San Diego
Water Department

Watershed Sanitary Survey

Volume 1 of 5
Executive Summary
January 2001
revised May 2003

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INTRODUCTION

This is the executive summary of the 2001 Watershed Sanitary Survey Update for the San Diego Water Department. In total the Watershed Sanitary Survey reports on eight watersheds and nine surface water reservoirs all located in San Diego County, California that comprise the local source waters used by the San Diego Water Department (Figures 1 and 2).

Watershed Sanitary Survey Requirements

California s Surface Water Treatment Rule Title 22, State Code of Regulations requires that every public water system using surface water conduct a comprehensive sanitary survey of its watersheds every five years. The purpose of a watershed sanitary survey is to identify actual or potential sources of contamination in the watersheds, and any other watershed related factors which are capable of producing adverse effects on the quality of water used for domestic drinking water purposes.

The San Diego Water Department and it s oversight agencies will use the Watershed Sanitary Survey Update (WSS Update) to evaluate the existing and potential water quality problems which could result from contaminants in the watersheds. The WSS Update will also serve as the foundation for and provide input to future watershed management and watershed planning efforts.

The initial sanitary survey of the San Diego Water Department s watersheds was completed in 1996. The report you have before you is the first five-year update of the watershed sanitary survey.

Objectives

The main objectives of this update of the WSS Update are as follows:

- Satisfy the regulatory requirement for a watershed sanitary survey.
- Identify and assess existing sources of contamination in the watersheds.
- Identify and assess potential future sources of contamination in the watersheds.
- Provide a general description of existing watershed control and management practices.
- Provide general recommendations for improvements to the watershed management practices which will protect the quality of the surface waters entering the reservoirs.

Figure 1

San Diego
Water Department

Watersheds and Source Water System

A watershed is the land area that drains to a single point.

This map shows the land areas, or watersheds, that are tributary to the water supply reservoirs of the San Diego Water Department.

Pacific Ocean

Hodges Watershed (248 square miles)
Sutherland Watershed (54 square miles)
El Capitan Watershed (189 square miles)
San Vicente Watershed (74 square miles)
Miramar Watershed (1 square mile)
Murray Watershed (4 square miles)
Otay Watershed (99 square miles)
Dulzura Watershed (11 square miles)
Barrett Watershed (121 square miles)
Cottonwood Watershed (244 square miles total)
Morena Watershed (114 square miles)

Imported Water Aqueducts
Escondido
Hodges Reservoir 29,000 AF
Sutherland Reservoir 30,000 AF
Sutherland - San Vicente Pipeline
Julian
Lake Ramona
Lake Poway
Ramona
Poway
Lake Cuyamaca
San Vicente Reservoir 90,000 AF
Miramar Reservoir 7,000 AF
Miramar WTP (140 MGD/215 MGD)
El Capitan Reservoir 113,000 AF
San Vicente Pipelines
El Capitan Pipeline
Miramar Service Area
El Monte Pipeline
Lakeside
Descanso
Alpine
Santee
Pine Valley
Murray Reservoir 4,000 AF
El Cajon
Loveland Reservoir
Alvarado WTP (120 MGD/200 MGD)
Alvarado Service Area
Morena Reservoir 50,000 AF
Sweetwater Reservoir
Jamul
Barrett Reservoir 45,000 AF
Otay Service Area
Otay Reservoir 58,000 AF
Chula Vista
Dulzura
Campo
Otay WTP (35 MGD/40 MGD)
Dulzura Conduit
Otay Service Area

SDWD Watersheds (watershed area, square miles)
SDWD Lands
SDWD Reservoirs
Lakes & Reservoirs, not SDWD
Streams & Rivers in SDWD Watersheds
Streams & Rivers not in SDWD Watersheds
SDWD Raw Water Pipelines
CWA Imported Water Aqueducts
Dulzura Conduit
SDWD Water Treatment Plants (existing capacity / future capacity)

SDWD Water Treatment Plant Service Areas
Miramar Service Area
Alvarado Service Area
Otay Service Area
Freeways and Major Highways
Jamul Communities or Cities

0 1 2 3 4 5 Miles

N W E S

SDWD - Watershed GIS

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WSS Volume 1\wtrshd_wtrsys_Fig 1.ap

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Updated May 23, 2003

Figure 2

San Diego
Water Department

Aerial Photograph* with Watersheds and Source Water System

Pacific Ocean

Hodges Watershed

Sutherland Watershed

Sutherland Reservoir

Sutherland - San Vicente Pipeline

El Capitan Watershed

Imported Water Aqueducts

Hodges Reservoir

San Vicente Reservoir

San Vicente Watershed

El Capitan Reservoir

Miramar WTP

Miramar Reservoir & Watershed

San Vicente Pipelines

El Capitan Pipeline

El Monte Pipeline

Alvarado WTP

Murray Reservoir & Watershed

Cottonwood Watershed

Morena Watershed

Morena Reservoir

Barrett Reservoir

Barrett Watershed

Otay Watershed

Otay Reservoir

Dulzura Watershed

Otay WTP

Dulzura Conduit

* This is a false-color infared orthographic image, derived from a mosaic of aerial photographs taken in 2000.

