



Southern California Steelhead Recovery Plan Summary



Adult Female Steelhead, Mission Creek, Santa Barbara County



**National Marine Fisheries Service
Southwest Regional Office
Long Beach, CA**

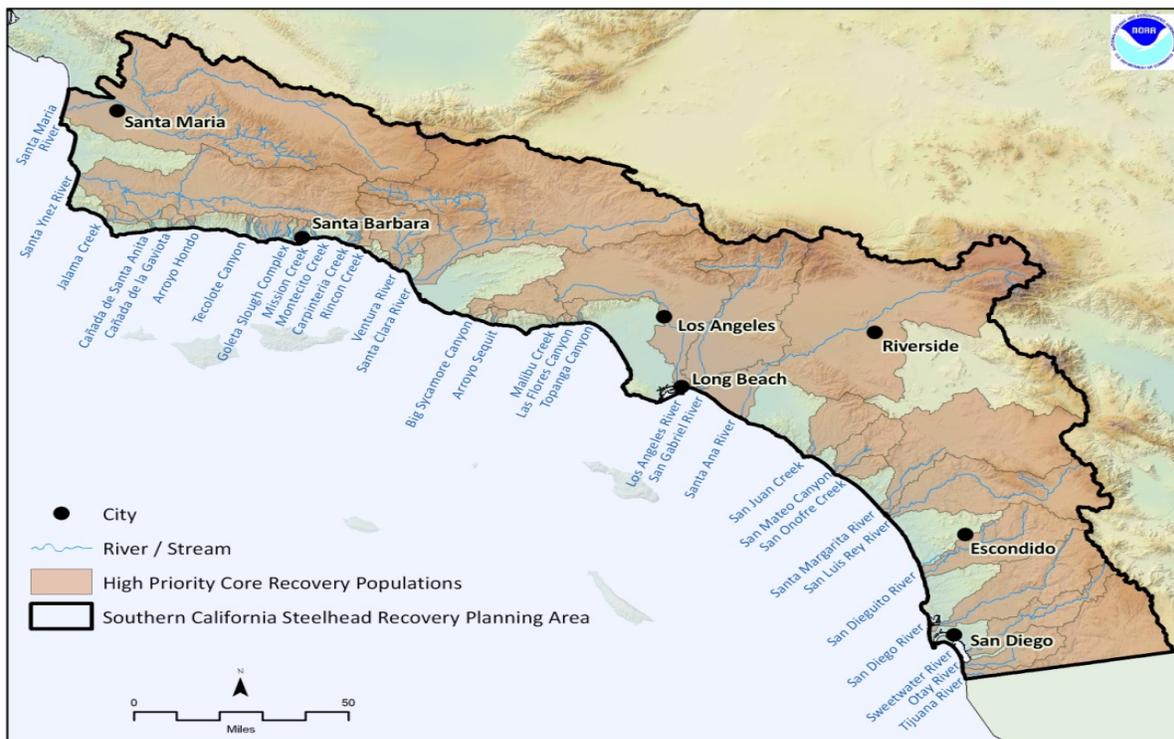
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Introduction

Steelhead are the anadromous, or ocean-going, form of the species *Oncorhynchus mykiss*. Steelhead are one of six Pacific salmon species that are native to the west coast of North America, and are currently the only species of this group that naturally reproduces within the coastal watersheds of southern California. Because steelhead employ several different life-history strategies that exploit all portions of a river system, they serve as an indicator of the health of southern California watersheds. Southern California steelhead populations have declined precipitously, largely due to extensive watershed development.

Following a comprehensive status review of all West Coast steelhead populations by the National Marine Fisheries Service (NMFS), southern California steelhead were listed as an endangered species under the Endangered Species Act (ESA) on August 18, 1997; the range of the listed steelhead was extended to the U.S.-Mexico Border in 2002. Following a status review in 2005, a final listing determination was issued on January 5, 2006 for the Southern California Steelhead Distinct Population Segment (DPS); critical habitat was also designated within 32 DPS watersheds.

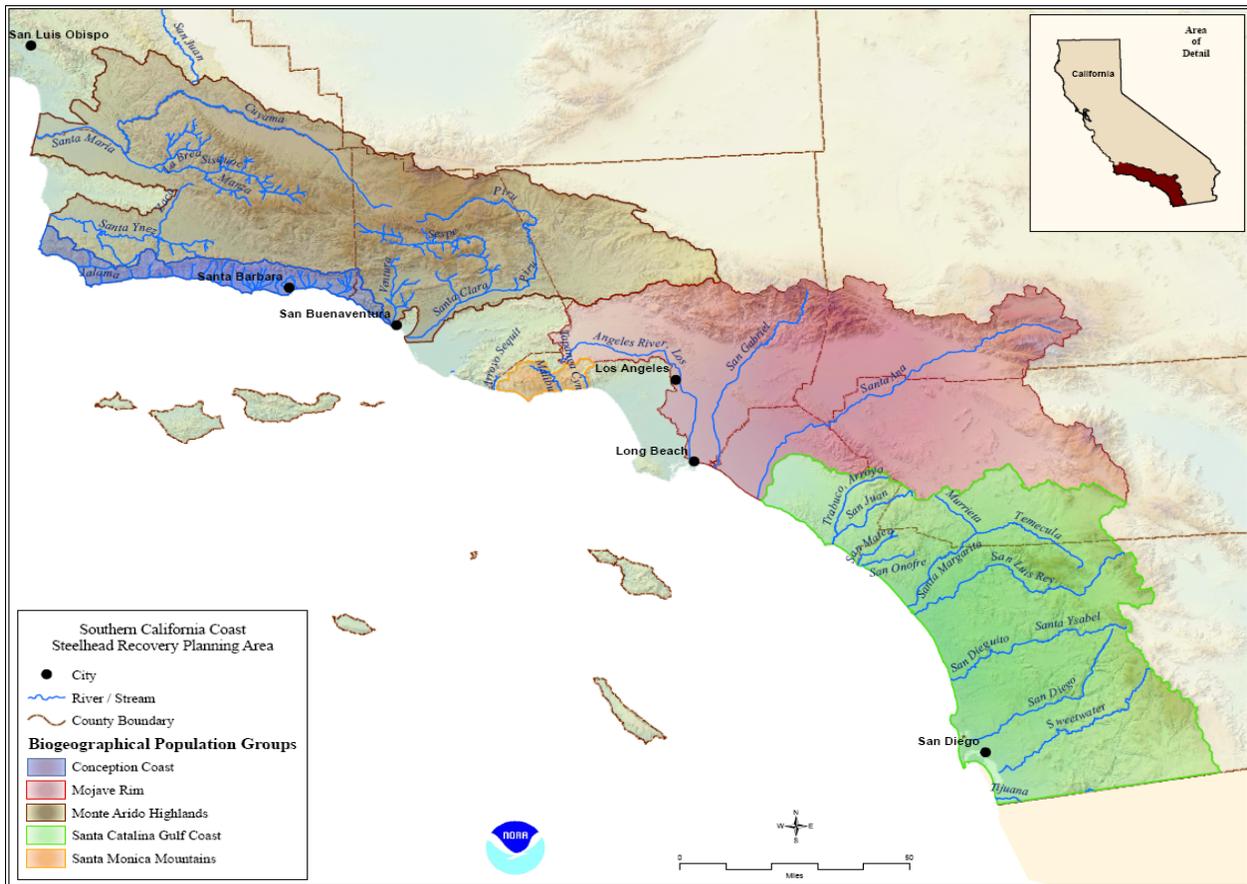
The Southern California Steelhead (SCS) Recovery Planning Area extends from the Santa Maria River to the Tijuana River at the U.S.-Mexico border. It includes both those portions of coastal watersheds that are at least seasonally accessible to steelhead entering from the ocean, and the upstream portions of watersheds that are currently inaccessible to steelhead due to man-made barriers but were historically used by steelhead. Major steelhead watersheds in the northern portion of the SCS Recovery Planning Area include the Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers, and Malibu and Topanga Creeks. Major steelhead watersheds in the southern portion of the SCS Recovery Planning Area include the San Gabriel, Santa Margarita, San Luis Rey, San Dieguito, and Sweetwater Rivers, and San Juan and San Mateo Creeks.



