

## EXECUTIVE SUMMARY

The goal of this Recovery Plan is to prevent the extinction of South-Central California Coast steelhead (*Oncorhynchus mykiss*) in the wild and to ensure the long-term persistence of viable, self-sustaining, populations of steelhead distributed across the South-Central California Coast Steelhead (SCCCS) Distinct Population Segment (DPS). It is also the goal of this Recovery Plan to ensure a sustainable South-Central California steelhead sport fishery through the restoration of a suite of viable steelhead populations across the SCCCPS DPS.

Recovery of the SCCCPS DPS will require the protection, restoration, and maintenance of a range of habitats throughout the DPS in order to allow the natural diversity of *O. mykiss* to be fully expressed (e.g., anadromous and resident forms, timing and frequency of runs, and dispersal between watersheds).

### Status of South-Central California Coast Steelhead

Steelhead are the anadromous, or ocean going form of the species *Oncorhynchus mykiss*, with adults spawning in freshwater, and juveniles rearing in freshwater before migrating to the ocean to grow and sexually mature prior to returning as adults to reproduce in freshwater. Steelhead populations along the West Coast of North America have experienced substantial declines as a result of human activities such as water development, flood control programs, forestry practices, agricultural activities, mining, and urbanization that have degraded, simplified, and fragmented aquatic and riparian habitats. In South-Central California, near the southern limit of the range for anadromous *O. mykiss* in North America, it is estimated that annual average runs have declined dramatically from an estimated 25,000 returning adults historically, to currently less than 500 returning adults (Williams *et al.* 2011, Good *et al.* 2005, Helmbrecht and Boughton 2005, Boughton and Fish 2003). These historic annual run sizes varied significantly, perhaps by one or two orders of magnitude, depending on the annual

rainfall patterns and longer term oceanic and climatic cycles. The present annual run sizes, also exhibit large inter-annual fluctuations, although at much lower levels.

Steelhead along South-Central California Coast comprise a “distinct population segment” of the species *O. mykiss* that is ecologically discrete from the other populations of *O. mykiss* along the West Coast of North America. Under the U.S. Endangered Species Act of 1973 (ESA), this DPS qualifies for protection as a separate species. In 1997, the SCCCPS DPS - originally referred to as an Evolutionarily Significant Unit (ESU) - was listed as a “threatened” species - a species that is likely to become in danger of extinction within the foreseeable future throughout all or a significant portion of its range.



South-Central California Steelhead Angling Heritage - Salinas River, c. 1940s.

### Recovery Planning

The ESA mandates that the National Marine Fisheries Service (NMFS) develop and implement Recovery Plans for the conservation (recovery) of listed species. The development

and implementation of a Recovery Plan for the SCCCS DPS is considered vital to the continued persistence and recovery of anadromous *O. mykiss* in South-Central California. However, the development of a recovery plan is only the beginning of the recovery process. Implementation of recovery plans will require the development of site-specific and project specific information, and involvement of interested stake-holders to ensure that recovery actions are effective and sustainable.

The SCCCS DPS encompasses *O. mykiss* populations in watersheds from the Pajaro River (at the boundary between Santa Cruz and Monterey Counties) south to Arroyo Grande Creek (San Luis Obispo County). For recovery planning purposes, the South-Central California Coast Steelhead (SCCCS) Recovery Planning Area includes those portions of coastal watersheds that are seasonally accessible to anadromous *O. mykiss* entering from the ocean, as well as the upper portions of watersheds above anthropogenic fish passage barriers that historically contributed to the maintenance of anadromous populations.

Recovery plans developed under the ESA are guidance documents, not mandatory regulatory documents. However, the ESA envisions Recovery plans as the central organizing tool for guiding the recovery of listed species. Recovery plans also guide federal agencies in fulfilling their obligations under Section 7(a)(1) of the ESA, which calls on all federal agencies to “utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species.” In addition to outlining proactive measures to achieve species recovery, Recovery plans provide a context and framework for other provisions of the ESA with respect to federally listed species, including but not limited to consultations on federal agency activities under Section 7(a)(2) and the development of Habitat Conservation Plans in accordance with Section 10(a)(1)(B).