SDWD Watersheds
Streams & Rivers in SDWD Watersheds
Streams & Rivers not in SDWD Watersheds
SDWD Raw Water Pipelines
CWA Imported Water Aqueducts
Dulzura Conduit

0 1 2 3 4 5 Miles

SDWD - Watershed GIS

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Report Organization

The 2001 WSS Update is organized around the San Diego Water Department s three water treatment plants. The local reservoirs and watersheds that supply each of the treatment plants are reported on in a single volume, with a separate volume for Hodges Reservoir, plus the Executive Summary. Thus, the organization of the 2001 WSS Update is as follows.

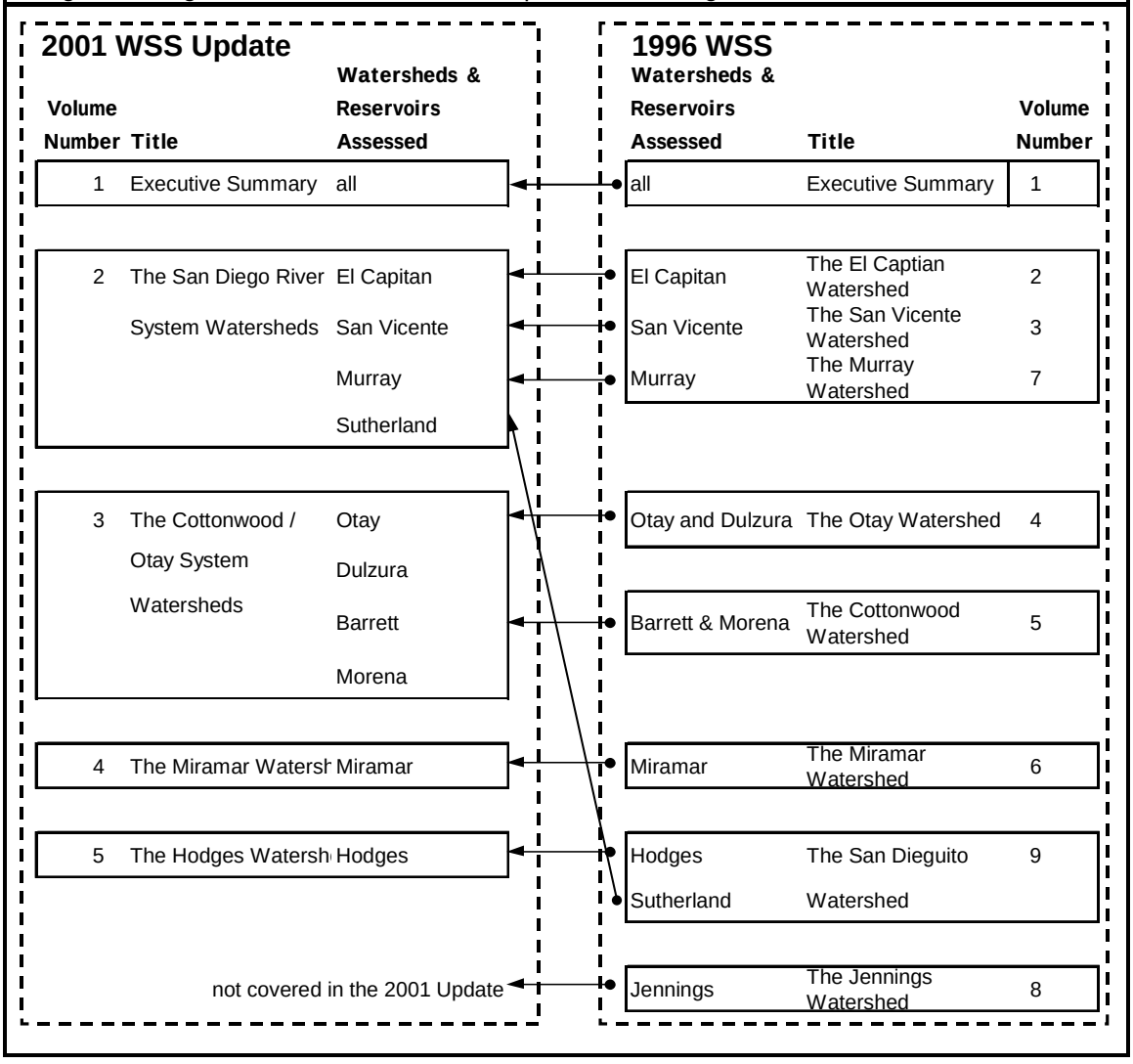
- Volume 1 - Executive Summary of the subsequent four volumes; this is volume you have before you.
- Volume 2 - The San Diego River System Watersheds; this volume covers the watersheds that supply water to the Alvarado Water Treatment Plant; these are the San Vicente, El Captian, Sutherland, and Murray Watersheds.
- Volume 3 - The Cottonwood - Otay System Watersheds; this volume covers the watersheds that supply water to the Otay Water Treatment Plant; these are the Otay, Dulzura, and Cottonwood Watersheds.
- Volume 4 - The Miramar Watershed; which supplies water to the Miramar Water Treatment Plant.
- Volume 5 - The Hodges Watershed; this volume covers the watershed of Hodges Reservoir, which does not supply water to any of the San Diego Water Department s treatment plants.

The organizational structure of the 2001 WSS Update differs significantly from the structure of the first Watershed Sanitary Survey conducted in1996. The relationship of the two versions can be understood by examining Figure 3.

