CHAPTER | FIVE

Fern Dell, Griffith Park

CHAPTER FIVE

community-based monitoring

A. INTRODUCTION

1. Background

Cities, agencies, and stakeholder groups currently collect data in the Ballona Creek Watershed, primarily related to water quality in Ballona Creek and at specific sites, in addition to habitat observations at some limited locations.

The scope of this Community-Based Monitoring Program is to describe existing monitoring efforts, determine whether there are data gaps or redundancies in these existing monitoring programs and to recommend a program that will track progress towards the goals and objectives adopted by the Ballona Creek Watershed Task Force. The authors wish to acknowledge substantial input from Santa Monica Baykeeper in the development of this chapter.

2. Mission

For the purposes of this Watershed Plan, community-based monitoring is monitoring of the physical environment by interested stakeholders (which include cities and agencies) and stakeholder groups, which typically rely upon volunteers to collect data. Community-based monitoring provides an opportunity to augment data and observations gathered by cities and agencies and can be useful to government agencies, environmental groups, and the general public.

As noted in Chapter 3, the BCWTF adopted the following overarching goal:

> To develop and facilitate implementation of a Comprehensive Watershed Management Plan for the Ballona Creek Watershed that sets forth pollution control and habitat restoration actions to *achieve ecological health*.

Therefore, the mission of the Ballona Creek Watershed Community-Based Monitoring Program is to assess progress towards achieving an ecologically healthy watershed. Specifically, this program focuses on three of the supporting goals adopted by the BCWTF:

- Improve Quality of Surface Water and Groundwater
- Improve Aquatic, Estuarine and Riparian Habitat Quality and Quantity
- Improve Habitat Quality, Quantity and Connectivity

TABLE 5-1
Ballona Creek Watershed Community-Based Monitoring Program Objectives

Monitoring Objective	*Description*
Provide data to determine the efficiency of pilot project implementation	Includes habitat and water quality monitoring at pilot sites where applicable. Compares implementation of pilot projects to the objectives of the Management Plan.
Provide data to support Total Maximum Daily Load (TMDL) development	Monitor water quality parameters on the 303(d) list.
Serve as TMDL compliance tool	Monitor water quality parameters that already have an established TMDL.
Identify tributary areas that are major sources of pollution	Monitor water quality parameters at strategic locations to determine sources of pollution.
Fill in identified data gaps	Where feasible, gather data to fill identified data gaps.
Volunteer involvement/education	Involve the community in as many aspects of the Monitoring Program as possible for hands on education and stewardship.
Monitor habitat quality and species diversity	Monitor birds, large mammals, and vegetation.

Progress towards the other adopted goals would be addressed as part of the plan update progress described in Chapter 4.

3. Objectives

Based on input from the BCWTF, a list of monitoring program objectives were developed that support the mission, as summarized in Table 5-1.

B. EXISTING MONITORING EFFORTS

1. Water Quality Monitoring

Information regarding existing water quality monitoring in the watershed was gathered from members of the Ballona Creek Task Force and other organizations known to conduct monitoring. Some of the information received was incomplete, and information on parameters, frequency, and precise sampling locations is not available for some of the listed monitoring efforts.

According to the responses received, the following agencies/organizations perform monitoring in the Ballona Creek Watershed:

- City of Los Angeles
- City of Santa Monica
- City of Culver City
- City of West Hollywood
- County of Los Angeles Department of Beaches and Harbors (LACDBH)
- County of Los Angeles Department of Public Works (LACDPW)
- Heal the Bay
- Los Angeles Regional Water Quality Control Board (RWQCB)
- Santa Monica Bay Restoration Commission (SMBRC)
- Santa Monica Baykeeper (Baykeeper)
- Southern California Coastal Water Research Project (SCCWRP)

- State Water Quality Control Board (State Board)
- UCLA—Dr. Michael Stenstrom
- United States Army Corps of Engineers (USACE)

Existing monitoring in the Ballona Creek Watershed is summarized below in narrative form by organization and then by pollutant category in tables. The narrative summary of agency monitoring uses two categories: studies and ongoing efforts. Studies are conducted for a specific period, while ongoing efforts occur on a regular interval and are scheduled to continue for the foreseeable future.

CITY OF CULVER CITY

Study: Ballona Creek Water Quality Improvement Project

The project will install a Continuous Deflective Separation (CDS) device at a storm drain outlet west of Overland. Baykeeper has monitored the storm drain flow weekly since January 2002 for total coliform, *E. coli.*, pH, turbidity, and trash (SMBRC 2003). The installation of the CDS unit is on hold pending additional funding (Wang 2003).

CITY OF LOS ANGELES

The City of Log Angeles has ongoing data gathering efforts and studies in the Ballona Creek Watershed. In addition, the City of Los Angeles assists in monitoring efforts through in-kind and monetary support for other organizations. Specific activities performed by the City of Los Angeles are described below.

Study: Storm Drain Bacteria Analysis

In April through June 1999 the City of Los Angeles analyzed samples from 28 sites on a weekly basis in Ballona Creek for total coliform and *E. coli*.

Study: Pollutant Removal Devices

The City of Los Angeles will install pollutant removal devices to treat urban runoff in the Ballona Creek watershed. Trash collection devices will be installed at four locations in South Central Los Angeles. A gravity system will be installed in an industrial land use area of Manchester to remove sediment, metals, oil, and grease (SMBRC 2003). The targeted completion date is June 2006 (Wang 2003).

Ongoing: Daily and Weekly Sampling

The City of Los Angeles analyzes daily grab samples in Ballona Creek at Centinela Avenue and weekly grab samples from Ballona Creek at Pacific Avenue (refer to Figure 5-1). The samples are tested for total coliforms, fecal coliform, *E. coli*, and *Enterococcus*.

CITY OF SANTA MONICA

Study: Pollutant Removal Devices

The city plans to install a 2-stage filter system to remove pollutants from a drainage area discharging to Ballona Creek. The units will be installed as Stage 1 treatment devices, primarily to remove gross solids and floatables. The Stage 2 storm filters will remove additional trash, sediment, and soluble compounds (SMBRC 2003). The City of Santa Monica is seeking additional funding. Completion is targeted for June 2006 (Wang 2003)

CITY OF WEST HOLLYWOOD

Study: Catch Basin Debris Excluder Devices

The City of West Hollywood will install and monitor the effectiveness of 20 catch basin debris excluder devices. The devices should significantly reduce the amount of litter and debris entering the Bay through the storm drain system (SMBRC 2003).

