunt & Associates 2008a, Kier Associates 2008b).

13.3 CURRENT WATERSHED CONDITIONS

Watershed conditions were assessed for the 10 watersheds and sub-watersheds in the Santa Catalina Gulf Coast BPG region. In general, instream, riparian, and floodplain conditions for anadromous *O. mykiss* in this BPG region are rated as “Poor” to “Very Poor”, reflecting pervasive agricultural and urban land uses, particularly along the middle and coastal reaches. In contrast, the upper watersheds of many of these drainages are in relatively good condition San Mateo and San Juan Creeks, Santa Margarita, San Luis Rey, San Dieguito, San Diego, and Sweetwater Rivers). Relatively few indicators were rated as “Good” or “Very Good.”

San Mateo Creek

Urban and agricultural conversion of coastal and middle reaches of these watersheds has created a number of severe stressors for anadromous *O. mykiss* in this BPG region. High road density increases sediment and pollutant inputs to these streams and their estuaries, degrading rearing and spawning habitat and likely increasing mortality of one or more life stages. In many urban and agricultural areas, channelization, levee construction, and other flood control activities have completely removed instream and riparian habitat or reduced instream refugia and structural complexity to a minimum. Flood control structures are widespread along the lower portions of drainages that pass through large urban areas, such as San Juan Creek, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, and the Otay River. The increase of impermeable surfaces as a result of urbanization (including roads) within the interior valleys, along the coastal terrace, has altered the natural flow regime of streams, particularly in the lower reaches, increasing the frequency and intensity of flood flows.

Santa Margarita River

At least 20 major dams and surface water diversions without provisions for fish passage have been constructed to serve agricultural, urban, and recreational purposes. These structures and water management practices have significantly altered natural sediment and hydrological processes in these watersheds. Dams also create and maintain favorable habitat conditions for several species of non-native fishes (*e.g.*, large and smallmouth bass, sunfish, bullhead catfish) and bullfrogs that may affect one or more life history stages of *O. mykiss* either directly (*e.g.*, predation) or indirectly (*e.g.*, competition for food). Non-native crayfish, fishes, and bullfrogs occur in all of the drainages in this BPG region, but are particularly abundant in the San Mateo Creek, San Onofre Creek, and Santa Margarita River watersheds. Widespread pumping of groundwater routinely eliminates surface flows in portions of most of these drainages, particularly during years of below-average precipitation.

San Luis Rey River

Fires have burned between 22% (San Mateo Creek) and 74% (San Diego River) of the watersheds in this BPG region in the past 25 years, including significant coastal portions of watersheds in southern Orange and northern and central San Diego counties in 2007 (Hunt & Associates 2008a, Kier Associates 2008b). Increased fire frequency can increase erosion and sediment input to streams, resulting in long-term changes to substrate composition and embeddedness, water quality (*e.g.*, turbidity), and water temperature (loss of riparian canopy cover). Anadromous *O. mykiss* in each of the watersheds in the BPG region have been subjected to these secondary effects of fire.

Cottonwood Creek –Tijuana River Tributary

Estuarine habitats at the mouths of these watersheds in this BPG region have been reduced in size by 48 – 95% by the development of roads and railroads, urbanization, and development of recreational facilities. Historically, these estuaries were large, with extensive distributary and backwater channel habitats, encompassing thousands of acres (Hunt & Associates 200ba, Kier Associates 2008b). Significant portions of the Santa Margarita River estuarine complex have been isolated from regular freshwater inflow as a result of the construction of the U.S. Interstate Highway 5. The remaining estuarine habitats are subject to constriction and isolation from urban, agricultural, and/or recreational development, as well as degradation of water quality from surface runoff from roads and other impervious surfaces, as well as a reduction in the amount and quality of surface flows resulting from groundwater extraction.

***O. mykiss* –Pine Valley Creek –Tijuana River Tributary**

Despite widespread and varied habitat degradation to the coastal and middle portions, native non-anadromous *O. mykiss* populations still inhabit the relatively high-quality habitat that remains upstream of most of the dams in this region (*e.g.*, Pine Valley Creek in the Otay River watershed), and small numbers of anadromous *O. mykiss* attempt to enter and spawn in each of the watersheds of the Santa Catalina Gulf Coast BPG when flow conditions are suitable (Hunt & Associates 2008a, Kier Associates 2008).

13.4 THREATS AND THREAT SOURCES

Varying numbers and intensity of habitat impairment (threats) were identified in the CAP Workbooks analyses, ranging from 11 in the San Onofre Creek watershed to 17 in the Santa Margarita River and San Luis Rey River watersheds. NMFS notes that portions of the San Luis Rey River run through tribal lands and additional information is needed to assess the conditions of those portions of the river. Most of the habitat impairments across the BPG were rated as "Severe" to "Very Severe" in all but the San Mateo Creek and San Onofre Creek watersheds, and are related to high human population densities and urban and agricultural conversion of watershed lands. The relatively good habitat quality in San Mateo and San Onofre creeks, and, to a lesser degree in the Santa Margarita River, is due to the presence of the Camp Pendleton Marine Corps Base, which covers substantial portions of the coastal and middle reaches of these watersheds. The upper watersheds, above dams and reservoirs, mostly are in public ownership within Cleveland National Forest. These reaches provide relatively good habitat conditions for anadromous *O. mykiss* and support reproducing populations of non-anadromous *O. mykiss*.

Thirteen anthropogenic activities ranked as the top sources of stress to steelhead in the Santa Catalina Gulf Coast BPG (Table 13-2). The most significant feature of this ranking is that each of the top five threats are rated as "Severe" or "Very Severe" and that groundwater extraction, dams and/or surface water diversions are pervasive threat sources in each of the watersheds. Although open space is the dominant land use in this BPG region, urban and agricultural conversion of the coastal and middle portions of these watersheds, especially within the floodplains of these drainages, has disproportionately degraded habitat conditions for anadromous *O. mykiss*. The occurrence of non-native invasive species in these highly regulated watersheds has spread and increased since this initial threats assessment, and will likely continue to do so unless recovery actions identified in this Recovery Plan are implemented.

Water management activities associated with urban and agricultural conversion of watershed lands are the most pervasive threat sources in this BPG region. Climatically, the Santa Catalina Gulf Coast BPG region is classified as semi-arid, and anadromous *O. mykiss* must compete for water with urban and agricultural interests throughout these watersheds. Widespread pumping of groundwater routinely eliminates surface flows in portions of most of these drainages. The magnitude of such losses of surface flows is greater during years of below-average precipitation. High road density and associated stream crossings (culverts, bridges, *etc.*) in most of the urbanized portions of these watersheds are also a common source of passage impediments for anadromous *O. mykiss*. As a result of the widespread construction of dams in the lower and middle reaches of these watersheds, non-anadromous *O. mykiss* populations are now isolated in the upper watersheds where higher-quality instream and riparian habitat still exists above reservoirs (Hunt & Associates 2008a, Kier Associates 2008b).

Table 13-2. Threat source rankings in watersheds of the Santa Catalina Gulf Coast BPG (see CAP Workbooks for details).

Santa Catalina Gulf Coast Component Watersheds (north to south)										
Threat Sources	San Juan Creek/ Trabuco Creek	San Mateo Creek	San Onofre Creek	Santa Margarita River	San Luis Rey River	San Dieguito River	San Diego River	Sweetwater River	Otay River	Tijuana River
Groundwater Extraction										
Dams and Surface Water Diversions										
Urban Development										
Agricultural Development										
Levees and Channelization										
Culvers and Road Crossings										
Recreational Facilities										
Non-Native Species										
Roads										
Flood Control Maintenance										
Upslope/Upstream Activities										
Agricultural Effluents										
Wildfires*										

***Key:** Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat (Threat cell colors represent threat rating from CAP Workbook)*

** Wildfires were not recognized during the CAP Workbook analyses as one of the top five threats in these watersheds, but recent fires in coastal watersheds of southern Orange and northern and central San Diego counties in Fall, 2007 could result in significant, long-term impacts to steelhead habitat. Also, the occurrence of non-native invasive species in these highly regulated watersheds has spread and increased since this initial threats assessment; and additional mining operations are under active consideration. Mining and urban effluents have also been subsequently identified as threat sources.*

13.5 SUMMARY

Dams and water diversions (including groundwater extraction) along with flood control structures on the major rivers of the Catalina Gulf Coast BPG region (Santa Margarita River, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, Otay River and Tijuana River) have had the most serve impacts on the anadromous *O. mykiss* populations in this BPG by cutting off access to upstream spawning and rearing habitats and altering the magnitude, duration, and timing of flows necessary for immigration of adults and emigration of juveniles. Additionally, impacts associated with wildland fires, including fire-fighting measures to control or extinguish them, and the post-fire measures to repair damages incurred in fighting wildland fires, poses a potential threat to watersheds in this BPG. Table 13-3 summarizes the critical recovery actions needed within the Core 1 populations of this BPG.

Restoring conditions for anadromous *O. mykiss* passage, spawning, and rearing in the Santa Catalina Gulf Coast BPG region will require multiple, long-term, measures related to water management, recreation, and urban development. A fish-passage barrier inventory and assessment should be conducted for each of the major watersheds. Impediments to fish passage stemming from the construction and operation of dams, groundwater extraction, and channel modification, and the loss of instream and adjacent riparian habitats by flood control measures need to be further evaluated for this BPG region. Additionally, the loss of estuarine functions caused by filling and pollution from point and non-point agricultural and urban waste discharges need to be addressed further in this region.

San Mateo Creek Steelhead – 1939.

Threat sources discussed in this section should be the focus of a variety of recovery actions to address specific stresses on anadromous *O. mykiss* viability. Spatial and temporal data, for water temperature, pH, nutrients, *etc*., are not uniformly available, and should be further developed, along with general habitat typing assessments, to better identify natural as well as anthropogenic limiting factors. This type of data acquisition should be the subject of site-specific investigations in order to refine the primary recovery actions or to target additional recovery actions as part of any recovery strategy for the Santa Catalina Gulf Coast BPG. Tables 13-4 through 13-13 below rank and describe proposed recovery actions for each sub-watershed in the Santa Catalina Gulf Coast BPG, including the estimated cost for implementing the actions in five year increments over the first 25 years, and where applicable extended out to 100 years, though many recovery actions can be achieved within a shorter period.

Table 13-3. Critical recovery actions for Core 1 populations within the Santa Catalina Gulf Coast BPG.

POPULATION	CRITICAL RECOVERY ACTION
San Juan Creek	Physically modify road crossings, highways, and railways to allow natural rates of adult and juvenile *O. mykiss* between the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean. Identify, protect, and restore estuarine and freshwater rearing habitat functions.
San Mateo Creek	Develop and implement a groundwater and surface water management program to provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Initiate an aquatic exotic species assessment and control program for the San Mateo Creek watershed.
Santa Margarita River	Physically modify or remove the O'Neill Diversion Dam to allow natural rates of adult and juvenile *O. mykiss* between the estuary and upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and ocean Review; modify the Rancho California Water District water release schedule program to provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Initiate an aquatic exotic species assessment and control program for the Santa Margarita River watershed.
San Luis Rey River	Implement operating criteria to ensure the pattern and magnitude of water releases from Pilgram, Turner, Lower and Upper Stehly, Agua Tibia, Henshaw, and Eagles Nest dams will maintain surface flows necessary to support all *O. mykiss* life history states, including volition rates of adult and juvenile *O. mykiss* migration, and suitable spawning and rearing habitat. Physically modify all dams, and road, highway, and railway crossings to allow volitional rates of adult and juvenile *O. mykiss* between the estuary and upstream spawning and rearing habitats and passage of smolts and kelts downstream to the estuary and ocean. Identify, protect, and restore estuarine and freshwater rearing habitat functions.

Southern California Steelhead DPS Recovery Action Tables Identification Key, Santa Catalina Gulf Coast BPG (Tables 13-4 – 13-13)

Recovery Action Number Key: XXXX – SCS – 1.2		XXXX ID Table		Threat Source Legend	
XXXX	Watershed	SJT	San Juan/Trabuco Creek	1	Agricultural Development
SCS	Species Identifier – Southern California Steelhead	SMC	San Mateo Creek	2	Agricultural Effluents
1	Threat Source	SO	San Onofre	3	Culverts and Road Crossings
2	Action Identity Number	SMR	Santa Margarita River	4	Dams and Surface Water Diversions
Action Rank		SLR	San Luis Rey River	5	Flood Control Maintenance
A	Action addresses the first listing factor regarding the destruction or curtailment of the species' habitat	SD	San Dieguito River	6	Groundwater Extraction
B	Action addresses one of the other four listing factors	SDR	San Diego River	7	Levees and Channelization
		SWR	Sweetwater River	8	Mining and Quarrying
		OR	Otay River	9	Non-Native Species
		TR	Tijuana River	10	Recreational Facilities
				11	Roads
				12	Upslope/Upstream Activities
				13	Urban Development
				14	Urban Effluents
				15	Wildfires

See Chapter 8, Table 8.1 for Detailed Description of Recovery Actions

Table 13-4. Southern California Steelhead DPS Recovery Action Table for the San Juan Creek/Trabuco Creek Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Juan Creek / Trabuco Creek												
SJT-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU,OC, RC	Agricultural Development	1, 4	3B	ongoing – costs of doing business					0	
SJT-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USGS, BLM,USFS, USFWS, NMFS,CDFG, RWQCB, SDT,CT,TU,OC, RC	Agricultural Development	1, 4,	3B	5	62400	0	0	0	0	62400
SJT-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,USGS, BLM,USFS, USFWS, NMFS,CDFG, RWQCB,SDT CT,TU,OC,RC	Agricultural Development	1, 4,	3B	10 - refer to regional costs	0	0	0	0	0	0
SJT-SCS-2.1	Develop and implement a plan to minimize runoff from agricultural activities	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDSRF, TRAN,OC,RC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SJT-SCS-3.1	Conduct a watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT, MWDSC,DWR, SDT,CT,TU,OC, RC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SJT-SCS-3.2	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT, MWDSC,DWR, SDT,CT,TU,OC, RC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
SJT-SCS-4.1	Develop and implement water management plan diversion operations	USFS,USFWS, NMFS,USGS, CDF,CDFG, SDT,CT,TU,OC, RC	Dams and Surface Water Diversions	1, 3, 4	2A	5	275550	0	0	0	0	275550
SJT-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USFWS,CDFG, CSCC,SDT,CT, TU,OC,RC	Flood Control Maintenance	1, 4	1B	100	0	0	0	0	0	0
SJT-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC,SDT, CT,TU,OC,RC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
SJT-SCS-6.2	Develop and implement a groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC,SDT, CT,TU,OC,RC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
SJT-SCS-7.1	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA, NRCS,USFWS,U SGS,ACOE, BLM,NMFS, CDFG,CSCC, CT,TU,SDT,OC, RC	Levees and Channelization	1, 4	1B	100	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SJT-SCS-7.2	Develop and implement plan to restore natural channel features	NRCS,USFWS, USGS,ACOE, BLM,NMFS, CDFG,CSCC, CT,TU,SDT,OC, RC	Levees and Channelization	1, 4	1B	20	4217625	4217625	4217625	4217625	0	16870500
SJT-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,SDT, CT,TU,OC,RC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SJT-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,SDT, CT,TU,OC,RC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SJT-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,SDT, CT,TU,OC,RC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SJT-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* San Juan Creek Trail Plan, Trabuco Creek Nature Trail Plan, and Descanso Park Plan)	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SDT,CT,TU,OC, RC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SJT-SCS-10.2	Review and modify development and management plans for recreational areas and national forests (*e.g.,* U.S. Forest Service Cleveland National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SDT,CT,TU,OC, RC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SJT-SCS-10.3	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CSCC, SDT,CT,TU,OC, RC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SJT-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU,OC, RC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SJT-SCS-11.2	Develop and implement a plan to remove or reduce approach-fill for railroad lines and roads (*e.g.*, U.S. Interstate 5)	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU,OC, RC	Roads	1, 4	2B	0	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SJT-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, RWQCB, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU,OC, RC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
SJT-SCS-12.1	Develop and implement an estuary restoration and management plan	CDFG,CSCC, USFWS,NMFS, SDT,CT,TU,OC, RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	3350000	0	0	0	0	3350000
SJT-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,NMFS, CT,TU,SDT,OC, RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
SJT-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,SDT,CT, TU,OC,RC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
SJT-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDOT USFWS,NMFS, SDT,CT,TU,OC, RC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0
SJT-SCS-14.2	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDOT USFWS,NMFS, SDT,CT,TU,OC, RC	Urban Effluents	1, 4	1B	20	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SJT-SCS-14.3	Review, assess and modify NPDES wastewater discharge permits	RWQCB, SWRCB,CDOT USFWS,NMFS, SDT,CT,TU,OC, RC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SJT-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USGS, CDF,CDFG, SDT,CT,TU,OC, RC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-5. Southern California Steelhead DPS Recovery Action Table for the San Mateo Creek Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($) FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Mateo Creek												
SMC-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU, SMCC,SDC,RC	Agricultural Development	1, 4	2B	ongoing – cost of doing business	0	0	0	0	0	0
SMC-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,SMCC, SDC,RC	Agricultural Development	1, 4,	2B	5	62400	0	0	0	0	62400
SMC-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU, SMCC,SDC,RC	Agricultural Development	1, 4,	2B	10 - refer to regional costs	0	0	0	0	0	0
SMC-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,BLM, NMFS,CDFG, RWQCB,SDT, CT,TU,SMCC, SDC,RC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SMC-SCS-3.1	Conduct a watershed-wide fish passage barrier assessment	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT, MWDSC, SDWA,DWR, SDT,CT,TU, SDC,RC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMC-SCS-3.2	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,ACOE, USDOT,USFWS, CDFG,CSCC, CDOT, MWDSC, SDWA,DWR, SDT,CT,TU, SDC,RC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0
SMC-SCS-4.1	Develop and implement water management plan or diversion operations	USFS,USFWS, NMFS,USGS, CDF,CDFG, SDWA,SDT,CT, TU,SMCC,SDC, RC	Dams and Surface Water Diversions	1, 3, 4	2A	5	275550	0	0	0	0	275550
SMC-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USFWS,BOR, CDFG,CSCC, SDWA,SDT,CT, TU.SMCC,SDC, RC	Flood Control Maintenance	1, 4	1B	100	0	0	0	0	0	0
SMC-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,SMCC, SDC,RC	Groundwater Extraction	1, 4	1B	5	275550	0	0	0	0	275550
SMC-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,SMCC, SDC,RC	Groundwater Extraction	1, 4	1B	10	254350	39775	0	0	0	294125
SMC-SCS-7.1	Develop and implement plan to restore natural channel features	NRCS,USFWS, USGS,ACOE, BLM,NMFS, CDFG,CSCC, SDWA,CT,TU, SDT,SMCC,	Levees and Channelization	1, 4	1B	100	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
		SDC,RC										
SMC-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA, NRCS,USFWS, USGS,ACOE, BLM,NMFS, CDFG,CSCC, SDWA,CT,TU, SDT,SMCC, SDC,RC	Levees and Channelization	1, 4	1B	100	0	0	0	0	0	0
SMC-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CSCC, USFWS,USFS, NMFS,USMC, SDWA,SDT,CT, TU,SMCC,SDC, RC	Non-Native Species	1, 3, 5	1A	100 - refer to regional costs	0	0	0	0	0	0
SMC-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CSCC, USFWS,USFS, NMFS,USMC, SDWA,SDT,CT, TU,SMCC,SDC, RC	Non-Native Species	1, 3, 5	1A	100 - refer to regional costs	0	0	0	0	0	0
SMC-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CSCC, USFWS,USFS, NMFS,USMC, SDWA,SDT,CT, TU,SMCC,SDC, RC	Non-Native Species	1, 3, 5	1A	20	76140	76140	76140	76140	0	304560
SMC-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* San Onofre State Park Plan and San Diego Regional Trails Plan)	CDPR,NMFS, USFS,USFWS, CDFG,CT,TU, SDT,SMCC, SDC,RC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMC-SCS-10.2	Develop and implement public education program on watershed processes	CDPR,NMFS, USFS,USFWS, CDFG,SDWA, CT, TU,SDT, SMCC,SDC,RC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SMC-SCS-10.3	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,BLM, CDFG,CDPR, CSCC,SDT,CT, TU,SMCC,SDC, RC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SMC-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, RWQCB, CSCC, USFWS,NMFS, USDOT,SDT,CT, TU,SMCC,SDC, RC	Roads	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SMC-SCS-11.2	Develop and implement a plan to remove or reduce approach-fill for railroad lines and roads (*e.g.*, U.S. Interstate 5)	CDOT,CDFG, RWQCB, CSCC,USFWS, NMFS,USMC, USDOT,SDT,CT, TU,SMCC,SDC, RC	Roads	1, 4	2B	10	7514534	7514534	0	0	0	15029069
SMC-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDPR,NMFS, USMC,CDFG, CT,TU,SDT, SMCC,SDC,RC	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
SMC-SCS-12.1	Review applicable Integrated Natural Resources Management Plans (*e.g.*, U.S. Marine Corps Camp Pendleton Integrated Natural Resources Management Plan)	USMC,USFWS, NMFS,NMFS, CT,TU,SDT, SMCC,SDC,RC	Upslope/ Upstream Activities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMC-SCS-12.2	Develop and implement an estuary restoration and management plan	CDPR,CDFG, CSCC,USFWS, NMFS,SDT,CT, TU,SMMC, SDC,RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	5360000	0	0	0	0	5360000
SMC-SCS-12.3	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,SDWA CT,TU,SDT, SMCC,SDC, RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
SMC-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,SDT,CT, TU,SMCC,SDC, RC	Urban Development	1, 4	2B	5	62400	0	0	0	0	62400
SMC-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDOT USFWS,NMFS, SDWA,SDT,CT, TU,SMCC,SDC, RC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0
SMC-SCS-14.2	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDOT USFWS,NMFS, SDT,CT,TU, SMCC,SDC, RC	Urban Effluents	1, 4	1B	20	0	0	0	0	0	0
SMC-SCS-14.3	Review, assess and modify NPDES wastewater discharge permits (e.g., U.S. Marine Corps Camp Pendleton Wastewater Treatment Facility)	USMC,NMFS, USFWS, RWQCB, CT,TU,SDT, SMCC,SDC,RC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMC-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, NMFS,USMC, USGS,CDF, CDFG,SDT,CT, TU,SMCC,SDC, RC	Wildfires	1, 4, 5	1B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-6. Southern California Steelhead DPS Recovery Action Table for the San Onofre Creek Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Onofre Creek												
SO-SCS-1.1	Manage agricultural development and restore riparian zones	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU,SDC	Agricultural Development	1, 4	3B	20 – refer to regional costs	0	0	0	0	0	0
SO-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,BLM, NMFS,USMC, CDFG, RWQCB,SDT, CT,TU,SDC	Agricultural Effluents	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SO-SCS-3.1	Conduct watershed-wide fish passage barrier assessment	USMC,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	2B	5	96690	0	0	0	0	96690
SO-SCS-3.2	Develop and implement plan to remove or modify fish passage barriers within	USMC,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SO-SCS-4.1	Develop and implement water management plan for diversion operations	USMC,USFWS, NMFS,USGS, CDFG,SDT,CT, TU,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	5	275550	0	0	0	0	275550
SO-SCS-5.1	Develop and implement flood control maintenance program	USMC,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,SDC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SO-SCS-6.1	Conduct groundwater analysis and assessment	USGS,NMFS, USMC,DWR, CDFG, MWDSC,SDT, CT,TU,SDC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
SO-SCS-6.2	Develop and implement groundwater monitoring program	USGS,NMFS, USMC,DWR, CDFG, MWDSC,SDT, CT,TU,SDC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
SO-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, USMC,SDT,CT, TU,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SO-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, USMC,SDT,CT, TU,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SO-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, USMC,SDT,CT, TU,SDC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SO-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.*, San Onofre State Park Plan and San Diego Regional Trails Plan)	USFS,USFWS, NMFS,USMC, CDFG,CDPR, CSCC,SDT,CT, TU,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SO-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,USMC, CDFG,CDPR, CSCC,SDT,CT, TU,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SO-SCS-11.1	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads (*e.g.,* U.S. Interstate 5)	CDOT,CDFG, RWQCB, CSCC,USFWS, NMFS,USMC, USDOT,SDT,CT, TU,SDC	Roads	1, 4	2B	0	0	0	0	0	0	0
SO-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, RWQCB, CSCC,USFWS, NMFS,USMC, USDOT,SDT,CT, TU,SDC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SO-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, RWQCB, CSCC,USFWS, NMFS,USMC, USDOT,SDT,CT, TU,SDC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SO-SCS-12.1	Review and modify applicable Integrated Natural Resources Management Plans (*e.g.,* U.S. Marine Corps Camp Pendleton Integrated Natural Resources Management Plan)	USMC,USFWS, NMFS,NMFS, CT,TU, SDT,SDC	Upslope/ Upstream Activities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SO-SCS-12.2	Develop and implement an estuary restoration and management plan	USMC,USFWS, NMFS,CT,TU, SDT,SD	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	402000	0	0	0	0	402000
SO-SCS-12.3	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,CT,TU, SDT,SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
SO-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDOT, USMC,USFWS, NMFS,SDT,CT, TU,SDC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0
SO-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, CDOT,USMC, USFWS,NMFS, SDT,CT,TU,SDC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SO-SCS-14.3	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDOT, USMC,USFWS, NMFS,USDOT, SDT,CT,TU,SDC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0
SO-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USMC,USGS, CDF,CDFG, SDT,CT,TU,SDC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-7. Southern California Steelhead DPS Recovery Action Table for the Santa Margarita River Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Santa Margarita River												
SMR-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USGS, BLM,USFS,USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,FLC, SDC,RC	Agricultural Development	1, 4	3B	ongoing – cost of doing business		0	0	0	0	0
SMR-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,FLC, SDC,RC	Agricultural Development	1, 4,	3B	5	62400	0	0	0	0	62400
SMR-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,FLC, SDC,RC	Agricultural Development	1, 4,	3B	10 - refer to regional costs	0	0	0	0	0	0
SMR-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USFS, USFWS,BLM, NMFS,USMC, CDFG, RWQCB,SDT, CT,TU.FLC, SDC,RC	Agricultural Effluents	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SMR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,BOR, USMC,USDOT, USFWS,CDFG, CSCC,CDOT, MWDSC, SDWA,DWR, SDT,CT,TU,FLC, SDC,RC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMR-SCS-4.1	Develop and implement water management plan for dam operations (*e.g.*, Lake O'Neill Dam, Vail Dam, Robert A. Skinner Dam)	USMC,USFWS, BOR,MWDSC, SDWADWR NMFS,USGS, CDFG,SDT,CT, TU,FLC,SDC, RC	Dams and Surface Water Diversions	1, 3, 4	2A	10	TBD	TBD	TBD	TBD	TBD	TBD
SMR-SCS-4.2	Develop and implement water management plan diversion operations (*e.g.,* Lake O'Neill Diversion)	USMC,BOR, USFWS,NMFS, USGS,CDFG, SDT,CT,TU,FLC, SDC,RC	Dams and Surface Water Diversions	1, 3, 4	2B	5	275550	0	0	0	0	275550
SMR-SCS-3/4.3	Conduct watershed-wide fish passage barrier assessment	NMFS,BOR, USMC,USDOT, USFWS,CDFG, CSCC,CDOT, MWDSC, SDWA,DWR, SDT,CT,TU,FLC, SDC,RC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690
SMR-SCS-5.1	Develop and implement and flood control maintenance program	USMC,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,FLC,SDC, RC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
SMR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, USMC,DWR, CDFG, MWDSC, SDWA,SDT,CT, TU,FLC,SDC, RC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, USMC,DWR, CDFG, MWDSC, SDWASDT, CT,TU,FLC, SDC,RC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
SMR-SCS-7.1	Develop and implement plan to restore natural channel features	NRCS, USFWS,USMC, USGS,ACOE, BLM,NMFS, CDFG,CSCC, CT,TU,SDT,FLC, SDC,RC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SMR-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, USMC,SDWA, SDT,CT,TU,FLC, SDC,RC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SMR-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, USMC,SDWA SDT,CT,TU,FLC, SDC,RC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SMR-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, USMC,SDWA, SDT,CT,TU,FLC, SDC,RC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* Santa Margarita River Watershed Management Plan and San Diego Regional Trails Plan, U.S. Forest Service Cleveland National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,USMC, CDFG,CDPR, CSCC,SDWA, SDT,CT,TU,FLC, SDC,RC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SMR-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,USMC, CDFG,CDPR, CSCC,SDWA, SDT,CT,TU,FLC, SDC,RC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SMR-SCS-11.1	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads (*e.g.,* U.S. Interstate 5)	CDOT,CDFG, RWQCB, CSCC,USFWS, NMFS,USMC, USDOT,SDT,CT, TU,FLC,SDC, RC	Roads	1, 4	2B	10	12296511	12296511	0	0	0	24593022

