SAN DIEGO RIVER WATERSHED MANAGEMENT PLAN

DRAFT WATERSHED MANAGEMENT PLAN
TASK 12.1

Prepared for

San Diego River Watershed Work Group

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AF	Acre-Feet
AFY	Acre-Feet per Year
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
CSD	County of San Diego
COC	Constituent of Concern
CWA	Clean Water Act
DO	Dissolved Oxygen
GP2020	General Plan Update
JURMP	Jurisdictional Urban Runoff Management Program
MSCP	Multiple Species Conservation Plan
MTBE	Methyl Tertiary Butyl Ether
NGO	Non-Governmental Organization
NPS	Nonpoint Source
N:P	Nitrogen to phosphorus
PDMWD	Padre Dam Municipal Water District
SDRFP	San Diego River Park Foundation
SDRW	San Diego River Watershed
SDRWMP	San Diego River Watershed Management Plan
SDRWQCB	Regional Water Quality Control Board, San Diego, Region 9
SDWD	City of San Diego Water Department
SUSMP	Standard Urban Stormwater Mitigation Plan
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
USFS	U.S. Forest Service
USMCAS	U.S. Marine Corps Air Station
WMP	Watershed Management Plan
WURMP	Watershed Urban Runoff Management Program
WWG	Watershed Work Group

1 INTRODUCTION

1.1 Overview

Public involvement in the process to develop a watershed management plan (WMP) for the San Diego River Watershed (SDRW) has been important from the first public meetings in 2002 to the present. The Watershed Work Group (WWG), comprised primarily of representatives from public agencies and non-governmental organizations (NGOs), has been instrumental in guiding and shaping the WMP. The benefits of watershed planning include informed decision-making, coordination of information throughout the watershed, improved water quality, groundwater protection, and habitat and wildlife protection. Benefits to local governments include increased awareness of sensitive lands and areas worthy of preservation, and new cooperative opportunities to comply with state and federal regulations. Benefits to landowners include improved recreational opportunities, long-term protection of natural features, and increased awareness of property resources and stewardship techniques.

Building on the 2002 workshop, the County of San Diego (CSD) and the State Water Resources Control Board (SWRCB) collaborated to fund the creation of a stakeholder driven WMP. A list of the stakeholders with key interests in the watershed is attached as Appendix A to the Watershed Assessment Report (Anchor et al. 2004[1]). Funding for this project has been provided in full or in part through a contract with the SWRCB pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The remainder of the funding for this program has been provided by the CSD, Department of Land Use and Planning.

The strategy to develop this plan was to gather existing data, identify and prioritize the stakeholders' concerns, analyze the existing data, and then address these concerns with specific actions. The Study Team (the team of consultants retained to assist the County in developing the WMP) divided the watershed into individual management areas so stakeholders could identify in the planning process those issues and concerns which affected their specific areas. The culmination of these efforts is this draft WMP, which intends to address the issues of concern in a holistic, watershed-based manner.

1.2 Development of Action Recommendations

The development of a vision, supporting goals, and strategies to achieve these goals begins to build the framework of the San Diego River Watershed Management Plan (SDRWMP) and sets the stage for implementation of the plan. Without coordination, groups may begin activities without an adequate understanding of the benefits or consequences. The vision process brings the diverse interests in the watershed together and promotes exploration and discussion of what people collectively want their watershed to be. The 2004 workshop combined the early concepts of a vision for the SDRW with a compilation of existing data, and solicited input from communities throughout the watershed. The vision articulated by the public and by the WWG is shown below.

> *"Enhance the quality of life in our communities by preserving and re-establishing the natural functions and features of the San Diego River Watershed. These natural watershed characteristics will be sustained by protecting and conserving the water, land, and habitats of the San Diego River Watershed, while preserving its cultural heritage."*

The WWG created a set of principles[1] to further clarify the vision statement. The following principles are intended to help guide the activities, programs, projects, and other endeavors proposed to be taken to attain the vision set forth for the SDRW.

1. Enrich the quality of life for future generations
2. Make decisions that consider the watershed in a holistic manner
3. Base decisions on sound science and the best available information
4. Support the development of new and better information and management practices
5. Advocate watershed stewardship
6. Engage an active citizenry
7. Promote stakeholder understanding of the watershed
8. Encourage citizens, communities, and agencies to communicate, coordinate, cooperate, and collaborate
9. Protect and restore natural watershed functions
10. Manage water supply and water use in a sustainable manner
11. Improve water quality
12. Safeguard cultural and historical resources
13. Utilize the WMP as a living document

[1] The set of principles was developed to replace the more traditional "goals." The WWG felt that the stated objectives did not provide an adequate framework for a holistic approach to reaching the articulated vision.

Based on the results from the public workshops and the WWG meetings, the importance of engaging and maintaining active participation in the WMP process by local and regional land use and planning authorities was rated high by both groups. The following needs and expectations were found to have the highest resonance with the public -- the numbers following the statements indicate the relative scoring given by the workshop participants. A complete list of the needs and expectations is provided in the Stakeholder's Input Report No. 2 (Anchor et al. 2004[2]).

1. Land use and regional planning authorities need to be involved to implement ideas such as: limiting growth in order to protect water and habitat quality; integrating land use planning policy and ordinances to reduce runoff by infiltration and vegetation cover. Using swales and wetlands in new development to increase groundwater infiltration; improving water quality by land use policy to reduce contaminants from various land uses; reducing variances in planning and permits; acquiring land or conservation easements to create buffers in riparian areas; and converting impervious surfaces to grass parking areas (68 points).
2. A coordinated and consistent effort toward the removal or exotics and invasive species is needed (47 points).
3. The sum and goal of all policies should be to allow water to sustain natural communities and prevent health risks to humans from pollutants. (42 points).
4. To preserve water quality, buffer zones should be established along riparian corridors to limit or prohibit industrial uses near water bodies (41 points).
5. Encourage water conservation to increase water availability (38 points).
6. Acquisition of land to create wetlands is the surest way to preserve and protect water quality (36 points).
7. Water quality should be improved by creating extensive wetland areas. Wetlands provide water filtration, nutrient and metals uptake, flood control, groundwater infiltration and recharge, and habitat (35 points).
8. Strategies should be implemented to reduce or eliminate development in the flood plain to provide opportunities to widen channel segments that influence flooding (33 points).
9. The success of riparian habitats is dependent on the stimulation provided by floods (30 points).
10. The local school system is an untapped resource. The WMP should include an outreach program that engages schools and gives students hands-on experience with preserving and protecting wildlife and water quality (30 points).

1.2.1 Watershed Management Planning Tools

Available planning tools that assisted in the development of the SDRWMP fall mainly into four categories and are fully described in the Watershed Assessment Report (Anchor et al. 2004[1]). These planning tools and are briefly described below.

- **Land Use Plans**

  As described in the Watershed Assessment Report (Anchor et al. 2004), land managers in the watershed include city and county governments, state and federal resource agencies, and Indian Tribes. Land use plans can guide development in ways that prevent loss of a resource or reduction of its use.

- **Regulations and Regulatory Reports**

  Reports produced as a result of the regulations imposed by these laws contain valuable data that were used in the development of the SDRWMP:
  - The Clean Water Act (CWA)
  - The Porter-Cologne Act
  - The California Environmental Quality Act (CEQA)
  - Watershed Urban Runoff Management Plans (WURMPs) annual reports
  - Jurisdictional Urban Runoff Management Plans (JURMPs) annual reports
  - National Pollution Discharge Elimination System (NPDES) monitoring reports

- **Watershed-specific Studies**

  The Study Team for the SDRWMP has produced reports and these watershed-specific documents are technical appendices (TAs) to this WMP. These TAs can be found http://www.projectcleanwater.org/html/ws_san_diego_river.html.
  - Stakeholder Input Report #1 (Needs and Expectations)
  - The List of Existing Data and Information Collected
  - The Watershed Characteristics Inventory Report
  - The Water Quality Report
  - Data and Information Management Plan
  - The Watershed Assessment Report
  - Stakeholder Input Report #2 (Strategy through Stakeholder Input)

2 CHARACTERIZATION OF THE WATERSHED

2.1 Brief Description of the Watershed

The SDRW is the second largest watershed (440 square miles) in San Diego County and has the highest population (approximately 509,000). Important water resources in the watershed include five water storage reservoirs, a large groundwater aquifer, extensive riparian habitat, coastal wetlands, and tidepools. Approximately 58 percent of the SDRW is undeveloped, primarily in the upper reaches; the highly urbanized area is found in the lower reaches. The undeveloped lands, including the Cleveland National Forest and Mission Trails Regional Park, host a wide variety of habitats and endangered species like the Arroyo Toad, Least Bell's Vireo, and the Southwestern Pond Turtle (Project Clean Water website, www.projectcleanwater.org/html/ws_san_diego_river.html).

Topographic elevations in the SDRW range from sea level at the mouth of the river to 6,512 feet at the eastern edge of the watershed. The San Diego River originates in the mountains northwest of the historic town of Julian and runs southwestward through an unincorporated, largely uninhabited area of San Diego County before entering El Capitan Reservoir. Downstream of El Capitan Reservoir, the river flows westward through the Cities of Santee and San Diego and past Famosa Slough to the San Diego River Estuary. Famosa Slough and the estuary are extremely productive wetland habitats. The river discharges into the Pacific Ocean just south of the jettied entrance of Mission Bay in the community of Ocean Beach. Primary tributaries to the San Diego River include Boulder Creek, Cedar Creek, Conejos Creek, Chocolate Creek, Los Coches Creek, San Vicente Creek, and Forester Creek, as shown in Appendix A (Figure 1-3).

The size and complexity of the SDRW suggests that the assessment of its resources can be made by dividing the watershed into three major sub-basins, or management areas: The El Capitan Management Area; the San Vicente Management Area; and the San Diego Management Area (Appendix A, Figure 1-2). Since the watershed can be divided into these management areas from geographic and land use perspectives, and because these sub-basins are essentially hydraulically disconnected, there is a great opportunity for watershed assessment, planning, and protection to address issues on either a watershed wide basis or by management area.

Threats to the watershed resources found in the SDRW include: water quality degradation; excessive extraction of groundwater; proliferation of invasive species; runoff containing excessive levels of nutrients and sediments; flooding; aggregate mining operations; and habitat loss and modification. Many human activities generate these threats. Automobile use contributes to polluted runoff from roads and the deposition of metals and airborne pollutants. Environmentally insensitive housing and commercial developments and farming techniques can compromise wetlands and increase sediment transport to the river and its reservoirs. Gravel mining alters the hydrology and contributes to total dissolved solids (TDS) and turbidity issues, especially in the lower watershed. The demand for water supply in the watershed requires large quantities of imported water. Groundwater extraction and damming of the river and its tributaries can have a profound influence on the quantity and quality of surface waters in the watershed. A complete description of the watershed is found in the Watershed Assessment Report (Anchor et al. 2004[1]).

2.2 Surface Water Hydrology

The surface water hydrology of the SDRW is governed by precipitation, stream flow, and flow control structures (e.g., dams) in the watershed. As discussed previously, precipitation is highly seasonal with almost all of the precipitation falling between November and April. Some of the precipitation percolates into the soil becoming groundwater while the rest produces runoff that moves along the surface towards receiving waters (e.g., streams, creeks, and rivers).

Due to the topography of the watershed and the influence of manmade structures, the surface water flow throughout the watershed is separated into three distinct management areas (i.e., hydrologic basins): El Capitan Management Area, San Vicente Management Area, and San Diego Management Area. In the El Capitan Management Area, San Vicente Management Area, and San Diego Management Area surface runoff is collected by the El Capitan Reservoir, San Vicente Reservoir, and Pacific Ocean, respectively. The drainage areas of the three management areas are shown in Table 2-1.

Table 2-1
Management Area Drainage Areas

Management Area	Area (Acres)
San Diego	111,183
San Vicente	47,622
El Capitan	118,735
TOTAL	277,540

The San Diego River system is composed of the San Diego River main stem, numerous tributaries, and five water supply reservoirs (El Capitan, San Vicente, Lake Jennings, Lake Murray, and Cuyamaca Reservoirs). The network of primary streams and reservoirs within the watershed is presented in Table 2-2.

Table 2-2
Stream Network of the SDRW

Management Area	Stream/Waterbody
El Capitan	Cuyamaca Reservoir
	San Diego River
	Boulder Creek
	Cedar Creek
	Ritchie Creek
	Kelly Creek
	Isham Creek
	Sand Creek
	Peutz Creek
San Vicente	San Vicente Reservoir
	San Vicente Creek
	Swartz Canyon Creek
	Klondike Creek
	Santa Ana Creek
	Longs Gulch
	West Branch
	Padre Barona Creek
San Diego	San Diego River Estuary
	Forester Creek
	Lower San Vicente Creek
	Los Coches Creek
	Wildcat Canyon Creek
	Little Sycamore Canyon Creek
	Oak Canyon Creek
	Murphy Canyon Creek

The San Diego River system is regulated by El Capitan, San Vicente, and Cuyamaca Reservoirs, and downstream streamflows are affected by the releases from these reservoirs. Downstrean of the reservoirs, the San Diego River discharges an average of approximately 32,780 acre-feet (AF) of water per year as measured at Fashion Valley in San Diego (USGS 1997).

The monthly flow rates, based on long-term flow measurements at the U.S. Geological Survey (USGS) Fashion Valley station (USGS 2002), are shown below in Table 2-3. The data indicate a strong seasonality in flows in the San Diego River, which is typical of the region. Summer low flows occur in the months of July through September, while winter high flows occur in the months of January through March. The highest flows occur in the month of March, which is characteristic of many regional streams.

Table 2-3
Monthly Mean Flow Rates

FLOW (CFS)[1]	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Mean	98.2	119.0	141.0	47.7	17.4	6.9	3.0	2.4	3.3	6.5	26.4	41.0
Maximum	683.0	668.0	777.0	242.0	135.0	21.3	8.9	9.5	20.0	31.2	144.0	143.0
Minimum	6.5	20.5	8.4	7.7	2.5	1.3	0.3	0.5	0.0	0.6	0.9	5.1

[1] Cubic feet per second.

