EXHIBIT 3A

SOUTH-CENTRAL CALIFORNIA STEELHEAD RECOVERY PLAN

Public Review Draft

Southwest Regional Office
National Marine Fisheries Service
Long Beach, CA

September 2012

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 establish a sustainable South-Central California steelhead sport fishery.*

Recovery of the SCCCS 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 before 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 habitats. In South-Central California, near the southern limit of the range for anadromous *O. mykiss* in North America, it is estimated that annual 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).

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 SCCCS 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.

The SCCCS DPS encompasses *O. mykiss* populations in watersheds from the Pajaro River (Monterey County) 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, including 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 range 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 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 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).

Recovery Strategy

Recovery of South-Central California steelhead will require effective implementation, as well as a scientifically based biological, recovery strategy. 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, 1999; Boughton 2010a, Naiman 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 SCCS Recovery Planning Area. Threats assessments for the species indicate that recovery actions related to the modification of existing fish passage barriers and changes in water storage and management regimes 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

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 also address watershed-wide processes (*e.g.,* wild-fire cycle, erosion and sedimentation, runoff and waste discharges) which will benefit a wide variety of native species (including other state and federally listed species, or species of special concern) by restoring natural ecosystem functions. Some of the listed species which co-occupy coastal watersheds with South-Central California steelhead include: Tidewater goby, Foothill yellow-legged frog, California least tern, California red-legged frog, Southwestern pond turtle, Arroyo toad, Least Bell's Vireo. Additionally, Pacific lamprey, 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.

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 five 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 (Oregon, Washington and California) and 6 million fishing trips were taken annually between 2004 and 2006 (National Marine Fisheries Service 2010b). 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 SCCS Recovery Planning Area is challenging for a variety of reasons. These include the need to 1) refine recovery criteria; 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 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 over the next 80 to 100 years. Appendix E (Estimated Costs of Recovery Actions) of the Recovery Plan contains estimates for categories of typical watershed restoration activities.

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 Game, 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 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 effected 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 Game, 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, and the U.S. Environmental Protection Agency, ad 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 U.S. Forest Service Land Resource Management Plans, State Park General Plans, Regional Water Control Board Basin Plans, and Local Coastal Plans.

Estimated Time to Recovery and Delisting

Given the scope and complexity of the threats and recovery actions identified within the SCCS 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.

10. Carmel River Basin Biogeographic Population Group

"Assessment at the group level indicates a priority for securing inland populations in southern Coast Ranges and Transverse Ranges, and a need to maintain not just the fluvial-anadromous life-history form, but also lagoon-anadromous and freshwater-resident forms in each population."

NOAA Fisheries Technical Recovery Team
Viability Criteria for South-Central and Southern California, 2007

10.1 LOCATION AND PHYSICAL CHARACTERISTICS

The Carmel River Basin Biogeographic Population Group BPG region is one of the smallest of the four BPG regions in the SCCS Recovery Planning Area (Figure 10-1). The main axis of the Carmel River watershed is just 28 miles long. In contrast, the main axis of the neighboring Interior Coast Range BPG region is over 180 miles long.

Upper Carmel River

The Carmel River Basin BPG region drains the eastern slopes of the northern Santa Lucia Range and the western slopes of the Sierra de Salinas in northwestern Monterey County Hunt & Associates 2008a, Kier Associates and National Marine Fisheries Service and National Marine Fisheries Service 2008a, 2008b).

Carmel River between Los Padres and San Clemente Dams

The Carmel River flows into the Pacific Ocean at Carmel Bay, just south of the

Monterey Peninsula. This BPG region shares some physical characteristics with the Interior Coast Range BPG region, such as general northwest-southeast watershed orientation, landform evolution largely controlled by tectonic activity associated with the San Andreas Fault, and a highly dissected watershed. There are seven major perennial tributaries to the Carmel River (Figure 10-1). Average annual precipitation in this region is relatively low and shows high spatial variability. In general, the coastal regions and higher elevations receive higher amounts of precipitation. The Carmel River watershed is relatively steep and most of the tributaries are naturally perennial (Hunt & Associates 2008a, Kier Associates and National Marine Fisheries Service 2008a, 2008b).

Carmel River Estuary

10.2 LAND USE

Table 10-1 summarizes land use and population density in this region. Human population density is moderate to high and concentrated in the lower and middle portions of the Carmel Valley, including the towns of Carmel and Carmel Valley (March 2012, Palumbi 2011, Chiang 2008, Hunt & Associates 2008a, Kier Associates and National Marine Fisheries Service 2008a, 2008b, Carmel River Watershed Conservancy 2004, Walton 2003, Stephenson and Calcarone 1999, Monterey Peninsula Water Management District 1987, 1983, Kondolf 1986, California Department of Water Resources 1978).