This Recovery Plan serves as a guideline for achieving recovery goals by describing the criteria by which NMFS would measure species recovery, the strategy to achieve recovery, and the recommended recovery actions necessary to achieve viable populations of steelhead within the SCCCS Recovery Planning Area.

## Environmental Setting

The SCCCS 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 (*e.g.*, Santa Cruz and Santa Lucia Mountains), and those watersheds containing larger river systems that extend inland through gaps in the coastal ranges (*e.g.*, Pajaro and Salinas Rivers, and Arroyo Grande Creek).

The SCCCS Recovery Planning Area has a Mediterranean climate, with long dry summers and brief winters with short, sometimes intense cyclonic winter storms. Rainfall is restricted almost exclusively to the late fall, winter, and early spring months (November through May). Additionally, there is a wide disparity between winter rainfall from north to south, as well as between coastal plains and inland mountainous areas. Snow accumulation is generally small and of short duration, and does not typically contribute significantly to peak run-off in South-Central California watersheds. The SCCCS Recovery Planning Area is also subject to an El Niño/La Niña weather cycle that can significantly affect winter precipitation, causing highly variable rainfall and significant changes in oceanic conditions.

Base flows (average dry-season flows) in South-Central California watersheds are strongly influenced by groundwater which is transported to the surface through faults and fractured rock formations. Many rivers and streams in this region naturally exhibit interrupted base flow patterns (*i.e.*, alternating reaches with perennial and seasonal surface flow) controlled by

geologic formations, and the strongly seasonal precipitation pattern characteristic of a Mediterranean climate. Water temperatures are generally highest during summer months, but can be locally cooled by springs, seeps, and rising groundwater, creating habitat refugia where conditions remain suitable for rearing salmonids, even during the summer.

Significant portions of the upper watersheds within the SCCCS Recovery Planning Area are contained within the Los Padres National Forest (Monterey and Santa Lucia Ranger Districts). These forests are managed primarily for water production, recreation, and protection of native fish, wildlife, and botanical resources (with limited cattle grazing).

Urban development is concentrated in coastal areas and inland valleys, with the most extensive and densest urban development located within the Pajaro, Salinas, San Luis Obispo and Arroyo Grande watersheds. The SCCCS Recovery Planning Area is home to more than 2.8 million people. Some coastal valleys and foothills are extensively developed with agriculture - principally row-crops, orchards, and vineyards (*e.g.*, Pajaro, Salinas and Arroyo Grande valleys).

### Recovery Goals and Viability Criteria

The overarching goal of this Recovery Plan is recovery of the SCCCS DPS and its removal from the Federal List of Endangered and Threatened Wildlife (50 C.F.R. 17.11). To achieve this goal, the ESA requires that Recovery plans, to the maximum extent practical, incorporate objective, measurable criteria that, when met, would result in a determination in accordance with the provisions of the ESA that the species be delisted (50 CFR 17.11 and 17.12). Recovery does not necessarily require restoring watersheds to a pre-development, pristine state, but restoring riverine functions to the point that they support viable populations of wild steelhead.

Recovery criteria are built upon viability criteria developed by NMFS's Technical Recovery Team (TRT) for the individual anadromous *O. mykiss* populations and the DPS as a whole. A **viable population** is defined as a population having a negligible risk (< 5%) of extinction due to threats from demographic variation, natural environmental variation, and genetic diversity changes over a 100-year time frame. A **viable DPS** is comprised of a sufficient number of viable populations spatially dispersed, but proximate enough to maintain long-term (1,000-year) persistence and evolutionary potential (McElhany *et al.* 2000). The viability criteria are intended to describe characteristics of the species, within its natural environment, necessary for both individual populations and the SCCCS DPS as a whole to be viable, *i.e.*, persist over a specific period of time, regardless of other ongoing effects caused by human actions.