Volumes 2 through 5 of the 2001 WSS Update are organized to generally follow the Watershed Sanitary Survey Guidance Manual as prepared by the California-Nevada Section of the American Water Works Association, published in1 993. Volumes 2 through 5 have the same general structure, with the following table of contents.

- Chapter 1: Summary
- Chapter 2: Introduction
- Chapter 3: Summary of the 1996 Watershed Sanitary Survey
- Chapter 4: Review of Recommendations of the1996 Sanitary Survey
- Chapter 5: Changes in the Watershed Since the 1996 Sanitary Survey
- Chapter 6: Water Quality
- Chapter 7: Conclusions and Recommendations

Figure 3. Organization of the 2001 WSS Update versus Organization of the 1996 WSS.



DESCRIPTION OF WATERSHEDS AND SOURCE WATER SYSTEM

Overview of the Source Water System

The San Diego Water Department's local source water system consists of nine reservoirs, the watershed lands tributary to these reservoirs, and raw water conveyances connecting the reservoirs to one another and to the water treatment plants (Figure 1).

The San Diego Water Department operates three water treatment plants, and it is useful to group the reservoirs and watersheds into three systems, each supplying raw water to a water treatment plant. Thus, the Cottonwood - Otay

System supplies the Otay Water Treatment Plant; the San Diego River System supplies the Alvarado Water Treatment Plant; and the Miramar System supplies the Miramar Water Treatment Plant. Each of these systems is described below. Hodges Reservoir and Watershed does not currently serve a San Diego Water Department water treatment plant and is described separately.

The local source water system is located in southern and central San Diego County on the western slope of the peninsular mountains. The region has a Mediterranean climate with distinct wet and dry seasons. Precipitation generally increases from west to east, with annual precipitation ranging from an average of about ten inches per year at Lake Murray to over 40 inches per year in the upper portions of the El Capitan and Sutherland Watersheds. Nearly all precipitation occurs in October through April. Winter snowfalls are common, though ephemeral, in the highest elevations of the watersheds. Summers are dry and hot.

The San Diego River System

Watersheds and Reservoirs

The San Diego River System consist of four reservoirs San Vicente, El Capitan, Murray, and Sutherland and their respective watersheds, plus interconnecting raw water pipelines (Figure 4). The four watersheds of the San Diego River System have an total area of 205,140 acres or about 321 square miles.

The San Vicente, El Capitan, and Murray Watersheds are geographical sub-units of the San Diego River basin, while the Sutherland Watershed is located in a different river basin the San Dieguito River. Water impounded in Sutherland Reservoir is transferred to San Vicente Reservoir and thus, for the purposes of this report, Sutherland Reservoir is considered part of the San Diego River System. All four reservoirs and watersheds are located in the central portion of San Diego County.

The San Vicente Watershed (47,545 acres) extends from foothills to interior valleys to low mountains. Land uses in the watershed are varied - parts of the watershed are remote, rural, and largely shielded from development while other areas are highly developed and densely populated. Although the overall population density remains low (0.3 persons per acre), the pace of new development and population growth has accelerated over the past five years. Approximately two-thirds of the land in the watershed is privately owned and much of this private land is available for residential, commercial, or agricultural development.

The El Capitan Watershed (120,773 acres) encompasses foothills, interior valleys, and the highest mountains in San Diego County, cresting at Cuyamaca

Figure 4

San Diego
Water Department

The San Diego River System

Hodges Watershed
(248 square miles)

Sutherland Watershed
(54 square miles)

Sutherland Reservoir
30,000 AF

Sutherland - San Vicente Pipeline

Imported Water Aqueducts

Escondido

Hodges Reservoir
29,000 AF

Julian

El Capitan Watershed
(189 square miles)

Lake Ramona

Lake Poway

Ramona

Poway

Lake Cuyamaca

San Vicente Watershed
(74 square miles)

San Vicente Reservoir
90,000 AF

7,000 AF

Miramar WTP
(140 MGD/215 MGD)

Miramar Watershed
(1 square mile)

El Capitan Reservoir
113,000 AF

San Vicente Pipelines

El Capitan Pipeline

El Monte Pipeline

Miramar Service Area

Lakeside

Santee

Descanso

Alpine

Pine Valley

Murray Reservoir
4,000 AF

El Cajon

Cottonwood Watershed
(244 square miles total)

Morena Watershed
(114 square miles)

Alvarado WTP
(120 MGD/200 MGD)

Murray Watershed
(4 square miles)

Loveland Reservoir

Alvarado Service Area

Morena Reservoir
50,000 AF

Sweetwater Reservoir

Jamul

Otay Watershed
(99 square miles)

Barrett Reservoir
45,000 AF

Barrett Watershed
(121 square miles)

Otay Service Area

Otay Reservoir
58,000 AF

Dulzura Watershed
(11 square miles)

Chula Vista

Dulzura

Otay WTP
(35 MGD/40 MGD)

Dulzura Conduit

Campo

San Diego River System

San Diego

(watershed area, square miles) SDWD Watersheds
SDWD Lands
SDWD Reservoirs
Lakes & Reservoirs, not SDWD
Streams & Rivers in SDWD Watersheds
Streams & Rivers not in SDWD Watersheds
SDWD Raw Water Pipelines
CWA Imported Water Aqueducts
Dulzura Conduit
SDWD Water Treatment Plants (existing capacity / future capacity)