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMR-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, RWQCB, CSCC, NRCS.USFWS,NMFS,USMC, USDOT,SDT,CT, TU,FLC,SDC, RC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SMR-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, RWQCB, CSCC,NRCS, USFWS,NMFS, USMC,USDOT, SDT,CT,TU,FLC, SDC,RC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SMR-SCS-12.1	Develop and implement an estuary restoration management plan	USMC,USFWS, USDOT,NMFS, CDFG,CSCC, CT,TU,SDT,FLC, SDC,RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	52292680	0	0	0	0	52292680
SMR-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,USMC, CT,TU,SDT,FLC, SDC,RC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
SMR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,USMC, USFWS,SDT,CT, TU,FLC,SDC, RC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
SMR-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, CDOT,USMC, USFWS,NMFS, SDT,CT,TU,FLC, SDC,RC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SMR-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Fallbrook Public Utility District Wastewater Treatment Facility)	RWQCB, SWRCB,CDFG, USMC,USFWS, NMFS,SDT,CT, TU,FLC,SDC, RC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SMR-SCS-14.3	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDFG, CDOT,USMC, USFWS,NMFS, USDOT,SDT,CT, TU,FLC,SDC, RC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0
SMR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USMC,USGS, CDF,CDFG, SDT,CT,TU,FLC, SDC,RC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-8. Southern California Steelhead DPS Recovery Action Table for the San Luis Rey River Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Luis Rey River												
SLR-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,SLRWC, SDC	Agricultural Development	1, 4,	2B	5	62400	0	0	0	0	62400
SLR-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU, SLRWC,SDC	Agricultural Development	1, 4,	2B	5	47520	0	0	0	0	47520
SLR-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU, SLRWC,SDC	Agricultural Development	1, 4,	2B	10 - refer to regional costs	0	0	0	0	0	0
SLR-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU, SLRWC,SDC	Agricultural Effluents	1, 4	2B	20 - refer to regional costs	0	0	0	0	0	0
SLR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USDOT, USFWS,CDFG, CSCC,CDOT, MWDSC,DWR, SDWA,SDT,CT, TU,SLRWC,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SLR-SCS-4.1	Develop and implement a water management plan for dam operations (*e.g.,* Pilgram, Turner, Lower and Upper Stehly, Aqua Tibia, Henshaw, and Eagles Nest dams)	NMFS, USFWS,BOR, CDFG,CSCC, MWDSC,DWR, SDWA,SDT,CT, TU,SLRWC,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SLR-SCS-4.2	Develop and implement water management plan for diversion operations (*e.g.*, Escondido Diversion)	USFWS,BOR, MWDSC,DWR NMFS,USGS, CDFG,SDWA, SDT,CT,TU, SLRWC,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	5	275550	0	0	0	0	275550
SLR-SCS-3/4.3	Conduct watershed-wide fish passage barrier assessment	CDOT,CDFG, CSCC,RWQC, NMFS,USMC, USFWS,SDWA SDT,CT,TU, SLRWC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690
SLR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,SLRWC, SDC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
SLR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,SLRWC, SDC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SLR-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SLRWC,SDC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
SLR-SCS-7.2	Develop and implement plan to restore natural channel features	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SLRWC,SDC	Levees and Channelization	1, 4	2B	20	4217625	4217625	4217625	4217625	0	16870500
SLR-SCS-7.3	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SLRWC,SDC	Levees and Channelization	1, 4	2B	100	0	0	0	0	0	0
SLR-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMG,SDT,CT, TU,SLRWC,SDC	Mining and Quarrying	1, 4	1B	5	68030	0	0	0	0	68030
SLR-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDT,CT,TU, SLRWC,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SLR-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SLRWC,SDC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SLR-SCS-9.3	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SLRWC,SDC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SLR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* San Luis Rey River Park Master Plan and San Diego Regional Trails Plan, U.S. Forest Service Cleveland National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDT,CT,TU, SLRWC,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SLR-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS, CDFG, CDPR,CSCC, SDWA,SDT,CT, TU,SLRWC,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SLR-SCS-11.1	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads (*e.g.,* U.S. Interstate 5	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT,SDT,CT,TU, SLRWC,SDC	Roads	1, 4	2B	0	0	0	0	0	0	0
SLR-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SLRWC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SLR-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SLRWC,SDC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SLR-SCS-12.1	Develop and implement an estuary restoration and management plan	USMC,USFWS, USDOT,NMFS, CDFG,CSCC, CT,TU,SDT, SLRWC,SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	8040000	0	0	0	0	8040000
SLR-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,USMC, CT,TU,SDT, SLRWC,SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
SLR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,USFWS, SDT,CT,TU, SLRWC,SDC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SLR-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Buena Sanitary District Wastewater Treatment Facility and Oceanside Wastewater Treatment Facility)	RWQCB, CDFG,USFWS, NMFS,SDT,CT, TU,SLRWC,SDC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SLR-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SLRWC,SDC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SLR-SCS-14.3	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDFG, CDOT,USDOT, USFWS,NMFS, SDT,CT,TU, SLRWC,SDC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0
SLR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USGS,CDF, CDFG,SDT,CT, TU,SLRWC,SDC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-9. Southern California Steelhead DPS Recovery Action Table for the San Dieguito River Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Dieguito River												
SD-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDRVC, SDC	Agricultural Development	1, 4	2B	20	10 - refer to region al costs	0	0	0	0	0
SD-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDRVC, SDC	Agricultural Development	1, 4,	2B	5	62400	0	0	0	0	62400
SD-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB, SDT,CT,TU, SDRVC,SDC	Agricultural Development	1, 4,	2B	10 - refer to regional costs	0	0	0	0	0	0
SD-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,SDRVC, SDC	Agricultural Effluents	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SD-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USDOT, USFWS,CDFG, CSCC,CDOT, MWDSC,DWR, SDWA,SDT,CT, TU,SDRVC,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SD-SCS-4.1	Develop and implement water management plan for diversion operations	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,CDFG, SDWA,SDT,CT, TU,SDRVC,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SD-SCS-4.2	Develop and implement a water management plan for dam operations (*e.g.,* Fairbanks, Upper and Lower 4 S, 4 S Ranch, Lake Hodges, and Sutherland dams)	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFS,USFWS, CDFG,SDWA, SDT,CT,TU, SDRVC,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SD-SCS-3/4.3	Conduct watershed-wide fish passage barrier assessment	CDOT,CDFG, CSCC,RWQC, NMFS, MWDSC, USFWS,SDWA, SDT,CT,TU, SDRVC,SDC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690
SD-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,SDRVC,SDC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
SD-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,SDRVC, SDC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
SD-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,SDRVC, SDC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SD-SCS-7.1	Develop and implement plan to restore natural channel features	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SDRVC,SDC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
SD-SCS-7.2	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SDRVC,SDC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SD-SCS-8.1	Review and modify mining operations	USGS,NMFS, USFWS,CDFG, CDMG,SDT,CT, TU,SDRVC,SDC	Mining and Quarrying	1, 4	2B	5	68030	0	0	0	0	68030
SD-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SDRVC,SDC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SD-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SDRVC,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SD-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SDRVC,SDC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SD-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* San Dieguito River Park Concept Plan and San Diego Regional Trails Plan, U.S. Forest Service Cleveland National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDT,CT,TU, SDRVC,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SD-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDWA,SDT,CT, TU,SDRVC,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SD-SCS-11.1	Develop and implement a plan to remove or reduce approach-fill for railroad lines and roads (*e.g.,* U.S. Interstate 5	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SDRVC,SDC	Roads	1, 4	2B	10	17078487	17078487	0	0	0	34156975

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SD-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SDRVC,SDC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SD-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SDRVC,SDC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SD-SCS-12.1	Develop and implement an estuary restoration and management plan	USFWS,USDOT, NMFS,CDFG, CSCC,CT,TU, SDT,SDRVC, SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	57651160	0	0	0	0	57651160
SD-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,CT,TU, SDT,SDRVC, SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
SD-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,USFWS, SDT,CT,TU, SDRVC,SDC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
SD-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SDRVC,SDC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SD-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SDRVC,SDC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SD-SCS-14.3	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SDRVC,SDC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0
SD-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USGS,CDF, CDFG,SDT,CT, TU,SDRVC,SDC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-10. Southern California Steelhead DPS Recovery Action Table for the San Diego River Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
San Diego River												
SDR-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDRFP, SDC	Agricultural Development	1, 4	3B	10 – refer to regional costs	0	0	0	0	0	0
SDR-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDRFP, SDC	Agricultural Development	1, 4,	3B	5	62400	0	0	0	0	62400
SDR-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDRFP, SDC	Agricultural Development	1, 4,	3B	10 - refer to regional costs	0	0	0	0	0	0
SDR-SCS-2.1	Develop and implement a plan to minimize runoff from agricultural activities	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,SDRFP, SDC	Agricultural Effluents	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SDR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USDOT, USFWS,USFS, CDFG,CSCC, CDOT, MWDSC,DWR, SDWA,SDT,CT, TU,SDRFP,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SDR-SCS-4.1	Develop and implement water management plan for diversion operations	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,CDFG, SDWA,SDT,CT, TU,SDRFP,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SDR-SCS-4.2	Develop and implement a water management plan for dam operations (*e.g.,* Murray, San Vicente, El Capitan, and Cuyamaca dams)	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,CDFG, SDWA,SDT,CT, TU,SDRFP,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SDR-SCS-4.3	Provide fish passage around dams and diversions	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,CDFG, SDWA,SDT,CT, TU,SDRFP,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SDR-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	NMFS,USDOT, USFWS,USFS, CDFG,CSCC, CDOT, MWDSC,DWR, SDWA,SDT,CT, TU,SDRFP,SDC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690
SDR-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,SDRFP,SDC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0
SDR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT,CT, TU,SDRFP,SDC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SDR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,SDRFP, SDC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
SDR-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SDRFP,SDC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SDR-SCS-7.2	Develop and implement plan to restore natural channel features	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SDRFP,SDC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
SDR-SCS-7.3	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SDRFP,SDC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SDR-SCS-9.1	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SDRFP,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SDR-SCS-9.2	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SDRFP,SDC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SDR-SCS-9.3	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,SDRFP,SDC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
SDR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* U.S. Forest Service Cleveland National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDT,CT,TU, SDRFP,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SDR-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDWA,SDT,CT, TU,SDRFP,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SDR-SCS-10.3	Review and modify development and management plans for recreational areas and national forests (*e.g.,* San Diego River Park Master Plan, San Diego Regional Trails Plan, and San Diego River Watershed Management Plan)	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDT,CT,TU, SDRFP,SDC	Recreational Facilities	1, 2, 3, 4, 5		ongoing - cost of doing business	0	0	0	0	0	0
SDR-SCS-11.1	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads (e.g., U.S. Interstate 5 bridge)	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SDRFP,SDC	Roads	1, 4	2B	0	0	0	0	0	0	0
SDR-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SDRFP,SDC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SDR-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SDRFP,SDC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SDR-SCS-12.1	Develop and implement an estuary restoration and management plan	USFWS,USDOT, NMFS,CDFG, CSCC,CT,TU, SDT,SDRFP, SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	5360000	0	0	0	0	5360000

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SDR-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,SDWA, CT,TU,SDT, SDRVC,SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	2B	5	62400	0	0	0	0	62400
SDR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,USFWS, SDT,CT,TU, SDRFP,SDC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
SDR-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Padre Dam Water Reclamation Facility)	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SDRFP,SDC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0
SDR-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SDRFP,SDC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0
SDR-SCS-14.3	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SDRFP,SDC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0
SDR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USGS,CDF, CDFG,SDT,CT, TU,SDRFP,SDC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-11. Southern California Steelhead DPS Recovery Action Table for the Sweetwater River Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Sweetwater River												
SWR-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SWA, SDC	Agricultural Development	1, 4,	2B	5	62400	0	0	0	0	62400
SWR-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SWA, SDC	Agricultural Development	1, 4,	2B	5	47520	0	0	0	0	47520
SWR-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SWA, SDC	Agricultural Development	1, 4,	2B	10 - refer to regional costs	0	0	0	0	0	0
SWR-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB,SDT, CT,TU,SWA, SDC	Agricultural Effluents	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SWR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USDOT, USFWS,USFS, CDFG,CSCC, CDOT, MWDSC, SDWA,DWR, SDT,CT,TU, SWA,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SWR-SCS-4.1	Develop and implement a water management plan for dam operations (*e.g.,* Sweetwater Main, Willow Tree, Loveland, and Palo Verde dams)	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,CDFG, SDWA,SDT,CT, TU,SWA,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SWR-SCS-4.2	Develop and implement water management plan for diversion operations	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,CDFG, SDT,CT,TU, SWA,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	5	275550	0	0	0	0	275550
SWR-SCS-4.3	Provide fish passage around dams and diversions	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,CDFG, SDWA,SDT,CT, TU,SWA,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
SWR-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	NMFS,USDOT, USFWS,USFS, CDFG,CSCC, CDOT, MWDSC, SDWA,DWR, SDT,CT,TU, SWA,SDC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690
SWR-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,SWA,SDC	Flood Control Maintenance	1, 4	2B	100	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SWR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC,SDT, CT,TU,SWA, SDC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
SWR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC,SDT, CT,TU,SWA, SDC,SDC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
SWR-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SWA,SDC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SWR-SCS-7.2	Develop and implement plan to restore natural channel features	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SWA,SDC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
SWR-SCS-7.3	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,SWA,SDC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
SWR-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SWMNWR SDT,CT,TU, SWA,SDC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SWR-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SWMNWR, SDWA,SDT,CT, TU,SWA,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
SWR-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SWMNWR, SDWA,SDT,CT, TU,SWA,SDC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
SWR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* Sweetwater River Watershed Management Plan, Sweetwater Marsh National Wildlife Management Plan)	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDT,CT,TU, SWA,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
SWR-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDWA,SDT,CT, TU,SWA,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560
SWR-SCS-11.1	Develop and implement plan to remove or reduce approach-fill for railroad lines and roads (*e.g.,* U.S. Interstate 5)	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SWA,SDC	Roads	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SWR-SCS-11.2	Manage roadways and adjacent riparian corridor and restore abandoned roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SDWA,SDC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
SWR-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, SWA,SDC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
SWR-SCS-12.1	Develop and implement an estuary restoration and management plan	USFWS,USDOT, NMFS, SWMNWR, CDFG,CSCC, CT,TU,SDT, SWA,SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	2010000	0	0	0	0	2010000
SWR-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,CT,TU, SDT,SWA,SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
SWR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,USFWS, SDT,CT,TU, SWA,SDC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
SWR-SCS-14.1	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SWA,SDC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
SWR-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* San Diego City Point Loma Wastewater Treatment Facility)	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SWA,SDC	Urban Effluents	1, 4	2B	ongoing - cost of doing business	0	0	0	0	0	0
SWR-SCS-14.3	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, SWA,SDC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0
SWR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USGS,CDF, CDFG,SDT,CT, TU,SWA,SDC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-12. Southern California Steelhead DPS Recovery Action Table for the Otay River Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Otay River												
OR-SCS-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB, SDT,CT,TU, ORCP,SDC	Agricultural Development	1, 4,	3B	5	62400	0	0	0	0	62400
OR-SCS-1.2	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB, SDT,CT,TU, ORCP,SDC	Agricultural Development	1, 4,	3B	5	47520	0	0	0	0	47520
OR-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB, SDT,CT,TU, ORCP,SDC	Agricultural Development	1, 4,	3B	10 - refer to regional costs	0	0	0	0	0	0
OR-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USGS, BLM,USFS, USFWS,NMFS, CDFG, RWQCB, SDT,CT,TU, ORCP,SDC	Agricultural Effluents	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
OR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USDOT, USFWS,CDFG, CSCC,CDOT, MWDSC, SDWA,DWR, SDT,CT,TU, ORCP,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	3A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
OR-SCS-4.1	Develop and implement water management plan for diversion operations	NMFS,USGS USFWS,BOR, MWDSC,DWR, CDFG,SDWA, SDT,CT,TU, ORCP,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
OR-SCS-4.2	Develop and implement a water management plan for dam operations (*e.g.,* Salvage and Upper Otay dams	NMFS,USGS USFWS,BOR, MWDSC,DWR, CDFG,SDWA, SDT,CT,TU, ORCP,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
OR-SCS-4.3	Provide fish passage around dams and diversions	NMFS,USGS USFWS,BOR, MWDSC,DWR, CDFG,SDWA, SDT,CT,TU, ORCP,SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
OR-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	DWR,CDOT, CDFG,CSCC, NMFS,USFWS, MWDSC, SDWA,SDT, CT,TU,ORCP, SDC	Dam and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	3A	5	96690	0	0	0	0	96690
OR-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USDOT,USFWS, CDFG,CSCC, CDOT,SDT,CT, TU,ORCP,SDC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0
OR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,ORCP, SDC	Groundwater Extraction	1, 4	3B	5	275550	0	0	0	0	275550

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
OR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, DWR,CDFG, MWDSC, SDWA,SDT, CT,TU,ORCP, SDC	Groundwater Extraction	1, 4	3B	10	254350	39775	0	0	0	294125
OR-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,ORCP,SDC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
OR-SCS-7.2	Develop and implement plan to restore natural channel features	CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS,USDOT,SDT,CT, TU,ORCP,SDC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
OR-SCS-7.3	Develop and implement a plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,CDFG, RWQCB, CSCC,NRCS,USFWS,NMFS, USDOT,SDT,CT, TU,ORCP,SDC	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
OR-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT, CT,TU,ORCP, SDC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0
OR-SCS-9.2	Develop and implement non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,ORCP,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
OR-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, SDWA,SDT,CT, TU,ORCP,SDC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
OR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* Otay River Watershed Management Plan and Otay Valley Regional Park Management Plan, U.S. Forest Service Cleveland National Forest Land Management Plan, Southern California National Forest Vision, Forest Strategy, and Design Criteria)	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDT,CT,TU, ORCP,SDC	Recreational Facilities	1, 2, 3, 4, 5	3B	ongoing - cost of doing business	0	0	0	0	0	0
OR-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,CDFG, CDPR,CSCC, SDWA, SDT,CT,TU, ORCP,SDC	Recreational Facilities	1, 2, 3, 4, 5	3B	20	76140	76140	76140	76140	0	304560
OR-SCS-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	DOT,CT,TU, SDT,CT,TU, ORCP,SDC	Roads	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
OR-SCS-11.2	Develop and implement a plan to remove or reduce approach-fill for railroad lines and roads (*e.g.*, U.S. Interstate 5)	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, ORCP,SDC	Roads	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0
OR-SCS-11.3	Retrofit storm drains to filter runoff from roadways	CDOT,CDFG, CSCC,USFWS, NMFS,USDOT, SDT,CT,TU, ORCP,SDC	Roads	1, 4	3B	20	32260	32260	32260	32260	0	129040
OR-SCS-12.1	Develop and implement an estuary restoration and management plan	USFWS,USDOT, NMFS,CDFG, CSCC,CT,TU, SDT,ORCP, SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	670000	0	0	0	0	670000
OR-SCS-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,CT,TU, SDT,ORCP, SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	3B	5	62400	0	0	0	0	62400
OR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,USFWS, SDT,CT,TU, ORCP,SDC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
OR-SCS-14.1	Retrofit storm drains in developed areas	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, ORCP,SDC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0
OR-SCS-14.2	Review, assess and modify NPDES wastewater discharge permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, SDT,CT,TU, ORCP,SDC	Urban Effluents	1, 4	3B	ongoing - cost of doing business	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
OR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USGS,CDF, CDFG,SDT,CT, TU,ORCP,SDC	Wildfires	1, 4, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Table 13-13. Southern California Steelhead DPS Recovery Action Table for the Tijuana River Watershed (Santa Catalina Gulf Coast BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Tijuana River												
TR-SCS-1.1	Manage livestock grazing to maintain or restore aquatic habitat functions	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDSRF, TRAN,SDC	Agricultural Development	1, 4,	3B	5	62400	0	0	0	0	62400
TR-SCS-1.2	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDSRF, TRAN,SDC	Agricultural Development	1, 4,	3B	5	62400	0	0	0	0	62400
TR-SCS-1.3	Manage agricultural development and restore riparian zones	NRCS,BLM, USFS,USFWS, NMFS,CDFG, RWQCB,SDT, CT,TU,SDSRF, TRAN,SDC	Agricultural Development	1, 4,	3B	10 - refer to regional costs	0	0	0	0	0	0
TR-SCS-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS,USGS, BLM,USFS, USFWS, NMFS,TRNER, CDFG, RWQCB,SDT, CT,TU,SDSRF, TRAN,SDC	Agricultural Effluents	1, 4	3B	20 - refer to regional costs	0	0	0	0	0	0
TR-SCS-3.1	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS,USFWS, USDOT,CDOT, CDFG,CSCC, DWR, MWDSC, SDWA,SDT,CT, TU,SDSRF, TRAN,SDC	Culverts and Road Crossings (Passage Barriers)	1, 4	1A	20 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TR-SCS-4.1	Develop and implement water management plan for diversion operations	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,TRNER, CDFG,SDWA, SDT,CT,TU, SDSRF,TRAN, SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
TR-SCS-4.2	Develop and implement a water management plan for dam operations (*e.g.,* Barrett Dam, Henry Jr. Dam, Campo Lake Dam, Morena Dam, Corte Madera Dam, Thin Valley Dam)	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,TRNER, CDFG,SDWA SDT,CT,TU, SDSRF,TRAN, SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
TR-SCS-4.3	Provide fish passage around dams and diversions	USFWS,BOR, MWDSC,DWR NMFS,USGS, USFWS,TRNER, CDFG,SDWA, SDT,CT,TU, SDSRF,TRAN, SDC	Dams and Surface Water Diversions	1, 3, 4	2A	20	TBD	TBD	TBD	TBD	TBD	TBD
TR-SCS-3/4.4	Conduct watershed-wide fish passage barrier assessment	NMFS,USFWS, USDOT,CDOT, CDFG,CSCC, DWR, MWDSC, SDWA,SDT,CT, TU,SDSRF, TRAN,SDC	Dams and Surface Water Diversions, Culverts and Road Crossings (Passage Barriers)	1, 4	1A	5	96690	0	0	0	0	96690
TR-SCS-5.1	Develop and implement flood control maintenance program	ACOE,NMFS, USDOT,USFWS, TRNER,CDFG, CSCC,CDOT, SDT,CT,TU, SDSRF,TRAN, SDC	Flood Control Maintenance	1, 4	3B	100	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TR-SCS-6.1	Conduct groundwater extraction analysis and assessment	USGS,NMFS, TRNER, DWR,CDFG, MWDSC, SDWA,SDT,CT, TU,SDSRF, TRAN,SDC	Groundwater Extraction	1, 4	2B	5	275550	0	0	0	0	275550
TR-SCS-6.2	Develop and implement groundwater monitoring and management program	USGS,NMFS, TRNER,DWR, CDFG, MWDSC, SDWA,SDT, CT,TU,SDSRF, TRAN,SDC	Groundwater Extraction	1, 4	2B	10	254350	39775	0	0	0	294125
TR-SCS-7.1	Develop and implement stream bank and riparian corridor restoration plan	CDFG, RWQCB, CSCC,NRCS,U SFWS,NMFS, USDOT,SDT,CT, TU,SDSRF,TRAN	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
TR-SCS-7.2	Develop and implement plan to restore natural channel features	CDFG, RWQCB, CSCC,NRCS,U SFWS,NMFS, USDOT,SDT,CT, TU,SDSRF, TRAN,SDC	Levees and Channelization	1, 4	3B	20	4217625	4217625	4217625	4217625	0	16870500
TR-SCS-7.3	Develop and implement plan to vegetate levees and eliminate or minimize herbicide use near levees	FEMA,CDFG, RWQCB, CSCC,NRCS,U SFWS,NMFS, USDOT,SDT,CT, TU,SDSRF,TRAN	Levees and Channelization	1, 4	3B	100	0	0	0	0	0	0
TR-SCS-9.1	Develop and implement watershed-wide plan to assess the impacts of non-native species and develop control measures	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, TRNER,SDWA SDT,CT,TU, SDSRF,TRAN, SDC	Non-Native Species	1, 3, 5	3B	100 - refer to regional costs	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TR-SCS-9.2	Develop and implement a non-native species monitoring program	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, TRNER,SDWA, SDT,CT, TU,SDSRF, TRAN,SDC	Non-Native Species	1, 3, 5	2B	100 - refer to regional costs	0	0	0	0	0	0
TR-SCS-9.3	Develop and implement public education program on non-native species impacts	CDFG,CDPR, CSCC,USFWS, USFS,NMFS, TRNER,SDWA, SDT,CT, TU,SDSRF, TRAN,SDC	Non-Native Species	1, 3, 5	2B	20	76140	76140	76140	76140	0	304560
TR-SCS-10.1	Review and modify development and management plans for recreational areas and national forests (*e.g.,* Tijuana River Watershed Management Plan, Tijuana River Valley Regional Park Management Plan, Border Field State Park Management Plan, and Tijuana River National Estuarine Research Reserve Plan)	USFS,USFWS, NMFS,TRNER, CDFG,CDPR, CSCC,SDT,CT, TU,SDSRF, TRAN,SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	ongoing - cost of doing business	0	0	0	0	0	0
TR-SCS-10.2	Develop and implement public education program on watershed processes	USFS,USFWS, NMFS,TRNER, CDFG,CDPR, CSCC,SDWA, SDT,CT,TU, SDSRF,TRAN, SDC	Recreational Facilities	1, 2, 3, 4, 5	2B	20	76140	76140	76140	76140	0	304560

