

3. Factors Contributing to Decline and Federal Listing

"Steelhead on the west coast of the United States have experienced dramatic declines in abundance during the past several decades as a result of human-induced and natural factors. The scientific literature is replete with information documenting the decline of steelhead populations and anadromous salmonid habitats. There is no single factor solely responsible for this decline."

Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead under the Endangered Species Act, 1996

3.0 INTRODUCTION

When evaluating a species for protection under the ESA, the Secretary of Commerce must consider whether any one (or more) of five listing factors affect the species. Listing factors deal with those aspects of the species' biology or habitat that affect the level of threat to the species' continued persistence. The ESA requires that each of the factors which contributed to the species' listing be addressed in the recovery actions identified in the recovery plan.

The five listing factors are:

1. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range
2. Over-Utilization for Commercial, Recreational, Scientific, or Educational Purposes
3. Disease and Predation
4. Inadequacy of Existing Regulatory Mechanisms
5. Other Natural or Human-Made Factors Affecting Continued Existence

NMFS' listing determinations regarding the SCCCPS DPS (71 FR 834, January 5, 2006, 68 FR 15100, March 28, 2003, 62 FR 43937, August 18,

1997, 55 FR 24296, June 15, 1990), and supporting technical reports (*e.g.*, Boughton *et al.* 2005, Good *et al.* 2005, Busby *et al.* 1996, National Marine Fisheries Service 1996a) have identified the factors adversely affecting steelhead at the time of listing. There was no single factor responsible for the decline of South-Central California Coast steelhead; however, of those factors identified, the destruction and modification of habitat and natural and man-made factors had been recognized as the primary causes for the decline of the SCCCPS DPS. While some of these factors have been ameliorated to some degree in a number of watersheds they continue to persist throughout the SCCCPS DPS (and the larger Recovery Planning Area), and thus continue to threaten the existence of the species.

This chapter summarizes the factors identified at the time of the listing of the species. All of these factors are still prevalent and widespread. As a result, there have been few changes to the factors affecting the species since the time of original listing. The following chapter, Chapter 4, discusses the current threats facing the SCCCPS DPS and represents our current understanding of how the listing factors continue to affect the species.

3.1 FACTOR 1: Present or Threatened Destruction, Modification or Curtailment of Habitat or Range

Steelhead in the SCCCS DPS have declined as a result of a wide variety of human activities, including, but not limited to, agriculture, mining, and urbanization activities that have resulted in the loss, degradation, simplification, and fragmentation of habitat. 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.



Nacimiento Dam, Nacimiento River

In addition to these systemic threats to steelhead habitat, dams and other water control structures have also resulted in increased direct mortality of adult and juvenile steelhead.

Land-use activities associated with urban development, mining, agriculture, ranching, and

recreation (including passive and active recreational activities and related facilities such as reservoirs and trails) 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 sediment input into spawning and rearing areas resulting in the loss of channel complexity, pool habitat, suitable gravel substrate, and large woody debris.



Flood Control Work – Carmel River Estuary

In addition, a significant percentage of estuarine habitats have been lost, with an average of 66 percent of estuarine habitat remaining across the SCCCS Recovery Planning Area. (Kier Associates and National Marine Fisheries 2008a and 2008b, Carmel River Coalition 2007, Smith *et al.* 2004, Gilchrist *et al.* 1997, Ferren *et al.* 1995, Cadmus Group 1992, Smith 1976, Gerdes *et al.* 1974). The condition of these remaining wetland habitats is significantly degraded, with many wetland areas at continued risk of loss or further degradation. Although many historically harmful practices have been halted, the historical damage remains largely unaddressed, and the necessary restoration activities will likely require decades. Many of these threats are

associated with most of the larger river systems such as the Pajaro and Salinas Rivers, and many also apply to the smaller coastal systems such as San Jose, San Simeon, Santa Rosa, San Luis Obispo, Pismo, and Arroyo Grande Creeks (National Marine Fisheries Service 1996a).



Wetland Fill – Pismo Creek Estuary

3.2 FACTOR 2: Over-Utilization for Commercial, Recreational, Scientific, or Educational Purposes

Steelhead populations traditionally supported an important recreational fishery throughout their 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 is not considered the principal cause for the decline of the species as a whole. During periods of decreased habitat availability (*e.g.*, drought conditions or winter and summer low flow periods when fish are concentrated in freshwater habitats), the impacts of recreational fishing on native anadromous stocks have been heightened.