All surface waters in the El Capitan Management Area flow into the El Capitan Reservoir and then the flows are distributed to urban users through a system of closed pipelines. Likewise, all surface waters in the San Vicente Management Area flow into the San Vicente Reservoir and then the flows are distributed to urban users through a system of closed pipelines. Discharge from these reservoirs to the downstream portion of the watershed occurs only if the reservoirs fill and overflow, which are rare events. The San Diego Management Area only receives water from the El Capitan Management Area and San Vicente Management Area through closed distribution pipelines to urban users, or on the rare occasions when the upper watershed reservoirs spill. The ultimate receiving water for the San Diego Management Area is the Pacific Ocean.

2.3 Surface Water Quality

Generally speaking, the water quality in the upper watershed (San Vicente and El Capitan Management Areas) is of much higher quality than the lower watershed (San Diego Management Area). The upper watershed's water quality is high due to the undeveloped nature of that area. The lower watershed's surface water quality is generally poor due to the more than 50 years of development and hydromodification that have adversely impacted surface water quality (Porter 2003). Programs that directly regulate water quality or assess ambient water quality are fully described in the SDRW Assessment (Anchor et al. 2004).

Section 303(d) of the CWA requires the State of California to identify surface waters that fail to meet designated water quality standards as described in the Basin Plan. The SWRCB updated California's 303(d) listings of non-complying (impaired) water bodies most recently in 2002. Water bodies and pollutants/stressors in the SDRW that are part of the federal section 303(d) impaired water bodies listing are shown in Appendix A, Figure 1-4. The state also publishes a Monitoring List that is not part of the formal federal section 303(d) process. The state Monitoring List includes water bodies that should be closely monitored for potential impairment by the constituents that are listed. Water bodies and pollutants/stressors on the monitoring list for the SDRW are also summarized in Appendix A, Figure 1-4.

El Capitan Management Area. Runoff in this management area is primarily from undeveloped land; however, it does receive runoff from the community of Alpine through Chocolate Creek. There currently are no water bodies in the El Capitan Management Area on the federal section 303(d) impaired water bodies list. The state Monitoring List sites benthic community effects, benzene, chlordane, eutrophic conditions, exotic species, Methyl Tertiary Butyl Ether (MTBE), and trash as potential concerns in the management area. Water bodies within the El Capitan Management Area on the state Monitoring List include Boulder Creek, Chocolate Creek, King Creek, and the San Diego River (Upper).

San Vicente Management Area. All surface water in this management area flows into and is impounded in San Vicente Reservoir. Land uses here are more variable than the El Capitan Management Area, but this area is comprised of a large amount of undeveloped land. Runoff in this management area is primarily from undeveloped land. Current surface water monitoring conducted within the San Vicente Management Area includes dry weather, stream bioassessment, reservoir monitoring of San Vicente Reservoir, reservoir source water protection, and a special study focused on source water protection of nitrate, TDS, and bacterial indicators. There currently are no water bodies in the San Vicente Management Area on the 303(d) impaired water bodies list. The state Monitoring List cites eutrophic conditions as a potential concern at Padre Barona Creek.

San Diego Management Area. This management area only receives water from the El Capitan and San Vicente Management Areas through closed distribution pipelines to urban users, or on the rare occasions when the reservoirs spill. The management area includes the Cities of Santee, El Cajon, La Mesa, and San Diego. Most of the land on the southwestern half of the San Diego Management Area is heavily urbanized, and the most pronounced water quality problems in the SDRW occur here. Deleterious effects of urbanization include the following:

- Increased impervious surfaces causing increased runoff and pollutant loading and poor natural pollutant assimilation.
- Alteration of river morphology and natural pollutant assimilation and buffering zones.
- Increased input of nutrients and pesticides from landscaped areas.
- Increased input of trash and other floatables.
- Local groundwater contamination from spills and leaks of hazardous materials.
- Accidental discharges of raw sewage.
- Increased erosion and siltation as a result of construction and other activities/practices.
- Increased TDS as a result of poor irrigation practices and imported water use.
- Stream modifications by aggregate mining with associated adverse changes in hydrology and habitat loss.

Water quality in the SDRW is fully discussed in the Water Quality Report (Anchor et al. 2003) and the Watershed Assessment Report(Anchor et al. 2004[1]).

2.4 Groundwater

El Capitan Management Area. Groundwater resources within the El Capitan Management Area are developed from fractured rock and shallow alluvium. Yields from individual wells are limited by the amount of storage in contiguous fractures and the amount of water that can recharge the fractures. Only a limited amount of recent data is available to characterize groundwater quality within the El Capitan Management Area. Historic data, however, demonstrate that groundwater quality is generally good, but varies with location, well depth, and sources of recharge. One exception to the good quality groundwater within the El Capitan Management Area is a site near Julian that is contaminated by gasoline leakage from an underground tank.

San Vicente Management Area. Groundwater resources within the San Vicente Management Area are principally developed from fractured rock or shallow alluvium/residuum that exists along major tributary streams. Recharge to the shallow alluvium/residuum and fractured rock is from streamflow infiltration, percolation of precipitation, and percolation from applied waters.

No comprehensive surveys of groundwater wells have been performed in the San Vicente Management Area, but water agency supply records and population data indicate that hundreds of private groundwater wells exist within the management area. Well yields from the fractured rock and shall alluvial aquifers are limited by local recharge.

Imported water use, increased development, and other salt and nitrate loads within the northern portion of the San Vicente Management Area indicate the potential for increased groundwater concentrations of TDS and nitrate.

San Diego Basin Management Area. The San Diego Basin Management Area is dominated by large alluvial aquifers, including the Santee/El Monte Basin, El Cajon Basin, and Mission Valley Basin. Each of these aquifers is recharged by streamflow infiltration, infiltrating precipitation, and infiltrating applied water. The Santee/El Monte Basin is the most important aquifer in the San Diego Management Area from both groundwater quality and groundwater production standpoints.

Groundwater TDS and nitrate concentrations within the Santee/El Monte basin are highly variable, and depend on well location, local hydrologic conditions, and local nitrate sources. TDS concentrations typically increase with distance downstream within the Santee/El Monte Basin. Groundwater within the upstream portion of the basin is usable as a source of potable supply without the need for treatment. Only limited water quality data are available for groundwaters within the Mission Valley Basin and El Cajon Basin. Historic data, however, indicate high TDS concentrations in both Mission Valley and the El Cajon Basin. Additionally, a portion of the Mission Valley aquifer is contaminated by fuel spills from the Mission Valley Terminal (fuel storage depot).

2.5 Surface Water Supply

El Capitan Management Area. Outside of the community of Alpine, groundwater serves as the exclusive source of water supply to homes and businesses within the El Capitan Management Area. Groundwater supply is provided by individual wells, wells connected to public water systems, and wells connected to non-public water systems. Groundwater also serves as a source of water supply within the Capitan Grande Indian Reservation. More than two dozen public water systems and several non-public water systems develop water supplies from groundwater within the El Capitan Management Area. With private wells developing an average of one-quarter to one-half acre-feet per year (AFY) each and public agency wells developing more, total groundwater pumped by within the El Capitan Management Area is estimated at several hundred AFY.

No surface water diversions occur along the surface streams of the El Capitan Management Area, but water supply is developed from two surface water reservoirs within the El Capitan Management Area. Cuyamaca Reservoir is owned and operated by the Helix Water District. El Capitan Reservoir is owned and operated by the City of San Diego and is used as a source of supply for the City's Alvarado Water Filtration Plant. Helix Water District also owns a portion of the storage capacity within El Capitan Reservoir and can transfer water to El Capitan by releasing water from the upstream Cuyamaca Reservoir. Storm runoff is the primary source of inflow to the reservoirs. Surface springs also contribute flow to the reservoirs.

San Vicente Management Area. Groundwater provides the exclusive source of water supply for the developed areas of the San Vicente Management Area (except for the northern portion of the area which is served by the Ramona Municipal Water District). Groundwater also serves as the primary source of supply within the Barona Valley. Over the past several years, private well owners in the vicinity of the Barona Indian Reservation have experienced declining water levels. Both on- and off-reservation development of the area and the recent drought conditions have likely contributed to these water level declines.

Well yields from the fractured rock and shall alluvial aquifers are limited by local recharge, but aquifers within the San Vicente Management Area are generally sufficient to provide water supply to sparsely developed rural areas. No surveys of groundwater wells have been performed in the San Vicente Management Area. Water agency supply records and population data, however, indicate that hundreds of private groundwater wells exist within the management area. While no collective data are available on the quantity of groundwater developed by the wells, typical residential water uses and well yields from similar aquifers indicate that total groundwater production by the private wells may be many hundreds of AFY throughout the San Vicente Management Area.

Groundwater also serves as the primary source of supply within the Barona Valley. Over the past several years, private well owners in the vicinity of the Barona Indian Reservation have experienced declining water levels. Both on- and off-Reservation development of the area and the recent drought conditions have likely contributed to these water level declines. As a result, water is currently being trucked on-site, and the Reservation is negotiating with the City of San Diego for water supply from San Vicente Reservoir.

Water supply is also developed from San Vicente Reservoir, which is owned and operated by the City of San Diego. San Vicente Reservoir receives runoff from the entire San Vicente Management Area, but imported water typically comprises the majority of water in the reservoir. The City of San Diego discharges imported water to the reservoir and withdraws water on an as-needed basis for municipal use. Water from San Vicente Reservoir is used as a source of supply to the City of San Diego Alvarado Water Filtration Plant.

San Diego Basin Management Area. Groundwater from the Santee/El Monte Basin serves as a source of municipal supply to Helix Water District, Lakeside Water District, and Riverview Water District. Additionally, a significant number of private wells exist within the Santee/El Monte basin.

No public water supplies are being developed by municipal agencies within the Mission Valley basin and El Cajon basin. Groundwater pumping by private well owners within the Mission Valley basin is estimated at 500 AFY, primarily for golf course irrigation. While no public water supply is currently being developed within the Mission Valley basin, the City of San Diego is exploring the potential for water supply development through groundwater demineralization.

Two surface water reservoirs exist within the San Diego Management Area. The City of San Diego owns and operates Lake Murray. Lake Murray serves as a forebay to the City of San Diego Alvarado Water Filtration Plant. Water within Lake Murray is comprised almost exclusively by imported water and water transferred from San Vicente and El Capitan Reservoirs. Helix Water District owns and operates Lake Jennings, which serves as a forebay to the Helix Water District R.M. Levy Water Filtration Plant. Lake Jennings is fed by imported water and water transferred from El Capitan Reservoir.

2.6 Biological Resources

The San Diego River Watershed is a region of great topographic variation – from Cuyamaca Peak in the east at 6,512 feet, to the San Diego River Estuary at sea level. The landscape within the watershed is characterized by additional abiotic conditions that influence the distribution of the vegetation communities and animals, including variations in microclimate, geology, and soils. These vegetation communities also provide important habitat for animals.

The San Diego Management Area contains the greatest number of endangered and threatened species, which is directly related to the greater degree of loss, degradation, and alteration of terrestrial and aquatic habitats due to the effects of urbanization. Existing dams of the large water bodies (i.e., Lake Murray, Lake Jennings, San Vicente Reservoir, El Capitan Reservoir, and Cuyamaca Reservoir) currently serve as a barrier to upstream movements of aquatic species. These barriers have, on the one hand prevented some deleterious exotic species, such as the African clawed frog, from gaining access to above reservoir habitats (Madden-Smith et al. 2004), but on the other hand have altered or eliminated suitable habitat above and below the dams.

El Capitan Management Area. Biological ecosystems and habitats within this management area are least affected by human impacts due to its location at the top of the watershed and its distance from major urbanized areas. The 2003 Cedar Fire, however, burned virtually all of this management area.

Major vegetation communities found within the El Capitan Management Area include Oak Woodland, Riparian Forest, Riparian Scrub, Mixed Chaparral, and Diegan Coastal Sage Scrub, as well as the Mixed Evergreen Forest, which is unique to this management area. The Mixed Evergreen community occurs in the highest elevations on the slopes of Japacha Peak, Cuyamaca Peak, and North Peak, within the west portion of Cuyamaca Rancho State Park, and northward towards Vulcan Mountain (located outside the watershed). The Oak Woodland community is most dominant in the area of Wynola, Julian, and Pine Hills, with smaller more linear patches along the uplands of rocky drainages.

The most abundant vegetation community is the Mixed Chaparral, which predominates on the mountain and hillsides in the southern portion of this management area and becomes transitional vegetation between many of the Mixed Evergreen and Oak Woodland communities in the north. Diegan Coastal Sage Scrub, while less common, occurs in a nearly continuous network along the east and western slopes of the rocky canyon along the San Diego River, including the lower reaches of the tributary canyons.

The vegetation community that is least represented and most localized is the Grassland community which occurs either within, or adjacent to, all the other vegetation communities mentioned above. Riparian Forests and Scrub communities follow the network of drainage bottoms. Open Water occurs in the form of seasonal or perennial artificial ponds, and Cuyamaca and El Capitan Reservoirs.

Threatened and endangered species currently known to occur in this management area include the, San Diego Ambrosia (*Ambrosia pumila*), San Diego Thorn-mint (*Acanthomintha ilicifolia*), Arroyo Toad (*Bufo californicus*), Southwestern Willow Flycatcher (*Empidonax trailii extimus*), Least Bell's Vireo (*Vireo bellii pusillus*), California Gnatcatcher (*Polioptila californica californica*), and Bald Eagle (*Haliaeetus leucocephalus*).

The El Capitan Management Area is unique in the watershed in that it includes both cold and warm water fish habitats. Indicators of cold water conditions include high elevation, dense overhead tree canopy, and spring-fed stream reaches. Within the SDRW, reaches of cold water habitat, some supporting introduced trout, are only found in the upper elevations of the eastern portion of the El Capitan Management Area. The warm water habitats of this management area also support a suite of exotic warm water fishes such as green sunfish, largemouth bass, black bullhead, and mosquitofish (TAIC and USGS 2002). No native fish species are known to occur in the management area (TAIC and USGS 2002).

San Vicente Management Area. Biological ecosystems and habitats within this management area being increasingly affected by human impacts due to the continued and new urban expansion.

