# Chapter 5.7 Environment & Habitat Enhancement

## Introduction

The OWOW program is a holistic planning effort that considers the various individual elements of a Watershed plan and how those elements can interact synergistically to optimize the overall wellbeing of the Watershed and its inhabitants. One of the ten planning elements, or Pillars, identified under the OWOW plan is Environmental and Habitat Enhancement, alternately referred to as the Environment/Habitat Pillar. The purpose of this chapter is to identify the scope of the Environment/Habitat Pillar and describe the current condition of and strategies used to manage water-oriented biological resources within the Watershed.

On a macro level, this chapter attempts to catalog the locations of many water-oriented habitats within the Watershed. While there are several types of habitat within the Watershed boundary that are not directly water-oriented (e.g., chaparral, pine forest, oak woodland, grassland), the primary focus is on water-oriented habitat types (e.g., alluvial fans, riparian woodland, emergent wetlands, vernal pools, lakes, streams, estuaries, tidelands, open ocean). These water-oriented habitats tend to show up on maps as the "corridors" that connect the larger, non-water-oriented habitats. Water-oriented habitats locations that are candidates for protection or enhancement are of particular interest.

It should be noted that this chapter uses broad, generic categories of habitat type in order to be understandable to scientists and non-scientists alike. While some scientists may find these categories to be imprecise, or even at times a bit inaccurate, the intent is to persuasively convey the importance of habitats in the overall health of any watershed planning effort. For a more detailed, scientific description of various locations, the reader can refer to the appendices or other references cited by the chapter.

Further, two terms of special importance to watershed planning are riparian areas and wetlands. These terms sometimes are used interchangeably, adding to the confusion associated with categorizing water-oriented habitat types. In order to differentiate these terms, but at the risk of adding to the confusion, the terms will be used in this chapter as described by the U.S. Environmental Protection Agency (EPA) in several of its guidelines and regulations.

According to EPA, ***riparian areas*** are defined as:

> A vegetated ecosystem along a water body through which energy, materials, and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent water body. These systems encompass wetlands, uplands, or some combination of these two landforms. They will not, in all cases, have all the characteristics necessary for them to also be classified as wetlands.

> For the purposes of this chapter, riparian areas generally are somewhat linear in shape, along water courses, or occupy the "bathtub ring" (lacustrine zone) around water impoundments. They are more characterized by trees and shrubs that tolerate periodic flooding than they are by emergent vegetation such as cattails and bulrush.

According to EPA, ***wetlands*** are defined as:

> Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Thus, wetlands usually are considered a subset of riparian areas. However, for the purposes of this chapter, they are being considered separately, with a separate chapter dedicated specifically to them. Further, for this chapter, wetlands are generally considered to be more "two dimensional" in shape than other riparian areas, whether they are extensive flat, marshy areas or small debris basins associated with flood control works. They are characterized by a dominance of emergent vegetation such as cattails and bulrush rather than by trees and shrubs.

The chapter cites many references for information included within. In some cases, the online encyclopedia, www.Wikipedia.com, is cited as an information source. While this reference usually is not used for scientific writings, it was included as a reference for this chapter because it provides ready access to readers that are interested in learning more about specific locations. Readers are cautioned that the information on Wikipedia may not have been fully reviewed by peer experts and authors that may or may not have been authenticated as knowledgeable on the particular topic presented.

## Legal and Regulatory Framework for Potential Environmental and Habitat Enhancement Projects

This chapter summarizes the Federal and State regulations and associated permits that may be necessary for the implementation of projects focusing on the enhancement of the SAR and adjacent wetland, riparian, and upland habitat. It is important to note that every project is different and will be subject to a different set of permitting procedures. Therefore, the information provided here is general and is intended to alert project proponents to various regulations and permits that may be applicable to their project. It serves as a starting point for those considering the aforementioned types of habitat improvement projects. Additional information on specific permitting requirements may be obtained from the agency responsible for issuing the permit.

The following are summaries of legal requirements for environmental and habitat enhancement projects. **Appendix A** contains a list of agencies that should be consulted early in the conceptual or visioning phase of a project to address project needs and requirements. These agencies also can be effective partners in the design and construction of a successful multi-benefit project.

## Clean Water Act

The Clean Water Act of 1972 (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States. The Clean Water Act is administered primarily by EPA and the Corps. In California, discharge permits under the CWA are issued by the SWRCB. The CWA contains various regulatory requirements, including permitting requirements, pertaining to activities that have the potential to result in the discharge of pollutants into the U.S. See below for a discussion of the relevant sections.

Waste treatment systems designed to meet the regulations of the CWA are not, by definition, considered waters of the U.S. In general, treatment wetlands systems constructed in upland areas are not considered waters of the U.S. and are not subject to CWA regulations. However, if a wetland treatment system itself is not considered a water of the U.S., but discharges into a water of the U.S., then a discharge permit under CWA Section 402 is required. If a treatment wetland system is constructed in an existing water of the U.S., then the area will remain a water of the U.S. and one or more of the following sections may be applicable (EPA, 2000).

### *Section 303 Water Quality Standards*

Under Section 303 of the CWA, states and tribes are required to develop water quality standards for waters of the U.S. These standards must include the following three components (EPA, 2000):

- Environmental Program Plan.
- Designated Uses: Each body of water is given a "designated use", or environmental goals such as recreation or agricultural supply. Each state or tribe is then responsible to maintain these uses.
- Water Quality Criteria: Criteria established to support and protect the designated uses of each water body.
- Antidegradation Policy: All states are required to have an antidegradation policy and an implementation plan to maintain the level of water quality necessary to protect existing in-stream water uses.

Permits issued to dischargers to waters of the U.S. must ensure that discharges will not violate or contribute to a violation of water quality criteria or impair the designated uses in receiving and downstream waters.

### *Section 401 Certification*

Projects that could potentially discharge to a water of the U.S. require certification. Applications need to certify that the activity will not violate any water quality standards or other State or Tribal requirements (EPA 2000).

### *Section 402 NPDES*

Section 402 of the CWA regulates the discharge from point sources into waters of the U.S. As construction and operation of a treatment wetland may result in a discharge into waters of the U.S., these projects may require an NPDES permit. If construction of a treatment wetland disturbs one acre or more, an NDPES permit for stormwater discharge from the construction activity is required. This requirement applies to all construction projects.

### *Section 404*

Section 404 of the CWA makes it unlawful to discharge dredged or fill material into waters of the U.S. (including wetlands) without obtaining a permit from the U.S. Army Corps of Engineers. If wetland construction activities involve the discharge of dredged (excavated materials) or fill materials (*i.e.*, material used to replace an aquatic area with dry land or to change the bottom elevation of a body of water), authorization must be obtained and may include mitigation for wetland impacts. Additionally, subsequent maintenance activities also may require a permit.

There are two basic types of Section 404 permits issued by the Corps, individual and general. An individual permit is usually required for potentially significant impacts. However, for most discharges that will have only minimal adverse effects, the Corps often grants general permits. These may be issued on a nationwide, regional, or statewide basis for particular categories of activities (e.g., minor road crossings, utility line backfill and bedding) in order to expedite the permitting process.

"Navigable waters" of the U.S. are those subject to the ebb and flow of the tide shoreward to the mean high water mark and/or presently used, or have been used in the past, or are susceptible for use to transport interstate or foreign commerce. The term includes coastal and inland waters, lakes, rivers, and streams that are navigable; and the territorial seas.

## Section 10 of the Rivers and Harbors Act

Under Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.), projects that involve any obstruction to the navigable capacity of any water of the U.S. require authorization from the Corps. "Obstruction" includes the construction of any structure in or over navigable water, excavation/ dredging, or deposition of material or any obstruction or alteration in any navigable water of the U.S. Projects outside the limits defined for navigable waters of the U.S. require a Section 10 permit if the structure or work affects the course, location, condition, or capacity of the water body. There is an overlap of Section 10 and CWA Section 404 for some activities involving wetlands, and permits for activities regulated under both are processed simultaneously by the Corps.

## Coastal Zone Management Act

The Coastal Zone Management Act was created to address overdevelopment along the nation’s coast and to actively involve states in the coastal preservation process. It establishes a program based on land development controls within coastal zones, and incorporates the development of programs for comprehensive state management. The Coastal Zone Management Act also requires that activities conducted by Federal agencies conform to the maximum extent practicable with a state's coastal zone management program.

Under the Coastal Zone Management Act, states may review Federal actions. These include activities conducted by parties authorized by Federal licenses and permits, such as CWA Section 404 permits. A certification of consistency with the California Coastal Management Program must be included with the application for Section 404 and Section 10 permits, and the Corps may not issue a permit until the California Coastal Commission reviews and concurs with the certification of consistency.

## California Coastal Act

The California Coastal Act is California's coastal zone management program that was created to provide long-term protection to California's coastline. The California Coastal Act is used to make decisions on permit applications, Federal consistency reviews (as set forth in the Coastal Zone Management Act), and local coastal programs. Almost all development within the coastal zone requires a coastal development permit from either the Coastal Commission or a local government with a certified Local Coastal Program. The "coastal zone" generally is defined under the California Coastal Act as the area that extends three miles seaward and roughly 1,000 yards inland. In generally undeveloped areas, the coastal zone extends to a maximum of five miles inland, and in developed urban areas, the coastal zone extends substantially less than 1,000 yards inland .

Under the California Coastal Act, wetlands are defined as lands within the coastal zone that may be covered periodically or permanently with shallow water, including saltwater marshes, swamps, mudflats, and fens. Development in coastal zone wetlands is limited to eight allowable uses as set forth in Section 30233.

## Guidelines: The California Environmental Quality Act and the National Environmental Policy Act

The California Environmental Quality Act (CEQA) is a statute that requires the State and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. The impetus for CEQA can be traced to the passage of the first Federal Environmental Protection Statute in 1969, the National Environmental Policy Act (NEPA). In response to this law, the California State Assembly created the Assembly Select Committee on Environmental Quality to study the possibility of supplementing NEPA through state law. In 1970, this legislative committee issued a report entitled, *The Environmental Bill of Rights*, which called for a California counterpart to NEPA. Later that year, acting on the recommendations of the select committee, the legislature passed, and then Governor Reagan signed, the CEQA statute. CEQA is a self-executing statute. Public agencies are entrusted with compliance with CEQA and its provisions are enforced, as necessary, by the public through litigation and the threat thereof. While the California Resources Agency is charged with the adoption of CEQA Guidelines, and may often assist public agencies in the interpretation of CEQA, it is each public agency's duty to determine what is and is not subject to CEQA. As such, the California Resources Agency does not review the facts and exercise of discretion by public agencies in individual situations. In sum, the California Resources Agency does not enforce CEQA, nor does it review for compliance with the many state and local agency actions which are subject to CEQA.

A public agency must comply with CEQA when it undertakes an activity defined by CEQA as a "project". A project can be defined as an activity undertaken by a public agency or a private activity which must receive some discretionary approval (meaning that the agency has the authority to deny the requested permit or approval) from a government agency which may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment.

Many wetland projects may trigger a "significant effect" as defined by CEQA. According to CEQA Guidelines (Office of Planning and Research 2004), significant effects related to wetland projects may include, but not be limited to, those that may:

- Have a substantial adverse effect, either directly or through habitat modifications, on any candidate, sensitive or special status species, as identified by local or regional plans, policies, or regulations, or by CDFG or USFWS
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified by local or regional plans, policies, regulations, or by CDFG or USFWS
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species with established native resident or migratory wildlife corridors, or with the use of native wildlife nursery sites
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan

Project proponents are encouraged to consult early with regulatory specialists and environmental planners with strong experience in wetland project implementation.

### *NEPA: Purpose of the National Environmental Policy Act Sec. 2 [42 USC § 4321].*

The purposes of NEPA are to: 1) declare a national policy which will encourage productive and enjoyable harmony between man and his environment; 2) promote efforts which will prevent or eliminate damage to the environment and biosphere, and stimulate the health and welfare of man; 3) enrich the understanding of the ecological systems and natural resources important to the Nation; and 4) establish a Council on Environmental Quality.

Certain projects also may be subject to NEPA review. The intent and process of NEPA is similar to CEQA. A project is subject to NEPA when one of the following occurs:

- Project requires a federal permit or entitlement
- Is jointly carried out by a federal agency
- Will be federally funded
- Will occur on federal land

Joint CEQA/NEPA documents are often used by agencies to address environmental effects of wetland projects. Project proponents are encouraged to consult early with appropriate agencies to determine the appropriate regulatory path for each wetland project.

## California Fish and Game Code 1600-1607

The Lake and Streambed Alteration Program (Section 1600-1607 of the CDFG Code) requires that CDFG be notified before beginning any proposed projects that will substantially divert or obstruct natural flow; substantially change the bed, channel, or bank of any river, stream, or lake; or use materials from a streambed. Notification is generally required for any project that will take place in or in the vicinity of a river, stream, lake, or their tributaries. If CDFG determines that a project may substantially adversely affect existing fish or wildlife resources, the project may not be started until

CDFG develops a Draft Lake or Streambed Alteration Agreement. CEQA review is required prior to the development of the draft Agreement.

## Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act establishes the SWRCB and the RWQCBs as the state agencies that have primary control over water quality in California. The RWQCBs' primary role is to enforce the CWA, and therefore, have regulatory authority over the development activities affecting the water quality of navigable water and wetlands. The RWQCBs regulate all pollutant or nuisance discharges that could potentially affect either surface water or groundwater. Any proposed project that that will discharge waste is required to file a report of waste discharge with the appropriate RWQCB. Project proponents should contact the appropriate RWQCB before proceeding with any action that may result in a discharge to waters of the State (California Resources Agency 98). Unlike waters of the U.S., waters of the State include groundwater.

## Vector Control

One potential undesirable attribute of wetland projects, if not addressed properly, is that they can become breeding grounds for mosquitoes that can serve as vectors for diseases harmful to humans such as West Nile virus, malaria, and encephalitis (MVCAC 2004).

The California Department of Health Services (DHS) has the authority to abate public nuisances, and has determined that water supports a breeding population of mosquitoes constitutes a public nuisance. DHS and other local vector control agencies have the authority to take necessary actions up to a legal notice to abate a public nuisance (DHS 01). As such, it is important to plan for vector control in wetland projects.

The Mosquito and Vector Control Association of California, established in 1951, is a non-profit association. They provide public information, mosquito and vector-borne disease surveillance, and advocate environmentally-friendly methods for vector control. They "support the sensible development of wetlands when they include best management practices for the control of mosquitoes", and advocate planning for mosquito control at during the early phases of a project (MVCAC 2004). In general, mosquito control in a wetland project is best handled through early planning and most importantly, the creation of long-term maintenance agreements that include vector monitoring and control as part of the projects operation and maintenance plan.

## Other Relevant Federal and State Laws and Regulations

The following is a list of other relevant Federal and State regulations that may apply to a wetland project and should be considered:

***Endangered Species Act:*** Provides a mechanism for the protection and recovery of species threatened with extinction. It prohibits unauthorized acquisition, possession, sale, and transport of federally-listed threatened and endangered species.

Information regarding the location of threatened or endangered species habitat can be obtained from the USFWS and the National Marine Fisheries Service (EPA 2000). Additionally, Section 404 permits

help protect endangered species by regulating projects that include the discharge of dredging or fill materials.

***National Wild and Scenic Rivers Act:*** Selects certain rivers that possess outstanding values and preserves them and their surrounding environment for the enjoyment of present and future generations. Designated rivers are protected from federally-supported dam building and other federally authorized structural changes that would adversely affect the river's values.