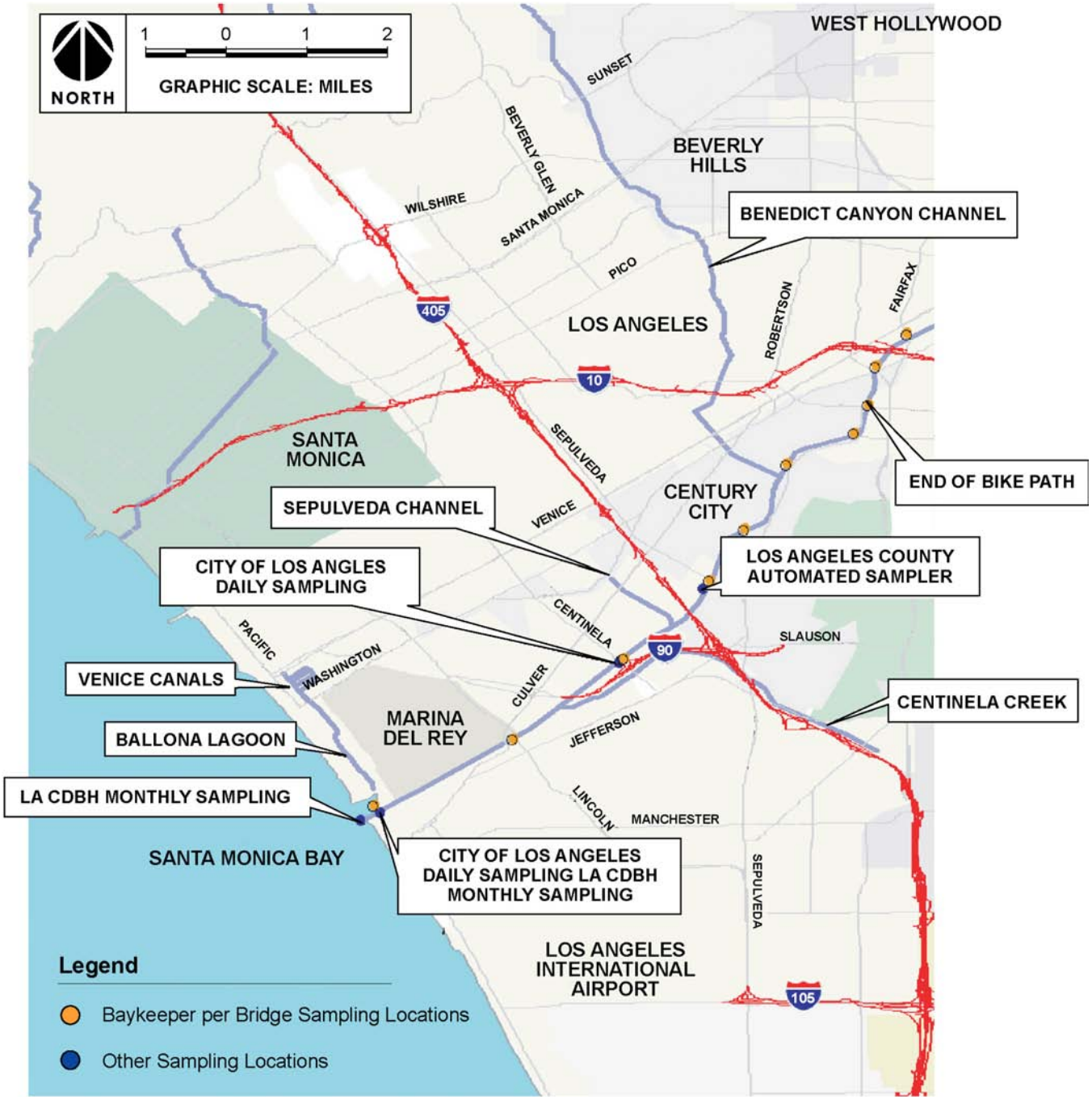

Figure 5-1 **Monitoring Locations**

SOURCE: EIP Associates, 2004

COUNTY OF LOS ANGELES DEPARTMENT OF BEACHES AND HARBORS

Ongoing: Monthly Sampling

LACDBH conducts monthly sampling at two locations, the Pacific Avenue footbridge and between the south jetty and the breakwater, as described below:

- **Water quality parameters**—temperature, salinity, dissolved oxygen (DO), pH, ammonia, biological oxygen demand (BOD), light transmissance, surface transparency, water color, total coliform, fecal coliform, and Enterococcus
- **Physical characteristics of benthic sediments**—particle size distributions
- **Chemical characteristics of benthic sediments—heavy** metals, chlorinated pesticides and PCBs (DDT and derivatives, remaining chlorinated pesticides, polychlorinated biphenyls), organics (TOC, volatile solids, immediate oxygen demand, COD, oil and grease, organic nitrogen, orthophosphate, sulfides), and minerals

Habitat monitoring, including benthic invertebrate and fish monitoring, conducted by LACDBH is discussed in the Habitat Monitoring section.

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

Study: Ballona Creek Litter Monitoring and Collection Project

LACDPW will monitor over 300 catch basin inserts and 16 vortex separation devices in the Ballona Creek Watershed (LACDPW 2003c). The trash from eight different land use types will be measured and analyzed (SMBRC 2003).

Study: Dry Weather Discharge Treatment Feasibility Study

LACDPW monitored dry weather discharge of eight storm drains between Centinela Avenue and Fairfax Avenue in 2003. The eight drains were prioritized based on their pollutant loadings. One drain was identified as a candidate for diversion to the City of Los Angeles sewer system (LACDPW 2003).

