SOUTH-CENTRAL/SOUTHERN CALIFORNIA COAST STEELHEAD RECOVERY PLANNING DOMAIN

5-Year Review:
Summary and Evaluation of

Southern California Coast Steelhead Distinct Population Segment

Mission Creek Steelhead

National Marine Fisheries Service
Southwest Region
Long Beach, CA

5-YEAR REVIEW
South-Central/Southern California Coast Steelhead Recovery Planning Domain

Species Reviewed	Evolutionarily Significant Unit or Distinct Population Segment
Steelhead *(O. mykiss)*	**Southern California Coast Steelhead DPS**

1.0 GENERAL INFORMATION

1.1 Reviewers

1.1.1. Southwest Region

Preparer:

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1.1.2. Southwest Fisheries Science Center

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1.2 Introduction

Many West Coast salmon and steelhead (*Oncorhynchus* spp.) stocks have declined substantially from their historic numbers and now are at a fraction of their historical abundance. There are multiple factors that contribute to these declines, including, particularly the loss of freshwater and estuarine habitat, periodic poor ocean conditions, and a variety of land-use practices which have impacted many watershed processes. These factors collectively led to the National Marine Fisheries Service (NMFS) listing of southern California steelhead as endangered under the Federal Endangered Species Act (ESA).

The ESA, under Section 4(c)(2), directs the Secretary of Commerce to review the listing classification of threatened and endangered species at least once every five years. After

completing this review, the Secretary must determine if any species should be: (1) removed from the list; (2) have its status changed from threatened to endangered; or (3) have its status changed from endangered to threatened. The most recent listing determinations for salmon and steelhead occurred in 2005 and 2006. This document reflects the agency's 5-year status review of the ESA-listed Southern California Coast Steelhead Distinct Population Segment (DPS).

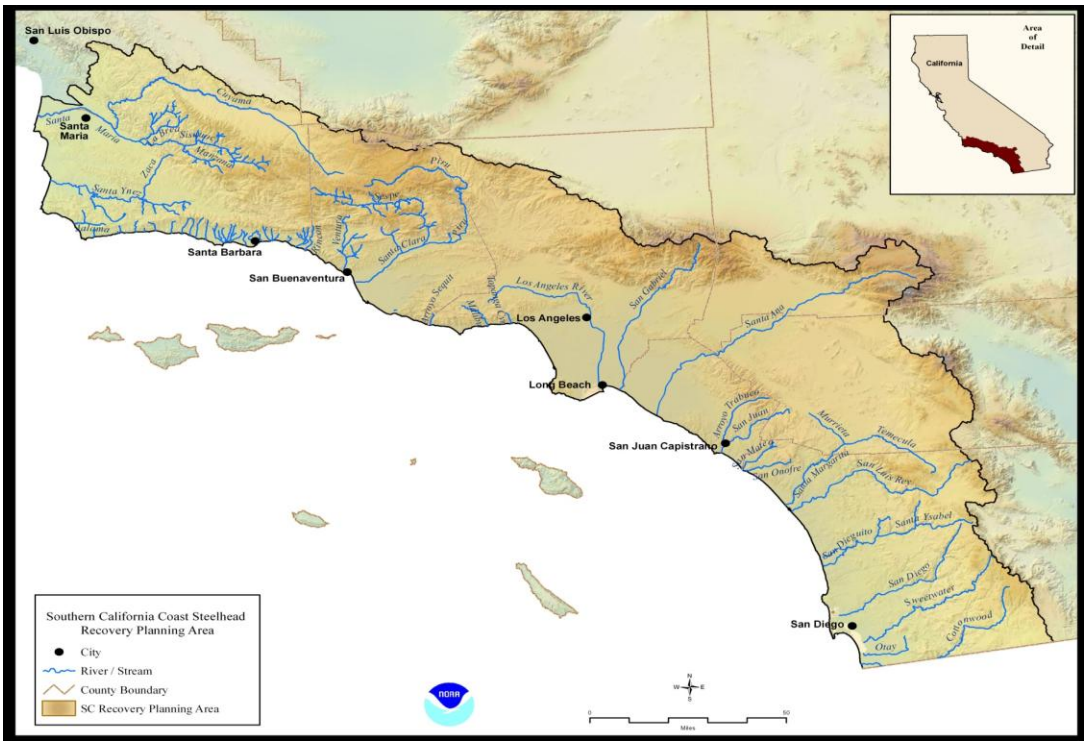

Figure 1. Southern California Coast Steelhead Recovery Planning Area.

1.3 Methodology used to complete the review

The Endangered Species Act (ESA) Section 4(c) (2) requires 5 year reviews for all species once listed to determine if a change in status is necessary. A public notice initiating this review and requesting information was published on March 18, 2010, with a 60-day comment period (75 FR 13082).

This 5-year review was conducted by NOAA Fisheries Regional Staff and Southwest Fisheries Science Center personnel. The review relied principally on the 2011 status review update prepared by NOAA's Southwest Fisheries Science Center, other Technical Memoranda prepared by the Science Center, a DPS wide threats assessments prepared under a contract from NMFS, and miscellaneous run-size data from a small number of watersheds where such data is regularly collected.

The Science Center reviewed all new and substantial scientific information since the most recent review in 2005 and produced an updated biological status summary report for the listed salmon and steelhead in California. The purpose of the status report (NNMS 2011) was to determine

whether or not the biological status of Southern California Steelhead DPS had changed since the last status review was conducted in 2005. NOAA staff from the Protected Resources Division (PRD) reviewed the status report and assessed whether the five ESA listing factors (threats) had changed substantially since the 2005 listing determination.

1.4 Background – Summary of Previous Reviews, Statutory and Regulatory Actions, and Recovery Planning

1.4.1 FR Notice citation announcing initiation of this review

75 FR 13082; March 18, 2010

1.4.2 Listing history

Table 1. Summary of the listing history under the Endangered Species Act for the Southern California Coast steelhead DPS.

Salmonid Species	ESU/DPS Name	Original Listing	Revised Listing(s)
Steelhead *(O. mykiss)*	**Southern California Coast Steelhead DPS**	**FR Notice: 62 FR 43937 Date Listed: 08/18/1997 Classification: Endangered**	**FR Notice: 67 FR 21586 Date: 05/01/2002 Classification: Southern Range Extension** **FR Notice: 71 FR 5248 Date: 01/05/2006 Re-classification: Endangered**

1.4.3 Associated rulemakings

Table 2. Summary of rulemaking for 4(d) protective regulations and critical habitat for the Southern California Coast steelhead DPS.

Salmonid Species	ESU/DPS Name	4(d) Protective Regulations	Critical Habitat Designations
Steelhead *(O. mykiss)*	**Southern California Coast Steelhead ESU/DPS**	**FR Notice: N/A Date: N/A**	**FR Notice: 70 FR 52488 Date: 09/02/2005**

1.4.4 Review History

Table 3. Summary of previous scientific assessments for the Southern California Coast steelhead DPS.