SDWD Water Treatment Plant Service Areas
Miramar Service Area
Alvarado Service Area
Otay Service Area

0 1 2 3 4 5 Miles

N
W E
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SDWD - Watershed GIS

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October 16, 2002

prepared by J. Pasek and J. Kapchinske

Layout = Source Water System Tabloid Size
Updated February 24, 2003

Peak (6540 feet above sea level). About two-thirds of the watershed is publicly owned land. The Cleveland National Forest is the major public land management agency in the watershed. While only 8% of the watershed currently has residential and commercial land uses, and the overall population density is low (0.13 persons per acre), significant development and growth has occurred over the past five years, specifically in the suburban community of Alpine at the southern end of the watershed and the rural community of Julian at the north. Cuyamaca Reservoir, owned by the Helix Water District, is located in the upper reaches of the El Capitan Watershed.

The Murray Watershed (2,298 acres) is highly urbanized. Much of the watershed (about 60%) is privately owned, and essentially all of this private land is fully built-out for residential and commercial uses. The publicly owned land, which comprises 40% of the watershed, is about evenly divided between urban park uses (e.g. ball fields, golf courses, neighborhood parks) and open space parkland preserved in Mission Trails Regional Park. The population density in the watershed is about 11 persons per acre. Murray Reservoir itself is surrounded by a diversion ditch which intercepts dry weather, low flow, and first flush runoff from all tributaries and diverts it around the reservoir to a discharge point below the dam. At higher runoff levels, for example, during major storm events, surface flow carries past the diversion system and into the reservoir.

The Sutherland Watershed (34,525 acres) is located in mostly mountainous terrain at the uppermost end of the San Dieguito River. It is rural and sparsely populated, with an average population density of 0.04 persons per acres. About two-thirds of the watershed is privately owned, and another 20% is Indian Reservation. Less than 2% of the watershed is devoted to residential and urban types of development, centered mainly around the small community of Santa Ysabel.

The San Diego River System

Water Supply System

Local runoff from the San Diego River System Watersheds is impounded in five major reservoirs (Sutherland, San Vicente, Cuyamaca, El Capitan, and Murray Reservoirs). Water impounded in Cuyamaca Reservoir is transferred along natural channels to El Capitan Reservoir. Water in Sutherland Reservoir is conveyed via a pipeline and a natural channel to San Vicente Reservoir.

Average annual runoff for El Capitan, San Vicente, and Sutherland Reservoirs is 27,800 AF/year, 7,400 AF/year, and 11,200 AF/year, respectively. Local runoff to Murray Reservoir is much smaller, at about 100 AF/year.

Imported water from the San Diego County Water Authority s First San Diego Aqueduct can be delivered to San Vicente, El Capitan, and Murray Reservoirs and stored there for future use.

Water impounded or stored in San Vicente, El Capitan, and Murray Reservoirs is delivered via a system of pipelines to the San Diego Water Department s Alvarado Water Treatment Plant. Water from El Capitan Reservoir is also delivered to the Helix Water District s R. M. Levy Water Treatment Plant.

The Alvarado Water Treatment Plant is a 120 MGD conventional water treatment plant using flocculation, sedimentation, and dual media filters. The plant is currently undergoing an expansion to 200 MGD ultimately the improvements will include ozone for primary disinfection.

The Cottonwood - Otay System

Reservoirs and Watersheds

The Cottonwood - Otay System consists of Morena, Barrett, and Otay Reservoirs and the Dulzura Conduit (Figure 5).

Morena and Barrett Reservoirs are impoundments along Cottonwood Creek. Downstream from Barrett Dam, Cottonwood Creek flows into Mexico and joins the Tijuana River. However, water impounded at Barrett Reservoir is diverted into the Dulzura Conduit, which follows an alignment entirely within the United States and discharges into Dulzura Creek at the headwaters of the Otay River. Ultimately, water from Barrett and Morena reaches Otay Reservoir. Thus, this system transfers water from the Tijuana River Basin to the Otay River Basin.

Natural runoff from a small area upslope of the Dulzura Conduit can be captured into the conduit via a series of diverting structures (Figure 5). This land area is ~~known as the Dulzua Water~~shed, and since it contributes directly to Otay Reservoir, it is considered part of the Cottonwood-Otay System.

The watersheds of the Cottonwood-Otay System have a combined area of 226,245 acres, or about 354 square miles.

The Cottonwood Watershed (155,984 acres) extends from steep-sided, low elevation valleys in the west to high mountains in the east. It is the least developed of all the watersheds contributing to the San Diego Water Department s local water supply. More than 90% of the watershed is classified as vacant and undeveloped land, while less than 1% is devoted to residential developments. Large portions of the Cottonwood Watershed are under the jurisdiction of the Cleveland National Forest.