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TR-SCS-12.1	Review and modify applicable County and/or City Local Coastal Plans	CCC,CSCC, CDFG,USFWS, NMFS,TRNER, CT,TU,SDT, SDSRF, TRAN,SDC	Upslope/ Upstream activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
TR-SCS-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CDOT,CDFG, CCC,RWQC, NMFS,USFWS, SDT,CT,TU, SDSRF,TRAN, SDC	Urban Development	1, 4	3B	5	62400	0	0	0	0	62400
TR-SCS-14.1	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* South Bay International Wastewater Treatment Facility and South Bay Water Reclamation Facility)	RWQCB, SWRCB,CDFG, USFWS,NMFS, TRNER,SDT,CT, TU,SDSRF, TRAN,SDC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0
TR-SCS-14.2	Review California Regional Water Quality Control Board Watershed Plans and modify Stormwater Permits	RWQCB, SWRCB,CDFG, USFWS,NMFS, TRNER,SDT,CT, TU,SDSRF, TRAN,SDC	Urban Effluents	1, 4	1B	ongoing - cost of doing business	0	0	0	0	0	0
TR-SCS-14.3	Retrofit storm drains in developed areas	USDOT,CDOT, RWQCB, SWRCB,CDFG, USFWS,NMFS, TRNER,SDT,CT, TU,SDSRF, TRAN,SDC	Urban Effluents	1, 4	2B	20	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Estimated Costs ($)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
TR-SCS-15.1	Develop and implement an integrated wildland fire and hazardous fuels management plan	USFS,USFWS, BLM,NMFS, USGS,TRNER CDF,CDFG, SDT,CT,TU, SDSRF,TRAN, SDC	Wildfires	1, 4, 5	2B	100 - refer to regional costs	0	0	0	0	0	0

14. Southern California Steelhead Research, Monitoring and Adaptive Management

"The analytic tools to evaluate species health have been greatly developed in recent years. The emergence of extinction theory from population genetics and ecology, the combination of demography and genetics in population viability analysis and the extension of risk analyses into the realm of biological conservation promises to lead us to wiser allocations of effort in the future."

Science and the Endangered Species Act, National Research Council, 1995

14.1 INTRODUCTION

Recovery of southern California steelhead will require a more thorough understanding of the distinctive biology of steelhead within the SCS Recovery Planning Area. Additionally, it is crucially important to identify a program for monitoring the status of individual populations and the DPS as a whole, and a plan for tracking and adjusting the recovery actions and recovery strategy over an extended period to optimize the effectiveness of the recovery effort. The following sections outline the basic elements of a research, monitoring, and adaptive management program, and identify high priority research and monitoring actions.

14.1.1 Southern California Steelhead Research

In 2002 NMFS convened a team of scientific specialists, the Technical Review Team (TRT), whose mission was to survey existing scientific information on steelhead ecology, and formulate a biological framework for a recovery plan for Southern California steelhead (Boughton *et al.* 2007b, 2006, Boughton and Goslin 2006, Boughton *et al.* 2005, Boughton and Fish 2003).

The current state of knowledge of steelhead ecology is largely descriptive and qualitative. This has led to uncertainties in the viability framework, including developing quantitative goals for distribution and abundance of steelhead trout and general strategies for how to achieve these goals. In general, the TRT approached uncertainty about recovery goals with a risk-averse, or precautionary, stance, consistent with accepted practice in conservation biology (McElhany *et al.* 2000). The TRT also recognized that key uncertainties involved in recovery planning arose from the qualitative nature of the current understanding, and could be improved by a carefully conceived and planned program of scientific research and monitoring. The benefits of pursuing such a program would be a more effective, and more-cost efficient, recovery effort for steelhead.

Recovery of southern California steelhead will depend upon a quantitative framework that addresses their annual run size, along with year-to-year variability over the long term; and the quantitative response of steelhead runs to specific recovery actions. These are related to the two overarching questions of steelhead recovery in this region:

- How do we improve the distribution, abundance, and resilience of steelhead trout populations; and

- How much do we need to improve these biological characteristics for steelhead to be considered viable and eligible for down-listing and/or delisting?

The following sub-sections focus on the viability criteria developed by the TRT, and a series of related research questions grouped into three areas: enhancing anadromy, clarifying the population structure of *O. mykiss*, and planning for climate change.

14.2 VIABILITY CRITERIA

The viability criteria address two levels of biological organization, populations within the Distinct Population Segment (*i.e.,* only the anadromous form), and the more encompassing Evolutionarily Significant Unit (ESU), which includes all life history forms. The *O. mykiss* ESUs in this Recovery Planning Area are composed of both anadromous and non-anadromous fish, but only the non-anadromous form is on the endangered species list, under the DPS provision of the Federal Endangered Species Act. One of the principal uncertainties is the complicated relationship between the anadromous and non-anadromous (or freshwater-resident) forms of the species. Following convention, the term "steelhead trout" is used for the anadromous fish, "rainbow trout" for non-anadromous fish, and "*O. mykiss*" when referring to both or either. The goal of the Recovery Plan is to ensure the continued persistence of steelhead trout in the region over the long term (Boughton *et al.* 2007b), but it is likely that rainbow trout have some role in securing this future, and thus the viability criteria have provisions for both forms of the species.

14.2.1 Population-Level Criteria

The TRT considered *O. mykiss* in the region to be grouped into demographically - independent populations. Generally, each discrete coastal watershed in the region was assumed to have historically supported one demographically independent population of *O. mykiss.* If migratory steelhead frequently move from one watershed to another, the one-watershed-one-population assumption may have some important exceptions with implications for recovery planning.

The TRT proposed population-level viability criteria for determining whether a demographically- independent population of *O. mykiss* should be considered viable for the purpose of steelhead recovery. The TRT identified two choices for meeting the viability criteria. The first was to meet a set of criteria: a population must exhibit a mean annual run size of at least 4,150 steelhead trout, including during periods of poor ocean conditions (such as occurred from the late 1970s through early 1990s). Additionally, the spawner densities in the river systems needed to meet a minimum density threshold (fish per kilometer of stream channel at some scale), a quantitative criterion yet to be determined. The second choice was to meet a performance-based criterion, demonstrating that the extinction risk for steelhead trout is less than 5% over 100 years, using commonly accepted quantitative methods from conservation biology, demographic data from the population in question, and passing an independent scientific review.

Extinction risk is very sensitive to both annual run size and year-to-year variability. As a result, the performance-based criteria cannot be applied in a meaningful way until run sizes have been monitored for a decade or more, allowing this key quantity to be estimated with reasonable accuracy. In the interim, the prescriptive criteria ensures that the year-to-year variability in run size, whatever its probable magnitude, is unlikely to pose a significant risk to the species. If year-to-year variability turns out to be relatively modest, a mean run size smaller than 4,150 steelhead would perhaps be sufficient to ensure a low extinction risk. Including the option for performance-based viability criteria, provides a mechanism for refining the viability criteria as more is learned over time.

Extinction risk for individual steelhead runs may also be sensitive to the influence of rainbow trout, if the trout tend to stabilize or augment those runs as a result of rainbow trout regularly producing anadromous progeny. This phenomenon is referred to as "life history crossovers," but it is not yet known whether such crossovers occur frequently enough to stabilize steelhead runs. This is another key uncertainty that, if resolved, might allow the run-size criterion of 4,150 spawners per year to be adjusted. In this case, the adjustment would be that some fraction of the 4,150 spawners within a watershed or metapopulation would need to exhibit the anadromous life history, rather than 100%. Additionally, data on the magnitude of natural fluctuations in anadromous run sizes in individual watersheds may identify a smaller mean run size is sufficient for viability in some basins (Williams *et al.* 2011). Until such research is undertaken and revisions made to the viability criteria, the population-level viability criteria for determining whether a demographically-independent population of *O. mykiss* should be considered viable for the purpose of steelhead recovery would remain 4,150. This criteria will be reviewed during NMFSs 5-year review of the Recovery Plan, and potentially during the Southwest Fisheries Science Center's 5-year status review update for Pacific salmon and steelhead listed under the ESA..

In the absence of specific information about the role of life history crossovers, the TRT took a precautionary approach (*i.e.*, it was assumed there was not any beneficial effect of crossovers). This meant that the 4,150 spawners per year required for viability must be composed entirely of steelhead trout, rather than a mixture of rainbow and steelhead to ensure viability. However, the TRT also believed that the criteria should cover the possibility that the beneficial effect of crossovers not only exists, but is necessary for viability of the listed species. This led to additional criteria that the anadromous and freshwater resident life history types should both be expressed in populations for them to be considered viable.

It would be useful to learn whether rainbow trout significantly enhance or stabilize steelhead runs. If rainbow trout progeny crossover does in fact have a beneficial effect on steelhead runs - and its magnitude can be quantified - such knowledge could be used to revise the criteria for anadromous fraction criteria, or it could be incorporated into a performance-based assessment of risk, possibly resulting in different run size and anadromous fraction criteria. Research into these topics is essential to resolve these issues in a way which maintains acceptably low extinction risk to the species.

14.2.2 ESU/DPS-Level Criteria

The TRT outlined a set of ESU/DPS-level criteria, which, if met, would indicate that a steelhead Distinct Population Segment has been successfully recovered. Satisfying the ESU/DPS-level criteria requires a set of *O. mykiss* populations in which:

- ❑ Each population satisfies the population-level criteria described above, and

- The set of populations as a whole satisfies requirements for ecological representation and redundancy, and

- The set of populations as a whole exhibit all three life history types (fluvial-anadromous, lagoon-anadromous, freshwater resident)

The criteria for representation and redundancy have two purposes. First, to protect the genetic and ecological diversity that ensures the long-term viability of the species under changing conditions, the set of populations should represent the entire range of ecological and genetic conditions originally present in the ESU/DPS. Second, to protect against catastrophic loss of entire populations due to disease, forest fires, drought, *etc.*, the set of populations should exhibit redundancy with respect to the range of ecological and genetic conditions originally present in the ESU. This ensures that if, for example, entire populations are lost from a particular ecotype, there will be at least one other population in that ecotype that survives, and can serve as a reservoir of individuals retaining the genetic and phenotypic adaptations necessary for inhabiting that ecotype. Ultimately, such individuals would be necessary for recolonizing the watersheds.

The TRT developed criteria for representation and redundancy by grouping the region's populations of *O. mykiss* into biogeographic groups, and specifying a minimum level of redundancy (number of viable populations) within each group. In addition, the TRT recommended that the core populations should inhabit watersheds with drought refugia, should be separated from one another by at least 42 miles if possible, and should exhibit three life history types—the rainbow trout form described previously, and two forms of steelhead trout, the lagoon-anadromous form and the fluvial-anadromous form.

The biogeographic groups were delineated on the basis of geographic proximity, broadly similar climate, and aspects of physiography that are relevant to the fish (see Table 5 and Figure 5 in Boughton *et al.* 2007b). Summer air temperatures, which strongly influence whether summer stream temperatures are cool enough for the fish, were a key consideration. The most important split was between coastal groups of populations, in which cool mesoclimates are maintained by proximity to the ocean, and interior groups of populations, where cool mesoclimates are primarily confined to mountain ranges, and are maintained by the temperature lapse rate (i.e. the reduction in temperature with increased elevation).

The criteria for redundancy within each biogeographic group were based on an assessment of catastrophic risks posed by wildfires and debris flows. However, the assessment was based on historical pattern and did not include considerations of climate change, which could have a large impact on the region. See Chapter 5, Southern California Steelhead and Climate Change.

The TRT also considered the catastrophic risk posed by drought, but could not incorporate it into the criteria due to insufficient information. The broad spatial extent of the typical drought in the region indicated that simple redundancy was not a suitable strategy for protecting the species from its effects. Watersheds having potential as drought refugia—stream systems that maintain suitable summer baseflows and water temperatures during severe multi-year droughts – should be identified and protected.

The broad-scale climatic factors that control the distribution of *O. mykiss* in the region appear to be summer air temperatures, annual precipitation, and the severity of winter storms, the last having its effect by determining the power of high flow events that organize the distribution and extent of in-stream steelhead habitat. All of these factors are likely to undergo a long-term shift as part of CO_2-induced climate change. In addition, the region's frequent wildfires strongly influence the sediment budgets of streams, and thus the distribution of steelhead habitat. The overall wildfire regime is also likely to undergo a permanent shift in response to climate change. The magnitudes of these shifts, and the magnitude of their direct and interaction effects on stream habitat, are not yet clear. Thus a key uncertainty is how to plan for climate change both at the level of the ESU and individual stream watersheds.

14.3 RESEARCH FOCUS: ANADROMY, POPULATION STRUCTURE, AND MONITORING STEELHEAD RECOVERY

The natural dynamics of watersheds and stream systems maintain steelhead habitat in the recovery planning area in a stochastic, dynamic equilibrium. This equilibrium can involve dramatic processes such as floods and forest fires that disrupt habitat in the short term but ensure its continued existence over the long term. Other processes that circumscribe the productivity of freshwater steelhead habitat, such as the severity of the dry season or the pattern of high-flow events during the wet season, may affect reproductive success. These ecological constraints are generally understood at a qualitative level, but this level of knowledge is, in some cases, too vague to provide specific guidance for setting goals and choosing specific recovery actions. The research program supporting steelhead recovery in this region should focus on quantitative studies that: 1) identify ecological factors that promote anadromy; 2) clarify key aspects of population structure; and 3) monitor progress toward recovery. Many of these research activities could be carried out within the context of the California Coastal Salmonid Population Monitoring Program (Adams *et al.* 2011).

14.3.1 Identify Ecological Factors that Promote Anadromy

The primary focus of this Recovery Plan - to recover and secure the anadromous form of *O. mykiss* - involves restoring ecological conditions that specifically promote the population growth and abundance of the anadromous form.

While it is necessary to have migration corridors for steelhead to reach a spawning area, this does not necessarily imply that anadromous forms will out-compete the freshwater residents that spawn in the same area. At present it is not clear what ecological conditions specifically promote the sea-going form over the resident form though there are some important clues. These clues present a prime opportunity for research that would lead to more effective recovery actions.

Anadromous females exhibit a large fecundity advantage over their resident counterparts. As shown in Figure 14-1, an adult female's egg production increases exponentially with body length, and adult *O. mykiss* are generally able to attain much larger sizes in the ocean than in freshwater.

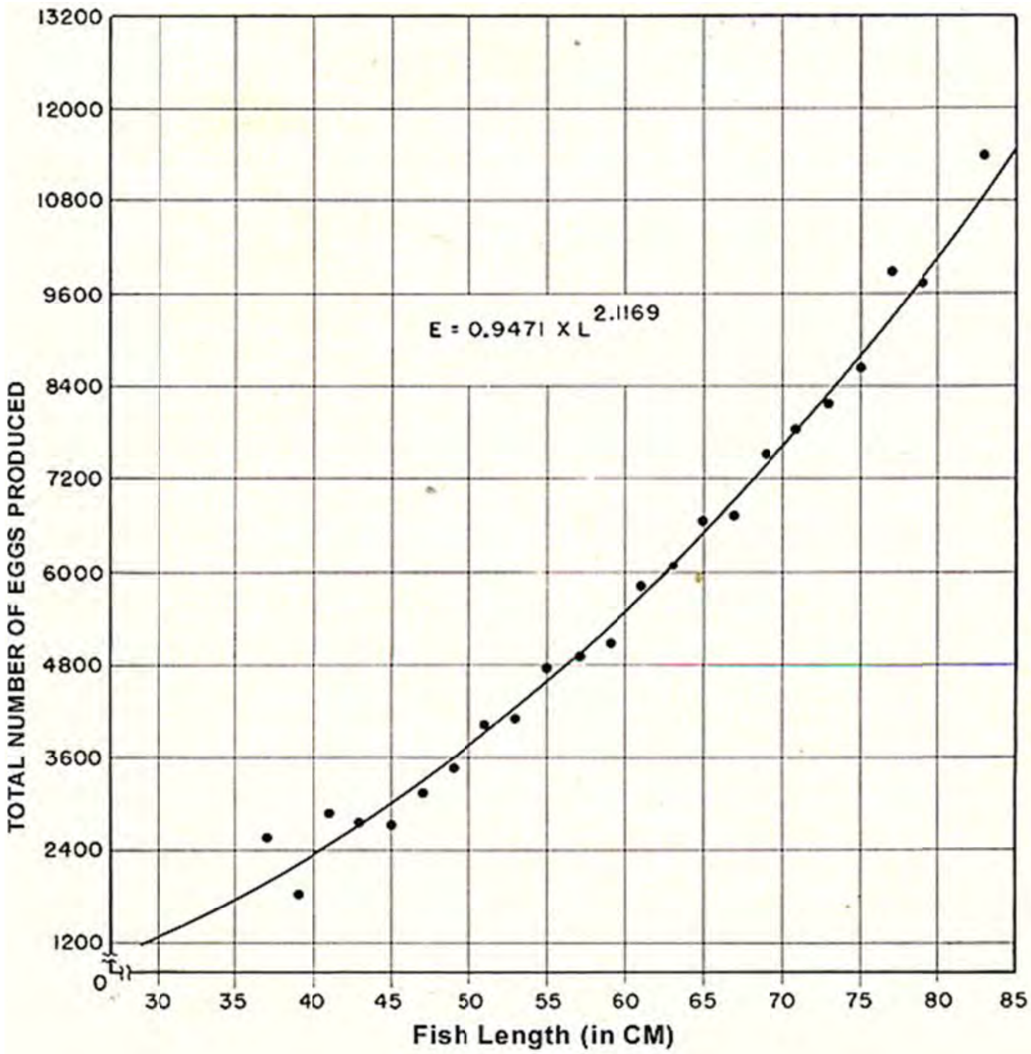


Figure 14-1. Fecundity as a function of body size for female steelhead sampled from Scott Creek in Santa Cruz County. Reproduced from Shapovalov and Taft (1954).

Thus, a typical female rainbow trout might attain a length of 35 cm, enabling her to produce 1800 eggs annually, whereas a medium sized steelhead female at 60 cm could produce over 3.5 times that number. This factor alone gives the sea-going form a distinct advantage and, all else being equal (and assuming the two forms breed true), over time the sea-going form should come to dominate any stream system with migration connectivity to the ocean. The resident forms would become confined to streams that lack migration connectivity. This pattern has been observed, for example, in the Deschutes River in Oregon (Zimmerman and Reeves, 2000).

In southern California, three ecological factors could potentially counteract this size advantage so that the resident form is sometimes favored in anadromous waters. First, the migration corridor between the ocean and freshwater habitat could be unreliable. Second, mortality may sometimes be much higher in the ocean than in freshwater, counteracting the potential size advantage of sea-going fish. Third, juveniles of the freshwater form may survive better or compete better in freshwater than juveniles of the sea-going form, which could also counteract the natural size/fecundity advantage of the sea-going form. Of these three possibilities, the first two are supported by various lines of evidence, and the third has some suggestive evidence. The need is to move beyond existing evidence to a quantitative understanding of ecological mechanism, so that specific recovery strategies can be linked to desired outcomes.

14.3.2 Reliability of Migration Corridors

Question: What is the relationship between reliability of migration corridors, and anadromous fraction?

Discussion: Migration corridors in this arid region are clearly unreliable, but it is not clear precisely how reliable they must be for the anadromous form to persist over the long term, nor how to best characterize reliability.

Recommendation: The relationship between flow patterns in managed rivers, the reliability of migration opportunities, and the long term persistence of steelhead runs is likely to be watershed specific, but could be characterized through the establishment of a long-term monitoring effort that tracks abundance and timing of steelhead runs, and the timing of smolt runs, in specific watersheds of interest. This would provide a framework by which management actions, in the form of managed flow regimes, could be related to outcomes, in the form of migrant abundance and timing. However, answers would probably emerge only over the long term, and numerous confounding factors would also need to be taken into account by the monitoring framework.

14.3.3 Steelhead-Promoting Nursery Habitats

Question: What nursery habitats promote rapid growth rates of juveniles (and therefore larger size) at the time smolts emigrate to the ocean?

Discussion: Marine survival varies among salmonids, ranging from 25% to below 1% (Welch *et al.* 2009, Logerwell *et al*. 2003, Peterson and Schwing, 2003, Ward 2000, Ward *et al*. 1989). Improving the marine survival rate of steelhead would be beyond the scope of most management strategies, since steelhead are rarely fished and other sources of ocean mortality are largely uncontrollable. However, mortality rates of many marine fishes are strongly size-dependent. Consistent with this general pattern, young steelhead migrating to the sea tend to survive much better if they have a larger size at ocean entry (Hayes, *et al.* 2008, Bond, 2006, Ward *et al*. 1989). Thus, their growth opportunities in freshwater may influence their subsequent marine survival.

Figure 14-2, indicates that an outgoing smolt that has a fork length of 14 cm has about a 3% chance of surviving to spawn, but a 16.5 cm smolt's chances are at least 3.5 times better (*c.* 10%), and a 22 cm smolt's chances are an order of magnitude better (37%). Thus, the mortality effects of size at ocean entry can be of the same order as the fecundity advantages of migrating to the ocean in the first place.

A similar relationship between survival and size at ocean entry was observed by Bond (2006) and Hayes *et al.* (2008) in Scott Creek in Santa Cruz County, which is much closer geographically to southern California. Size at ocean entry appears to be at least as important as final spawning size in modulating the relative abundances of the freshwater and ocean-going forms of *O. mykiss.* [1]

[1] Its importance can vary over time, however. Ward (2000) observed that after 1989, marine survival drastically declined in the Keogh River population, and the relationship disappeared between marine survival and size at ocean entry. This was attributed to a change in ocean conditions, and indicates that the survival advantage of being a large smolt varies over time.