Major vegetation communities found within the San Vicente Management Area include Mixed Chaparral, Oak Woodlands, Riparian Forests, Riparian Scrub, and Diegan Coastal Sage Scrub. The most abundant vegetation community is Mixed Chaparral, which is distributed across the hillsides and ridge tops. The Oak Woodland community occurs throughout the management area in many small highly localized patches often associated with drainage uplands. Diegan Coastal Sage Scrub occurs in larger more contiguous patches in the areas of Ramona and the area of Foster Valley located between Iron Mountain and San Vicente Reservoir. Riparian Forests and Scrub communities follow the network of drainage bottoms. Open Water occurs in the form of seasonal or perennial artificial ponds, and San Vicente Reservoir.

Threatened and endangered species currently known to occur in the San Vicente Management Area include the, San Diego Thorn-mint, Encinitas Baccharis (*Baccharis vanessae*), Arroyo Toad, California Gnatcatcher, and Bald Eagle.

Aquatic habitats throughout the San Vicente Management Area are all classifiable as warm water. Introduced trout only persist in the deeper and colder regions of San Vicente Reservoir. The warm water habitats of this management area also support a suite of exotic warm water fishes such as green sunfish, largemouth bass, and mosquitofish. No native fish species are known to occur in the management area (Madden-Smith et al. 2004).

San Diego Management Area. This management area contains the greatest amount of urbanization and, as a consequence, has experienced the greatest amount of habitat loss in the SDRW. A great deal of the natural vegetation in this management area is restricted to canyons isolated by expansive urbanization, however, Mission Trails Regional Park is nearly vegetatively connected to the eastern portion of U. S. Marine Corps Air Station (USMCAS) Miramar. From USMCAS Miramar, the vegetation communities continue northeastward toward the San Vicente Reservoir. Major vegetation communities found within the San Diego Management Area include Mixed Chaparral, Diegan Coastal Sage Scrub, Grassland, Riparian Forests, and Riparian Scrub. The most abundant vegetation community is Mixed Chaparral, which is distributed across the hillsides and mesa tops. Diegan Coastal Sage Scrub is less common and occurs in large patches within an urban matrix, and is located in Mission Trails Regional Park, in the Santee area, and occurs in a more highly fragmented distribution in the eastern portion of the management area. Grasslands are restricted to the open space areas within Santee and to a lesser extent, Mission Trails Regional Park.

Threatened and endangered species currently known to occur in this management area include the, San Diego Ambrosia, San Diego button celery (*Eryngium aristulatum* var. *parishii*), San Diego Thorn-mint, San Diego Fairy Shrimp (*Branchinecta sandiegoensis*), Quino Checkerspot Butterfly (*Euphydryas editha quino*), Arroyo Toad, California Brown Pelican (*Pelecanus occidentalis californicus*), Peregrine Falcon (*Falco peregrinus anatum*), Western Snowy Plover (*Charadrius alexandrinus nivosus*), California Least Turn (*Sterna antillarum browni*), Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*), Least Bell's Vireo, Light-footed Clapper Rail (*Rallus longirostris levipes*), and California Gnatcatcher.

The San Diego Management Area contains all warm water aquatic habitats that support a diversity of exotic fish species, including, but not limited to, green sunfish, largemouth bass, black bullhead, and mosquitofish (Madden-Smith et al. 2004). No fresh water native fish species are known to exist in this management area, however, the brackish–fresh water interphase zones of the San Diego Estuary do support highly adaptable native species such as Killifish (*Fundulus heteroclitus*) and Striped Mullet (*Mugil cephalus*) that are known to migrate up into more freshwater conditions.

2.7 Land Use and Planning

2.7.1 Land Use Plans in the Watershed

Local Jurisdictional Comprehensive Planning

- The Cities of Poway and El Cajon had completed their respective General Plan updates prior to 2003. Modifications made to these documents can be found within their respective JURMP.
- The City of La Mesa amended its General Plan to incorporate stormwater monitoring and the use and selection of best management practices (BMPs) in 2002.
- The City of Santee adopted a comprehensive update to its General Plan in 2003, with its Conservation Element providing policy guidance related to water quality and watershed protection.
- The City of San Diego is in the midst of comprehensively updating its General Plan. It has adopted its Strategic Framework Element and Action Plan in 2002, which lays out a strategy for updating all of the remaining Plan elements by 2008.
- The CSD is currently in the midst of a General Plan update (GP2020). The GP2020 initially focused on the development of goals and policies to create and maintain a built environment that is sensitive and compatible with the natural environment without significantly changing the unique local character of the county's rural communities and towns. See the CSD's website for information regarding the current status of GP2020.
- In addition to the general plans, a variety of other land use plans and programs have been, or are being, developed to protect and manage the resources within the SDRW. (See also Anchor et al. 2004[1].)

Regulatory Planning Documents

The Municipal Permit requires the Copermittees to develop and maintain, both cooperatively and independently, a set of documents which provides the background information and forum for coordinating land use planning efforts in regards to water quality protection and improvement within the SDRW. These documents provide planning guidance and requirements for the SDRW, as well as at the individual project scale, and they are:

- The 2003 San Diego River WURMP and subsequent annual reports
- The JURMP
- The Standard Urban Stormwater Mitigation Plan (SUSMP)

The WURMP focuses specifically on water quality related issues within the SDRW that are wholly or at least partially attributable to discharges from the municipal stormwater conveyance system. The WURMP identifies cooperative activities being undertaken by the Copermittees within the SDRW that require cross-jurisdictional approaches for successful implementation. Each of the Copermittees has also developed individual JURMPs to guide their implementation of stormwater related activities. The JURMPs identify how each Copermittee will (1) conduct public participation, education, and enforcement; (2) perform water quality monitoring, inventories, program assessment, and fiscal analysis; and (3) participate in watershed planning. They also identify the BMPs currently employed or that will be employed to address municipal facilities and the status of household hazardous waste programs. They state how Copermittee-owned leased properties will be managed, as well as non-emergency fire fighting, commercial and industrial uses, and existing residential uses. The SUSMPs are one of the primary implementation mechanisms utilized to protect and improve future water quality within the SDRW and the County. All of the Copermittees participated in the development of the model SUSMP that was submitted to and approved by the Regional Water Quality Control Board, San Diego, Region 9 (SDRWQCB). Each Copermittee has since adopted its own SUSMP which may deviate somewhat from the model SUSMP as long as it still meets the basic Municipal Permit requirements. The SUSMPs are designed to reduce or minimize to the maximum extent practicable stormwater quality impacts where practical in stormwater runoff.

Other Organizations and Planning Efforts

The San Diego River has many local, state, and national organizations active within its boundaries, such as the San Diego River Park Foundation (SDRPF) and the San Diego

River Conservancy. Of those organizations, a few have broad goals and watershed-wide perspectives.

2.7.2 Impervious Surfaces as a Planning Metric

Impervious surfaces (asphalt, concrete, and to some degree grass) increases surface water runoff. Many water quality related plans and programs have acknowledged that past construction techniques and development patterns have created large expanses of impervious surfaces that are directly linked current to hydrologic modifications and water quality problems. Therefore, imperviousness has been identified as a primary indicator to measure the impacts of land development within a watershed.

Impervious surfaces include roads, freeways and parking, buildings, rooftops, sidewalks, and any development that interrupts the transport of water into the soil. At higher levels of urbanization (imperviousness), base flow is diminished, stormwater flows are larger and more frequent, sediment loads are higher, and the stability of the watershed channels degrades. Pollutant loads are also increased in areas of high urbanization as runoff speed and quantity increases and pollutants that have been deposited on the impervious surfaces are suspended as runoff flows over them. Infiltration is greatly reduced due to decreases in pervious areas, which can also result in reductions in groundwater recharge.

Imperviousness can be explicitly quantified, managed, and controlled at each stage of land development. It can be assessed and managed on various management related scales, from watershed-wide (437 square miles), to hydrologic basin (75 to 189 square miles), to sub-basin (1 to 50 square miles), down to the catchment scale (1 to 5 square miles). Researchers have identified three categories relating to the percent of impervious cover:

- 1 to 10 percent impervious surface is a sensitive watershed
- 11 to 25 percent is an impacted watershed
- More than 25 percent is a non-supporting watershed

A sensitive watershed should be the most protected category with zoning, site impervious restrictions, stream buffers, and stormwater practices applied to maintain predevelopment stream quality. An impacted watershed can expect to see more degradation after development with less stable channels and some loss of biodiversity.

Non-supporting watersheds cannot maintain predevelopment channel stability and biodiversity, even when stormwater practices and zoning restrictions are fully applied. The objective then becomes to protect the downstream water quality by removing pollutants and to restore biodiversity in degraded streams.

Imperviousness varies between the individual jurisdictions and averages about 15 percent for the entire SDRW, as shown in Table 2-4, placing it in the impacted watershed category. This suggests that regulations on development and zoning restrictions should be applied to maintain the overall quality of the watershed before it reaches the triggering threshold of 25 percent.

Table 2-4
Percent Impervious Coverage by Jurisdiction in the SDRW

	Total Acres in Watershed	Impervious Acres	% Impervious
El Cajon	9,244	6,782	73%
La Mesa	3,052	2,432	80%
Poway	596	0	0%
San Diego	46,850	18,710	40%
Santee	10,540	4,268	40%
Unincorporated	209,275	9,706	5%
Total Acres	279,557	41,898	15%

2.7.3 Making Connections Through Land Use and Planning

El Capitan Management Area. The El Capitan Management Area is the least developed and is comprised of unincorporated County lands and the community planning areas of Julian, Ramona, Central Mountain, and Alpine. This management area is home to a majority of the headwaters that flow into the San Diego River. Two major reservoirs, the Cuyamaca Reservoir and the El Capitan Reservoir, can be found here as well. The U.S. Forest Service (USFS) is the largest landowner at 42,867 acres or 36 percent of the entire basin. Private land is second with 39,885 acres or 33 percent of the management area, with most of the development occurring along Interstate-8 (I-8). Scattered development is also found north of Cuyamaca Reservoir and near the community of Julian. The remaining 32 percent is sparsely developed and under the control of the USFS, U.S. Bureau of Land Management (BLM), Indian Reservations (Capitan Grande, Inaja, and

Cosmit), and other miscellaneous land owners. Table 2-5 shows the distribution of the different land uses currently in the El Capitan Management Area.

Table 2-5
El Capitan Land Use

Existing Land Use	Acres	Percent
Agriculture	618.1	2.5%
Aviation	1.0	0.0%
Family Housing	167.0	0.7%
Group Quarters	4.2	0.0%
Hotel/Motel	1.8	0.0%
Industrial	0.8	0.0%
Lakes / Bays / Lagoons	953.1	3.8%
Medical	3.1	0.0%
Office	3.6	0.0%
Parks / Preserves	11351.6	45.2%
Public Services	9.8	0.0%
Recreation	64.1	0.3%
Retail	28.3	0.1%
Rural Family Housing	1109.5	4.4%
Schools	7.2	0.0%
Transportation	528.3	2.1%

Source: SANDAG 2002 Land Use

The El Capitan Management Area is 2 percent impervious which places it in the sensitive watershed category (Table 2-6). BMPs such as zoning restrictions and stormwater management can still be implemented to keep the health of the watershed in good standing. Of the 120,753 acres within the management area, 1,891 acres are impervious and 40 percent of this acreage can be found near the community of Alpine along I-8.

Table 2-6
Impervious Surfaces by Sub-basin within the El Capitan Management Area

Sub-basin #	Total Acres	Impervious Acres	Percent
72240	1,231	67	5%
72250	665	0	0%
90731	51,818	195	0%
90733	3,905	775	20%
90741	52,194	595	1%
90742	4,758	202	4%
90743	6,061	54	1%
90933	114	3	3%
90935	7	0	0%

According to SANDAG data (Table 2-7), population will increase within the management area by 47 percent bringing the total up to 17,762 people in 2020 from 12,119 in 2000. While only a small fraction of the total population within the watershed, this is a significant increase within the El Capitan Management Area. However, population density will remain stable at approximately one person per acre, with sub-basins 90733 (Alpine), 90743 (Cuyamaca), and 90731 (Descanso/Alpine) receiving disproportionate shares of the population increases. The land use data also reflects this trend (Table 2-8).

Table 2-7
Population (2000 & 2020) by Sub-basin within the El Capitan Management Area

Sub-basin #	Total Acres	2002	Density	2020	Density	Increase	% Increase
72240	1,231	201	0.2	224	0.2	23	11%
72250	665	0	0.0	0	0.0	0	0%
90731	51,818	1,722	0.0	2,666	0.1	944	55%
90733	3,905	8,057	2.1	11,983	3.1	3,926	49%
90741	52,194	1,388	0.0	1,956	0.0	568	41%
90742	4,758	561	0.1	625	0.1	64	11%
90743	6,061	138	0.0	261	0.0	123	89%
90933	114	52	0.5	47	0.4	-5	-10%
90935	7	0	0.0	0	0.0	0	0%
Basin Total	120,753	12,119	0.1	17,762	0.1	5,643	47%

Table 2-8
Land Uses Conversions by Sub-basin within the El Capitan Management Area

Sub-basin #	72240	72250	90731	90733	90741	90742	90743	90933	90935
Family Housing	626	61	5,762	1,045	23,181	3,240	1,358	45	-
Public Services	-	-	<12>	67	<17>	56	<49>	-	-
Transportation	-	-	-	1	<1>	-	-	2	-
Parks / Preserves	<413>	<55>	689	<104>	<289>	<3>	<734>	<2>	-
Agriculture	<37>	-	<46>	<39>	<879>	<934>	<45>	-	-
Indian Reservations	-	-	<77>	-	<39>	-	-	-	-
Vacant Land	<177>	<6>	<6,433>	<988>	<21,802>	<2,401>	<530>	<45>	-
Miscellaneous	1	-	117	17	-	43	-	-	-

San Vicente Management Area. The San Vicente Management Area is 47,662 acres (74 square miles) and is the smallest of the SDRW management areas. The San Vicente

Reservoir is the only body of water within the management area and lies at its southwestern most edge. A small portion of the City of Poway makes up the northwestern most edge of the management area, approximately 596 acres or 1 percent of the management area. The rest of the area is occupied by the communities of Lakeside, Ramona, and the Barona Indian Reservation. The Barona Indian Reservation manages 6,823 acres or 14 percent of the management area. Private land is the predominant ownership of the San Vicente Management Area covering 55 percent of the land which most can be found north of the reservoir. Family housing is the second most predominant land use in terms of acreage at 7,530 acres just behind vacant land and open space at 26,479 acres or 56 percent of the San Vicente Management Area. The City of Poway's contribution to the basin is strictly open space and vacant land. Table 2-9 shows the land use acres across the San Vicente Management Area.