Ongoing: Mass Emissions Station

LACDPW has an automated sampler that collects flow-weighted composite samples during storm events in Ballona Creek. The sampler is located between Sawtelle Boulevard and Sepulveda Boulevard (Station F38C-R) (LACDPW 2003a). The location is upstream of tidal influence. The sampler has a tributary area of 88.8 square miles out of a 127-square-mile watershed (LACDPW 2002).

The sampler is used in dry and wet weather. In wet weather, the automated sampler is triggered during storm events when the water level in the channel exceeds the maximum annual dry weather stage. Grab samples are taken at the site for parameters with short holding times and for bacteria, which requires a sterile sample bottle (LACDPW 2002).

The suite of analytes and associated minimum levels for samples collected at the mass emission station are specified in the Municipal Storm Water Permit. The extensive suite of analytes includes metals, bacteria, nutrients, oil and grease, and pesticides. In the 2002/03 storm season, the mass emissions station in Ballona Creek was used to sample two wet weather and two dry weather events for water column toxicity testing. Visual observation of trash and photo documentation were conducted at the mass emission station after four storm events for the 2002/03 storm season (LACDPW 2003c).

Ongoing: Bioassessments

LACDPW began performing bioassessments in Ballona Creek at Culver and Lincoln Boulevard in October 2003 (LACDPW 2003c).

HEAL THE BAY

Heal the Bay was listed as an organization with monitoring efforts in the Ballona watershed. However, Heal the Bay currently focuses its monitoring efforts on the Malibu Creek watershed and Santa Monica Bay and does not currently perform sampling in the Ballona Watershed.

SANTA MONICA BAY RESTORATION COMMISSION

Study: Ballona Stormwater Structural Best Management Practices (BMPs).

The project, scheduled for completion in 2004, will develop a systematic monitoring program for evaluating the effectiveness of BMPs once they are installed.

SANTA MONICA BAYKEEPER

In addition to ongoing efforts, the Baykeeper is conducting a number of studies to gather data in the Ballona Creek Watershed. The Baykeeper program is designed to identify sources of urban runoff and other discharges along the Santa Monica Bay and to assess levels of pollution in the discharges (Baykeeper 2001).

Study: Snapshots

Baykeeper works with the Southern California Coastal Water Research Project (SCCWRP) and local agencies to conduct dry and wet weather snapshots, a one-day sampling event of the entire Creek. Samples have been taken at each flowing drain and Pacific, Lincoln, Centinela, Sepulveda, Overland, Duquesne, Rodeo/ Higuera, Cochran, National, La Cienega, and Fairfax bridges.

Study: Mapping Storm Drain Outlet Locations

Baykeeper mapped the GIS coordinates of each storm drain on the main channel of Ballona Creek and cataloged the drains with photos and descriptions.

Ongoing: Storm Drain and Creek Sampling

Baykeeper's sampling plan changes with regional needs and available funding. Baykeeper typically samples each flowing drain in the main channel and from bridges. The number of flowing storm drains varies but averages approximately 50. Storm drain sampling has occurred approximately quarterly since 2001. Parameters analyzed include total coliform, *E. coli.*, dissolved and total metals, total suspended solids (TSS), flow estimates, and trash.

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT

Study: Contaminated Sediments Task Force

SCCWRP collected water quality data for Ballona Creek for 2000/01 and 2001/02 seasons as part of a study for the Contaminated Sediments Task Force. The study found that the majority of lead and aluminum in the Creek were discharged during the wet season. In contrast, zinc, nickel, and copper loading were more evenly distributed between the wet and dry season. However, due to small sample size, these conclusions were noted as preliminary (SCCWRP 2003).

Study: Multipurpose Dry Weather Sampling

The purposes of dry weather sampling include development of TMDLs; help for municipalities to develop implementation plans; and provision of data for the SCCWRP dry weather model. Three monitoring events (snapshots) were conducted during the dry season

of 2003 to sample each drain and Ballona Creek. Parameters included bacteria (total coliform, fecal coliform, and *Enterococcus*), metals (dissolved and total), trash, and flow. Sampling was done by a combination of volunteers and staff from LACDPW, the City of Los Angeles, and RWQCB (Stein 2003).

Study: Development and Evaluation of Wet Weather Watershed Models

Monitoring in Ballona Creek is part of a larger stormwater monitoring effort for wet weather runoff into Santa Monica Bay. The program is in its fourth year. In the winter of 2003/04, sampling of the Ballona Creek Watershed will be conducted in the creek and at representative, homogeneous land use sites, but will not include sampling individual drains. This study will monitor loading from specific land uses. Sites will be monitored multiple times throughout storms to obtain temporally resolved data (timing will be based on a profile of loading for land uses in Ballona Creek).

Parameters to be addressed include bacteria (total coliform, fecal coliform, and Enterococcus), metals (total—wet weather metals tend to be particulate), nutrients, and organics (PAHs, organophospate pesticides, chlorinated organics [DDT, etc.]) (Stein 2003).

Study: Regional Monitoring Program (Bight '03)

Regional-scale monitoring of the Southern California Bight is conducted every five years. SCCWRP is coordinating monitoring with approximately 64 agencies for Bight '03. Much of the monitoring for Bight '03 is planned for the winter of 2003/04. The three components of Bight '03 are summarized below:

- Coastal Ecology will sample the Ballona Creek estuary (approximately five sites) for sediment chemistry, sediment toxicity, and benthic macroinvertebrate diversity (Schiff 2003).
- Shoreline Microbiology will compare bacteria indicators at different water depths near a storm drain (ankle depth vs. surf zone). Samples will be taken at varying distances from the mouth of Ballona Creek. The preliminary plan is to monitor one dry weather event and two wet weather events (Schiff 2003). The plume in Santa Monica Bay from Ballona Creek will be sampled approximately 1, 3, and 5 days after the storm events (Bera 2003).
- Water quality—Measurement of the spatial extent of the stormwater plume from Ballona Creek combining different methods of measurement including satellites, airplanes, and samples from boats. Temporal variation and ecosystem impacts will be measured. Bacteria, water column toxicity, and salinity will be measured in two storm events (Schiff 2003).