Golf Course Development

Population density averages 70 persons per square mile. Although less than four percent of the watershed is classified as urban, well over 50 percent of the watershed is privately-owned and the Carmel Valley, through which the mainstem flows, is surrounded by extensive ranches and areas of rural land use. Less than one percent of the watershed is under cultivation.

There are four dams in the Carmel River watershed: Black Rock Creek Dam, Old Carmel River Dam, San Clemente Dam, and Los Padres Dam. Black Rock Creek Dam, constructed in 1925 on a tributary to the Carmel River, is used for recreational purposes. The Old Carmel River, San Clemente and Los Padres Dams, were constructed on the mainstem Carmel River in 1880, 1921 and 1949, respectively, for municipal and agricultural water supply (California Department of Fish and Game 2011b, California Department of Water Resources1988).

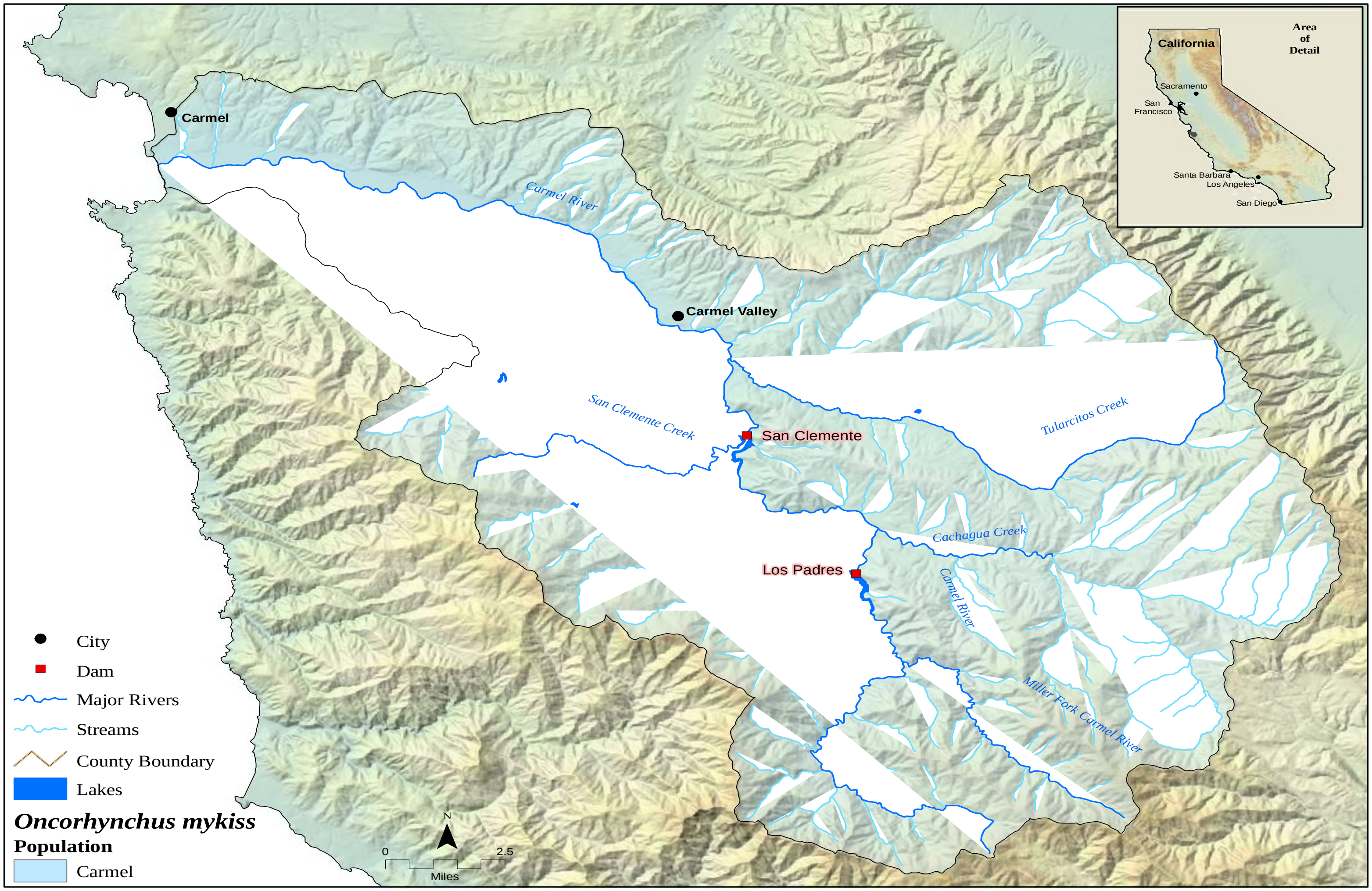

Figure 10-1. The Carmel River Basin BPG region. This BPG region is comprised of a single watershed (Carmel River).

Table 10-1. Physical and Land-Use Characteristics of Watersheds in the Carmel River Basin BPG region.