The Southern California Steelhead Recovery Planning Area.

The Southern California Steelhead DPS encompasses all naturally-spawned anadromous *O. mykiss* between the Santa Maria River (inclusive) and the U.S.-Mexico border, whose freshwater habitat occurs below artificial or natural impassible upstream barriers, as well as *O. mykiss* residing above impassible barriers that are able to emigrate into waters below barriers and exhibit an anadromous life-history.

The SCS Recovery Planning Area is divided into five Biogeographic Population Groups (BPGs): Monte Arido Highlands, Conception Coast, Santa Monica Mountains, Mojave Rim and Santa Catalina Gulf Coast. Each BPG is characterized by a unique combination of physical and ecological characteristics that present differing natural selective regimes for steelhead populations utilizing the individual watersheds. The separate watersheds comprising each BPG are generally considered to support individual *O. mykiss* populations (*i.e.*, one watershed = one steelhead population). Thus, single BPGs encompass multiple watersheds and multiple *O. mykiss* populations.



The Southern California Steelhead Recovery Planning Area Biogeographic Population Groups.

The basic goal of the Southern California Steelhead Recovery Plan is to recover anadromous steelhead and ensure the long-term persistence of self-sustaining wild populations of steelhead across the DPS – and ultimately to remove southern California steelhead from the Federal List of Endangered and Threatened Wildlife. The Recovery Plan proposes to accomplish this goal by addressing factors limiting the species ability to survive and naturally reproduce in the wild within a set of core watershed populations distributed across the SCS Recovery Planning Area.

Environmental Setting

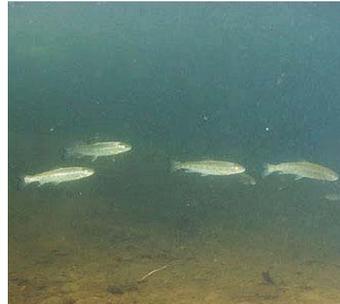
The SCS Recovery Planning Area is dominated by a series of steep mountain ranges and coastal valleys and terraces. Watersheds within the region fall into two basic types: those characterized by short coastal streams draining mountain ranges immediately adjacent to the coast and those watersheds containing larger river systems that extend inland through gaps in the coastal ranges. The SCS Recovery Planning Area has a Mediterranean climate, with long dry summers and brief winters with short, sometimes intense cyclonic winter storms. Significant portions of the upper watersheds within the SCS Recovery Planning Area are contained within four U.S. National Forests (Los Padres, Angeles, San Bernardino, and Cleveland National Forests).

Steelhead Biology and Ecology

Steelhead exhibit an anadromous life-history: juveniles born and reared in freshwater undergo a physiological change (smoltification) that allows them to migrate to and mature in saltwater before returning to their natal rivers or streams (streams where they were spawned) to reproduce and complete their life cycle. After maturing in the marine environment for two to four years, returning adults may migrate from several to hundreds of miles upstream to reach their spawning grounds. Once in spawning habitat, a female will excavate a nest, termed a “redd”, in streambed gravels where she deposits her eggs. After fertilization by the male, hatching time varies from about three weeks to two months, with the young fish emerging two to six weeks later. Adult anadromous steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more times.



Juvenile *O. mykiss* (~10 cm)
Santa Ana Creek



Smolt *O. mykiss* (~16 cm)
Carpinteria Creek



Adult *O. mykiss* (~76 cm)
Mission Creek

Within this basic life-history pattern, individuals may exhibit great variation in the time and location spent at each life-history stage. *O. mykiss* exhibit three basic life-history strategies: fluvial-anadromous (migration between freshwater and saltwater), lagoon-anadromous (migration to and from a brackish lagoon) and freshwater residency (remain in freshwater). The diversity of these life-history strategies has allowed *O. mykiss* to take advantage of different habitats and to persist in the highly variable and challenging southern California environment. Anadromous steelhead reach a larger size and produce more eggs per individual than typical freshwater resident *O. mykiss*; they can also spawn in non-natal streams and thus re-colonize watersheds whose populations have been extirpated. Lagoon-reared juveniles can attain a larger size in a single rearing season than freshwater-reared individuals, which enhances their survival in the ocean. However, freshwater-reared individuals, referred to as rainbow trout, may exhibit higher survival rates than ocean-reared individuals during poor ocean conditions, that can persist for multiple decades. Fish that exhibit any one of these life-history strategies can produce progeny that exhibit one or more of the other life-history strategies. The switching of life-history strategies is an important adaptive response to the highly variable environments characteristic of southern California watersheds.

Southern California Steelhead

For millennia, steelhead have been an integral part of southern California watershed ecosystems. The subsistence role of steelhead in pre-European settlement Native American cultures, however, is not as well understood as other marine species, and continues to be a subject of archeological and ethnographic research.



Ventura River Steelhead Anglers, 1909



Santa Ynez River Steelhead Angler, 1942

Up until the mid-1900s recreational steelhead angling was prevalent during the early to mid-1900s, and both steelhead and their progeny were sought out by recreational anglers - the ocean going steelhead pursued during the winter and the freshwater juveniles during the spring and summer angling seasons.