Study: Temporal Storm Drain Variability Study

The temporal variation in flow and quality from one storm drain will be monitored in dry weather for 48 hours. Samples will be taken from the drain flow and at three locations in the drain plume in Ballona Creek and will be analyzed for total coliform, *E. coli.*, and toxicity (Bera 2003).

Study: Dilution Study

SCCWRP will work with Loyola Marymount University to track the influence of tide and dilution in Ballona Creek during fall 2003 (Bera 2003). Fluorescent dye will be added into the creek and the dilution will be measured with fluorimeters at different points downstream (Schiff 2003).

WATER QUALITY CONTROL BOARD

The State Water Resources Control Board generally administers statewide monitoring programs, which the LARWQCB prepares annual work plans and may assist monitoring contractors (typically the California Department of Fish and Game). LARWQCB also acts as a clearinghouse for much of the data in the watershed to aid in the development of Total Maximum Daily Loads (TMDL) and other permitting efforts.

Recent:State Mussel Watch Program

The State Board Toxic Substances Monitoring Program (TSMP) and the State Mussel Watch Program (SMWP) initiated in 1976 were designed to detect the presence and concentration of toxic pollutants in fish, mussels, clams, and other aquatic organisms in selected fresh, estuarine, and marine waters. The California Department of Fish and Game (CDFG) operated the field collection and laboratory aspects of the TSMP and SMWP for the State Board in accordance with interagency agreements. The SMWP program is no longer funded, although the data from the program may be found on the State Board's website.

Ongoing: Surface Water Ambient Monitoring Program (SWAMP)

SWAMP is a statewide monitoring effort designed to assess the conditions of surface waters throughout the state of California, and includes a general bioaccumulation element. Responsibility for implementation of monitoring activities resides with the LARWQCB. The most recent monitoring of Ballona Creek as part of SWAMP occurred in 2003.

UCLA SCHOOL OF CIVIL & ENVIRONMENTAL ENGINEERING— DR. MICHAEL STENSTROM

Dr. Michael Stenstrom of UCLA is involved in several studies that gathered data in the Ballona Watershed.

Study: Comparison of Dry vs. Wet Weather Flows

Studied pollutant loads in wet weather vs. dry weather. Used flow data from LACDPW and existing wet weather water quality data from the Santa Monica Bay Urban Runoff Database. Monitored dry weather water quality in summer 1999 and measured TSS, TIN, TKN, TP, BOD, arsenic, cadmium, chromium, copper, lead, and nickel (all metals tested for dissolved and suspended forms). Found that the majority of the annual pollutant load is in wet weather and that metals are predominantly dissolved in dry weather and suspended in wet weather (McPherson *et al.* 2002).

Study: Metals in Ballona Creek Tributaries

Analyzed hazardous metals in samples taken from Sawtelle Boulevard Bridge in Ballona Creek and two tributaries, Sepulveda Channel and Centinela Channel, during the storm season of 1997/98. Found very little first flush phenomenon. Found significant amounts of metals in wet weather flows. Found lower metals concentrations in the Centinela watershed (Buffleben *et al.* 2002).

Study: Storm Drain Assessment

Dr. Stenstrom co-wrote a series of six papers published 1992 to 1998 regarding pollution assessment and monitoring of Santa Monica Bay. Volume VI—Toxicity of Wet Weather Urban Runoff, sampled stormwater during 1996/97 water year in Ballona Creek. Performed analysis for trace metals, organics, and short-term toxicity using red abalone and purple sea urchin. The other volumes mainly make recommendations based on existing data.

UNITED STATES ARMY CORPS OF ENGINEERS

Study: Sediment Sampling

Four sediment samples were taken just downstream of the Centinela Channel in 2001 (Anderson 2003).

Study: Marina del Rey Dredge Material Management Plan Study and Sediment Control Plan F3 Report

Water and sediment sampling was conducted in 1997–98 (Anderson 2003)

Study: Marina del Rey and Ballona Creek Feasibility Study

Sediment sampling and testing programs within Marina del Rey were conducted in 1986, 1991, 1993, 1995, August 1997, and December 1997. The 1993 sediment sampling effort was the most comprehensive, providing physical and bulk sediment chemistry data for 29 cores sampled throughout the entrance channels and the mouth of Ballona Creek. The August 1997 sampling program included tests and analyses to classify the sediments for landfill disposal.

Ongoing: Marina del Rey Entrance Channel Dredging

Dredging of sediment inside the breakwater between Marina Channel and Ballona Creek occurred in 1992, 1994, 1996, 1998, and 1999, with between 16,438 to 477,306 cubic meters of material removed. Turbidity sampling at the time of dredging is required; however, the results of sampling are unknown.

2. Location of Water Quality Sampling

Figure 5-1 shows Ballona Creek and its major tributaries as well as the locations of ongoing monitoring efforts by the organizations above. (Note: Baykeeper also samples at every flowing storm drain in the main Ballona Creek Channel up to the end of the bike path, or up to the daylight point if LACDPW vehicles are available.)

3. Summary of Water Quality Sampling

Existing water quality sampling efforts in the Ballona Creek Watershed are summarized, by pollutant type in Tables 5-2 through 5-13.

TABLE 5-2
Summary of Existing Water Quality Monitoring Efforts: Flow

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
All flowing storm drains, Ballona Creek at multiple locations	Flow estimation	2001–present	Quarterly (approx)	Baykeeper
Ballona Creek Mass Emissions Station at Beloit Ave.	Flow	1967–Present	Constant	LACDPW
In creek and from representative land use sites	Flow	2000–present	Unknown	SCCWRP

TABLE 5-3
Summary of Existing Water Quality Monitoring Efforts: Trash

Sampling Location	*Date Range*	*Frequency*	*Organization*
Various trash BMPs in the upstream watershed	Ongoing and planned through 2006	During storm events	City of Los Angeles, City of Santa Monica, City of West Hollywood, Los Angeles County
Flowing storm drains	2001–present	Quarterly (approximately)	Baykeeper
Ballona Creek Mass Emissions Station at Beloit Ave.	2002–present	After storm events	LACDPW
Drain west of Overland Ave.	2002–present	Weekly	Baykeeper / Culver City

TABLE 5-4
Summary of Existing Water Quality Monitoring Efforts: Conventional Analytes