Table 2-9
San Vicente Land Use

Existing Land Use	Acres	Percent
Agriculture	690.2	6.3%
Family Housing	425.0	3.9%
Industrial	5.0	0.0%
Junkyard/Landfill	1.8	0.0%
Lakes / Bays / Lagoons	15.4	0.1%
Parks / Preserves	2926.6	26.9%
Public Services	4.8	0.0%
Recreation	269.7	2.5%
Retail	3.9	0.0%
Rural Family Housing	1153.2	10.6%
Schools	12.2	0.1%
Transportation	299.4	2.7%
Tribal Lands	751.8	6.9%
Under Construction	14.3	0.1%
Undeveloped Land	4323.0	39.7%
	10896.3	**100.0%**

Source: SANDAG 2002 Land Use

Of the 47,662 acres, only 1,418 acres (3 percent) are impervious (Table 2-10), which places the San Vicente Management Area in the sensitive watershed category. Most of the urbanization occurs in the northeastern edge of the basin where the San Diego Country Estates can be found southeast of the community of Ramona.

Table 2-10
Impervious Surfaces by Sub-basin* within the San Vicente Management Area

Sub-basin #	Total Acres	Impervious Acres	Percent
90721	14,077	197	1%
90722	8,491	83	1%
90723	14,853	1,022	7%
90724	10,201	114	1%

* City of Poway does not have any impervious acres in the San Vicente Management Area.

According to SANDAG data (Table 2-11), population is expected to increase by 22 percent in the next 20 years primarily in the private lands north of the reservoir along Mussey Grade Road. The total number of residents will jump from 11,833 in 2000 to 14,494 in the year 2020. This increase in population is over-emphasized within the planned land use data (Table 2-12) that shows an additional 20,342 acres of land being converted for residential purposes, which equates to about 7.6 acres of land per individual. Based on topography and access constraints, in addition to existing land development policies, the amount of land converted would appear to be inflated.

Table 2-11
Population (2000 & 2020) by Sub-basin within the San Vicente Management Area

Sub-basin #	Total Acres	2002	Density	2020	Density	Increase	% Increase
90721	14,077	1,077	0.1	2,179	0.2	1,102	102%
90722	8,491	502	0.1	805	0.1	303	60%
90723	14,853	9,639	0.6	10,473	0.7	834	9%
90724	10,201	615	0.1	1,037	0.1	422	69%
Basin Total	47,622	11,833	0.2	14,494	0.3	2,661	22%

Table 2-12
Land Uses Conversions by Sub-basin within the San Vicente Management Area

Sub-basin #	90721	90722	90723	90724
Family Housing	5,633	4,831	7,119	2,759
Public Services	-	<28>	<263>	<325>
Transportation	-	-	1	19
Parks / Preserves	<66>	<87>	<986>	<258>
Agriculture	<169>	<373>	<530>	<963>
Indian Reservations	164	28	<145>	1,144
Vacant Land	<5,598>	<4,666>	<6,066>	<2,655>
Miscellaneous	36	295	870	280

San Diego Management Area. The second largest basin in the SDRW is the San Diego Management Area, representing 40 percent of the watershed. This management area boasts the highest numbers in terms of population, population density, urbanization, and imperviousness due to the urban development within the cities of San Diego, Santee, El Cajon, and La Mesa as well as the higher density development within the unincorporated communities of Lakeside, Valle De Oro and Crest-Dehesa. Of the 111,184 acres (174 square miles), family housing dominates the landscape with a little over 31,000 acres or 28 percent of the San Diego Management Area, 41 percent of which can be found in the unincorporated areas. The City of Santee has the least amount of family housing at 2,916 acres. With a relatively east-west orientation, the family housing patterns are predominantly on the southern half of the basin due to the presence of the USMCAS Miramar, Mission Trails Regional Park, Sycamore Canyon Preserve, and BLM land in the northern half. These open spaces make up 17 percent of the San Diego Management Area. The City of San Diego is the largest jurisdiction in the San Diego Management Area making up 42 percent of the area, while the unincorporated County accounts for 37 percent.

With the urbanization and population increase occurring in the San Diego Management Area, its impervious cover is significantly higher than the other two management areas at 35 percent. This places the San Diego Management Area well into the Non-supporting watershed category with 38,590 of its 111,184 acres being considered impervious. As with the other management areas, examining the sub-basins closely (Table 2-13) provides additional insight into the dynamics of imperviousness, in particular imperviousness increases dramatically in two of the sub-basins: 90711 and 90713. These two sub-basins are also the most urbanized and populated.

Table 2-13
Impervious Surfaces by Sub-basin within the San Diego Management Area

Sub-basin #	Total Acres	Impervious Acres	Percent
90711	37,224	21,083	57%
90712	39,002	6,380	16%
90713	16,628	9,289	56%
90714	10,050	1,770	18%
90715	8,280	72	1%

The population within the San Diego Management Area is just under half million people (Table 2-14). This by far is the most populated management area in the SDRW. With an estimated increase of 22 percent over the next 20 years, the population will reach nearly 600,000 people. Population density is also the highest in this management area with an average of 4.3 people per acre. In the next 20 years, this density will increase to an average of 5.3 people per acre. A breakdown of population density within each sub-basin shows much higher density than the 4.3 average. For example, sub-basin unit number 90713 (El Cajon Valley) has the highest population density at 7.8 people per acre and is expected to reach 9.1 people per acre in the next 20 years, primarily through redevelopment and increased densities (Table 2-14). The San Diego Management Area shows an increase in family housing throughout the management area with the largest growth being in sub-basin unit number 90712 north of the San Diego River. This projected increase is due to the proposed development of Fanita Ranch in Santee which also correlates to the overall population growth occurring within Santee and the community of Lakeside. Agriculture and vacant land decreases in all sub-units and a total of 3,101 acres of parks and preserves are lost due to projected housing growth (Table 2-15).

Table 2-14
Population (2000 & 2020) by Sub-basin within the San Diego Management Area

Sub-basin #	Total Acres	2002	Density	2020	Density	Increase	% Increase
90711	37,224	249,723	6.7	301,976	8.1	52,253	21%
90712	39,002	76,376	2.0	99,581	2.6	23,205	30%
90713	16,628	130,035	7.8	150,985	9.1	20,950	16%
90714	10,050	22,217	2.2	29,588	2.9	7,371	33%
90715	8,280	718	0.1	2,361	0.3	1,643	229%
Basin Total	111,184	479,069	4.3	584,491	5.3	105,422	22%

Table 2-15
Land Uses Conversions by Sub-basin within the San Diego Management Area

Sub-basin #	90711	90712	90713	90714	90715
Family Housing	280	8,502	1,622	1,530	2,763
Public Services	<1,067>	295	<12>	<22>	-
Transportation	54	10	97	2	-
Parks / Preserves	1,116	<529>	115	<2,572>	652
Agriculture	<1>	<460>	<52>	<964>	<586>
Indian Reservations	-	-	-	-	-
Vacant Land	<1,711>	<13,482>	<1,948>	<1,716>	<3,610>
Miscellaneous	1,330	5,665	177	3,743	780

3 WATERSHED ISSUES OF CONCERN

3.1 Surface Water Hydrology

The two primary watershed issues of concern relating to hydrology include data gaps in flow monitoring and watershed hydromodifications.

There are no stream flow monitoring gauges along Forester Creek or San Vicente Creek both of which are located within the San Diego Management Area. This information is important for providing and maintaining adequate levels of flood protection along these creeks, especially Forester Creek which is highly urbanized. In addition, these data would be of importance to water quality control and Total Maximum Daily Load (TMDL) development efforts. The flow and stage data from the reinstated station would aid in flood hazard analysis of the flood-prone Forester Creek sub-basin.

The results of the assessment indicated that although most hydromodification has been limited primarily to the San Diego Management Area; hydromodification is occurring in the other two management areas as documented by recent permit activity processed by the SDRWQCB. This indicates that future hydromodification of the watershed may continue unless guidelines or policy changes are adopted to give the SDRWQCB the ability to prohibit or restrict these activities in the future (e.g., channelization). However, there are very limited data (e.g., maps or reports) indicating the type, extent, and location of hydromodifications throughout the watershed. These data are needed to analyze the impacts of existing hydromodifications on the health of the watershed and to estimate the impacts of future hydromodifications.

3.2 Surface Water Quality

El Capitan Management Area. Source water and reservoir monitoring in the El Capitan Management Area showed the primary constituents of concern (COCs) to water quality are excessive nutrients, total organic carbon (TOC), and TDS (City of San Diego 2004). This management area lies entirely within unincorporated San Diego County and is largely comprised of undeveloped land; however, it does receive runoff from the community of Alpine through Chocolate Creek. There are no point sources of the COC, and the nonpoint sources (NPS) sources include the geology, wildlife, and soil composition of the management area.

The City of San Diego Water Department (SDWD) has concluded that diffuse NPS from residential and commercial developments are the most significant sources of COCs in the management area (Pasek 2004). The 2003 Cedar Fire burned this entire management area, and water quality issues associated with sediment loading and nutrient cycling will persist for many years. This will require additional effort and expense by the SDWD and the SDWD will incur additional near-term water treatment costs due to post-fire inputs of sediment, ash, and nutrients. Long-term, the nutrients previously locked in the vegetation will continue to enter the reservoir as ash and sediment after storm events. Depending on the severity of the storms in the few years following the fire, the management area may be able to recover sufficiently to prevent nutrient loading to the reservoir.

San Vicente Management Area. In this management area, nitrate has been shown to be a COC in dry weather monitoring results, and eutrophic conditions are a potential concern in Padre Barona Creek. Point sources in the San Vicente Management Area include the Ramona and Barona Wastewater Treatment Plants. The primary NPS are the geology, wildlife, and soil composition of the management area. However, the SDWD has concluded that diffuse NPS from residential and commercial developments are the most significant sources of COCs in the management area (Pasek 2004). The 2003 Cedar Fire had similar impacts to the San Vicente Management Areas as described for the El Capitan Management Area.

San Diego Management Area. The most pronounced water quality problems in the SDRW occur in the San Diego Management Area. These impacts are primarily attributable to the high degree of urbanization in this area. The San Diego Management Area is the only major sub-basin within the SDRW that has water bodies listed on the State 303(d) list. Water bodies and pollutants/stressors in the San Diego Management Area that are on the 303(d) impaired water bodies listing include:

- The lower San Diego River (bacteria, low dissolved oxygen [DO], phosphorus, TDS)
- Forester Creek (TDS, pH, fecal coliform)
- Famosa Slough (eutrophic conditions)

The stormwater monitoring data show that the COCs with high frequencies of occurrence include fecal coliform, turbidity, and copper; potential COCs included chlorpyrifos, total coliform, and *Enterococcus*, and diazinon. All bacteria parameters (*Enterococcus*, total coliform, and fecal coliform) measured occasionally exceeded the action levels of 10,000, 50,000 and 20,000 MPN/100 mls, respectively, throughout the sampling period. *Enterococcus*, total coliform, and fecal coliform concentrations all ranged between zero to greater than 160,000 MPN/100 mls. Some high concentrations of bacteria occurred across all jurisdictional boundaries. However, results from focused monitoring suggest that local beach sources are the cause of bacterial contamination at Ocean Beach and that the San Diego River is not the primary source (MEC 2004).

Relative to point source monitoring, principal conclusions developed to date from the receiving water monitoring program include undertaken by the Padre Dam Municipal Water District (PDMWD):

- Receiving waters in the lower one mile of Forester Creek do not consistently comply with Basin Plan receiving water quality concentration standards for fecal coliform, specific conductance, and TDS
- Receiving waters in the lower 20 miles of the San Diego River do not consistently comply with Basin Plan receiving water quality concentration standards for DO, fecal coliform, phosphorus, and TDS
- The Forester Creek watershed is the primary source of mass emissions into the lower portion of the SDRW
- The PDMWD Santee Lakes overflow discharge represents only a fraction of the natural nitrogen and phosphorus mass emissions that occur within the SDRW upstream from the Santee Lakes
- Concentrations of total phosphorus tend to increase with distance downstream within the lower portion of the SDRW
- Long-term average concentrations of total nitrogen in the upstream stations (Monitoring Station Nos. 1 and 2) are approximately the same as concentrations in the downstream stations (Monitoring Station Nos. 5, 6, and 7)

Nitrogen to phosphorus (N:P) ratios tend to decrease with distance downstream. Downstream monitoring stations (Monitoring Station Nos. 6 and 7) appear to be nitrogen-limited (N:P ratios less than 10:1), while upstream stations (Monitoring Station Nos. 1 and 2) appear to be phosphorus-limited (N:P ratios significantly greater than 10:1)

3.3 Groundwater

El Capitan Management Area. Groundwater resources within the El Capitan Management Area are developed from fractured rock and shallow alluvium. Yields from individual wells are limited by the amount of storage in contiguous fractures and the amount of water that can recharge the fractures. Only a limited amount of recent data are available to characterize groundwater quality within the El Capitan Management Area. Historic data, however, demonstrate that groundwater quality is generally good, but varies with location, well depth, and sources of recharge. One exception to the good quality groundwater within the El Capitan Management Area is a site near Julian that is contaminated by gasoline leakage from an underground tank.

San Vicente Management Area. Groundwater resources within the San Vicente Management Area are principally developed from fractured rock or shallow alluvium/residuum that exists along major tributary streams. Recharge to the shallow alluvium/residuum and fractured rock is from streamflow infiltration, percolation of precipitation, and percolation from applied waters.

No comprehensive surveys of groundwater wells have been performed in the San Vicente Management Area, but water agency supply records and population data indicate that hundreds of private groundwater wells exist within the management area. Well yields from the fractured rock and shall alluvial aquifers are limited by local recharge.

Imported water use, increased development, and other salt and nitrate loads within the northern portion of the San Vicente Management Area indicate the potential for increased groundwater concentrations of TDS and nitrate.

San Diego Basin Management Area. The San Diego Basin Management Area is dominated by large alluvial aquifers, including the Santee/El Monte Basin, El Cajon Basin, and Mission Valley Basin. Each of these aquifers are recharged by streamflow infiltration, infiltrating precipitation, and infiltrating applied water. The Santee/El Monte Basin is the most important aquifer in the San Diego Management Area from both groundwater quality and groundwater production standpoints.