***National Historic Preservation Act:*** Preserves significant historic features and establishes a National Register of Historic Places, which is an inventory of the United States' historic resources that includes buildings, structures, objects, sites, districts, and archeological resources. Section 106 of the National Historic Preservation Act requires that a Federal agency involved in a proposed project must confer with the State Historic Preservation Officer and the National Historic Preservation Act to determine if the project will impact a significant historic feature.

***Migratory Bird Treaty Act:*** Implements four international treaties and establishes federal responsibility for protecting and managing migratory and non-game birds. The Migratory Bird Treaty Act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued by the USFWS.

***The Fish and Wildlife Coordination Act:*** Requires that all Federal agencies consult with the USFWS, the National Marine Fisheries Service, and State wildlife agencies (e.g., CDFG) for projects that could affect, control, or modify any stream or body of water.

***Estuary Management Plans CWA Section 320:*** Provides means for states to nominate estuaries within, or partially within, its borders as an estuary of national significant. The state also may request a management conference to develop a comprehensive management plan for the estuary.

***Magnuson-Stevens Fishery Conservation and Management Act:*** Provides for the designation of "essential fish habitat" for managed fish and shellfish, and requires Federal agencies to consult with the National Marine Fisheries Service on any federal action or federally authorized action that may adversely affect the essential fish habitat.

***California Endangered Species Act:*** The current version of the California Endangered Species Act, enacted in 1984, is generally parallel to the Federal Endangered Species Act. The CDFG and the Fish and Game Commission are responsible for the implementation of the California Endangered Species Act. State lead agencies are required to consult with CDFG to ensure that a proposed project is not likely to jeopardize the continued existence of any California-listed endangered or threatened species, or result in destruction or adverse modification of essential habitat.

***The Natural Community Conservation Planning Act:*** Added to California Endangered Species Act in 1991, the Natural Community Conservation Planning Act provides for voluntary cooperation among CDFG, landowners, and other interested parties to develop natural community conservation plans which provide for coordination to protect listed species or species that are not yet listed. The primary purpose of the Natural Community Conservation Planning Act is to preserve species and their habitats, while allowing reasonable and appropriate development to occur.

***The California State Coastal Commission:*** Although it has no regulatory function, the California State Coastal Commission is a State agency actively involved in the protection and enhancement of coastal wetlands. A primary purpose of the California State Coastal Commission is to resolve coastal land use conflicts in order to protect coastal resources and expedite environmentally sound development.

***Food, Agriculture, Conservation, and Trade Act:*** The "Swampbuster" provision removes a farmer's eligibility from all government price and income support programs for violations of the Food, Agriculture, Conservation, and Trade Act including draining, dredging, filling, leveling or otherwise altering a wetland.

***Non-point Source:*** Sources of pollution not defined by statute as point sources. Non-point source pollution results from the transport of pollutants into receiving waters via overland flow runoff within a drainage basin. Because non-point source pollution is diffuse, its specific sources can be difficult to identify.

***Point Source:*** Any discernible, confined, and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agricultural or agricultural runoff. (40 CFR§ 122.2)

***Non-point Source Management Programs under CWA Section 319:*** Provides for the assessment of water bodies that cannot be expected to meet water quality standards without actions to control non-point sources of pollution and the preparation of management programs for controlling pollution and water quality from non-point sources. It emphasizes a watershed-based approach which may include protection and/or restoration of wetlands and riparian areas.

***California Non-point Source Program:*** Established under the framework CWA Section 319, the California Non-point Source Program is a comprehensive statewide effort aimed to reduce and prevent non-point source pollution under the authority of the California State Coastal Commission and the RWQCBs. The Program identifies non-point source management measures to be implemented by 2013.

# 3.0 Existing Regional Management Plans

## Upper Santa Ana River Wash Land Management and Habitat Conservation Plan

The project is located in the eastern valley portion of San Bernardino County, mostly within the Cities of Highland and Redlands, but also partially within County jurisdiction. The plan area is bounded by Greenspot Road to the north and east, Alabama street to the west and the SAR Wash to the south.

The purpose of the proposed project is to allow the continued use of land and mineral resources while maintaining the biological and hydrological resources of the planning area in an environmentally sensitive manner. The Wash Plan is intended to coordinate and manage the present and future activities in the Wash which are part of multiple jurisdictions, each with different needs. The goal of the project is to balance the ground-disturbing activities of aggregate mining, recreational activities, water conservation, and other public services with quality, natural habitat for endangered, threatened, and sensitive species (San Bernardino Valley, 2007).

## Western Riverside County Multiple Species Habitat Conservation Plan

The Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) is a comprehensive, multi-jurisdictional Habitat Conservation Plan (HCP) focusing on the conservation of species and their associated habitats in Western Riverside County. The MSHCP is one of several large, multi-jurisdictional habitat-planning efforts in southern California with the overall goal of maintaining biological and ecological diversity within a rapidly urbanizing region. Large-scale HCP planning efforts have been completed in San Diego and Orange Counties, and a similar effort is underway in the Coachella Valley. The MSHCP will allow Riverside County and its cities to better control local land use decisions and maintain a strong economic climate in the region while addressing the requirements of the State and Federal Endangered Species Acts.

Riverside County's population in 2000 was approximately 1.5 million people. Its population is expected to double by 2020, to reach approximately 3.5 million by 2030, and to be approximately 4.5 million by 2040, according to forecasts by SCAG. This is nearly a 400% increase over the next 40 years. Most of southern California's growth over the next 40 years is expected to occur in the Inland Empire (San Bernardino and Riverside Counties) (SCAG 2001). Accommodating an increase in population of this magnitude will involve urbanizing thousands of acres of undeveloped land and result in significant conflicts with regulations protecting species and their habitats. Conflicts and delays will escalate costs for all development projects, uncoordinated mitigation efforts will fragment habitats, the region will miss opportunities to improve the quality of life, and economic development opportunities for the current and future residents of Riverside County also will not be realized.

The MSHCP plan area encompasses approximately 1.26 million acres (1,966 square miles); it includes all unincorporated Riverside County land west of the crest of the San Jacinto Mountains to the Orange County line, as well as the jurisdictional areas of the Cities of Temecula, Murrieta, Lake Elsinore, Canyon Lake, Norco, Corona, Riverside, Moreno Valley, Banning, Beaumont, Calimesa, Perris, Hemet, and San Jacinto. This HCP is one of the largest plans ever attempted. It covers multiple species and multiple habitats within a diverse landscape, from urban centers to undeveloped foothills and montane forests, all under multiple jurisdictions. It extends across many bioregions as well, including the Santa Ana Mountains, Riverside Lowlands, San Jacinto Foothills, San Jacinto Mountains, Agua Tibia Mountains, Desert Transition, and San Bernardino Mountains. It will provide a coordinated MSHCP Conservation Area and implementation program to preserve biological diversity and maintain the region's quality of life.

**Existing Reserves within the Western Riverside County MSHCP**

| | |
|---|---|
| Box Springs Reserve | Prado Basin |
| Bureau of Land Management Lands | Riverside County Flood Control & Water |
| Cleveland National Forest | Conservation District Lands |
| Emerson Oaks Reserve | San Bernardino National Forest |
| Harford Springs Reserve | San Diego Gas and Electric Lands |
| Kabian Park | San Jacinto Wildlife Refuge |
| Lake Mathews-Estelle Mountain Reserve | San Timoteo Creek State Park |
| Lake Perris Recreation Area | Santa Margarita Ecological Reserve |
| Lake Skinner Recreation Area | Santa Rosa Plateau Nature Reserve |
| March Air Reserve Base Reserve Lands | Southern California Edison Lands |
| Metropolitan Water District Lands | Southwestern Riverside County Multi Species |
| Motte Rimrock Reserve | Reserve |
| Mount San Jacinto Wilderness State Park | Sycamore Canyon Wilderness Park |
| Norton Younglove Reserve | UC James San Jacinto Mountain Reserve |
| Orange County Water District Lands | |

## Orange County Natural Communities Conservation Plan

The purpose of this project is to create a sub-regional multi-habitat-based HCP that balances resource protection with reasonable economic growth.

This was a chance to preserve coastal sage scrub and oak woodland habitats that have nearly disappeared from southern California. The remote canyons of the 13,000-acre northern boundary, east of the City of Orange, are notable for "The Sinks" area of Limestone Canyon, a huge, steep-walled sandstone ravine that resembles a mini-Grand Canyon. The land harbors some of Orange County's richest oak and sycamore woodlands, as well as streams and springs laced with blackberries and monkey flowers and shared by animals of all sizes – from mountain lions to rare lizards. The ranch's 12,000-acre Weir, Gypsum and Fremont Canyons, adjacent to Cleveland National Forest, are home to many native animals and plants. These include the rare Tecate cypress, found only in three other areas of California. The 14,000-acre southern boundary, with its hills, meadows, wooded canyons and sweeping views of the Pacific, connects Crystal Cove State Park and the Laguna Coast Wilderness Park. The Irvine Ranch Wildlands and Parks are home to bobcats, red-tailed hawks, coyotes, mule deer, meadowlarks, and an abundance of other wildlife (Nature Conservancy, 2008).

The Irvine Ranch Conservancy was established in 2005. It is a non-profit, non-advocacy organization, created to help care for the 50,000 acres of permanently protected wildlands and parks on the historic Irvine Ranch. The organization works with its partners to enhance the public's appreciation, understanding and connection to the land, while helping other landowners and managers with all aspects of stewardship. The Irvine Ranch Conservancy contributes its resources, expertise and energy to achieve the best possible balance of preservation and public participation. Nearly 50,000 acres of wildlands and parks have been designated as permanent open space on The Irvine Ranch. However, protecting the land is only the first step. Mediterranean ecosystems like these need extremely attentive stewardship. The rare plants, animals, and habitats found here are adapted to specialized conditions

and need our long-term management to survive. The mission of the Irvine Ranch Conservancy is to make sure that these lands are cared for and enjoyed to the highest possible standards.

The wildlands of the North Ranch are connected to the Cleveland National Forest and are one of the few places where natural habitat ranges relatively unbroken from lowland scrub, grassland and oak woodlands up to higher altitude montane chaparral and conifers. The Venturan and Diegan associations of coastal sage scrub and native grasslands of southern California are all critically endangered and the Irvine Ranch Wildlands and Parks and adjacent wildlands offer one of the last, best places to protect these ecosystems and many of the species associated with them.

This area also is sufficiently large and continuous to support native ecosystems that still benefit from the presence of large predators such as mountain lion, coyote, golden eagle, and bobcat. Their ecological role as top carnivores helps maintain a healthy and resilient ecosystem. The wildlands are some of the last and most extensive lower elevation habitat for these important predators. For all of these reasons, The Irvine Ranch Wildlands and Parks has been identified by The Nature Conservancy as one of the top 50 priority conservation landscapes in California.

Not only are these natural areas a globally important conservation priority, they are remarkably close to one of the world's largest urban regions. This offers an unparalleled opportunity for people to experience and enjoy these extraordinary native ecosystems in their own backyard, while enhancing understanding and support for their protection and stewardship (Irvine Ranch Conservancy, 2008).

**Existing Conservation Plans**
***Western Riverside County MSHCP***

| PLAN | AGENCY | ACRES | STATUS |
|---|---|---|---|
| WRC MSHCP | WRC RCA | | Underway |
| Cleveland NF | USFS | | Completed |
| San Bernardino NF | USFS | | Completed |
| Prado Basin | OCWD | | Completed |
| Bureau of Land Management Lands | BLM | | Fluctuates |
| Lake Perris SRA | CA State Parks | | Completed |
| San Jacinto WR | CA State Parks | | Underway |
| San Timoteo Creek SP | CA State Parks | | Underway |
| Mt San Jacinto Wilderness SP | CA State Parks | 10,000 | Completed |
| Santa Margarita Ecological Reserve | | | Completed |
| Santa Rosa Plateau Nature Reserve | | 8,300 | Completed |
| Motte Rimrock Reserve | UC NRS | | Completed |
| Box Springs Reserve | UC NRS | 1,155 | Completed |
| Emerson Oaks Reserve | UC NRS | | Completed |
| James San Jacinto Mountain Reserve | UC NRS | 160 | Completed |
| Kabian Park | RC Parks | 640 | Completed |
| Norton Younglove/De Anza Reserve | | | Completed |
| Harford Springs Reserve | RC | | Completed |
| Lake Skinner Recreation Area | RC Parks | | Completed |

| | | | |
|---|---|---|---|
| Lake Mathews-Estelle Mountain Reserve | MWD | | Completed |
| SW Riverside County Multi Species Reserve | RCHCA | | Completed |
| Metropolitan Water District Lands | MWD | | Completed |
| March ARB Reserve Lands | USAF | | Completed |
| Southern California Edison Lands | SCE | | Completed |
| San Diego Gas and Electric Lands | SDGE | | Completed |
| | **Total Acres:** | 500,000 | |

***San Bernardino County MSHCP***

| PLAN | AGENCY | ACRES | STATUS |
|---|---|---|---|
| San Bernardino National Forest | USFS | | |
| San Bernardino County MSHCP | SB County | | Hiatus |
| Upper Santa Ana River Land Management & Habitat Conservation Plan | SBVWCD | | Underway |
| | **Total Acres:** | | |

***Orange County MSHCP***

| PLAN | AGENCY | ACRES | STATUS |
|---|---|---|---|
| Cleveland National Forest | USFS | | Completed |
| Irvine Ranch Wildlands | Nature Conservancy | 50,000 | Underway |
| Irvine Open Space Preserve - South | City of Irvine | 4,000 | Underway |
| | **Total Acres:** | | |

## Current Issues, Challenges and Potential Approaches

While most of the Watershed can be described as semi-arid to arid coastal plain, historically, water has played a critical role in supporting a rich diversity of seasonal and year-round wildlife. Expansive seasonal and permanent wetlands, estuaries, ephemeral and perennial streams, vernal pools, and natural lakes all provided life-giving water to thousands of square miles of land inhabited by many species of plants and animals.

As the Watershed has been developed over the last two centuries, many water-oriented habitats have been altered by man. Where water-oriented habitats have been reduced, the flora and fauna have adapted, moved, or disappeared. Through the OWOW process, stakeholders will investigate how to successfully manage water-oriented habitats while ensuring adequate public water supply, protecting water quality, and providing housing and commerce for a growing population.

The purpose of this chapter is to identify the issues and challenges related to the successful management of water-oriented habitat. The following is a list of issues/challenges, followed by a brief discussion of potential approaches to address them.

## Pollutant Trading Programs

Constructed wetlands can be used to remove pollutants from surface runoff using natural processes. Formal pollutant trading programs provide the mechanism to pool funding from multiple, smaller sources to construct wetlands that would create habitat and increase the pollutant removal benefit.

Potential Approach:

- Develop formal pollutant trading programs that facilitate pooling of funds to construct wetlands

## Innovative Conservation Arrangements

Over the last few decades, development interests, regulators and environmental groups have worked together to encourage habitat conservation and enhancement while allowing for reasonable land development. Such efforts include Natural Community Conservation Plans and HCPs. These programs have provided large conservation areas to accommodate large developments, but have taken years and large financial commitments to develop and implement.

Other programs include the Federal Safe Harbor Policy, which protects the ability of landowners to use their land responsibly in exchange for the setting aside of large land parcels for conservation of specific threatened or endangered species.