Following the dramatic rise in southern California's human population after WW II, and the associated land and water development in coastal watersheds, steelhead populations rapidly declined from an estimated 32,000 - 46,000 fish per year to less than 500 returning adults. While the steelhead populations declined sharply, most coastal watersheds retained populations of the non-anadromous form of the species, with many populations trapped behind dams and other impassible barriers.

Factors Leading to Federal Listing

There is no single factor responsible for the decline of southern California steelhead; however, the destruction and modification of habitat has been identified as one of the primary causes of the decline of the Southern California Steelhead DPS.

Approximately half of the population of the State of California currently lives and works within the SCS Recovery Planning Area, placing extraordinary pressure on natural resources. As a result, anadromous *O. mykiss* in southern California face significant threats from water and land management practices that have degraded or curtailed freshwater and estuarine habitats, reducing the capability of the anadromous form of *O. mykiss* to persist within many watersheds.

Water withdrawals and diversions for agriculture, flood control, domestic water supply and hydropower purposes have greatly reduced or degraded historically accessible habitat. Dams and other water control structures have blocked access to historically important spawning and rearing areas; modified flow regimes necessary for migration, spawning and rearing; increased downstream water temperatures; degraded riparian habitats; and reduced gravel recruitment essential to support spawning and invertebrate food sources for rearing juveniles.



Rincon Creek Estuary and Urban Development



Matilija Dam, Matilija Creek

Land-use and flood control activities associated with urban development, mining, agriculture, ranching, and recreation have significantly altered the quantity and quality of steelhead habitat in multiple ways. These include: alteration of stream banks; increases in ambient stream water temperatures; degradation of water quality through municipal and industrial waste discharges; removal of riparian vegetation resulting in increased stream bank erosion, loss of channel complexity, pool habitat, and increased sedimentation into spawning and rearing areas; and fragmentation of remaining habitats. The substantial increase of impermeable surfaces (including roads) as a result of urbanization has also altered the natural flow regimes of rivers and streams, particularly in their lower reaches. A significant percentage of estuarine habitats have been lost across the DPS due to urban development, including recreational development; the remaining wetland areas remains at risk of further loss or degradation.



Agricultural Development



Sedimentation Following Wildfires



Channel Modification

Other factors contributing to the decline of southern California steelhead populations and leading to the listing of the species as endangered include impacts from recreational activities (*e.g.*, off-road vehicles, summer dams); the introduction and spread of non-native species which can compete directly or indirectly for habitat space, serve as vectors for disease, or increase predation; and the inadequacy of existing planning or regulatory and enforcement mechanisms at the local, state, and federal levels.

The natural environmental variability of the SCS Recovery Planning Area has both masked and exacerbated the problems associated with degraded and altered riverine and estuarine steelhead habitats. Floods and persistent drought conditions have periodically reduced naturally limited spawning, rearing, and migration habitats. Projected impacts of future climate change pose additional challenges to southern California steelhead.



Steelhead Recovery Goals, Objectives, and Criteria

The Recovery Plan is a guidance document for achieving recovery goals that include viability criteria for populations of *O. mykiss* and the DPS as a whole. The basic goal of the Southern California Steelhead Recovery Plan is to prevent the extinction of anadromous steelhead by ensuring the long-term persistence of viable, self-sustaining, wild populations of steelhead across the DPS. It is also the goal of the Recovery Plan to re-establish a sustainable southern California steelhead sport fishery.

The Recovery Plan outlines the following objectives that address factors limiting the species' ability to survive and naturally reproduce in the wild:

- ❑ *Prevent steelhead extinction by protecting existing populations and their habitats.*
- ❑ *Maintain current distribution of steelhead and restore distribution to some previously occupied areas.*
- ❑ *Increase abundance of steelhead to viable population levels, including the expression of all life-history forms and strategies.*
- ❑ *Conserve existing genetic diversity and provide opportunities for interchange of genetic material between and within viable populations.*
- ❑ *Maintain and restore suitable habitat conditions and characteristics to support all life-history stages of viable populations.*

Biological viability criteria are identified for individual populations and the DPS as a whole. A *viable population* is defined as a population having a negligible (< 5%) risk of extinction due to threats from demographic variation, non-catastrophic environmental variation, and genetic diversity changes over a 100-year time frame. A *viable DPS* is comprised of a sufficient number of viable populations widely distributed throughout the DPS but sufficiently well-connected through ocean and freshwater dispersal to maintain long-term (1,000-year) persistence and evolutionary potential of the DPS.

The population-level viability criteria apply to core populations in all of the BPGs. These criteria include population characteristics such as mean annual run-size, persistence during varying ocean conditions, spawner density, and the anadromous fraction of the individual populations. Because of the uncertainty regarding important aspects of the biology and ecology of southern California steelhead further research is needed to refine the population-level criteria in all BPGs, as well as the role of each of the BPGs.

The DPS-level viability criteria identify a minimum number of populations which must be restored to viability and the minimum spatial distribution between populations in each BPG: Monte Arido – 4 populations, Conception Coast - 3 populations, Santa Monica Mountains – 2 populations, Mojave River – 3 populations, and Santa Catalina Gulf Coast -8 populations).

This redundancy ensures that there are a sufficient number of populations within the BPGs and across the DPS to provide resiliency in the face of environmental fluctuations, and also that a variety of habitat types and environmental conditions are represented to promote the continued evolution of the species. Some of these populations may be comprised of multiple watersheds if further research indicates that they act as trans-basinal populations.



Summary of DPS-Wide Recovery Actions

Recovery of the Southern California Steelhead DPS will require recovery of a number of viable populations (or sets of interacting trans-basinal populations) within each of the five BPGs to conserve the natural diversity (genetic, phenotypic, and behavioral), spatial distribution, and resiliency of the DPS as a whole. Core populations in all BPGs must be restored to viability before the DPS as a whole can be recovered and delisted.