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek Mass Emissions Station at Beloit Ave.	BOD, COD, MBAs, Oil and grease, pH, phenols, TSS, TOC, Turbidity	1994–present	4-6 times per year, wet and dry weather	LACDPW
Ballona Creek at Inglewood Blvd.	COD, pH, phenols	1986–1992	Every other month in 1986; Once a year 1990, 1991 and 1992	LARWQCB
Drain west of Overland Ave.	pH, turbidity, trash	January 2002 –present	Weekly	Culver City / Baykeeper
Unspecified location in Ballona Creek	TSS, BOD	Summer 1999	Unknown	UCLA / Stenstrom
Ballona Creek at Sawtelle Blvd. Bridge	TSS, VSS, pH, turbidity, conductivity, alkalinity, COD, DOC, oil & grease, fluoride, chloride	January –February 1996	Four storm events	UCLA / Stenstrom
All flowing storm drains, Ballona Creek at multiple locations	TSS	2001–present	Quarterly (approximately)	Baykeeper

TABLE 5-5
Summary of Existing Water Quality Monitoring Efforts: Bacteria

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek Mass Emissions Station at Beloit Ave.	Total coliform, fecal coliform, *Enterococcus*, fecal streptococcus	1994 –present	4–6 times per year, wet and dry weather	LACDPW RWQCB Data Set
Ballona Creek at Inglewood Blvd.	Total coliform, fecal coliform	1992	One month only	LARWQCB RWQCB Data Set
All flowing storm drains, Ballona Creek at multiple locations	Total coliform, *E. coli*.	2001 –present	Quarterly (approximately)	Baykeeper
Centinela Ave.—South side of bridge	Total coliform, fecal coliform, *E. coli*., Enterococcus	Unknown –Present	Daily	City of Los Angeles
Pacific Ave.—north side of bridge	Total coliform, fecal coliform, *E. coli*., *Enterococcus*	Unknown –Present	Weekly	City of Los Angeles
28 sites in Ballona Creek	Total coliform, *E. coli*.	April–June 1999	Weekly	City of Los Angeles
Each drain in Ballona Creek (dry weather snapshot)	Total coliform, fecal coliform, *Enterococcus*	2003	Three events	SCCWRP/ Baykeeper
In creek and from representative land use sites	Total coliform, fecal coliform, *Enterococcus* Wet weather with temporal variation	2000 –present	Unknown	SCCWRP
Drain west of Overland Ave.	Total coliform, *E. coli*.	January 2002–Present	Weekly	Baykeeper / Culver City

TABLE 5-6
Summary of Existing Water Quality Monitoring Efforts: Nutrients

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek, Sepulveda Channel, and Centinela Channel	TIN, TKN, TP	Summer 1999	3 times per day for six days	UCLA/ Stenstrom
Ballona Creek at Sawtelle Bridge	Nitrite, nitrate (as NO_3)	January– February 1996	Four storm events	UCLA/ Stenstrom
Ballona Creek Mass Emissions Station at Beloit Ave.	Nitrate (as N), nitrate (as NO_3), nitrite (as N), nitrogen, ammonia (as N), TIN, phosphorus	1995–present	4-6 times per year, wet and dry weather	LACDPW
Ballona Creek at Inglewood Blvd	Nitrate (as N), nitrite (as N), nitrogen, ammonia (as N), phosphate	1986–1992	Once a year	LARWQCB
In creek and from representative land use sites	Nutrients in wet weather with temporal variation	2000–present	Unknown	SCCWRP

TABLE 5-7
Summary of Existing Water Quality Monitoring Efforts: Metals

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek Mass Emissions Station at Beloit Ave.	Hardness (as $CaCO_3$) Total and dissolved metals	1995–present	4–6 times per year, wet and dry weather	LARWQCB
Ballona Creek at Inglewood Blvd.	Hardness (as $CaCO_3$) Total metals	1986–1992	Once a year	LARWQCB
All flowing storm drains, Ballona Creek at multiple locations	Total and dissolved metals	2001–present	Quarterly (approximately)	Baykeeper
In creek and from representative land use sites	Total metals during wet weather with temporal variation	2000–present	Unknown	SCCWRP
Ballona Creek, Sepulveda Channel, and Centinela Channel	Total and dissolved metals	Summer 1999	3 times per day for six days	UCLA/ Stenstrom
Sawtelle Blvd. Bridge, Sepulveda Channel, Centinela Channel	Metals	Winter 1997/98	Two storm events	UCLA/ Stenstrom
Ballona Creek at Sawtelle Blvd. Bridge	Metals, hardness (as $CaCO_3$)	January–February 1996	Four storm events	UCLA/ Stenstrom

TABLE 5-8
Summary of Existing Water Quality Monitoring Efforts: Salts

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek Mass Emissions Station at Beloit Ave.	Bicarbonate (HCO_3), boron, calcium, calcium Hardness (as $CaCO_3$), carbonate alkalinity (as $CaCO_3$), chloride, fluoride, magnesium, potassium, sodium, specific conductance (µ-mho/cm), sulfate, TDS	1995–Present	4–6 times per year, wet and dry weather	LACDPW
Ballona Creek at Inglewood Blvd.	Alkalinity (as CaCO3), boron, calcium, chloride, hardness (as CaCO3), magnesium, potassium, silica (same as Si as SiO2), sodium, sulfate, TDS	1986–1992	Monthly	LARWQCB

TABLE 5-9
Summary of Existing Water Quality Monitoring Efforts: VOCs and SVOCs

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek Mass Emissions Station at Beloit Ave.	PAHs, Bis(2-ehtylhexyl) phthalate	1999–present	4–6 times per year, wet and dry weather	LACDPW
SCCWRP	PAHs	2000–present	Unknown	SCCWRP

TABLE 5-10
Summary of Existing Water Quality Monitoring Efforts: Organics

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek Mass Emissions Station at Beloit Ave.	Chlorinated pesticides, polychlorinated biphenyls, organophosphate pesticides, herbicides	1995–present	4–6 times per year, wet and dry weather	LACDPW
Wet weather, in creek	Organic compounds	January–February 1996	Four storm events	UCLA/ Stenstrom
In creek and from representative land use sites	Organophosphate pesticides, chlorinated organics	2000–present	Unknown	SCCWRP