Figure 5
San Diego
Water Department

The Cottonwood-Otay System and the Miramar System

Hodges Watershed
(248 square miles)
Sutherland Watershed
(54 square miles)
Sutherland Reservoir
30,000 AF
Sutherland - San Vicente Pipeline
Imported Water Aqueducts
Escondido
Hodges Reservoir
29,000 AF
Julian
El Capitan Watershed
(189 square miles)
Lake Ramona
Lake Poway
Ramona
Poway
Lake Cuyamaca
Miramar System
San Vicente Watershed
(74 square miles)
San Vicente Reservoir
90,000 AF
7,000 AF
Miramar WTP
(140 MGD/215 MGD)
Miramar Watershed
(1 square mile)
El Capitan Reservoir
113,000 AF
San Vicente Pipelines
Miramar Service Area
El Monte Pipeline
El Capitan Pipeline
Lakeside
Descanso
Alpine
Santee
Pine Valley
4,000 AF
El Cajon
Cottonwood Watershed
(344 square miles total)
Morena Watershed
(114 square miles)
Loveland Reservoir
Alvarado WTP
(120 MGD/200 MGD)
Murray Watershed
(4 square miles)
Alvarado Service Area
Morena Reservoir
50,000 AF
Cottonwood-Otay System
Sweetwater Reservoir
Jamul
Barrett Reservoir
45,000 AF
Otay Watershed
(99 square miles)
Barrett Watershed
(121 square miles)
Otay Service Area
Otay Reservoir
58,000 AF
Dulzura Watershed
(11 square miles)
Dulzura
Chula Vista
Otay WTP
(35 MGD/40 MGD)
Dulzura Conduit
Campo
Otay Service Area

(watershed area, square miles) SDWD Watersheds
SDWD Lands
SDWD Reservoirs
Lakes & Reservoirs, not SDWD
Streams & Rivers in SDWD Watersheds
Streams & Rivers not in SDWD Watersheds
SDWD Raw Water Pipelines
CWA Imported Water Aqueducts
Dulzura Conduit
SDWD Water Treatment Plants (existing capacity / future capacity)

SDWD Water Treatment Plant Service Areas
Miramar Service Area
Alvarado Service Area
Otay Service Area

0 1 2 3 4 5 Miles

SDWD - Watershed GIS
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The Otay / Dulzura Watershed (70,322 acres) is characterized by relatively steep mountains in the east and relatively gentle valleys and rolling hills to the west. Currently, more than 80% of the watershed is vacant and undeveloped land. Agriculture accounts for approximately 5% of the land area, and residential development accounts for an additional 5%.

In recent years there has been significant residential and commercial development in the vicinity of Otay Reservoir, and numerous new developments are anticipated in the western portion of Otay Watershed in the next few years.

The Cottonwood - Otay System

Water Supply System

Local runoff from the Otay - Cottonwood System is impounded in four reservoirs Morena, Barrett, Upper Otay and Lower Otay. Water impounded in Morena Reservoir is transferred to Barrett Reservoir along the natural course of Cottonwood Creek. Water from Barrett Reservoir is transferred to Lower Otay Reservoir using the Dulzura Conduit and Dulzura Creek. Runoff from the Dulzura Watershed is diverted directly into the Dulzura Conduit and then conveyed to Lower Otay Reservoir. Water captured in Upper Otay Reservoir is released to Lower Otay Reservoir, which is located immediate downstream of Upper Otay dam.

Lower Otay Reservoir serves as the southern terminus of the San Deigo County Water Authority Second San Diego Aqueduct, carrying imported water to the San Diego area. Thus, water in Lower Otay Reservoir is a blend of water from two different local river basins, plus water imported from the Colorado River and California State Water Project.

Average annual runoff for Cottonwood Watershed is 22,200 AF/year. Average annual runoff for the Otay /Dulzura Watershed is 6,400 AF/year. Ignoring losses to evaporation, the combined local runoff in these watersheds (28,600 AF/year) would represent approximately 11 percent of the total water supply for the San Diego Water Department. Actual yield from the watersheds is significantly less than this amount.

The Otay Water Treatment Plant is a conventional 40 MGD water treatment plant using flocculation, sedimentation and dual media filters.

The Miramar System

Reservoir and Watershed

The Miramar System consists of Miramar Reservoir and its watershed (Figure 5). The Miramar Watershed is relatively small, with an area of only 645 acres or about one square mile. It is located in the western portion of San Diego County,

California.

The Miramar Watershed is the most developed of all the San Diego Water Department s watersheds. Twenty-four percent of the watershed is developed as residential area. The reservoir itself accounts for 21% of the watershed area, and the remaining 55% is occupied by surface streets, community parks, open space parks, and the area of the Miramar Water Treatment Plant. Most of the rain runoff from residential areas and surface streets is diverted out of the watershed via storm drains only a small part of the residential area drains to Miramar Reservoir.

The Miramar System

Water Supply System

Miramar Reservoir is almost totally dependent on imported water, which is supplied via the San Deigo County Water Authority Second San Diego Aqueduct, carrying Colorado River and State Project water. Miramar Reservoir receives very little local runoff runoff is limited to rain that falls on Miramar Reservoir itself and on portions of its small watershed. Miramar Reservoir acts as a storage reservoir to meet the peak and emergency demands for the Miramar Water Treatment Plant.

The Miramar Water Treatment Plant is located adjacent to Miramar Reservoir and serves the northern section of the City. The plant currently uses flocculation, sedimentation and dual media filters, and has a capacity of 140 MGD. Future improvements are planned to increase the plant capacity to 215 MGD and add new treatment processes, most notably ozone.

The Hodges Watershed

Though owned and operated by the San Diego Water Department, Hodges Reservoir is not currently connected to the San Diego Water Department s system (Figure 6). Water impounded in Hodges Reservoir is supplied to other agencies.