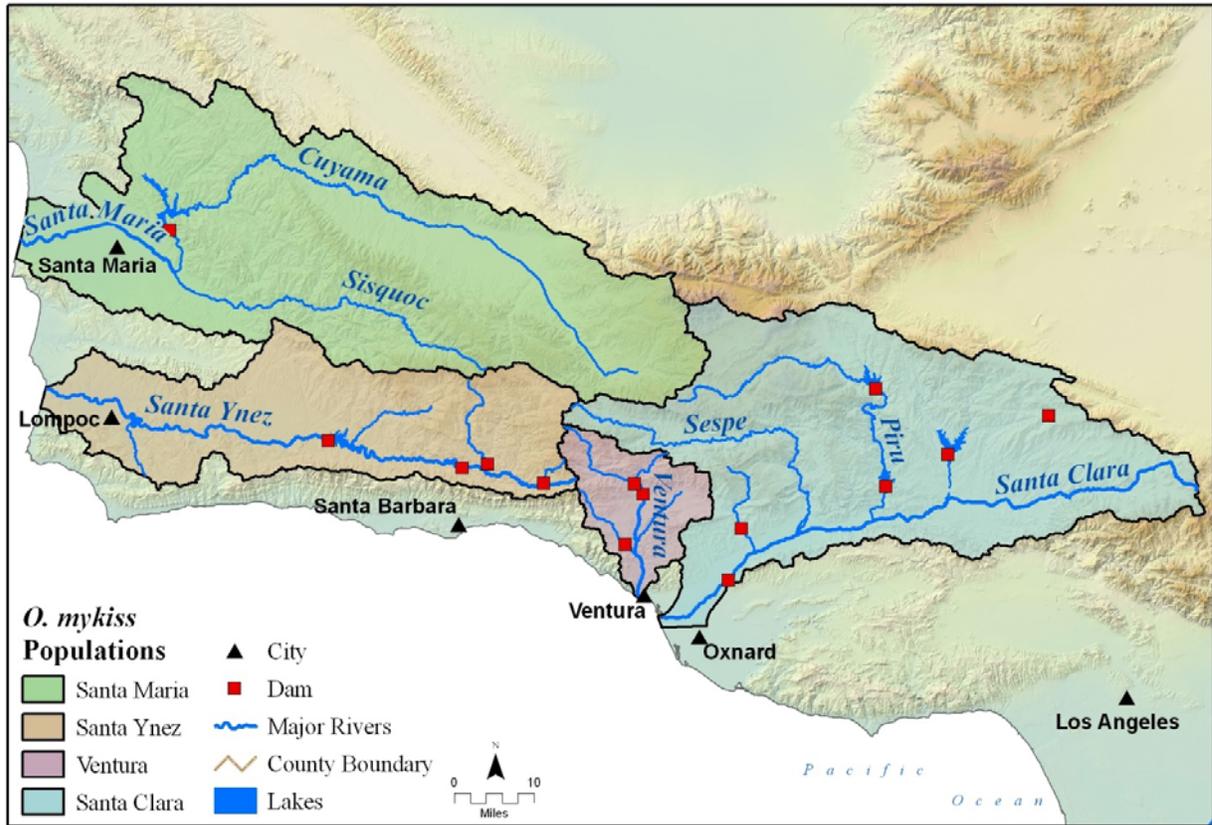
There are two types of developments and activities that pose the principal threats to the species: 1) impassible barriers to fish passage; and 2) water storage and withdrawal, including groundwater extraction. The Recovery Plan provides additional information on these and other threats and related recovery actions necessary to recover steelhead within individual watersheds and the DPS as a whole.

The Recovery Plan highlights a number of high priority DPS-wide recovery actions, including:

- ❑ *Physically modify passage barriers such as dams and diversion facilities to allow natural rates of migration to upstream spawning and rearing habitats.*
- ❑ *Coordinate with the California Department of Fish and Game and State Water Resources Control Board to ensure the effective implementation of California Fish and Game Code Sections 5935-5937 (provision of fishway and fish flows associated with dams and diversions).*
- ❑ *Extend California Water Code Section 1294.4 (dealing with instream flows to protect instream beneficial uses, including native fishes), to southern California.*
- ❑ *Enhance protection of natural in-channel and riparian habitats, including appropriate management of flood-control activities, off-road vehicle use, and in-river sand and gravel mining practices.*
- ❑ *Reduce water pollutants such as fine sediments, pesticides, herbicides, and other non-point source waste discharges.*
- ❑ *Assess the condition of and restore estuarine habitats through the control of fill, waste discharges, and establishment of buffers; control artificial breaching and/or draining of coastal estuaries.*
- ❑ *Conduct research on the relationship between resident and anadromous forms of *O. mykiss*, and the population dynamics regarding distribution, abundance, residualization, dispersal, and recolonization rates.*
- ❑ *Survey and monitor the distribution and abundance of non-native plant and animal species that degrade natural habitats or compete with native species; reduce and/or control such non-native invasive species.*
- ❑ *Incorporate appropriate elements of the Recovery Plan into the state-sponsored and funded Integrated Regional Water Management Plans (IRWMP).*
- ❑ *Finalize and implement the Statewide Coastal Monitoring Plan for anadromous salmonids.*

As part of an adaptive management program, population and habitat responses to recovery actions will be evaluated through on-going research and monitoring.

Monte Arido Highlands Biogeographic Population Group



The Monte Arido Highlands BPG 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. 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 in its lower elevation, 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 long, due to multiple tributaries and topographic relief in the interior watersheds. The Santa Maria River watershed (Cuyama River sub-watershed) extends the furthest inland—almost 90 miles between the mouth and the limits of the upper watershed.



Santa Maria River



Adult Steelhead, Santa Clara River



Bradbury Dam, Santa Ynez River



Threat Source Rankings: Monte Arido Highlands BPG Component Watersheds (north to south)													
Threat Sources	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	Light Green	Light Green	Red	Red	Dark Green
Flood Control	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

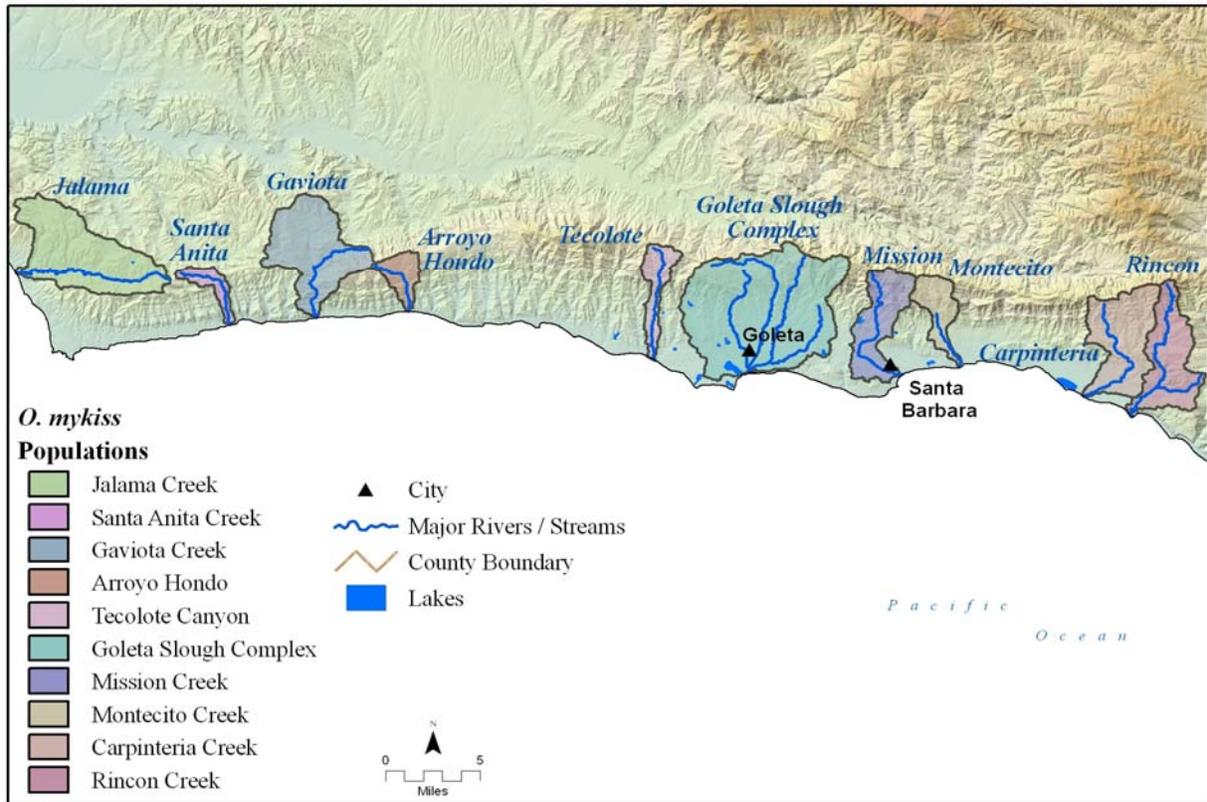
Key: Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat
Threat cell colors represent threat rating from Conservation Planning (CAP) Workbooks.