Groundwater TDS and nitrate concentrations within the Santee/El Monte basin are highly variable, and depend on well location, local hydrologic conditions, and local nitrate sources. TDS concentrations typically increase with distance downstream within the Santee/El Monte Basin. Groundwater within the upstream portion of the basin is usable as a source of potable supply without the need for treatment. Only limited water quality data are available for groundwaters within the Mission Valley Basin and El Cajon Basin. Historic data, however, indicate high TDS concentrations in both Mission Valley and the El Cajon Basin. Additionally, a portion of the Mission Valley aquifer is contaminated by fuel spills from the Mission Valley Terminal (fuel storage depot).

3.4 Surface Water Supply

El Capitan Management Area. Outside of the community of Alpine, groundwater serves as the exclusive source of water supply to homes and businesses within the El Capitan Management Area. Groundwater supply is provided by individual wells, wells connected to public water systems, and wells connected to non-public water systems. Groundwater also serves as a source of water supply within the Capitan Grande Indian Reservation.

More than two dozen public water systems and several non-public water systems develop water supplies from groundwater within the El Capitan Management Area. With private wells developing an average of one-quarter to one-half acre-feet per year (AFY) each and public agency wells developing more, total groundwater pumped by within the El Capitan Management Area is estimated at several hundred AFY.

No surface water diversions occur along the surface streams of the El Capitan Management Area, but water supply is developed from two surface water reservoirs within the El Capitan Management Area. Cuyamaca Reservoir is owned and operated by the Helix Water District. El Capitan Reservoir is owned and operated by the City of San Diego and is used as a source of supply for the City's Alvarado Water Filtration Plant. Helix Water District also owns a portion of the storage capacity within El Capitan Reservoir and can transfer water to El Capitan by releasing water from the upstream Cuyamaca Reservoir. Storm runoff is the primary source of inflow to the reservoirs. Surface springs also contribute flow to the reservoirs.

San Vicente Management Area. Groundwater provides the exclusive source of water supply for the developed areas of the San Vicente Management Area (except for the northern portion of the area which is served by the Ramona Municipal Water District). Groundwater also serves as the primary source of supply within the Barona Valley. Over the past several years, private well owners in the vicinity of the Barona Indian Reservation have experienced declining water levels. Both on- and off-reservation development of the area and the recent drought conditions have likely contributed to these water level declines.

Well yields from the fractured rock and shall alluvial aquifers are limited by local recharge, but aquifers within the San Vicente Management Area are generally sufficient to provide water supply to sparsely developed rural areas. No surveys of groundwater wells have been performed in the San Vicente Management Area. Water agency supply records and population data, however, indicate that hundreds of private groundwater wells exist within the management area. While no collective data are available on the quantity of groundwater developed by the wells, typical residential water uses and well yields from similar aquifers indicate that total groundwater production by the private wells may be many hundreds of AFY throughout the San Vicente Management Area.

Groundwater also serves as the primary source of supply within the Barona Valley. Over the past several years, private well owners in the vicinity of the Barona Indian Reservation have experienced declining water levels. Both on- and off-Reservation development of the area and the recent drought conditions have likely contributed to these water level declines. As a result, water is currently being trucked on-site, and the Reservation is negotiating with the City of San Diego for water supply from San Vicente Reservoir.

Water supply is also developed from San Vicente Reservoir, which is owned and operated by the City of San Diego. San Vicente Reservoir receives runoff from the entire San Vicente Management Area, but imported water typically comprises the majority of water in the reservoir. The City of San Diego discharges imported water to the reservoir and withdraws water on an as-needed basis for municipal use. Water from San Vicente Reservoir is used as a source of supply to the City of San Diego Alvarado Water Filtration Plant.

San Diego Basin Management Area. Groundwater from the Santee/El Monte Basin serves as a source of municipal supply to Helix Water District, Lakeside Water District, and Riverview Water District. Additionally, a significant number of private wells exist within the Santee/El Monte basin.

No public water supplies are being developed by municipal agencies within the Mission Valley basin and El Cajon basin. Groundwater pumping by private well owners within the Mission Valley basin is estimated at 500 AFY, primarily for golf course irrigation. While no public water supply is currently being developed within the Mission Valley basin, the City of San Diego is exploring the potential for water supply development through groundwater demineralization.

Two surface water reservoirs exist within the San Diego Management Area. The City of San Diego owns and operates Lake Murray. Lake Murray serves as a forebay to the City of San Diego Alvarado Water Filtration Plant. Water within Lake Murray is comprised almost exclusively by imported water and water transferred from San Vicente and El Capitan Reservoirs. Helix Water District owns and operates Lake Jennings, which serves as a forebay to the Helix Water District R.M. Levy Water Filtration Plant. Lake Jennings is fed by imported water and water transferred from El Capitan Reservoir.

3.5 Biological Resources

3.5.1 Habitat Degradation

Habitat loss for plants and animals, whether in the form of destruction or degraded beyond their ability to adjust to the new condition, is considered to be the number one threat to conservation of biological diversity. Within the SDRW, the rate of habitat degradation is increasing with the increased growth and establishment of additional urban centers. The natural communities least affected by human impacts are high in the eastern portion of the watershed at the higher elevations, while natural communities most effected by human impacts are along the coast lower in the watershed, where the urban centers and the human population is the highest. Human actions such as, ground water pumping, diversion or damming of waterways, and permitting contaminated water from urban runoff or agricultural areas to flow into streams and rivers, has negatively affected aquatic habitats. The clearing of native vegetation and reshaping the topography to make way for residential, commercial, industrial, and agricultural operations, has resulted in significant loss and degradations of terrestrial in the western portion of the SDRW. Disturbance to aquatic and terrestrial habitats lower the suitability for the biodiversity of native species and favor the influx and establishment of exotic species. In the San Diego Management Area, loss of riparian and floodplain fringe habitat has lessened the viability of the remaining habitat features by resulting in an all to common separation of upland and wetland communities. These separations of habitats can result in significant impairment to the distribution of species for which both aquatic and terrestrial habitats are critical, such as the endangered Arroyo Toad.

3.5.2 Exotic Species Control

Introduced flora and fauna can be detrimental to the health and function of the SDRW. Action is often required to reduce, control, and where feasible, eradicate exotic invasive flora and fauna due to their ability to expand distribution, interfere with the natural function of ecological systems, reduce diversity, and reduce the growth and health of native species.

Restoring extirpated native species in conjunction with the removal of invasives is required to maintain a balanced ecosystem. Unlike impacts such as chemical pollutant discharges that naturally diminish with time, exotic species tend to proliferate and capitalize on stressed systems to a greater degree than healthy ecosystems. As a result, once established in the watershed, directed action is almost always necessary to remove or control exotics. The list of introduced flora in the SDRW is extensive and many are highly opportunistic, settling in disturbed areas.

These species include giant reed (*Arundo donax*), Brazilian pepper tree (*Schinus terebinthifolius*), Peruvian pepper tree (*Schinus molle*), pampas grass (*Cortaderia jubata*), perennial pepperweed (*Lepidium latifolium*), castor-bean (*Ricinus communis*), fennel (*Foeniculum vulgare*) and common poison hemlock (*Conium maculatum*), as well as weedy grasses, including but not limited to, annual beard grass (*Polypogon monspeliensis*), ripgut grass (*Bromus diandrus*), and slender wild oat (*Avena barbata*). Of these species the two most highly invasive wetland plants that occur within the watershed are giant reed (*Arundo donax*) and tamarisk (*Tamarix* spp.). These species, in particular, have an adverse affect on the hydrology and geomorphology, habitat diversity, and ecological integrity along the San Diego River.

There are several introduced faunal species that also affect the diversity and structure of the wildlife communities within the SDRW. Some affect whole ecosystems such as the introduced aquatic species that depredate native fish and amphibian species (Ervin et al 2000; Hovey and Ervin In Press). These include predatory exotic fish, crayfish (*Procambarus clarkii*), bullfrogs (*Rana catesbeiana*), and the African clawed frog (*Xenopus laevis*), which are all non-native predatory species that have impacted the biological diversity and abundance of amphibian species within the river system.

The exotic fish identified by along the river include western mosquitofish (*Gambusia affinis*), bass (*Micropterus* spp.), green sunfish (*Lepomis cyanellus*), trout (and bullhead (*Amelurus* sp.) (TAIC and USGS 2002; Madden-Smith et al. 2004). Both crayfish and bullfrog are widespread within the watershed (TAIC and USGS 2002; Madden-Smith et al. 2004). The African clawed frog is limited to below El Capitan Reservoir (TAIC and USGS 2002).

Other introduced species such as Argentine ants (*Iridomyrmex humilis*) and brown-headed cowbird (*Molothrus ater*) also impact native species (Suarez and Case 2002; Ortega 1998). Argentine ants increase with urban development agriculture and habitat restoration due to their dependence on mesic conditions (Holway et al. 2002). Argentine ants displace native ants but are also predators of ground or shrub nesting bird species (Peterson et al. 2004). The parasitic brown-headed cowbird directly affects reproductive success of other small avian species and are, therefore, responsible for the decline of a number of species.

3.6 Land Use and Planning

3.6.1 Interagency Cooperation

The backbone to any successful large-scale land management effort is the cooperation and coordination of the entities having land management responsibility and authority. Developing a process and structure that allows for and encourages land management cooperation and coordination is one of the most significant issues of concern identified during the WMP process. There are more than ten jurisdictional entities that have authority within the SDRW including: five cities, San Diego County, USFS, BLM, various state agencies, military and Indian Reservations; all oversee large expanses of land. The Watershed Assessment Report for the SDRW identifies the San Diego Management Area having the most managers with eight of the managers within its boundaries. The El Capitan Management Area has five land managers, while the San Vicente Management Areas has six.

3.6.2 Urbanization and Impervious Surfaces

The effects of impervious surfaces have been linked to a wide range of environmental issues including, but not limited to: higher flood elevations; increased frequency of flooding; decreased natural base-flows and associated groundwater recharge; increased flow velocities and associated stream-bank erosion and sediment transport; habitat degradation and loss; improved conditions for exotic species; and increased pollutant loads related to urbanized land uses. Existing conditions identify the San Diego Management Area as having impervious surfaces accounting for approximately 35 percent of it land area, placing it in well into the Non-Supporting category. Future urbanization and associated impervious surfaces throughout the SDRW are cause for concern. The El Capitan Management Area will see the highest percent increase in population growth and development potentially will increase its imperviousness. The San Vicente Management Area has the least amount of development but the highest increase in population density suggesting and influx of people into higher density housing, thus keeping imperviousness at its current state but potentially increasing pollutants derived from urbanization. Developing mechanisms to map and manage impervious surfaces is a key issue of concern within the entire SDRW, with an emphasis on the El Capitan and San Vicente Management Areas where the most development is projected to occur.

3.6.3 Data Management

Data management, meaning the active collection, storage, categorization, and analysis of spatial (GIS and CAD), attribute (descriptive), and hard copy (reports and maps) for a defined purpose, is one of the underlying needs within any large-scale management effort. Similar to the issue of cooperation and coordination between the various land managers, the management of data related to the management of the SDRW is also critical since many of the land managers also develop and potentially maintain spatial and attribute information for their respective land areas, or develop reports that pertain to the management of their jurisdictional areas. Having a current comprehensive inventory of this data that identifies basic bibliographic or metadata information about the various data sets would be a logical first step as this will help identify data gaps, both spatial and temporal. Once developed and ongoing management responsibility is defined, additional tools to access and manipulate these data can be developed for the purposes of furthering various watershed management activities and goals.

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4 ACTION RECOMMENDATIONS

Based on the results of the assessment of the watershed, public meetings, and on the feedback during the ongoing WWG meetings, the following actions have been identified as high priority. Additionally, projects and activities identified by the stakeholders fall within these broad actions.

4.1 Ongoing Collaborative Management and Interagency Cooperation

4.1.1 Summary of Problem

The backbone to any successful large-scale land planning effort is a collaborative management structure that is flexible and adaptable over time. It needs to be inclusive enough to develop and maintain broad public support, yet streamlined to enable efficient and effective decision-making. Cooperative and coordinated involvement of the land management entities is a critical component of this structure, but cannot be allowed to overshadow the importance of active and engaged NGOs and community groups. Currently, none of entities or management groups existing within the SDRW have the responsibility or authority to spend resources in such a broad, watershed-based coalition, one that may require them to deviate from their existing land use plans. Nevertheless, it is essential to develop immediately a stable, yet flexible process and structure that allows for and encourages cooperation, coordination, open communication, and collaboration on watershed management activities.

4.1.2 Contributing Elements

Several elements contribute to the difficulty in successfully developing and implementing a process that is structured yet flexible, inclusive yet manageable, and politically connected but not politically driven. The key contributing elements are:

- **The number of active management groups.** The San Diego River Conservancy, San Diego River Coalition, the NPDES Copermittees, and the participants of the Multiple Species Conservation Plan (MSCP) are all currently undertaking activities that relate to various aspects of watershed management, yet none of them offer a broad enough focus, both geographically and issue area, nor are they inclusive enough to function in the long-term as the management and guidance body for the SDRW.
- **The complex pattern of land ownership.** Ownership within the SDRW includes one county, five cities, five Tribal reservations, a military installation, and significant portions of the Cleveland National Forest and Cuyamaca State Park.

Developing a structure that allows all of these entities to communicate and coordinate in the planning and implementation of watershed management related activities is essential to successfully navigating the potential hurdles introduced by the complex ownership patterns within the SDRW. Due to the large number of federal, state, local, and special purpose entities within the SDRW a fully inclusive process may not only be infeasible due to the logistics, but also potentially undesirable as the number of stakeholders trying to reach a consensus could be extremely difficult thus crippling the ability to move forward and implement management actions.