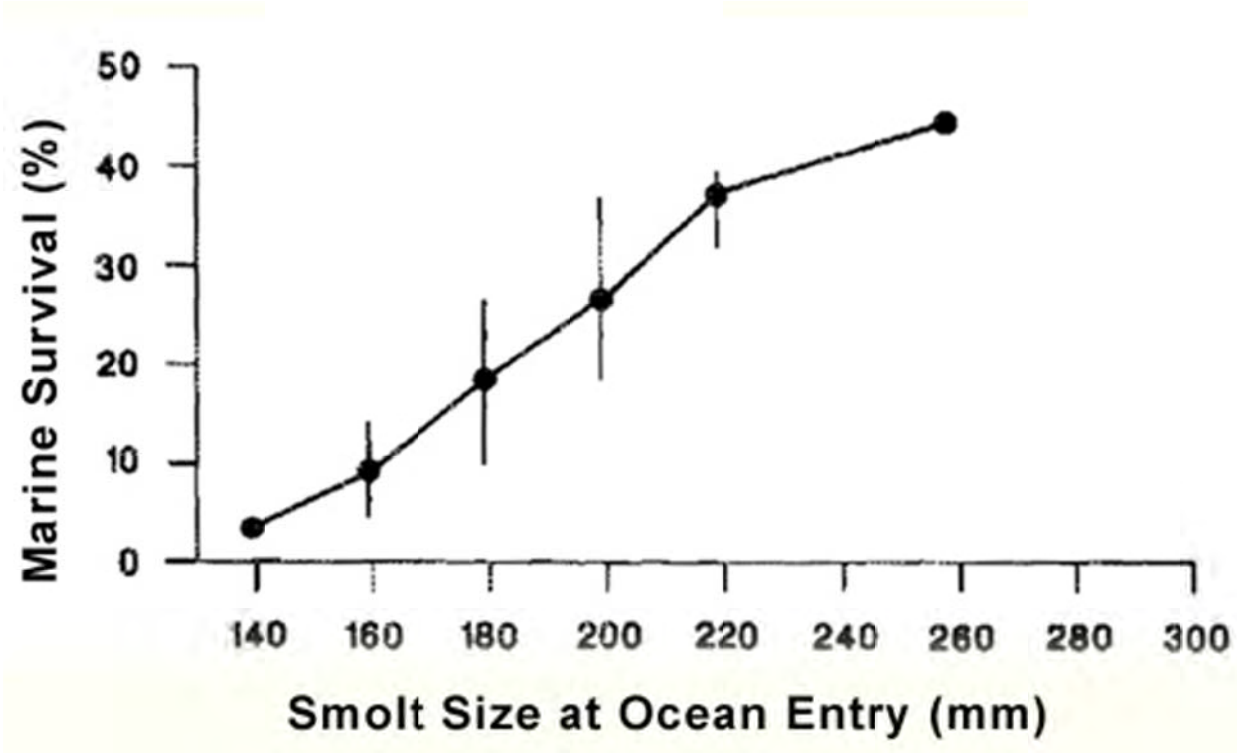


Figure 14-2. Marine survival of steelhead as a function of body size at ocean entry, in the Keogh River steelhead population described by Ward *et al*. (1989). Figure depicts the average survival to spawning of smolts emigrating in years 1977 - 1982.

High quality steelhead nursery habitats might develop where cool-water habitats receive large terrestrial inputs of food items. Terrestrial insects often fall in the water (Harvey *et al.* 2002, Douglas *et al.* 1994), and can provide a significant component of the diet of young steelhead (Rundio 2009, Rundio and Lindley, 2008). The study by Rundio and Lindley (2008) in the Big Sur area found terrestrial insects were sporadic in the diet of *O. mykiss*, but each item had large mass and thus was highly nutritious for the fish. Habitats with more frequent inputs of terrestrial insects would afford larger growth opportunities.

Finally, some habitats might produce rapid growth if there is a mechanism to keep juvenile densities low, so that individuals have expanded feeding opportunities. For example, it might be the case that intermittent streams provide expanded feeding opportunities during their wet season, because their dry season prevents the establishment of a large permanent population of resident rainbow trout. Overall, this suggests that the recovery prospects for steelhead runs would be significantly improved by identifying, restoring, and protecting those freshwater habitats that tend to produce large smolts, as part of the overall recovery strategy. These areas would qualify as steelhead "nursery habitats," defined as juvenile habitats that produce adult recruits out of proportion to their spatial extent relative to other habitats (Beck *et al.* 2001).

Recommendation: The identification and restoration of steelhead nursery habitats is a prime research opportunity with large potential for enhancing steelhead recovery efforts. Nursery habitats would likely be estuarine or freshwater habitats that support rapid growth of young fish during the first or possibly second year of life, since large body size of migrants at ocean entry substantially improves their subsequent survival in the ocean. The simplest type of study to identify such habitats would be to use mark-recapture techniques to track growth and survival of juveniles as a function of habitat use. A more complete study would also track the consequences for marine survival.

14.3.4 Comparative Evaluation of Seasonal Lagoons

Question: What role do seasonal lagoons play in the life history of steelhead, and in particular, to what extent are seasonal lagoons used as nursery areas and promote the growth of juveniles prior to emigration to the ocean as smolts? What specific ecological factors contribute to lagoon suitability steelhead rearing (survival, growth)? What ecological factors contribute to the persistence of those lagoon features?

Discussion: One type of steelhead nursery habitat is the freshwater lagoons that form in the estuaries of many stream systems during the dry season. In some of these seasonal lagoons, juvenile steelhead can grow very quickly and enter the ocean at larger sizes, where they survive relatively well and thus contribute disproportionately to returning runs of spawners (Bond, 2006). Smith (1990), however, has observed that some lagoons can be quite vulnerable to rapid degradation in quality, and others may never be suitable, due to local environmental factors that can produce anoxic conditions or poor feeding opportunities. The existing information on the role of lagoons mostly comes from Santa Cruz County, and is focused only on a few systems. As described above, this work suggests that lagoons can comprise steelhead nursery habitat, but can also be vulnerable to various natural and anthropogenic disturbances (Smith, 1990). There is a need to determine which lagoons have the potential to play a positive role in anadromy-targeted recovery efforts.

Seasonal lagoons are a specific kind of estuary and in general, estuaries are highly dynamic interfaces between two other much larger ecosystems: freshwater stream networks on the terrestrial side, and the ocean ecosystem on the marine side. This accounts for estuaries' dynamism, complexity, and sensitivity to external influences, but also for much of their productivity (Hofmann, 2000; Jay *et al.* 2000). Although there appears to be a general unity in function of many of the small estuaries in our region (due to the general similarity of climate, terrestrial watershed conditions, and the raised coast), there is also much variation and one would expect that small differences in, say, watershed condition or coastal wind and current patterns, would sometimes translate into large differences in the suitability of lagoons as steelhead nursery habitat (Rich and Keller 2011).

Recommendation: Comparative studies on the environmental controls for productivity and reliability of lagoon habitat (including how to restore it if necessary) would aid in identifying those estuaries capable of serving as reliable steelhead nursery habitat. Such studies should focus on factors enabling rapid growth of juvenile steelhead, and factors conferring resiliency against catastrophic failure of habitat quality (anoxia, premature breaching, *etc*.).

14.3.5 Potential Nursery Role of Mainstem Habitats

Question: What role do mainstem habitats play in the life history of steelhead, and in particular, to what extent are they used as nursery areas and promote the growth of juveniles prior to emigration to the ocean as smolts? What specific ecological factors contribute to mainstem quality (survival, growth) for steelhead rearing? What ecological factors contribute to mainstem reliability?

Discussion: There may be other freshwater habitats that support high survival and robust growth of juveniles, and so constitute nursery habitat specifically for the anadromous form of the species. Low-gradient mainstem habitats, such as the trunks of the Santa Ynez, Ventura, Santa Clara, Santa Margarita, San Luis Rey, and San Dieguito River may also have once supported rapid growth of juveniles, particularly if reaches received enough sunlight to support primary productivity, but artesian flows or other groundwater inputs kept water cool in the summer (C. Swift, personal communication). Most mainstem habitats have now been highly altered by agricultural clearing and groundwater pumping, so an effort to determine their potential to contribute to steelhead recovery would require a focused effort.

Recommendation: The potential nursery role of mainstem habitat is much more speculative than the nursery role of lagoons. Initial assessment of the potential nursery role could take the form of 1) empirical study of mainstem habitat use by juvenile steelhead, at broad and fine scales; and 2) water-temperature modeling that accounts for effects of climate, insolation, and groundwater interaction on mainstem water temperatures, especially during the summer. The empirical work would be most useful if it applied mark-recapture techniques to assess growth and survival as a function of habitat use, and in managed rivers, as a function of the flow regime.

14.3.6 Potential Positive Roles of Intermittent Creeks

Question: Do intermittent creeks, serving as steelhead nursery habitat, positively influence the anadromous fraction of *O. mykiss* populations, or otherwise enhance viability of the anadromous form of the species?

Discussion: Juvenile *O. mykiss* are common in intermittent creeks (Boughton *et al*. 2009), but it is unclear whether these only function as sink habitat (a net drain on productivity) or play a more positive role in population viability. Boughton *et al.* (2009) observed that during the early summer in a moderately wet year, densities of young-of-the-year *O. mykiss* were nearly identical in the perennial and intermittent creeks of the Arroyo Seco watershed in Monterey County. Much of the intermittent creeks dried up and killed juveniles later in the summer, and indeed such mortality has been observed in the region for many years (Shapovalov, 1944), although it is also common to find scattered residual pools or reaches packed with fish in late summer. For example, Spina *et al.* 2005 observed fish in San Luis Obispo creek moving into sections of the stream network retaining perennial flow as other streams dried out over the summer months. The important issue for recovery purposes is identifying the potential positive, rather than negative, roles of intermittent creeks in sustaining the viability of steelhead populations.

The most obvious positive role is that intermittent creeks provide migration corridors to perennial creeks during the wet season. Perennial reaches often occur in low-order streams upstream of intermittent sections, so the corridor role increases the amount of accessible perennial habitat, and thus the size of the steelhead population that can be supported. In dry years, the corridor function would fail in some areas.

Boughton *et al*. (2009) found that most spawning habitat in the Arroyo Seco system tended to occur in intermittent streams, and argued that hydrologic and geomorphic processes would tend to produce such a pattern in general. This suggests a second positive function of intermittent streams—significantly expanding the amount of spawning habitat beyond what is available in perennial streams—but it also suggests a need for an additional corridor function. In this case, the corridor function is for young-of-the-year to emigrate to perennial reaches before the summer dry season traps and kills them.

It is possible that intermittent streams enable a high-risk, high-reward strategy on the part of young steelhead. Many individuals may be killed during the summer drying season, but those surviving in the residual pools may benefit from enhanced growth. One mechanism for enhanced growth may be cannibalism of trapped cohorts. Another mechanism for rapid growth may be rapid recolonization of the dried stream channels as flows become re-established with cooler, wet weather in the fall.[2] Such fish would find few competitors, and perhaps even an enhanced opportunity to feed on eggs and fry of the following winter's spawners (Ebersole *et al.* 2006). In this manner, intermittent creeks could serve as steelhead nursery habitat

In wet years, the seasonal drying may be substantially reduced, increasing summer survival and allowing large pulses of juveniles to be recruited to the subpopulation of adult steelhead in the ocean. Under some scenarios, such as a highly plastic life history strategy (see next section), it is possible that such pulses would be the primary mode of production for anadromous individuals, and sustain the anadromous form of the species over the long term.

Recommendation: Intermittent creeks comprise a large proportion of freshwater *O. mykiss* habitat in the region. Despite an obvious negative role in the species ecology, they may have important positive roles as well. These potentially positive roles have the status of hypotheses with general implications for recovery strategies and viability targets, and should be tested.

[2] Fall rains can re-establish flows, but flows may also be re-established by cooler fall weather, which presumably lowers transpiration demands of riparian vegetation, leaving more groundwater to maintain base flows in stream channels.

14.3.7 Spawner Density as an Indicator of Viability

Question: What spawner density (at what spatial and temporal scale) is sufficient to indicate a viable population of steelhead?

Discussion: Answering this question requires that one or more robust anadromous populations be carefully characterized. The answer is more useful in the long-term, as an indicator of progress toward recovery, than it is in the short term for achieving recovery. The most useful data would be a time-series of observations of spawner density over many years.

Recommendation: Monitor a select number of core and non-core populations to determine the numbers of spawners using both mainstem and tributary spawning habitats.

14.3.8 Clarify Population Structure

Population structure concerns the ecological and biological factors that cause fish to naturally group into functional units known as independent populations. Independent populations are defined as "a collection of one or more local breeding units whose population dynamics or extinction risk over a 100-year time period is not substantially altered by exchanges of individuals with other populations" (McElhany *et al*. 2000).

If groups of fish regularly exchange individuals, they are members of the same population, whereas if exchange is rare or does not significantly affect population dynamics, they are members of separate populations. This definition of "separateness between, exchange within" means that the proper context of most management strategies is the independent population: a strategy that directly affects only a portion of a population will soon have significant indirect effects on the rest of the population, but few immediate effects on other populations. [3]

The independent population is also the fundamental functional unit of species persistence, and hence viability. As a result, many of the viability criteria described by Boughton *et al.* (2007b) were defined in terms of population traits such as anadromous fraction and mean spawner abundance over time. The collections of fish to which these criteria should be applied are a function of what is known about the patterns of exchange of fish among breeding biological units. Open questions about such exchange result in uncertainty about how to apply the criteria.

Thus, an analysis of a simple quantitative model led Boughton *et al*. (2007) to conclude that an annual adult abundance of 4,150 fish were necessary for an independent population to be considered viable. But it was unclear, due to questions of exchange patterns, whether the criteria should be applied to:

- ❑ anadromous fish in a particular watershed, or
- ❑ the sum of anadromous fish across several watersheds, or
- ❑ the sum of anadromous and freshwater-resident fish in a particular watershed, or
- ❑ the sum of anadromous and freshwater-resident fish across several watersheds

The answer has implications for the scope and scale of recovery efforts. The answer depends on the level of exchange of fish across separate coastal watersheds, and on the level of exchange between the anadromous and resident forms of the species within a particular watershed—termed 'life history crossovers". A life history crossover is a freshwater parent that has anadromous fish among its progeny, and/or vice versa. Questions about inter-watershed exchanges and life history crossovers, and the implications for viability criteria, are key issues addressed in this section.

14.3.9 Partial Migration and Life History Crossovers

Partial migration is the phenomenon in which a population consists of both migratory and resident individuals (Jonsson and Jonsson, 1993), implying the regular or at least occasional occurrence of life history crossovers. A diversity of crossover patterns have been observed in the small number of studies conducted on *O. mykiss* to date. Zimmerman and Reeves (2000) observed no crossovers in resident and anadromous *O. mykiss* of the Deschutes River in Oregon, suggesting two demographically distinct (independent) populations. For one natural and eight hatchery populations in California, Donohoe *et al.* (2008) found that anadromous females sometimes produced resident progeny, but resident females did not produce anadromous progeny, suggesting a one-way flow of crossovers away from the anadromous form.

The Babine River *O. mykiss* in British Columbia apparently exhibit modest levels of crossover (*c.* 9%) in both directions (Zimmerman and Reeves, 2000), suggesting a single population that is partially subdivided, whereas J. R. Ruzycki (personal communication in Donohoe *et al.* 2008, p. 1072) reports a high level of bidirectional crossover in various tributaries of the Grande Ronde River in Oregon (0% to 33% of anadromous adults were progeny of resident females, and 44% of resident adults were progeny of anadromous females), indicating a fully integrated population in which the two life history forms functionally coexist.

[3] Over the longer term, a permanent change in population dynamics *would* be expected to trickle out to other independent populations, due to occasional exchanges of individuals. Occasional exchanges are expected to drive important processes such as gene exchange and recolonization of stream systems following a drought.

This continuum has significant implications for viability criteria. Are the populations in southern California fully integrated, or does each form more or less breed true, implying demographically independent populations that share stream systems but play no role in supporting one another, and perhaps even compete? Boughton *et al.* (2007b) made recommendations that embodied these two possibilities (actually two endpoints of a continuum). In one scenario, one should specify criteria that would secure the ocean-going fish if they turn out to comprise a demographically independent population. Under the other scenario, one should specify criteria that secure the ocean-going fish if they turn out to depend on the resident form with which they coexist. However, it is possible that resolution of this uncertainty would eliminate some of the need for hedging and thus lead to a more efficient and effective recovery plan. Resolution would involve two fundamental questions:

Question 1: What is the mechanism for, and frequency of, life history crossovers in southern California?

Question 2: How does crossover affect the persistence of the anadromous form?

Discussion: Answering the first question will take an extended research effort. Currently, Devon Pearse and S. Sogard (NOAA Fisheries) and M. Mangel (UC Santa Cruz) are leading a research effort to better understand life history crossovers in California steelhead; Mangel and Satterthwaite (2008) give an overview of the framework being used. The hypothesis being examined is that the anadromy/residency life history crossover made by individual *O. mykiss* is cued by the environment, using a mechanism similar to what has been observed in Atlantic salmon (*Salmo salar)*, a better-studied species that also exhibits variation in the timing of the smolting process during life history. Specifically, the hypothesis is that the smolting/residency life history crossover is made by individual fish during a sensitive period some months before the actual process of smolting is observed, and that the cues for the crossover are the fish's size and growth rate during the sensitive period. This might be expected because size and growth in the freshwater habitat integrate information about the quality of that habitat, as well as about the expected survival and fecundity in the marine environment versus the freshwater environment. What is hypothesized is a physiological (and perhaps hormonal) process that processes information from the environment to produce an adaptive life history crossover (See Hayes, *et al*. 2011a, 2011b).

Though the research effort of Sogard and Mangel is important progress on the anadromy/residency life history crossover phenomenon in steelhead recovery planning, it has important limitations at this time. First, it has the status of a hypothesis and at this writing no one has actually experimentally induced life history crossovers in *O. mykiss* by manipulating size, growth rates or any other environmental factor. Second, even if the Atlantic salmon model is useful for understanding life history plasticity in *O. mykiss*, there are almost certain to be important differences and indeed surprises in the *O. mykiss* life history story. Finally, the existence of a plastic life history strategy does not preclude the possibility of important genetic constraints. For example, one might expect that even if the model is broadly correct, the specific timing of sensitive periods, and the thresholds for the size and growth cues, would probably vary quite markedly among populations of steelhead due to genetic differences. In short, the responses to environmental cues would likely have a heritable component, and this component would likely exhibit local adaptation to specific conditions. A response that is adaptive in one watershed may be selected against in another watershed, depending on environmental factors such as those discussed in the previous section.

Recommendation: It is essential for rigorous research on the mechanisms of life history plasticity in *O. mykiss* to be pursued vigorously, for it is difficult to envision a successful recovery effort without a better understanding of the functional relationship between resident and anadromous fish. The current effort of Sogard, Mangel, and coworkers should yield useful information over time, but it focuses on two systems outside southern California: Soquel Creek in Santa Cruz County (a coastal redwood forest system), and the American River near Sacramento (a large Central Valley River system). One should expect local adaptation of steelhead populations in southern California.

Because of the likelihood of local adaptation, it would be useful and practical to address some related questions about the frequency of life history crossovers and their implications for recovery planning in the southern California. In particular:

- Identify environmental factors that specifically promote anadromy (discussed in the previous section). It is clear that the abundance of anadromous fish needs to be increased, and identifying relevant environmental factors would usefully inform this goal. The principal uncertainty is how much the abundance of anadromous fish needs to be increased, a separate question that depends on the frequency of life history crossovers and the mechanisms underlying them. This question can be addressed over the longer term as more is learned about the mechanism, and used to refine the viability criteria described by Boughton *et al.* (2007b).

- Estimate the frequency of life history crossovers in populations of interest, to determine whether it even occurs with any regularity. The most practical method for doing so is by analyzing otolith microchemistry of juvenile *O. mykiss* (see Donohoe *et al.* 2008), but this requires lethal sampling of juveniles. Modest lethal sampling of juveniles (as opposed to adults) may pose only a negligible increase extinction risk, due to the low reproductive value of juveniles.

- Determine how life history crossover affects the persistence of the anadromous form. This could be done using existing frameworks in population modeling, such as individually-based models or integral projection models, but would require assumptions about typical mortality and growth rates in freshwater and marine environments, as well as about frequency of life history crossovers. However, it might produce important insights. For example, persistence of anadromous runs could be strongly affected by the difference between complete lack of crossovers and a modest rate, such as 5%. However, effects would be much smaller between a 10% rate versus a 50% rate. It would be useful to more rigorously evaluate the validity and relevance of these levels of life history crossovers.

14.3.10 Rates of Dispersal Between Watersheds

Question: How common is dispersal of anadromous *O. mykiss* between watersheds, and how does it relate to population structure, especially in small coastal watersheds?

Discussion: Just as life history crossovers may knit resident and anadromous *O. mykiss* into integrated populations, frequent movement of anadromous fish through the ocean to neighboring watersheds may knit neighboring *O. mykiss* into integrated "trans-watershed" populations. If inter-watershed exchange is common, the most effective recovery strategies might be those that emphasize integration of recovery efforts across a set of linked watersheds. If inter-watershed exchange is rare, the most effective strategies would be those that identify watersheds having stable conditions that protect small, inherently vulnerable populations.

The places where the implications of the single-watershed versus trans-watershed scenarios are most distinct are those areas along the coast where numerous small coastal watersheds occur in close proximity. In the SCS Recovery Planning Area, these areas include the south coast of Santa Barbara County, and the small watersheds draining the Santa Monica Mountains just north of Los Angeles.

Recommendation: Answering this research question will involve tracking the populations from multiple watersheds, including groupings of small, closely spaced watersheds as well as groupings involving large and small watersheds more spatially dispersed. However, it is not clear at this time what is the most practical and effective way to try to estimate exchange rates in the Recovery Planning Area. Genetic and Radio Frequency Identification (RFID) tags and ecological traps may have potential to effectively address this question, particularly in small basins where it is possible to sample a significant fraction (perhaps all) of a given cohort of adults.

14.3.11 Revision of Population Viability Targets

In the framework described by Boughton *et al.* (2007), the key criteria for establishing population viability was that a population be demonstrated to sustain a long-term mean run size of at least 4,150 anadromous spawners per watershed per year. However, the authors noted that the criteria were chosen to be precautionary due to scientific uncertainty about key issues, and that better information might allow the criteria to be revised without increasing the risk of extinction. There were three types of information that seemed most likely to lead to useful revisions of the viability criteria:

1. The threshold run size might be able to be revised downward from 4,150 spawners per year if it was determined that year-to-year variation in run size was modest enough to be consistent with a lower threshold. The necessary information—annual estimates of run size over several decades—would come from the types of monitoring programs described below.

2. Data on the frequency of life history crossovers might justify that the 4,150 threshold could include some fraction of adult resident fish, rather than the 100% anadromous fraction currently recommended (*i.e.,* because the resident and anadromous forms are shown to comprise functionally integrated populations). The necessary information would come from successfully implementing the recommendations identified above.

3. Data on inter-basin exchanges might justify that the 4,150 threshold include spawners from neighboring watersheds (*i.e.,* because inter-watershed exchanges is sufficiently high that the fish in neighboring watersheds comprise a single, trans-watershed population). The necessary information would come from successfully implementing the recommendations identified above.

It should be noted that data for item 1 would arise over time as a byproduct of a comprehensive monitoring program, which is necessary to assess risk in any case. The priority item, however, is probably item 2, since the integration of the resident and anadromous forms is not well understood, but has profound implications for a very diverse set of management issues beyond just revision of recovery criteria.

14.4 MONITORING PROGRESS TOWARD RECOVERY GOALS

Monitoring should be conducted for each BPG, with monitoring initially focused on Core 1 populations. Monitoring involves two different but related activities: status and effectiveness monitoring. Status monitoring is intended to assess the status of a population (or a DPS) as a whole, and to assess its progress toward recovery or further decline toward extinction. It should also be designed to gather data for assessing the viability criteria described by Boughton *et al*. (2007b). Monitoring the annual run size of populations is the most important objective of status monitoring. Effectiveness monitoring is intended to assess the response of populations to specific recovery actions, and thereby develop a better understand of their effectiveness. Effectiveness monitoring will generally be more powerful if it focuses on the specific life stage affected by the recovery actions in particular habitats, and it if compares it to the same life stage in similar unaffected habitats that serve as controls.

As described by Boughton *et al.* (2007b), the general goal of recovery is to establish a diverse and geographically distributed set of populations, each of which meets viability criteria over the long term. These viability criteria are expressed in terms of mean annual runs size, persistence over time, spawner density, anadromous fraction, as well as the continued expression of life history diversity, and the spatial structure of the population. Strategies for monitoring these properties of steelhead populations over the long term are essential for assessing the attainment of recovery goals.

14.4.1 Strategy for Monitoring Steelhead in Southern California

Southern California steelhead habitats exhibit characteristics that must be considered in formulating a monitoring plan. These characteristics include differences in geology, climate and hydrology, as well as the fact that other species of anadromous salmonids are absent. The differences in the geology, climate, and hydrology are described in Adams *et al.* 2011, Boughton and Goslin (2006), and Boughton *et al*. (2006). The strategy described below considers these factors, as well as the spatial and temporal distribution of southern California steelhead. The basic components of the southern California steelhead monitoring strategy include:

- ❑ Reconnaissance surveys and assessments of steelhead populations
- ❑ Reconnaissance surveys and assessments of riverine and estuarine habitat conditions
- ❑ Counting stations stratified at both the BPG and population levels
- ❑ Life cycle stations (LCS) stratified at both the BPG and population levels

Presently there is no current comprehensive assessment of the condition and distribution of steelhead populations and habitats in southern California that use standard population and habitat assessment protocols. However, NMFS and the DFG have begun to develop a comprehensive coastal salmonid monitoring program and have identified a basic strategy, design, and methods of monitoring California coastal salmonid population (Adams *et al.* 2011).

The monitoring strategy outline here includes an, initial assessment both of the fish populations and habitat conditions. Assessments should initially focus on Core 1 populations in each BPG, and ultimately include all populations that are necessary for full recovery of the species. Stream habitat assessments should be conducted using the protocol in the California Department of Fish and Game's California Salmonid Stream Habitat Restoration Manual (California Department of Fish and Game 2010).

Counting stations comprised of fixed structure utilizing technologies such as DIDSON cameras are the most effective means of establishing abundance and trends of adult anadromous runs of steelhead and juvenile out migration. Counting stations should initially be located in Core 1 populations in each BPG.

Life cycle monitoring can be co-located with counting stations, but may also be conducted in one or more of the non-core populations which support smaller but less impacted populations. LCS monitoring efforts provide the foundation for evaluating the relationship of fish habitat use and habitat condition over time and should focus on:

- ❑ Estimation of marine and freshwater survival
- ❑ Spawning success (spawning ground distribution, redd to adult ratio)
- ❑ Juvenile rearing success (over-summering and winter growth)
- ❑ Major life history traits (anadromy/resident relationships, sex ratio, age and size structure, habitat utilization patterns, emigration age and timing, maturation patterns, run-timing, and physiological tolerances)

These LCSs could also be used in evaluating nutritional needs, predation, disease, and other environmental factors relevant to assessing the status of individual populations. Where permanent LCSs are not established, temporary stations should be deployed to maximize the development of population information in Core population watersheds.