*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 indicates that future wild fires could result in significant habitats impacts.

Priority Recovery Actions

- Develop and implement operating criteria to ensure the pattern and magnitude of water releases from dams, including Twitchell, Bradbury, Gibraltar, Juncal, Casitas, Matilija, Robles Diversion, Santa Felicia, Pyramid, Vern Freeman Diversion, and Castaic dams, provide the essential habitat functions to support the life-history and habitat requirements of adult and juvenile *O. mykiss*.
- Develop and implement plans to physically modify Twitchell, Bradbury, Gibraltar, Mono, Juncal, Casitas, Matilija, Robles Diversion, Santa Felicia, Pyramid, Vern Freeman Diversion, and Castaic dams to allow natural rates of adult and juvenile *O. mykiss* migration between the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Develop and implement a groundwater monitoring program to guide management of groundwater extractions within steelhead bearing watersheds to ensure surface flows provide essential support for all *O. mykiss* life-history stages, including adult and juvenile *O. mykiss* migration, spawning, incubation, and rearing habitats.
- Develop and implement plans to physically modify the lower Santa Paula Creek flood control channel to allow natural rates of migration of adult and juvenile *O. mykiss* between n the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Develop and implement restoration and management plans for the estuaries associated with steelhead bearing watersheds. To the maximum extent feasible, the plan should restore the physical configuration, size and diversity of the wetland habitats, eliminate exotic species, control artificial breaching of the sand bar, and establish effective buffers to restore estuarine functions and promote *O. mykiss* use (including rearing and acclimation) of the estuaries.

Conception Coast Biogeographic Population Group



The Conception Coast BPG 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. 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 BPGs 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. Stream lengths are relatively short in this BPG; the Gaviota Creek watershed penetrates the furthest inland (about seven miles). Rainfall amounts in the upper watersheds can be five to six times higher than on the coastal terrace during the same storm event, and the steep topography creates extremely “flashy” flows within these watersheds.



Gaviota Creek



Maria Ygnacio Creek



Adult Steelhead, Carpinteria



Threat Source Rankings: 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	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	Dark green	Yellow	Light green	Dark green	Yellow	Light green
Non-Point Pollution	Dark green	Dark green	Light green	Dark green	Dark green	Yellow	Yellow	Light green	Yellow	Yellow
Flood Control	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

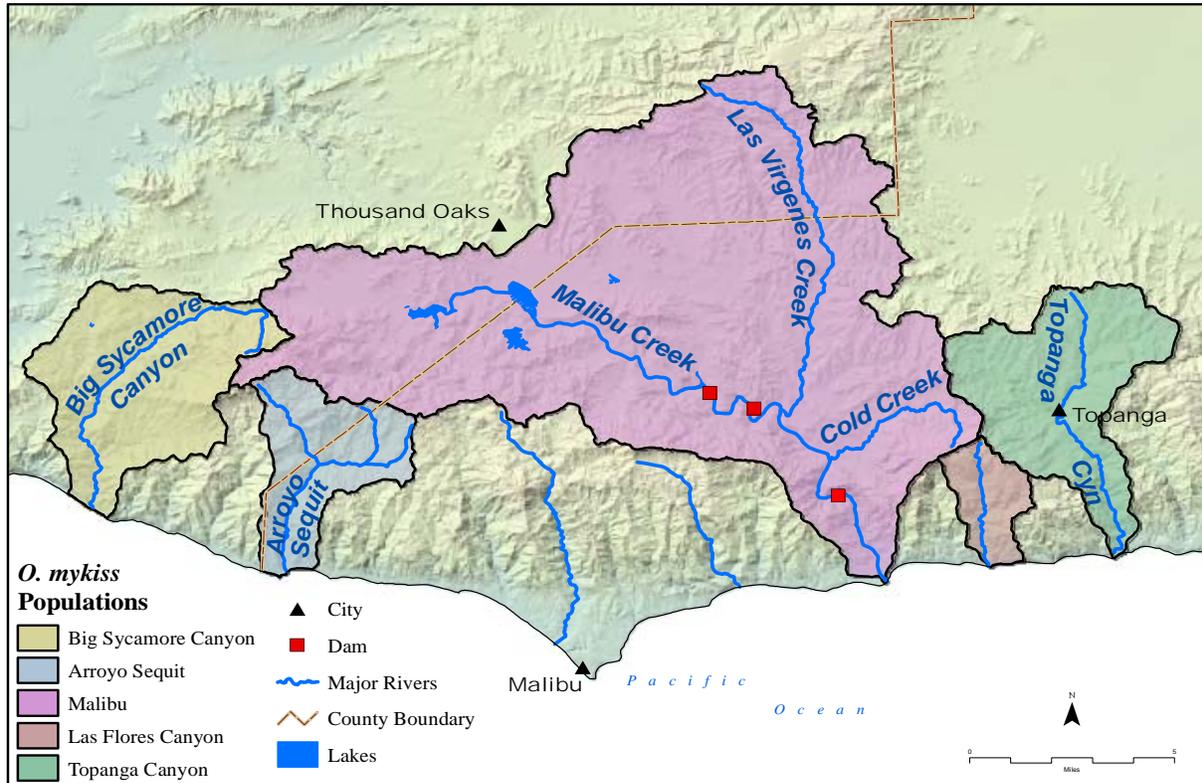
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*Wildfires were not identified during the CAP Workbook analyses as one of the top five threats in several of these watersheds, but recent fires in coastal watersheds indicates that future wildfires could result in significant habitats impacts.