TABLE 5-11
Summary of Existing Water Quality Monitoring Efforts: Water Column Toxicity

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona Creek Mass Emissions Station at Beloit Ave.	Water flea 7-day survival/ reproduction Purple sea urchin fertilization	2002–03	Two wet weather and two dry weather events	LACDPW
Stormwater discharge plume off Ballona Creek in Santa Monica Bay	Sea urchin fertilization	2003	Two storm events	SCCWRP
Ballona Creek at Sawtelle Blvd	Short-term toxicity, using red abalone and purple sea urchin	January–February 1996	Four storm events	Stenstrom *et al.*

TABLE 5-12
Summary of Existing Water Quality Monitoring Efforts: Sediments

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
At mouth of Ballona Creek and between south jetty and breakwater	Heavy metals, chlorinated pesticides, PCBs, TOC, volatile solids, BOD, COD, oil and grease, nutrients, minerals	1976–present	Monthly	LACDBH
Entrance channel to Marina del Rey and other channels	Temperature, salinity, dissolved oxygen, pH, ammonia, BOD, light transmissivity, fecal coliform	1986-present	Varies	USACE
Unknown	Unknown	2000-02	Unknown	CSTF / SCCWRP
Approximately 5 sites in Ballona Estuary	Sediment chemistry, toxicity	2003–04	Approximately 3 times	SCCWRP

TABLE 5-13
Summary of Existing Water Quality Monitoring Efforts: Bioassessment/Tissue

Sampling Location	*Constituents*	*Date Range*	*Frequency*	*Organization*
Ballona & Marina del Rey	Tissue of fish, mussels, clams, and other aquatic organisms	1976–1993	Unknown	State Board
Ballona Creek at Lincoln Blvd./Culver Blvd.	Bioassessment	Planned October 2003	Unknown	LACDPW
Approximately 5 sites in Ballona estuary	Benthic macroinvertebrate diversity and bioaccumulation	2003–04	Approximately 3 times	SCCWRP
At mouth of Ballona Creek and between south jetty and breakwater	Benthic infauna diversity	1976–present	Monthly	LACDBH

4. Habitat Monitoring

At the present time only a few ongoing habitat monitoring programs are in place in the Ballona Creek Watershed, and all the existing monitoring programs are in the lower portion of the watershed. Monitoring programs presently are being conducted in the Ballona Wetlands, the Ballona Freshwater Marsh, Ballona Lagoon, and Marina del Rey Harbor. Each of those programs is discussed below.

BALLONA WETLANDS

USACE initiated a monitoring program in the Ballona Wetlands in 2001. The purpose of the monitoring program is to document habitat conditions before and after the installation of two self-regulating tide gates and one flap gate to restore tidal circulation to the wetlands. USACE's contractor for the monitoring program is MEC Analytical Systems. The Ballona Wetlands monitoring program includes the following four components:

Vegetation

Saltmarsh vegetation is monitored along ten permanent transects in spring and fall:

- Percent plant cover and plant height of each species along each transect is recorded.
- Soil salinity is analyzed.

Channel Invertebrates

Channel invertebrates are sampled in summer:

- Invertebrates are identified and counted in five sediment core samples at eight stations.
- Large clams are counted in deep cores.
- Temperature, salinity, and DO measurements are taken at each station.

Marsh Fishes

Marsh fishes are sampled in spring, summer, fall, and winter:

- Fishes are sampled at same eight channel stations as invertebrates.
- Fishes are collected with a 15-meter-long beach seine.
- All fishes are counted and identified to species.
- Up to 100 fish per species in each sample are measured and weighed.
- Salinity, temperature, DO, and pH are measured at each station.

Marsh Birds

Marsh birds are surveyed in spring, summer, fall, and winter:

- Birds are observed along transects.
- All species of birds observed are recorded along with information on location and habitat.
- For Belding's savannah sparrows, evidence of breeding behavior is noted and the location of sightings is marked on a vegetation map.
- During the California least tern summer breeding season, weekly surveys to document least tern foraging activity are conducted.

BALLONA FRESHWATER MARSH

The 51.5-acre Ballona Freshwater Wetland System has been designed with two components: a 26.1-acre Freshwater Marsh and a 25-acre Riparian Corridor. Planting of about 23.8 acres of the Freshwater Marsh was completed in late 2001. Planting of the remaining 2.3 acres is scheduled for completion by the end of 2004. Construction of the Riparian Corridor is scheduled to begin after the Freshwater Marsh is completed. Habitat monitoring of the Ballona Freshwater Marsh is being

conducted by the Center for Natural Lands Management under the direction of Dr. Edith Read. The Ballona Freshwater Marsh monitoring program includes the following bird and vegetation components:

Birds

Breeding birds are censused quarterly:

- Birds are censused by Dan Cooper of Audubon California.
- Censusing uses the National Breeding Bird Census Protocol.
- Bird use of different habitats is identified.

Bird counts are conducted on an ongoing basis:

- Audubon Society volunteers under direction of Jean Pickus conduct bird counts.
- The bird counts record the number of individuals of each species.

Vegetation

- Vegetation is mapped using an aerial photograph.
- Vegetation is censused along fifty-six belt transects that are 30 feet long by 6 feet wide.
- The number of species, height, and percent cover of each species is recorded.

BALLONA LAGOON

Bird use of Ballona Lagoon is censused monthly by Santa Monica Bay Audubon under the direction of Charles Almdale. The census started in April 1996. Santa Monica Bay Audubon does its census as close to the monthly low tide as is practical. Bird monitoring in Ballona Lagoon has the following components:

Birds

- Observers record species, number of individuals per species, habitat, census start and end times, actual water level, time of nearest low tide and miscellaneous comments.
- To date, 81 species and 14,923 individual birds have been documented.
- The average per survey is 20 species and 167 individual birds.