The Hodges Watershed has an area of 158,417 acres or about 248 square miles. It is located in the west-central portion of San Diego County, California. The main tributary is Santa Ysabel Creek, beginning at Sutherland Dam and flowing through San Pasqual Valley to Hodges Resevoir.

The eastern portion of Hodges Watershed is dominated by steep hills and narrow valleys. To the west the watershed opens into low hills and open valleys and becomes highly developed. Roughly 54% of the watershed is vacant and undeveloped land, while 20% is devoted to agriculture, including intensive farming and livestock grazing operations. The developed areas are mostly

Figure 6

San Diego
Water Department

The Hodges Watershed

Location Map

San Diego County

City of San Diego

Watersheds

Hodges Watershed

Hodges Watershed (248 square miles)

Sutherland Watershed (54 square miles)

Sutherland Reservoir 30,000 AF

Sutherland - San Vicente Pipeline

Imported Water Aqueducts

Escondido

Julian

Hodges Reservoir 29,000 AF

Lake Ramona

Lake Poway

Ramona

El Capitan Watershed (189 square miles)

Lake Cuyamaca

Poway

San Vicente Watershed (74 square miles)

San Vicente Reservoir 90,000 AF

7,000 AF

Miramar WTP (140 MGD/215 MGD)

Miramar Watershed (1 square mile)

El Capitan Reservoir 113,000 AF

San Vicente Pipelines

El Capitan Pipeline

Miramar Service Area

El Monte Pipeline

Lakeside

Descanso

Alpine

Santee

Pine Valley

4,000 AF

El Cajon

Cottonwood Watershed (244 square miles total)

Morena Watershed (114 square miles)

Alvarado WTP (120 MGD/200 MGD)

Murray Watershed (4 square miles)

Loveland Reservoir

Alvarado Service Area

Morena Reservoir 50,000 AF

Sweetwater Reservoir

Jamul

Barrett Reservoir 45,000 AF

Barrett Watershed (121 square miles)

Otay Watershed (99 square miles)

Otay Service Area

Otay Reservoir 58,000 AF

Dulzura Watershed (11 square miles)

Chula Vista

Dulzura

Campo

Otay WTP (35 MGD/40 MGD)

Dulzura Conduit

Otay Service Area

0 1 2 3 4 5 Miles

(watershed area, square miles) SDWD Watersheds

SDWD Lands

SDWD Reservoirs

Lakes & Reservoirs, not SDWD

Streams & Rivers in SDWD Watersheds

Streams & Rivers not in SDWD Watersheds

SDWD Raw Water Pipelines

CWA Imported Water Aqueducts

Dulzura Conduit

SDWD Water Treatment Plants (existing capacity / future capacity)

SDWD Water Treatment Plant Service Areas

Miramar Service Area

Alvarado Service Area

Otay Service Area

SDWD - Watershed GIS

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May 23, 2003

prepared by J. Pasek and J. Kapchinske

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residential, commercial, and other non-industrial type of urban uses.

Local runoff within Hodges Watershed is impounded in Hodges Reservoir or recharged to the San Pasqual Groundwater Basin upstream of Hodges Reservoir. Average runoff from the watershed to Hodges Reservoir is 21,500 AF/year. An additional 9,400 AF/year of runoff recharges into the groundwater basin.

Water impounded in Hodges Reservoir is sold as raw water to other water agencies the San Dieguito Water District and the Santa Fe Irrigation District. The Badger Filtration Plant, which is jointly owned by the San Dieguito Water District and Santa Fe Irrigation District, treats water from Hodges Reservoir and distributes it to the communities of Rancho Sante Fe, Solana Beach, and Encinitas.

In an effort to maximize the use of local water and local storage the San Diego Water Department and the San Deigo County Water Authority are considering several options for Hodges Reservoir. One project would connect Hodges Reservoir to the San Diego Water Department s system via the Second San Diego Aqueduct. This would, in effect, connect Hodges Reservoir to the Miramar Filtration Plant and allow the San Diego Water Department to utilize local runoff from the Hodges Watershed, as well as imported water stored in Hodges. Another alternative would connect Hodges Reservoir to the new Olivenhain Reservoir. In this alternative water from Hodges Reservoir could be treated at the Olivenhain Water District s new treatment plant and distributed to the community of Olivenhain.

REVIEW OF THE RECOMMENDATIONS OF THE 1996 WATERSHED SANITARY SURVEY

The 1996 Watershed Sanitary Survey included an extensive list of recommendations for improved watershed management and source water control. These recommendations, along with detailed discussions of their implementation and success, are given in Chapter 6 of Volumes 2 through 5.

The recommendations of the 1996 Watershed Sanitary Survey fell into four categories:

- water quality monitoring;
- inter-jurisdictional coordination;
- watershed management control practices; and
- public education and outreach.

Generally, only a few of the specific recommendations were implemented and success was limited. In the five years following the 1996 Watershed Sanitary

Survey some progress was made in increased water quality monitoring at the reservoirs and in the watersheds. Inter-jurisdictional coordination became a focus of the staff of the San Diego Water Department; however, this inter-jurisdictional coordination was mostly on an informal, person-to-person basis and included few formal agreements between jurisdictions.