Priority Recovery Actions

- Develop and implement a plan to physically modify channelized reaches of lower Mission Creek, and upstream road crossings, to allow natural rates of migration 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.
- Develop and implement a plan to physically modify upstream debris basins and other fish passage barriers within steelhead bearing watersheds to allow natural rates of adult and juvenile *O. mykiss* of migration between the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Develop and implement a plan to physically modify the Highway 101 and railroad culvert over lower Rincon Creek, and upstream road crossings to allow natural rates of adult and juvenile *O. mykiss* migration between the estuary and spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Develop and implement a groundwater monitoring program to guide management of groundwater extractions within steelhead bearing watersheds to ensure surface flows provide essential support for all *O. mykiss* life-history stages, including adult and juvenile *O. mykiss* migration, spawning, incubation, and rearing habitats.
- Develop and implement restoration and management plans for estuaries associated with steelhead bearing watersheds. To the maximum extent feasible, the plans should restore the physical configuration, size and diversity of the wetland habitats, eliminate exotic species, control artificial breaching of the sand bar, and establish effective buffers to restore estuarine functions and promote *O. mykiss* use (including rearing and acclimation) of the estuaries).

Santa Monica Mountains Biogeographic Population Group



The Santa Monica Mountains BPG consists of five coastal watersheds located in southern Ventura and western Los Angeles counties which drain the east-west coastal Santa Monica Mountains. Similar to the Conception Coast BPG, it is comprised of a series of short, nearly parallel streams that drain steep south-facing slopes, but with an average elevation of less than 2,500 feet. 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. Malibu Creek is the largest of the five watersheds, encompassing approximately 110 square miles, and penetrates through a break in the Santa Monica Mountains to drain a portion of its north-facing slopes and the south-facing slopes of the Simi Hills. There are also a number of smaller watersheds within this BPG (e.g., Trancus, Zuma, Solstice, and Las Flores Canyon) which may also be used by steelhead when water conditions are periodically favorable. Calleguas Creek and the Los Angeles River, to the east and west of the BPG, drain the northern slopes of the Santa Monica Mountains.



Malibu-Los Angeles



Adult Steelhead, Malibu Creek



Rindge Dam, Malibu Creek



Threat Source Rankings: 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	Red	Red	Red	Yellow	Yellow
Recreational Facilities	Red	Red	Red	Dark Green	Light Green
Culverts and Road Crossings	Red	Red	Red	Light Green	Dark Green
Wildfires*	Yellow	Light Green	Light Green	Light Green	Light Green
Urban Development	Dark Green	Dark Green	Light Green	Light Green	Yellow
Levees and Channelization	Dark Green	Dark Green	Dark Green	Light Green	Dark Green
Dams and Surface Water Diversions	Dark Green	Light Green	Red	Dark Green	Dark Green
Non-Native Species	Dark Green	Dark Green	Red	Dark Green	Light Green
Upslope/Upstream Development	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green
Urban Effluents	Dark Green	Dark Green	Light Green	Light Green	Light Green

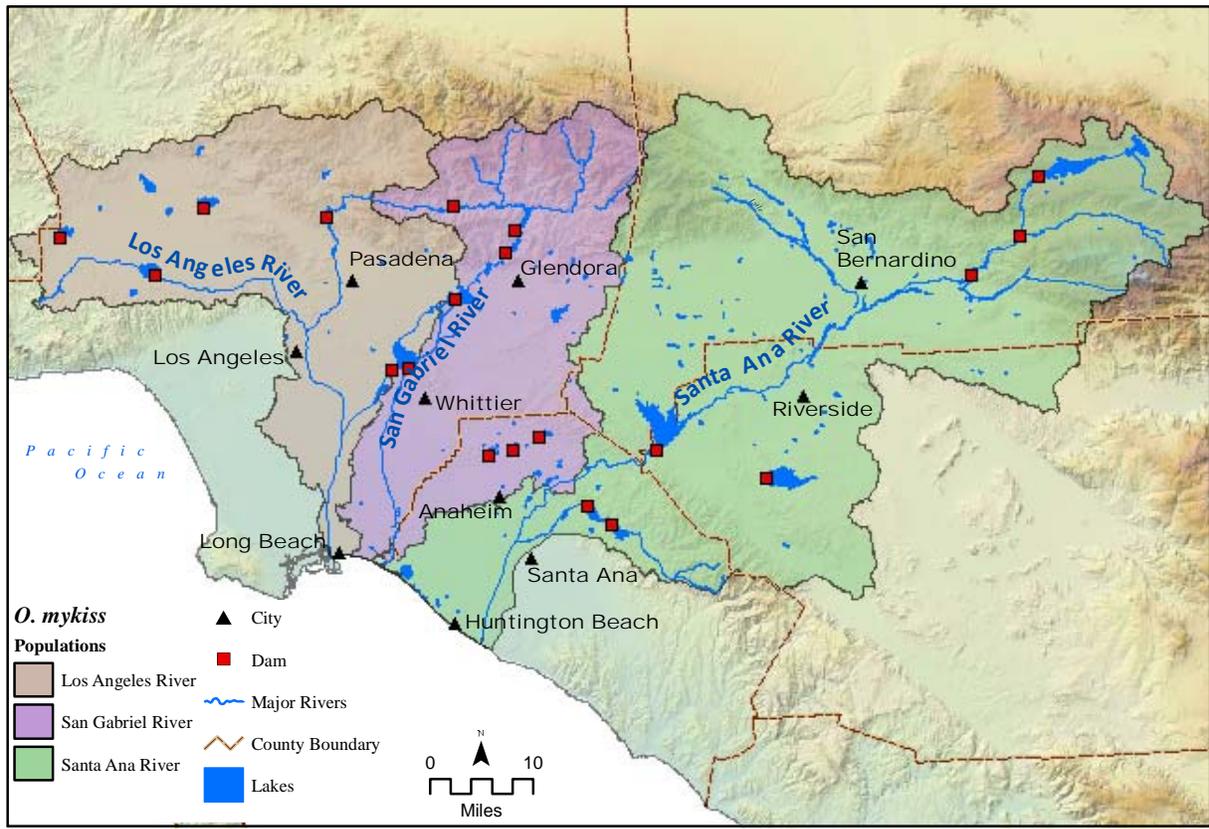
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*Wildfires were not identified during the CAP Workbook analyses as one of the top five threats in several of these watersheds, but recent fires in coastal watersheds indicates that future wildfires could result in significant habitats impacts.