PHYSICAL CHARACTERISTICS						**LAND USE**			
WATERSHED	**Area** (acres)[1]	**Area** (sq.miles)[1]	**Stream Length**[2] (miles)	**Ave. Ann. Rainfall**[3] (inches)	**Total Human Population**[4]	**Public Ownership***	**Urban Area**[5]	**Agriculture/ Barren**[5]	**Open Space**[5]
Carmel River	162,286	254	248	19.8	17,020	31%	4%	0.6%	95%

[1] From: CDFFP CalWater 2.2 Watershed delineation, 1999 (www.ca.nrcs.usda.gov/features/calwater/)
[2] From: CDFG 1:1,000,000 Routed stream network, 2003 (www.calfish.org/)
[3] From: USGS Hydrologic landscape regions of the U.S., 2003 (1 km grid cells)
[4] From: CDFFP CalFire FRAP (http://cdf.ca.gov/data/frapisdata/select.sap)(migrated)
[5] From: CDFFP Multi-source land cover data (v02_2), 2002 (100 m grid cells) (http://frap.cdf.ca.gov/data/frapgisdata/select.asp)
** Includes National Forest Lands and Military Reservations only; does not include State or County Parks (from:*

http://old.casil.ucdavis.edu/casil/gis.ca.gov/teale/govtowna/)

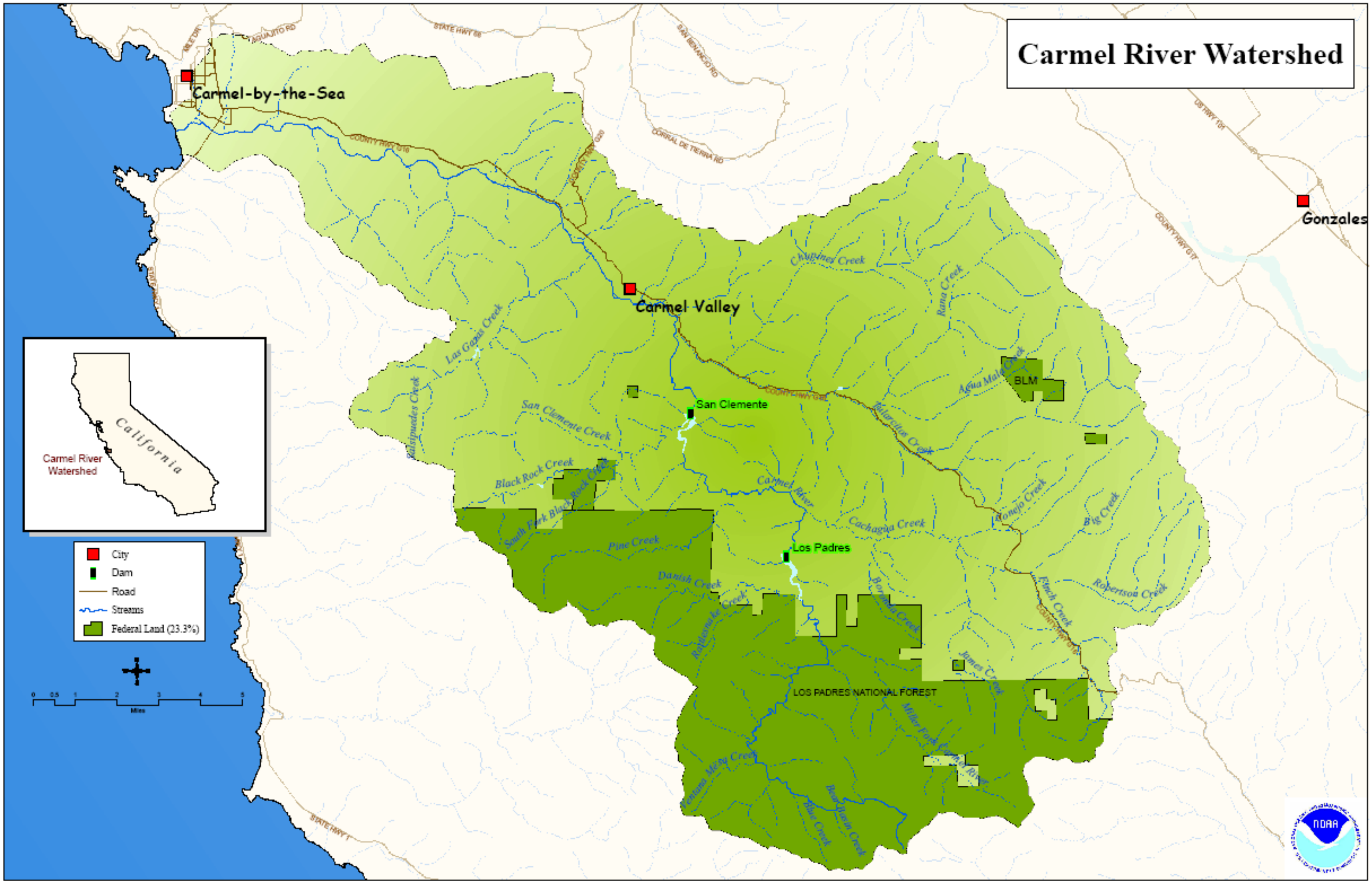

Figure 10-2. Federal and Non-Federal Land ownership within the Carmel River Watershed.