EXISTING CONDITIONS IN THE WATERSHEDS

Survey Methods

This update of the WSS was conducted principally by staff of the San Diego Water Department; with assistance from the following environmental and data management consulting firms:

- Metcalf and Eddy, Inc provided assessment of water quality monitoring data;
  Berryman & Henigar, Inc. summarized and condensed the 1996 Watershed Sanitary Survey;
  RECON, Inc. gathered and synthesized information on concentrated animal facilities, reclaimed water use, grazing, and septic systems;
  San Diego Data Processing Corporation developed and refined Geographic Information System data layers.

The WSS Update assess information and data for the five year period 1995-2000. Information and data from many sources were used for this study, including the databases of at least seven governmental agencies. The WSS Update draws on technical reports, aerial photographs, interviews with key contacts, and the personal knowledge of staff. All of this was supplemented by extensive field surveys by staff of the San Diego Water Department.

Much the data and information collected for the WSS Update was transformed into geospatial formats, and analyzed and archived in the Watershed Geographic Information System in the San Diego Water Department. Details of the methods used to conduct the Survey are given in Chapter 5 of Volumes 2 through 5. Sources of information are referenced throughout those volumes.

Potential Contaminant Sources

The WSS Update identified the major potential contaminant sources within the watersheds of the San Diego Water Department s source water system. These are:

- non-point source pollution from residential and commercial development;
  sewage spills from sewer collection systems and pump stations;
  discharges, both intentional and accidental, at several small wastewater treatment plants;
  discharges of partially treated sewage from failing, older septic systems;
  livestock grazing; and

hazardous waste spills at hazardous waste storage sites or along transportation corridors.

Most of the potential sources of contamination listed above are spatially and temporally limited. That is to say, these sorts of contamination are likely to occur only rarely (e.g. hazardous waste spills) or at identifiable locations (e.g. sewage spills). However, diffuse, non-point source pollution from residential and commercial development differs in that it is widespread throughout the watersheds and occurs essentially continuously. The WSS Update finds that non-point source pollution from residential and commercial development is probably the most significant potential source of contamination in the watersheds.

WATERSHED MANAGEMENT AND CONTROL

Two key factors limit the San Diego Water Department s control over its watershed areas. First, the San Diego Water Department owns, and thus exerts direct control over, barely six percent of its watershed lands. Second, except for the relatively small Murray and Mirarmar Watersheds and a portion of the Hodges Watershed, all of the watershed lands are outside of the City of San Diego (Figure 1). Only ten percent of the watershed lands are within the City of San Diego. Nearly all of the watersheds are, therefore, outside of the City s jurisdictional control of land use planning, zoning, building codes, and enforcement of environmental regulations.

It follows, then, that control and management of activities in the watersheds lies almost entirely with other governmental agencies, and the San Diego Water Department must work effectively with these agencies to protect its source waters. To this end, San Diego Water Department staff has become increasingly involved in reviewing and commenting on development proposals and other land use decisions in the watersheds. A network of inter-agency contacts, both formal and informal, serves to alert the Water Department about contamination events in the watersheds.

Figure 7 shows the municipal jurisdictions, federal, tribal, and state lands, and land owned by the San Diego Water Department in the watersheds.