Table 14-1 lists the preliminary sites where counting stations and LCSs should be established. LCS sites should be sited based on two criteria: their relation to the DPS and whether they are necessary to represent the full range of watershed types for each BPG.

Table 14-1. Potential Southern California Steelhead Life Cycle Monitoring Stations (alternative populations are listed in parentheses).*

Life Cycle Monitoring Station	Population	Potential Locations
1	Santa Maria River	Suey Crossing Garey Road Tespesquet Road
2	Santa Ynez River	Highway 1 Alisal Road Refugio Rod Highway 154
3	Ventura River	Robles Diversion Casitas Vista Road Santa Ana Road
4	Santa Clara River	Vern Freeman Diversion Highway 123 Highway 126
5	Mission Creek (Arroyo Hondo Creek)	Highway 101 Tallant Road Mission Canyon Road (Highway 1)
6	Carpinteria Creek	Highway 101 East Valley Road
7	Rincon Creek	Highway 101 Highway 150
8	Malibu Creek (Arroyo Sequit, Topanga Creek)	Highway 1 Cross Creek Road (Highway 1)
9	San Gabriel River	Highway 1 San Gabriel Canyon Road
10	San Juan Creek	Highway 1 Metro-link Crossing
11	San Mateo Creek (Santa Margarita River)	Highway 1 (Highway I-5, De Luz Road)
12	San Luis Rey River (San Dieguito River)	College Boulevard Mission Road (Highway I-5, El Camino Real)

* Note: Additional evaluation of other locations may identify more suitable locations than those provisionally identified here.

To the maximum extent possible, monitoring the status and trends of steelhead populations should be undertaken simultaneously with restoration efforts. Watersheds where restoration has occurred or is occurring should be considered a high priority for monitoring. Monitoring stations, whether counting or life cycle stations, should serve as a magnet for research efforts depending on fish and fish related field data.

14.4.2 Monitoring Protocols

There are various ways that status and effectiveness monitoring can be integrated, but the focus of the following discussion is on status monitoring. Below is a brief summary of potential methods to monitor run-size of steelhead (number of anadromous spawners per year per population). All these methods necessarily involve two components:

1. Observed counts for some life history stage of *O. mykiss* that contains information about run size

2. Some method for estimating the number of unobserved fish

For the first component, the observed count may actually be the run, but if it is some other life stage, there is a need to collect data to estimate a conversion factor. For example, if redds are counted, it is necessary to estimate redds per female and sex ratio to get an estimate of the full run size (Gallagher and Gallagher 2005).

The second component is necessary because simple observations can confound the true number of fish with the detection rate of the observer: A large population with poor observing conditions looks the same as a small population with excellent observing conditions. Thus, one must also estimate the number of unobserved fish, which corresponds to estimating the detection rate of the observer.

There are numerous ways to do this (Williams *et al*. 2001 provides a comprehensive technical review), but they all involve making repeated observations (often only two times) of the same group of fish. This redundancy is necessary for estimating unobserved fish. Doing so, and getting an estimate of the full population, is often far more informative than obtaining partial counts in which abundance and detection rate are confounded, because detection rates can be highly variable (Rosenberger and Dunham 2005)

14.4.2.1 Counting at Fish Ladders

Fish ladders can provide important opportunities to count upstream migrants, assuming the fish passage facilities themselves provide effective unimpeded fish passage opportunities. There are a number of technical challenges in operating fish detection and counting devises in extremely flashy systems characteristic of southern California (see discussion below). Additionally, this method is only relevant to watersheds that have fish ladders, and cannot quantify the portion of the run that spawns below the fish ladder. Depending on the location of the ladder and the amount and type of habitat downstream of the ladder, the spawners below the ladder can be an important component of the run.

14.4.2.2 Redd Counts

Gallagher and Gallagher (2005) have shown that salmon and steelhead runs can be estimated using redd counts. A summary of their method and is provided below:

To estimate Chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, and steelhead *O. mykiss* escapement in several coastal streams in northern California a stratified index redd method was developed, based on the assumption that redd size is related to the number of redds a female builds. Redd area escapement estimates were compared with estimates from more conventional methods and releases of fish above a counting structure. Reduction of counting errors and uncertainty in redd identification, biweekly surveys throughout the spawning period, and the use of redd areas in a stratified index sampling design produced precise, reliable, and cost-effective escapement estimates for Chinook salmon, coho salmon, and steelhead.

This method has considerable promise, but has not been tried in the southern California setting, where stream turbidity and channel geomorphology, or repeated disturbance of redds by winter storms, may make redds difficult to detect.. The method has high personnel requirements, because it requires the survey reaches to be visited biweekly throughout the spawning season. On the other hand, it is simple, requires only modest training in field personnel, and has modest costs other than the hiring of personnel.

14.4.2.3 Monitoring runs using the DIDSON Acoustic Camera

Dual-frequency identification sonar (DIDSON) is an off-the-shelf device that uses high frequency sound waves to produce near video-quality images of underwater objects. It can potentially be used to identify and count all migrating steelhead at some survey point in a stream system, for the entire spawning season. Its advantages are similar to those of using a weir to make counts, but has two additional advantages that are key: 1) There is no need for a weir or other device that impedes flow, and so fouling, destruction by high-flow events, etc., are not a major constraint; and 2) it can see through turbid waters (unlike a regular video camera). These two traits appear well suited to the flashy, turbid conditions typical of southern California streams.

DIDSON has been successfully used to estimate adult salmon escapement in high-abundance rivers in Alaska, Idaho, and British Columbia. In principle it should be suitable for low-abundance creeks, such as those in southern California. NOAA's' Southwest Fisheries Science Center have evaluated field methods for using the device to monitor steelhead runs in southern California streams (Pipal *et al.* 2010).

The principal disadvantages are: (1) the cost of the device; (2) deployment constraints for getting good images; and the risk of "flashy flows" damaging or destroying the installation. These constraints have to do with maintaining a good "insonified region" of the channel being monitored for migrants. Some channel shapes are better than others, and there also need to be a strategies for maintaining a completely insonified cross section during the advance and retreat of high flow events. In addition, there is a need to learn how to interpret poor images when they occur. However, the method has the potential to solve some of the intractable problems of monitoring steelhead in southern California, including counting very small numbers of migrants in very turbid waters during and after very flashy high-flow events.

14.4.2.4 Tagging Juveniles and Monitoring Migrants (T-JAMM design)

Steelhead runs can potentially be estimated by tagging juveniles with Radio Frequency Identification (RFID) tags during their freshwater phase, and subsequently monitoring migrants using in-stream tag readers.

The tagging phase use standard block-netting and electro-fishing techniques during the summer low-flow season. Depletion-sampling can be used to estimate juvenile abundances. However, Rosenberger and Dunham (2005) found that capture-recapture methods gave more robust estimates than depletion sampling, and Temple and Pearsons (2006) showed that the customary 24-hour period in capture-recapture sessions can be shortened to one or two hours, which simplifies logistics so that capture-recapture sampling can have a time-efficiency similar to that of depletion sampling.

The monitoring phase is accomplished using instream tag readers such as those described by Bond, *et al.* (2007), Zydlewski *et al.* (2006, 2001), Ibbotson *et al.* (2004). These must be deployed for the duration of the migration season (both outgoing and incoming) each year.

The design has promise for monitoring runs of steelhead for which many other methods are problematic. In unpublished simulations, Boughton has found that the precision of run size estimates is primarily controlled by the number of tagged spawners that ultimately return and get detected. The number required is modest: around 30 to 90 tagged spawners are necessary to obtain 50% confidence intervals that stay below one-third of the estimated of run size. However, with marine survival typically falling between 0.3% and 3%, the required tagging effort would usually be between 3,400 and 45,000 juvenile fish tagged per generation per population. Other considerations in using implanted tags are the mortality/fitness risks and the permitting requirements to allow some level of take of the species. The tagging effort could perhaps be spread across a set of populations if one were willing to assume uniform marine survival across the populations.

The estimation method is robust to imperfect detection of tagged fish by the instream tag readers, as long as there are at least two readers that independently scan for tags. Reach-sampling allows the entire run to be estimated using fish from a sample of reaches. In the simulations, the number of reaches needed for acceptable precision could be as low as 30-40 under scenarios of high marine survival, with a sampling fraction of around 2% in large watersheds, such as the Arroyo Seco watershed used in the simulations.

Under low marine survival, the necessary sampling fraction was around 10% in the simulations. A side-benefit of this method is that one would obtain very good estimates of ocean survival. This is useful because it allows the overall trajectory of steelhead runs to be decomposed into marine and freshwater components. This, in turn, will deliver greater statistical power for analyzing patterns in the freshwater component. In short, one would have greater statistical power for determining if recovery actions on the freshwater side are actually having the desired effect.

Boughton has written software to estimate run size from data produced by tagging juveniles and monitoring migrants. It is written in the R computer language, a freely-available statistical programming environment that is widely used in the scientific world. Currently the work is in manuscript form. Williams, Rundio, and Lindley of the Science Center are currently tagging juveniles and monitoring migrants in a case study of Big Creek steelhead population, a member of the Big Sur Coast BPG within the South-Central California Steelhead DPS.

14.4.2.5 Sampling Young-of-the-Year Otoliths (YOYO design)

This method is similar to tagging juveniles and monitoring migrants, but instead of tracking the fate of captured juveniles to estimate run size, one would collect some fraction of the juveniles, and examine their otoliths and genetic relatedness. From this, one could estimate the number of anadromous mothers (and as a byproduct, non-anadromous mothers) for each annual cohort of young-of-the year fish. This should be suitable for estimating annual run size, at least of female fish.

This method would dispense with the need to implant RFID tags in fish, and the need to maintain instream tag readers during difficult winter conditions. All field work would consist of electrofishing juveniles at randomly-sampled stream reaches each summer. However, the method would require the time and expense of otolith analysis, and it would require collecting (*i.e.* killing) some fraction of the juveniles that are electrofished during the summer field season.

This method is currently not well-developed, but it has promise as a relatively simple and efficient way to estimate run sizes using established and familiar field methods. A potential drawback is the need to kill juveniles to get their otoliths. The key unknown at this point is how many fish would have to be sampled to get a reasonable estimate of the number of anadromous mothers.

14.5 ADAPTIVE MANAGEMENT: LEARNING FROM RECOVERY EFFORTS

Adaptive management is a systematic process that uses scientific methods for monitoring, testing, and adjusting resource management policies, practices, and decisions, based on specifically defined and measurable objectives and goals (Walters 1997, 1996). Adaptive management is predicated on the recognition that natural resource systems are variable, and that knowledge of natural resource systems is often uncertain. Further, the response of natural resources systems to restoration and management actions is complex, and frequently difficult to predict with precision. The Recovery Plan provides both overall goals in the form of viability criteria, and suite of DPS-wide watershed specific recovery actions. The viability criteria, however, are provisional, and the central recovery actions are couched in broad terms which must be given more specificity on a case-by-case basis, and ultimately assessed for their effectiveness. Hence the need to adapt resource management policies, practices and research decisions to changing circumstances, or a better understanding of natural resource systems and their responses.

The success of an adaptive management program can be enhanced by having stakeholders and scientists engage in developing a shared vision for an indefinitely long future together. The development of a guiding image helps organize an adaptive management program, align interests, and enhance cooperation in a complex process. Focusing on fundamental values, rather than on predetermined means can open up possible alternative solutions; participating in this type of framework, scientists can help construct solutions that may not be self-evident to stakeholders.

Adaptive management can be applied at two basic levels: the overall goals of the recovery effort, or the individual recovery or management actions undertaken in pursuit of overall goals. The research sections above are intended to address the first application. The following discussion is focused on the second application of the concept of adaptive management.

14.5.1 Elements of an Adaptive Management Program

There is no uniformly applicable model for an adaptive management program, and key elements must be identified and tailored to recovery action-specific, site-specific, and impact-specific issues. However, effective adaptive management programs will contain three basic components: 1) adaptive experimentation by which scientists and others with appropriate expertise, learn about ecosystem functions response to recovery or management actions; 2) social learning (through public education and outreach) by which stakeholders share in the knowledge gained about ecosystem functions, and 3) institutional structures and processes of governance by which people respond by making shared decisions regarding how the ecosystem will be managed and the natural services it provides will be allocated.

Six specific elements associated with adaptive management have been identified (Panel on Adaptive Management for Resource Stewardship 2011):

1st Element: Recovery Action Objectives are Regularly Revisited and Revised. Key recovery action objectives (and related questions) should be regularly reviewed in an iterative process to help stakeholders maintain a focus on objectives and appropriate revisions to them. The recovery goals, objectives, and criteria in Chapter 6, Steelhead Recovery Goals, Objectives & Criteria, should provide a basic framework, and the recovery actions identified for each BPG should be a starting point for the adjustment of recovery action objectives. The mandatory five-year review process can serve as a means of conveying any needed modification to the overall recovery goals, as well as individual recovery actions.

2nd Element: Model(s) of the System Being Managed. Four types of models have been have been identified in the use of adaptive management program to test hypotheses regarding the effectiveness of recovery actions (Thomas *et al*., 2001):

Conceptual Model: Synthesis of current scientific understanding, field observation and professional judgment concerning the species, or ecological system

Diagrammatic model: Explicitly indicates interrelationships between structural components, environmental attributes and ecological processes

Mathematical model: Quantifies relationships by applying coefficients of change, formulae of correlation/causation

Computational Model: Aids in exploring or solving the mathematical relationships by analyzing the formulae on computers.

River systems are generally too complex and unique for controlled, replicated experiments, or to be the subject of traditional scientific models. However, conceptual models based on generally recognized scientific principles can provide a useful framework for refining recovery actions and testing their effectiveness. Diagrammatic models such as the one used to characterize the parallel and serial linkages in the steelhead life cycle, can also be used *in lieu* of formal mathematical models to test hypotheses regarding the effectiveness of recovery actions. Mathematical and computational models, themselves have their limitations in the context of an adaptive management program: they are difficult to explain, and require specific assumptions that may be difficult to justify. As noted in the discussion above regarding recovery goals, viability criteria are based on a combination of a synthesis of current scientific information and a simplified model which uses data not specific to the Southern California Steelhead Recovery Planning Area. Additional quantifiable data is necessary to refine the viability population and DPS models that form the basis of the provisional recovery goals, objectives and criteria. Modification of the model could result in modification of the priorities assigned to the individual recovery actions in individual populations or BPGs.

3rd Element: A Range of Management Choices. Even when a recovery action objective is agreed upon, uncertainties about the ability of possible recovery or management actions to achieve that objective are common. The range of possible recovery or management choices should be considered at the outset. This evaluation addresses the likelihood of achieving management objectives and the extent to which each alternative will generate new information or foreclose future choices. A range of recovery actions and management measures should be considered, either through a planning process or the environmental review process prior to permitting the individual recovery action.

4th Element: Monitoring and Evaluation of Outcomes. Gathering and evaluation of data allow for the testing of alternative hypotheses, and are central to improving knowledge of ecological and other systems. Monitoring should focus on significant and measurable indicators of progress toward meeting recovery objectives. Monitoring programs and results should be designed to improve understanding of environmental systems and models, to evaluate the outcomes of recovery actions, and to provide a basis for better decision making. It is critical that "thresholds" for interpreting the monitoring results are identified during the planning of a monitoring program. This element of adaptive management will require a design based upon scientific knowledge and principles. Practical questions to be addressed include what indicators to monitor, and when and where to monitor. Guidance on a number of these issues is provided in the sections above regarding research and monitoring.

5th Element: A Mechanism for Incorporating Learning Into Future Decisions. This element recognizes the need for means to disseminate information to a wide variety of stake-holders, and a decision process for adjusting various management measures in view of the monitoring findings. Periodic evaluations of the proposed recovery action, the monitoring data and other related information, and decision-making should be an iterative process in which management objectives are regularly revisited and revised accordingly. Public outreach, including Web-based programs, should be actively pursued. Additionally, the mandatory five-year review process can serve as a means of conveying any needed modification to the Recovery Plan, and well as individual recovery actions.

6th Element: A Collaborative Structure for Stakeholder Participation and Learning. This element includes information dissemination to a variety of stakeholders, as well as a proactive program focused on soliciting decision-related inputs from a variety of stakeholder groups. Inevitably, some of the onus for adaptive management goes beyond managers, decision makers, and scientists, and rests upon interest groups and even the general public. NMFS has provided a general framework by which a shared vision can be further developed and pursued for restoring a set of watersheds supporting a network of viable steelhead populations, and providing sustainable ecological services to the human communities of southern California (Boughton, 2010a, Tallis *et al*. 2010, Levin *et al*., 2009, Ruckelshaus *et al*. 2008). Such a vision also provides opportunities for the protection and restoration of other native freshwater and riparian species which form an integral part of the ecosystems upon which steelhead depend.

15. Implementation by NMFS

"If anthropogenic changes can be shaped to produce disturbance regimes that more closely mimic (in both space and time) those under which the species evolved, Pacific salmon should be well equipped to deal with future challenges, just as they have throughout their evolutionary history."

Dr. Robin R. Waples, NOAA Fisheries, Research Fish Biologist

15.1 INTEGRATION OF RECOVERY INTO NMFS ACTIONS

NMFS must formally incorporate the Recovery Plans within its daily tasks and decision-making, including the actions identified in the DPS-wide Recovery Action narratives and the Recovery Action summaries for each BPG. All of NMMS' missions can be accomplished with due consideration to the needs of listed salmon and steelhead. If NMFS is to promote species and ecosystem conservation (and meet its obligations under section 7(a)(1) of the ESA), then means of incorporating recovery goals and actions must be incorporated into all of the programs and actions we administer and implement. This includes, for example, listing reviews and critical habitat designations under ESA section 4, ESA consultations under section 7, and permit actions under ESA section 10.

Implementation of the Recovery Plan by NMFS will take many forms and is generally and specifically described in the NMFS Protected Resources Division (PRD) Strategic Plan. The Interim Recovery Planning Guidance (National Marine Fisheries Service 2010a) also outlines how NMFS shall cooperate with other agencies regarding plan implementation. These documents, in addition to the ESA, shall be used by NMFS to set the framework and environment for plan implementation. The PRD Strategic Plan asserts that species conservation (in implementing Recovery Plans) by NMFS will be more strategic and proactive, rather than reactive. To maximize existing resources with workload issues and limited budgets, the PRD Strategic Plan champions organizational changes and shifts in workload priorities to focus efforts towards "those activities or areas that have biologically-significant beneficial or adverse impacts on species and ecosystem recovery" (National Marine Fisheries Service 2006a). The resultant shift will reduce NMFS engagement on those activities or projects not significant to species and ecosystem recovery.

NMFS actions to promote and implement recovery planning shall include:

- ❑ Formalizing recovery planning goals on a program-wide basis to prioritize work load allocation and decision-making (including developing mechanisms to assure the effective and timely implementation of the Recovery Plan);
- ❑ Conducting an aggressive outreach and education program aimed at all stakeholders, including federal, tribal, state, local, non–governmental organizations, landowners, and interested individuals;

- Facilitating a consistent framework for research, monitoring, and adaptive management that can directly inform recovery objectives and goals;
- Participating in the land use and water planning process at the federal, state, and local level to ensure that the provisions of the steelhead Recovery Plan are reflected in the full range of decision making processes;
- Establishing an implementation tracking system that is adaptive and pertinent to annual reporting for the Government Performance and Results Act, Bi-Annual Recovery Reports to Congress and 5-Year Reviews of each species listing status.

15.1.1 Work with Constituents and Partners

Successful implementation of Recovery Plans will require the efforts and resources of many entities, from federal agencies to the individual contributions of members of the public. NMFS commits to working cooperatively with other individuals and agencies on implementation of recovery actions and to encourage other federal agencies to implement the actions for which they have responsibility or authority. The benefits of a successful plan to the species and the currently regulated communities are immense, but the costs can be counted in time, money, and changed behaviors. NMFS is committed to using Recovery Plans as the guiding mechanism for its daily endeavors and can directly implement some of the actions called for in the plans. However, our primary role in plan implementation will be to promote the recovery strategy and provide the needed technical information and expertise to other entities implementing the part of the plan or contemplating actions that may impact the species' chances of recovery.

NMFS is engaged in outreach to various constituencies where we provide technical assistance regarding listed salmonids, their habitat needs, and various life history requirements. Developing partnerships through providing technical assistance will be critical for recovery. Our outreach efforts will need to increase both towards those constituencies with which we already engage and to expanded sets of constituencies including communities, Non-Governmental Organizations (NGOs), and Federal and State legislative representatives.

To focus efforts in areas critical for recovery, NMFS shall:

- Develop outreach and educational materials to increase public awareness and understanding of the multiple societal benefits that can be gained from steelhead recovery in southern California watersheds;
- Inform federal, state, and local governmental agencies of the provisions of the Southern California Steelhead Recovery Plan, and how these respective agencies' activities or planning and regulatory efforts may assist the implementation of the Recovery Plan;
- Advise watershed groups and other non-governmental organizations about the Recovery Plan, and the role of on-going watershed conservation efforts in implementing recovery actions and achieving steelhead recovery within their respective watersheds;
- Facilitate and participate in public forums designed to provide interested parties with an opportunity to directly share experiences and ideas, and learn about the methods and means of implementing steelhead recovery actions;
- Provide technical support and assistance to partners engaged in implementing steelhead recovery actions identified in the Southern California Steelhead Recovery Plan, including research and monitoring;
- Work with Federal and State agencies to coordinate and develop programmatic permits for incidental take authorization for

actions that contribute to the recovery of southern California steelhead and their habitats;

- ❑ Work to assure adequate funding and staff support for full compliance with the legal requirements of land use, water, and natural resource protection laws, codes, regulations and ordinances across the Southern California steelhead DPS; and
- ❑ Support the development of information networks that allow collaborators to disseminate information to a broad array of interested and affected parties about steelhead recovery efforts;

15.1.2 Funding Implementation of Recovery Plans

As a means of providing funding to the States, Congress established the Pacific Coastal Salmon Recovery Fund (PCSRF) to contribute to the restoration and conservation of Pacific salmon and steelhead populations and their habitats. The states of Washington, Oregon, California, Nevada, Idaho, and Alaska, and the Pacific Coastal and Columbia River tribes receive PCSRF appropriations from NMFS each year. The fund supplements existing state, tribal, and local programs to foster development of Federal-state-tribal-local partnerships in salmon and steelhead recovery and conservation. NMFS has established memoranda of understanding (MOU) with the states of Washington, Oregon, California, Idaho, and Alaska, and with three tribal commissions on behalf of 28 Indian tribes. The MOUs establish criteria and processes for funding priority PCSRF projects.

For as long as these funds are available to the State of California, NMFS intends on working with the State to ensure the southern California steelhead recovery strategy and priorities are included in the considerations of funding for projects. NMFS also intends on using PCSRF reports as a mechanism to highlight those areas and actions where PCSRF funds have been used to implement needed recovery actions that might not otherwise occur in the absence of PCSRF funds.

NMFS has also identified other potential funding sources to support the implementation of recovery actions identified in the Southern California Steelhead Recovery Plan (for a list of additional funding sources, see Appendix E, Habitat Restoration Cost References for Steelhead Recovery Planning).

15.2 ONGOING REGULATORY PRACTICES

The ESA provides NMFS with various tools for first protecting and then recovering listed species. The ESA focuses on first identifying species and ecosystems in danger of immediate or foreseeable extinction or destruction and protecting them as their condition warrants. Then, the ESA focuses on the prevention of further declines in their condition through the consultation provisions of section 7(a)(2), habitat protection and enhancement provisions of sections 4 and 5, take prohibitions through sections 4(d) and 9, cooperation with the State(s) in which these species are found (section 6) and needed research and enhancement as well as conservation of species taken by non-federal actions through section 10. Ultimately, the ESA focuses on the conservation (commonly equated with the term recovery) of these species and ecosystems through the recovery planning provisions of section 4, cooperation with States in section 6, and direction to all federal agencies to conserve species in section 7(a)(1). Clean Water Action Section 404 is an important tool for regulating the discharge of material or the additional of fill material to the rivers, streams, and estuaries of California, and is one of the principle means by which consultations under section 7(a)(2) can be initiated.

In the case of listed salmon and steelhead in California, NMFS has already used the listing and designation of critical habitat provisions to protect the current populations of these species. For the past two decades, NMFS has also worked closely with federal agencies and private landowners pursuant to sections 7(a)(2) and 10(a)(1) of the ESA to avoid and minimize additional harm to these species during the course of land and water-use activities. Significant benefits have already accrued to these listed species from changes in land and water-use practices. Unfortunately, in many areas, salmon and steelhead populations continue to decline. The development and implementation of Recovery Plans has a greater scope and objective than the project-by-project focus of most section 7 and 10 efforts, however. NMFS intends to use this broader perspective to effect more significant and focused beneficial change for salmon and steelhead. In addition, NMFS intends to implement every action within this Recovery Plan for which it has authority.

The following sections describe the methods NMFS intends to use when implementing various sections of the ESA. These methods are intended to institutionalize the Recovery Plans in the daily efforts and decision-making at NMFS in the Southwest Region. Of necessity, some of these methods address the urgent issues of staffing and workload that NMFS faces. As a result, our commitment to implementing Recovery Plans extends to the ways in which we prioritize the many requests for consultations and permits we receive.

15.2.1 ESA Section 4

Section 4 provides the mechanisms to list new species as threatened or endangered, designate critical habitat, develop protective regulations for threatened species, and to develop Recovery Plans. The currently designated critical habitat includes only a portion of the habitat which may be necessary for recovery of the DPS. NMFS intends on using our recovery strategy, recovery criteria and recommended recovery actions to review the Southern California steelhead DPS critical habitat designation. A review of the current critical habitat designations may result in modifications of the current critical habitat designations, including the addition of unoccupied habitat which exhibit Primary Constituent Elements (PCEs).