10.3 CURRENT WATERSHED CONDITIONS

Watershed conditions in this BPG region were assessed for the Carmel River watershed. A total of 30 indicators were used in the CAP Workbook analysis for this BPG. This analysis rated overall habitat conditions for anadromous *O. mykiss* in the Carmel River watershed as "Fair." Approximately 33 percent of the indicators were impaired (fair condition) or severely impaired (poor condition) and these indicators repeatedly focused on lack of surface flows in the mainstem caused by water management activities (*i.e.,* dams, surface water diversions, and excessive pumping of groundwater). (Hunt & Associates 2008a, Kier Associates and National Marine Fisheries Service 2008a, 2008b; see also, March 2012, Monterey Peninsula Water Management District, 2000-2011, 1983, Casagrande 2006, Casagrande and Watson 2003, California Department of Fish and Game 2005, Monterey Peninsula Water Management District and Carmel River Watershed Conservancy 2004, Carmel River Conservancy 2004, Stephenson and Calcarone 1999, Dettman 1987, 1986, Kondolf 1986, Snider 1983, California Department of Water Resources 1978.)

The mainstem contains suitable spawning habitat and functions as the conduit connecting the ocean and estuary to even more extensive spawning habitat in the upper watershed. However, San Clemente and Los Padres dams (while equipped with fish passage facilities) impede access to spawning and rearing habitat in at least 50 percent of the Carmel River watershed. Native non-anadromous *O. mykiss* populations persist in the mainstem and most of the tributaries above these dams. Additionally, a significant portion of the lower Carmel River below San Clemente Dam has been altered by bank protection for flood control purposes, thus adversely affecting steelhead habitats.

Carmel River – Residential Encroachment

Another aspect of the Carmel River watershed that received low ratings was the estuary. While the existing estuary has undergone substantial restoration and still contains valuable rearing habitat, at least 33% of the original estuary has been eliminated due to encroachment from residential development, transportation corridors (Highway 1), and recreational development (Carmel Beach State Park). (See Anderson *et al*. 2008, California Department of Fish and Game 2008, Carmel River Coalition 2007, Perry *et al.* 2007, Casagrande 2006, Casagrande and Watson 2003, Larson *et al.* 2006, Watson and Casagrande 2004, Hagar 2003, Alley Associates 1997, Kitting 1990, Dettman 1984.)

Carmel River Estuary – Artificial Breaching

10.4 THREATS AND THREAT SOURCES

Information identified in the CAP Workbooks on habitat and land-use indicators for the Carmel River Basin BPG was supplemented by additional information developed since the preparation of the CAP Workbooks and incorporated into the threat assessment. However, the underlying threat sources that determined the poor to very poor conditions of approximately one-third of those indicators repeatedly pointed to a limited number of anthropogenic causes, including: passage barriers caused by excessive surface and groundwater diversions; passage impediments caused by dams; loss or degradation of spawning substrates below San Clemente Dam due to water management practices, including substantial groundwater use for golf course irrigation; urban development, and associated levee construction that has significantly reduced estuarine habitats and constricted the lower floodplain of the river; and artificial breaching of the estuary sandbar to alleviate flooding of adjacent residential development.

San Clemente Dam

A pervasive threat to anadromous *O. mykiss* throughout the Carmel River BPG region are impediments to upstream and downstream fish passage, either in the form of dams and surface water diversions, or excessive groundwater extraction that creates dry stream reaches (Table 10-2), and connectivity with the Carmel River Estuary. Several miles of the mainstem Carmel River below San Clemente Dam that would otherwise have perennial surface flows frequently dry up or are reduced to isolated pools by late spring and early summer due to a combination of reduced runoff and surface and subsurface water withdrawals. As a result, an annual fish rescue and relocation efforts is made to deal with this situation on an interim basis (with fish reared and subsequently released from the Sleepy Hallow rearing facility located downstream of the San Clemente Dam and operated by the Monterey Peninsula Water Management District. Spawning habitat in the mainstem below San Clemente Dam has been degraded by water releases from the dam, contributing to increasing bank erosion and armoring. The Los Padres Dam has also constrained the natural movement of steelhead, both upstream migrating adults and downstream emigrating juveniles (Capelli 2007, Entrix 2006, Raines and Carella 2002, Monterey Peninsula Water Management District 2000, R2 Resource Consultants 2000, Stephenson and Calcarone 1999, Alley Associates 1998, 1996, 1992, Dettman 1993, 1989).