Salmonid Species	ESU/DPS Name	Document Citation
Steelhead *(O. mykiss)*	**Southern California Coast Steelhead DPS**	**Williams T. H. et al. 2011. Status Review Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Southwest. Southwest Fisheries Science Center.** **Boughton, D. A. 2010. Some Research Questions on Recovery of Steelhead on the South-Central and Southern California Coast. NOAA-TM-NMFS-SWFSC-467.** **Clemento, A. J. et al. 2009. Population Genetic Structure and Ancestry of *Oncorhynchus mykiss* Populations Above and Below Dams in South-Central California. *Conservation Genetics* 10:1321-1336.** **Pearse, D. and J. C. Garza. 2008. Historical Baseline for Genetic Monitoring of Coastal California Steelhead, *Oncorhynchus mykiss.* Final Report for California Department of Fish and Game Fisheries Restoration rant Program P0510530.** **Garza, J. C. and A. Clemento. 2007. Population Genetic Structure of Oncorhynchus *mykiss* in the Santa Ynez River, California. Final Report for Project Partially Funded by the Cachuma Conservation Release Board.** **Boughton, et al. 2007. Viability Criteria for Steelhead of the South-Central and Southern California Coast. NOAA-TM-NMFS-SWFSC-407.** **Jackson, T.A. 2007. California Steelhead Fishing Report-Restoration Card: A Report to the Legislature. California Department of Fish and Game, Sacramento, California.** **Girman, D. and J. C. Garza. 2006. Population Structure and Ancestry of O. mykiss populations in South-Central California Based on Genetic Analysis of Microsatellite Data. Final Report for California Department of Fish and Game Project No. P0350021 and Pacific State Marine Fisheries Contract No. AWIP-S-1.** **Boughton, et al. 2006. Steelhead of the South-Central/Southern California Coast: Population Characterization for Recovery Planning NOAA-TM-NMFS-SWFSC-394** **Boughton, D. A. and M. Goslin. 2006. Potential Steelhead**

		Over-Summering Habitat in the South-Central/Southern California Coast Recovery Domain: Maps Based on the Envelope Method NOAA-TM-NMFS-SWFSC-391 **Boughton, et al. 2005. Contraction of the Southern Range Limit for Anadromous Oncorhynchus mykiss. NOAA-TM-NMFS-SWFSC-380** **Helmbrecht, S and D. A. Boughton. 2005. Recent Efforts to Monitor Anadromous Oncorhynchus Species in the California Coastal Region: A Complication of Metadata NOAA-TM-NMFS-SWFSC-381** **Good, T. P., R. S. Waples, and P. Adams (eds.) 2005. Updated Status of Federally Listed EUS of West Coast Salmon and Steelhead. NOAA-TM-NWFSC-66.** **Busby, P. J. T. C. Wainwright, G. J. Bryant, L. Liereimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. NOAA-TM-NWFSC-27.**

1.4.5 Species' Recovery Priority Number at start of 5-year review

NOAA Fisheries issued guidelines in 1990 (55 FR 24296) for assigning listing and recovery priorities. Three criteria are assessed to determine a species' priority for recovery plan development, implementation, and resource allocation: 1) magnitude of threat; 2) recovery potential; and 3) existing conflict with activities such as construction and development. The recovery priority number for this DPS, as reported in the *2008-20010 Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species, is* listed in Table 4 below.

1.4.6 Recovery Plan or Outline

Table 4. Recovery Priority Number and Endangered Species Act Recovery Plans for Southern California Coast steelhead DPS.

Salmonid Species	ESU/DPS Name	Recovery Priority Number	Recovery Plans/Outline
Steelhead *(O. mykiss)*	**Southern California Coast Steelhead DPS**	**3**	**Final Recovery Outline - 2007** **Draft Recovery Plan - 2010**

The recovery priority number "3" for the Southern California Coast Steelhead DPS is based on a high magnitude of threat to a small number of extant populations vulnerable to extirpation due to loss of accessibility to freshwater spawning and rearing habitat, low abundance, degraded estuarine habitats and watershed processes essential to maintain freshwater habitats. The recovery potential is low to moderate due to the lack of additional populations, lack of available/suitable freshwater habitat, fish passage barriers, and inadequate instream flow. There is a moderate magnitude of threat to smaller watersheds, and higher risk in larger watersheds with major water supply and flood control facilities. Conflict was determined to be present due to existing and anticipated future development, habitat degradation, and conflict with land development and associated flood control activities and water supplies.

2.0 REVIEW ANALYSIS

2.1 Delineation of Species under the Endangered Species Act

2.1.1 Is the species under review a vertebrate?

ESU/DPS Name	YES*	NO**
Southern California Coast Steelhead DPS	**X**	

** if "Yes," go to section 2.1.2*
*** if "No," go to section 2.2*

2.1.2 Is the species under review listed as a DPS?

ESU/DPS Name	YES*	NO**
Southern California Coast Steelhead DPS	**X**	

** if "Yes," go to section 2.1.3*
*** if "No," go to section 2.1.4*

2.1.3 Was the DPS listed prior to 1996?

ESU/DPS Name	YES*	NO**	Date Listed if Prior to 1996
Southern California Coast Steelhead DPS		**X**	***n/a***

** if "Yes," give date go to section 2.1.3.1*
*** if "No," go to section 2.1.4*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

In 1991 NMFS issued a policy to provide guidance for defining ESUs of salmon and steelhead that would be considered for listing under the ESA (56 FR 58612; November 20, 1991). Under this policy a group of Pacific salmon populations is considered an ESU if it is substantially reproductively isolated from other con-specific populations and it represents an important component in the evolutionary legacy of the biological species. This DPS was originally defined and listed under NMFS's ESU policy in 1998. The 1996 joint NMFS-FWS DPS policy affirmed that a stock of Pacific salmon (or steelhead) was considered a DPS if it represented an ESU of a biological species and also concluded that NMFS' ESU policy was a detailed extension of the joint DPS policy. Accordingly, we considered the originally defined and listed ESU to also be a distinct population segment under the ESA. After reassessing the status of steelhead ESUs in

2005, NMFS decided to use the joint NMFS-FWS DPS policy to define steelhead only DPSs and in 2006 announced final listing determinations for steelhead based on the joint DPS policy (71 FR 834). That analysis concluded that Southern California Coast steelhead constituted a DPS under the joint DPS policy and that it continued to be an endangered species. In summary, therefore, the Southern California Coast steelhead DPS has been found to meet the 1996 joint DPS policy standards.

2.1.4 Summary of relevant new information regarding the delineation of the ESUs/DPSs under review

Since publication of the last status review (Good *et al.* 2005), significant new genetic data are available for populations across much of coastal California. Clemento *et al.* (2009) described the genetic relationships for *O. mykiss* sampled above and below impassable dams, in a series of basins in the South-Central/Southern California Coast Steelhead Recovery Planning Domain. The basins included the Santa Ynez River system; the Ventura River system, and the Santa Clara River system. Also included in the analysis were *O. mykiss* sampled from Fillmore Hatchery strains. Fillmore Hatchery is located on a tributary of the Santa Clara River, and has been the origin of trout planted in many reservoirs of the domain over the years.

Juvenile fish from 20 locations and hatchery strains were evaluated from neutral alleles at 24 microsatellite loci. Phylogeographic trees and analysis of molecular variance showed that subpopulations within a basin, both above and below dams, were generally each other's closest relatives. Data showed the absence of hatchery fish or their progeny in the tributaries above dams, which indicate that hatchery fish planted in those areas did not commonly spawn in the wild, and that above-barrier fish were descended from coastal steelhead trapped above the dams when they were originally constructed. Finally, although samples from each individual basin had distinctive gene frequencies, there was little evidence for broader-scale genetic structure in the domain. In particular, the analysis of neutral alleles provided no evidence for a genetic transition between the Coast Range and Transverse Range (*i.e.*, the current DPS boundary), or anywhere else within the South-Central/Southern California Coast Steelhead Recovery Planning Domain extending from the Pajaro River in the north to the Tijuana River in the south.

2.2 Recovery Criteria

2.2.1 Do the species have final, approved recovery plans containing objective, measurable criteria?

ESU/DPS Name	YES	NO
Southern California Coast Steelhead DPS		**X**

Although a final recovery plan has not been approved for the Southern California Coast Steelhead DPS, a public draft recovery plan has been prepared which contains objective measurable recovery criteria for both individual populations and the DPS as a whole based upon the viability criteria developed by the Southwest Fisheries Science Center and the recovery strategy developed by the NOAA Fisheries Southwest Region (Boughton *et al.* 2007). These criteria specify a minimum number of populations distributed through five distinctive

biogeographic populations groups within the DPS which much exhibit a suite of biological characteristics, including minimum annual run-size, life-history diversity, persistence through long-term oceanic conditions, population density, and an anadromous fraction.