Potential Approaches:

- Facilitate legislation to simplify landowner habitat conservation programs.
- Develop an inventory of existing mitigation lands.
- Develop a Watershed-wide, water-oriented habitat conservation program.
- Create mitigation banks to "pool" smaller mitigation requirements to enable the creation of larger, more beneficial habitat mitigation projects.
- Work with private landowners to manage habitat more effectively, provide "assistance agreements" that help those landowners manage their lands partnership, and management education.
- Build on successes of the Western Riverside County MSHCP and other similar efforts to expand conservation opportunities.

## Multi-Purpose Publicly Owned Lands

There is a significant amount of land across the Watershed that is owned by federal, state, and local governments for purposes other than water-oriented habitat conservation. In many cases, these lands currently are left unmanaged or are managed in a manner that discourages the development of habitat. In many cases, unused portions of public lands could be set aside for habitat enhancement without impacting the landowner's primary purpose. An example might be flood control channels and basins that could provide habitat while still providing critical flood protection.

Potential Approaches:

- Develop a public land database as a first step toward a more comprehensive, coordinated management plan.

- Develop a regional plan for public land use.
- Develop regional "safe harbor" type agreements that allow for short- or long-term management of public lands for multiple uses including habitat conservation.
- Coordinate wildlife management with local parks departments.
- Provide expert assistance to public agency landowners to help them better understand how they can manage their lands for multiple purposes, especially short- or long-term habitat enhancement.
- Partner with public utilities in utility corridors.

## Economic Development

The region's favorable climate and historically high employment rate make the region prime for development and urban growth, and it is expected to remain so in the future. This produces a great deal of pressure on water-oriented habitat. To address these pressures, this plan recommends that the development community consider water-oriented habitats early in the development planning process.
Potential Approaches:

- Analyze the economic value of environmental and habitat enhancement to new and existing communities
- Identify early what general and specific areas should be preserved at full build-out of the Watershed rather than identifying them after landowners have prepared development plans (the latter approach can result in inequitable, piecemeal conservation efforts)
- Incorporate water-oriented habitat conservation into land use planning in a manner that provides a return on investment while protecting the environment
- Modify the state tax structure to encourage conservation
- Facilitate cooperation among regulators and private landowners to prioritize lands that could be purchased and set aside as public lands
- Identify funding sources for such purchases or facilitate development agreements that transfer such lands to public agencies for future management
- Consider the natural configuration of water-oriented habitat that does not recognize political jurisdictional boundaries. A regional coordination effort is needed to provide consistent planning and regulation across multiple jurisdictions

## Private and Public Funding

Despite significant bond funding in recent years, there still is a shortage of funding available in both the private and public sectors to purchase, operate, and maintain valuable habitat areas.

Potential Approaches:

- Research and develop innovative funding arrangements to buy high priority, water-oriented conservation lands, construct needed improvements for appropriate public access, and fund on-going operation and maintenance of those lands
- Develop an in-lieu funding program or habitat bank for water-oriented habitats throughout the Watershed

## Connection Between People and Local/Regional Habitats

As development moves into the arroyos and hillsides of the Watershed, more people are living closer to valuable habitat. Unfortunately, not enough emphasis has been placed on developing a land ethic across the Watershed, even among those residents who live directly adjacent to some of the Watershed's richest habitats. There is a great deal of potential to improve the connection between people and local habitats. For instance, along the northeastern slope of the Santa Ana Mountains, stewardship groups could be formed among residents to care for the habitat and wildlife in the local canyons and forest water courses.

Some of the Watershed's high quality, water-oriented habitats are near disadvantaged communities, where historically, little attention has been paid to stewardship of the local resources. Developing local "ownership" of these habitats could benefit both the habitat and the community.
Potential Approaches:

- Develop a social marketing campaign, including opinion surveys to determine how to best enhance the people/habitat connection.
- Develop community "ownership" of local water courses and wetlands by forming wetland societies or stewardship/"friend" groups.
- Create educational centers near water-oriented habitat areas.
- Provide educational tours of both local and regional water-oriented habitat areas.
- Sponsor conferences that include outdoor seminars.
- Produce/distribute wildlife habitat maps and make them available on-location and on the Internet.
- Increase citizen science opportunities/involvement.

## Comprehensive Habitat Management

Without a comprehensive, regional plan for water-oriented habitat conservation, independent efforts by various planners, regulators, and landowners can lead to fragmented habitat areas and fragmented management of those areas. In addition, a parcel-by-parcel, or piecemeal planning approach can lead to inconsistent, inequitable regulation of land development and unnecessary costs and delays. Broader planning and management approaches would benefit both the environment and development.

In general, the larger a habitat area, the healthier it is, with ample breeding, feeding, and shelter opportunities for its inhabitants. Fragmented, small habitat areas can pose a threat to species diversity and the overall health of ecosystems. Habitat fragmentation is frequently caused when native vegetation is cleared for activities such as agriculture or urbanization. Habitats, which were once continuous, become divided into separate fragments or islands. When habitat is fragmented, plants and animals lose their protective buffers around the fringes and access to each other, food, and water. Eventually the fragments become unable to support their natural diversity and species disappear.

Fragmented management refers to piecemeal approaches to conservation and restoration of water-oriented habitat. When management is approached in a collective, comprehensive manner, overall costs can be reduced, funding can be pooled, and wasteful or harmful practices can be minimized or eliminated. When management is fragmented, there is a potential for duplication of effort, conflicting practices, and excessive costs.

Large conservation groups do not generally operate within the region; however, Santa Ana Watershed Association (SAWA) and the Riverside Land Conservancy have active habitat programs. There also are numerous "friends" groups throughout the Watershed providing area-focused land conservation.

Potential Approaches:

- Develop a map of the Watershed reflecting all the water-oriented habitat areas as described in this chapter.
- Develop a landownership database along riparian corridors.
- Work with landowners to manage habitat more effectively and provide "assistance agreements"
- Develop an urban habitat management model that softens/blurs the transition from urban development to surrounding habitat areas, and allows urban gardens and green space to be used safely/responsibly by wildlife based in the habitat areas.
- Partner with transportation agencies to minimize fragmentation and incorporate wildlife crossings.
- Incorporate vector control efforts into habitat management efforts to avoid conflicting activities.
- Consolidate the various "vision plans" by various agencies regarding water-oriented habitat conservation.

## Evaluation of Hardened and Buried Water Courses

Many water courses throughout the Watershed have been hardened or contained in pipelines to protect urban development. Unfortunately, while such efforts improve the efficiency and safety of the water courses, it tends to eliminate critical wildlife connectivity between habitat areas. Not all flood control facilities are in areas where softer, above ground designs would be beneficial or necessary for habitat conservation. A prioritization process could identify where such designs would be of the highest value to habitat conservation.

Potential Approaches:

- Include flood control officials in any regional habitat conservation planning.
- Coordinate flood control management efforts with habitat conservation efforts to recognize/enhance the use of channels/basins by wildlife for connectivity among habitat areas.
- Identify and fund efforts to "daylight" or soften specific existing hardened channels and pipelines.

## Invasive Species

One component of integrated programs to rehabilitate and improve the Watershed, is the removal of exotic and invasive plant species within the Watershed, primarily giant reed or wild cane (*Arundo donax*). SAWA, the Riverside County Parks and Open-Space District, RCFCWCD, OCWD, the Orange County RDMD, and the Orange County Conservation Corps, collectively known as "Team Arundo", participated in a comprehensive Arundo Removal Program (ARP). The ARP will remove Arundo and other invasive species, thereby helping to achieve the following goals:

- Remove non-native plants and create new open space and wetlands.
- Conserve water, use water efficiently, and capture and manage stormwater.

- Plan and implement a flood control program to protect agricultural operations and adjacent property, and to assist in abating the effects of waste discharges into waters of the State.

In addition to Arundo, team members may remove other invasive species while undertaking Arundo removal activities. These species include, but are not limited to, castor bean (*Ricinus communis*), artichoke thistle (*Cynara cardunculus*), tree or wild tobacco (*Nicotiana glauca*), tamarisk or saltcedar (*Tamarix* sp.), tall whitetop (*Lepidium latifolium*), and tree of heaven (*Ailanthus altissima*). These species disrupt natural ecosystems by competing with native flora for limited resources and generally providing poor quality habitat for native fauna. Removing any exotic species, including Arundo and other species, must follow applicable permit conditions.

Currently, more than 95% of the historic riparian habitat in the southern part of California has been lost to agriculture, development, flood control, and other human-related impacts (Zembal and Hoffman 2000). However, the greatest threat to the remaining riparian corridors is the invasion of exotic plant species, primarily Arundo. As a result of past and present introductions, its ability to colonize new areas relatively easily, and its ability to outcompete native species, Arundo has infested nearly every drainage system in the southwestern United States (Brotherson and Field 1987).

Because this exotic plant alters ecosystem dynamics and interrupts and redirects succession, the removal of Arundo from the Watershed offers numerous direct and indirect benefits to landowners, land managers, public agencies, and other Watershed residents. These benefits include reduction in risk of flooding and fire, improvements in water quality, increased water conservation, and restoration of habitat for native species, including several threatened and endangered species.

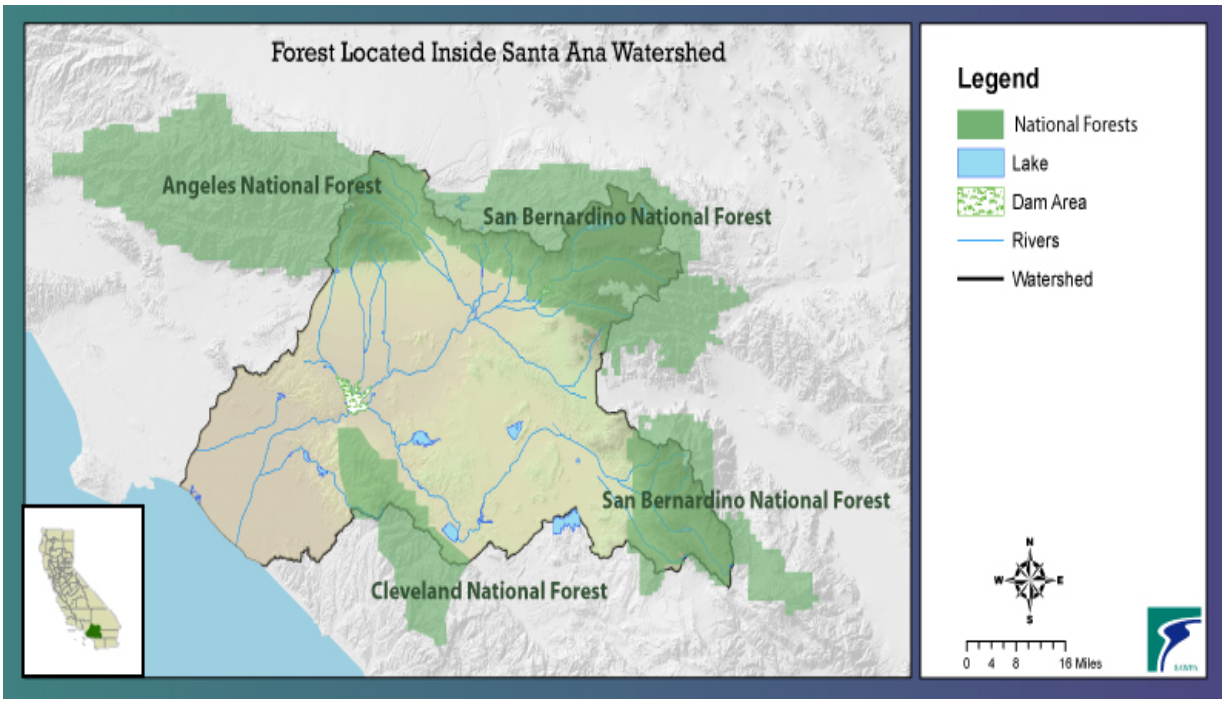
This Team Arundo approach to habitat management and restoration has been dependent upon a large upstream seed bank that re-seeds areas where non-native plants are removed, and replaces the invasive, non-native plants with stands of riparian vegetation. These areas have provided excellent habitat for the native species using the river corridors. As natural lands are restored, it becomes important to balance their value as habitat resources with the important recreation benefit they provide.

## Wildfires and Forest Planning

Wildfires are an important habitat and public safety issue throughout the Watershed.

There are five national forests located in southern California and three of them are located in and around the Watershed (**Figure 5.7-1**). Angeles National Forest covers over 650,000 acres and is located northwest of the Watershed; Cleveland National Forest is located in the southern area of the Watershed and covers 460,000 acres; and San Bernardino National Forest, located in the northern and eastern areas of the Watershed, covers over 670,000 acres.

**Figure 5.7-1 National Forests located in and around the Watershed**




National forests provide habitat and a safe haven for threatened and endangered plants and animals, as well as provide people with opportunities for recreation in a natural environment. Forests also are a major source of water. In fact, many of California's National Forests were created specifically to safeguard and preserve water supplies essential to life in California's semi-arid climate. The Watershed receives the majority of its water from rainfall in and around the San Bernardino, San Gorgonio, and the San Jacinto Mountain's forest areas. Rainfall in these areas provides surface water and groundwater recharge throughout the region.

Along with the benefits that come from being near forests, the Watershed's proximity to three national forests also yields additional responsibilities. Proper forest planning is essential to maintaining the Watershed's water supply and water quality. Wildfires are always a threat, and the resulting physical, chemical and biological impacts on the Watershed will continue to be experienced for years after a fire.

The wildfires that were a natural part of California's historic landscape cleared the forest floor of debris and small trees. Historically, forest fires were generally low-intensity affairs. Fires might cover large areas, but flames stayed close to the ground with relatively modest temperatures. Today's infernos sometimes tower hundreds of feet above the ground and reach 3,000°F, hot enough to melt metal. They can travel 20 miles in a day and sterilize soils. However, it is the unnatural number of trees, not the amount of precipitation that is at the root of the problem. With 50-70 trees per acre, as was historically natural for much of California, forests could survive limited droughts relatively unharmed. However, with five to 30 times that amount of trees, even relatively wet years may not provide sufficient moisture for the trees.

Water also is the key to a tree's ability to survive bark beetle attacks. When a tree has sufficient moisture available, it can "pitch out" beetles by blocking the holes they bore into the tree with sap. Moisture-stressed trees, however, cannot. They succumb to insect infestation and become fire hazards.

Over the last several years, the Watershed has experienced drought conditions due to significantly decreased rainfall. This, combined with an infestation of bark beetles, has resulted in the large-scale mortality of trees, creating an enormous source of combustible material. Fuel loads in the San Bernardino National Forest and adjoining areas are extraordinarily high due to forest and private property management practices in these urban forest areas.

In 2003 and in 2007, the Watershed experienced major wildfires. There were three large fires in 2003 (**Figure 5.7-2**). The "Padua" fire burned 10,810 acres, the "Grand Prix" fire burned 49,184 acres, and the "Old Fire" burned 93,119 acres. In 2007 there were six wildfires (**Figure 5.7-3**). The "Slide" fire burned 12,759 acres, the "Cajon" fire burned 104 acres, the "Grass Valley" fire burned 1,242 acres, the "Santiago" fire burned 28,410 acres, the "Rosa" fire burned 409 acres, and the "Roca" fire burned 270 acres.