Los Padres Dam

Surface and groundwater extractions artificially modify the pattern of sandbar formation and natural breaching at the estuary. The sandbar is also breached artificially for flood control, which causes premature draining of the estuary; these artificial breachings can result in the loss of important juvenile steelhead rearing habitat, as well as the flushing of rearing juveniles to the ocean (California Department of Parks and Recreation 2008, Watson and Casagrande 2004, National Marine Fisheries Service 2002, Dettman 1984, U.S. Fish and Wildlife Service 1980).

Carmel River Estuary.

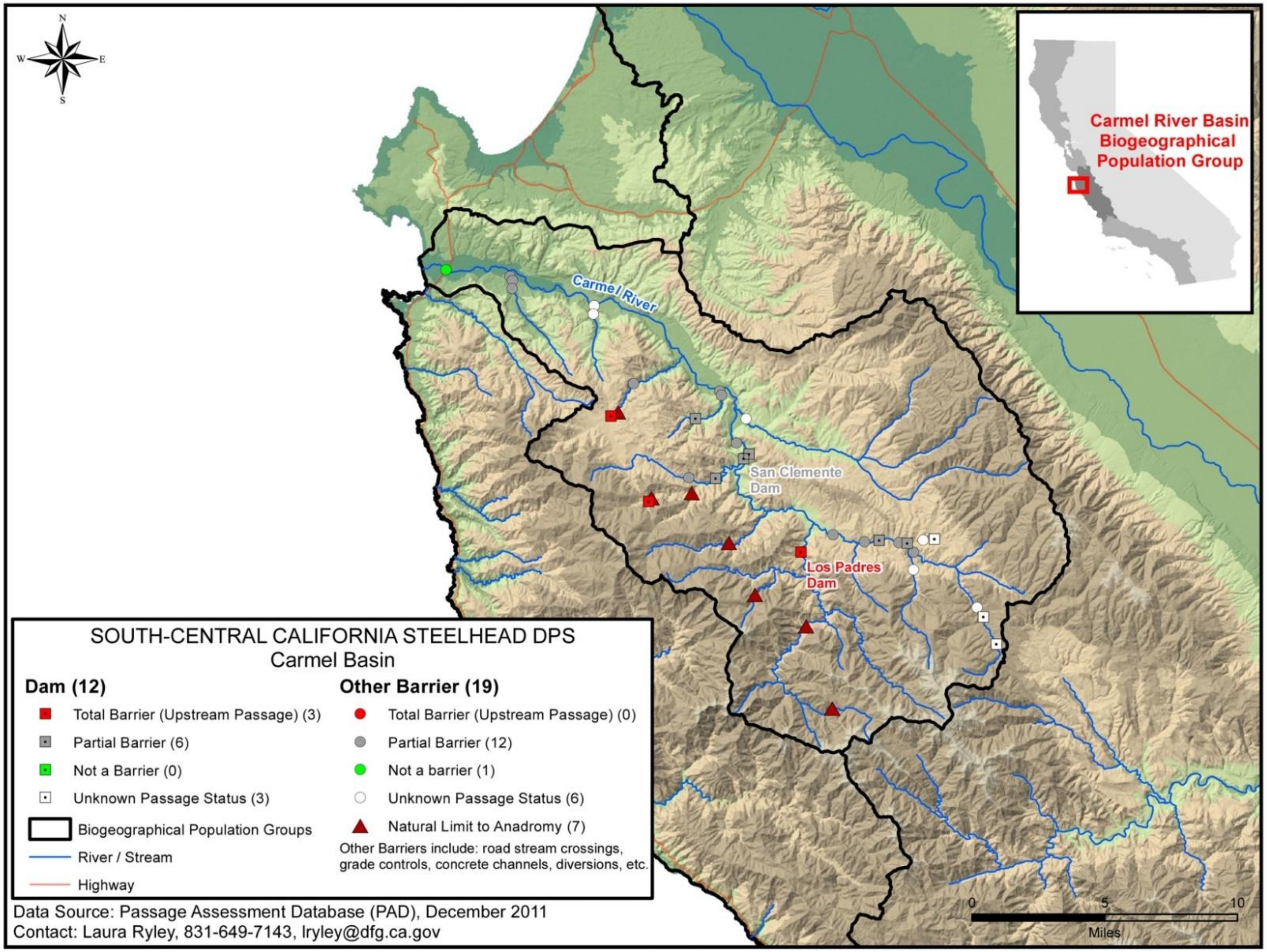

Figure 10-4. Major Fish Passage Barriers, Carmel River Basin BPG.

Table 10-2. Threat source rankings in the Carmel River Basin BPG region (see CAP Workbooks for details).