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

ESU/DPS Name	YES	NO
Southern California Coast Steelhead DPS	X	

The draft recovery criteria reflect the best available and most up to date information on the biology of the species based upon the viability criteria developed by the Southwest Fisheries Science Center. The draft Recovery Plan has undergone independent scientific peer and co-manager review.

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

ESU/DPS Name	YES	NO
Southern California Coast Steelhead DPS	X	

The draft recovery plan includes recovery criteria that address identified threats to key populations and the species as a whole. The identified threats include those factors considered responsible for the species decline and its listing.

2.2.3 List the recovery criteria as they appear in any final or interim recovery plan, and discuss how each criterion has or has not been met, citing information

The draft Southern California steelhead recovery plan contains objective, measurable recovery criteria based upon the viability criteria developed by the Science Center and the recovery strategy developed by the NOAA Fisheries Southwest Region. The following summarizes the draft recovery criteria:

Population-Level Criteria

Mean Annual Run Size – Each core population within each of the five biogeographic regions must meet the mean annual run size. In some cases the population may be comprised of two or more closely interacting watersheds. This numeric criterion is subject to modification pending further research.

Ocean Conditions – Each core population within each of the five biogeographic regions must meet the mean annual run size during variable oceanic conditions over the course of at least 6

decades. In some cases the population may be comprised of two or more closely interacting watersheds.

Population Density - Each core population within each of the five biogeographic regions must meet the density criteria (currently unspecified pending further research). In some cases the population may be comprised of two or more closely interacting watersheds.

Anadromous Fraction – Each of the core populations within each of the five biogeographic regions that is counted towards the meeting the population size criteria must be comprised of 100% anadromous fish. In some cases the population may be comprised of two or more closely interacting watersheds. This numeric criterion is subject to modification pending further research.

DPS-Level Criteria

Biogeographic Diversity – A minimum number of viable populations must be distributed through each of the five biogeographic population groups. These viable populations must inhabit watersheds with drought refugia and be separated a minimum of 68 km to the maximum extent possible. The draft recovery plan identifies a minimum suite of core populations within each biographic group, including those portions of the watersheds which contain drought refugia.

Life-History Diversity – The viable populations within each biogeographic population group must exhibit the three principal steelhead life-history types (fluvial-anadromous, lagoon-anadromous, and freshwater resident). The draft recovery plan identifies a suite of core populations in each biogeographic population group with habitats having the intrinsic potential to support the three principal life-history types.

2.3 Updated Information and Current Species Status

2.3.1 Analysis of Viable Salmonid Population (VSP) Criteria

There is little new evidence to suggest that the status of the Southern California Steelhead DPS has changed appreciably in either direction since publication of the last status review (Good *et al.* 2005). New information since the last review concerning the status of anadromous runs in the DPS is limited and does not suggest a change in extinction risk. The following provides a summary of the run size information available from those few watersheds where monitoring has occurred (Williams *et al*. 2011).

Santa Ynez River

Staff of the Cachuma Conservation Release Board have monitored anadromous adults in the Santa Ynez River system since 2000 (Tim Robinson, Cachuma Operations and Maintenance Board, personal communication), primarily through trapping efforts on two tributaries, Salsipuedes Creek and Hilton Creek, and a section of the mainstem just downstream of Cachuma Dam (which is a complete passage barrier for steelhead) in the mid-basin. Salsipuedes Creek

(and tributaries) is in the lower basin, just upstream of the Santa Ynez River confluence with the ocean. Hilton Creek is a small tributary just downstream of Cachuma Dam.

The number of anadromous adults observed each year varied between zero and four, except for the year 2008, when 16 anadromous adults were observed (Figure 2). Resident fish were commonly caught in traps as well, indicating the co-occurrence of the anadromous and resident forms in the same tributaries.

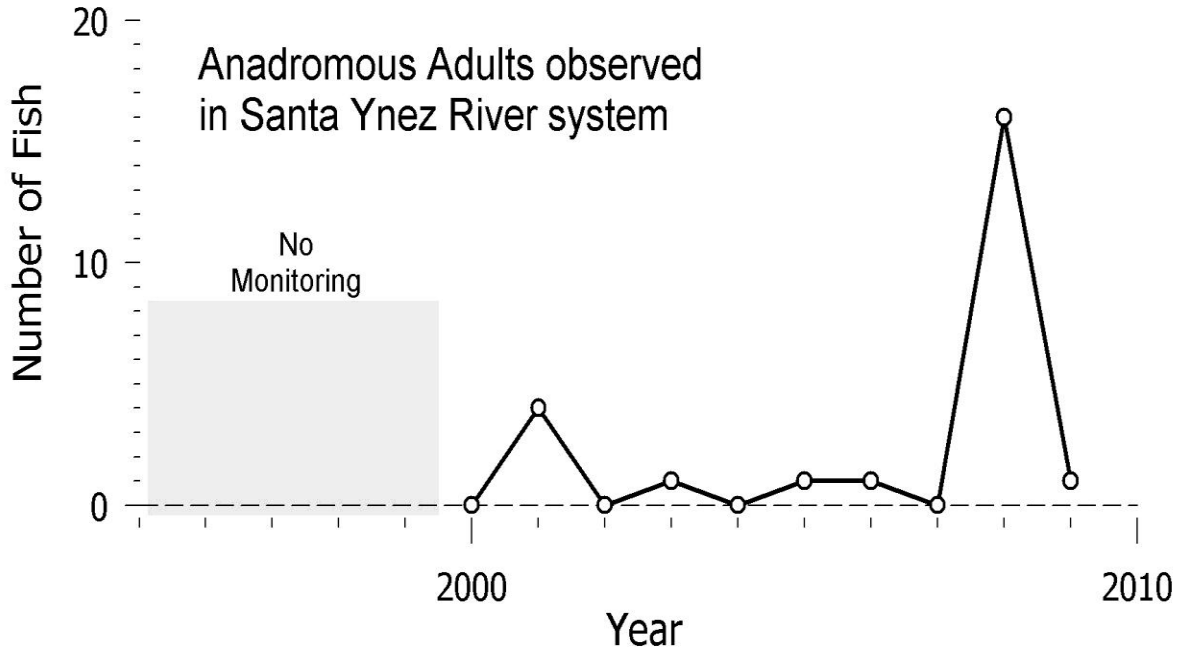

Figure 2. Anadromous adult steelhead observed in the Santa Ynez River System. Numbers are incomplete counts, unadjusted for observation probabilities/errors (Williams *et al.* 2011).

Ventura River

A fish ladder on the Robles Diversion Dam which is located on the Ventura River was completed in 2006 and since that time upstream migrants passing through the ladder have been monitored using a VAKI River Watcher which staff of Casitas Municipal Water District believe obtains observation probabilities effectively equal to 1.0 (Scott Lewis, Casitas Municipal Water District, personal communication). The Dam is located about 14 miles from the ocean and the counts made there omit spawning in this portion of the mainstem as well as an important tributary, San Antonio Creek. Redd surveys were conducted in 2009 and 2010 to estimate the entire spawning run, but these estimates are not yet available.

The annual number of upstream migrants observed at Robles Diversion Dam from 2006 through 2009 was 4, 0, 6, and 0 fish, for a mean annual run of 2.5 fish (not including fish spawning downstream of the dam and in San Antonio Creek). Most of these fish were judged as

anadromous based on their size, but the 4 fish observed in 2006 were relatively small and possibly freshwater residents (Figure 3).