Recovery of the threatened SCCCS DPS will require recovery of a minimum number of viable populations within each of four Biogeographic Population Groups (BPGs) within the SCCCS Recovery Planning Area. Recovery of these individual populations is necessary to conserve the natural diversity (genetic, phenotypic, and behavioral), spatial distribution, and abundance of the species, and thus the long-term viability of the SCCCS DPS. Each population must exhibit a set of biological characteristics (*e.g.*, minimum mean annual run size, persistence over variable oceanic conditions, spawner density, anadromous fraction, *etc.*) in order to be considered viable. (Boughton *et al.* 2007b).

To focus recovery efforts and facilitate the recovery of the species, the SCCCS Recovery Plan identifies populations essential to meeting recovery goals and criteria (Core 1, 2, and 3 populations) in each of the four BPGs within the SCCCS DPS, and prioritizes recovery actions for each of the watersheds within these BPGs (see Recovery Action Tables in Chapters 9-12).

## Recovery Strategy

Restoring the diversity of steelhead habitats (and access to them) that was previously available to steelhead within coastal watersheds is central to the recovery of the SCCCS DPS. Such a strategy aims to restore the natural selective regime under which steelhead evolved their diversity, and which is a key to the species' long-term survival.

Recovery of South-Central California steelhead will require a scientifically based biological, recovery strategy as well as effective implementation. The framework for a durable implementation strategy involves two key principles: 1) solutions that focus on fundamental causes for watershed and river degradation, rather than short-term remedies; and 2) solutions that emphasize resilience in the face of projected climate change to ensure a sustainable future for both human communities and steelhead (Beechie *et al.* 2010, Beechie and Bolton 1999; Boughton 2010a, Naiman *et al.* 2005, Lubchenco 1998). Such a strategy:

- ❑ Looks for opportunities for sustainable water and land-use practices;
- ❑ Restores river and estuary processes that naturally sustain steelhead habitats;
- ❑ Provides diverse opportunities for steelhead within the natural range of ecological adaptability;
- ❑ Sustains ecosystem services for humans by reinforcing natural capital and the self-maintenance of watersheds and river systems; and
- ❑ Builds natural and societal adaptive capacity to deal with climate change.

A comprehensive strategic framework is necessary to serve as a guide to integrate the actions contributing to the goal of recovery of the SCCCS DPS. This strategic framework incorporates the concepts of viability at both the population and DPS levels, and the

identification of threats and recovery actions for each of the four BPGs.

NMFS has identified core populations intended to serve as the foundation for the recovery of the species in the SCCCS Recovery Planning Area. Threats assessments for the species indicate that recovery actions related to changes in water storage and management regimes and the modification of fish passage barriers and within certain rivers of the SCCCS Recovery Planning Area are essential to the recovery of the species. Extensive, high quality habitat exists above a large number of passage barriers in these river systems. These areas are currently not included within the SCCCS DPS as defined in the listing rule (71 FR 834). However, because these habitat areas comprise a majority of the prime steelhead spawning and rearing habitat within the species' natural range, they are a major focus of recovery actions.

Uncertainties remain regarding the level of recovery necessary to achieve population and DPS viability, therefore, additional research and monitoring of *O. mykiss* populations within the SCCCS Recovery Planning Area is an essential component of this Recovery Plan. As the Recovery Plan is implemented, additional information will become available to: (1) refine the viability criteria; (2) update and refine the threats assessment and related recovery actions; (3) determine whether individual threats have been abated or new threats have arisen; and (4) evaluate the overall viability of anadromous *O. mykiss* in the SCCCS Recovery Planning Area. Additionally, there will be a review of the recovery actions implemented and population and habitat responses to these actions during the 5-year status reviews of the DPS.