THREAT SOURCES*	**WATERSHED**
	Carmel River
Dams and Surface Water Diversions	[Red]
Groundwater Extraction	[Red]
Urban Development	[Yellow]
Levees and Channelization	[Red]
Culverts and Road Crossings (Other Passage Barriers)	[Yellow]
Recreational Facilities	[Dark green]

Key: Threat cell colors represent threat rating from CAP Workbook: Red = Very High threat; Yellow = high threat; Light green = Medium threat; Dark green = Low threat

**Note Agricultural development was not identified during the CAP Workbook analyses as one of the top five threats in this watershed, but agricultural development in the middle reaches of the Carmel River, and with some tributaries could be a significant threat to these population.*

10.5 SUMMARY

Dams and diversions (including groundwater extractions) on the Carmel River have had the most severe adverse impacts on steelhead populations in this BPG by reducing access to upstream spawning and rearing habitats and altering the magnitude, and timing of flows necessary for immigration of adults and emigration of juveniles. Urban and agricultural developments within the Carmel River watershed are also significant threats. For example, residential development around the estuary and along some reaches of the lower mainstem has encroached on and degraded estuarine and riparian habitats. Generally, road density, population density, and fire frequency are relatively low; however these factors can be expected to increase in the future.

Because the mainstem of the Carmel River is the conduit that connects upstream spawning and rearing habitat with the ocean, recovery actions in this watershed should focus on reducing the severity of anthropogenic impacts stemming from the construction and operation of dams (*e.g.,* San Clemente and Los Padres Dams) and groundwater extractions along the mainstem in order to promote connectivity between the ocean and estuarine habitats, as well as to maintain spawning and rearing habitat in the mainstem itself. Additionally, degraded estuarine conditions stemming from filling, artificial sandbar manipulation, and both point and non-point waste discharges, should be further evaluated and addressed. Table 10-3 summarizes the critical recovery actions needed within the Core 1 populations of this BPG.

The threat sources discussed in this chapter are the focus of a variety of recovery actions to address specific stresses associated with these threats. Spatial and temporal data acquired on specific indicators associated with sources of threats or stresses, such as water temperature, pH, nutrients, *etc.,* are generally inadequate to be the target of specific recovery actions. This type of data acquisition should be the subject of site-specific investigations in order to refine the primary recovery actions or to target additional recovery actions as part of any recovery strategy for the Carmel River Basin BPG. Recovery Action Table 10-4 below ranks and describes proposed recovery actions in the Carmel River Basin BPG including the estimated cost for implementing such actions in five year increments, and where applicable extended out to 100 years, though many of the recovery actions can and should be achieved within a shorter period (Hunt & Associates 2008a 2008b, Kier Associates and National Marine Fisheries Service 2008a, 2008b).

Table 10-3. Critical recovery actions for Core 1 populations within the Carmel River Basin BPG.

POPULATION	CRITICAL RECOVERY ACTIONS
Carmel River	Implement operating criteria to ensure the pattern and magnitude of groundwater extractions and water releases, including bypass flows around diversions, from San Clemente and Los Padres Dams to provide the essential habitat functions to support the life history and habitat requirements of adult and juvenile steelhead. Remove San Clemente, Los Padres, and Old Carmel River Dams to allow steelhead natural rates of migration to upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean. Identify, protect, and where necessary, restore estuarine and freshwater rearing habitats.

South-Central California Coast Steelhead DPS Recovery Action Tables Identification Key, Carmel River Basin BPG (Table 10-4).

Recovery Action Number Key: XXXX – SCCCS – 1.2	
XXXX	Watershed
SCCCS	Species Identifier – South-Central California Steelhead
1	Threat Source
2	Action Identity Number
Action Rank	
A	Action addresses the first listing factor regarding the destruction or curtailment of the species' habitat
B	Action addresses one of the other four listing factors

XXXX ID Table	
Car	Carmel River

Threat Source Legend	
1	Agricultural Development
2	Agricultural Effluents
3	Culverts and Road Crossings (Passage Barriers)
4	Dams and Surface Water Diversions
5	Flood Control Maintenance
6	Groundwater Extraction
7	Levees and Channelization
8	Mining and Quarrying
9	Non-Native Species
10	Recreational Facilities
11	Roads
12	Upslope/Upstream Activities
13	Urban Development
14	Urban Effluents
15	Wildfires

See Chapter 8, Table 8-1 for Detailed Description of Recovery Actions. See Appendix E for discussion of recovery action cost estimates.

Table 10-4. South-Central California Steelhead DPS Recovery Action Table for the Carmel River Watershed (Carmel River Basin BPG).