Angling for both adults and juveniles in those portions of coastal rivers and streams accessible

to anadromous runs from the ocean is permitted in some waters under the CDFW's angling regulations, though the CDFW imposes angling restrictions within the anadromous waters of the SCCCPS DPS to minimize impacts to native *O. mykiss* from angling activities (*e.g.*, restrictions on the length of the winter angling season; limiting angling to the lower reaches of most anadromous rivers and streams; angling gear limitations, including barbless hooks; and catch and release only of steelhead), though the take of hatchery fish (including hatchery reared steelhead) is allowed in anadromous waters. There is generally no summer trout angling season for the anadromous waters of the SCCCPS DPS. The exceptions to these restrictions include San Benito River within the Pajaro River watershed, the upper reaches of the Arroyo Seco and the Nacimiento River, within the Salinas River watershed, the Carmel River above Los Padres Dam, and the Big Sur River and Salmon Creek, above natural barriers to upstream fish migration).¹ All anglers must possess a nontransferable Steelhead Fishing Report and Restoration Card issued by the CDFW in their possession while fishing for steelhead trout in anadromous waters (California Department of Fish and Wildlife 2013).

While there is indirect evidence that such fishing pressure has resulted in minimal or no significantly mortality to native *O. mykiss*, the reduction in risk to listed *O. mykiss* cannot be estimated quantitatively from the existing data because the natural abundance of *O. mykiss* and the mortality resulting from angling opportunities is not quantitatively known. No Fishery Management and Evaluation Plan (FMEP) has been approved by NMFS for the SCCCPS DPS (California Department of Fish and Wildlife 2001).

¹Angling regulations are subject to periodic modification. The CDFW's annual Sport Fishing Regulations should be consulted for current restrictions on angling for *O. mykiss* (both resident and anadromous).

Steelhead are not targeted in commercial fisheries. 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.

While there is indirect evidence that recreational angling pressure has resulted in minimal or no significant mortality to *O. mykiss*, poaching remains a potential form of unauthorized take of South-Central California Coast steelhead, particularly in watersheds that traverse areas with concentrated human populations such as the Pajaro River (and its tributaries), and the Carmel River.



Fish Trap - Lower Pajaro River - 2013 (Courtesy Monterey County Sheriff Department)

NMFS had previously concluded, based on the available information, that recreational harvest is a limiting factor for South-Central California Coast steelhead, though the significance of this factor is uncertain (Good *et al.* 2005, Busby *et al.* 1996, National Marine Fisheries Service 1996a).

The completion of an FMEP for the SCCCS DPS provides one mechanism for addressing this issue and informing fishery managers' decisions on annual angling regulations (California

Department of Fish and Wildlife 2001, Guthrie 1990).

3.3 FACTOR 3: Disease and 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 (Noga 2000, Wood 1979, Rucker *et al.* 1953). Very little current or historical information exists to quantify changes in 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 (Belchik *et al.* 2004, Stocking and Bartholomew 2004). However, studies have shown that native fish in unimpaired native habitat tend to be less susceptible to pathogens than hatchery cultured and reared fish (Buchanan *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 (National Marine Fisheries Service 1996a). Non-native species, particularly fishes and amphibians such as large and smallmouth basses and bullfrogs have been introduced and spread widely (often in association with the construction of dams and associated reservoirs that act a refugia for non-native warm water species). 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 (Marks *et al.* 2010, Scott and Gill 2008, Fritts and Pearsons 2006, Bonar *et al.* 2005, Dill and Cordone 1997).



Adult *O. mykiss* – San Carpoforo Creek

Artificially induced summer low-flow conditions may also benefit non-native species, exacerbate spread of diseases, and permit increased avian predation. NMFS concluded that the information available on these impacts to steelhead did not suggest that the SCCCS DPS was in danger of extinction, or likely to become so in the foreseeable future, because of disease or predation. It is recognized, however, that small populations such as South-Central California Coast steelhead can be more vulnerable to extinction through the synergistic effects of other threats, and the role of disease or predation may be heightened under conditions of periodic low flows or high temperatures characteristic of steelhead habitats within the SCCCS Recovery Planning Area.

Finally, the introduction of a variety of non-native plant and animal species can alter ecosystems and related food-webs in complicated and subtle ways that can have unpredictable, long term impacts on native organisms (Cucherousset and Olden 2011, Davis 2009, Lockwood *et al.* 2007, Bonar *et al.* 2005, Sax *et al.* 2005, Bossard 2008, Gamradt *et al.* 1997, Gamradt and Kats 1996, Williamson 1966, Elton 1958).