**Figure 5.7-2 Location of 2003 Wildfires in the Watershed**

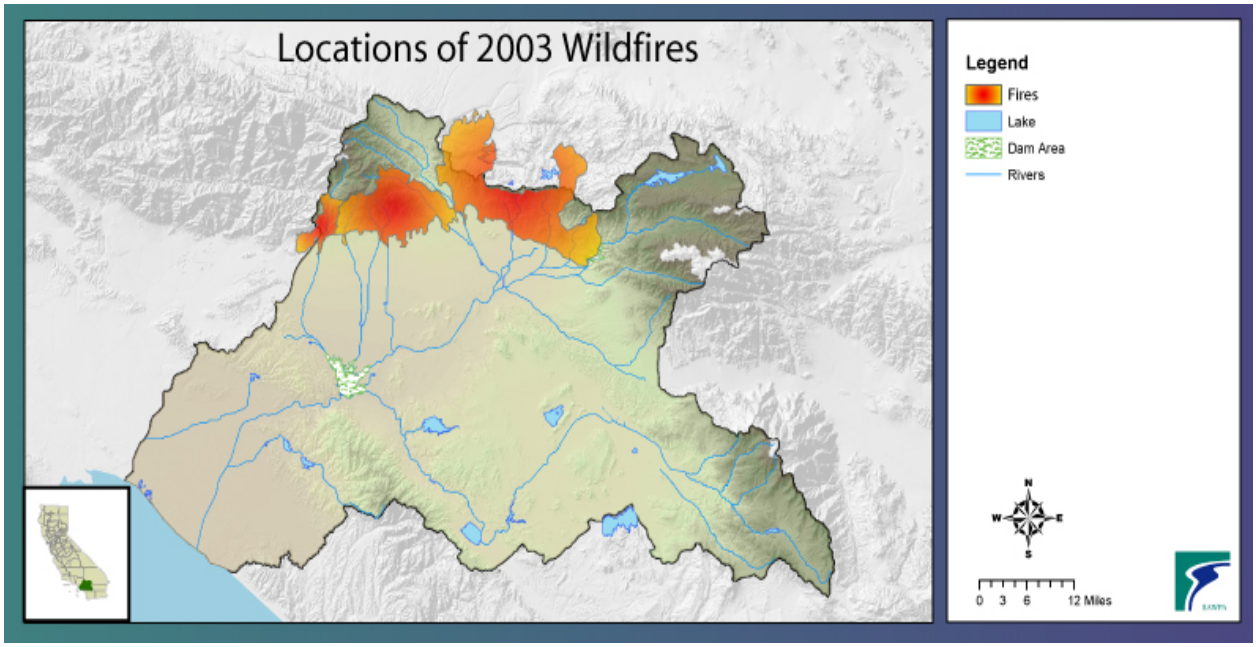
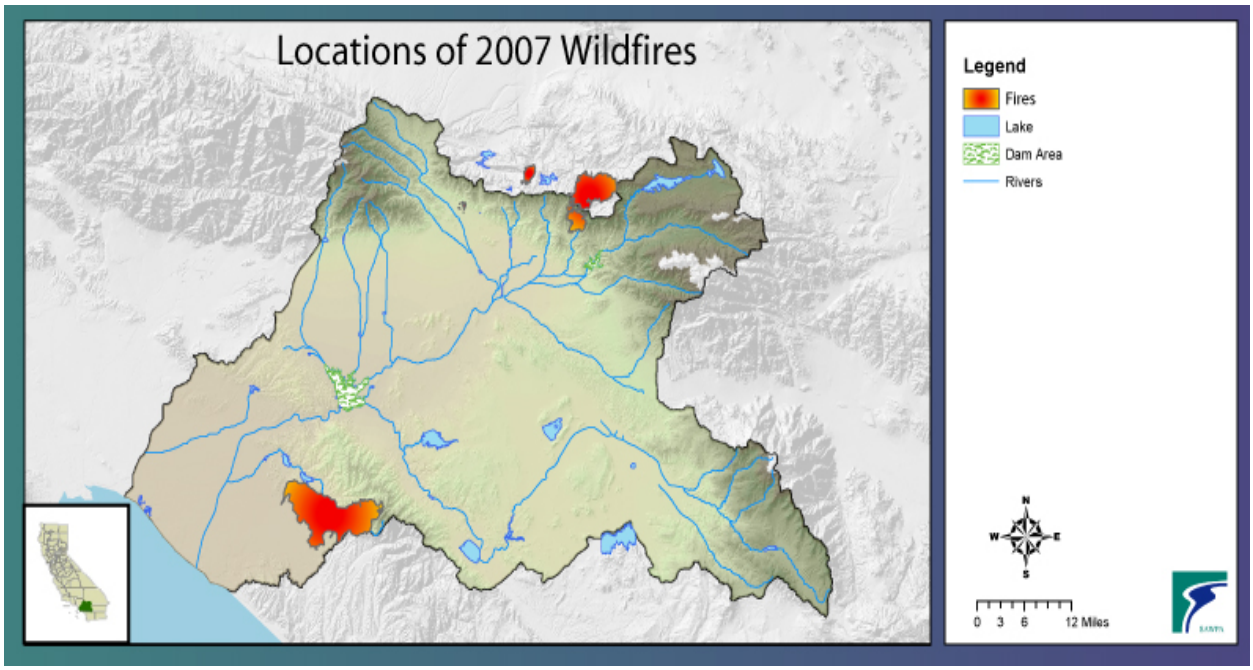


**Figure 5.7-3 Location of 2007 Wildfires in the Watershed**




For the first time, SAWPA developed a fire impact cost estimate to determine the cost of mitigating the long-term and short-term effects caused by 2003 wildfires. The costs of mitigating the effects of these three fires were estimated to be around $450 million (for a summary of the costs, (**Figure 5.7-4**).

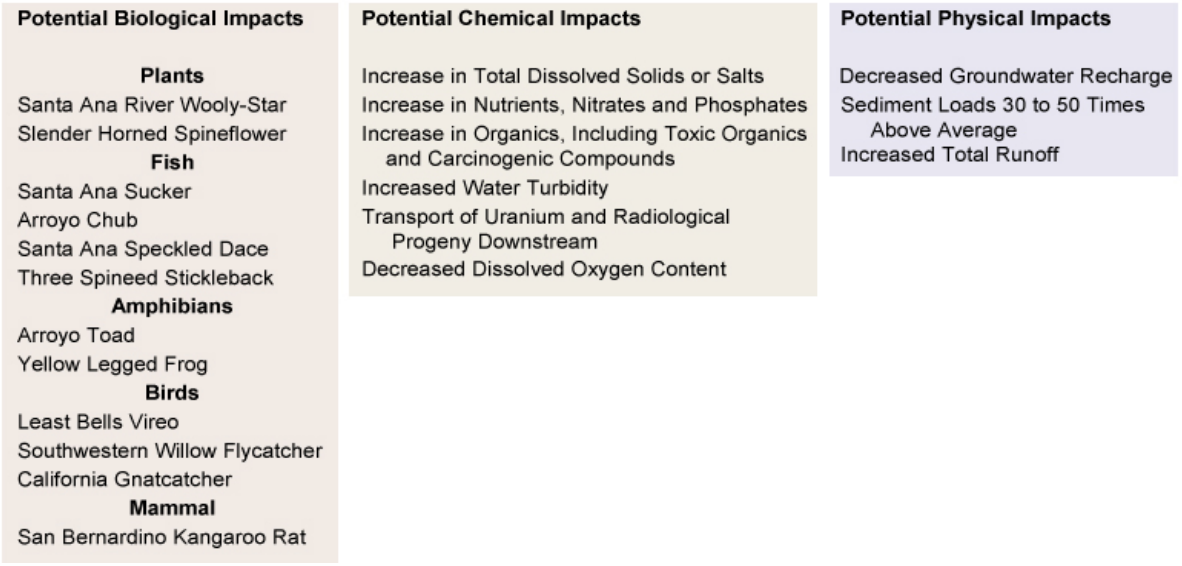
**Figure 5.7-4 Fire Impact Cost Estimates based on 2003 Fires**

| Impact Type | Total Cost | First Year |
|---|---|---|
| Sediment Removal (5 years) | $ 125,250,000 | $ 12,525,000 |
| Flood Control Improvements (56 basins) | $ 56,000,000 | $ 5,600,000 |
| Basin Percolation Restoration (25 basins) | $ 6,250,000 | $ 1,250,000 |
| Habitat Restoration (7,500 acres) | $ 15,000,000 | $ 1,500,000 |
| Toxic or Radiological Treatment | $ 13,000,000 | $ 500,000 |
| Inorganic Salt Removal (Capital and 20 yrs Op) | $ 182,000,000 | $ 18,200,000 |
| River and Basin Quality Monitoring | $ 8,850,000 | $ 1,770,000 |
| Water Supply Emergency | $ 35,350,000 | $ 3,535,000 |
| Wetland Restoration (2,500 acres) | $ 5,000,000 | $ 500,000 |
| **TOTAL** | **$ 446,700,000** | **$ 45,380,000** |

Wildfires have a direct impact on the habitat of plants and animals. The 2003 fires affected the habitat of 16 species federally listed as threatened or endangered, as well as other sensitive and watch-list species. Most of the habitat that burned in these fires was chaparral, a habitat where periodic fires are an important ecological component. However, there are post-fire concerns about several species that depend on riparian or alluvial fan scrub habitats. Federally-listed species such as San Bernardino kangaroo rat, Santa Ana woolly-star, slender-horned spineflower, and California gnatcatcher are at post-fire risk if flood control measures outside national forest lands are not properly planned and the effects mitigated.

Besides causing physical damage to habitat, wildfires in national forests and the surrounding wildlands have a significant impact on the water in the SAR and other areas far from the burn sites. Serious water supply and water quality problems will likely begin during the winter following a fire event. Stormwater runoff from burned areas could contain high concentrations of manganese, lead, phosphorus, mercury, total organic carbon, and uranium, as shown in **Figure 5.7-5**. This degraded runoff will have significant downstream impacts.

**Figure 5.7-5 Biological, Chemical and Physical Impacts on the Watershed from Wildfires**




A single storm event could result in approximately 20,000 AF of sediment laden runoff that would flow down the SAR and its tributary streams, filling the recharge basins with debris and silt, and decreasing the rate of percolation. Increased nutrients in the runoff could promote the growth of algae and other vegetation that also may result in the clogging of the recharge basin substrate. These recharge basins play a major role in refilling the groundwater basin in this region. Reducing the rate of percolation decreases the amount of groundwater recharge. Increased basin maintenance and basin cleaning machines, developed and operated by OCWD, will be necessary to restore groundwater recharge rates. Increased silt also will have a negative impact on water quality. Currently, OCWD owns and operates 2,150 acres of wetlands for natural nitrate purification. Over 90% of the nitrate removal is accomplished through de-nitrification processes that occur in the bottom of the wetland substrate.

Under storm runoff conditions, the silt coming into the wetlands from the upstream tributaries likely will result in severe clogging, and reduce the effectiveness of the natural nitrate removal process. Wetland restoration will be required to repair damage caused by runoff from burn areas.

In addition to silting impacts, the runoff will contain increased levels of TDS, turbidity and nutrients such as nitrates from the burned area. Salt levels in runoff water are assumed to increase five-fold after a fire. For example, after the "Old Fire", 135,000 tons of salt was expected to infiltrate the groundwater basin and degrade groundwater quality for up to ten years following the fire. With larger storm runoff events, the salt infiltration quantities are likely to be even greater. Without some means of off-setting the increased salt loads in the groundwater basins, local water and wastewater agencies will be unable to meet California State and Federally mandated water quality regulations necessary to protect downstream beneficial uses. Existing desalination facilities likely will need to be expanded, and new facilities may need to be built depending levels.

Another source of concern is the high level of ash, both coarse and fine, that will enter the surface water supply system. Estimates indicate that possibly as much as 10,000,000 cubic yards of ash could enter the Watershed during storm events. Elevated levels of ash will persist for several years after the fire. Elements of the ash will be moved directly from the burn surfaces by storm runoff and will be incorporated into surface water flows. Furthermore, the high ash content of the first stormwater runoff event could affect the net oxygen availability in streams and wetlands.

In the Upper Watershed, clay and ash could mix and be deposited in rivers, streams and recharge basins. There are historical and current references to the use of baked clay and wood ash to form a material similar to Portland cement. Clay-ash slurry settling in low points in the upper Watershed may form hardened impermeable deposits. The removal of these deposits would require repeated maintenance activities.

There also are several other water quality parameters that could impact Watershed water supplies. These include uranium and its radiological progeny, toxic organics, and carcinogenic compounds. Some of the expected organic and carcinogenic compounds may be removed by desalination facilities. However, for uranium, radon and radiological progeny removal, there are no regional facilities that have been constructed. New facilities may need to be constructed depending on the results of monitoring and water quality measurements made in the storm runoff and burn areas.

Wildfires also can cause a significant, immediate change to the soil chemistry of the Watershed and could result in direct impacts on drinking water reservoirs. The abundant carbon left over from burned vegetation competes for oxygen with stable, oxidized metal compounds. During rainfall events, these metals dissolve and can be conveyed into mountain streams and receiving waters. Recent research on the effects of wildfires on drinking water quality has demonstrated that post-fire watershed runoff could contain spikes in the concentrations of manganese, phosphorous, lead, mercury, nitrate, total organic carbon, aluminum, barium, cobalt, copper, niobium, zinc, and uranium (Wildland Fire Impacts on Watershed, Geological Society of America, 2003).

Wildfires also have an impact on flood control. The Watershed's close proximity to both the ocean and the mountains at times brings heavy storms, which are problematic from a flood control standpoint. Many of the SAR's tributaries are dry throughout most of the year, but can quickly become raging torrents. The burned areas of the Watershed reveal exposed hillsides of rock; sand and debris; parched chaparral; and dead trees with a high potential for severe erosion, flooding, and mudslides.

As rainfall starts to saturate the burned portion of the Watershed, intense storms can result in rapid erosion and slope failures. This can lead to debris flows and rapidly moving flood events that carry a large concentration of soil, rock, and organic debris. In general, a fire causes an increase in the amount of sediment delivered by the Watershed to downstream areas. The increased volume of sediment could be 30 to 50 times the average amount.

Leaving forests alone is not a sustainable approach to managing natural resources. People are dying in high intensity wildfires, biodiversity is suffering, and the situation is getting worse as an increasing population puts more demands on forests.

Restoration forestry, on the other hand, is a real-world solution for addressing the forest health and wildfire crisis California is facing. Restoration forestry is a comprehensive plan that could:

- Restore natural forest conditions to California's landscape
- Reduce the threat of catastrophic wildfire
- Enhance biodiversity
- Protect water and air quality
- Pay for itself
- Encourage use of renewable resources
- Save taxpayers millions of dollars (Bonnicksen, Protecting Communities and Saving Forests, 2008)

During the first half of 2009, SAWPA staff provided information to the United Dates Department of Agriculture (USDA) Forest Service, Pacific Southwest Region, for an assessment of potential ecological restoration and ecosystem services strategies to assist in the Forest Service efforts in the restoration of California national forests. The Forest Service developed a strategy document called "Leadership Intent for Ecological Restoration" outlining the vision for the region and layout specific restoration strategies and expected benefits.

The goal of the Forest Service, Region 5, is to retain and reestablish ecological resilience on forest lands to achieve a sustainable management of forests to provide environmental services, including air and water purification, flood and climate regulation, biodiversity, scenic landscapes, wildlife habitat and carbon sequestration and storage. Work will be focuses on three influences: climate change and shifting hydrological patterns, overly dense forests, and rapid population increase.

The Forest Service estimates that by approximately 2050, the ability of national forests to sequester carbon and deliver ecosystem services will start to collapse. This will result in the loss of the ecosystem services mentioned above, many of which are directly related to water supply, both in terms of quantity and quality.