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Fiscal Year Costs ($K)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Carmel River												
Car-SCCC S-1.1	Develop, adopt, and implement agricultural land-use planning policies and standards	NRCS, BLM, NMFS, MC, MPWMD, CRWC	Agricultural Development	1, 4, 5	2B	20	0	0	0	0	0	0
Car-SCCC S-1.2	Manage agricultural development and restore riparian zone	NRCS, BLM,NMFS, MC, MPWMD, CRWC, CCON, CDFG, CRA, CRSA, CRWC, CVPOA	Agricultural Development	1, 4, 5	2B	5	0	0	0	0	0	0
Car-SCCC S-2.1	Develop and implement plan to minimize runoff from agricultural activities	NRCS, BLM,NMFS, MC, MPWMD, CRWC, CCON, CDFG, CRA, CRSA, CRWC, CVPOA	Agricultural Effluents	1, 4, 5	2B	100	0	0	0	0	0	0
Car-SCCC S-3.1	Conduct watershed-wide fish passage barrier assessment	NMFS, CDFG, CCON, MPWMD, CAWC, CRLC, CRSA, CRWC, CRWCO	Culverts and Road Crossings (Passage Barriers)	1, 4, 5	1B	5	96690	0	0	0	0	96690
Car-SCCC S-3.2	Develop and implement plan to remove or modify fish passage barriers within the watershed	NMFS, CDFG, CCON, MPWMD, CAWC, CRLC, CRSA, CRWC, CRWCO	Culverts and Road Crossings (Passage Barriers)	1, 4, 5	1B	20	TBD	TBD	TBD	TBD	TBD	TBD
Car-SCCC S-4.1	Develop and implement water management plan for dam operations	NMFS, CDFG, MPWMD, CAWC, CRA, CRWC	Dams and Surface Water Diversions	1, 3, 4	1A	5	91850	0	0	0	0	91850
Car-SCCC S-4.2	Develop and implement water management	NMFS, CDFG, MPWMD, CAWC, CRA, CRWC	Dams and Surface Water Diversions	1, 3, 4	1A	5	91850	0	0	0	0	91850

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Fiscal Year Costs ($K)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	plan for diversion operations											
Car-SCCC S-4.3	Provide fish passage around dams and diversions	NMFS, CDFG, MPWMD, CAWC, CRA, CRWC	Dams and Surface* Water Diversions *Reflects only the cost of the removal of San Clemente Dam; the removal of Los Padres and Old Carmel River Dams have not been estimated.	1, 3, 4	1A	5	84000000	0	0	0	0	84000000
Car-SCCC S-5.1	Develop and implement flood control maintenance program	ACOE, FEMA, NMFS, CDFG, MC, COC, MCPWP, MPWMD, CRLC, CRSA, CRWC, CRWCO, CVPOA	Flood Control Maintenance	1, 3, 4	2A	100	0	0	0	0	0	0
Car-SCCC S-6.1	Conduct groundwater extraction analysis and assessment	MC, MCWRA, MPWMD, NMFS, CDFG, CAWC, CRA, COC, PBCSD, CRLC, CRSA, CRWC, CRWCO	Groundwater Extraction	1, 4	1A	5	91850	0	0	0	0	91850
Car-SCCC S-6.2	Develop and implement a groundwater monitoring and management program	MC, MCWRA, MPWMD, NMFS, CDFG, CAWC, CRA, COC, PBCSD, CRLC, CRSA, CRWC, CRWCO	Groundwater Extraction	1, 4	1A	10	254350	39775	0	0	0	294125
Car-SCCC S-7.1	Develop and implement a plan to restore natural channel features	NRCS, FEMA, NMFS, CDFG, CRA, COC, CRSA, CRWC, CRWCO, CVPOAMCPA, MCWRA,MPWMD, MCUSA	Levees and Channelization	1, 4	1B	20	4217625	4217625	4217625	4217625	0	16870500
Car-SCCC S-7.2	Develop and implement plan to vegetate levees and eliminate or	NRSC, FEMA, NMFS, CDFG, CRA, CRSA, CRWC, CRWCO, CVPOAMCPA,	Levees and Channelization	1, 4	1B	100	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Fiscal Year Costs ($K)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	minimize herbicide use near levees	MCWRA,MPWMD, MCUSA										
Car-SCCC S-7.3	Develop and implement stream bank and riparian corridor restoration plan	NRSC, FEMA, NMFS, CDFG, CRA, COC, CRSA, CRWC, CRWCO, CVPOAMCPA, MCWRA,MPWMD, MCUSA	Levees and Channelization	1, 4	1B	5	10521940	0	0	0	0	10521940
Car-SCCC S-9.1	Develop and implement a watershed-wide plan to assess the impacts of non-native species and develop control measures	USFWS, USFS, NMFS, CDFG, CDPR, CRA, CRSA, CRWC, CRWCO	Non-Native Species	1, 3, 5	1B	100	0	0	0	0	0	0
Car-SCCC S-9.2	Develop and implement a non-native species monitoring program	USFWS, USFS, NMFS, CDFG, CDPR, CRA, CRSA, CRWC, CRWCO	Non-Native Species	1, 3, 5	1B	100	0	0	0	0	0	0
Car-SCCC S-9.3	Develop and implement a public educational program on non-native species impacts	USFWS, USFS, NMFS, CDFG, CDPR, CRA, CRSA, CRWC, CRWCO	Non-Native Species	1, 3, 5	1B	20	76140	76140	76140	76140	0	304560
Car-SCCC S-10.1	Review and modify development and management plans for recreational areas and national forests	CDPR, CDFG, USFS, NMFS, MC, CRA, COC, CRLC, CRSA, CRWC, CRWCO, MBNMS, MRPD	Recreational Facilities	1, 2, 3, 4, 5	1B	20	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Fiscal Year Costs ($K)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	(*e.g.,* the Carmel State Beach Management Plan)											
Car-SCCC S-10.2	Develop and implement a public educational program on watershed processes	CDPR, CDFG, USFS, NMFS, MC, CRA, COC, CRLC, CRSA, CRWC, CRWCO, MBNMS, MRPD	Recreational Facilities	1, 2, 3, 4, 5	1B	20	76140	76140	76140	76140	0	304560
Car-SCCC S-11.1	Manage roadways and adjacent riparian corridor and restore abandoned roadways	USDOT, CDOT, MC, MCPWD, NMFS, CDPR, CDFG, AMBAG, CRA, COC, CRSA, CRWC, CRWCO, CWPOA	Roads	1, 4	2B	20	0	0	0	0	0	0
Car-SCCC S-11.2	Retrofit storm drains to filter runoff from roadways	USDOT, CDOT, MC,MCPWD, NMFS, CDPR, CDFG, AMBAG, CRA, COC, CRSA, CRWC, CRWCO, CWPOA	Roads	1, 4	2B	20	32260	32260	32260	32260	0	129040
Car-SCCC S-11.3	Develop and implement plan to remove or reduce approach fill f or railroad line and roads	USDOT, CDOT, MC,MCPWD, NMFS, CDPR, CDFG, AMBAG, CRA, COC, CRSA, CRWC, CRWCO, CWPOA	Roads	1, 4	2B	20	0	0	0	0	0	0
Car-SCCC S-12.1	Develop and implement an estuary restoration and management plan	USDOT, CDOT, MC, MCPWD, NMFS, CDPR, CDFG, AMBAG TWI	Upslope/Upstream Activities	1, 2, 3, 4, 5	1A	5	1876000	0	0	0	0	1876000