3.4 FACTOR 4: Inadequacy of Existing Regulatory Mechanisms

3.4.1 Federal Mechanisms

At the time of listing, several principal federal regulatory and planning mechanisms affected the conservation of steelhead populations within the SCCCS Recovery Planning Area (National Marine Fisheries Service 1996b, 1997a). These included: 1) land management practices within the one U.S. National Forest within the SCCCS Recovery Planning Area (Los Padres National Forest, Monterey and Santa Lucia Ranger Districts); 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 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, has resulted in 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.

Additionally, the USACE does not regulate most agricultural, forestry, or ranching activities through administration of the 404 Program.

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 SCCCS Recovery Planning Area, 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.

Finally, prior to the listing of SCCCS DPS, the NMFS exercised only a limited role in the protection of the listed species. While this role has expanded, the enforcement of the protections afforded by Section 9 of the ESA is constrained by limited staffing and remains a substantial challenge.

3.4.2 Non-Federal Mechanisms

At the time of listing, several principal non-federal regulatory and planning mechanisms affected the conservation of steelhead populations within the SCCCS Recovery Planning Area (National Marine Fisheries Service 1997a, 1996b). 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 California Fish and Wildlife Code Sections 1600-1603 (Streambed Alteration Agreements) program and 5957-5937 (regulation of dams); and 4) the lack of a Coast-Wide Anadromous Fish Monitoring Plan for California to 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 adequate regulatory mechanism to implement the CDFW Code Sections 5935-5937 requirements for the owner of any dam to protect fish populations below impoundments. Currently the SWRCB's administrative policy implementing California Water Code Section 1294.4 applies only to northern California counties. Additionally, SWRCB generally lacks the effective 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 CDFW provides protection of riparian and aquatic habitats. Inadequate funding, staffing levels, training and administrative support have led to inconsistent implementation of this critical program, resulting in inadequate protection of riparian and aquatic habitats important to migrating, spawning and rearing steelhead.

Additionally, within the SCCCS Recovery Planning Area there is limited institutional organization specifically dedicated to steelhead recovery planning and implementation. Currently, the principal entities include the Tri-Counties Fish Team (which covers Ventura, Santa Barbara, and San Luis Obispo Counties), the state-wide organization, CalTrout, and the national organization, Trout Unlimited; other portions of the SCCCS Recovery Planning Area are the focus of attention of individuals,

watershed groups, or agencies with broader responsibilities or interests.

Finally, monitoring of stocks (particularly annual run-sizes) is essential to assess the current and future status of individual populations and the SCCCS DPS as a whole, as well as to develop basic ecological information of the steelhead populations of the SCCCS Recovery Planning Area. However, the Coast-Wide Anadromous Fish Monitoring Plan remains unfinished, existing funding is limited, and dedicated funds for its implementation have not been identified and secured.

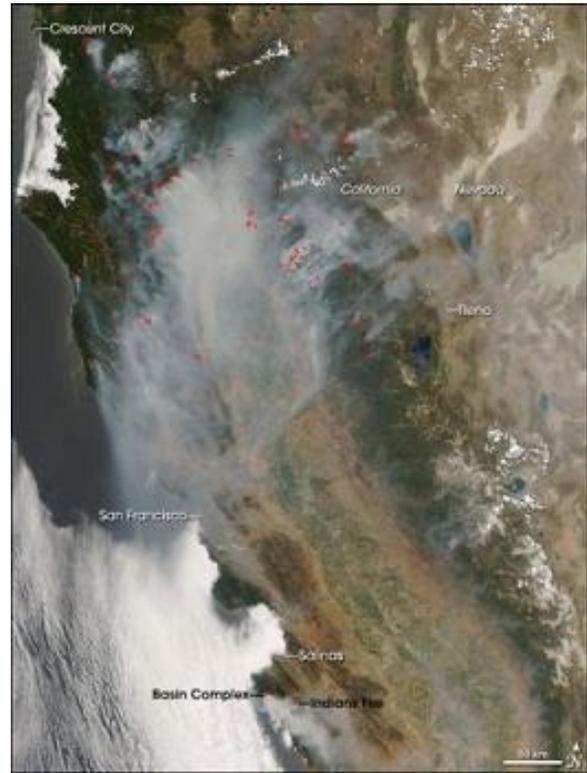
3.5 FACTOR 5: Other Natural or Human-Made Factors Affecting Continued Existence

This factor encompasses two specific threats to the species identified at the time of listing: 1) environmental variability and 2) stocking programs. As with the other listing factors, these threats have continued to play a role in the status the SCCCS DPS. More recent information regarding environmental variability, including the effects of climate change on ocean and freshwater, and increases in the occurrence and severity of wildfire, indicate the threat from “environmental variability” is expected to increase.