MARINA DEL REY HARBOR

LACDBH has been censusing water quality and aquatic habitat in Marina del Rey Harbor since 1976. Until 1996, the contractor for the harbor monitoring program was Harbors Environmental Projects of the University of Southern California. In 1996, the program was taken over by Aquatic Bioassay and Consulting Laboratories. Habitat monitoring in Marina del Rey Harbor includes benthic invertebrate and fish monitoring.

Benthic Invertebrates

- Sediments are collected by grab sample at thirteen stations in fall (usually October) of each year.
- One station at the mouth of Ballona Creek and one station between the south jetty and the breakwater are included.
- All invertebrates in the sediments are identified to species and counted.

Fishes

- Bottom fishes are sampled by otter trawl at three stations.
- Fish eggs and larvae are sampled by plankton net at three stations.
- Midwater fishes are sampled by gill net at three stations.
- Reef fishes are sampled by diver transect at three stations.
- Inshore fishes are sampled by beach seine at one station.
- Fish surveys are conducted twice per year in fall and spring.

C. DATA GAP ANALYSIS

Based on the monitoring efforts discussed above in Existing Efforts, a data gap analysis was performed to address all monitoring needs for both water quality and habitat, not just data needs that can be filled by volunteers. The results of the gap analysis have been used to frame the proposed Monitoring Program and may help other organizations redirect resources to areas where they will have the most benefit. The following section evaluates which of the data gaps can and should be filled by volunteer efforts. The other data gaps should be filled by organizations/agencies.

1. Water Quality Monitoring Data Gap Analysis

A fundamental goal of the Management Plan is to restore Ballona Creek's beneficial uses (consistent with the Federal Clean Water Act fishable/swimmable mandate) by achieving water quality objectives. Therefore, most monitoring efforts should either track progress towards water quality objectives, or identify pollutant sources that hinder attainment of water quality objectives.

The following categories were evaluated for data gaps:

- Existing water quality impairments
- Other water quality parameters
- Sources of pollution and spatial distribution of monitoring efforts
- BMP effectiveness

EXISTING WATER QUALITY IMPAIRMENTS

Data regarding water quality parameters that are recognized as impairments are needed for TMDL development and compliance. Water quality impairments are those parameters for which the Creek does not consistently attain applicable water quality standards. The State Board compiles a list of water quality impairments known as the 303(d) list. Each parameter on the 303(d) list must be addressed by a TMDL. Table 2-2 lists the water quality impairments for Ballona Creek as represented on the 303(d) list.

The 303(d) list parameters are compared to existing monitoring efforts to determine data gaps. Parameters with sufficient monitoring are discussed below, followed by parameters without sufficient monitoring.

TABLE 5-14
Proposed Pilot Site Water Quality BMPs

Pilot Site	*Water Quality BMP*
Mar Vista Recreation Center	Sedimentation pretreatment facility, underground storage and infiltration gallery
Lafayette Park	Sedimentation pretreatment facility, underground storage and infiltration gallery
Ladera Park	Sedimentation pretreatment facility, dam for stormwater retention, underground storage and infiltration gallery
Culver City High School	Sedimentation pretreatment facility, swale, underground storage and infiltration gallery
University High School / Kuruvungna Springs	Sedimentation pretreatment facility, underground storage and infiltration gallery
Baldwin Hills to Ballona Trail	Stormwater retention facilities
Oxford Flood Control Basin	Influent trash/sediment treatment, aeration facilities, disinfection
Street retrofit	Swales and infiltration facilities

Sufficient Monitoring

A thorough wet weather dataset currently exists for many 303(d) list parameters due to LACDPW's ongoing monitoring program. LACDPW has monitored several storms each year since 1994—thus covering a wide range of hydrologic conditions, including the dry La Niña 1998/99 and wet El Niño 1997/98 seasons—for the full suite of priority pollutants at the LACDPW's Beloit Avenue mass emission and flow gauging station. The Beloit Avenue location is upstream of tidal influences. Both composite and first flush grab sampling are conducted. The parameter suite includes general minerals (including pH, a 303(d)-listed parameter), indicator bacteria, nutrients, metals (total and dissolved), semi-volatile organics (including PAHs), pesticides (including organochlorine and organophosphorus-based chemicals) and PCBs, although monitoring for most metals and pesticides only began in 1996 or 1997, and for PAHs in 1999. Recently, trash was added to the list of parameters measured.

Bacteria. Ballona Creek and Estuary are impaired for high coliform count based on the Basin Plan REC-1 fecal coliform limit (200 MPN/100 mL). A thorough dataset also exists for bacteria during both the dry and wet seasons. During the summer of 2003, SCCWRP, Baykeeper, LACDPW, City of Los Angeles, and RWQCB conducted three dry season 'snapshot' monitoring events, sampling each flowing drain as well as eleven bridge locations for indicator bacteria (total coliform, fecal coliform, and Enterococcus). LACDPW takes samples four to six times per year in wet and dry weather for total coliform, fecal coliform, Streptococcus and Enterococcus. In addition, the City of Los Angeles has an ongoing monitoring program in which indicator bacteria (total coliform, fecal coliform, E. coli. and Enterococcus) are sampled daily at Centinela Avenue and weekly at Pacific Avenue at the mouth of the Creek. Assuming that all of the methods used are comparable to the Basin Plan standard, there is sufficient monitoring for Bacteria in Ballona Creek and the Estuary.

Metals in the water column. Ballona Creek has the following metal impairments in the water column:

- Dissolved lead, compared to the California Toxics Rule Criteria Continuous Concentration (CTR CCC) of 2.5 µg/L
- Total selenium, compared to CTR CCC of 5 µg/L

A thorough dataset also exists for metals during both the dry and wet seasons. Baykeeper monitors dissolved and total metals from bridges and flowing storm drains approximately three times per year. Dr. Stenstrom of UCLA conducted a dry weather study of total and dissolved metals in Ballona Creek during the summer of 1999. Dr. Stenstrom also conducted two wet weather studies: the first on metals, organics, and acute toxicity in Ballona Creek location during the storm season of 1996/97, and the second on metals (total and dissolved) at Sawtelle Blvd. and two major tributaries, Sepulveda Channel and Centinela Channel, during the storm season of 1997/98. LACDPW monitors metals at the mass emissions station approximately six times per year, including both wet and dry weather. Assuming that all of the methods used are comparable to the CTR standard, there is sufficient monitoring for metals in the Ballona Creek water column.