WATER QUALITY

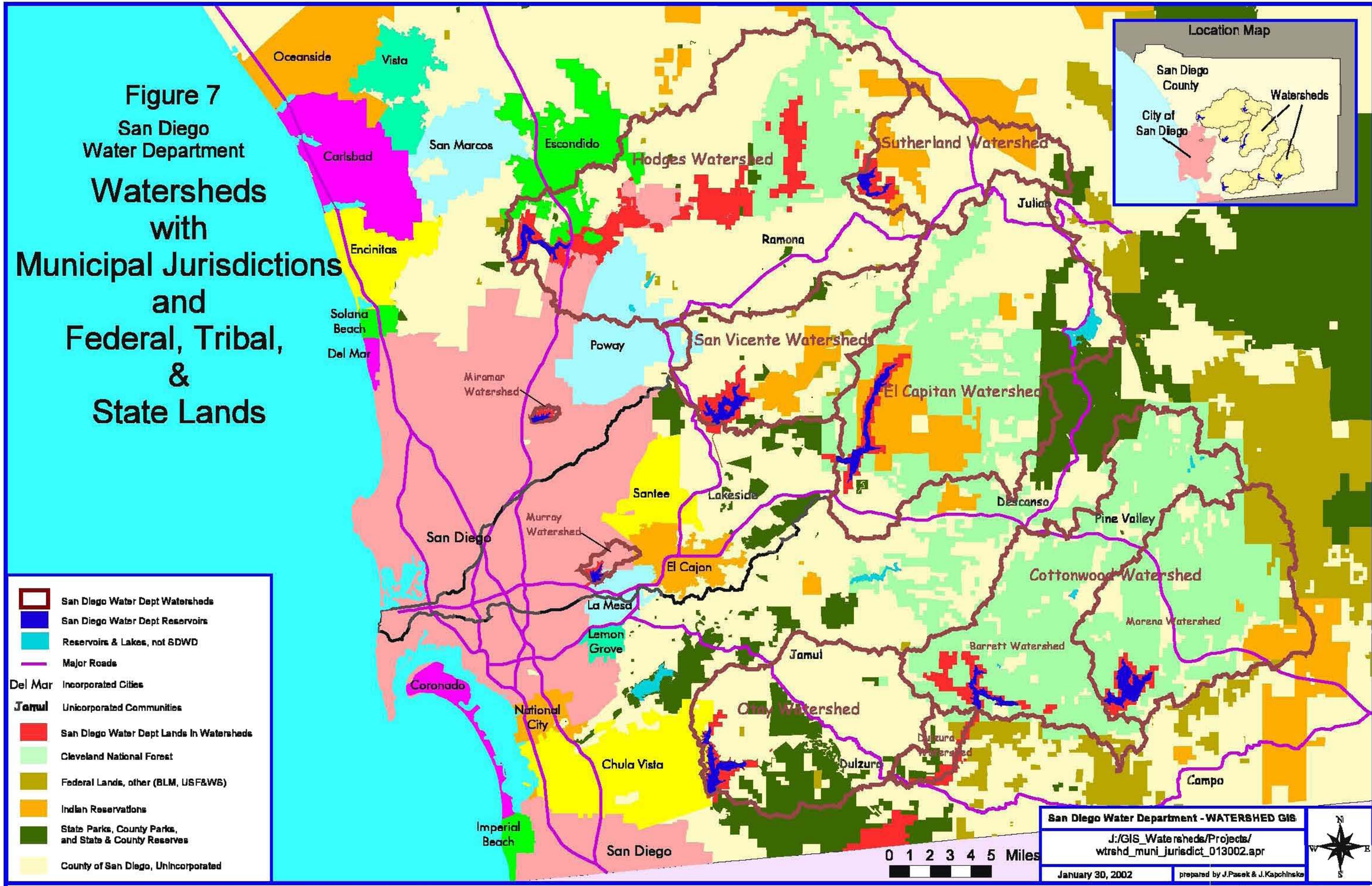
Source Water Quality

As part of the WSS Update five years (1996-2000) of water quality monitoring data at the reservoirs and in the watersheds were compared to current and proposed regulatory standards for drinking water. An extensive discussion of source water quality and comparisons of source water quality to drinking water standards can be found in Chapter 6 of Volumes 2 through 5.

Figure 7

San Diego
Water Department

Watersheds with Municipal Jurisdictions and Federal, Tribal, & State Lands



Comparison of the quality of raw source water to drinking water standards is for illustrative purposes only. Although monitoring results for raw water in the watersheds, in the reservoirs, and at the influent of the three water treatment plants sometimes exceeded maximum contaminant levels (MCL s) for drinking water, the combination of blending of various sources plus effective treatment at the plant produced water that consistently met all standards for drinking water.

When compared to standards for drinking water (i.e., treated water), raw water in the watersheds and in the reservoirs commonly exceeded limits for pH, turbidity, color, odor, coliform bacteria, manganese and aluminum. The source water sometimes exceeded drinking water limits for iron, total dissolved solids, and conductivity.

The only organic contaminant measured in source waters at levels greater than drinking water standards was the gasoline additive Methyl Tertbutyl Ether (MTBE). Methyl Tertbutyl Ether has a primary Maximum Contaminant Level (MCL) of 13 ug/l and a secondary MCL of 3 ug/l. Concentrations of MTBE exceeded the primary MCL at El Capitan, San Vicente, and Sutherland Reservoirs, and was also found at concentrations exceeding the secondary MCL at Hodges, Miramar, Otay, and Morena Reservoirs. However, MTBE never exceed the secondary MCL in any of the water treatment plant influents.

No other organic constituents, heavy metal, nor radiological constituent, was found at levels greater than drinking water standards in the reservoirs or watersheds.

Assessment of the System s Ability to Meet Drinking Water Standards

Existing water quality monitoring data from 1996 to 2000 was used to assess the San Diego Water Department s system ability to meet current and proposed regulations.

Existing data shows that the Alvarado, Otay, and Miramar Water Treatment Plants, each drawing on its local source water system, would be in compliance with the Stage 2 Disinfectants and Disinfection Byproducts Rule (D/DBP), the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), and proposed Radon and Sulfate regulations.

Hodges Reservoir is not currently connected to a San Diego Water Department treatment facility, so no detailed assessment was made of the ability to meet drinking water standards using water from this reservoir.

CONCLUSIONS AND RECOMMENDATIONS

The WSS Update proposes recommendations to strengthen the first barrier protecting drinking water quality protection of the source watershed. By strengthening this first barrier, the potential impacts on the second barrier water treatment may be reduced. The following are the recommendations of the WSS Update.

Water Quality Monitoring

- Continue and expand the long-term monitoring program for the watersheds and reservoirs to establish baseline conditions, identify trends in degradation, isolate sources of contamination, and determine effects of management practices. Watershed monitoring should include water quality, land use, and land conditions.

Inter-jurisdictional Coordination

- Centralize, within the Water Department, relationships and networks with other agencies and jursidictions in the watersheds, and strengthen these relationships.
- Develop written guidelines for the review of new residential or commercial development.
- Establish written guidelines for review of proposed activities that are potential contamination sources.
- Establish workgroups and standing meetings with agencies in the watersheds; notably the County of San Diego Department of Planning and Land Use, the Cleveland National Forest, Native American governments, and the land use and planning functions of the cities of Chula Vista, Escondido, Poway.

Watershed Management Control Practices

- Work with landowners and regulatory agencies in reducing the potential affects of cattle grazing.
- Develop a watershed land acquisition strategy to acquire parcels, conservation easements, or development rights for lands proximate to the water bodies that, if preserved, would protect water quality.

Public Education

- Develop and distribute educational materials for people living, working, or recreating in the watersheds.