An environmental restoration program of unprecedented scale and with the collaboration of different ownerships and jurisdictions is required. Activities to be performed as part of this program need to include, among other, management of vegetation, wildlife, water, wildland fires, and recreation. Activities include meadow and riparian restoration, invasive species eradication, wildlife and fish habitat improvements, and landscape restoration.

# Lakes

## Current Conditions

This section discusses lakes within the Watershed, from the headwaters in the San Bernardino Mountains, through the basin and the SJR Watershed to the SAR's terminus in Orange County. These include a number of natural sumps and large, man-made lakes formed by dams. Excluded from this discussion are small private lakes disconnected from the Watershed, and have not been assigned beneficial uses by the Regional Board, for example golf course or park lakes.

### *San Bernardino Mountains Lakes*

*Erwin Lake*

Erwin Lake is relatively small and only a couple feet deep. It is located off Highway 38 near the community of Sugar Loaf. Erwin Lake is fed by a spring and surrounding creeks. If Erwin Lake overflowed, it would connect with Baldwin Lake to the north. Noting Baldwin Lake's endangered species and importance as an ecological reserve, it would be beneficial to study Erwin Lake further. Two additional lakes that are far smaller in size with very little known about them include Lake Williams (a.k.a. Deadmans Lake) and Oakes Lake, both south of Erwin Lake and east of Highway 38. In the rare event of an overflow, these two sumps would ultimately connect with Baldwin Lake.

*Baldwin Lake*

Directly north of Erwin Lake is the much-larger Baldwin Lake that is characterized by mountain meadowland and a plain of pebble-size quartz rocks – remnants of the ice age lake that formed this natural depression. Called the "original" Big Bear Lake, Baldwin Lake is located at the very top of the Watershed. The lake can fill to 1,400 acres with a maximum depth of approximately 10 feet in wet years (CDFG, 1995). The lake is usually dry in spring or summer and has no natural outlet.

The combination of unique soils, harsh growing conditions, and isolation from other similar areas has created a plant community found nowhere else in the world (Flannery, 2001). In spring, Baldwin Lake displays wildflowers such as Douglas' violets (*Viola douglasii*), Parish's rock-cress (*Arabis parishii*), ash-grey Indian paintbrush (*Castilleja cinerea*), slender-petaled mustard (*Thelypodium stenopetalum*) and Kennedy's buckwheat (*Eriogonum kennedyi var austromontanum*). Both the ash-grey Indian paintbrush and Kennedy's buckwheat are listed as threatened, and the slender-petaled mustard is endangered on both state and federal lists. The ash-grey Indian paintbrush and the slender-petaled mustard are endemic to the San Bernardino Mountains.

When the lake is full, it supports populations of the unarmored three-spine stickleback (*Gastereosteus aculeatus williamsoni*), which is both federally and state listed as endangered. CDFG operates the Baldwin Lake Ecological Reserve on the north shore of the lake (Flannery, Meyer, Sudduth, 2001). A local non-profit organization, Natural Heritage Foundation, is looking to develop a waterfowl viewing platform and visitor center.

*Big Bear Lake*

Big Bear Lake, located downstream from Baldwin Lake, is a man-made reservoir that was dammed for the first time in 1884, and then again in 1912 when the current dam was built about 100 yards downstream of the original dam, tripling the lake volume to 73,000 AF. The lake is managed by Big

Bear Municipal Water District (BBMWD) for the purposes of recreation, water supply for downstream users, and wildlife. BBMWD also releases lake water to support the trout fishery in Bear Creek located below the dam.

Nine types of aquatic plant species have been identified in the lake. Of these, two invasive species have become problematic; Eurasian watermilfoil (*Myriophyllum spicatum*) and coontail (*Ceratophyllum demersum*). These species crowd out the native species that provide habitat for fish and waterfowl. Also, they can release high levels of phosphate resulting in algae blooms during the summer months. Other aquatic plants include smartweed, curlyleaf pondweed, American waterweed, sago pondweed, leafy pondweed, Widgeon grass, and spikerush.

Fish present in the lake include black crappie, blue catfish, bluegill, carp, channel catfish, largemouth bass, rainbow trout, and smallmouth bass. Recreational fishing is important to the economy in the Big Bear Valley, so game fish are regularly stocked.

Adjacent to the lake is Stanfield Marsh, a 145-acre wildlife preserve established in 1982. Since 1993, efforts have been underway to re-create a working wetland and marsh environment. It is located at the most easterly end of the lake, separated by a highway bridge, but water flows between the two water bodies through culverts. The purpose of the marsh is to provide year-round habitat for native plant species, waterfowl, and aquatic species through permanent wet basins and permanently dry loafing islands. Public walkways and interpretive signs are planned.

*Jenks Lake*

Located in Barton Flats along Highway 38 in the San Bernardino Mountains, Jenks Lake is a 10-acre public lake that is regularly stocked for recreational fishing by CDFG. The lake is fed by Frog Creek and maintains several fish species including bass, bluegill and rainbow trout. There is a picnic area and lake platform. When the lake overflows, it flows into Barton Creek that connects with the SAR upstream of Seven Oaks Dam (Reach 6).

### *San Jacinto River Watershed*

*Lake Perris*

Lake Perris was constructed in 1974 as the last drinking water reservoir in the SWP, and is managed by DWR. It is surrounded by the Lake Perris State Recreation Area, an area managed by the California State Parks Department. The surface area of the lake is roughly 2,000 acres and the State Recreation Area covers more than 6,000 acres of open space. For the most part, the environment within the lake is constructed and managed to support recreational interests; however, the environment around the lake provides an important open space area for local native species of plants and animals.

Lake Perris provides an important stop-over point for migratory birds. The State Park preserves open space for wildlife like mule deer, roadrunners, bobcats, coyotes, long-tailed weasels, skunks, badgers, cotton tail rabbits, jack rabbits, quail, gopher snakes, rattlesnakes, lizards, and rodents.

Fishing, boating, and swimming provide the major recreational attraction for Lake Perris. Largemouth bass, spotted bass (rare), catchable trout (stocked by CDFG), rainbow trout, channel catfish, bull catfish, red ear sunfish, green sunfish, and Florida bluegill are caught in the lake. In addition, small

shrimp that arrived from San Francisco via the California Aqueduct and crawdads are present (Rocky Mountain Recreation, 2006; Lake Perris State Recreation Area, 2008; and Lake Perris Dam Project, 2008).

*Lake Hemet (Hemet Reservoir)*

In 1895, the Great Hemet Dam was completed on the San Jacinto River for the purpose of providing a reliable water supply to the San Jacinto Valley. It is located in the San Jacinto Mountains with a capacity of 8,100 AF, and managed by the Lake Hemet Municipal Water District. Hurkey Creek, Apple Canyon Creek and Garner Valley Wash drain into Lake Hemet from the San Jacinto Wilderness Area. The reservoir provides water to the Cities of Hemet and San Jacinto, and the community of Garner Valley. The reservoir is not connected to the SWP or MWD.

Fishing is one of the primary recreational attractions of the reservoir; and it is stocked with rainbow trout, channel catfish, bluegill, and largemouth bass. Activities such as camping, hiking, and wildlife viewing are available (Lake Hemet, 2008; Hemet History, 2008; and Hemet Museum, 2008).

*Lake Fulmor*

Lake Fulmor is a naturally-formed, three-acre mountain lake fed by Indian Creek which flows out of Hall Canyon. It is easily accessible along the Banning Idyllwild Panoramic Highway (Highway 243). It is enjoyed year-round for picnicking and fishing; stocked trout, largemouth bass, bluegill, and catfish are present. From Lake Fulmor, Indian Creek flows westerly and joins the SJR near Valle Vista.

*Mystic Lake*

Like Erwin Lake, Lake Fulmor, Jenks Lake, and Baldwin Lake, Mystic Lake is a natural, ephemeral lake that is fed mainly by the SJR. It fills during the rainy season and often dries up in summer. The lake soil is characteristically alkaline and supports many unique and isolated plant species. The most notable plant is the San Jacinto Valley crownscale (*Atriplex coronata var. notatior*) that is endemic and federally endangered. In the early 1990s, one of the largest known concentrations of this species was along the margin of Mystic Lake. However, the lake was full during the wet years of 1993 and 1994, and the species has not been noted since (Fred Roberts, personal communication, 04-25-08).

Other species known to occur or likely to occur within the Mystic Lake Basin, which have adapted to the alkaline conditions include: navarretia (*Navarretia fossalis*), federally listed as threatened; thread-leaved brodiaea (*Brodiaea filifolia*), federally listed as threatened and state listed as endangered; Coulter's goldfields (*Lasthenia glabrata ssp. coulteri*), identified by the California Native Plant Society as “seriously endangered in California”; Davidson's saltscale (*Atriplex serenana var. davidsonii*), identified by the California Native Plant Society as “fairly endangered in California”; Parish’s brittlescale (*Atriplex parishii*), identified by the California Native Plant Society as “seriously endangered in California”; smooth tarplant (*Centromadia pungens ssp. laevis*), identified by the California Native Plant Society as “seriously endangered in California”; mud nama (*Nama stenocarpum*), identified by the California Native Plant Society as “fairly endangered in California”; and Wright's trichocoronis (*Trichocoronis wrightii var. wrightii*), identified by the California Native Plant Society as “seriously endangered in California”.

Evidence suggests that the San Jacinto Valley contains the world's largest concentration of Coulter's goldfields, and Mystic Lake has the only known population of mud nama in Riverside County. Parish's brittlescale is the most endangered saltbush in southern California. Prior to its rediscovery near Hemet in 1993, it had last been seen in 1974 near Mystic Lake (near Lakeview).

Mystic Lake has long provided an important stop-over point for migratory birds, and an important watering hole for animals in the valley. In 1774, Spanish explorer Juan Bautista de Anza described the lake's size and waterfowl as, "several leagues in circumference and as full of white geese as water". It is part of, and located adjacent to the 9,000-acre San Jacinto Wildlife Area managed by CDFG. The area includes an active duck hunting area.

The lake is steadily sinking and increasing its holding capacity due to valley subsidence and the decreasing amount of silt deposition.

*Canyon Lake (Railroad Canyon reservoir)*

After the SJR flows from Lake Hemet through Mystic Lake, it flows south through Railroad Canyon Reservoir; named for the California Southern Railroad line that was built through the canyon in 1882. This line was repeatedly washed out by the river before it was abandoned. Later, a water company bought the land rights and built the dam in 1929 to supply water for the Temescal Valley. The Canyon Lake reservoir is fed mainly by the SJR and Salt Creek, and has a capacity of 11,900 AF. The lake is designated as a municipal drinking water supply, and water volume and quality are managed by Elsinore Valley Municipal Water District (EVMWD). The City of Canyon Lake and the Canyon Lake Property Owner's Association are largely responsible for the quality of runoff that enters the lake from the surrounding community. The environment surrounding Canyon Lake is almost completely urbanized, and the environment within the lake is highly monitored and controlled for the dual beneficial uses of recreation and municipal supply.

Fishing has been a recreational attraction to the lake, and anecdotal evidence suggests bass and trout are present.

*Lake Elsinore*

Lake Elsinore is located in a rapidly urbanizing landscape, just 60 miles southeast of the City of Los Angeles, and 22 miles south of the City of Riverside. This large, shallow, natural Lake is the terminus of the SJR. As a terminal basin, Lake Elsinore is subject to highly variable hydrological conditions that influence the physical-chemical environment of the lake which, in turn, influences the aquatic biological resources (e.g., fish, zooplankton, phytoplankton, benthic invertebrates) that can be supported by the Lake. Over the past 120 years, Lake Elsinore has experienced wet periods during which the Lake has overflowed to Warm Springs Creek, as well as dry periods when the Lake has dried up completely. As settlement in the region increased, Lake Elsinore and the many hot springs around the Lake became popular recreation destinations. During the heyday of initial settlement in the region and recreational development at Lake Elsinore, Federal and State agencies, as well as private groups stocked a wide variety of fish species in the lake with the goal of drawing people to Lake Elsinore by providing recreational fishing opportunities.

Currently, little resembling a native plant community remains around the shoreline of Lake Elsinore. While the native willow (*Salix gooddingii*), cattail (*Typha latifolia*), and tule (*Scipus actutus*) remain in suitable habitats scattered around the Lake, most of the lakeshore vegetation does not consist of true riparian species, but rather, non-native, early serial stage colonizers that can grow on the exposed lakeshore as the water level recedes. A typical example of this community may be found at the Four Corners area. While a few willows remain in this area, most of the lakeshore plant community consists of mustard (*Brassica camestris*), bermuda grass (*Cynodon dactylon*), castor bean (*Ricinus communus*), filaree (*Erodium* sp.), wild radish (*Raphanus sativus*), jimsonweed (*Datura stramonium*), wild oats (*Avena* sp.), dock (*Rumex* sp.), and tamarisk (*Tamarix* sp.).

Lake Elsinore currently does not support any species of floating or submerged, rooted aquatic macrophyte. The absence of a floating or submerged aquatic macrophyte community is a consequence of: 1) the variable water level from year-to-year and even seasonally within a year; 2) limited suitable shoreline sediments for rooting; 3) shading of light by the dense algal populations; 4) turbidity caused by several mechanisms; and 5) the constant foraging of the common carp across the bottom. In the absence of a relatively stable lake level, aquatic plants cannot become established and persist. While Lake Elsinore is a highly alkaline lake (pH typically >9), there are numerous aquatic plant species that can grow in alkaline waters. Even though the lake has dried up completely in the past, it is likely that waterfowl have served, and continue to serve, as a vector for the introduction of aquatic plants to the lake.

### *Other Inland Lakes*

*Lee Lake (Corona Lake)*

Lee Lake is an artificial reservoir located in Corona, approximately eight miles north of Lake Elsinore, managed by the Lee Lake Water District. Formed in the mid-1940s, its purpose has evolved from primarily flood control and irrigation of orange, grapefruit, lemon, and lime groves to fishing and general agricultural customers. Potable and non-potable water is provided to more than 2,000 retail customers. The Lake covers about 56 surface acres and is up to 28 feet deep. Since 1983, a fishing concession has operated at the site. The lake has been stocked with trout, carp, shad, bass, and catfish. Much of the water supply in Lee Lake comes from the Mills Treatment Plant in Riverside. Temescal Wash and overflows from Lake Elsinore also supply water to the Lake.

Most of the area surrounding the Lake is altered for parking, picnicking, boat loading, and fishing. However, on the easterly side is linked to coastal sage scrub. One should expect typical flora and fauna here, but it is unlikely the Lake is frequented by wild animals due to a constant human presence (Kelly, 2007; Romo, 2005; and MWH, 2006).

*Lake Mathews*

Lake Mathews was created to serve as the western terminus of the CRA and provides drinking water supply for MWD. It was formed by constructing the Cajalco Dam on Cajalco Creek, which flows from Mead Valley to the east to the Elsinore Valley to the west. The Lake and the 4,000 acres surrounding it are part of a State Ecological Reserve and public access is prohibited.

*Mockingbird Reservoir (Gage Canal Basin)*

Mockingbird reservoir is a man-made reservoir for collecting flood waters from Mockingbird Canyon, an eight-mile drainage starting near Lake Mathews and its tributaries. The canyon and creek were

dammed around 1913 by the Gage Canal Company, which delivers water to farms along Riverside's southern boundary including the California Citrus State Historic Park, located north of the dam.