3.5.1 Environmental Variability

Natural environmental variability in a Mediterranean climate both masks and exacerbates problems associated with degraded and altered riverine and estuarine habitats. Assessing the role of natural variability in the decline of anadromous and non-anadromous *O. mykiss* requires long-term comparative investigations of unimpaired and impaired watersheds. Floods and persistent drought conditions, however, have periodically reduced naturally limited spawning, rearing, and migration habitats (e.g., by reducing flows, spawning-gravel recruitment, vegetative cover). Long long-term climate changes may exacerbate

the effects of these periodic conditions as well as complicate long-term comparative studies in the SCCCS Recovery Planning Area.



California Wildfires (Courtesy NASA)

Furthermore, El Niño 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 (National Marine Fisheries Service 1996a). The current and future threat to species recovery from environmental variation is discussed in more detail in Chapters 4 and Current DPS-Level Threats Assessment, and 5, South-Central California Coast Steelhead and Climate Change.

3.5.2 Stocking Programs

There are no steelhead production hatcheries operating in or supplying hatchery reared steelhead to the SCCCS Recovery Planning Area. However, up until the mid to late 1990's steelhead smolts derived from the San Lorenzo River were placed in the anadromous waters of the Pajaro River and various tributaries (*e.g.*, Corralitos, Browns Valley, Uvas Creeks) as well as in the Arroyo Seco in the early 1990s.

There is a small anadromous *O. mykiss* rearing operation on the Carmel River and in the past there has also been an anadromous *O. mykiss* rearing operation on Old Creek, Garrapata Creek and an ocean net pen rearing operation for Chinook salmon (*Oncorhynchus tshawytscha*) operated by Central Coast Salmon Enhancement from 1984-2007 (in later years this was operated as a cooperative facility with the CDFW). The pens were located in San Luis Bay and returning adults were occasionally observed in adjacent San Luis Obispo Creek.

CDFW maintains a stocking program of hatchery-derived non-anadromous *O. mykiss* to support put-and-take fisheries. These stockings are generally conducted in non-anadromous waters (*i.e.*, areas above natural barriers and dams), though fish may enter anadromous waters during spillage at dams. Until recently, CDFW planted non-native steelhead in anadromous waters in the Nacimiento River, and there are reports of plantings in non-anadromous portions of the Pajaro River prior to the list of the SCCCS DPS (J. Ambrose, personal communication). Since the issuance of the CDFW's Hatchery and Stocking Program EIR/EIS, the CDFW has limited fish stocking of hatchery reared *O. mykiss* to triploid rainbow trout, and to non-anadromous waters and waters where fish cannot emigrate downstream into anadromous waters (California Department of Fish and Wildlife and U.S. Fish and Wildlife Service 2010). Other non-native game species, such as smallmouth bass and bullhead catfish, are often stocked into anadromous waters by a variety of public and private entities (California

Department of Fish and Wildlife and Fish and Wildlife Service 2010, Leitritz 1970).

While these programs have provided seasonal fishing opportunities, the impacts of these programs on native, naturally-reproducing steelhead stocks is the subject of considerable discussion and active research (Berejikian 2011, Chilcote 2011, Tatara *et al.* 2011a, 2011b, Fraser 2008, Myers *et al.* 2004, California Department of Fish and Wildlife and National Marine Fisheries Service 2001). Increased restrictions on recreational angling have been prompted by increasing human pressures on the indigenous fishery resources, but are not intended to address the underlying causes of population declines or maintain natural ecosystem functions (California Department of Fish and Wildlife 2000, Butler and Borgeson 1965).

Competition, genetic introgression and disease transmission resulting from hatchery introductions may have the potential to reduce the production and survival of native, naturally-reproducing steelhead (Chilcote 2011, Hayes *et al.* 2004, Myers *et al.* 2004). Genetic investigations of SCCCS steelhead have not detected any substantial interbreeding of native *O. mykiss* with hatchery reared *O. mykiss* (Abadia-Cardoso *et al.* 2011, Christie *et al.* 2011, Clemento *et al.* 2009, Girman and Garza 2006).



Steelhead Rearing Facility — Carmel River

Stocking to support recreational angling within the SCCCS Recovery Planning Area are now

generally conducted in non-anadromous waters, though fish in some cases may escape into anadromous waters (California Department of Fish and Wildlife and U.S. Fish and Wildlife Service 2010). Collection of native steelhead for hatchery broodstock purposes has the potential to harm small or dwindling natural populations.

However, artificial propagation may play an important role in steelhead recovery through preservation of individuals representing genetic resources which would otherwise be lost as a result of local extirpations (see Chapter 8, Summary of DPS-Wide Recovery Actions, Section 8.3 Conservation Hatcheries).