Southern California Steelhead Recovery Plan Summary

"A recovery plan serves as a road map for species recovery—it lays out where we need to go and how best to get there."



Adult female anadromous O. mykiss (approx. 75 cm), Mission Creek, Santa Barbara County, 2008.



Introduction to the Species

Steelhead are the anadromous, or ocean-going, form of the species *Oncorhynchus mykiss* and are one of seven Pacific salmon in the genus *Oncorhynchus* that are native to the west coast of North America. *O. mykiss*, along with the other species of Pacific salmon, exhibit an anadromous life-history in which the juveniles undergo a change that allows them to migrate to and mature in salt water before returning to their natal rivers or streams to reproduce. Southern California steelhead, once the prized trophy of California anglers, is now on the verge of extinction.



Southern California Coast Steelhead Recovery Planning Area

The Southern California Steelhead Recovery Planning Area extends from the Santa Maria River south to the Tijuana River at the U.S.-Mexico border and includes those portions of coastal watersheds that are at least seasonally accessible to steelhead entering from the ocean and the upstream portions of some watersheds that are currently inaccessible to steelhead due to man-made barriers. In the northern portion of the recovery planning area the major watersheds include the Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers; in the southern portion, Malibu and Topanga Creeks, the Los Angeles, San Gabriel, Santa Ana, Santa Margarita, San Luis Rey, Dan Dieguito, San Diego and Sweetwater Rivers, and San Juan and San Mateo Creeks. Approximately half of the population of the steelhead populations persist at low levels. Despite encroaching urbanization and other threats, the fish are incredibly resilient and recovery of the species is possible but will require the cooperation and dedication of many stakeholders.

Steelhead History

Historically, steelhead were the only abundant salmon species that naturally occurred within the coastal mountain ranges of southern California. They entered the rivers and streams draining these ranges during the winter months when storms produced sufficient runoff for the fish to breach the sandbars that formed at the mouths of the rivers and migrate upstream to spawning and rearing habitats. The ocean-going fish were sought out by recreational anglers during the winter and the juveniles during the spring and summer fishing seasons.

With a dramatic rise in human population after World War II, land and water development within coastal drainages led to the sharp decline of steelhead populations in many watersheds, leaving only sporadic and



Ventura River Estuary, 1909

remnant populations. While the steelhead populations declined sharply, most coastal watersheds retained populations of the non-anadromous form of the species (commonly known as rainbow trout), with many populations trapped behind dams and other impassible barriers.

After the National Marine Fisheries Service (NMFS) conducted a comprehensive status review of all west coast steelhead populations, southern California steelhead were proposed for listing as endangered on August 9, 1996. Southern California steelhead were formally listed as endangered on August 18, 1997. A second status review in 2005 led to the continued listing of the Southern California Steelhead Distinct Population Segment (DPS) in 2006. This listed species encompasses all naturally spawned steelhead between the Santa Maria River and the U.S.-Mexico border. This listing includes only those *O. mykiss* whose freshwater habitat occurs below impassible barriers, artificial or natural, that exhibit an anadromous lifehistory. Those fish from above impassible barriers that are able to emigrate into waters below the barrier and exhibit anadromous life-histories are also protected as part of the DPS.



Santa Ynez River, 1942

Steelhead Biology and Ecology



Juvenile O. mykiss (~ 10cm), Juncal Creek



Adult female O. mykiss, Carpinteria Creek dependent on streamflow, and influe

Steelhead utilize all portions of a river system, including the estuary at the mouth and the spawning and nursery areas in the headwaters, to complete their life history. Steelhead therefore serve as an indicator species, providing a measure of the health of southern California rivers and streams. There are several factors of steelhead biology and behavior that are important when considering their conservation. The most fundamental is the diversity of life-history strategies which the species *O. mykiss* relies on to persist in a naturally highly variable and challenging southern California

environment. There are three basic life-history strategies: migration to the sea (fluvial-anadromous), migration to and from a lagoon (lagoon-anadromous), and freshwater residency.

These three life-history variations have allowed *O*. mykiss to take advantage of a range of different habitats and overcome harsh environmental conditions such as droughts, floods, and climate change for millennia. Fish that exhibit one of these life-history strategies can produce progeny that exhibit one or more of the other life-history strategies, therefore switching between the different strategies is possible.