Priority Recovery Actions

- Develop and implement plans to remove Rindge and Malibu dams, and physically modify road crossings and other fish passage barriers to allow natural rates of adult and juvenile *O. mykiss* migration between the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and the ocean.
- Develop and implement plan to replace the U.S. 101 culvert over Topanga Creek with a full span bridge and remove fill from the Topanga Creek Estuary to allow natural rates of adult and juvenile *O. mykiss* migration to upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Develop and implement restoration and management plans for estuaries associated with steelhead bearing watersheds. To the maximum extent feasible, the plans should restore the physical configuration, size and diversity of the wetland habitats, eliminate exotic species, control artificial breaching of the sand bar, and establish effective buffers to restore estuarine functions and promote *O. mykiss* use (including rearing and acclimation) of the estuaries.
- Develop and implement an integrated wildland fire and hazardous fuels management plan, including monitoring, remediation and adaptive management, to reduce potentially catastrophic wildland fire effects to adult and juvenile *O. mykiss* and their habitat and preserve natural ecosystem processes (including sediment transport and deposition).

Mojave Rim Biogeographic Population Group



The Mojave Rim BPG encompasses three large coastal watersheds that drain the northern slopes of the Santa Monica Mountains and the southern 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. The upper portions of each of these watersheds include steep, mountainous terrain (within the Angeles and San Bernardino National Forests) and the lower watersheds cut across the Los Angeles Basin—an extensive coastal plain, with comparatively few, small tributaries.



Morris Dam, San Gabriel River



East Fork San Gabriel River



Santa Ana River Estuary



Threat Source Rankings: Mojave Rim BPG Component Watersheds (west to east)								
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	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	White	Dark Green	Dark Green
Culverts and Road Crossings	Yellow	Light Green	Red	Dark Green	Dark Green	White	Dark Green	Dark Green
Agricultural Development	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	White	Dark Green	Dark Green
Upslope/Upstream Development	Yellow	Yellow	Yellow	Dark Green	Dark Green	White	Yellow	Yellow
Wildfires*	Dark Green	Dark Green	Red	Red	Red	Red	Red	Red

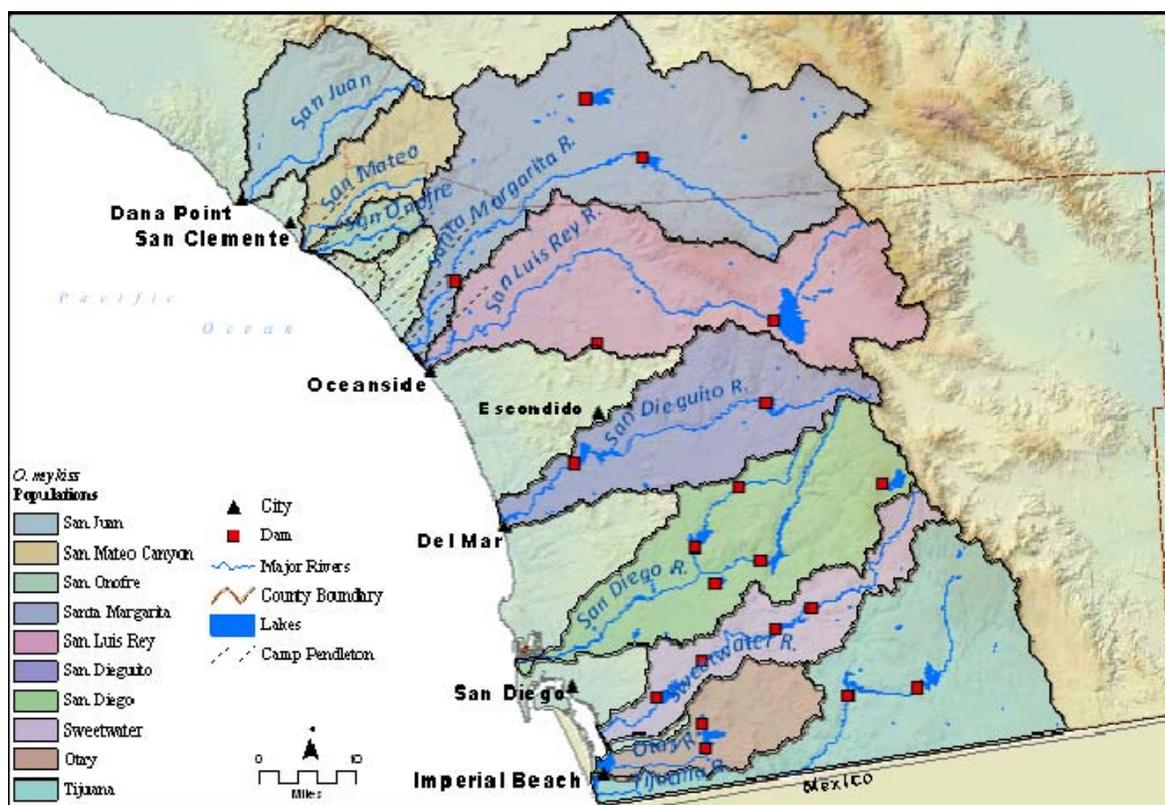
Key: Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat
Threat cell colors represent threat rating from Conservation Action Planning (CAP) Workbooks.

* Wildfires were not identified during the CAP Workbook analyses as one of the top five threats in several of these watersheds, but recent wildfires indicates that future wildfires could result in significant habitats impacts; additionally, the presence of non-native species is not reflected in the CAP Workbook analyses, but non-native species is a potential threat in this BPG.

Priority Recovery Actions

- Develop and implement operating criteria to ensure the pattern and magnitude water releases from dams, including Morris, San Gabriel, Cogswell, Santa Fe, Prado, Seven Oaks, and Bear Valley dams, provide the essential habitat functions to support the life-history and habitat requirements of adult and juvenile *O. mykiss*.
- Develop and implement a plan to physically modify dams, including Morris, San Gabriel, Cogswell, Santa Fe, Prado, Seven Oaks, and Bear Valley dams, to allow adult and juvenile *O. mykiss* natural rates of migration between the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Develop and implement a plan to physically modify or remove fish passage barriers at debris basins, diversions, roads, and highways to allow adult and juvenile *O. mykiss* natural rates of migration between the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Develop and implement restoration and management plans for steelhead bearing watersheds. To the maximum extent feasible, plans should restore the physical configuration, size and diversity of the wetland habitats, eliminate exotic species, control artificial breaching of the sand bar, and establish effective buffers to restore estuarine functions and promote *O. mykiss* use (including rearing and acclimation) of the estuaries.
- Develop and implement an integrated wildland fire and hazardous fuels management plan, including monitoring, remediation and adaptive management, to reduce potentially catastrophic wildland fire effects to adult and juvenile *O. mykiss* and their habitat and preserve natural ecosystem processes (including sediment transport and deposition).
- Develop and implement flood control maintenance plan for steelhead bearing watersheds to minimize the frequency and intensity of disturbance of instream habitats and riparian vegetation of the mainstem and tributaries to protect all *O. mykiss* life-history stages, including adult and juvenile migration, spawning, incubation and rearing, and their associated habitats.