## Recovery Actions

Restoring flows, access to spawning and rearing habitats, and instream habitat conditions (including estuarine conditions) necessary to support steelhead are the principal recovery actions identified in this Recovery Plan to restore the SCCCS DPS, and will require

continuing active management in a region with a large human population and extensively developed land-uses.

Many complex and inter-related biological, economic, social, and technological issues must be addressed in order to recover anadromous *O. mykiss* in the SCCCS DPS. Policy changes at the federal, state and local levels will likely be necessary to implement many of the recovery actions identified in this Recovery Plan. For example, without substantial strides in water conservation, efficiency, and re-use throughout South-Central California, flow conditions for anadromous salmonids will limit recovery. Similarly, recovery is unlikely without programs to restore properly functioning historic habitats such as estuaries, and access to upstream spawning and rearing habitat.

Many of the recovery actions identified in this Recovery Plan address watershed-wide processes which are also the focus of other local, state and federal programs (e.g., wild-fire cycle, erosion and sedimentation, runoff and waste discharges) which will benefit a wide variety of native species (including federally listed species or species of special) by restoring natural ecosystem functions. Some of the listed species which co-occupy coastal watersheds with South-Central California steelhead include: Tidewater goby (*Eucyclogobius newberryi*), Foothill yellow-legged frog (*Rana boylei*), California least tern (*Sterna antillarum browni*), California red-legged frog (*Rana aurora draytonii*), Southwestern pond turtle (*Clemmys marmorata*), Arroyo toad (*Bufo microscaphus californicus*), Least Bell's Vireo (*Vireo bellii pusillus*), and Western snowy plover (*Charadrius alexandrinus nivosus*). Additionally, Pacific lamprey (*Entosphenus tridentata*), another anadromous species occupying South-Central California watersheds, and whose numbers have declined significantly, can also be expected to benefit from many of the recovery actions identified in this Recovery Plan. Coordinating the implementation of recovery actions identified in this Recovery Plan with local, state and federal land use and water management

programs, as well as private land owners and other interested stakeholders, is essential to the effective and timely recovery of the SCCCS DPS.

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 damage from periodic flooding resulting from floodplain development, and controlling invasive exotic animal and plant species which can threaten water supplies and increase flooding risks. Restoring and maintaining ecologically functional watersheds also enhances important human uses of aquatic habitats occupied by steelhead; these include activities such as outdoor recreation, environmental education (at primary and secondary levels), field-based research of both physical and biological processes of coastal watersheds, aesthetic benefits, and the preservation of tribal and cultural heritage values.

The final category of benefits accruing to recovered salmon and steelhead populations involve the ongoing costs associated with maintaining populations that are at risk of extinction. Significant resources are spent annually by federal, state, local, and private entities to comply with the regulatory obligations that accompany species that are listed under the ESA. Important activities, such as water management for agriculture and urban uses, can be constrained to protect ESA listed species. As a result of these ESA related obligations, such as compliance with Section 7 requirements, the take prohibitions of Section 9, and the development of Section 10 Habitat Conservation Plans, a degree of uncertainty is often experienced by regulated entities. Recovering listed salmonid species will 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.

Although the recovery of South-Central California steelhead is expected to be a long process, the TRT recommended certain actions that should be implemented as soon as possible to help facilitate the recovery process for the SCCCS DPS. These include identifying a set of core populations on which to focus recovery efforts, protecting extant parts of inland populations, identifying refugia habitats, protecting and restoring estuaries, and collecting population data (Boughton *et al.* 2007b). Recovery actions for individual watersheds are identified in separate chapters covering the four BPGs within the SCCCS Recovery Planning Area (see Chapters 9-12).

### Implementation and Recovery Action Cost Estimates

Implementation of this Recovery Plan will require a shift in societal attitudes, understanding, priorities, and practices. Many of the current land and water use practices that are detrimental to steelhead (particularly water supply and flood control programs) are not sustainable. Modification of these practices is necessary to both continue to meet the needs of the human communities of South-Central California and restore the habitats upon which viable steelhead populations depend.