15.2.2 ESA Section 5

Section 5 is a program that applies to land acquisition with respect to the National Forest System. Four National Forests (Los Padres, Angeles, Cleveland and San Bernardino) are present within the range of southern California steelhead. As funds become available, NMFS will work with the U.S. Forest Service to acquire important habitat areas for the purpose of protecting habitat features and functions needed to support the expression of diversity and spatial structure in the species.

15.2.3 ESA Section 7

15.2.3.1 Section 7(a) (1)

Section 7(a)(1) provides that all Federal agencies shall "…in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species…". Section 7(a)(1) provides that Federal agencies give the conservation of endangered species a high priority.

To prompt Federal agencies to develop conservation programs to fulfill their Federal obligations, NMFS shall:

- ❑ Prepare, and send, after Recovery Plan approval, a letter to all other appropriate Federal agencies outlining section 7(a)(1) obligations and meet with these agencies to discuss listed steelhead conservation and recovery priorities;
- ❑ Incorporate recovery actions in formal consultations as Conservation Recommendations;
- ❑ Encourage meaningful and focused mitigation, in alignment with recovery goals for restoration and threats abatement, for all

actions that incidentally take steelhead or affect their habitat;

- Encourage Federal partners to include recovery actions in project proposals; and
- Incorporate conservation actions, as appropriate, into the actions that NMFS authorizes, funds, or carries out.

15.2.3.2 Section 7(a) (2)

The purpose of section 7(a)(2) is to "insure that any action authorized, funded, or carried out by [a Federal agency] is not likely to jeopardize the continued existence of any [listed species] or result in the destruction or adverse modification of [a listed species' critical habitat]." Federal agencies request interagency consultation with NMFS when they determine an action may affect a listed species or its critical habitat. NMFS then conducts an analysis of potential effects of the action. In the process of consultation, NMFS currently expends considerable effort to assist agencies in avoiding and minimizing the potential effects of proposed actions, and to ensure agency actions do not jeopardize a species or destroy or degrade habitat. Whether the action has a negative effect on the likelihood of the species recovering is considered as part of the analysis; the action may not appreciably reduce the likelihood of recovery. As a result, these consultations have helped avoid and minimize direct take and contributed to recovery of Southern California steelhead DPS.

Because section 7(a)(2) applies only to Federal actions, its applications are limited only to those areas and actions with federal ownership, oversight, or funding. In the Southern California Steelhead DPS, land ownership varies across the watersheds from areas with significant levels of public ownership to areas almost entirely privately owned. Most of the land use practices on private ownership do not trigger interagency consultation.

Currently, NMFS expends most of its staff time and resources on conducting section 7 consultations. Implementation of the Recovery Plan will require improvements to the process and application of section 7(a)(2) consultation requirements across the DPS.

In order to devote more resources towards recovery action implementation and to ensure section 7(a)(2) consultations are effective, NMFS will utilize its authorities to:

- Use recovery criteria, objectives, and ongoing monitoring efforts as a reference point to determine effects of proposed actions on the likelihood of species' recovery;
- Utilize information on threats to species recovery and needed actions to address such threats when evaluating the impacts of proposed Federal actions on southern California steelhead;
- Place high priority on consultations for actions that implement the recovery strategy or specific recovery actions;
- Develop and maintain databases to track the amount of incidental take authorized and effectiveness of conservation and mitigation measures;
- Incorporate recovery actions in formal consultations as Reasonable and Prudent Measures, Reasonable and Prudent Alternatives, and Conservation Recommendations as appropriate;
- Focus staff priorities towards section 7 and 9 compliance in watersheds identified as core populations for the purpose of recovery of the Southern California Steelhead DPS;
- Streamline consultations for those actions with little or no effect on recovery areas or priorities. Develop streamlined

programmatic approaches for those actions that do not pose a threat to the survival and recovery of the species; and

- Apply the VSP framework and recovery priorities to evaluate population and area importance in jeopardy and adverse modification analyses.

Within this framework NMFS will utilize its authorities to encourage:

- Federal Emergency Management Agency (FEMA) to fund upgrades for flood-damaged facilities to meet the requirements of the ESA and facilitate recovery;
- Environmental Protection Agency (EPA) to prioritize actions on pesticides known to be toxic to fish and/or are likely to be found in fish habitat; and to take protective actions, such as restrictions on pesticide use near water;
- Development of section 7 Conservation Recommendations to help prioritize Federal funding towards recovery actions (NFMS, USFWS, NRCS, EPA, *etc.*) during formal consultations;
- All Federal agencies that designate a non-Federal representative to conduct informal consultation or prepare a biological assessment to ensure the associated documentation comports to 50 CFR 402.14(c) prior to initiating consultations with NMFS; Compliance with these requirements is expected to increase consultation effectiveness and timeliness;
- All Federal agencies, or their designated representatives, to field review projects and actions upon project completion to determine whether or not the projects were implemented as planned and approved. Encourage all Federal agencies, or their designated representatives to report the initial findings of field review to NMFS; and
- Federal agencies to coordinate and develop programmatic incidental take authorization for activities that contribute to the recovery of southern California steelhead to streamline their permitting processes

15.2.4 ESA Section 9

Section 9 prohibits any person from harming members of listed species including direct forms of harm such as killing an individual, or indirect forms such as destruction of habitat where individuals rear or spawn. The Recovery Plan will assist NMFS' Office of Law Enforcement (OLE) personnel by targeting focus watersheds essential for species recovery. NMFS PRD staff will work closely with NMFS' OLE regarding the identification of threats and other activities believed to place steelhead at high risk of take.

Towards this end, NMFS will:

- Conduct outreach and provide the NMFS' OLE a summary of the recovery priorities and threats;
- Prioritize those actions and areas deemed of greatest threat or importance for focused efforts to halt illegal take of listed species
- Periodically review existing protocols establishing responsibilities and priorities between PRD and Enforcement to ensure activities by NMFS staff, when supporting NMFS' OLE are focused on the highest recovery priorities; and
- When take has occurred in a primary focus area, NMFS PRD will work with NMFS' OLE, to the extent feasible, with the development of a take statement.

15.2.5 ESA Section 10

Section 10(a)(1)(A) provides permits for the authorization of take of listed species for scientific research purposes, or to enhance the propagation or survival of listed species. Typically NMFS has authorized conservation hatcheries and research activities under section

10(a)(1)(A). Section 10(a)(1)(B) provides permits for otherwise lawful activities that incidentally take listed species. Habitat conservation plans minimizing and mitigating the incidental take of listed species from non-federal activities are prepared under section 10(a)(1)(B). Currently, both processes take a long time to implement and Recovery Plans have not been available to guide priorities for permit issuance. To improve the section 10 authorization process, NMFS will utilize its authorities in the following ways:

15.2.5.1 Section 10(a) (1) (A) Research Permits

In order to assure that the best available science is developed and used to recover the Southern California Steelhead DPS NMFS will:

- ❑ Prioritize permit applications that address identified research, monitoring, and/or enhancement activities, including any conservation hatchery operations, in the Southern California Steelhead Recovery Plan;
- ❑ Evaluate all proposed research and/or enhancement activities within the framework of identified threats, recovery strategy, and recovery actions identified in the Recovery Plan;
- ❑ Develop a streamlined process for permitting priority research activities to facilitate the implementation of the research program identified in the Recovery Plan; and
- ❑ Support and maintain the national research and enhancement database to track the amount of take authorized and the effectiveness of conservation and mitigation measures identified in the Recovery Plan.

15.2.5.2 Section 10(a) (1) (B) Habitat Conservation Plans

To ensure that all of the mechanisms available to achieve the goals, objectives and criteria of the Southern California Steelhead Recovery Plan, NMFS will:

- ❑ Place the highest priority on cooperation and assistance to landowners proposing activities or programs designed to achieve recovery objectives; and
- ❑ Prioritize those areas and actions where threats abatement has the potential to provide the most significant contribution to species recovery based on the threats assessment developed and updated as part of the Recovery Plan.

APPENDIX A

Glossary and Abbreviations

Acclimation
Gradual physiological adjustment in response to relatively long-term environmental changes.

Acidification
Ocean acidification is the process by which CO_2 is dissolved in seawater resulting in an increase in hydrogen ion (H+) concentration, and a corresponding decrease in the ocean's pH.

Acid Rain
Precipitation which contains sulfate aerosols consisting of sulfuric acid, derived from industrial and other emissions.

Age Class
Individuals in a population of the same age. In Pacific salmonids, an individual of less than one year is referred to a 0+ age class; a fish older than one, but less than two years, is termed a 1+ age class fish, etc.

Adaptation
The evolutionary process, whereby populations become better suited to deal with their physical and biological environments, and therefore to survive and reproduce. It is driven by a host of factors including population diversity (genetic, phenotypic, physiological, and behavioral), inter and intra-specific competition, natural selection, and genetic processes.

Adaptive Trait
Any specific physical, physiological, or behavioral trait of an organism that promotes the likelihood of an organism's survival and reproduction in a particular environment.

Adipose fin
Small fin located composed of fatty tissue on the top-side of a fish between the dorsal and caudal fin.

Adiabatic
Insulated from the surroundings, unable to gain or lose heat from the environment.

Albedo
The fraction of incoming solar radiation that is reflected back to space without being absorbed.

Allele
One of two or more forms of a gene. Sometimes, different alleles can result in different physical or physiological traits. Other times, different alleles will have the same result in the expression of a gene.

Allele Frequency
The relative proportion of all copies of a particular gene variant (allele) among the chromosomes carried by an individual of a population. In population genetics, allele frequencies are used to depict the amount of genetic diversity at the individual, population, and species level.

Alevins
Newly hatched salmon or trout with a visible yolk sac, usually still maturing while still in the redd.

Anadromous
A life history cycle that involves reproducing in freshwater, maturing in marine waters, and returning to freshwater to reproduce.

Anadromous Fraction
The proportion of a heterogeneous *O. mykiss* population that exhibits an anadromous life history, as opposed to the freshwater-resident life history.

Anadromous Waters
Water bodies typically accessible to fish migrating from the ocean, including estuaries, rivers, and lakes.

Anal fin
Fin located on the near the rear, and on the bottom side; used for stability when swimming.

Baseline
A set of reference data sets or analyses use for comparative purposes; it can be based on a reference year or a reference set of standard conditions.

Bayesian
A formal statistical approach in which expert knowledge or beliefs are analyzed together with data. Bayesian methods make explicit use of probability for quantifying uncertainty, and are used in decision making.

Benthic
A habitat or organism found on the stream, lake or ocean bottom.

Biological Diversity
The range of in a range of characteristics within an ecosystem or taxonomic group, including genetic, phenotypic and physiological variability of individuals, and life history strategies, age structure and fecundity of populations.

Bootstrap
A statistical methodology use to quantify the uncertainty associated with estimates obtained from a model. The bootstrap is often based on Monte Carlo resampling of residual form the initial model fit.

Brackish Water
Water that has more salinity than fresh water, but not as much as seawater. It may result from mixing of seawater with fresh water, as in estuaries, or it may occur in brackish fossil aquifers. Technically, brackish water contains between 0.5 and 30 grams of salt per liter—more often expressed as 0.5 to 30 parts per thousand (ppt or ‰). Thus, *brackish* covers a range of salinity regimes and is not a precisely defined condition. By comparison, average, seawater in the world's oceans has a salinity of about 35 ppt.

Brood Stock
Sexually mature individuals used within a hatchery or other controlled environment for breeding purposes.

Carnivore
An organism or species that derives its energy and nutrient requirements from a dies consisting mainly or exclusively of animal tissue, whether through predation or savaging. Animals that depend solely on animal flesh for their nutrient requirements are considered obligate carnivores while those that also consume non-animal food are considered facultative carnivores.

Carrying Capacity
The maximum population of a species that an area or specific ecosystem can support indefinitely without deterioration of the character and quality of the resources. It can also refer to the maximum level of recreational use, in term of numbers of people and type of activity, which can be accommodated before ecological value of the area declines.

Catadromous
A life history cycle that involves reproducing in saltwater, maturing in freshwater, and returning to saltwater to reproduce.

Caudal fin
Tail fin, usually with distinct rays; used principally for propulsion and turning.

Climate
The average prevailing conditions in the atmosphere (air temperature, wind speed and direction, humidity, precipitation, etc.) based upon a series of years.

Coded-wire Tag
Coded-wire tags are small pieces of stainless steel wire that are injected into the snouts of juvenile salmon and steelhead. Each tag is etched with a binary code that identifies its time and place of release.

Coefficient of Variation (CV)
The standard error of a statistic, divided by its point estimate. The CV gives an idea of the precision of an estimate, independent of its magnitude.

Competition
Interaction of individual organisms that occupy or share some part of an ecological niche such that both depend upon the same food source, shelter, or some other resource in the same community; competition may be between individuals of the same or different species.

Cohort
A group of fish generated during the same spawning season, and is part of the same age class.

Confidence Interval (CI)
The probability, based on statistics, that a number will be between and upper and lower bound.

Conspecific
Two or more individuals, populations, or other higher order taxonomic grouping such as a sub-species, are said to be conspecific when they belong to the same species.

Continental Shelf
The underwater shelf of the continent, extending seaward from the shore, with a moderate inclination, to the edge of the continental slope where the inclination increases sharply; water depth varies from 0 to 200 meters.

Demersal
Living in close association with the bottom and generally dependent upon it.

Demographic
Properties of a population such as rate of growth, age structure, sex ratio, number of reproductive individuals, etc.

Density Dependence
In population ecology density-dependence is any population characteristic that varies with the degree of the density of the population.

Density Independence
External factors that influence all individual of a population regardless of population density such as climate.

Dimorphism
Existence within a species of two distinct forms according to color, sex, size, organic structure, etc.

Distinct Population Segment
The smallest division of a taxonomic species that can be protected under the U.S. Endangered Species Act.

Dorsal fin
Located on the top side, generally mid-way along the body, and usually distinct rays; provides stability when swimming.

Ecological niche
The position a species or population its ecosystem. The ecological niche describes how an organism or population responds to the distribution of resources and competitors (*e.g.*, by growing when resources are abundant, and when predators, parasites and pathogens are scarce) and how it in turn alters those same factors (*e.g.*, limiting access to resources by other organisms, acting as a food source for predators and a consumer of prey).

Ecosystem
A biological environment consisting of all the organisms living and interacting in a particular area, as well as all the nonliving, physical components of the environment with which the organisms interact, such as air, soil, water and sunlight.

Ecosystem Functions
Intrinsic ecosystem characteristics related to the set of conditions and processes whereby an ecosystem maintains its integrity. Ecosystem functions include such processes as decomposition, production, nutrient cycling, and fluxes of nutrients and energy.

Ecosystem Services
The benefits that people obtain from functioning ecosystems; they include provisioning services such as food, timber, fiber, fuel and energy, and freshwater; regulating services such as air and water quality, equable climate, control of diseases, pests, and sediment supplies (e.g., beaches, building materials); supporting services such as soil formation, photosynthesis, nutrient cycle; and cultural services such as fulfilling spiritual, religious, and aesthetic needs.

Effective Population Size (N_e)
The number of individuals that contribute offspring to the next generation; generally smaller than the absolute population size (N); a basic parameter in many models in population genetics.

El Niño /La Niña Southern Oscillation
A weather pattern that occurs across the tropical Pacific Ocean roughly every five to seven years. It is characterized by variations in the surface temperature of the tropical eastern Pacific Ocean—warming associated with El Niño and cooling with La Niña. The two variations are coupled: the warm oceanic phase, El Niño, accompanies high air surface pressure in the western Pacific, while the cold phase, La Niña, accompanies low air surface pressure in the western Pacific. ENSO causes extreme weather (such as floods and droughts) in many regions of the world, including the west coast of the United States.

Emigration
Movement of individuals out of a population. With Pacific anadromous salmonids, emigration refers to the movement of juveniles (and also adults) from freshwater to a brackish or marine environment.

Endemic
Species or populations occurring in restricted geographic areas due to the presence of a unique suite of environmental and biological conditions that limit the distribution of the species or population.

Ephemeral Streams
Streams that flow briefly after rainstorms.

Essential Fish Habitat
Waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16U.S.C. 1802(10)).

Estuary
Estuaries form a transition zone between river environments and ocean environments and are subject to both marine influences, such as tides, waves, and the influx of saline water; and riverine influences, such as flows of fresh water and sediment. The inflow of both seawater and freshwater provide high levels of nutrients in both the water column and sediment, making estuaries among productive natural habitats.

Eutrophication
Enrichment of water by nutrients required for plant growth. The addition of artificial or natural substances, such as nitrates and phosphate through agricultural fertilizer or animal wastes, to an aquatic system. Negative environmental effects include the depletion of oxygen in the water, which induces reductions in specific fish and other animal populations.

Evolutionary Significant Unit
A population (or group of populations) which exhibit two biological characteristics: (1) it is substantially reproductively isolated from other conspecific (of the same taxonomic species) population units; and (2) it represents an important component of the evolutionary legacy of the species.

Evolvability
The potential to generate heritable variation with individuals of a population that can be exploited by natural or artificial selection.

Extinction
The disappearance of a species or some other taxonomic group from a region or biota; the precise moment of extinction is generally considered to be the death of the last individual of the species (although the capacity to reproduce and recover may have been lost before that point).

Eutrophication
The process by which a body of water becomes enriched in dissolved mineral nutrients (often phosphorus and nitrogen) that stimulates the growth of aquatic plants, and leads to depletion of dissolved oxygen, and the mortality of oxygen dependent organisms.

Fecundity
The reproductive potential or capacity of an organism or population, usually expressed as the number of eggs or progeny produced during a reproductive cycle. Fecundity usually increases with age and size.

Facultative
The characteristic of being able to adjust to a variety of conditions or circumstances; optional or discretionary.

Fish Ladder
An artificial facility made of a series of steps, with flowing water and pools, to assist fish in swimming up or downstream of a fish passage barrier such as a dam or diversion.

Fitness
The degree that an individual is adapted to or is able to produce progeny in its local environment.

Fry
Juvenile fish that have absorbed their yolk sacs and can emerge from a redd and into deeper water to feed on their own.

Genotype
The genotype of an organism is the inherited genetic code of the individual. Not all individuals with the same genotype look or behave the same way because appearance and behavior are modified by

environmental and developmental conditions. Similarly, not all individual that look alike necessarily have the same genotype.

Genetic Distance
A measure of the difference in allele frequencies between populations. Genetic distance can be used to compare the genetic similarity between different species, such as humans and chimpanzees. Within a species genetic distance can be used to measure the divergence between different sub-species, or populations of the same species.

Gravid
The condition of an individual female carrying ripe eggs, usually with a distended body.

Greenhouse Gas
A gas which is capable of absorbing and emitting infrared light (e.g., water vapor H_20, carbon dioxide $C0_2$, methane CH_4, nitrous oxide N_20, and ozone O_3).

Habitat
The area that is inhabited by a particular species of animal, plant or other type of organisms. It is the natural environment in which an organism lives, or the physical environment that surrounds (influences and is utilized by) a population of a species. The term microhabitat is often used to describe the small-scale physical requirements of a particular organism or population.

Herbivore
An organism that consumes living plants or their parts.

Hydrologic Cycle
The continuous movement of water on, above and below the surface of the Earth, such as from river to ocean, or from the ocean to the atmosphere, by the physical processes of evaporation, condensation, precipitation, infiltration, runoff, and subsurface flow. Water takes alternative forms of liquid, vapor, and a solid (snow and ice). The hydrologic cycle also involves the exchange of heat energy, which leads to temperature changes. For instance, in the process of evaporation, water takes up energy from the surroundings and cools the environment. Conversely, in the process of condensation, water releases energy to its surroundings, warming the environment.

The water cycle figures significantly in the maintenance of life and ecosystems on Earth. By transferring water from one location to another, the water cycle purifies water, replenishes the land with freshwater, and transports minerals to different parts of the globe. It is also involved in reshaping the geological features of the Earth, through such processes as erosion and sedimentation. The water cycle exerts an influence on climate as well.

Incidental Take
The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Independent population
Any collection of one or more local breeding units whose population dynamics or extinction risk over a 100-year time frame are not substantially altered by exchanges of individuals with other populations. For

example, if one independent population were to go extinct, it would not have a significant impact on the 100-year extinction risk experienced by other independent populations.

Indigenous Species
A species occurring naturally in a particular region, and not artificially introduced.

Intermittent Streams
Streams that flow for some, but not all, of the year. Such streams usually receive their waters primarily from surface runoff following storm events.

Interspecific
Interactions, such as competition or predation, between different species.

Interrupted Stream
Stream that flow alternately on and below the surface contemporaneously. Such streams often flow through coarse gravels.

Intraspecific
Interactions, such as competition or predation, between individuals of a single species.

Introgression
The movement of genes from one gene pool to another as a result of hybridization between individuals from genetically distinct populations.

Iteroparous
An organism that has the potential to reproduce more than one during its life cycle. Steelhead are the only members of the Pacific anadromous salmonids (*Oncorhynchus* spp.) that do not die after initial spawning , and may return to the ocean and then return to freshwater to repeat their reproductive phase.

Latent Heat
Heat carried by water, and released when the water vapor condenses to liquid.

Lateral line
A series of sensory receptor arrayed along the sides mid-way between top and bottom of the body; these sensory receptors detect water movement around the fish, allowing it to efficiently navigate currents, detect prey, and swim in coordination with other fish of the same species.

Life Cycle
The successive series of changes through which an organism passes, whether through asexual or sexual reproduction, including breeding, gestation, growth and maturation, and death. This cycle of phases of an individual is also referred to a life history.

Life History Crossover
In Pacific salmonids, the ability of anadromous *O. mykiss to* produce progeny which assume a freshwater reproductive life cycle, and the ability of resident *O. mykiss*, to produce progeny which assume an anadromous reproductive life cycle.

Life History Polymorphism
In Pacific salmonids, the co-occurrence of the anadromous and resident life cycle forms within a population.

Limiting Factor
Any factor that controls a process, such as organism growth or species population size, or distribution. The availability of food, predation pressure, or availability of shelter are examples of natural limiting factors. An example of an anthropogenic limiting factor is set of barriers to migration, which is necessary to complete an organism's life cycle.

Littoral Zone
The zone along the coast the forms the interface between the land and water, and often includes intertidal and near-shore waters.

Mediterranean Climate
The climate is characterized by warm to hot, dry summers and mild to cool, wet winters. Mediterranean climate zones are associated with the five large subtropical high pressure cells of the major oceans. These high pressure cells shift toward the poles in the summer and toward equator in the winter.

Meristics
Measurements of an organism's physical characteristics such as length, scale, spine, fin-ray counts.

Metapopulation
A set of populations that is composed of multiple local populations geographically separated but connected through dispersal and periodic interbreeding. Generally individual populations within such a system have a relatively high probability of local extinction and also recolonization by other populations within the metapopulation. Metapopulations persist as a result of a balance between extinctions of subpopulations and recolonization by others.

Migrate
Travelling of long distances in search of a specific type of habitat to enable an organism to complete some phase of its life cycle; fish such as Pacific anadromous salmonids migrate between their spawning and rearing areas in freshwater habitat the marine environment to feed and grow to maturity.

Mathematical Model
A quantitative description of anything (including processes) that cannot be directly observed, but for which relevant data can be developed, and used to simulate an approximation or estimate of the thing being modeled.

Natural Selection
The process by which the frequency of genetic traits in a population through differential survival and reproduction of individual bearing those traits is determined. Natural selection acts on the phenotype or the observable characteristics of an organism, but the genetic (heritable) basis of any phenotype which gives a reproductive advantage will become more common in a population (see allele frequency). Over time, this process can result in adaptation that adapts populations for a particular ecological niche and may eventually result in the emergence of new species. It is a key mechanism of evolution.

Obligate
The characteristic of being unable able to adjust to a variety of conditions or circumstances; a life history or response to particular environmental conditions without alternative means of responding.

Omnivore
An organism whose diet is broad, including both plant and animal foods; specifically an organism that feeds on more than one trophic level; omnivorous organisms are opportunistic, general feeders not specifically adapted to eat and digest either meat or plant material primarily.

Operculum
The gill cover in bony fishes

Orographic Precipitation
Precipitation induced when air masses pushed by winds are forced up the side of elevated land formations, such as large mountains. The lift of the air up the side of the mountain results in cooling, and ultimately condensation and precipitation.

Otolith
Calcareous concretions in the inner “ear” of lower vertebrates such as fish; the daily accumulation calcareous layers of can be used to determine the age of an organism, and in some cases detect the time spent in waters with different chemical composition (*e.g*., salt and freshwater).

Pacific Decadal Oscillation (PDO)
A pattern of climate variability that shifts phases on at least an inter-decadal time scale, usually about 20 to 30 years. The PDO is detected as warm or cool surface waters in the Pacific Ocean north of 20° N. During a "warm", or "positive", phase, the west Pacific becomes cool and part of the eastern ocean warms; during a "cool" or "negative" phase, the opposite pattern occurs.

Panmictic Population
A population in which all individuals are potential reproductive partners, that is, there are no restrictions of mating (e.g., genetic or behavioral).

Parameterization
A technique used in constructing models of substituting an unknown feature such as process or limit, with a simplified, but informed estimate of the feature.

Parr
The rearing stage of freshwater salmonids between alevins and smolt that is distinguished by vertical bars or oval spots (parr marks) on the side of the fish.

Pectoral fin
Fin located high up on the sides of deep bodied fish; used for precise movements.

Pelvic fin
Fin located toward the rear of the fish; used for steering and stopping.

Pelagic
Associated with the open sea or at or near the water's surface. Pelagic fish live near the surface or in the water column of coastal, ocean and lake waters, but not on the bottom of the sea or the lake. They are usually agile swimmers with streamlined bodies, capable of sustained cruising on long distance migrations. They can be contrasted with demersal fish which do live on or near the bottom, and reef fish which are associated with coral or volcanic reefs.

pH
A measure of the acidity or basicity of an aqueous solution (generally expresses as the concentration of H+ ions). pH is normally measured in a range of 0-14. Pure water is said to be neutral, with a pH close to 7.0 at 25 ^{0}C (77 ^{0}F). Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline.