Santa Catalina Gulf Coast Biogeographic Population Group



The Santa Catalina Gulf Coast BPG 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. 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 and numerous tributaries contribute to the large total stream length for this BPG (4,235 miles). Because of low rainfall, many of the drainages in this BPG are naturally seasonal or have extensive dry reaches during years of below-average precipitation, particularly in their lower reaches.



Arroyo Trabuco Creek



O. mykiss, Pine Valley Creek



San Mateo Creek



Threat Source Rankings: 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	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Dams and Surface Water Diversions	Light Green	Red	Red	Red	Red	Red	Red	Red	Red	Red
Urban Development	Red	Dark Green	Dark Green	Light Green	Yellow	Red	Red	Red	Red	Red
Agricultural Development	Light Green	Red	Dark Green	Dark Green	Red	Red	Light Green	Yellow	Yellow	Yellow
Levees and Channelization	Red	Dark Green	Dark Green	Dark Green	Red	Yellow	Yellow	Light Green	Yellow	Yellow
Culverts & Road Crossings	Red	Dark Green	Dark Green	Dark Green	Red	Dark Green	Yellow	Yellow	Light Green	Light Green
Recreational Facilities	Light Green	Red	Red	Red	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green
Non-Native Species	Dark Green	Red	Red	Red	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Roads	Light Green	Dark Green	Dark Green	Red	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Flood Control Maintenance	Red	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Yellow	Light Green
Upslope/Upstream Development	Light Green	Light Green	Dark Green	Light Green	Light Green	Yellow	Yellow	Yellow	Red	Red
Agricultural Effluents	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green	Yellow	Yellow
Wildfires*	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Light Green	Yellow	Yellow	Yellow

Key: Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat
Threat cell colors represent threat rating from the Conservation Action Planning (CAP) Workbooks.

* Wildfires were not recognized during the CAP Workbook analyses as one of the top five threats in these watersheds, but recent fires indicate that future wildfires could result in significant habitat impacts.

Priority Recovery Actions

- Develop and implement plans to physically modify or remove fish passage barriers at dams, debris basins, diversions, roads, and highways to allow adult and juvenile *O. mykiss* natural rates of migration between the estuary and upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean.
- Development and implement operating criteria to ensure the pattern and magnitude of water releases from Pilgram, Turner, Lower and Upper Stehly, Agua Tibia, Henshaw, Eagles Nest, and O’Neill Diversion dams provide the essential habitat functions to support the life-history and habitat requirements of adult and juvenile *O. mykiss*.
- Develop and implement watershed-wide plans for steelhead bearing watersheds to identify and determine the type, distribution, and density of non-native species; assess their impacts on all *O. mykiss* life-history stages; and eliminate or control non-native species to protect all *O. mykiss* life history stages.
- Develop and implement restoration and management plans for estuaries in steelhead bearing watersheds. To the maximum extent feasible, the plan should restore the physical configuration, size and diversity of the wetland habitats, eliminate exotic species, control artificial breaching of the sand bar, and establish effective buffers to restore estuarine functions and promote *O. mykiss* use (including rearing and acclimation) of the estuaries.



Summary

An array of natural and anthropogenic factors has reduced both the population size and historical distribution of steelhead within the SCS Recovery Planning Area, placing severe pressure on the species' ability to survive. However, steelhead are resilient fish and despite encroaching agricultural and urban development, they continue to persist in small numbers throughout the SCS Recovery Planning Area. The Southern California Steelhead Recovery Plan outlines a strategy for species' recovery by identifying core watersheds, threats to these watersheds and recovery actions to address those threats. The Recovery Plan also identifies a research program to address the biology and ecology of southern California steelhead necessary to refine the viability recovery criteria, and a monitoring program to assess the effectiveness of recovery actions and the status of individual populations and the DPS as a whole.

Many of the recovery actions identified in this Recovery Plan address watershed-wide processes (*e.g.*, wild-fire cycle, erosion and sedimentation, runoff, and non-point waste discharges) which will benefit a wide variety of other native species (including other state and federally listed species, or species of special concern) by restoring natural ecosystem functions.

Restoration of steelhead habitats in coastal watersheds will also provide substantial benefits for human communities. These include, but are not limited to, improving and protecting the water quality of important surface and groundwater supplies, reducing damages from periodic flooding resulting from floodplain development, and controlling invasive exotic animal and plant species which can threaten water supplies and increase flood risks. Restoring and maintaining ecologically functional watersheds also enhances important human uses of habitats occupied by steelhead; these include such activities as outdoor recreation, environmental education (at primary and secondary levels), field-based research on the physical and biological processes of coastal watersheds, aesthetic enjoyment, and the preservation of important tribal and cultural heritage values. Investment in the recovery of southern California steelhead will provide economic benefits, including stimulating the economy directly through the employment of a restoration workforce, and the expenditure of wages and restoration dollars for the purchase of goods and services. In addition, viable salmonid populations provide ongoing direct and indirect economic benefits as a natural resource base for angling, outdoor recreation, and tourist related activities. Recovering and delisting the Southern California Steelhead DPS will also reduce the regulatory obligations imposed by the ESA, and allow land and water managers greater flexibility to optimize their activities, and reduce costs related to ESA protections.

Recovery of viable, self-sustaining populations of southern California steelhead will require a shift in societal attitudes, understanding, priorities, and practices, and ultimately the re-integration of the species into a highly altered landscape that is home to more than 22 million people. These changes are necessary to both ensure sustainable communities in southern California and to restore the habitat upon which viable steelhead populations depend.

Recovery of southern California steelhead depends most fundamentally on a shared vision of the future. A shared vision for the future can align interests and encourage cooperation that, in turn, has the potential to improve rather than undermine the adaptive capacity of natural public resources such as functioning watersheds and river systems. The on-going cooperation and dedication of many stakeholders from both public and private sectors will therefore be essential to achieve the recovery of southern California steelhead.

Southern California Steelhead Recovery Plan may be obtained from:

National Marine Fisheries Service
Office of Protected Resources
501 W. Ocean Blvd., Suite 4200
Long Beach, CA 90802
562-980-4000

Or can be downloaded from the NMFS Recovery Planning website:

<http://swr.nmfs.noaa.gov/pr/recovery/plans.htm>