The canyon contains healthy stands of typical riparian trees and shrubs, but also was plagued with stands of giant cane (*Arundo donax*). Intensive efforts to remove 170 acres of this fast-growing, water-consuming bamboo-like plant occurred in 2003, with on-going management continuing today. SAWA, a non-profit organization, is conducting on-going monitoring for increases in threatened native animal species as a result of removing giant cane and other invasive plants.

The federally endangered least Bell's vireo (*Vireo belli pusillus*) and the California gnatcatcher (*Polioptila californica*) are known to occur in the canyon (Fishing Works, 2008 and SAWA, 2005).

*Prado Park Lake (El Prado Lake)*

Prado Park Lake serves as the terminus of the Chino Creek Watershed, a 6,500-acre area that drains agricultural, dairy, urban and suburban properties. Also, the Lake receives treated wastewater outflow from IEUA's Regional Plant 1. The 56-acre Lake outlets to the Prado Wetlands behind Prado Dam.

CDFG stocks the lake with trout and catfish; largemouth bass, carp, and bluegill also are present. The Lake is surrounded by a San Bernardino County park that provides camping, fishing, boating, picnicking, hiking, horseback riding, playing fields, a dog training facility, a golf course, and an Olympic shooting range.

Much of the Chino Creek Watershed, including Prado Park Lake, is listed on the 303(d) list for pathogens. The Regional Board is in the process of developing a TMDL for the middle SAR, an area that includes Prado Park Lake (Prado Regional Park, 2008 and Press Enterprise, 2003). Water quality is monitored jointly by OCWD, IEUA, and the surrounding Cities of Chino and Chino Hills.

*Lake Norconian*

Lake Norconian, a 60-acre man-made lake, was constructed in 1928 as part of the Norconian Resort. The resort was popular by those visiting for the mineral hot springs. In the 1930s, the resort was converted into a naval hospital, and then into a naval weapons testing site and the California Men's Rehabilitation Center, part of the California prison system. Although the resort hotel is now abandoned, the Lake and grounds are maintained by the Navy. The Norco Regional Conservancy is a non-profit organization with two specific projects, one being the Lake Norconian Club Foundation, who is working to get the property renovated and keep it from being demolished.

*Lake Evans (Fairmount Park)*

Lake Evans in downtown Riverside is the man-made terminus of Springbrook Wash. The wash begins to the east in the Box Springs Mountains. Lake Evans has an outfall directly into the SAR. The Lake is surrounded by Fairmount Park and split by roads into three lakes; two small and one large. The Lake and adjoining park was designed by park designer F.L. Olmsted. The Lake was an early multi-benefit project, developed for a dual purpose of flood retention and the provision of recreational amenities. Recently, the Lake was dredged to improve water quality. The Lake and surrounding park is owned and managed by the City of Riverside through the Parks, Recreation and Community Service Department.

### *Lower Santa Ana River Watershed Lakes*

*Anaheim Lake*

Anaheim Lake is a key component of north Orange County's water supply system serving as a groundwater recharge facility. The Lake is located in the City of Anaheim and covers approximately 75 acres. Anaheim Lake was originally opened in 1969 for recreational fishing and quickly became one of the most popular fishing spots in all of southern California. Anaheim Lake is owned and managed by OCWD as a groundwater recharge facility.

*Irvine Lake*

Irvine Lake is located within the Santiago Creek Watershed in the west-facing foothills of the Santa Ana Mountains. The Lake was created when the Santiago Dam was constructed in 1931 to create a reservoir for local agricultural use. Irvine Lake captures runoff from a 63 square mile watershed and also is used to store untreated imported water from MWD. The 25,000 AF Lake is an important regional water storage facility, as well as a recreational amenity offering boating and fishing.

Irvine Lake covers approximately 580 acres and is primarily surrounded by lands within the Nature Reserve of Orange County, a permanently protected 38,000-acre reserve system. It is located adjacent to the Cleveland National Forest. Surrounding habitat includes typical riparian species, native and exotic grassland, and small areas of oak woodland habitat. This area is impacted by recreational use, wildfires that occur too frequently to allow native plant communities and animal populations to reestablish, and exotics and invasive plants that are difficult to eradicate (IRWD, 2008 and Irvine Lake, 2008).

*Peters Canyon Reservoir*

Peters Canyon Reservoir is located in Peters Canyon Regional Park (354 total acres) in the City of Orange, which is within the permanently protected lands of the Nature Reserve of Orange County. A wildlife undercrossing allows for connectivity between the park and conservancy lands on the eastern side of the transportation corridor. The reservoir is owned by the County of Orange, and is currently operated by the Orange County Flood Control District to provide runoff storage and flood control for the communities surrounding the reservoir. Irvine Ranch Water District (IRWD) is evaluating the use of the reservoir for recycled water storage. Outflows from the reservoir to Peters Canyon Wash occur infrequently and are regulated by the County. Stormwater exits the reservoir through an outlet pipe to Handy Creek. Water levels can be lowered in case of emergency related to the integrity of the dam, or as a vector control mechanism.

The surrounding publicly accessible park offers a variety of trails; public amenities; and recreation opportunities for hikers, mountain bikers, and equestrians. It is surrounded by development and a major arterial roadway. Recreation activities in the reservoir are prohibited.

Surrounding the open water reservoir is a narrow band of freshwater marsh dominated by cattail (*Typha* sp.) and rushes (*Scirpus* sp. and *Juncus* sp.). Mule fat (*Baccharis salicifolia*) scrub communities, which includes sweet fennel, saltgrass (*Distichlis spicata*), and western ragweed (*Ambrosia psilostachya*) buffer the freshwater marsh habitat. Peters Canyon Regional Park supports a variety of vegetation communities and land covers, including coastal sage scrub, riparian, freshwater marsh, and grasslands. A black willow (*Salix gooddingii*) riparian forest community is present amongst mule fat, poison oak (*Toxicodendron diversilobum*), mugwort (*Artemisia douglasiana*), and nutsedge (*Cyperus* sp.).

The upper Peters Canyon area is 55 acres of abandoned agricultural operations containing non-native grassland and some habitat restoration of coastal sage scrub. It also is a source of sediment deposition in the reservoir.

*Syphon Canyon Reservoir*

The Syphon Canyon Reservoir, was created by the impoundment of an unnamed drainage in the Santa Ana Mountains near the southern edge of Loma Ridge between Hicks and Bee Canyons in the City of Irvine, and was used for recreational fishing. IRWD is evaluating the conversion of the reservoir to recycled water storage. Aquatic recreation activities are now prohibited within the storage reservoir. The reservoir continues to provide irrigation water storage for agricultural uses. The Syphon Canyon Dam is located at the southern side of the reservoir and controls outflows from the reservoir to downstream agricultural lands.

The surface area is approximately 65 acres, and when constructed, had a capacity of 1,090 AF (DSOD, 2008). The catchment area draining to Syphon Canyon Reservoir is approximately 186 acres (DSOD, 2008). This area includes open space area directly surrounding the reservoir, between Bee Canyon and the Eastern Transportation Corridor. Like Peters Canyon Reservoir and Irvine Lake, Syphon Canyon Reservoir is within the permanently protected lands of the Nature Reserve of Orange County. Previous land use of the area was citrus orchards.

The surrounding open space covers approximately 27 acres and the topography ranges from gentle slopes to steep, south-facing slopes located immediately west of the reservoir. Syphon Canyon Reservoir supports upland and riparian vegetation communities and land covers. The vegetation communities have developed as a result of habitat restoration activities as part of the Foothill (241) and Eastern (241, 261 & 133) Toll Roads mitigation. A coastal sage scrub community dominated by California sagebrush, California buckwheat, white sage (*Salvia apiana*), black sage (*Salvia mellifera*), bush sunflower, and prickly pear cactus surrounds the open water reservoir. Immediately adjacent to the open water reservoir is most likely a narrow band of freshwater marsh similar to that found at Peters Canyon Reservoir. A small riparian community dominated by willows and mule fat occurs in the northeastern portion of the study area (Dudek, 2008).

*Laguna Lake*

Laguna Lake is located at Laguna Park within the City of Fullerton, and is the only public lake in the city. Laguna Lake is now open to the public and is being stocked for fishing. The Lake restoration and trail improvements recently have been completed. Trail improvements also were completed, which included new fencing, trees benches, and tables. The Lake is now stocked on a regular basis by CDFG. Cormorants have been spotted near the lake.

Laguna Lake Park opened in 1952 and provides recreational services to the public such as fishing, biking, and hiking. By the mid-1990s, the Lake, originally up to 11 feet deep, had decreased to five feet as the result of sedimentation. The purpose of the Lake restoration was to protect the coastal water quality from the toxic sediment that has accumulated in the lake, which drains to the ocean after storms. This renovation also included vegetation management and the construction of a new aeration system to protect water quality.

*Rattlesnake Reservoir*

Rattlesnake Reservoir is an open reservoir, roughly 3,200 feet long and up to 1,600 feet wide within IRWD's non-potable water system. It is located in the San Diego Creek Watershed in the foothills of the

Santa Ana Mountains, south of Loma Ridge. It was originally constructed for agricultural irrigation and receives winter flows from Rattlesnake Creek. The eastern edge of the reservoir lies within the Nature Reserve of Orange County.

Vegetation immediately adjacent to the reservoir consists of herbaceous riparian vegetation and wetland species adapted to the fluctuating shoreline such as California rush (*Scirpus californicus*), southern cattail (*Typha* domingensis), rabbitfoot grass (*Polypogon monspeliensis*), great-water speedwell (*Veronica anagallis-aquatica*), hairy willow-herb (*Epilobium ciliatum*), bristly ox-tongue (*Picris echioides*), willow smartweed (*Polygonum lapathifolium*), cocklebur (*Xanthium strumarium*), nutsedges (*Cyperus* sp.), spikerush (*Eleocharis* sp.), and duckweed (*Lemna* sp.).

Beyond this initial zone lies an extensive area of willow riparian scrub, particularly along the northern and eastern ends of the reservoir. The willow riparian scrub is dominated by arroyo willow (*Salix lasiolepis*) and black willow (*Salix gooddingii*) with lesser amounts of mulefat (*Baccharis salicifolius*). Understory species included those also found in the herbaceous riparian habitats.

Hillsides in the vicinity of the reservoir support either coastal sage scrub or avocado orchards. The coastal sage scrub is dominated by California sagebrush (*Artemisia californica*), bush buckwheat (*Eriogonum fasciculatum*), black sage (*Salvia mellifera*), white sage (*Salvia apiana*), coast prickly pear cactus (*Opuntia littoralis*), and coastal cholla (*Opuntia prolifera*).

*Sand Canyon Reservoir*

Sand Canyon Reservoir, an open reservoir in the San Joaquin Hills of the San Diego Creek Watershed, is used to store recycled water for IRWD's service area. It is approximately 1.1 miles long and up to 600 feet wide.

Vegetation immediately adjacent the reservoir consists of herbaceous riparian vegetation and wetland species adapted to the fluctuating shoreline such as California rush (*Scirpus californicus*), southern cattail (*Typha* domingensis), rabbitfoot grass (*Polypogon monspeliensis*), great-water speedwell (*Veronica anagallis-aquatica*), hairy willow-herb (*Epilobium ciliatum*), bristly ox-tongue (*Picris echioides*), willow smartweed (*Polygonum lapathifolium*), cocklebur (*Xanthium strumarium*), nutsedges (*Cyperus* sp.), spikerush (*Eleocharis* sp.), and duckweed (*Lemna* sp.).

Willow riparian scrub can be found along the corridors, particularly along the upstream end of the reservoir and downstream of the spillway. The willow riparian scrub is dominated by arroyo willow (*Salix lasiolepis*) and black willow (*Salix gooddingii*) with lesser amounts of mulefat (*Baccharis salicifolius*). Understory species included those also found in the herbaceous riparian habitats.

# Riparian

## Current Conditions

### *Santa Ana River, Reaches Five and Six*

The upper most reach of the SAR, Reach Six, extends 18 miles from the headwaters of the river below Big Bear Lake Dam to the Seven Oaks Dam (EPA, 2004). The water quality in this reach tends to be of higher quality than other river reaches, as it receives a substantial amount of water from mountain snowmelt and runoff from the least developed region in the Watershed. Impaired water bodies do contribute to this reach including Big Bear Lake and Knickerbocker, Summit, and Rathbun Creeks. However, according to the 2004 National Assessment Database, categories such as wildlife habitat and

drinking water supply potential remain listed as non-threatened (EPA, 2004). Predominant species in Reach Six include both the lodgepole pine (*Pinus contorta*) and yellowpine (*Pinus echinata*); the yellow pine forest contains Jeffrey pine (*Pinus jeffreyi*), Ponderosa pine (*Pinus ponderosa*), black oak (*Quercus kelloggii*), and a variety of willows (*Salix spp.*).

Reach Five of the SAR extends 51.6 miles from the Seven Oaks Dam to the San Jacinto Fault line, which is marked by the Bunker Hill Dam. The water quality of Reach Five is currently lower than that of Reach Six. According to EPA, water recreation, wildlife habitat, and overall use of the water body are considered "threatened" in the reach (EPA, 2004). One of the reasons for lower water quality likely is that several tributaries to Reach Five are considered impaired including Mountain Home Creek, Mill Creek, and Lytle Creek. In addition to impaired streams, land surrounding this reach also has experienced two rounds of recent major wildfires, one occurring in 2003 and the other in 2007.

The prevalent habitat along this reach is fire and flood adapted. However, this pattern has been disrupted by urban development in the valley region. Pollution caused by runoff after fires can have devastating effects on populations of threatened and endangered species and sources of drinking water located downstream in the Watershed. The Santa Ana speckled dace, the California Mountain yellow-legged frog, and the Santa Ana sucker all likely have been impacted by fire in the San Bernardino Mountains. In addition to fire damage, Reach Five also has experienced runoff pollution as a result of human activities including direct dumping of trash in these rural areas. The hydrology has been altered and increased runoff also has occurred due to the increase in the percentage of pervious surfaces in this urban/suburban area.

This reach tends to be dry most of the year, only flowing during stormflows. The channel is largely operated as a flood control facility. The extreme lower end of this reach is wetted by rising groundwater and intermittently, San Timoteo Creek flows (City of Colton). The vegetation of Reaches Five and Six include coastal sage scrub, chamise chaparral (dominated by *Adenostoma fasciculatum*), mixed and semi-desert chaparral, conifer woodland forest, pinyon-juniper forest, and a very small percent of riparian habitat. According to the California Rare Plant Society, there are over 20 species of rare plants in this area including Mount Gleason paintbrush (*Castilleja gleasonii*) and lemon lily (*Lilium parryi*).

### *Santa Ana River, Reach Four*

Reach Four of the SAR begins at the Bunker Hill Dam, extending to Mission Boulevard Bridge in Riverside. The Bridge marks the upstream limit of rising water induced by the flow constriction in the Riverside Narrows. Until about 1985, the reach was mostly dry. Flows are now perennial because of discharges from local POTWs. Much of this reach also is operated as a flood control facility. Reach Four is home to several threatened and endangered species including the southwestern willow flycatcher (*Empidonax traillii extimus*) and the Santa Ana Sucker (*Catostomus santaanae)*. Reach Four currently also has been designated by USFWS as critical habitat for the southwestern willow flycatcher (Anderson, 2006). Finally, the Santa Ana woolly-star (*Eriastrum hooveri*) also is found in this reach, and it is dependent upon adequate scour by stormflow.
The vegetation of Reach Four is a mix of species including alluvial sage scrub. This includes the presence of juniper (*Juniperus communis*), cottonwood (*Populous fremontii*), buckwheat (*Eriogonum annuum*), yucca (*Yucca schidigera*), mulefat (*Baccharis salicifolia)*, and California wild rose (*Rosa californica*).