Since the listing of South-Central California steelhead as threatened in 1997, efforts have accelerated to change many unsustainable water and land-use practices; however a great deal more needs to be done before steelhead are recovered and ultimately removed from the list of federally endangered or threatened species.

Investment in the recovery of South-Central California steelhead will provide economic and societal as well as environmental benefits. Monetary investments in watershed restoration projects can benefit the economy in multiple ways. These include stimulating the economy directly through the employment of workers, contractors and consultants, and the expenditure of wages and restoration dollars for

the purchase of goods and services. Habitat restoration projects have been found to stimulate job creation at a level comparable to traditional infrastructure investments such as mass transit, roads, or water projects (Sunderstrom *et al.* 2011, Nielsen-Pincus and Moseley 2010, Meyer Resources Inc., 1988). 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. Dollars spent on steelhead recovery have the potential to generate significant new dollars for local, state, federal and tribal economies.

Perhaps the largest direct economic returns resulting from recovered anadromous salmonids are associated with angling. On average 1.6 million anglers fish the Pacific region annually (Washington, Oregon, and California) and 6 million fishing trips were taken annually between 2004 and 2006 (National Marine Fisheries Service 2010c). Most of these trips were taken in California and most of the anglers live in California. Projections of the economic and jobs impacts of restored salmon and steelhead fisheries for California have been estimated from \$118 million to \$5 billion dollars, and supporting thousands of jobs (Michael 2010, Southwick Associates 2009; see also, Meyer Resources, Inc. 1988).

Estimating total cost to recovery in the SCCCS Recovery Planning Area is challenging for a variety of reasons. These include the need to 1) refine recovery criteria which form the basis of the biological recovery strategy; 2) complete investigations such as barrier inventories and assessments, and habitat typing surveys in the core populations; 3) identify flow regimes for individual watersheds; and 4) develop site-specific designs and plans to carry out individual recovery actions. Additionally, the biological response of steelhead to many of the recovery actions is inherently uncertain and will require extensive monitoring. The recovery action tables (Tables 9-4 through 13-13) for each BPG within the SCCCS Recovery Planning Area

includes a preliminary estimate of the costs of individual recovery actions, based on the general recovery action descriptions contained in Chapter 8, Summary of DPS-Wide Recovery Actions, Table 8.2 (Recovery Actions Glossary).

Costs estimates have been provided wherever possible, but in some cases where the uncertainties regarding the exact nature of the recovery actions is unknown (*e.g.*, complete barrier removal versus modification), these costs estimates can only be provided after site-specific investigations are completed. Estimating the total cost to recovery is further complicated because achieving recovery will be a long-term effort, involving multiple decades. Based upon the costs of individual recovery actions identified, NMFS estimates that the cost of implementing recovery actions throughout the SCCCS Recovery Planning Area will be approximately 560 million dollars borne over the next 80 to 100 years, though many smaller scale recovery actions are projected to be completed in a much shorter time-frame. Appendix E (Estimated Costs of Recovery Actions) of the Recovery Plan contains estimates for categories of typical watershed restoration activities; it also identifies a variety of local, state, and federal funding sources to support the implementation of recovery actions

Many of the recovery actions identified in the recovery action tables are intended to restore basic ecosystem processes and functions. As a result, many of these recovery actions will be, or already have been, initiated by local, state and federal agencies, as well as non-governmental organizations and other private entities as a part of their local or regional environmental protection efforts. Recovery actions may be eligible for funding from multiple funding sources at the federal, state, and local levels. Many of these grant programs also offer technical assistance, including project planning, design, permitting, and monitoring. Regional personnel with NMFS, California Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service can also provide assistance and current

information on the status of individual grant programs. Appendix E provides a list of federal, state, and local funding sources. In weighing the costs and benefits of recovery, the multiple long-term benefits derived from short-term costs must be considered in any assessment. South-Central California steelhead recovery should therefore be viewed as an opportunity to diversify and strengthen the regional economy while enhancing the quality of life for present and future generations.