Phenotype
Any observable characteristic or trait of an organism such as its morphology (shape and size) developmental pattern, biochemical or physiological properties, and behavior. Phenotypes result from the expression of an organism's genes as well as the influence of environmental factors and the interactions between the two.

Phenotypic Plasticity
The ability of an individual to modify behavioral or other phenotypic characteristics to adjust to differing environmental conditions. In some Pacific salmonids such as steelhead, phenotypic plasticity refers to the ability to adopt either the anadromous or freshwater-resident life cycle, depending on environmental cues or influences.

Photic Zone
The surface layer of water where there is sufficient light for photosynthesis to occur.

Population
A group of interbreeding individuals that have developed a distinct gene pool and that breed in approximately the same place and time.

Population Density
The number of individuals per unit area, or linear distance.

Population Model
A quantitative description of how a population changes over time; population models can take a variety of basic forms, including age/size structured or biomass based, deterministic, or stochastic, density-dependent, or density-independent, spatially structured, or spatially aggregated, equilibrium or nonequilibrium.

Predation
Predation describes a biological interaction a predator feeds on its prey. Predators may or may not kill their prey prior to feeding them, but the act of predation always results in the death of its prey and the eventual absorption of the prey's tissue through consumption. The key characteristic of predation however is the predator's direct impact on the prey population.

Primary Productivity
The production of organic compounds from atmospheric or aquatic carbon dioxide, principally through the process of photosynthesis, with chemosynthesis being much less prevalent. Almost all life on earth is directly or indirectly reliant on primary production. The organisms responsible for primary production form the base of the food chain. In terrestrial ecosystem these are mainly plants; in aquatic ecosystems, algae are primarily responsible.

Radiative Balance
The physical state of a system, such as the earth-atmosphere system, where the incoming and outgoing solar radiation is in equilibrium; greenhouse gases diminish outgoing solar radiation**.**

R-strategists
R-strategists are species characterized by relatively early age of first reproduction, large brood size, numerous progeny, no parental care, and short generations. Populations exhibit exponential growth rate followed by sudden crashes in population size, and tend to live in unpredictable and rapidly changing environments. Pacific anadromous salmonids are an example of an r-strategist species.

Recruitment
The number of fish from a year class reaching a certain age; in fisheries management it is generally the number of fish that grow to a size subject to harvesting.

Redd
A shallow gravel depression excavated by a fish for the purpose of depositing its eggs within the stream channel.

Refugia
Habitats where individuals can avoid predation or environmental stressors such as elevated temperatures, or flood flows.

Relative humidity
The amount of water vapor in the air, compared with complete saturation. If relative humidity is greater than 100%, the vapor will tend to condense to liquid, until 100% is reached.

Salmonids
Fish of the taxonomic family Salmonidae that includes salmon, trout, whitefish, and char.

Seasonal Lagoon
An estuary that becomes separated from the ocean by a sandbar barrier for part of the year.

Sea Level Rise
The rise in average sea level elevation with respect to current terrestrial elevations. Increasing sea level is the result of increasing temperatures causing the thermal expansion of water and the addition of water to the oceans from the melting of mountain glaciers, polar ice caps, and Greenland and Antarctic ice sheets.

Semelparous
Organisms which reproduce only once. The single reproductive event of semelparous organisms is usually large, as well as fatal. An example of a semelparous organism is the Pacific salmon (*Oncorhynchus* spp.), which lives for several years in the ocean before migrating to the freshwater stream of its birth, laying eggs, and dying.

Sink Population
A local population that has a negative growth rate, or a high probability of periodic extinction; it continued persistence is dependent upon immigration from other local populations, or dispersal from more remote populations.

Smolt
A young salmon or steelhead that is undergoing physiological changes in preparation for entering the ocean.

Source Population
A local population that has a sufficiently high growth rate when small to persist even without immigration from other local populations, or dispersal from more remote populations.

Spawning Density
The number of potentially spawning individual in a length of stream, tributary, or some other hydrologic unit.

Steelhead
A rainbow trout (*Oncorhynchus mykiss*) that exhibits an anadromous life cycle.

Stochastic
The state where a system's components are affected by random variability. A stochastic model is a model whose behavior is not fully specified by its form and parameters, but which contains an allowance for unexplained effected represented by random variables.

Stratification
The establishment of distinct layers of temperature or salinity in bodies of water such as an ocean, lake, or estuary, based upon the different density of warm and cold water or saline or freshwater.

Sustainable Fishery
A fishery that does not cause or lead to undesirable changes in the biological and/or economic productivity, biological diversity, ore ecosystem structure and functioning from one human generation to the next.

Taxon
Any named group of organisms at any taxonomic level (*e.g.,* Phylum, Order, Class, Genus, Species, etc.).

Temperature Lapse Rate
The rate of decrease in temperature with altitude in the stationary atmosphere at a given time and location.

Thermocline
A region below the surface layer of the sea or lake, or pool where the temperature gradient increases abruptly (*i.e.*, where temperature decreases rapidly with increasing depth). It is often an ecological barrier, and its oscillations have significant consequences on the distribution of organisms.

Total-Length (TL)
The length of a fish defined as the straight-line distance from the tip of the snout to the tip of the tail (caudal fin) while the fish is lying on its side normally extended.

Triploid
An organism having three sets of chromosomes.

Trophic Level
The position an organism or species occupies in the food chain, or web. A food chain represents a succession of organisms that eat another organism and are, in turn, eaten themselves. The number of energy transfer steps organism is from the start of the chain is a measure of its trophic level. Food chains start at trophic level 1 with primary producer such as plants, move to herbivores level 2, predators at level 3 and typically finish with carnivores or aped predators at level 4 or 5.determined by the number of energy-transfer steps to that level.

Upwelling
An oceanographic phenomenon that involves wind-driven motion of dense, cooler, and usually nutrient-rich water towards the ocean surface, replacing the warmer, usually nutrient-depleted surface water. The increased availability in upwelling regions results in high levels of primary productivity and thus fish growth and abundance. Wind-driven currents are diverted to the right of the winds in the Northern Hemisphere and to the left in the Southern Hemisphere. When surface water transport is occurring away from the coast, surface waters are replaced by deeper, colder, and denser water.

Viable Salmonid Population
An independent population of any Pacific salmonid (genus Oncorhynchus) that has a negligible risk of extinction due to threats from demographic variation (such as population size or sex ratio), local environmental variations, and genetic diversity changes over a 100-year time frame.

Viability Population Parameters
The four measurable characteristics of a viable salmonid population: abundance, growth rate, spatial structure, and diversity (including genetic, phenotypic diversity).

Volitional Fish Passage
The natural movement of fish in response to cues such as natural flow patterns or water temperature, or natural physiological changes in individuals.

Weathering
The physical/chemical processes in which a material is broken down through exposure to the atmospheric conditions (heat, water, etc.)

Young-of-the Year
Fish that are less than a year old (and are in their first year of growth).

Abbreviations

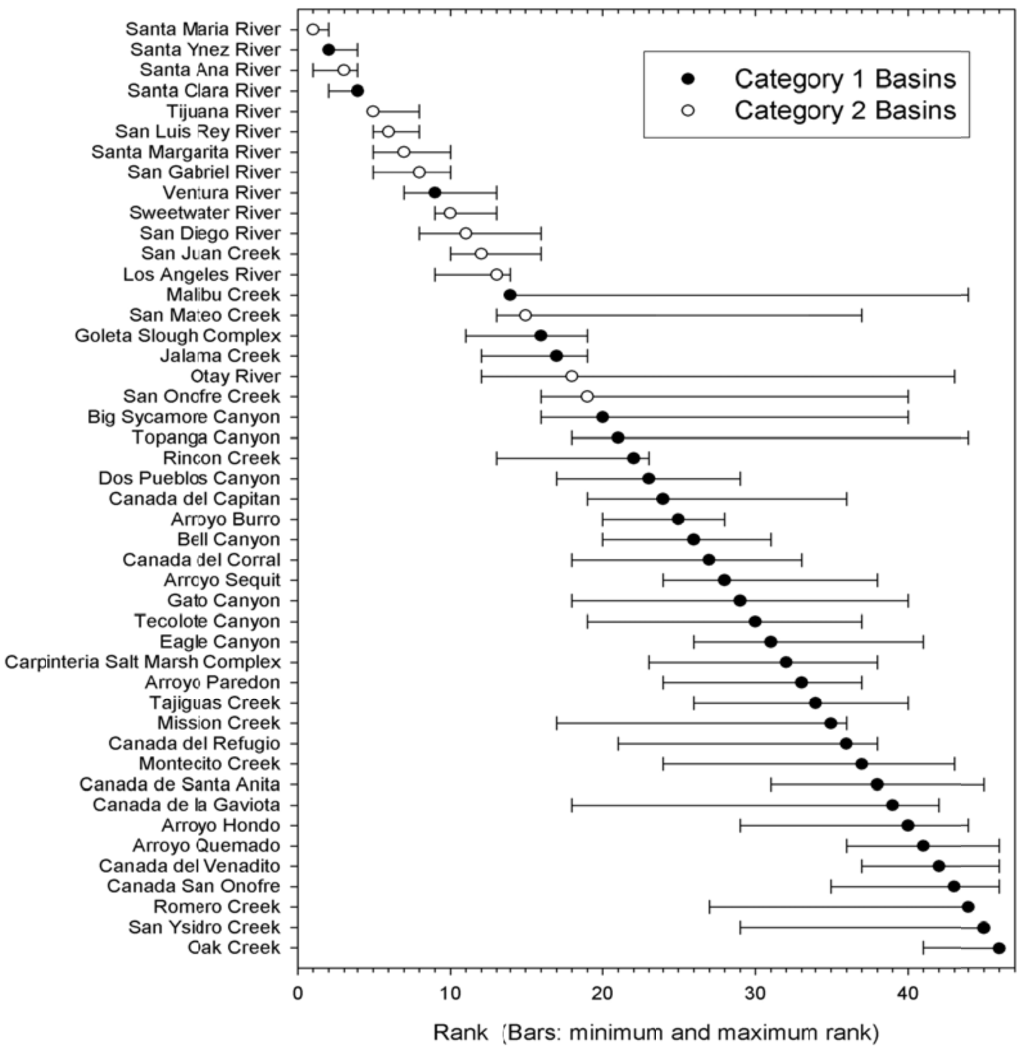
AC	Audubon California
ACOE	Army Corps of Engineers
ACWA	Association of California Water Agencies
AFRP	Anadromous Fish Restoration Program
BIA	Bureau of Indian Affairs
BOR	Bureau of Reclamation
BPG	Biogeographic Population Group
BRT	Biological Review Team
CAMP	Comprehensive Assessment and Monitoring Program
CCC	California Coastal Commission
CCRB	Cachuma Conservation Release Board
CDFG	California Department of Fish and Game
CDF	California Department of Forestry
CDOT	California Department of Transportation
CDPR	California Department of Parks and Recreation
CDMG	California Division of Mines and Geology
CESA	California Endangered Species Act
CI	Confidence Interval
CMARP	Comprehensive Monitoring Assessment and Research Program
CMWD	Casitas Municipal Water District
COMB	Cachuma Operations and Maintenance Board
CSCC	California State Coastal Conservancy
C^0	Centigrade
cm	Centimeters
cm/sec	Centimeters per second
CT	California Trout
CV	Coefficient of Variation
CWT	Coded Wire Tag
DIDSON	Dual-Frequency Identification Sonar
DPS	Distinct Population Segment
DWR	Department of Water Resources
EFH	Essential Fish Habitat
EII	Earth Island Institute
ENSO	El Nino/Southern Oscillation
ESA	Federal Endangered Species Act
ESU	Evolutionarily Significant Unit
FLC	Fallbrook Land Conservancy
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FL	Fork Length
FLC	Fallbrook Land Conservancy
FOLAR	Friends of the Los Angeles River
FOR	Friends of the River
FOSCR	Friends of the Santa Clara River
FOSMR	Friends of the Santa Margarita River

FOVR	Friends of the Ventura River
FRGP	Fisheries Restoration Grant Program
ft/sec	Feet per second
GSDCRCD	Greater San Diego County Resource Conservation District
HCP	Habitat Conservation Plan
IRWMP	Integrated Watershed Management Plan
km/hr	Kilometers per hour
KSW	Keep Sespe Wild
LAC	Los Angeles County
LPFW	Los Padres Forest Watch
m	Meters
mi^2	Square miles
m/sec	Meters per second
mm	Millimeters
MC	Matilija Coalition
MWDSC	Metropolitan Water District of Southern California
MRCD	Mission Resource Conservation District
ORCP	Otay River Conservation Program (WildCoast)
TBD	To Be Determined
TNC	The Nature Conservancy
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPSPWRO	National Park Service, Pacific Western Regional Office
NRCS	National Resources Conservation Service
OC	Orange County
OVLC	Ojai Valley Land Conservancy
PCSRF	Pacific Coastal Salmon Recovery Fund
PITT	Passive Integrated Responder Tags
ppt	Parts per thousand
PVA	Population Viability Analyses
RC	Riverside County
RFID	Radio Frequency Identification
RM	River Mile
RST	Rotary Screw Trap
RWQCB	Regional Water Quality Control Board
SARWA	Santa Ana River Watershed Alliance
SBC	Santa Barbara County
SBRC	San Bernardino County
SCHR	South Coast Habitat Restoration
SCCWRP	Southern California Coastal Water Research Project
SDBNWR	San Diego Bay National Wildlife Refuge
SDC	San Diego County
SDRPF	San Diego River Park Foundation
SDRVC	San Dieguito River Valley Conservancy
SDSRF	San Diego Surfrider Foundation

SDT	San Diego Trout
SDWA	San Diego Water Authority
SGMRC	San Gabriel Mountains Regional Conservancy
SLRWC	San Luis Rey Watershed Council
SMBRC	Santa Monica Bay Restoration Commission
SMCC	San Mateo Creek Conservancy
SMMC	Santa Monica Mountains Conservancy
SMMRCD	Santa Monica Mountains Resource Conservation District
SWA	Sweetwater Authority
SWMNWR	Sweetwater Marsh National Wildlife Refuge
SWP	State Water Project
SWRCB	State Water Resources Control Board
TBD	To Be Determined
TCFT	Tri-County Fish Team
TL	Total Length
TRAN	Tijuana River Action Network
TRNER	Tijuana River National Estuarine Reserve
TRT	Technical Recovery Team
TU	Trout Unlimited
TWC	The Wildlands Conservancy
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USLRRCD	Upper San Luis Rey Resource Conservation District
UWCD	United Water Conservation District
VC	Ventura County
VSP	Viable Salmonid Population
USAF	United States Air Force
USDOT	United States Department of Transportation
USMC	United States Marine Corps

APPENDIX B
Watershed Intrinsic Potential Rankings

Watershed rankings in the Southern California Steelhead DPS.[1] The rankings are based on the amount of potential habitat as in indicator of potential viability. Watersheds are ranked on the single habitat model that is preferred on *a priori* biological grounds. Horizontal bars show the range of ranks (minimum and maximum) for 48 variant biological models (See Boughton *et al*. 2006).



[1] Category 1 Watersheds are watersheds that experience regular winter flows to the ocean and therefore provide access to freshwater spawning areas. Category 2 Watersheds (*i.e.*, all large Watersheds within the southern portion of the Southern California Steelhead DPS, and the Santa Maria River) experience irregular winter flows to the ocean, even in an unimpaired state. Bars indicate the range of ranks (minimum and maximum) for 48 variant models. (See Boughton *et al*. 2006).

APPENDIX C

COMPOSITION OF SOUTHERN CALIFORNIA RECOVERY PLANNING AREA STEELHEAD BPGs

Biogeographic Group	**Member Populations (ordered north to south)**
Monte Arido Highlands	Santa Maria River, Santa Ynez River, Ventura River, Santa Clara River
Conception Coast[1]	Jalama Creek, Cañada de Santa Anita, Cañada de la Gaviota, Cañada San Onofre, Arroyo Hondo, Arroyo Quemado, Tajiguas Creek, Cañada del Refugio, Cañada del Venadito, Cañada del Corral, Cañada del Capitan, Gato Canyon, Dos Pueblos Canyon, Eagle Canyon, Tecolote Canyon, Bell Canyon, Goleta Slough Complex, Arroyo Burro, Mission Creek, Montecito Creek, Oak Creek, San Ysidro Creek, Romero Creek, Arroyo Paredon, Carpinteria Salt Marsh Complex, Carpinteria Creek, Rincon Creek
Santa Monica Mtns[1]	Big Sycamore Canyon, Arroyo Sequit, Malibu Creek, Topanga Canyon, Solstice
Mojave Rim	Los Angeles River, San Gabriel River, Santa Ana River (multiple subpopulations)
Santa Catalina Gulf Coast	San Juan Creek, San Mateo Creek, San Onofre Creek, Santa Margarita River, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, Otay River, Tijuana River

[1] Population delineations in these groups may be split too finely if there is significant dispersal of fish among neighboring coastal watersheds. For discussion see Boughton *et al.* 2006.

APPENDIX D

SOUTHERN CALIFORNIA STEELHEAD RECOVERY PLANNING AREA THREATS ASSESSMENT (CAP WORKBOOK) METHODOLOGY

Introduction

The Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) contracted with Hunt & Associates Biological Consulting Services to provide technical support in developing Recovery Plans for *Oncorhynchus mykiss* populations in the Southern California Coast Steelhead Recovery Planning Area. Hunt & Associates (2008a, 2008b) was tasked with reviewing existing information on *O. mykiss* habitat conditions, assessing the magnitude and extent of threats to *O. mykiss* and their habitats, and developing recovery actions across the Southern California Coast Recovery Planning Area. This document summarizes the methodology used to assess *O. mykiss* threats and sources of threats in Southern California coastal watersheds from the Santa Maria watershed of Santa Barbara County southward to the Tijuana River watershed in San Diego County. Specifically, this document details the use of modified Conservation Action Planning Workbooks to assess watershed and life stage specific threats and threat sources for Southern California Coast *O. mykiss*. CAP workbooks have been developed previously for salmonid threat assessment and recovery planning for southern Oregon and northern California coast coho salmon as well as south-central and southern California steelhead. However, previous *O. mykiss* threat assessment workbooks, described in Kier Associates and National Marine Fisheries Service (2008b), were not inclusive of all watersheds within the Southern California Coast Recovery Planning Area or all available environmental data and information. The CAP workbook analysis results presented in this Recovery Plan builds on information presented in these earlier versions.

Methods

The Conservation Action Planning (CAP) Workbook is a database tool developed by The Nature Conservancy to identify conservation targets, assess existing habitat conditions, and identify management issues for target populations. CAP is a Microsoft Excel-based tool that facilitates the assessment of aquatic habitat quality and human-caused threats to that habitat. The CAP Workbook process uses available information in an explicit, consistent, and transparent way, to assess current habitat conditions. The CAP Workbook allows the user to input quantitative as well as qualitative (including best professional judgment) information in order to determine what existing conditions are and what healthy targets should look like. Once data are entered, the CAP workbook then links the observed aquatic habitat conditions to watershed conditions, provides a prioritized list of threats, and provides a summary of overall watershed health. The CAP Workbooks can be used to organize and evaluate large amounts of information on current *O. mykiss* habitat conditions and threats in selected watersheds. The Workbook is iterative and should be updated as additional information becomes available.

The CAP Workbook methodology provides a number of useful features in assessing the magnitude and extent of threats to *O. mykiss* and their habitats in that it:

- Incorporates both quantitative and qualitative (*e.g.*, professional judgment) measures of existing habitat conditions;

- Is an objective, consistent tool for tracking changes in the status of each conservation target (i.e., *O. mykiss* life history stage) over time and between watersheds;
- Provides an overall assessment of a watershed's "health" or viability and objective comparisons to other watersheds;
- Focuses recovery actions by identifying past, current, and potential threats to *O. mykiss* and their habitats;
- Becomes a central repository for documenting and updating knowledge and assumptions about existing conditions; and
- Creates a foundation upon which recovery actions can be tracked and up-dated, based on changing current conditions.

Thirty-four out of 46 coastal watersheds were identified as supporting historical and extant *O. mykiss* populations within the SCS Recovery Area (Boughton *et al.* 2006, Becker *et. al.* 2008, Sleeper 2002, Titus *et al.* 2010, M. Larson, personnel communication 2007-2010). Of the thirty-four coastal watersheds, 26 were selected for threats assessment analysis. A separate CAP Workbook was created for each of the 46 component drainages (Table D-1). Information on existing *O. mykiss* habitat conditions in each watershed was gathered from a broad range of published and unpublished materials, including, peer-reviewed scientific publications, technical reports, federal, state, and local planning documents, EIS/EIRs, management plans, passage barrier assessments, habitat evaluations, and field surveys, as well as information provided by NOAA-NMFS staff, and stakeholders and other interested parties at a series of public workshops held in 2007. These sources are listed in the bibliography at the end of this document.

The CAP workbook data base organized data around several basic categories for analysis; these include conservation targets and related key ecological attributes.

Conservation Targets. Specific "conservation targets" for analysis within a CAP workbook must be identified by the user. The conservation targets in this case were *O. mykiss* life history stages: egg, fry, smolt, and adult. A more general conservation target, "Multiple Life Stages", was also established to allow landscape-scale land use and habitat assessment, based on information derived from GIS-based analysis of entire watersheds.

Key Ecological Attributes (KEAs). Assessing the "viability" or "health" of a particular conservation target (i.e., life history stage) required identifying "Key Ecological Attributes" (KEA) for each target. Specific KEAs are aspects of the conservation target's biology or ecology such that if missing or severely degraded, would result in loss of that target over time. KEAs, such as substrate quality, non-native species, food availability, water quality, *etc.*, were identified for each target and measurable indicators, such as turbidity, water temperature, aquatic invertebrate species richness, presence or absence of non-native predators, miles of road/square mile of watershed, *etc.*, were identified in order to characterize existing conditions in the component watersheds.

All KEAs were grouped into three categories:

- *Size*: target abundance (*e.g.*, number of adult *O. mykiss*);
- *Condition*: a measure of the biological composition, structure, and biotic interactions that characterize the target's occurrence (i.e., generally a local measure of habitat quality or composition), and;

- *Landscape Context*: an assessment of the target's environment (*i.e.*, landscape-scale processes, such as connectivity, accessibility of spawning habitat; hydrology).

Because of the lack of consistent data regarding many key ecological attributes for most of the watersheds,, as well as the lack of established reference values for parameters such as water temperature, the threat assessment utilized the presence threat sources such as physical passage barriers such as dams, extent of surface and groundwater extractions, agricultural and urban development, flood control facilities, mining and quarrying operation, and non-native, invasive species to evaluate threats to steelhead, and the overall condition of individual watersheds. This assessment was used to identify recovery actions which target these threat sources.

The following table provides an inventory of the watersheds for which CAP workbooks were developed, organized by the five Biogeographic Population Groups of the Southern California Steelhead Recovery Planning Area.

Table D-1. Southern California Steelhead Recovery Planning Area Component Biogeographic Population Groups, Watersheds, and Corresponding CAP Workbooks.

BPG	Watershed	CAP Workbook
Monte Arido Highlands	Santa Maria River	Mainstem Santa Maria River
		Cuyama River
		Sisquoc River
	Santa Ynez River	Mainstem Santa Ynez River (lower, middle, and upper)
	Ventura River	Mainstem Ventura River
		Coyote Creek
		Mainstem Matilija Creek
		North Fork Matilija Creek
		San Antonio Creek
	Santa Clara River	Mainstem Santa Clara River
		Santa Paula Creek
		Sespe Creek
		Piru Creek
Conception Coast	Jalama Creek	Jalama Creek
	Canada de Santa Anita	Canada de Santa Anita
	Gaviota Creek	Gaviota Creek
	Arroyo Hondo Creek	Arroyo Hondo Creek
	Tecolote Creek	Tecolote Creek
	Goleta Slough	San Jose, Atascadero, San Pedro & Maria Ygnacio creeks
	Mission Creek	Mission Creek
	Montecito Creek	Montecito Creek
	Carpinteria Creek	Carpinteria Creek
	Rincon Creek	Rincon Creek
Santa Monica Mountains	Big Sycamore Canyon Creek	Big Sycamore Canyon Creek
	Arroyo Sequit	Arroyo Sequit
	Malibu Creek	Malibu Creek
	Las Flores Canyon Creek	Las Flores Canyon Creek
	Topanga Canyon Creek	Topanga Canyon Creek
Mojave Rim	Los Angeles River	Mainstem Los Angeles River
		Arroyo Seco
	San Gabriel River	Mainstem San Gabriel River
		East Fork San Gabriel River
		West Fork San Gabriel River
	Santa Ana River	Mainstem Santa Ana River
		Lytle Creek
		Mill Creek
Santa Catalina Gulf Coast	San Juan River	San Juan River/Trabuco Creek
	San Mateo Creek	San Mateo Creek
	San Onofre Creek	San Onofre Creek
	Santa Margarita River	Santa Margarita River
	San Luis Rey River	San Luis Rey River
	San Dieguito River	San Dieguito River
	San Diego River	San Diego River
	Sweetwater River	Sweetwater River
	Otay River	Otay River
	Tijuana River	Tijuana River

Current Indicators. The range of variation found for each indicator was then subdivided into four somewhat subjective, but discrete, categories: "Poor", "Fair", "Good", or "Very Good". The current condition of a specific indicator, taken from a field measurement, literature source, or professional judgment, is assigned to one of these four discrete rating categories. A description of indicators used in the CAP steelhead analyses and the rationale for these indicators is available in Kier Associates and National Marine Fisheries Service (2008). Functionally, however, we assumed that there are essentially two states for an indicator as it relates to the target: 1) "poor-fair", in which the indicator exceeds or minimally meets the requirements for species survival and the population is in danger of extirpation, and 2) "good-very good", where habitat conditions are favorable for species persistence.