### *Reach Three and Chino Basin Surface Water Bodies*

Reach Three of the SAR begins at the Mission Boulevard Bridge in Riverside and extends to Prado Dam in Corona. In the Riverside Narrows, rising water increase flows in the SAR. Several small tributaries (Sunnyslope Channel, Tequesquite Arroyo, and Anza Park Drain) can provide important places of refuge for native fish. Other important tributaries of Reach Three include Temescal, Chino, Mill, and Cucamonga Creeks. The water contained within and contributing to this portion of the SAR including Chino Basin, Chino Creek, Mill Creek, and the rest of Reach Three is classified as impaired. This impairment may be the result of the land use surrounding this portion of the river. At one time, land surrounding this Reach contained the highest concentration of dairy animals in the world (SWRCB Fact Sheet). There still are significant numbers of dairy animals in this area, but a number of programs and projects have been implemented to reduce agricultural runoff from reaching surface waters.

Reach Three is home to a variety of vegetation communities, including riparian woodlands, grasslands, coastal sage scrub, and southern oak woodlands; of these, the two latter communities are considered "sensitive" habitat. Reach Three also houses several sensitive species of fauna including the Arroyo chub, currently listed as a "species of concern" in the State of California. The Reach Three region also contains a unique geologic formation known as the Delhi Sands. The Delhi Sands is the largest remaining sand dune system within the Los Angeles Region. This formation hosts several rare flowers, pocket mice, butterflies, and an isolated population of the federally-endangered Delhi Sands flower-loving fly (*Raphiomidas terminatus abdominalis*).

### *San Jacinto River*

Surface water in this reach is supplied from groundwater, imported water, surface water, and recycled water sources. Major issues along the SJR include groundwater salinity and reliance on imported water supplies, especially because groundwater supply is threatened by high TDS and nitrate concentrations. The largest problem identified in groundwater pollution of the SJR Watershed is the effect of dairies in the region (SAIWP, 2005). Failed, leaking, or abandoned septic tanks also have been identified as a source of pathogen pollution.

Like the Chino Basin and Reach Three, water bodies are impacted by animal feeding operations in the area. The land use in the immediate area of the San Jacinto Basin contains 50,000 dairy animals generating manure, waste water, and stormwater runoff.

Significant portions of the San Jacinto Basin are devoted to agricultural cropland and grassland, consisting of predominantly winter annual grasses, forbes, and subshrubs. Foothill vegetation consists mostly of evergreen species well adapted to withstand drought. Chaparral vegetation is dominated by chamise (*Adenostoma fasciculatum*) and scrub oak (*Quercus dumosa*). Coastal sage scrub type vegetation dominates the Santa Ana Mountain Range. Canyons and riparian sites produce oak (*Quercus spp.*), and cottonwood (*Populous fremontii*) trees. Above 5,000 foot elevation, the mountains are dominated by stands of Jeffery (*Pinus jeffreyi*) and Ponderosa pine (*Pinus ponderosa*) trees.

### *Santa Ana River, Reaches 2 & 1, and Santiago Creek Watershed*

Reach Two carries all the upstream flows from Prado Dam through the Santa Ana Canyon to Orange County, where as much of the water as possible is recharged into the Orange County Groundwater Basin. The downstream end of the forebay/recharge area and, therefore, the ordinary limit of non-storm surface flows, occurs at 17th Street in Santa Ana. Reach One is primarily a dry flood control facility. This reach extends from 17th Street to the tidal prism at the ocean.
The adjoining Santiago Creek Watershed encompasses 100.6 square miles. There are many challenges to maintenance of water quality in the riparian environment of this Watershed including urbanization, human activities, and more recently, the Santiago Canyon wildfires of 2007. The vegetation of Santiago Creek includes communities such as riparian and coastal sage scrub populated with chamise (*Adenostoma fasciculatum*), lemonade berry (*Rhys integrifolia*), Monkeyflower (*Mimulus flemingii*), and Matilija Poppy (*Romneya coulterii)*.

### *Coyote/Carbon Canyon Creek Watershed*

The Coyote/Carbon Creek Watershed is located primarily in Orange County and Los Angeles County, with a small portion in San Bernardino County. The watershed drains approximately 165 square miles of densely urbanized residential, commercial, and industrial development, and includes some areas of open space and natural lands. Near the northern border of the City of Anaheim, the Carbon Canyon Channel branches off Carbon Creek and drains to the SAR on the south (County of Orange, 1989). The flows above Carbon Canyon Dam and releases from Carbon Canyon Dam drain to Carbon Canyon Channel and the SAR.

The habitat within this heavily urbanized and developed area is limited to landscaped parks and golf courses, residential neighborhoods, transportation corridors, and flood control channels. Drainage channels generally consist of concrete-lined or otherwise concrete-armored conveyance facilities with limited aquatic or riparian (streamside) habitat. Within the Watershed; however, some areas of open space and natural lands persist. These areas include some relatively natural stream channels with intact riparian vegetation and diverse aquatic habitat, and open hillsides with remnant native plant communities. The Watershed area includes coastal sage scrub, coast live oak woodland, native grasslands, coastal dunes and salt marsh, California walnut woodlands, and riparian woodlands. The most extensive of these remnant habitats are present in Tonner Canyon, Brea Canyon, Carbon Canyon, and open areas extending west to the Whittier Hills.

### *San Diego Creek and Newport Bay*

San Diego Creek and the Upper Newport Bay Ecological Reserve are two major waters listed as impaired due to water quality impacts from nutrients. Nutrient loads from the agricultural, residential, and commercial land uses, as well as from point source discharges flow from upper San Diego Creek into the lower Creek and upper Newport Bay. The nutrient-laden loads cause algal blooms and eutrophic conditions in poorly flushed areas of the watershed.

The San Diego Creek Watershed is 122 square miles with over 380 linear miles of ephemeral, intermittent, and perennial streambed. Riparian habitat can be found along portions of the major stream systems including San Diego Creek, Serrano Creek, Borrego Canyon Wash, Peters Canyon Wash, and Hicks Canyon Wash.

Over the past 50 years the watershed has transitioned from an agricultural area to a developed urban area. Once-stable channels have significantly eroded. More severe winter storm seasons, such as the El Niño winter of 1997-98, have impacted channel stability. In that year alone, several hundred thousand cubic yards of material deposited in the bay, and watershed channel basins were filled to capacity. Channel erosion, including incising and loss of bank slopes, were clearly evident along Serrano Creek and other tributaries to the bay (SD/NBWSP, 1999).

Newport Bay is mainly fed by San Diego Creek and Bonita Creek. San Diego Creek alone accounts for about 80% of the Newport Bay Watershed area and is responsible for over 90% of the sediment delivered to the Bay. Newport Bay is home to several distinctive vegetation communities including low marsh, middle marsh, high marsh, upland, riparian, and freshwater marshes; and salt panne habitats populated by species including cordgrass (*Spartina foliosa*), pickleweed (*Salicornia virginica*), marsh jaumea (*Jaumea carnosa*), and turtleweed (*Batis maritime).*

## Current Management Strategies

| | Santa Ana River Watershed-wide plans | Upper Santa Ana River Watershed (Big Bear Lake headwaters to Prado Dam) | Lower Santa Ana River Watershed (Prado Dam to Ocean) | Chino Basin and surface water bodies | San Jacinto River Watershed | Coyote/ Carbon Canyon Creek | Santiago Creek and Newport Bay |
|---|---|---|---|---|---|---|---|
| **Watershed/ Area Management Plans** | Santa Ana River Basin Water Quality Control Plan; Watershed Management Initiative | The Upper Santa Ana Wash Plan; The Upper Santa Ana Integrated Regional Water Management Plan | | OBMP; Chino Basin Maximum Benefit Plan; | San Jacinto Mountain Communities Coordinated Resource Management Plan; SJR Watershed management plan | Coyote Creek Watershed Management Plan | Santiago Creek Watershed Special Area Management Plan; Newport Bay/San Diego Creek Watershed Management Plan |
| **Federal/State/ County Efforts** | Riverside County MSHCP(RCIP); Santa Ana River Basin Plan (SWRCB) | | | | San Jacinto Groundwater Management Plan | | |
| **Specific Water Use Strategies** | | | | Recycled Water Program (IEUA); Regional Urban Water Management Plan (IEUA); Chino Basin Desalter Authority | | | |
| **Special District/Non-Profit Efforts** | IE Sustainable Watershed Program (California Resource Connections) | Inland Empire RCD arundo removal; SAWA arundo removal/least Bell's vireo monitoring | Riverside-Corona RCD arundo removal/Land use learning center; SAWA arundo removal/least Bell's vireo monitoring | | SJBRCD arundo removal | | The Santiago Creek Watershed Preservation and Restoration Project; Upper Newport Bay Project |

# Coastal Marshes, Estuaries and Open Ocean

The SAR Region, with 18 miles of coastline, includes significant coastal habitat areas within bays, estuaries, and the open ocean. This includes a national wildlife refuge, two state ecological reserves, and two areas of special biological significance (ASBS). These habitat areas have regional, statewide and national significance as they provide habitat for threatened and endangered species, as well as critical habitat for migratory species along the Pacific Flyway. They also support commercial and recreational fisheries that provide a high-quality food source, enhanced recreational opportunities, and economic value to coastal communities.

The State has afforded special protection to marine and estuarine areas through the Marine Managed Areas Improvement Act, the Marine Life Protection Act, and the California Ocean Plan, among others. The five classifications of Marine Managed Areas are defined in the Public Resources Code (Section 36700); Marine Protected Areas are a subset of Marine Managed Areas and have specific regulations that limit the take of living resources. Within this region, there are five geographic areas designated as Marine Managed Areas with further protection as Marine Protected Areas:

- Bolsa Chica State Ecological Reserve
- Upper Newport Bay State Ecological Reserve
- Robert E. Badham ASBS
- Crystal Cove State Marine Conservation Area
- Irvine Coast ASBS

In addition, the coastal area includes the 920-acre Seal Beach National Wildlife Refuge and the 25-acre Talbert Marsh near the mouth of the SAR.

Marine habitat is affected by natural and human-caused factors including shifts in oceanographic conditions and human activities. Climate patterns, such as short-term conditions associated with El Niño, La Niña, and long-term climate changes impact habitat and the presence of species.

Growth and development within the Watersheds also has influenced coastal ecosystems, primarily due to water quality and recreational uses. Most of these coastal habitat areas are receiving waters for runoff from the developed areas; as a result, they are impacted by pollutants and sediment.

The open ocean section, also known as the pelagic zone, extends 12 nautical miles from the shore. This zone has a rich and varied habitat that supports a diversity of marine life.

## Current Conditions

### *Seal Beach National Wildlife Refuge*

The 965-acre Seal Beach National Wildlife Refuge is located on the Seal Beach Naval Weapons Station in Orange County within the Anaheim Bay-Huntington Harbor Watershed. Formed through a partnership between the USFWS and the Department of the Navy, this refuge was established to protect the endangered California least tern, light-footed clapper rail, and to provide quality habitat for California brown pelican, Peregrine falcon, and Belding's savannah sparrow. The purpose of Seal Beach National Wildlife Refuge is to provide for the conservation, protection, and propagation of native species of fish and wildlife including migratory birds that are threatened with extinction.

About 740 acres of the Refuge are subject to regular, unobstructed tidal influence supporting 565 acres of salt marsh vegetation, 60 acres of intertidal mudflats, and 115 acres of tidal channels and open water. Another 160 acres of the Refuge have been restored, providing a combination of coastal salt marsh, mudflat, open water, and upland habitats.

The restored coastal wetland areas, which experience some degree of tidal muting, support a diverse array of marine and avian species. The remaining portions of the Refuge (about 65 acres) consist of uplands, developed areas, and roads. A few of the Refuge's upland areas are considered potential sites for salt marsh restoration, while other areas may provide opportunities for restoring native wetland/upland transition areas that would benefit a variety of bird and sensitive plant species.

The extensive sub-tidal habitat on the Refuge supports a diverse array of fish, benthic invertebrates, and other marine organisms. These species provide important food sources for migratory birds and marine organisms including species important to commercial and recreational fishing interests.

The Refuge supports three federally listed species including the endangered California brown pelican, light-footed clapper rail, and California least tern. Clapper rails and least terns, as well as the state listed endangered Belding's savannah sparrow, nest and raise their young within the boundaries of the Refuge.

### *Bolsa Bay*

The Bolsa Bay encompasses approximately 1,600 acres including the Bolsa Chica lowlands with a 1,350 acre State Ecological Reserve. The Ecological Reserve extends along the east side of Pacific Coast Highway in the City of Huntington Beach from Warner Avenue to Seapoint Avenue. This area is designated as a State Marine Park, and therefore, is a Marine Protected Area.

The Bolsa Chica lowlands receive tidal influence from the Pacific Ocean through a direct connection to the Pacific Ocean that was re-established in 2006. There were two existing nesting areas within the State Ecological Reserve; as part of the restoration, three additional nesting areas were created on 20 acres within the site to establish additional habitat for threatened and endangered species. The special status species that are present include the Federal and State listed endangered California least tern (*Sterna antillarum browni*) and light-footed clapper rail (*Rallus longirostris levipes*), federal threatened western snowy plover (*Charadrius alexandrinus nivosus*), and the state endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*). Cordgrass habitat is being established to support the clapper rail population.

### *Huntington Beach Wetlands*

The Huntington Beach Wetlands are located in the city of Huntington Beach between the SAR and Beach Boulevard along the eastern side of Pacific Coast Highway. The wetland area is divided into six parcels by Southern California Edison power plant, mobile home sites, roadways, and flood control levees. This includes the 25-acre Talbert Marsh located adjacent to the SAR. The Talbert flood control channel was reconfigured to flow through this restored marsh. It is the only area within the Huntington Beach wetlands that has been restored. The remaining five parcels of degraded marsh and uplands are designated as coastal conservation, coastal zone, and floodplain. The Huntington Beach flood control channel is leveed adjacent to these five sites. At this point, only the Talbert Marsh has

been restored to full tidal action. The wetlands characteristics of the remaining unrestored marsh areas are maintained through fluctuations in the local water table, direct precipitation, and limited urban runoff.

Tidal action was restored to Talbert Marsh in 1989. This restoration project included relocation of the Talbert Channel ocean outlets, development of intertidal mud-flats, and refuge islands. Numerous other studies have been completed on part or all of the various six sites to determine the potential for restoration, with limited results.

Within Talbert Marsh, habitat is primarily salt marsh with brackish/freshwater conditions, mudflats, and some open water areas. Cordgrass is present. Beneficial uses include REC1, REC2, BIOl, Wild, Rare, MAR, and EST.

### *Newport Bay*

Newport Bay is comprised of lower and upper Newport Bay. Lower Newport Bay is surrounded by development, and is used primarily for recreational boating. Upper Newport Bay begins at the Pacific Coast Highway Bridge and extends inland to the mouth of the San Diego Creek. The upper Bay is surrounded by high bluffs and contains a State Ecological Reserve, as well as a nature reserve. The upper Bay is primarily a salt marsh with freshwater inflows from San Diego Creek, the Santa Ana-Delhi Channel, local springs, and local area drainage. The salt marsh habitat is directly influenced by the tides. The low marsh areas are dominated by cordgrass. The middle marsh ecological community is dominated by common pickleweed, while the high marsh areas support diverse plant communities. Other habitats include open water, transitional/coastal dune, riparian/freshwater marsh, and upland vegetation.