4.1.3 Early Action Recommendations

- Work with members of the WWG to identify additional stakeholders that need to be engaged and develop an initial committee structure for participation. The purpose of this action is to enable the active stakeholders within SDRW to take control of the process and identify the structure and membership of the group or committee that will continue to discuss issues related to the SDRW and make management decisions.
- Identify the stakeholders that need to coordinate, cooperate, communicate, and collaborate on the highest priority issues within various portions of the SDRW. These smaller groups of stakeholders should form specialized working groups that meet and discuss in more detail those issues that are of specific concern to them, and then report back to the larger watershed management group on their findings and recommendations. In this manner, stakeholders that are prepared to move forward and take action on a specific action can begin the often lengthy process of data collection, analysis and modeling, solution generation and selection, environmental documentation, and finally implementation. For some issue areas this process may take several years to accomplish, whereas for others that are more limited spatially or narrowly focused may be ready for implementation in a matter of a few months.

4.1.4 Long-term Action Recommendations

- Develop a management structure and membership that is stable and broad enough to enable more policy type actions to be developed and implemented consistently across jurisdictional and land management boundaries.

4.2 Stakeholder Education and Outreach

4.2.1 Summary of Problem

Many of the common issues that watersheds face are directly linked to the activities and decisions made by the individuals that live, work, and recreate within their boundaries.

Unfortunately, most individuals cannot define a watershed much less understand the compounding effect of their individual actions on the health and function of their watershed. As such, education materials and outreach mechanisms are needed that first focus on the basic watershed definitions and mechanics, then on the existing issues to be addressed, and finally on the day-to-day actions individuals can take and decisions they can make to influence those issues. The affects of this type of education and outreach often take years, if not generations to fully materialize.

In addition to this broad-based general education and outreach, topic specific materials and programs should also be augmented or developed. Many of these types of efforts should be directly linked to the planning, development, and implementation of the other actions recommended in this plan.

4.2.2 Contributing Elements

Elements contributing to the general lack of understanding about watersheds, include:

- Watershed planning is a relatively new scientific study that is merging together diverse disciplines that previously have not been integrated. The scientific fields are increasing their knowledge and understanding of watershed functions at an exponential rate and only recently (decades) have made linkages and identified cause-and-effect relationships to understand how watersheds functions in both natural and disturbed conditions. The rate this information is being developed outpaces the ability of the educational system at a non-collegiate to incorporate it into the curricula. Until this information is integrated into the various biological and physical sciences text books, outreach and education programs will continue to be the primary mechanism for the public to learn about watersheds and watershed management.
- Many watershed issues are not 'visible' to the untrained eye. Many people understand issues they can see, like flooding and trash, but it is more difficult to understand high TDS, toxicity, or bacteria since they are not observable. Improving an understanding of the importance of both the obvious and imperceptible watershed concerns and how they are linked to human and watershed health and quality of life are integral to gaining support for watershed management actions.
- The issues are often perceived as regulatory issues for governmental entities to manage. Since many of the watershed issues are typically identified as individual pollutants and responsibility for reducing them have been integrated into agency permits, it has been easy for the general public to assume that these

issues are for the public agencies to deal with and manage and that they have no direct linkage to their individual day-to-day actions.

4.2.3 Early Action Recommendations

- Identify the various target groups that should be the focus of outreach efforts and use this information to determine the most effective mechanisms for getting the message to them and measuring its effectiveness.
- Develop or augment outreach materials that define a watershed, where the SDRW is located, its issues, and how individual actions contribute to both the problems and solutions, as well as any other pertinent information for each targeted stakeholder group.
- Identify existing outreach program to integrate the material developed in the previous action and begin disseminating it out to different target groups.

4.2.4 Long-term Action Recommendations

- Maintain and augment the efforts initiated in the early action recommendations.
- Ensure education and outreach efforts are integrated into every watershed management action, and that these efforts are coordinated and complimentary with each other.

4.3 Hydromodification

4.3.1 Summary of Problem

Human modifications (e.g. dams, stream channelization, culverts, roads, driveways, and urban development) to the surface water hydrology have been shown to result in higher flood elevations, increased flood frequency, loss of habitat, decreased groundwater recharge, and elevated base-flows from irrigation return flow and urban runoff. The SDRW is likely being affected in a similar manner due to the presence of the El Capitan and San Vicente dams and the significant level of urban development; the fact that it is the most populated watershed within San Diego County increases the risks associated with hydromodification. To address these issues, the primary contributors to the problem must be addressed in a comprehensive and coordinated manner.

4.3.2 Contributing Elements

- Modification of the hydrology of the San Diego River and its tributaries

- Land development
  - Impervious surfaces
  - Irrigation return flows

4.3.3 Early Action Recommendations

- Develop regional mapping procedure for determining impervious surfaces.
- Establish monitoring stations.
- Develop land use to impervious surface relationship and use it to model potential future impervious conditions within the SDRW.
- Identify and map existing hydromodifications throughout the watershed.
- Develop a watershed modeling framework and goals.
  - Develop modeling and assessment goals.
  - Delineate sub-basins and catchments.
  - Identify data gaps and develop program to fill them.

4.3.4 Long-term Action Recommendations

- Integrate impervious surface criteria into land development review process.

4.4 Groundwater Management

4.4.1 Summary of Problem

El Capitan and San Vicente Management Areas. The task of characterizing groundwater availability and quality (and how groundwater influences beneficial uses) is difficult within the El Capitan and San Vicente Management Areas. Because groundwater is derived from fractured rock aquifers and shallow alluvium, a high degree of variability occurs in water quality and well production rates. Additional factors that add to the difficulty in characterizing groundwater availability and quality include:

1. A limited amount of water quality and groundwater availability data are developed within El Capitan and San Vicente Management Areas.

2. Existing groundwater monitoring efforts are not coordinated or standardized.

The limited available data indicate that groundwater quality is generally good within the El Capitan and San Vicente Management Areas. The potential exists, however, for groundwater quality within the El Capitan and San Vicente Management Areas to be compromised as a result of locally high concentrations of TDS, nitrate, or organic constituents.

Due to the nature of the aquifers in the El Capitan and San Vicente Management Areas, groundwater production at any location is restricted by the amount of locally-available recharge and aquifer storage. When pumping exceeds available recharge, groundwater levels in wells decline and shallower wells may go dry.

San Diego Management Area. A significant amount of historic groundwater quality data exists within the San Diego Management Area, but only a limited amount of recent groundwater quality data have been collected. The most recent comprehensive well surveys within the San Diego Management Area occurred during the 1990s, but the surveys have not been updated.

Groundwater use within the San Diego Management Areas is generally limited by poor water quality; groundwater quality complies with state and federal drinking water standards for TDS only in the eastern portion of the San Diego Management Area (El Monte basin).

Within the Santee basin, El Cajon basin, and Mission Valley, groundwater quality is compromised by high concentrations of TDS. Higher concentrations of nitrate also occur in localized areas. Iron and manganese concentrations exceed drinking water standards in portions of the Santee Basin. Additionally, a number of local sites within the San Diego Management Area have been identified that are contaminated by toxic organic chemicals.

4.4.2 Contributing Elements

El Capitan and San Vicente Management Area. A number of factors contribute to the lack of adequate data on groundwater quality and availability within the El Capitan and San Vicente Management Areas, including:

- Required public water supply monitoring is infrequent and focuses on a limited number of drinking water parameters.
- Different water agencies or groundwater well owners have different means of collecting and recording data.
- The limited amount of water quality monitoring information collected by private well owners is normally kept confidential.
- Groundwater monitoring associated with contaminant spills is typically limited to shallow groundwaters in areas surrounding known contaminant sources and focuses on suspected spill contaminants.
- No system for coordinating, collecting, and compiling available water quality information currently exists within the El Capitan Management Area.

Groundwater quality within the El Capitan and San Vicente Management Areas is generally good. Contamination of groundwater by high concentrations of TDS or nitrate within the El Capitan and San Vicente Management Areas, however, can result from:

- Irrigation/fertilization operations
- Septic tank discharges

Additionally, organic constituents may be introduced to aquifers of the El Capitan and San Vicente Management Areas as a result of spills from underground tanks.

For aquifers regulated solely by the CSD, development is limited by the CSD Groundwater Ordinance to insure adequate groundwater availability. The principal groundwater availability problem within the El Capitan and San Vicente Management Areas occurs in the Barona Valley, where Indian Reservation lands are regulated by a different jurisdiction not subject to CSD groundwater controls.

San Diego Management Area. Factors that contribute to the lack of adequate water quality and availability data within the San Diego Management Area include:

- The limited number of public water supply wells within the San Diego Management Area.
- Required public water supply monitoring is infrequent and focuses on a limited number of drinking water parameters.
- Different water agencies or groundwater well owners have different means of collecting and recording data.

- The limited amount of water quality monitoring information collected by private well owners is normally kept confidential.
- Groundwater monitoring associated with contaminant spills is typically limited to shallow groundwaters in areas surrounding known contaminant sources and focuses on suspected spill contaminants.
- No system for coordinating, collecting, and compiling available water quality information currently exists within the San Diego Management Area.

Groundwater TDS and nitrate concentrations within the San Diego Management Area may be impacted by:

- Salt imports associated with imported water use
- Irrigation/fertilization operations
- Septic tank discharges
- Wastewater discharges
- Urban runoff
- Agricultural runoff

Organic constituents may be introduced to aquifers of the San Diego Management Area as a result of spills from underground tanks.

Iron and manganese concentrations in groundwaters within the San Diego Management Area are believed to naturally occur within the aquifer.

Imported water is available throughout the San Diego Management Area. Adequate supplies of groundwater currently exist within the San Diego Management Area. Excellent quality groundwater exists in the El Monte Basin and the eastern portion of the Santee Basin, but groundwater use in other portions of the San Diego Management Area is currently limited to irrigation use as a result of higher TDS concentrations. Several public agencies (e.g. Padre Dam MWD and City of San Diego) have explored the potential for implementing demineralization treatment as a means of rendering the groundwater in Mission Valley and the western Santee Basin fit for potable use.

4.4.3 Early Action Recommendations

El Capitan, San Vicente, and San Diego Management Areas. A centralized, coordinated groundwater data collection effort is recommended to allow for more complete characterization of groundwater availability and quality within the El Capitan, San Vicente, and San Diego Management Areas. Such a centralized, coordinated groundwater data collection effort should include:

- Researching CSD and California Department of Water Resources records to identify active wells within the SDRW.
- Performing field inspections to update well locations and groundwater use.
- Identifying which wells have known screening depths.
- Identifying existing water quality monitoring being performed by each well owner.
- Selecting additional groundwater wells as being representative and appropriate for long-term monitoring and use in characterizing regional groundwater availability and quality within the San Vicente, and El Capitan Management Areas.
- Securing well owner approval for performing monitoring on the selected representative wells.
- Implementing a program of periodic monitoring of the selected wells for (1) depth-to-water and (2) water quality monitoring for key groundwater contaminants of concern.
- Compiling existing information collected by well owners and supplemental information collected as part of the regional groundwater monitoring program into a centralized database.

Groundwater quality within the SDRW can be protected by minimizing the use of fertilizers and pesticides and insuring that fertilizer and pesticide use is optimized to the soils and local conditions. To achieve this protection, recommended near-term action items include:

- Requesting that the County Agriculture Department collect and provide information on fertilizer use and nutrient loads within the watershed.
- Requesting that the University of California Cooperative Extension gather information on fertilizer use and management strategies.
- Coordinating with the U.S. Natural Resource Conservation Service, County Department of Agriculture, and Farm Bureau for educating growers on (1) the use of liquid (irrigation fed) fertilizer systems, (2) proper fertilization use and

strategies, and (3) and best management practices for erosion control and storm runoff protection.

- Continuing and expanding ongoing education programs to include information to educate residents and growers on proper fertilizer techniques and best management practices.

Additional recommended near-term actions items include:

- Continued regulation and oversight of septic tank waste discharges by the SDRWQCB and CSD.
- Continued regulation of land use by the CSD in accordance with the County's Groundwater Ordinance.
- Coordination between the CSD and SDRW Indian Reservations in regulation of groundwater use.
- Continued oversight and regulation of storm runoff by the SDRWQCB.

4.4.4 Long-term Action Recommendations

El Capitan and San Vicente Management Areas. Long-term action recommendations for the El Capitan and San Vicente Management Areas include reviewing collected well, groundwater use, and groundwater availability data to determine if:

- Revision of the CSD Groundwater Ordinance is required.
- Further regulation of wastewater dischargers is appropriate.
- Revision of the Basin Plan is warranted.

San Diego Management Area. Long-term action recommendations for the San Diego Management Area include reviewing collected well, groundwater use, and groundwater availability data to:

- Develop updated salt balance estimates for the principal alluvial aquifers of the San Diego Management Area and project future water quality trends.
- Determine if further regulation of wastewater dischargers are appropriate.
- Determine if physical projects should be considered for enhancing groundwater supply or groundwater quality.
- Determine if revision of the Basin Plan is warranted.

4.5 Habitat Degradation

4.5.1 Summary of Problem

Habitat loss is considered to be the number one threat to conservation of biological diversity on a global scale, and on a regional scale, habitat conservation needs have been well recognized. These needs are being addressed through multi-jurisdictional planning efforts such as the MSCP and similar federal lands programs. Because these efforts are well underway and, by all accounts, appear to be working to acquire and protect important habitat areas, including those within the SDRW, this SDRWMP action focuses on identifying synergistic benefits that would add value to conservation actions currently undertaken through existing programs. In particular, this action aims to bridge gaps between species conservation efforts targeted by the regional plans and strategic conservation and habitat restoration efforts that would assist in the enhancement of beneficial uses within the watershed.

In particular, regional habitat conservation planning has generally focused on habitat types and presence of target species for conservation. This approach does not specifically link hydrologic functions or aquatic habitat needs with the conservation objectives. Therefore, it is essential that land and habitat resources along drainages and riparian fringe areas be considered for acquisition and restoration to serve multiple planning objectives.

4.5.2 Contributing Elements

- Need for assessment of the current regional habitat planning efforts relative to opportunities and gaps in coverage that would benefit accomplishment of SDRWMP goals and objectives.
- Need for coordination of conservation and restoration efforts to leverage the efforts of regional conservation programs and efforts under the SDRWMP to accomplish joint objectives.
- Need to conduct a gap analysis of present conservation efforts and local land-use plans to identify how well these efforts serve the needs of the SDRWMP.
- Need to evaluate opportunities to fulfill habitat restoration and beneficial hydrologic modification within the watershed by looking to joint land uses with conservation areas.