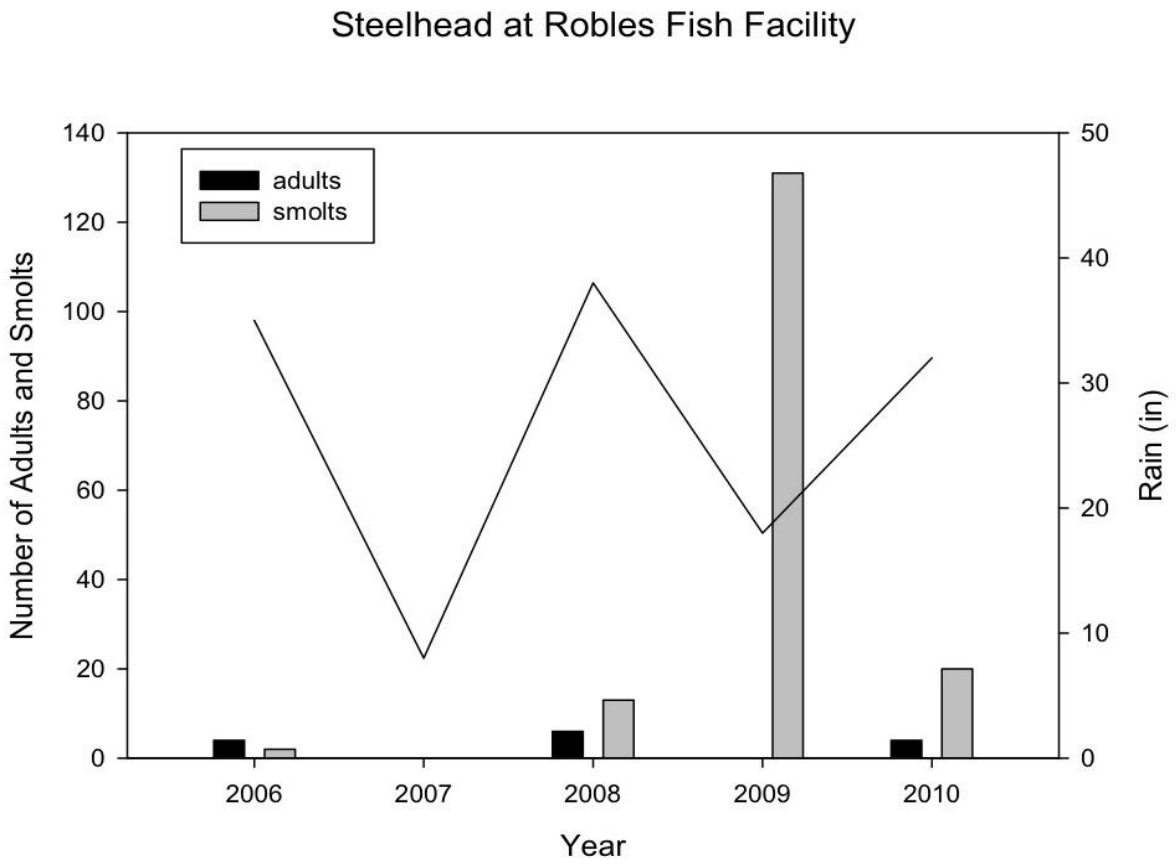

Figure 3. Anadromous adult steelhead observed in the Ventura River System. Numbers are incomplete counts, unadjusted for observation probabilities/errors (Williams *et al.* 2011)

Santa Clara River

Anadromous *O. mykiss* migrating upstream have been monitored, with uncertain observation probabilities, at the Freeman Diversion Dam on the mainstem of the Santa Clara River since 1995. With the exception of the estuary, most spawning and rearing habitat occurs upstream of this dam, so few if any steelhead are missed because they spawn downstream of the dam. As indicated in Figure 4, counts ranged from 0 to 2 anadromous adults per year between 1995 and 2009; however, the counts suffer from various technical difficulties in operating the passage facility and/or observing fish passing through it.

The active upstream migrant trap was decommissioned in 1997 and counting methods and staff expertise were variable through 2002. A passive upstream migrant counter was installed in 2003 or 2004, but was thought to be inefficient, and a more complete counting system was put on line for the 2010 season. Thus, the anadromous run through the facility is likely somewhat larger than implied by the counts. At this writing, data for the 2010 season are not yet available. Numerous resident *O. mykiss* passed through the facility during the period of observation, in numbers

ranging from 0 to 68 per year. (S. Howard, United Water Conservation District, personal communication). The total resident population, mostly resident to the lower mainstem, Santa Paula, Sespe, Hopper, and Piru creeks, and their tributaries, has not been estimated but is presumably much larger.

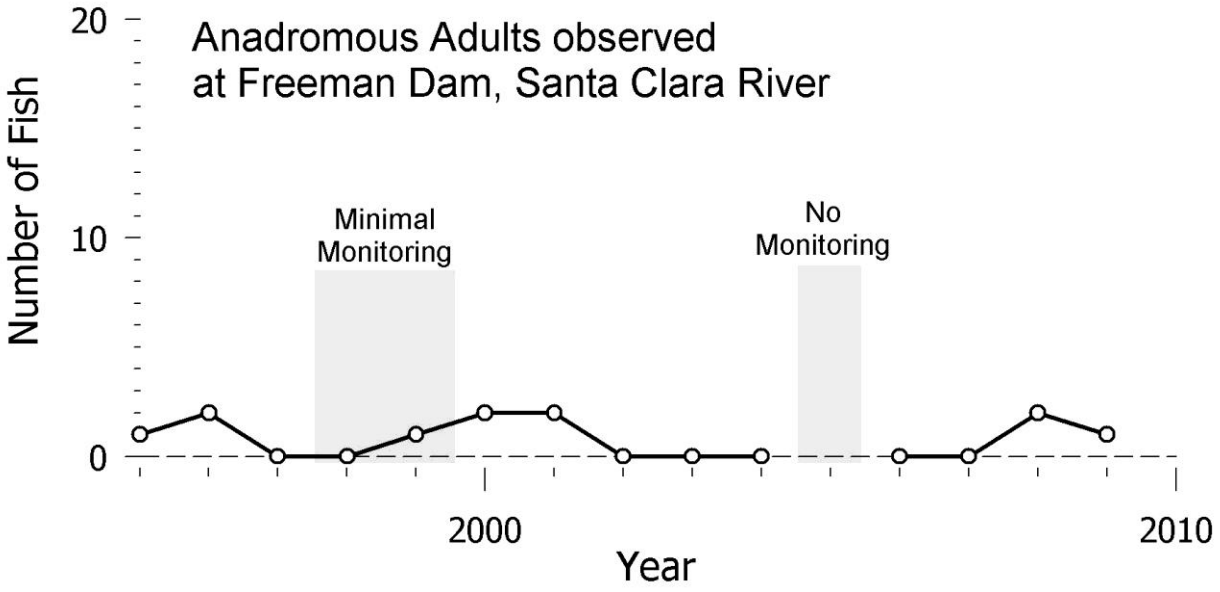

Figure 4. Anadromous adult steelhead observed in the Santa Clara River System. Numbers are incomplete counts, unadjusted for observation probabilities/errors (Williams *et al.* 2011).

Topanga Creek

Stillwater Sciences (2010) describe observations of *O. mykiss* in Topanga Creek, a small system in the Santa Monica Mountains just north of Los Angeles. Snorkel-counts have been conducted monthly since June 2001. In addition, tagging and recapture efforts using PIT tags were conducted in fall of 2008 and 2009, and migrant trapping was conducted opportunistically for a total of 27 days from February 2003 through March 2010 (Dagit and Krug 2011).