Upper Newport Bay supports diverse habitat. Open water is used by a variety of fish, and others use the mudflats during high tide. Fish-eating birds, including the State and Federally endangered brown pelican and California least tern, forage in the bay. Intertidal areas of mudflats and low marsh serve as nursery areas for fish and forage for shorebirds including the federally threatened western snowy plover. The salt marsh provides nesting habitat for birds such as the state endangered Belding's savannah sparrow and state and federally endangered light-footed clapper rail. The upper Bay provides critical habitat for migratory species of the Pacific Flyway, and is home to the largest single population of light-footed clapper rails. Salt marsh bird's beak, a Federally endangered plant, thrives in the upper Bay's marsh areas (Corps, Upper Newport Bay Ecosystem Restoration Feasibility Study Draft EIR/EIS, May 2000).

### *Current Management Strategies*

Current management strategies for the coastal habitat areas include planning and project implementation using the applicable regulatory context as a guide. As described above, there are numerous planning efforts underway to address resource management and protection.

- The USFWS is currently developing a Comprehensive Conservation Plan for the Seal Beach National Wildlife Refuge. A Comprehensive Conservation Plan provides a clear vision of the desired future conditions for the Refuge, and is used to ensure consistent management of the Refuge over a 15-year period. The Seal Beach National Wildlife Refuge Comprehensive Conservation Plan is expected to be complete in 2009

- In conjunction with the Bolsa Chica Lowland Restoration Project completed in 2006, the USFWS is conducting beach monitoring to ensure that the beach area ultimately reaches stabilization following the creation of the inlet. In addition, a long-term ecological monitoring program is being conducted to document the habitat improvements for fish and wildlife, the success of re-vegetation efforts, and the use of the site by endangered species. The ecological monitoring objectives are:
  - Facilitate evaluation of the effectiveness of the restoration to provide habitat for fish and wildlife
  - Document changes in the ecology of the wetlands environment over time
  - Provide timely identification of any problems with the physical, or biological development of the restored area
  - Assist in providing a technical basis for resource management of the restored wetland by documenting maintenance needs and enhancement opportunities
- The Talbert Marsh is managed by the Huntington Beach Wetlands Conservancy, a non-profit organization that works with local, State and Federal agencies to acquire, restore, and manage coastal wetlands in Orange County. Talbert Marsh is one of the most successful saltwater marsh restoration projects in the state

# Constructed Wetlands

## Current Conditions

Constructed wetlands have a wide range of benefits. They protect surface waters. Constructed wetlands designed to treat secondary effluent will directly affect the reclaimed water supply. If water produced from the wetlands is of suitable quality to be recharged into groundwater aquifers, diminishing groundwater resources can be supplemented, or in some areas, reclaimed water can be recharged as part of a groundwater remediation program. Located along the Pacific Flyway, the critical migratory corridor connecting Alaska and Canada to Latin America, southern California wetlands provide vital habitat for migratory waterfowl. Opportunities for wildlife enhancement were considered in the construction/preservation of many of the following wetlands with environmental features that increase habitat diversity and wildlife productivity.

### *Prado Wetlands*

Within the 2,150 acres of land owned by the OCWD in Prado Basin, 465 acres have been modified into treatment wetlands that include a network of 50 shallow ponds. In the 1970s, irrigated agriculture fields were turned into ponds for duck hunting and later re-constructed as permanent ponds to maximize nitrate removal. The wetland system contributes significant habitat diversity to the Prado Basin, as well. They are a mix of open water, fresh water marsh, and woodland habitats that harbor significant populations of birds, particularly waterfowl.

### *San Jacinto Wetlands*

The Hemet/San Jacinto Multi-purpose Constructed Wetlands was designed to focus on reclaimed water treatment, migratory, and resident waterfowl and shorebird habitat enhancement, wildlife diversity, and public education, as well as recreation opportunities. A cooperative effort by USBOR, the

National Biologic Service, and EMWD, the one million gallon per day system occupies about 26 acres of the 50-acre site. The design is a three phase (marsh/pond/marsh) integrated system consisting of five separate wetlands treatment units, a combined open water and marsh habitat area, and a final polishing wetlands. Secondary reclaimed water from the Hemet/San Jacinto Waste Water Plant is distributed to the five wetland treatment units, and is recombined in the central area to flow through the open pond prior to flowing through the final wetland, which combines all flows to remove biological input produced in the open water area. From the air, the system is "amoeba-shaped", and on the ground, the curved lines give the appearance of a natural system.

### *Stanfield Marsh*

BBMWD designated the 145-acre Stanfield Marsh as a wildlife preserve in 1982. The Marsh is located at the east end of Big Bear Lake, and is separated from the main body of the Lake by the Stanfield Cutoff highway bridge. The water flows back and forth between the two bodies of water through a permeable structure under the bridge and three culvert pipes.

In 1993, a joint project with the Natural Heritage Foundation, Inc. was approved in which very specific objectives were established for improvements. The adopted wetlands enhancement project has the goal of restoring some wetlands' function and values while enhancing existing functions and uses.

Because the Marsh is subject to extreme variations in water levels and during dry cycles is devoid of water, dredging to create permanently wet basins is needed to protect the wildlife in the area during those dry cycles.

### *Gunnerson Pond*

Gunnerson Pond is a 60-acre site located on the west edge of the Temescal Creek Floodplain one mile below Lake Elsinore, adjacent to Highway 74. The site was a Corps 1135 restoration project that restored pond and freshwater marsh habitat to an area of the floodplain that once held a private residence whose property was regularly flooded during high water events. The project was authorized under Assembly Bill 1389 in 1999 for enhanced flood control and wildlife benefits. Riverside County asserted that the Gunnerson Pond project was necessary to restore 60 acres of degraded riparian and wetland area to be used for habitat for migratory waterfowl including the endangered least Bell's vireo. The pond also serves as an overflow basin to prevent floods.

### *San Joaquin Freshwater Marsh Reserve*

The San Joaquin Freshwater Marsh Reserve represents one of the last remnants of freshwater wetlands that once covered much of Orange County's flood plain and is located adjacent to the University of California, Irvine campus. Located in an ancient river-cut channel at the head of Newport Bay, the Reserve supports a variety of wetland habitats including freshwater marshlands, shallow ponds, and channels confined by earthen dikes. Dry upland habitats with a remnant coastal sage scrub community are found on the margins of the reserve. The marsh is a critical stopping place for 100 migratory bird species using the Pacific Flyway. Altogether, more than 200 bird species (20 nesting) have been sighted in the reserve including two resident endangered bird species, the light-footed clapper rail and the California least tern. The marsh is located within a ten-minute walk from UC Irvine, making it convenient for day use by faculty and numerous students.

### *San Diego Creek Natural Treatment System*

The County of Orange, cities, and IRWD are taking IRWD's successful wetlands restoration program at the San Joaquin Marsh and extending it throughout the watershed. The natural treatment system is a cost-effective, environmentally sound alternative for handling dry weather runoff. In very simple terms, it will work much like the San Joaquin Marsh with smaller, man-made wetlands placed strategically in many areas throughout the watershed. Low-flow, natural, and urban runoff, as well as smaller stormflows will be diverted into man-made wetlands throughout the San Diego Creek Watershed where contaminants will be removed and prevented from reaching the upper Newport Bay. At the same time, the system will provide a natural resource, riparian habitat, wildlife, and water quality benefits throughout the Watershed.

### *Lake Elsinore Back Basin*

Lake Elsinore sits at the bottom of a 720 square mile watershed, the area that drains into the Lake. The Watershed begins up in San Jacinto Mountains, in the Idyllwild area near Lake Hemet. Runoff, from as far away as Moreno Valley, San Jacinto, Hemet, Perris and Canyon Lake, contribute to flows that occasionally reach Lake Elsinore in very wet years. Normal rainfall in the watershed is about 11 inches per year and does not result in Canyon Lake Dam spilling. Only about one in six years does Canyon Lake Dam spill to Lake Elsinore, which often correlates to El Niño conditions; only one in 15 years results in receiving enough water to offset evaporation (15,000 AF). The Lake Elsinore Back Basin Wetland area comprises approximately 360 acres and includes the old SJR channel. There is a 48-inch conduit for fish passage, and the basin is closed at 1,243-feet elevation to retain flood storage and maintain habitat. The Old San Jacinto Riverbed was to be restored to native riparian habitat with the Cereal Street wells plumbed to the head of the old channel and a 24-inch conduit connecting the inlet channel to the historic SJR channel as an option to maintain the riparian habitat.

### *Shay Meadows*

Shay Meadows is a 30-acre wetland on the edge of Baldwin Lake. The creation of the Big Bear Lake reservoir in 1911 resulted in the inundation of nearly 3,000 acres of meadows and wetlands, nearly half of the total regional acreage. Subsequent urbanization around Big Bear Lake's and Baldwin Lake's shores has reduced much of the remaining meadow habitat.

The drying clay soils create a saline situation, as indicated by associated halophytic species such as salt grass (*Distichlis spicata*) and *Atriplex* species. Other associated endemic species include *Castilleja cinera, Ivesia argyrocoma, Orthocarpus lasiorhynchus, Perideridia parishii, Poa atropurpurea, Haplopappas uniflora* subsp. *gossypina, Senecio bernardinus*, and *Taraxacum californicum*.

Surrounding dominant forest types include pinyon pine (*Pinus monophylla*) and western juniper (*Juniperus occidentalis*), Jeffrey pine (*Pinus jeffreyi*), and lodgepole pine (*P. contorta* var. *murrayana*) at Bluff Lake.

### *Vernal Pools*

Vernal Pools or hog-wallows are generally small, rain-filled depressions that retain very local drainage for a prolonged period of time due to underlying hardpan, particularly heavy clay soils. The annual size and longevity of a pool varies with annual rainfall amounts and climatic conditions responsible for

evaporative rates. These seasonal wetlands fill up with rainwater and are generally dry before summer. Many vernal pool associated species are endangered.

There are vernally moist soils along SJR and Mystic Lake that support an endangered alkaline endemic plant, San Jacinto Valley Crown-scale (*Atriplex coronata* var. *notatior*). This species also is found in the upper Salt Creek vernal pool complex encompassing approximately 1,200 acres above Railroad Canyon Reservoir in the west Hemet area. A 40-acre upper Salt Creek Wetland Preserve was purchased and preserved on the west side of this complex. The preserve was established to protect native species in perpetuity to offset impacts associated with the Eastside Pipeline Project.

Alkali vernal wetlands are found mainly along the SJR between Mystic Lake and the City of Perris and in the upper Salt Creek drainage. The community is unique consisting of alkali scrub, playa, annual grasslands, and vernal pools. Over 200 vernal pools have been identified in the vicinity of Hemet alone. Here are the largest remaining populations of extremely rare plants such as the little mouse-tail, Coulter's seaside daisy, Parish's saltbush, and the threatened spreading navarretia. Once occupying approximately 32,000 acres in this area, alkali vernal wetlands occur today on no more than 7,000 acres.

One small remnant pool on the Pechanga Indian Reservation is home to endangered Riverside fairy-shrimp.

The region's largest concentration of vernal pool habitat, located at Skunk Hollow and on the Santa Rosa Plateau, are just south of the Watershed located in the drainage of the Santa Margarita River. Skunk Hollow is part of a preserve and wetland mitigation bank located in the unincorporated area of French Valley, Riverside County and consists of 138 acres of annual grassland, coastal sage scrub and vernal pool. The pool reaches a maximum size of 32 acres and is home to four listed species: the Riverside fairy shrimp (*Streptocephalus wootoni*), vernal pool fairy shrimp (*Branchinecta lynchi*), California orcutt-grass (*Orcuttia californica*), and San Diego ambrosia (*Ambrosia pumila*). The preserve also acts as a dispersal corridor for the California gnatcatcher (*Polioptila californica*) and *Quino checkerspot* butterfly (*Euphydryas editha quino*).

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Section 1451 http://www4.law.cornell.edu/uscode/16/1451.html

# Appendix A

Sources for Further Information

**U.S. Army Corps of Engineers**
Los Angeles District
911 Wilshire Boulevard
Los Angeles, CA 90053-2325
(213) 452-3406 or
(213) 452-3921
http://www.usace.army.mil/

Rivers and Harbor Act information can be found at:
http://ceres.ca.gov/wetlands/permitting/RHA_summary.html
http://www4.law.cornell.edu/uscode/33/401.html

Coastal Zone Management Act (CZMA)
http://ceres.ca.gov/wetlands/permitting/CZMA_summary.html
http://www4.law.cornell.edu/uscode/16/1451.html

**Environmental Protection Agency**
Region 9 (AZ, CA, HI, NV)
75 Hawthorne Street
San Francisco, CA 94105
(415) 947-8000 or
(866) EPA-WEST
http://www.epa.gov/

Clean Water Act websites include:
http://ceres.ca.gov/wetlands/permitting/sec404_descrip.html
http://www4.law.cornell.edu/uscode/33/1344.html

Environmental Quality
http://ceres.ca.gov/topic/env_law/ceqa/flowchart/index.html

**U.S. Department of Fish and Wildlife**
Carlsbad Office
6010 Hidden Valley Road
Carlsbad, CA 92009
(760)-431-9440
http://www.fws.gov/

**National Marine Fisheries Service**
Southwest Regional Office
501 West Ocean Boulevard
Long Beach, CA 90802
(562) 980-4000
http://www.nmfs.noaa.gov/

California Fish and Game
South Coast Regional Office
4949 Viewridge Avenue
San Diego, CA 92123
(858) 467-4201
http://www.dfg.ca.gov/

California Fish and Game Code 1600-1607
http://ceres.ca.gov/wetlands/permitting/DFG_summary.html
http://www.dfg.ca.gov/1600/1600code.html

California Coastal Commission
South Coast District Office
200 Oceangate, 10th Floor
Long Beach, CA 90802-4416
(562) 590-5071
http://www.coastal.ca.gov/

California Coastal Act (CCA)
http://ceres.ca.gov/wetlands/permitting/cca_summary.html
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California Coastal Conservancy
11th Floor, 1330 Broadway
Oakland, CA 94612
(510) 286-1015
http://www.coastalconservancy.ca.gov/

Mosquito and Vector Control
Association of California
660 J Street, Suite 480
Sacramento, CA 95814
(916) 440-0826
http://www.mvcac.org/

Santa Ana Regional Water Quality Control Board
3737 Main St., Suite 500
Riverside, CA 92501
(909) 782-4130
http://www.swrcb.ca.gov/

Porter-Cologne Water Quality Control Act
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# Appendix B

Contributors

The following stakeholders provided data and information, wrote, reviewed and commented upon the text, and/or provided ideas and concepts for the development of the One Water One Watershed Water Environmental and Habitat Enhancement Pillar.

| | | |
|---|---|---|
| Autumn | Dewoody | Inland Empire Waterkeeper |
| Beatrice | Musacchia | OC Watersheds |
| Dick | Zembal | Orange County Water District |
| Jean | Watt | Friends of Harbors, Beaches and Parks (Orange County) |
| Jeff | Beehler | Santa Ana Watershed Project Authority |
| Jennifer | Ares | East Valley Resource Conservation District |
| Mandy | Parkes | Santa Ana Watershed Association |
| Natalie | Likens | Irvine Ranch Water District |
| Norris | Brandt | Elsinore Valley Municipal Water District |
| Pat | Boldt | San Jacinto River Watershed Council |
| Peter | Kiriakos | Sierra Club |
| Rene | Latu | Santa Ana Watershed Association |
| Ron | Baxter | Riverside County Parks and Recreation Department |