4.5.3 Early Action Recommendations

- Complete a watershed-wide evaluation of present conservation efforts and identify gaps in coverage that are considered important to fulfilling objectives of the SDRWMP.
- Evaluate conservation lands or targeted lands for opportunities to conduct beneficial restoration that would support SDRWMP goals.
- Seek opportunities for joint acquisitions, restoration, and management of lands where a program value is recognized.
- Prioritize habitat restoration opportunities where parallel efforts are underway to enhance watershed functions.

4.5.4 Long-term Action Recommendations

- Identify recommended land-use policy changes that would enhance protection and restoration of riparian and riparian fringe environments.
- Promote regional conservation program objectives that would support multiple purpose benefits that favor accomplishing SDRWMP objectives.
- Develop programmatic partnerships between land-use agencies and environmental stewards that would leverage the capabilities of partners for acquisition, restoration, and management to accomplish multiple goals.

4.6 Exotic Species Control

4.6.1 Summary of Problem

Invasive exotic species pose one of the greatest threats to the conservation of biological diversity on a global scale. In addition, exotic species infestations can significantly alter hydrology, erosion and sedimentation, and water quality conditions within affected areas. Invasive plant species are early colonizers of disturbed habitats and are often competitively superior to the native species. One aspect of many invasive plants species is that it forms dense monotypic patches that reduce available space for native species; as a result of the loss of habitat complexity, habitat for invasive exotic animal species is created. In turn, impacts to natural communities by invasive exotic animal species include unbalanced predation of native species, competition for limited resources, and introduction of vectors for pathogens and parasites.

The SDRW suffers from major infestations of both exotic plants and animals, and their impacts to the system are apparent. Although widespread interest in the effects of invasive exotic species has increased dramatically in the last several years, a coordinated effort to address the problems they create has yet to be developed or institutionally supported to the extent necessary to implement meaningful action in most areas. Further, response to exotic species requires several parallel actions to be undertaken at appropriate scales and within appropriate venues to be effective.

4.6.2 Contributing Elements

Principal exotic species needs to be addressed within the SDRW include the following:

- Need for a programmatic approach to address infestations.
- Need for adequate fiscal and regulatory support to implement control or eradication programs.
- Need for adequate outreach and regulatory support to curb new introductions.
- Need for institution of an on-going surveillance and response program.
- Need for proper recognition and prioritization of exotics infestations within the context of governmentally administered regulatory programs.

4.6.3 Early Action Recommendations

- Complete a watershed-wide inventory of exotic species infestations and prioritize response actions.
- Develop a systematic response plan that integrates surveillance, control and eradication, introduction controls, public and private outreach, and funding programs, and that defines effective management areas and milestones to measure success.
- Initiate pilot eradication efforts in strategic areas to perfect methodologies and expand public and governmental interest, support, and participation.
- Pursue local jurisdictional support to modify local codes and ordinances in a manner that bans the use of invasive species in landscaping or other locally authorized activities.
- Clear out exotic vegetation and actively maintain "exotic plant free areas."
- In areas where potentially impacted endangered species (Least Bell's Vireo, Arroyo Toad) occur, initiate an exotic animal (cowbirds, predatory fish) removal program that includes the on-going maintenance of reduced exotic species abundance.

- Develop a list of ongoing exotic species (plant/animal) eradication/control projects and programs that need support.

4.6.4 Long-term Action Recommendations

- Initiate land management programs that promote the restoration of natural ecological and hydrological processes because healthy ecosystems exert resistance to future invasions of some exotic species.
- Develop based land use policies that permit compatible human activities that do not increase the risk of exotic species introductions such as, prohibiting activities outside of designated areas and trail systems (hiking, bike or horseback riding), the use of live bait for fishing, and the release of animals (fish, frogs, turtles) in the wild.
- Develop an education program for general public about the detrimental effects of nonnative invasive species to natural habitats and the benefits of preserving open space with natural functioning ecosystems.
- Restore and manage habitats with an ecosystem approach for endangered species (Least Bell's Vireo, Arroyo Toad) because other sensitive species would also likely benefit as well.

4.7 Data Management

4.7.1 Summary of Problem

Data management, meaning the active collection, storage, categorization, and analysis of spatial (GIS and CAD), attribute (descriptive), and hard copy (reports and maps) for a defined purpose, is one of the underlying needs within any large-scale management effort. Similar to the issue of cooperation and coordination between the various land managers, the management of data related to the management of the SDRW is also critical since most of the land managers also develop and potentially maintain spatial and attribute information for their respective land areas, or develop reports that pertain to the management of their jurisdictional area. Having a current comprehensive inventory of this data that identifies basic bibliographic or metadata information about the various data sets would be a logical first step as this will help identify data gaps, both spatial and temporal. Once developed and ongoing management responsibility is defined, additional tools to access and manipulate these data can be developed for the purposes of furthering various watershed management activities and goals.

4.7.2 Contributing Elements

A few of key factors contribute to the need for a coordinated data management approach, including:

- **The large number of entities collecting and maintaining data throughout the watershed.** If the large number of entities collecting and maintaining data within the SDRW are to share a common goal for the use of their individual data, then they must coordinate and cooperate with one another.
- **The potential for similar data needs by the various entities collecting data**. A coordinated approach allows for these entities to work toward their common goals, collect the data consistently, and utilize the data in a more efficient and effective manner than if they acted independently. These entities may also need to maintain or develop additional data requirements in addition to the common ones.
- **The potential for redundant data collection efforts.** A coordinated approach can allow for the elimination of spatially redundant data collection points. For example, neighboring jurisdictions could combine some of their collection points into a single data collection point, thus allowing another data collection point to be identified and implemented for the same overall costs.
- **The potential for data collected by different groups to be unusable to other groups without minor modifications, either spatial or attribute.** Without a coordinated approach there is the potential for each entity to collect data using variant techniques and different attributes that may complicate or even make impossible large-scale assessments of various attributes.

4.7.3 Early Action Recommendations

- Support and augment the efforts initiated by the SDRPF in developing and populating an inventory of the various monitoring efforts occurring throughout the SDRW.
- Coordinate within the stakeholder group to determine the availability of data to support the development of high priority action areas and ensure that available data is incorporated into the SDRPF inventory described above and establish priorities for filling any identified data gaps.
- Coordinate within the stakeholder group to determine the feasibility and recommended structure for a SDRW Data Repository to ensure the best available data is accessible to entities involved with management efforts.

5 WMP PLAN IMPLEMENTATION STRATEGY AND STRUCTURE

5.1 Implementation Structure Guidelines

The first step in any implementation plan is to prioritize the actions. Important considerations during the prioritization process are:

- Action efficiencies considering benefits and impediments
- Available funds
- Return on investment of those funds
- Time requirements and other non-financial needs
- Ability to get the action done
- Early successes motivate more action
- The need for pre-curser actions to complete long-term actions
- Regulatory obligations can either facilitate actions or divert resources
- Partnering may be essential to effectively accomplish some actions

Smaller, short-term actions will be required to reach the long-term goal in most cases. For example, inter-jurisdictional coordination and cooperation (long-term) starts with the establishment of a broad-based watershed council or other management body (short-term). Urgent issues may need to be addressed in the short-term but they may be difficult or expensive to achieve, while other short-term efforts are ready to go and relatively simple to implement. Additionally, it is important to get preventative actions underway coincident or before taking restoration actions.

It is also important to consider how to evaluate the success of the WMP. Success may be measured by many metrics, from numerical improvements (number of acres of invasive species removed) to maintaining "to do" and "action completed" lists. Regardless of the metric, it is important to report progress back to both the partnership and to the public via the press. Only by everyone seeing progress will they continue to work toward making the plan a success (CTIC, Getting to Know Your Local Watershed; website: http://www.ctic.purdue.edu/CTIC/CTIC.html).

5.2 Implementation Schedule

The following table shows the various actions identified to date in the SDRWMP. The priorities and project descriptions provided within the table are not intended to be used as strict governance, but as collaborative guidance. Opportunities may arise that support the implementation of a low priority action while several other higher priority actions remain unpursued. As such, both this document and the table will necessarily be modified as actions are completed and as others become identified. [Remaining tasks with the WWG include prioritization of the specific actions to be taken, and concurrence with the study team's assignment of responsibility for taking the actions. The WWG has agreed to prioritize their activities by following the project template used to prioritize projects for Proposition 50 funding.] The project template provided by Project Clean Water is attached as Appendix B.

The labels for the prioritization of the actions shown below refer to possible timeframes for the actions. "E1" identifies early action recommendations of high priority and they would occur between January 2005 and June 2006; "E2" identifies early action recommendations not of high priority and they would occur between June 2005 and January 2008; "L1" identifies long-term action recommendations of high priority and they would occur between January 2006 and January 2010; "L2 identifies long-term action recommendations not of high priority and they would occur between June 2006 and January 2011.

Table 5-1
Implementation Schedule

Priority	Action	Responsible Parties	Time Frame
Interagency Cooperation			
E1	Identify additional stakeholders that need to be engaged and develop an initial committee structure for participation.	WWG	January 2005 to June 2006
E1	Identify the stakeholders that need to coordinate, cooperate, communicate, and collaborate on the highest priority issues within various portions of the SDRW; form specialized working groups that meet and discuss in more detail those issue that are of specific concern to them, and then report back to the larger watershed management group on their findings and recommendations for discussion and approval.	WWG, federal and state land managers, local jurisdictions	January 2005 to June 2006

Table 5-1
Implementation Schedule

Priority	Action	Responsible Parties	Time Frame
L1	Develop over time a management structure and membership that is stable and broad enough to enable more policy type actions to be developed and implemented consistently across jurisdictional and land management boundaries.	Newly formed Watershed Council	January 2006 to January 2010
Education and Outreach			
E1	Identify the various target groups that should be the focus of outreach efforts and use this information to determine the most effective mechanisms for getting the message to them and measuring its effectiveness.	Newly formed Watershed Council, organizations conducting education and outreach	January 2005 to June 2006
E1	Develop or augment outreach materials that define a watershed, where the SDRW is located, its issues, and how individual actions contribute to the problems and solutions.	Newly formed Watershed Council, educators	January 2005 to June 2006
E1	Identify existing outreach programs to integrate the material developed in the previous action and begin disseminating it out to different target groups.	Newly formed Watershed Council, educators	January 2005 to June 2006
L1	Maintain and augment the efforts initiated in the Early Actions.	Newly formed Watershed Council, educators	January 2006 to January 2010
L2	Ensure education and outreach efforts are integrated into every watershed management action, and that these efforts are coordinated and complimentary with each other.	Newly formed Watershed Council, local jurisdictions, water districts	June 2006 to January 2011
Hydromodification			
E2	Develop regional mapping procedure for determining impervious surfaces.	Watershed Council, local jurisdictions, federal and state land managers	June 2005 to January 2008
E2	Develop a watershed modeling framework and goals.	Watershed Council, local jurisdictions, federal and state land managers	June 2005 to January 2008
E1	Develop land use to impervious surface relationship and use it to model potential future impervious conditions within the SDRW.	Watershed Council, local jurisdictions, federal and state land managers	January 2005 to June 2006
E1	Establish monitoring stations to evaluate impervious surfaces.	Watershed Council, local jurisdictions, federal and state land managers	January 2005 to June 2006
E1	Identify and map existing hydromodifications throughout the watershed.	Watershed Council, local jurisdictions, federal and state land managers	January 2005 to June 2006
L2	Integrate impervious surface criteria into land development review process.	Watershed Council, local jurisdictions, federal and state land managers	June 2006 to January 2011

Table 5-1
Implementation Schedule

Priority	Action	Responsible Parties	Time Frame
Groundwater Management			
E1	Develop a centralized, coordinated groundwater data collection effort.	Local jurisdictions, federal and state land managers, water districts, Department of Water Resources (DWR)	January 2005 to June 2006
E1	Research County of San Diego and DWR records to identify active wells within the SDRW.	Watershed Council, water districts, SDRWQCB, DWR	January 2005 to June 2006
E2	Perform field inspections to update well locations and groundwater use.	Water districts, DWR, SDRWQCB	June 2005 to January 2008
E2	Identify which wells have known screening depths.	Water districts, DWR, SDRWQCB	June 2005 to January 2008
E1	Identify existing water quality monitoring being performed by each well owner.	Watershed Council, water districts, DWR, SDRWQCB	January 2005 to June 2006
E1	Select additional groundwater wells as being representative and appropriate for long-term monitoring and use in characterizing regional groundwater availability and quality within the San Vicente, and El Capitan Management Areas.	Water districts, local jurisdictions, DWR, SDRWQCB	January 2005 to June 2006
E1	Secure well owner approval for performing monitoring on the selected representative wells.	Water districts, local jurisdictions, DWR, SDRWQCB	January 2005 to June 2006
E2	Implement a program of periodic monitoring of the selected wells for (1) depth-to-water and (2) water quality monitoring for key groundwater contaminants of concern.	Water districts, local jurisdictions, DWR, SDRWQCB	June 2005 to January 2008
E1	Compile existing information collected by well owners and supplemental information collected as part of the regional groundwater monitoring program into a centralized database.	Water districts, local jurisdictions, DWR, SDRWQCB	January 2005 to June 2006
E1	Request that the County Agriculture Department collect and provide information on fertilizer use and nutrient loads within the watershed.	Watershed Council, educational organizations	January 2005 to June 2006
E1	Request that the University of California Cooperative Extension gather information on fertilizer use and management strategies.	Watershed Council, educational organizations	January 2005 to June 2006
E1	Coordinate with the U.S. Natural Resource Conservation Service, County Department of Agriculture, and Farm Bureau for educating growers on (1) the use of liquid (irrigation fed) fertilizer systems, (2) proper fertilization use and strategies, and (3) and best management practices for erosion control and storm runoff protection.	Watershed Council, educational organizations	January 2005 to June 2006