The CAP Workbook can use indicators at a local, regional, and landscape-scale. For example, land use indicators, such as density of roads per square mile of watershed, has been widely employed as a landscape-scale metric of watershed "health" for salmonids throughout the western United States (see Kier Associates and NMFS, 2008b). These landscape-scale metrics were used in this threat assessment to overcome logistical and analytical problems inherent in local-scale metrics of *O. mykiss* habitat quality (*e.g.*, water temperature), that exhibit extreme spatial and temporal variation, which can lead to misinterpretations.

The goal of establishing measurable indicators in a number of instances was not possible with the current knowledge of existing habitat conditions in the component watersheds. For example, turbidity is known to be an important habitat indicator for *O. mykiss*. For the *O. mykiss* fry life stage, turbidity was defined as the "number of days turbidity exceeded 25 NTUs"[1]. Currently, there is little or no systematic and widespread collection of turbidity data in most of the subject watersheds drainages to permit a quantitative assessment of this indicator. In these instances, subjective information, such as observations of mass wasting of slopes, descriptions of point and non-point sediment inputs, *etc.*, were used to qualitatively assess a current condition and rating for this indicator. Because the CAP Workbook analysis is iterative, results can be improved as better quantitative information becomes available.

Stresses and Sources of Stress (Threats). An important step in the CAP Workbook assessment, and the purpose of these analyses, is identification of a series of stresses to each *O. mykiss* life history stage. These stresses are basically altered KEAs, *e.g.*, degraded hydrologic function, increased turbidity, presence of non-native predators, increased substrate embeddedness. Because of the lack of field derived information on specific habitat requirements and specific habitat conditions, the GIS-based surrogate variables used for the "Multiple Life Stages" conservation target actually are sources of stress, not direct stressors on *O. mykiss* life stages; for example,, increased road density (a source of stress) contributes indirectly to increased turbidity (a direct stressor). The severity (very high, high, medium, or low) and geographic scope (very high, high, medium, and low) of each stress was determined through a review of existing information. The CAP Workbook then assigns an overall stress rank (very high, high, medium, or low) to that stress.

The CAP Workbook automatically inputs the overall rank of each stress into a table that relates the stress to a series of anthropogenic sources of stress (also called Threats) that have been identified by the user as relevant to that watershed (*e.g.*, roads, grazing practices, logging, recreational facilities, agricultural conversion of watershed lands, dams, groundwater extraction, in-channel mining, *etc.*). Each threat is ranked on the basis of its relative "contribution" (very high, high, medium, or low) and "irreversibility" (very high, high, medium, or low) to each stress (*e.g.*, increased turbidity). The CAP Workbook then ranks

[1] Nephelometric Turbidity Unit.

the threat (source of stress) as "Very High', "High", "Medium", or "Low" and inputs that rank into the next step of the assessment. This process is repeated for each conservation target (egg, fry, juvenile, smolt, and adult), as well as the "Multiple Life Stages" conservation target.

Summary of Threats. The CAP Workbook ranks the threat sources for each conservation target (*i.e.*, life history stage) from the previous analysis into a "Summary of Threats" table that lists all the threat sources for all life history stages and assigns a composite "Overall Threat Rank" to each threat source (*e.g.*, dams and surface water diversions), as well as an overall threat rank to that watershed for all threat sources combined. The Workbook derives a second table ("Stress Matrix") that shows the rank of each stress on each life history stage. The final step in the steelhead CAP assessment is the derivation of a third table entitled, "Overall Viability Summary", that ranks the viability of each life history stage and KEA category (size, condition, and landscape context) by calculating a composite rank of the current habitat indicators from the "Viability" table of the workbook, as well as an overall "Project Biodiversity Health Rank", which is a measure of watershed "health" based on current habitat conditions. The first and third summary tables proved the most useful in analyzing stresses and sources of stress to *O. mykiss* in the Southern California Coast Steelhead Recovery Planning Area.

Data Gaps. The tables in the CAP Workbooks for the present study have numerous blank cells. Blank cells indicate a lack of available information. Watersheds that have been intensively studied have fewer blank cells than watersheds with few studies. In general, the level of available information on current watersheds conditions relevant to *O. mykiss*, with a few notable exceptions, decreased dramatically south of the Santa Monica Mountains (*e.g.*, the Mojave Rim Biogeographic Population Group watersheds and most of the Orange and San Diego county watersheds). However, an important feature of the CAP Workbook methodology is the ability to update the assessment as information becomes available.

The CAP Workbook analysis of Southern California *O. mykiss* prepared by Hunt & Associates was intended to build on those prepared previously by Kier Associates. Hunt & Associates' workbooks are based on review of a large number and broad range of ground-based *O. mykiss* surveys, habitat and barrier assessments, and other fieldwork, as well as the GIS-based indicators for the "Multiple Life History" target category developed by Kier Associates. Hunt & Associates developed CAP Workbooks for each of the 46 watersheds in the Southern California Coast Steelhead Recovery Planning Area. Kier Associates analyzed 31 of these watersheds, using the GIS-based regional indicators and a small number of point-data measurements (e.g., dissolved oxygen, water temperature, *etc.*). Kier Associates' workbooks are provided in a separate document (Kier Associates and NMFS, 2008b).

Table D-2 compares the results of the two documents for watersheds in the Southern California Coast Steelhead Recovery Planning Area. It should be noted that the difference between a "poor" and "fair" habitat rating and a "good" and "very good" rating was often a matter of professional judgment and may not always represent ecologically important differences in habitat quality. Table D-2 compares the discrepancies between "poor-fair" and "good-very good" categories between the Hunt & Associates and Kier Associates CAP Workbook analyses.

Discrepancies typically could be explained by the type (point-data measurements) and the number of indicators used in the analysis by Kier Associates versus Hunt & Associates. As the number of indicators decreases, the relative weight given to each indicator in the analysis correspondingly increases, and if these indicators are based on point-data measurements, such as water temperature or dissolved oxygen, that exhibit extreme spatial and temporal variation, then different results can be obtained. Aside from these relatively few specific differences, the results of the two assessments closely agree.

Further refinement of individual threat severity and threat sources in specific watersheds was conducted for these threat assessments by using information from NOAA staff familiar with these watersheds to override individual assessments.

Table D-2. Assessment of Overall Habitat Conditions for Steelhead in Component Watersheds in the Southern California Coast Steelhead Recovery Planning Area Between Two CAP Workbook Analyses*

WATERSHED	Steelhead Habitat Rating		Reasons for Discrepancy**
	Hunt & Associates	Kier Associates	
Santa Maria River			N/A
Santa Ynez River			fewer number of indicators used in the Kier analyses
Ventura River			fewer number of indicators used in the Kier analyses
Santa Clara River			N/A
Gaviota Creek			fewer number of indicators used in the Kier analyses
Arroyo Hondo			Hunt & Associates rates passage barrier at Highway 101 as severe, but being re-designed for fish passage. Override function used to rate this relatively undisturbed watershed as “good”
Tecolote Creek			fewer number of indicators used in the Kier analyses
Goleta Slough			fewer number of indicators used in the Kier analyses
Mission Creek			fewer number of indicators used in the Kier analyses
Montecito Creek			fewer number of indicators used in the Kier analyses
Carpinteria Creek			fewer number of indicators used in the Kier analyses
Rincon Creek			fewer number of indicators used in the Kier analyses
Big Sycamore Creek			fewer number of indicators used in the Kier analyses
Arroyo Sequit			fewer number of indicators used in the Kier analyses
Malibu Creek			N/A
Las Flores Canyon Creek			N/A
Topanga Canyon Creek			N/A

Los Angeles River			N/A
San Gabriel River			N/A
Santa Ana River			N/A
San Juan/Trabuco Creek			N/A
San Mateo Creek			fewer number of indicators used in the latter analyses
San Onofre Creek			fewer number of indicators used in the latter analyses
Santa Margarita River			fewer number of indicators used in the latter analyses
San Luis Rey River			fewer number of indicators used in the latter analyses
San Dieguito River			fewer number of indicators used in the latter analyses
San Diego River			fewer number of indicators used in the latter analyses
Sweetwater River			fewer number of indicators used in the latter analyses
Otay River			fewer number of indicators used in the latter analyses
Tijuana River			fewer number of indicators used in the latter analyses

Key: dark green = very good conditions; light green = good conditions; yellow = fair conditions; red = poor conditions.

**Overall habitat condition rating taken from "Project Biodiversity Health Rank" rating in "Overall Viability Summary" table in Summary section of individual CAP Workbooks (composite rating of habitat conditions for all steelhead life history stages combined). Many of the watersheds exhibit higher quality habitat conditions in portions of the watershed (particularly in upper tributaries, or publically owned reaches) than the overall ranking indicates; however, conditions for the anadromous form of O. mykiss in these watersheds is generally fair to poor as evidenced by the severely depressed (or in some cases irregular, or non-existent) annual run size of anadromous O. mykiss.*

***Pervasive discrepancies between Hunt & Associates vs. Kier Associates "poor" and "fair" categories here are due to fewer number of indicators used in the latter analyses. Watersheds analyzed only by Hunt & Associates are not shown.*

The full CAP Workbooks, with references, are available upon request to NOAA Fisheries Southwest Regional Office, Long Beach, CA.

APPENDIX E

RECOVERY ACTION COST ESTIMATES FOR STEELHEAD RECOVERY PLANNING

Introduction

The ESA provides that "recovery plans, shall, to the maximum extent practicable . . . incorporate in each plan . . . (iii) . . . estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal." NMFS interim recovery planning guidance (2010) further provides that, "There may be extreme cases in which estimating the date and cost to recovery is not possible due to uncertainty in what actions will need to be taken to recover the species." The precision of any recovery cost estimate is necessarily governed by the specificity of the recovery action, and the availability of information regarding the costs of individual components of that recovery action (labor, materials, logistics, geographic scope and duration, etc.).

As noted in the Recovery Plan, there are many uncertainties regarding the recovery of southern California steelhead, ranging from fundamental biological questions about the ecology of the species, to anticipated changes in climate. The Recovery Plan identifies categories of systemic threat sources within individual watersheds across the DPS but, because of the large number of individual threats (from site-specific activities to general land-use practices), does not provide a detailed assessment of each specific threat, and in many cases calls for further investigations to more clearly characterize and assess threats which are believed to be of particular significance for the conservation of the species (*e.g.*, fish passage barrier inventories, flows restrictions, introduction exotic species, and degradation of estuarine and other habitat types). Because of the uncertainties regarding specific aspects of the life history of steelhead (*e.g.*, relationship between anadromous vs. resident reproductive life history cycles), the Recovery Plan also provides provisional viability, delisting and downlisting criteria, and identifies important research and monitoring needed to better illuminate the biological requirements of the species and thereby better refine the viability, delisting and downlisting criteria, and related recovery actions.

The recovery action tables (Tables 9-4 through 13-10) developed for each BPG within the DPS identify broadly conceived recovery actions for each major threat source in all the core populations (as well as providing a priority ranking for recovery action within each core watershed). These recovery actions are based on the general recovery action descriptions contained in Chapter 8, Summary DPS-Wide Recovery Actions, Table 8.2 (Recovery Action Glossary). However, implementation of the recovery actions will require detailed background studies, and in some cases, engineering and other types of site-specific plans and/or environmental documentation, to further refine the nature, scope and other relevant details of the recovery action. Within the limits of these information constraints, an effort has been made to identify, within an order of magnitude, the estimated cost of the basic types of recovery actions.

Cost Estimation Methodology

The following describes the methods by which cost of individual types of recovery actions were estimated.

NMFS's Southwest Region has utilized a series of assumption tables for costs derived initially from the Southwest Region's *Habitat Restoration Cost References for Salmon Recovery Planning* (Thompson and Pinkerton 2008). These assumption tables have been adjusted to the extent practicable to reflect conditions in southern California, and applied across the DPS.

The "Cost of Doing Business" is estimated on a staff-time basis. When staff is required for review only, the cost is attributed to the initial fiscal year; when implementation is intended, the staff time is annually attributed across the projected duration of the recovery action. All other costs are estimated on a per project, per area, or per distance basis.

Finally the cost estimates provided in the cost assumption tables are the direct costs of implementing each recovery action, and do not reflect indirect costs, or benefits (*e.g*., benefits to the local economy stemming from restored habitats that support recreational activities, reducing flood hazards, improving water quality, etc.).

Agricultural Development

The costs for implementing a plan to minimize runoff from agricultural activities were derived by estimating the number of river or stream miles running through agriculturally-zoned or agriculturally-designated lands in each BPG using Geographic Information Systems (GIS). After applying a cost per linear mile, project costs were then projected over a twenty-year period. (See Assumptions and Categories Tables 15 and 19.)

Dams and Diversions

The costs to execute recovery actions associated with dams and diversions were calculated using the CalFish.org mapping tool. This tool allows the determination of the number of dams/diversions across the BPG and assigns costs according to passage barrier severity. While this method may be useful for small dams and diversion, the modification or removal of large dams is highly dependent on site-specific conditions and cannot be accurately estimated without extensive technical and planning studies. (Refer to Assumptions and Categories Tables 4 and 5 for cost identities).

Other Passage Barriers

Culvert replacement costs were calculated based on the assumption that a minimum of one culvert would need to be replaced in each identified watershed, or sub-watershed, annually for the first five years of Recovery Plan implementation. (See Assumptions and Categories Table)

Groundwater Management

Groundwater management costs are made based on hiring one staff scientist to assess current groundwater management practices, and identify steps, if necessary, to modify practices to address potential threats. After the first year, the scientist position is dropped to 'Cost of Doing Business". Sediment assessments are initially calculated by stream length and then on a per mile basis. (See Assumptions and Categories Tables 1, 2, and 19.)

Flood Control

The costs for levee and channelization-related recovery actions are estimated by using GIS to perform a dimensional analysis of parameters such as stream length, acreage, etc. Based on these results, costs are assigned on a per mile or per acre basis. As with large dams and diversion, while this method may be useful for facilities, the modification removal of large flood control works is highly dependent on site-specific conditions and cannot be accurately estimated without extensive technical and planning studies. Federal, state and local flood control works, as well as actions such as "minimize herbicide use near levees" are considered to be "Cost of Doing Business". (See Assumptions and Categories, Tables 1, 12 and 13.)

Mining and Quarrying

The cost estimates for aggregate mining operations are made based on hiring one staff biologist to make an initial assessment of current mining practices, and identify steps, if necessary, to modify practices to address potential threats. After the first year, the position is considered to be 'Cost of Doing Business". (See Assumptions and Categories, Tables 1 and 2).

Non-Native Species

Non-native species recovery actions consist of several distinct activities, including assessment, control, education and outreach, as well as development of monitoring programs. The costs for controlling and removing non-native species are derived on a per acre basis and a staff time scenario. The education and outreach costs are based on per program scenarios. The monitoring program costs were based on hiring a biological scientist for one year to develop a monitoring program, and then transitioning that cost into a "Cost of Doing Business" scenario. (See Assumptions and Categories, Tables 2, 17 and 18.)

Urban Development

The costs for recovery actions focused on urban development threat sources were calculated based on the hiring of an Urban Regional Planner under a staff-time scenario for the first year. To assess the adequacy of current land-use planning standards and programs, and to identify step, if necessary, to address potential inadequacies. After the first year, the cost reverts to "Cost of Doing Business". Managing effluents and storm drains were considered to be annual maintenance scenarios and "Cost of Doing Business". (See Assumptions and Categories, Table 1.)

General Planning

The costs associated with reviewing and updating General Plans or Local Coastal Plans, and more focused plans such as transportation, recreation, and water quality plans were all considered to be "Cost of Doing Business". (See Assumptions and Categories, Table 1.)

Wildfires

Public agencies are assumed to be responsible for fuel and equipment required for wildfire planning and management, as is required by the Endangered Species Act for the protection of listed species, including steelhead. Therefore, all costs associated with wildfire planning and management throughout the DPS are considered to be "Cost of Doing Business". (See Assumptions and Categories, Tables 1 and 2.)

Upslope/Upstream Activities

The costs for estuarine restoration recovery actions designed to deal with a variety of upslope/upstream activities were made on a per acre basis using a staff-time scenario. Costs are based on a combination of GIS dimensional analysis to determine currently existing estuarine areas as well as factoring in the percentage of historical estuarine area that still remains. The restoration of coastal estuaries is highly dependent on site-specific conditions and cannot be estimated without extensive technical and planning studies. (See Assumptions and Categories, Tables 2 and 16.)

Regional Cost Estimate Tables: Categories and Assumptions

Table 1. Cost of Doing Business (CDB)

Action Type	Cost Representation
CDB: Enough Staff Available	0
CDB: Inadequate Funding/Staff	0[1]
Over and Above CDB	FTEs[2]

[1]Defer to IRM action where additional FTEs accounted for
[2] See Bureau of Labor Statistics, FTE assumption table (2008) for costs.

Table 2. Staff Time[2]

Occupation	Wage[1] ($/hr.)	Annual Wage ($/FTE)
Biologist	33	68030
Biologist Technician	20	40900
Fish and Game Warden	27	56030
Police/Sheriff Patrol Officers	25	52810
Forest Fire Inspectors/ Prevention	18	36400
Forest and Conservation Workers	13	26110
Urban and Regional Planners	30	62400
Physical Scientists (all others)	44	91850

[1] Seasonal
[2] Source: Bureau of Labor Statistics, 2009

Table 3. Groundwater Management[1]

Action	Cost ($/gage) & ($/year)
Installation of State/Private Gage	26136
Installation of USGS Gage	29545
Annual Maintenance of State/Private Gage	7955
Annual Maintenance of USGS Gage	3409

[1] Source: Dem-WRB Streamflow Committee, 2004

Table 4. Fish Passage Improvement ($/Project)[1]

Stream Crossing	Land Use			
	Forest	Agriculture	Suburban	Urban
Tributary: Total Barrier	63,636	159,090	318,181	556,818
Tributary: Partial/Temporal Barrier	31,818	79,545	159,090	278,409
Stream : Total Barrier	159,090	381,818	556,818	795,454
Stream: Partial/Temporal Barrier	79,545	190,909	278,409	397,727

[1]Source: CDFG 2004 (p. 1-16)

Table 5. Dam Removal[1]

Dam Height	Cost ($/foot)
< 15’	568,181
>15’	17,045
unknown height: complete barrier	1,022,727
unknown height: partial/temporal/unknown barrier	511,363

[1] Source: CDFG 2004 (p. I.11)

Table 6. Bridge Construction[1]

Bridge Type	$/sq. ft. of decking
RC Slab	191
RC Box Girder	170
CIP/PS Slab	168
CIP/PS Box Girder	298
PC/PS "I" Girder	231
PC/PS Bulb "T" Girder	239
Average	216

Source: DOT, 2008.

Table 7. Replacing a Culvert

New Type of Crossing	Average Cost ($)
Bridge <40ft	51,546
Bridge >40ft	103,093
Bottomless/Open Bottom Arch	193,961
Natural Bottom Pipe Arch	215,776
Box Culvert	248,352

Source: NMFS 2008, p. 11-15

Table 8a. Road Upgrade/Road Decomissioning[1]	
Location	**Cost ($/mile)**
California	18,104
California	93,279
Table 8b. Road Construction (for relocation purposes)[2]	
Type of Road	**Cost ($/mile)**
Non paved: two directional 12' shared path	175,000
Undivided 2-lane rural road w/ 5' paved shoulders	1,713,000

[1] Source: NMFS 2008, p. 43-44
[2] Source: DOT 2010

Table 9. New Fish Ladder[1]	
Waterway Size	**Cost ($)**
Large	1,022,727
Small	568,181

[1] Source: NMFS 2008, p. 9

Table 10. Culvert Replacement ($/Culvert)[1]

Size of Waterway	Road Type			
	Forest Road	Minor 2 Lane	Major 2 Lane	Hwy 4+ Lane
Small (0-10')	31,976	87,209	174,419	319,767
Medium (10-20')	87,209	220,930	319,767	436,047
Large (20-30')	133,721	267,442	406,977	813,953

[1]Source: NMFS 2008, p. 10

Table 11. Storm Drain Retrofit[1]

Action	Cost ($/filter) or ($/program)
Catch Basin/Filter Installation	98
Annual Maintenance Program	6452

[1]Source: Kosciusko County 2002

Table 12. LWD/Instream Restoration[1*]	
Stream Type	**Cost ($/mile)**
Small, Rocky	68,182
Large, Rocky	159,091

[1]Source: CDFG 2004, p. 1.23 – 1.24
**includes 5 yrs. of monitoring/maintenance and 10% administrative fee*

Table 13. Channel Restoration[1]	
Type	**Cost ($/mile)**
Large scale reach restoration	4,217,623

[1]Source: NMFS 2008, p. 27

Table 14. Riparian Planting			
Materials/Site Accessibility	**Site Preparation Costs ($/acre)[1]**		
	Flat/Light Clearing	**Average Clearing**	**Steep/Heavy Clearing**
Low Cost	17,442	40,698	93,023
Medium Cost	26,163	63,954	110,465
High Cost	46,512	78,488	1,366,279

[1] Source: NMFS 2008, p. 32

Table 15. Bank Stabilization[1]	
Distance From Road (miles)	**Cost ($/foot)**
0.25 - 0.5	284
0.5 - 1	313
1 - 2	341
2 - 3	369
> 3	398

[1]Source: NMFS 2008, p. 38

Table 16. Estuary Restoration[1]	
Project Type	**Cost ($/acre)**
Small: tide gate removal, culvert upgrade, tidal salt marsh restoration	6000
Medium: automated tide gates, culverts, 500 feet of new dikes	67000
Large: automated tide gates, excavation of fill, re-vegetation	20000

[1]Source: Coastal Resources Management Council 2010

Table 17. Education and Outreach Programs[1]	
Type	**Cost ($)**
General Education and Outreach	76,136
Coho Specific Education	55,682

[1] Source: CDFG 2004, p. 1.42

Table 18. Removal of Invasive Plant Species	
Invasive Species	**Cost ($/acre)**
Average	8028

[1]Source: Neil 2002
[2]Source: Bennet 2007 (average cost)
[3]Source: U.S. FWS 2001
[4]Source: Northern California Conservation Center 2010

Table 19. Sediment Assessments[1]	
Location	**Cost ($/mile)**
Average all assessments in CA	1,240

[1]Source: NMFS 2008, p. 61-62

Table 20. BPG: Core 1 and 2 Population Cost Estimates

BPG: Core 1 and 2 Population Cost Estimate

BPG	FY 1-100 Total Costs	Core 1 Populations	Core 1 FY 1-100 Costs	Core 2 Populations	Core 1 + 2 FY 1-100 Costs
Monte Arido	905,765,708	Santa Maria, Santa Clara, Santa Ynez, Ventura	598,092,098	No Core 2 Identified	N/A
Conception Coast	496,776,819	Mission, Carpinteria, Rincon	178,635,055	Goleta & Gaviota	358,983,979
Santa Monica Mountains	125,825,465	Malibu, Topanga	49,591,810	Arroyo Sequit	72,512,230
Mojave Rim	261,428,356	San Gabriel Mainstem	120,068,707	Santa Ana	176,623,694
Santa Catalina Gulf Coast	344,666,136	San Juan, San Luis Rey, San Mateo, Santa Margarita	149,990,421	San Onofre, San Dieguito	262,473,286

Funding Recovery Actions

Many of the recovery actions identified in the recovery action tables are intended to restore basic ecosystem processes and function such as more natural hydrologic conditions, water quality, and riparian and estuarine habitats. These actions will, in many cases, serve to restore multiple native species and associated human uses of these natural resources. As a result, such activities may be eligible for funding from multiple funding sources at the federal, state, and local levels.

Federal funding sources include:

- NOAA/NMFS Restoration Center Community-Based Restoration Program
  NOAA/NMFS Restoration Center Open Rivers Initiative
- NOAA/NMFS Proactive Species of Concern Grant Program
- NOAA National Sea Grant College Program
- NOAA Coastal and Estuarine Land Conservation Program
- NOAA/ACOE/USFWS/EPA/NRCS Estuary Habitat Restoration Program
- EPA Wetlands Protection Grants and Near Coastal Waters Programs
- US. Department of Transportation Highway Bridge Rehabilitation and Replacement Program
- U.S. Fish and Wildlife Service National Coastal Wetlands Conservation Grant Program
- U.S. Fish and Wildlife Service Coastal Program
- U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program
- U.S. Fish and Wildlife Service North American Wetland Conservation Act
- National Resource Conservation Service
- Federal Highway Administration – Road Aquatic Species Passage Funding

State funding sources include:

- California Department of Fish and Game Pacific Coast Salmon Restoration Fund
- California Coastal Conservancy Proposition 84 Funds

- California Coastal Conservancy Southern California Wetlands Recovery Project Community Wetland Restoration Grants
- California Wildlife Conservation Board
- California State and Regional Water Quality Control Board Clean Water Grant Program
- California Integrated Watershed Management Grant Program Proposition 50 Funds
- California Department of Parks and Recreation Habitat Conservation Fund
- CalTrans Environmental Enhancement and Mitigation Program
- U.C. California/NOAA California Sea Grant College Program

In addition to federal and state funding sources, there are also numerous private national, regional and local funding sources for southern California habitat restoration projects, such as:

- National Fish and Wildlife Foundation
- Santa Barbara County Coastal Resource Enhancement Fund
- Santa Monica Bay Restoration Commission Proposition Prop 84 Grant Program
- San Diego Association of County Governments TransNet Environmental Mitigation Program

Many of these grant programs also offer technical assistance, including project planning, design, permitting, monitoring. Additionally, regional personnel with NOAA, California Department of Fish and Game, and the U.S. Fish and Wildlife Service can provide assistance and current information on the status of individual grant programs.

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