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Fiscal Year Costs ($K)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
Car-SCCC S-12.2	Review and modify applicable County and/or City Local Coastal Plans	CCCOM, MC, COC, NMFS, CDFG, MCPWD, CRA, CRSA, CRWC, CVPOA	Upslope/Upstream Activities	1, 2, 3, 4, 5	1B	5	62400	0	0	0	0	62400
Car-SCCC S-13.1	Develop, adopt, and implement urban land-use planning policies and standards	CCCOM, MC, NMFS, CDFG, AMBAG, MCPWD, COC, CRA, CRSA, CRWC, CVPOA	Urban Development	1, 4, 5	1B	5	62400	0	0	0	0	62400
Car-SCCC S-13.2	Retrofit storm drains in developed areas	RWQCB, MC, NMFS, CDFG, AMBAG, MCPWD, COC, CRA, CRSA, CRWC, CVPOA	Urban Development	1, 4, 5	1B	20	0	0	0	0	0	0
Car-SCCC S-14.1	Review California Regional Water Quality Control Board s Watershed Plans and modify applicable Stormwater Permits	RWQCD, SWRCB, MC, NMFS, CDFG, AMBAG, MCPWD, CRA, COC, CRLC, CRSA, CRWCO, CVPOA, PBCSD, MC, MCWRA, MPWMD	Urban Effluents	1, 4	1B	20	0	0	0	0	0	0
Car-SCCC S-14.2	Review, assess and modify NPDES wastewater discharge permits (*e.g.,* Carmel Area Wastewater Treatment Facility)	RWQCD, SWRCB, NMFS, CDFG, CAWD, CRA, COC,CRLC, CRSA, CRWCO, CVPOA, PBCSD, MC, MCWRA, MPWMD	Urban Effluents	1, 4	1B	20	0	0	0	0	0	0
Car-SCCC S-15.1	Develop and implement an integrated wildland fire and hazardous fuels management	USFS, USFWS, CDF&FP, MC, NMFS, CDFG, MPWMD, MRPD, CRA, CRSA, CRWC, CRWCO	Wildfires	1,4,5	1B	100	0	0	0	0	0	0

Action #	Recovery Action Description	Potential Collaborators	Threat Source	Listing Factors (1 - 5)	Action Rank (1A, 1B, 2A, 2B, 3A, 3B)	Task Duration	Fiscal Year Costs ($K)					
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	FY 1-100
	plan											