Trapping efforts have documented downstream migrants of age 1+ and 2+, and a total of three upstream migrants, size and age not given in the report. Snorkel counts indicate the persistent occurrence of juvenile and freshwater-resident *O. mykiss*. The authors consider fish with fork length greater than 50 cm (20") to be anadromous adults; and consider fish with fork length between 25 cm and 50 cm to be resident adults (R. Dagit, Santa Monica Mountains Resource Conservation District, personal communication). These assumptions allow a rough estimate for the lower bound of abundance of the two life-history types.

The number of anadromous adults is likely undercounted relative to resident adults, because conditions for observation are worse during the spring migration season than in the summer and fall, when many of the largest counts of resident adults were made. Observed numbers of

anadromous fish ranged between zero and 4 annually. Even with observation probabilities as low as 10%, the largest run would have been about 40 fish at the most.

According to the authors, mark-recapture data from 2007-08 indicate a population of resident fish whose abundance is on the order of 500 individuals, including all size and age classes. The authors observed very little use of lagoon habitat; and a trend toward broader freshwater habitat use during the study period. An unusually large number of juveniles was observed in summer 2008, suggestive that at least one anadromous (i.e., high-fecundity) female spawned the previous spring.

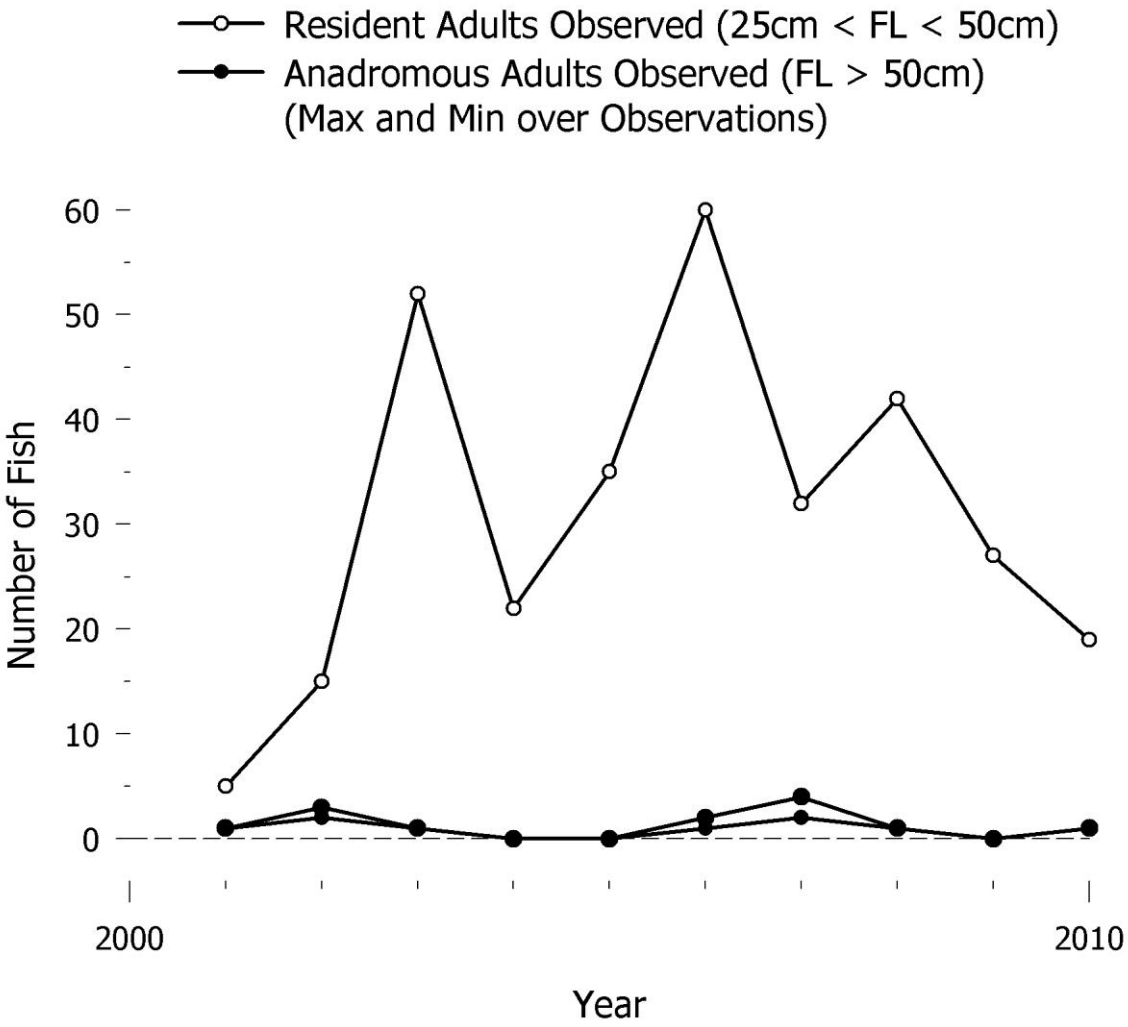

Figure 5. Anadromous adult steelhead observed in the Topanga Creek. Numbers are incomplete counts, unadjusted for observation probabilities/errors (Williams *et al.* 2011).

Malibu Creek

Recent snorkel surveys have been conducted in Malibu Creek downstream of Rindge Dam, and one anadromous adult was reported in each of the summers between 2007 and 2010 (R. Dagit, personal communication). These surveys typically commenced in May or June and so the bulk

of the run (expected to occur February through April) was over prior to when the counts were made (Dagit and Krug 2011).

Discussion

The picture which emerges from these data are that very small (<10 fish) but surprisingly consistent annual runs of anadromous fish are currently being monitored across a limited but diverse set of basins within the range of this DPS. Unusually strong runs emerged in the year 2008, possibly because it occurred two years after a long wet spring that presumably gave smolts ample opportunity to migrate to the ocean late in the spring. Though here "strong" is an appropriate term only within the context of this recovery domain, since elsewhere such runs would be considered very weak. Some of the strength of the 2008 season may also be an artifact of conditions that year. Low rainfall appears to have caused many spawners to get trapped in freshwater, where they were observed during the summer; in addition, low rainfall probably improved conditions for viewing fish during snorkel surveys, and for trapping fish in weirs (Williams *et al.* 2011).

How such small runs of anadromous fish (single digits) persist, even over the short term (1 decade) is not clear, but they could be maintained either by strays from some source population located elsewhere and/or from the consistent production of smolts by the local population of freshwater non-anadromous *O. mykiss*. Genetic assignment tests can be used to assess the likelihood that anadromous fish are strays from other basins. Of the 16 anadromous fish captured in the Santa Ynez River system in 2008, data from tissue samples assigned 6 (38%) to origins outside the basin, and 10 to origins within the basin (T. Robinson, personal communication). The broader-scale study of Clemento *et al.* (2009) tended to indicate that populations in different basins are linked by frequent straying, although "frequent" should be understood here in a genetic sense rather than a demographic sense: frequent enough so that family structure dominated the genetic distinctions among basins. There is also anecdotal evidence that freshwater resident populations of *O. mykiss* can produce smolts (reviewed in previous status reviews and TRT reports). Size and growth rate may provide valuable information as to whether the anadromous or freshwater-resident strategy would provide greater reproductive potential. If this model is generally applicable, then fish with this plastic strategy should generally outcompete either a purely resident or purely anadromous strategy over the long term. However, conditions particular to a given basin and time period may select for a pure strategy in the short term. One would expect that if such a situation persisted long enough, the ability to express the plastic strategy would become vestigial. This has yet to be empirically demonstrated in *O. mykiss* (Williams *et al.* 2011).