Table 5-1
Implementation Schedule

Priority	Action	Responsible Parties	Time Frame
E1	Continue and expand ongoing education programs to include information to educate residents and growers on proper fertilizer techniques and best management practices.	Watershed Council, educational organizations	January 2005 to June 2006
E1	Continued regulation and oversight of septic tank waste discharges by the SDRWQCB.	SDRWQCB	January 2005 to June 2006
E1	Continued regulation of land use by the County of San Diego in accordance with the County's Groundwater Ordinance.	County of San Diego	January 2005 to June 2006
E2	Coordination between the County of San Diego and SDRW Indian Reservations in regulation of groundwater use.	County of San Diego	June 2005 to January 2008
E1	Continued oversight and regulation of storm runoff by the Regional Water Quality Control Board.	SDRWQCB	January 2005 to June 2006
L2	Develop updated salt balance estimates for the principal alluvial aquifers of the San Diego Management Area and project future water quality trends.	Water districts, County of San Diego, local jurisdictions, SDRWQCB	June 2006 to January 2011
L2	Determine if further regulation of wastewater dischargers are appropriate.	Water districts, County of San Diego, local jurisdictions, SDRWQCB	June 2006 to January 2011
L2	Determine if physical projects should be considered for enhancing groundwater supply or groundwater quality.	Water districts, County of San Diego, local jurisdictions, SDRWQCB	June 2006 to January 2011
L2	Determine if revision of the Basin Plan is warranted.	Water districts, County of San Diego, local jurisdictions, SDRWQCB	June 2006 to January 2011
Habitat Degradation			
E1	Complete a watershed-wide evaluation of present conservation efforts and identify gaps in coverage that are considered important to fulfilling objectives of the SDRWMP.	SDRWQCB	January 2005 to June 2006
E1	Evaluate conservation lands or targeted lands for opportunities to conduct beneficial restoration that would support SDRWMP goals.	Watershed Council	January 2005 to June 2006
E2	Seek opportunities for joint acquisitions, restoration, and management of lands.	Watershed Council, land managers	June 2005 to January 2008
E1	Prioritize habitat restoration opportunities where parallel efforts are underway.	Watershed Council, local jurisdictions	January 2005 to June 2006
L1	Identify recommended land-use policy changes that would enhance protection and restoration of riparian and riparian fringe environments.	Watershed Council, local jurisdictions	January 2006 to January 2010

Table 5-1
Implementation Schedule

Priority	Action	Responsible Parties	Time Frame
L1	Promote regional conservation program objectives that would support multiple purpose benefits that favor accomplishing SDRWMP objectives.	Watershed Council, local jurisdictions	January 2006 to January 2010
L2	Develop programmatic partnerships between land-use agencies and environmental stewards that would leverage the capabilities of partners to accomplish multiple goals.	Watershed Council, local jurisdictions	June 2006 to January 2011
Exotic Species Control			
E2	Complete a watershed-wide inventory of exotic species infestations and prioritize response actions.	Watershed Council, weed management programs, research organizations	June 2005 to January 2008
E2	Develop an exotic species systematic response plan that integrates surveillance, control and eradication, introduction controls, outreach, and funding programs.	Watershed Council, weed management programs, research organizations, local jurisdictions	June 2005 to January 2008
E1	Initiate pilot eradication efforts in strategic areas to perfect methodologies and expand public and governmental interest, support, and participation.	Watershed Council, weed management programs, research organizations, local jurisdictions	January 2005 to June 2006
E2	Pursue local jurisdictional support to modify local codes and ordinances to ban the use of invasive species in landscaping or other locally authorized activities.	Watershed Council	June 2005 to January 2008
E1	Clear out exotic vegetation and actively maintain “exotic plant free areas.”	Watershed Council, weed management programs, research organizations, local jurisdictions	January 2005 to June 2006
E2	In areas where potentially impacted endangered species, initiate an exotic animal removal program.	Watershed Council, weed management programs, research organizations, local jurisdictions	June 2005 to January 2008
E2	Develop a list of ongoing exotic species (plant/animal) eradication/control projects and programs that need support.	Watershed Council, weed management programs, research organizations, local jurisdictions	June 2005 to January 2008
L2	Initiate land management programs that promote the restoration of natural ecological and hydrological processes.	Local jurisdictions, land managers	June 2006 to January 2011
L2	Develop land use policies that do not permit human activities that increase the risk of exotic species introductions.	Local jurisdictions, land managers	June 2006 to January 2011
L1	Develop an education program for general public about the detrimental effects of nonnative invasive species to natural habitats and the benefits of preserving open space with natural functioning ecosystems.	Watershed Council, local jurisdictions, land managers	January 2006 to January 2010
L1	Restore and manage habitats with an ecosystem approach for endangered species.	All watershed stakeholders	January 2006 to January 2010

Table 5-1
Implementation Schedule

Priority	Action	Responsible Parties	Time Frame
Data Management			
E1	Support and augment the efforts initiated by the SDRPF in developing and populating an inventory of the various monitoring efforts occurring throughout the SDRW.	Watershed Council, educators, research organizations	January 2005 to June 2006
E1	Coordinate within the WWG to determine the availability of data to support the development of high priority action areas and ensure that available data is incorporated into the SDRPF inventory described above and establish priorities for filling any identified data gaps.	Watershed Council	January 2005 to June 2006
E1	Coordinate within the stakeholder group to determine the feasibility and recommended structure for a SDRW Data Repository to ensure the best available data is accessible to entities involved with management efforts.	Watershed Council	January 2005 to June 2006
L1	Implement the recommended structure for the SDRW Data Repository and ensure the integration and maintenance of the SDRPF data inventory.	Watershed Council	January 2006 to January 2010
L2	Develop cooperative agreements among the major land managers and jurisdiction regarding the development and ultimate use of data necessary to plan for, develop, and implement management actions within the SDRW.	Watershed Council	June 2006 to January 2011

5.3 Regulatory Conflicts – Beneficial Use Designation

The establishment of an achievable vision and supporting principles that fit the natural capacity of the watershed is a crucial component in determining the action recommendations. “Natural capacity” refers to the ability of the watershed to support beneficial uses. While designated or potential beneficial uses can be achieved or enhanced within the SDRW, the extent of the improvement can and does vary for given beneficial uses. An understanding of what can and cannot be achieved is critical to establishing action priorities.

The SDRWMP evaluates the opportunities for meaningful management benefits and makes recommendations for actions based on the achievable beneficial uses. Where applicable, the uses. An understanding of what can and cannot be achieved is critical to establishing action priorities.

The SDRWMP evaluates the opportunities for meaningful management benefits and makes recommendations for actions based on the achievable beneficial uses. Where applicable, the beneficial uses are placed in context of management recommendations, and highest priority is given to actions that would result in the greatest achievable improvements.

While regulatory policies and numeric limits are considered to be tools that can aid in the implementation of SDRW recommendations, they do not necessarily form the basis for establishing goals for improvements within the watershed. A case in point can be seen when one considers the relative roles of two different impairments within the SDRW: exotic species, a non-regulated issue, and TDS, a regulated water quality parameter. It is almost certainly the case that the ubiquitous presence of exotic species has been the greatest single factor resulting in degradation of remaining riparian habitats, aquatic communities, and rare species within the San Diego River, yet no local, state, or federal regulatory program directly addresses this concern, and efforts to systematically address exotic species impacts are not uniformly supported as a priority. Conversely, TDS within the upper San Diego River has not been demonstrated to result in significant adverse effects to designated beneficial uses yet, significant resources are directed to address compliance with numeric limits on TDS. It is logical that a WMP with goals for tangible improvements in the watershed would prioritize actions on exotic species ahead of actions on TDS in certain areas. Unfortunately, where resources are limited, actions must first focus on legal compliance and secondarily on non-mandated activities to avoid legal challenges.

Since it is important that the SDRWMP focus on measures to provide tangible benefits to achieving the defined objectives of the planning effort, SDRWMP recommendations focus on activities that link directly to issues of concern within the watershed or portions of the watershed rather than specifically on the attainment of water quality objectives as required by the Basin Plan or other regulatory policy. The SDRWMP identifies issues and outlines recommendations without regard to legal obligations for action; however the issues of concern may intersect the regulatory compliance defined for a beneficial use.

Along the same line, it should also be noted that a serious impediment to taking significant watershed management actions can be the diversion of limited resources to mandatory compliance requirements that are of lesser importance to overall watershed health than are some of the unregulated issues. For this reason, it is strongly recommended that the regulated and regulatory communities work collaboratively to prioritize the phasing of activities and to establish regulatory compliance schedules where applicable in a manner that allows for the effective and timely implementation of high priority actions and deferral of lesser needs, whether or not the actions are driven by regulatory obligations. In particular, exotic species control and sedimentation and erosion control within instream sources are more urgently needed within the SMRW than is immediate compliance with some of the regulated numeric receiving water limits and Basin Plan objectives. While this management plan does not advocate dismissal of regulatory standards, it does advocate prioritization of management actions based on net benefits and establishment of implementation schedules and activities across stakeholders appropriately to maximize watershed improvements under resource limited conditions.

5.4 Stakeholder Conflicts and Conflict Management

Conflicts are an almost inevitable aspect of any planning or implementation process that has more that one entity involved. These conflicts are not always negative, and can be healthy when effectively managed to lead to growth and innovation and additional management options (CTIC, Managing Conflict; website: http://www.ctic.purdue.edu/CTIC/CTIC.html). They can arise from a wide variety of sources and be associated with a wide range of issues. Some conflicts will arise from internal sources (i.e. between stakeholders) over issues like priorities, money, recognition, and many other interpersonal and interagency motives. Conflicts typically arise when it is perceived that the needs of all participants are not considered; as the result of perceived threats; inappropriate use of power or influence; a difference of values; and from differing feelings and emotions over particular issues. Other conflicts may be due to management actions requiring modification of existing codes, ordinances, or regulations within each jurisdiction that may or may not be fully understood or supported within those organizations. These actions may also be perceived as being contrary to other goals and objectives of the organization. These conflicts will take time to resolve and are a key reason for initiating these types of actions early, even if they are to resolve the conflict? Would consensus serve all interests? What is the timeline for a decision?

2. **Determine management strategy.** Is a neutral facilitator needed? Can a "win-win" strategy be developed, or is this a competitive "win-lose" situation? What compromises must be made by whom? How willing are the participants to compromise?
3. **Pre-Negotiation.** Here is where the ground work is laid for negotiations. What is negotiable and what is not? What are the ground rules for communication, negotiation, and decision-making? What are the objectives and how will the negotiation process be organized?
4. **Negotiation.** During this step, the interests and options are openly discussed. The options are discussed and the areas of agreement and disagreement are understood. Commitment must be made by all involved parties to carry out their parts of the agreement.
5. **Post-Negotiation.** This is where the negotiated actions are implemented and where monitoring occurs. Support from other stakeholders or partners may be necessary. The monitoring plan to measure success is developed and successes are documented and celebrated.

5.5 Funding to Implement Strategies

This information is being developed and will be included in the final draft management plan.

Funding for this project has been provided in full or in part through a contract with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

6 REFERENCES

Anchor Environmental CA, L.P., Everest International Consultants, KTU+A, Merkel and Associates, TRAC, Welch, Michael. 2004[1]. San Diego River Watershed Management Plan – Baseline Assessment; Subtask 10.8. Prepared for the San Diego River Watershed Work Group.

Anchor Environmental CA, L.P., Everest International Consultants, KTU+A, Merkel and Associates, TRAC, Welch, Michael. 2004[2]. San Diego River Watershed Management Plan – Stakeholders Input Report No. 2; Subtask 11.3. Prepared for the San Diego River Watershed Work Group.

Anchor Environmental CA, L.P., Everest International Consultants, KTU+A, Merkel and Associates, TRAC, Welch, Michael. 2003. San Diego River Watershed – Water Quality Report Subtask 8.5. Prepared for the San Diego River Watershed Work Group.

City of San Diego. 2004. Water Department Source Water Protection Guidelines for New Development. January 2004.

CTIC (Conservation Technology Information Center). Undated. Getting to Know Your Local Watershed; a Guide for Watershed Partnerships. Website: http://www.ctic.purdue.edu/CTIC/CTIC.html

CTIC (Conservation Technology Information Center). Undated. Managing Conflict; a Guide for Watershed Partnerships. Website: http://www.ctic.purdue.edu/CTIC/CTIC.html

Ervin, E.L., R.N. Fisher, K. Madden. 2000. Predation: *Hyla cadaverina* (California Treefrog) Herpetological Review 31(4), p. 234.

Hovey, T.E. and E.L. Ervin (In Press) Predation: *Pseudacrisa cadaverina* (California Treefrog) Herpetological Review.

Holway, D.A., A.V. Suarez and T.J. Case. 2002. The role of abiotic factors in governing susceptibility to invasion: a test with a widespread invasive social insect. Ecology 83:1610-1619.

Madden-Smith, M., E.L.Ervin, K. Meyer, S. Hathaway, and R. Fisher. 2004. Distribution and Status of the Arroyo Toad (*Bufo californicus*) and Western Pond Turtle (*Emmys marmorata*) in the San Diego MSCP and Surrounding Areas. Prepared by U.S. Geological Survey, Biological Resources Discipline. San Diego Field Station. Technical report prepared for California and California Department of Fish and Game, County of San Diego, and Sweetwater Authority, San Diego, California. Under Contract.

MEC. 2004. San Diego County Municipal Copermittees 2002-2003 Urban Runoff Monitoring. Volume 1, Final Report. Prepared for County of San Diego. January 2004.

Ortega, C.P. 1998. Cowbirds and Other Brood Parasites. University of Arizona Press. Arizona.

Pasek, J. 2004. Personal communication between Jeff Pasek, City of San Diego Water Department and Liz Giffen, County of San Diego. Email on June 23, 2004.

Peterson, B.L., B.E. Kus, and D. H. Deutschman. 2004. Determining nest predators of the Least Bell's Vireo through point counts, tracking stations, and video photography. Jour. Field Ornith. 75:89-95.

Porter, M. 2003. California Regional Water Quality Control Board, San Diego Region. 2003. Status Report: San Diego River Watershed. To John H. Robertus from Michael Porter, September 10, 2003.

Suarez, A.V. and T.J. Case. 2002. Bottom-up effects on the persistence of a specialist predator: ant invasions and coastal horned lizards. Ecological Applications 12:291-298.

TAIC and USGS. 2002. Studies of the Arroyo Toad and Coast Range Newt on the Upper San Diego River Watershed — Annual Report. Prepared by Technology Associates International Corporation, San Diego, California, and U.S. Geological Survey, Biological Resources Discipline, San Diego Field Station. Prepared for Helix Water District, San Diego County. Under Contract.

USGS (U.S. Geological Survey). 1997. Water Data of California. U.S. Geological Survey. Menlo Park, CA.

USGS (U.S. Geological Survey). 2002. Water Data of California. Menlo Park, CA.