Adult steelhead migration to freshwater spawning areas is dependent on adequate stream flows during the winter and spring, which can be significantly affected by dams, water diversions, and modification of the natural channel used for migration. Juvenile emigration to the ocean is also

dependent on streamflow, and influenced by factors such as water temperature and growth rate. Consequently

changes in water flow or temperature can potentially affect the ability of juvenile steelhead to successfully migrate to the ocean. Migration of juvenile steelhead to the ocean provides a reproductive advantage because individuals who feed in the ocean tend to grow larger than freshwater residents and females tend to produce more eggs. Adult anadromous steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more times. This lends importance to the protection of anadromous adults since there is potential for multiple generations of offspring per mature female.

A Species in Distress



Rincon Creek Estuary

Most steelhead populations within the Southern California Steelhead DPS have been severely reduced, particularly near the southern extent of their range south of the Santa Monica Mountains. According to a NMFS population survey conducted in 2002, of the 46 watersheds in which steelhead were known to have occurred historically, between 37-43% were still occupied by either resident or anadromous steelhead. Land use in southern California watersheds is highly variable, with the upper reaches comprised of undeveloped National Forest lands, and the lower reaches and along the coast highly urbanized. An important indication of the degree of habitat degradation in the lower portions of southern California watersheds is the loss of estuarine habitat. Approximately 75% of estuarine habitats across the Southern

California Steelhead Recovery Planning Area have been lost, and the remaining 25% are constrained by agricultural and urban development, levees, and transportation corridors (highways and railroads). Because estuaries are the gateway used by both immigrating adults and emigrating juveniles moving between the marine and freshwater environments, estuarine loss affects the entire watershed.

Threats

There is no single factor responsible for the decline of southern California steelhead; however, of the various factors imperiling the species, the destruction and modification of habitat has been identified as one of the primary causes

for the decline of the Southern California Steelhead DPS. Anthropogenic activities such as agriculture, mining, recreation, and urbanization; water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic, and hydropower purposes have had a particularly adverse effect on anadromous steelhead. Dams and the associated modification of natural flow regimes have resulted in increased water temperatures, changes in the fish community structure, inhibited flushing of sediments from spawning gravels, and blocked access to prime steelhead spawning and rearing areas.



Other factors contributing to the decline of steelhead include the introduction of non-native aquatic species through recreational fishing (*e.g.*, bass,

Matilija Dam

bullfrogs, carp, and catfish) which has increased predation on juveniles, competition for space, cover, and food, and the spread of disease. There are no steelhead hatcheries operating in or supplying hatchery-reared steelhead to the Southern California Steelhead DPS. There is however a stocking program for non-anadromous *O. mykiss* for a catch-and-release fishery. Recreational fishing also results in the trampling of redds and increased mortality of adults and juveniles.

Anthropogenic activities have decreased the species ability to survive natural environmental variables such as wildfires and droughts. For example, modification of natural river and estuary environments has restricted the ability of steelhead to utilize suitable refugia habitat in response to natural variability in habitat conditions within Southern California watersheds and the ocean. Climate change is expected to lead to further habitat modification, including increased water temperature, loss of instream refugia, increased wildland fires and related stream sedimentation, and increased nutrient loading.

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.



Fish Passage Blockage Trabuco Creek Road Crossing



Channel Modification Los Angeles River



Wheeler Gorge Fire Effects North Fork Matilija Creek

Recovery

The Southern California Steelhead Recovery Plan is a guideline for achieving recovery goals by describing the biological criteria that individual populations of *O. mykiss* and the DPS as a whole must exhibit to be delisted and the recovery actions NMFS believes are necessary to address the threats to the species and allow for their recovery. The Recovery Plan is not a regulatory document and its recovery actions are not mandatory. The recovery of the species therefore depends upon the cooperation of stakeholders and planning and regulatory entities to ensure appropriate implementation of recovery actions.

The overall goal of the Southern California Steelhead Recovery Plan is to prevent the extinction of anadromous steelhead in the wild and ensure the long-term persistence of self-sustaining, harvestable, wild populations of steelhead across the DPS by addressing factors limiting the species' ability to survive and naturally reproduce in the wild. To achieve this goal, the plan outlines the following objectives:

- 1. Reduce the factors that threaten the long-term persistence of wild populations of O. mykiss.
 - There are two types of developments and activities that pose the principal threats to the species: (1) impassable barriers, and (2) water storage and withdrawal, including groundwater extraction. These priority threats must be reduced if the steelhead are to recover, and ultimately be delisted.
- 2. Protect existing populations and habitats and maintain multiple interconnected populations of steelhead across diverse habitats.
 - The full range of all life-history forms of *O. mykiss* must be able to successfully use as many types of habitat as possible in order to overcome the natural challenges of a highly variable natural environment and random or unpredictable biological processes.
- 3. Conserve existing genetic diversity and provide opportunities for interchange of genetic material between and within viable populations within the DPS.
- 4. Restore and maintain suitable habitat conditions and characteristics for all life-history strategies thereby preserving the diversity of life-history strategies that allow for adaptation.
- 5. Conduct necessary research to refine recovery criteria, monitor the status and trends of individual populations, and adaptively modify recovery actions and strategies in response to new information and better understanding of the biology and habitat requirements of the species.