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range

Southern California steelhead declined in large part as a result of agriculture, mining, and urbanization activities that have resulted in the loss, degradation, simplification, and fragmentation of habitat (Hunt & Associates 2008).

Water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat. Modification of natural flow regimes by dams and other water control structures have resulted in increased water temperatures, changes in fish community structures, depleted flow necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, and reduced gravel recruitment. The substantial increase of impermeable surfaces as a result of urbanization (including roads) has also altered the natural flow regimes of rivers and streams, particularly in the lower reaches.

Land-use activities associated with urban development, mining, agriculture, ranching, and recreation have significantly altered steelhead habitat quantity and quality. Associated impacts of these activities include: alteration of stream bank and channel morphology; alteration of ambient stream water temperatures; degradation of water quality; elimination of spawning and rearing habitats; fragmentation of available habitats; elimination of downstream recruitment of spawning gravels and large woody debris; removal of riparian vegetation resulting in increased stream bank erosion; and increased sedimentation input into spawning and rearing areas resulting in the loss of channel complexity, pool habitat, suitable gravel substrate, and large woody debris.

A significant amount of estuarine habitat has been lost across the range of the DPS with an average of only 22 percent of the original estuarine habitat remaining. The condition of these remaining wetland habitats is largely degraded, with many wetland areas at continued risk of loss or further degradation. Although many historically harmful practices have been halted, much of the historical damage remains to be addressed and the necessary restoration activities will likely require decades. Many of these threats are associated with the larger river systems such as the Santa Maria, Santa Ynez, Ventura, Santa Clara, Los Angeles, San Gabriel, Santa Ana, San Luis Rey, Santa Margarita, San Dieguito, and San Diego Rivers, but they also apply to smaller coastal systems such as Malibu, San Juan, and San Mateo creeks.

Overall, these threats have remained essentially unchanged for the DPS as a whole since the last status review (Good et al. 2005) though some individual, site specific threats have been reduced or eliminated as a result of conservation actions such as the removal of small fish passage barriers.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes

Steelhead populations traditionally supported an important recreational fishery throughout the species range. Recreational angling for both winter adult steelhead and summer rearing juveniles was a popular sport in many coastal rivers and streams until the mid-1950s. Recreational angling in coastal rivers and streams for native steelhead increased the mortality of adults (which represent the current generation of brood stock) and juveniles (which represent the future generations of brood stock) and may have contributed to the decline of some naturally small

populations, but its is not considered the principal cause for the decline of the DPS as a whole. During periods of decreased habitat availability (*e.g.*, drought conditions or summer low flow) when fish are concentrated in freshwater habitats, the impacts of recreational fishing may have been heightened (NMFS 2011).

Until this DPS was listed in 1997, recreational angling for *O. mykiss* was permitted in all coastal drainages and continues in areas above barriers, such as major dams, which are currently impassible to fish migrating upstream. Angling for both adults and juveniles in those portions of coastal rivers and streams accessible to anadromous runs from the ocean has been eliminated through modification of the California Department of Fish and Game's (CDFG) angling regulations, with the notable exceptions of the Sisquoc River (including Manzana and Davy Brown Creeks) in Santa Barbara County, and the upper portions of the North Fork of Matilija Creek (including Bear Creek), and Sespe Creek above Alder Creek in Ventura County). Under the current DFG regulations, poaching or harassment remain potential forms of unauthorized take of Southern California steelhead.

Ocean harvest of steelhead is extremely rare, and is considered to be an insignificant source of mortality for Southern California steelhead. High seas driftnet fisheries in the past may have contributed slightly to a decline of this species in local areas, although steelhead are not targeted in commercial fisheries and reports of incidental catches are rare. Commercial fisheries are not believed to be principally responsible for the large declines in abundance observed along most of the Pacific coast over the past several decades. Sport and commercial harvest of steelhead in the ocean is prohibited by CDFG (California Department of Fish and Game 2010).

While insufficient data exists to estimate Southern California steelhead freshwater exploitation rates, they are likely relatively low given California's statewide prohibition of natural-origin steelhead retention since 1998. Fishing effort estimates based on angler self-report cards are available for 1993–2005 which suggest extremely low levels of effort in this DPS (Figure 5). Although fishing effort estimates for more recent years are not available, there has been no change in the fishing opportunity since 2005.

In summary, while no direct information is available on the level of Southern California steelhead fishery impacts since 2005, it is reasonable to conclude that the level of impact has not appreciably changed since the last status review (Good et al. 2005).

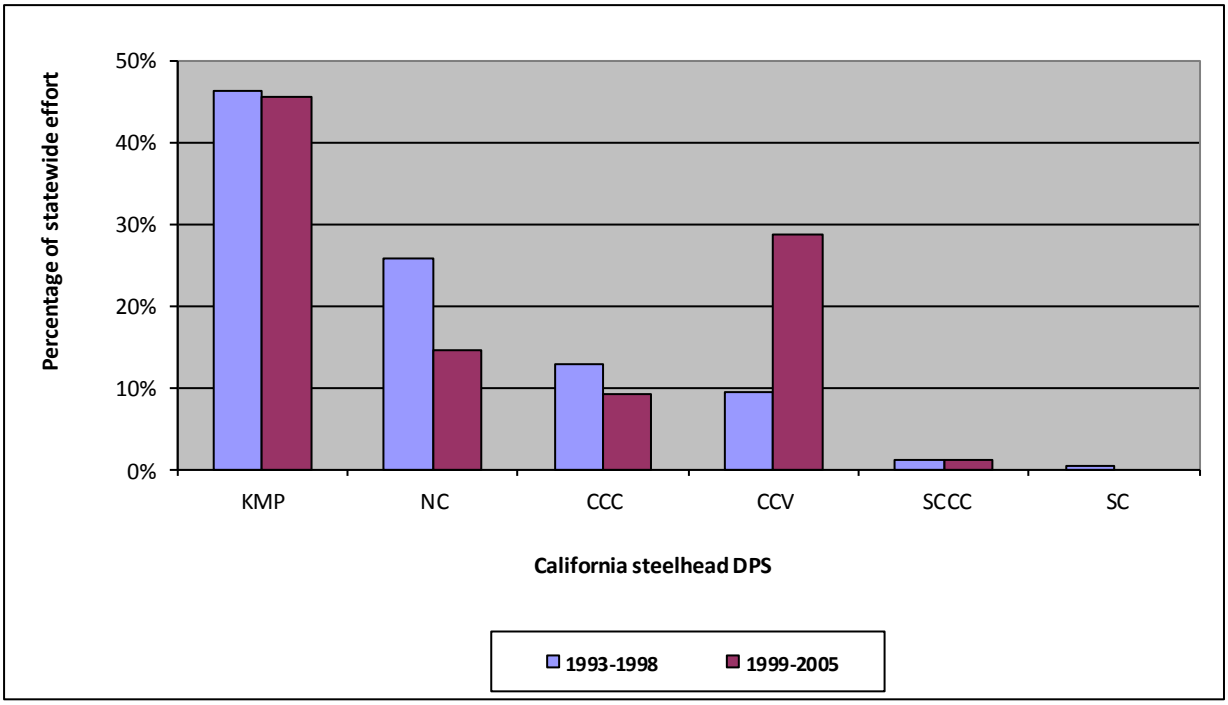

Figure 5. Distribution of California statewide steelhead fishing effort by DPS for years 1993–1998 and 1999–2005 (Jackson 2007).