### Recovery Partners

Recovery of South-Central California steelhead is dependent on the cooperation of a variety of local, state, and federal partners, including private landowners, and non-governmental organizations working at the community and regional level. The implementation of recovery actions by these parties will require in some cases streamlining environmental review and regulatory processes to reduce costs and create incentives to landowners, non-governmental organizations, and managers undertaking recovery actions. This Recovery Plan builds on the restoration efforts which have already been made by a wide variety of local, state, and federal agencies, as well as important work undertaken by private landowners and non-governmental agencies.

Recovery of South-Central California steelhead depends most fundamentally on a shared vision of the future. Such a vision would include a set of rehabilitated watersheds, rivers, and estuaries which support steelhead and other native species over the long-term, efficiently sustain ecological services for people, and allow river systems to respond to climate change. 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 public resources such as functioning watersheds and river systems. The construction of a shared vision for South-Central California steelhead will require a number of basic institutional arrangements: 1) a deliberative forum (or set of forums) where

interested stakeholders, including non-governmental organizations, can share experiences and ideas; 2) information networks that allow stakeholders to disseminate information with a broad array of interested and affected parties; and 3) the development and maintenance of trust and reciprocity that allows meaningful deliberation on inherently complex and contentious issues.



Technical Recovery Team Members – Pajaro River 2006

Achieving recovery of South-Central California steelhead will also require a number of coordinated activities, including implementation of strategic and threat-specific recovery actions, monitoring of the existing population's response to recovery actions, and further research into the diverse life history patterns and adaptations of *O. mykiss* to a semi-arid and highly dynamic environment (including the ecological relationship between anadromous and non-anadromous life history patterns).

Effective implementation of recovery actions will entail: 1) development of cooperative relationships with private land owners, non-governmental organizations, special districts, and local governments with direct control and responsibilities over non-federal land-use practices to maximize recovery opportunities; 2) participation in the land use and water planning and regulatory processes of local, regional, state, and federal agencies to integrate recovery efforts into the full range of land and water use planning; 3) close cooperation with state resource agencies such as the California Department of Fish and Wildlife, California Coastal Commission, CalTrans, California

Department of Parks and Recreation, State Water Resources Control Board, and Regional Water Quality Control Boards, and University Cooperative Extension to ensure consistency of recovery efforts; and 4) partnering with federal resource agencies, including the U.S. Forest Service, U.S. Fish and Wildlife Service, National Park Service, U.S. Bureau of Reclamation, U.S. Bureau of Land Management, U.S. Army Corps of Engineers, U.S. Department of Transportation, U.S. Department of Defense, U.S. Environmental Protection Agency, and the U.S. Natural Resource Conservation Service.

NMFS intends to promote the Recovery Plan and provide needed technical information and assistance to entities responsible for activities that may impact the species' recovery, including implementation of high priority recovery actions. Additionally it will be important to work with cities and counties to incorporate protective measures consistent with recovery objectives in their General Plans and Local Coastal Plans. NMFS also intends to work with state and federal regional entities on regional planning efforts such as U.S. Forest Service Land Resource Management Plans, State Park General Plans, Regional Water Control Board Basin Plans (including Integrated Regional Water Management Planning efforts), and Local Coastal Plans.

### Estimated Time to Recovery and Delisting

Given the scope and complexity of the threats and recovery actions identified within the SCCCS Recovery Planning, the time to full recovery can be provisionally estimated to vary from 80 to 100 years. Delays in the completion of recovery actions, time for habitats to respond to recovery actions, or the species' response to recovery actions would lengthen the time to recovery. A modification of the provisional population or DPS viability criteria resulting in smaller run-sizes, or the number or distribution of recovered populations, could shorten the time to recovery.