In order to recover, the species needs substantially higher numbers of returning adults, successful spawning and rearing in freshwater and estuarine environments, and successful migration of juveniles to the ocean. To conserve the natural diversity (genetic, physical, and behavioral), spatial distribution, and resiliency of the DPS as a whole will require recovery of a sufficient number of viable populations within each of the five Biogeographic Population Groups (BPGs) which consists of the Monte Arido Highlands, Conception Coast, Santa Monica Mountains, Mojave Rim, and the Santa Catalina Gulf Coast. This criterion includes the recovery of all life-history forms. The full Recovery Plan outlines the recovery criteria for each of the BPGs and for the species. However, significant data

gaps limit NMFS' ability to prescribe specific criteria for many of these measures of recovery. Further research described in the Recovery Plan is intended to provide the information necessary to develop specific recovery criteria for the species.



Biogeographic Population Groups (BPGs) in the Southern California Steelhead Recovery Planning Area

DPS-Wide Recovery Actions

The actions below summarize recommendations that are designed to address common threats across the DPS. The full Recovery Plan provides additional information on these and other actions necessary to restore the health of steelhead within individual watersheds for the five BPGs and the DPS as a whole:

- □ Modify passage barriers and ensure that the pattern and magnitude of water releases from water storage and diversion facilities mimic as much as possible natural or pre-dam patterns and magnitude of stream-flow.
- □ Prioritize and promote restoration projects, threat abatement, and monitoring actions.
- □ Secure funding for and engage in full enforcement of relevant laws, codes, and protective regulations.
- □ Reduce water pollutants such as fine sediments, pesticides, and other point and non-point source waste discharges.
- □ Eliminate stocking of hatchery-reared fish in anadromous waters in order to preserve the genetic integrity of wild fish, use sterile triploid fish where stocking is otherwise appropriate. Evaluate the development of a conservation hatchery program for endangered steelhead.
- □ Promote wildfire prevention and water usage awareness.
- Curb angling below impassible barriers.
- □ Promote continued research and education.

NMFS' Role

NMFS' primary role in the implementation of the Steelhead Recovery Plan is to promote and refine the recovery strategy and provide the needed technical information and expertise to other entities implementing the plan or contemplating actions that may impact the species' chances of recovery. NMFS is responsible for prioritizing its work load allocation and decision-making, as well as developing implementation mechanisms. This includes conducting outreach and education programs and facilitating a consistent framework for research, monitoring, and adaptive management.

NMFS is committed to working cooperatively with other individuals, stakeholders and agencies on implementation of recovery actions and encourages other federal agencies to implement the actions for which they have responsibility or authority.

Summary

Southern California steelhead are facing imminent extinction. Annual runs have declined dramatically from 32,000-46,000 returning adults historically, to less than 500 returning adults today (Good *et al.*, 2005). Widespread threats to their natural habitats place tremendous pressure on the species' ability to persist. However, steelhead are resilient fish and despite the threats to their habitat they continue to persist in small numbers. The Southern California Steelhead Recovery Plan outlines a strategy for the species recovery by identifying vital watersheds, threats to those watersheds, and ways to address those threats. Recovery of viable, self-sustaining populations of anadromous southern California steelhead will require the re-integration of these populations into a highly altered landscape that is home to 23 million people. This will entail an effort to restore habitats and manage water resources in ways that support both southern California steelhead and the human population. Recovery of steelhead in Southern California will require the efforts of many stakeholders from both the public and private sector.

Key Terms

- <u>DPS</u>: distinct population segment
- <u>BPGs</u>: Biogeographic Population Groups
- <u>Viable population</u>: populations having a negligible risk of extinction due to threats from demographic variation, non-catastrophic environmental variation, and genetic diversity changes over a 100-yr frame
- <u>Viable DPS</u>: comprised of a sufficient number of viable populations broadly distributed throughout the DPS but sufficiently well-connected through ocean and freshwater dispersal to maintain long-term persistence and evolutionary potential.

Full 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 website:

http://swr.nmfs.noaa.gov/recovery/So_Cal.htm