2.3.2.3 Disease or predation

Infectious disease is one of many factors that can influence adult and juvenile steelhead survival. Specific diseases such as bacterial kidney disease, Ceratomyxosis, Columnaris, Furunculosis, infectious hematopoietic necrosis, redmouth and black spot disease, Erythrocytic Inclusion Body Syndrome, and whirling disease among others are present and are known to affect steelhead and salmon. Very little current or historical information exists to quantify infection levels and mortality rates attributable to these diseases for steelhead. Warm water temperatures, in some cases can contribute to the spread of infectious diseases; however, studies have shown that native fish tend to be less susceptible to pathogens than hatchery cultured and reared fish (Buchanon *et al*. 1983).

Introductions of non-native aquatic species (including fishes and amphibians) and habitat modifications (*e.g.*, reservoirs, altered flow regimes, *etc*.) have resulted in increased predator populations in numerous river systems, thereby increasing the level of predation experienced by native salmonids (Busby *et al.* 1996). Non-native species, particularly fishes and amphibians such as large and smallmouth basses and bullfrogs have been introduced and spread widely in many watersheds. These species can prey upon rearing juvenile steelhead (and their conspecific resident forms), compete for living space, cover, and food, and act as vectors for non-native diseases. Artificially induced summer low-flow conditions may also benefit non-native species, exacerbate spread of diseases, and permit increased avian predation.

In previous reviews, NMFS did not conclude that disease and predation were significant factors responsible for the decline of steelhead in this DPS. However, small populations of steelhead such as those found in this DPS may be more vulnerable to the effects of disease and/or predation particularly in combination with the synergistic effects of other threats. In addition, the effects of disease or predation may be heightened under conditions of periodic low flows or high temperatures which are characteristic of southern California steelhead habitats.

Overall, these threats have remained essentially unchanged for the DPS as a whole since the last status review (Good et al. 2005) though some individual, site specific threats may have been reduced or eliminated as a result of conservation actions such as the restoration of flows or riparian habitats which influence water temperature.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

At the time of listing in 1997, several Federal regulatory and planning mechanisms were identified as having potential adverse effects on steelhead populations and their habitat within this DPS. These included: 1) land management practices within the four U.S. National Forests in the DPS (Los Padres, Angeles, San Bernardino, and Cleveland); 2) the regulation of dredging and the placement of fill within the waters of the United States by the U.S. Army Corps of Engineers (USACE) through the Clean Water Act (CWA) Section 404 Program; 3) the regulation of dredging and the placement of fill within the waters of the United States through the CWA section 401 water quality certification regulations; 4) the Federal Emergency Management Agency (FEMA) administration of a Flood Insurance Program which strongly influences the development in waterways and floodplains; and 5) inadequate implementation of the CWA sections 303(d)(1)(C) and (D) to protect beneficial uses associated with aquatic habitats, including fishery resources, particularly with respect to non-point sources of pollution (including increased sedimentation from routine maintenance and emergency flood control activities within the active channel and floodplain).

For example, the USACE's program is implemented through the issuance of a variety of Individual, Nationwide and Emergency permits. Permitted activities should not "cause or contribute to significant degradation of the waters of the United States." A variety of factors, including inadequate staffing, training, and in some cases regulatory limitations on land uses (e.g., agricultural activities) and policy direction, have resulted in the ineffective protection of aquatic habitats important to migrating, spawning, or rearing steelhead. The deficiencies of the current program are particularly acute during large-scale flooding events, such as those associated with El Niño conditions, which can put additional strain on the administration of the CWA Section 404 and 401 programs.

Similarly, the National Flood Insurance Program regulations allow for development in the margins of active waterways if they are protected against 100-year flood events, and do not raise the water elevations within the active channel (floodway) more than one foot during such flood events. This standard does not adequately reflect the dynamic, mobile nature of watercourses in southern California, and the critical role that margins of active waterways (riparian areas) play in the maintenance of aquatic habitats. In addition, FEMA programs for repairing flood related damages (Public Assistance Program, Individual and Households Program, and Hazard Mitigation Grant Program) promote the replacement of damaged facilities and structures in their

original locations which are prone to repeated damage from future flooding, and thus lead to repeated disturbance of riparian and aquatic habitats important to migrating, spawning, or rearing steelhead.

At the time of listing, several non-Federal regulatory and planning mechanisms were identified as having potential adverse effects on steelhead populations and their habitat within this DPS. These included: 1) administration of the California State Water Resources Control Board (SWRCB) water rights permitting system which controls utilization of waters for beneficial uses throughout the state; 2) state and local government permitting programs for land uses on non-Federal and non-state owned lands; 3) administration of the Fish and Game Code Section 1600 (Streambed Alteration Agreements) program; and 4) the lack of a State-wide coastal anadromous fish monitoring plan for California that would inform regulatory actions such as angling restrictions.

For example, the SWRCB water rights permitting system contains provisions (including public trust provisions) for the protection of instream aquatic resources. However, the system does not provide an explicit regulatory mechanism to implement the CDFG Code Section 5937 requirement for the owner or operator of a dam to protect fish populations below impoundments. Additionally, SWRCB generally lacks the oversight and regulatory authority over groundwater development comparable to surface water developments for out-of-stream beneficial uses.

The Section 1600 Lake or Streambed Alteration Agreements program is the principal mechanism through which the CDFG provides protection of riparian and aquatic habitats. Inadequate funding, staffing levels, training and administrative support have led to inconsistent implementation of this program, resulting in inadequate protection of riparian and aquatic habitats important to migrating, spawning and rearing steelhead.

Additionally, there is a lack of local or regional public institutions specifically dedicated to promote steelhead recovery planning and implementation within the geographic range of this DPS. Only the Tri-Counties Fish Team (which deals with the Counties of Ventura, Santa Barbara, and San Luis Obispo) currently exists to promote funding and implementation of steelhead recovery actions in a specific geographic area. Elsewhere within the range of this DPS, conservation of steelhead is only the focus of individuals, groups, or agencies with broader responsibilities or interests.

Finally, monitoring of steelhead populations (particularly annual run-sizes) is essential for assessing the current and future status of this DPS, as well as collecting basic ecological information about the species. Unfortunately, the State's Coast-Wide Anadromous Fish Monitoring Plan remains unfinished and funding for its implementation has not been identified or secured.

These regulatory mechanisms have not been fundamentally changed since the last status review (Good et al. 2005) and as a consequence the threats to steelhead and its habitat from inadequate regulatory mechanisms are largely unchanged.

2.3.2.5 Other natural or manmade factors affecting its continued existence

At the time of listing, two specific threats to steelhead were identified under this factor: 1) environmental variability, including projected long-term climate change, and 2) stocking programs. Similar to the other listing factors, these threats continue to persist and recent information about environmental variability, including the effects of ocean conditions on the survival of salmonid populations and increases in wildfire occurrence and severity, indicate that the threat from "environmental variability" can be expected to increase.

Environmental Variability

Variability in natural environmental conditions has both masked and exacerbated the problems associated with degraded and altered riverine and estuarine habitats. Floods and persistent drought conditions have periodically reduced naturally limited spawning, rearing, and migration habitats. Furthermore, El Nino events and periods of unfavorable ocean-climate conditions can threaten the survival of steelhead populations already reduced to low abundance levels due to the loss and degradation of freshwater and estuarine habitats. However, periods of favorable ocean productivity and high marine survival can temporarily offset poor habitat conditions elsewhere and result in dramatic increases in population abundance and productivity by increasing the size and correlated fecundity of returning adults (NMFS 2011).

Overall, this threat has remained essentially unchanged since the last status review (Good et al. 2005), though the threats posed by environmental variability (from projected climate change) are likely to exacerbate this effects of this factor on steelhead and its habitat in the future.

Stocking Program

There are no steelhead hatcheries operating in or supplying hatchery reared steelhead for stocking into streams within the range of this DPS. However, there is an extensive stocking program of hatchery cultured and reared, non-anadromous *O. mykiss* which supports a "put-and-take" fishery that is stocked for removal by anglers. These stockings are now generally conducted in non-anadromous waters although other non-native game species such as large and smallmouth bass and bullhead catfish are stocked into anadromous waters by a variety of public and private entities). Nevertheless, hatchery origin non-anadromous fish may enter anadromous waters as a result of spillage over dams.

While some of these programs have succeeded in providing seasonal fishing opportunities, the impacts of these programs on native, naturally-reproducing steelhead stocks are not well understood. Competition, genetic introgression and disease transmission resulting from hatchery introductions may significantly reduce the production and survival of native, naturally-reproducing steelhead (Araki *et al.* 2007, 2008, 2009). However, genetic investigations of southern California steelhead have not detected any substantial interbreeding of native steelhead with hatchery reared *O. mykiss* (Girman and Garza 2006, Garza and Clemento 2007, Clemento et al. 2009; see also, Christie, et al. 2011, Abadia-Cardoso et al. 2011). These stockings are now generally carried out in non-anadromous waters, though fish in some cases may escape into anadromous waters. Collection of native steelhead for hatchery broodstock purposes can harm

small or dwindling natural populations. Artificial propagation can also, in some situations, play an important role in steelhead recovery through, among other means, preservation of individuals representing genetic resources which would otherwise be lost as a result of local anthropogenic driven extinctions, but are not a substitute for naturally-reproducing populations.

Overall, threats from stocking have remained essentially unchanged since the last status review (Good et al. 2005).

2.4 Synthesis

There is little new evidence to suggest that the biological status of the Southern California Steelhead DPS has changed appreciably since the last status review (Good et al. 2005) and Williams et al. (2011) conclude the extinction risk of this DPS is essentially unchanged since 2005. Similarly, our review indicates that the listing factors (or threats) identified at the time of listing and reviewed during the last status review also remain largely unchanged. However, increased environmental variability resulting from projected climate change is now recognized as a new and more serious threat to this DPS because it is likely to exacerbate those factors currently and contributing to its endangered status.

While the status of steelhead populations within the DPS has not changed appreciably since the last status review, a number of recovery related activities have been undertaken which may reduce threats in the future and lead to increased abundance of individual populations. Inventories of passage impediments have been conducted on major watersheds (Santa Maria/Sisquoc, Santa Ynez, Santa Ynez Mountains complex, Ventura, Santa Clara, and Santa Monica Mountains complex, San Juan/Arroyo, San Luis Rey) throughout the range of the DPS and fish passage facilities have been constructed on a number of streams including Ventura River (Robles Diversion Dam), Santa Paula Creek (Harvey Dam), Salsipuedes Creek, San Ysidro Creek, and a number of smaller watersheds along the Conception Coast. Additional fish passage projects are in the planning stages along the Conception Coast, the Santa Monica Mountains, and on San Juan/Arroyo Trabuco Creek in Orange County. A number of impediments to fish passage caused by road crossings and other instream structures have been eliminated or substantially improved as a result of retrofitting such structures (e.g. Horse Creek on the Sisquoc River). Planning for the removal of Matilija Dam in the Ventura River watershed has advanced substantially and planning has commenced on the removal of Rindge Dam on Malibu Creek. Funding for these two major dam removal projects has been provided by the U.S. Bureau of Reclamation, the U.S. Army Corps of Engineers, the U.S. Department of Justice, the California Coastal Conservancy, and the local dam owners, but is currently inadequate to complete the projects because of reduced federal funding. NMFS has issued two important biological opinions addressing fish passage and migration flows for populations in the DPS; one for Santa Felicia Dam on Piru Creek (a tributary to the Santa Clara River) and one for the Vern Freeman Diversion on the Santa Clara River. Angling regulations for native steelhead have been changed to eliminate recreational angling in virtually all coastal rivers and streams in the DPS that are accessible to adult steelhead migrating up from the ocean. Additionally, the CDFG has curtailed stocking of hatchery-reared trout and limited stockings to reservoirs or stream reaches above impassible barriers. In at least one case the CDFG has begun stocking sterile (triploid) fish to

prevent the interbreeding of hatchery-reared fish with native steelhead (*e.g.*, Rose Valley Lakes, tributary to the Sespe Creek-Santa Clara River system).

In summary, the best available information on the biological status of the Southern Califonria Steelhead DPS and the factors (threats) responsible for its decline indicate that it continues to be an endangered species.

3.0 RESULTS

3.1 Recommended Classification and DPS Boundary

Based upon a review of the best the available information, we recommend that the Southern California Coast steelhead DPS remain classified as an endangered species. Similarly, we do not recommend any changes to the geographic boundary of this DPS at this time. The SWFSC has convened a Biological Review Team to evaluate all new genetic information for this and the other coastal steelhead DPSs in California. The SWFSC will provide the Region with an analysis of this and other information which will be evaluated by the Region to determine whether any changes in steelhead DPS boundaries are warranted.

3.2 New Recovery Priority Number

No change is recommended in the recovery priority number for this DPS.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

We recommend the following future actions be implemented to promote conservation of the Southern California Steelhead DPS:

(1) Finalize the Southern California Steelhead Recovery Plan
(2) Finalize the Coast-Wide Salmonid Monitoring Plan for California
(3) Initiate the research and monitoring plan identified in the draft Southern California Steelhead Recovery Plan. Important research topics that should be addressed include:

   a. Ecological factors that promote anadromy
   b. Reliability of migration corridors
   c. Steelhead-Promoting nursery habitats
   d. Comparative evaluation of seasonal lagoons
   e. Potential nursery role of mainstem habitats
   f. Potential positive spawner density as an indicator of viability
   g. Roles of intermittent creeks
   h. Population structure
   i. Partial migration and life history crossovers
   j. Rates of dispersal between watersheds
   k. Revision of population viability targets

(4) Regarding the population viability and delisting criteria for this DPS, it is essential to investigate further the life-history of the species, including utilization of estuarine

habitat, juvenile growth and smolting patterns, distribution of residualized populations above artificial impassable barriers, and the relationship between putative resident and migratory forms of steelhead.

(5) High priority recovery actions identified in the Southern California Steelhead Recovery Plan should be implemented including.

- Identify and remove fish passage barriers in all core population watersheds.
    - Re-establish access to upper watersheds in both small coastal streams and several of the larger river systems within each biogeographic region identified by the TRT.
    - Complete planning for the removal of Matilija Dam on the Ventura River and Rindge Dam on Malibu Creek.

- Provide ecological meaningful flows below dams and diversions in all core population watersheds.
    - Re-establish adequate flow regimes (and in some instances fish passage facilities) for the Santa Maria, Santa Ynez, Ventura, Santa Clara, San Gabriel, Santa Ana, Santa Margarita, and San Luis Rey, San Dieguito, and Sweetwater Rivers.
    - Further investigate potential recovery actions south of Malibu Creek (within the southern range extension), including watershed barrier inventories, habitat suitability assessments, and metapopulation dynamics between the larger river systems and short run coastal streams.

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NATIONAL MARINE FISHERIES SERVICE
5-YEAR REVIEW
South-Central/Southern California Coast Steelhead Recovery Domain
Southern California Coast Steelhead DPS

Current Classification: Endangered

Recommendation resulting from the 5-Year Review: Retain current ESA classification as endangered and current DPS boundary.

REGIONAL OFFICE APPROVAL:

Lead Regional Administrator, NOAA Fisheries

Approve: Alan E Yale FOR Rodney McInnis Date: 11 NOV 2011

Cooperating Regional Administrator, NOAA Fisheries

_____Concur _____ Do Not Concur

Signature_____ Date_____

HEADQUARTERS APPROVAL:

Assistant Administrator, NOAA Fisheries

____Concur _____ Do Not Concur

Signature_____ Date 11/29/11