Trash. Ballona Creek and Wetlands are impaired for trash. Trash is extensively measured by a number of programs instituted in preparation and response to the Ballona Creek trash TMDL finalized in 2001. Baykeeper counts and uses photo-documentation for trash at each storm drain during their approximately quarterly monitoring events. They monitor one drain west of Overland Boulevard on a weekly basis. LACDPW recently began documenting and measures trash at their mass emissions stations after each storm event (Ramos 2003). At least four organizations are monitoring trash removal by BMP devices in the watershed.

Insufficient Monitoring

Despite a relatively thorough set of monitoring data for the Ballona Creek Watershed, additional monitoring is recommended for several parameters shown in Table 2-2 including the following:

- Sediment toxicity and sediment impairment by organic chemicals, PAHs, and metals in Ballona Creek and Ballona Estuary upstream of the mouth for toxicity
- Tissue sampling in Ballona Creek and Estuary for PAHs, PCBs, and chlorinated pesticides
- Enteric Viruses in Ballona Creek and Estuary
- Water column toxicity and source identification in Ballona Creek

Sediment Toxics and Impairments in Ballona Creek and Ballona Estuary. LACDBH extensively studies sediments in the estuary and between the south jetty and the breakwater. Although LACDBH conducts frequent and thorough monitoring of the sediments, the monitoring does not include sediment toxicity tests. SCCWRP's Bight '03 study will monitor sediment toxicity on a limited basis. There is no known monitoring of sediment toxicity in Ballona Creek.

Sediments should be monitored upstream of the mouth of Ballona Creek because the impairment is listed in both the Estuary and Ballona Creek. Most of the annual sediment loads are transported to Santa Monica Bay during wet weather. Sediments from the Ballona Creek drainage area are scoured during storm events and deposited at the mouth of the Creek and downcurrent in the Santa Monica Bay, therefore these sediment reservoirs require intensive sampling to provide a thorough assessment of sediment quality, impacts, and impairments.

Tissue Sampling in Ballona Creek and Ballona Estuary. Additional sampling is also recommended for parameters that are bioaccumulative in animal tissues. These analyses should focus on tissue sampling for PAHs, PCBs, and chlorinated pesticides in the lower Creek and estuary. Bight '03 contains limited bioaccumulation testing. Lack of bioaccumulation data is a data gap because the Creek and estuary are listed for several impairments to tissue quality. Therefore a comprehensive assessment of tissue quality conditions is needed.

Enteric Viruses in Ballona Creek and Estuary. Viruses should be studied during both dry and wet weather, to verify the existing 303(d) impairment listing. Enteric virus testing can also provide more information regarding a link between bacteria and virus presence. Viruses have been identified as a more reliable indicator of pathogens than traditional indicator bacteria. Therefore, this is an important parameter group to monitor to properly assess the Creek's attainment of the body contact recreation (REC-1) designated beneficial use. Sampling should be conducted both in the Creek and in the estuary, with an intensive storm drain sampling effort to help identify major sources of contamination. Both composite and first flush grab sampling should be conducted.

Water Column Toxicity in Ballona Creek. A comprehensive source investigation of toxicity is needed. SCCWRP's 1999 Santa Monica Bay Impacts Report recommended that monitoring programs should make locating sources of toxicity and contamination within the Ballona Creek Watershed a high priority. Current water column toxicity efforts are limited and are not focused on source identification. Bight '03 will monitor toxicity in the stormwater discharge plume from Ballona Creek, using sea urchin fertilization tests during two storm events, as well as toxicity of corresponding composite samples of Ballona Creek stormwater at LACDPW's Beloit Avenue site. LACDPW now performs water column toxicity tests at Beloit Avenue multiple times per year.

A comprehensive investigation would include a detailed sampling effort throughout the Creek and its tributary storm drains and channels. Both composite and first flush grab samples should be taken, with greater attention paid to the dry season when metals are primarily in the dissolved phase and are hence more bioavailable. Toxicity

analyses should include sea urchin fertilization, which is among the most sensitive tests for toxicity. Toxicity testing using multiple marine species could be useful to provide a more complete assessment of the causes of toxicity in stormwater discharged to Santa Monica Bay. For instance, tests with crustaceans (e.g., shrimp) are recommended, as they are likely to be sensitive to pesticides such as diazinon and chlorpyrifos, whereas sea urchin fertilization may be more sensitive to metals. Furthermore, Toxicity Identification Evaluations (TIEs) should be conducted to elucidate the chemical parameters responsible for the observed toxicity effects.

OTHER WATER QUALITY PARAMETERS

Other water quality parameters are parameters of interest that are not listed as impairments. The review of existing monitoring efforts revealed that two groups of parameters are missing from the existing monitoring efforts: emerging chemicals and VOCs.

Emerging Chemicals. Emerging chemicals are water quality parameters that are of increasing importance. These chemicals include perchlorate, N-nitrosodimethylamine (NDMA), a carcinogen, polybrominated diphenyl ethers (PBDEs), a fire retardant that may bioaccumulate, and pharmaceuticals. Although several of these compounds are more commonly associated with municipal wastewater treatment plant effluent, there remains the potential for their presence in urban runoff. The scientific community is beginning to discover that these compounds are more ubiquitous in the environment than was originally assumed. As a result, this class of compounds is receiving increased regulatory scrutiny. These chemicals also may have the potential to impair the aquatic life beneficial uses of the Creek and estuary, and so should be among the constituents of concern for the Ballona monitoring program.

Volatile Organic Compounds (VOCs). Continued water column sampling needs to be conducted for a variety of organic constituents. Although LACDPW's ongoing monitoring program includes semi-volatiles, PCBs and pesticides, it is unclear whether VOCs (including MTBE) are included in the analysis suite. Although VOCs are not typically detected in urban runoff, a water body characterization should be conducted to assess their presence during dry and wet weather conditions, especially considering that light industrial—a potential VOC source—makes up a portion of the Creek's drainage area. Furthermore, LACDPW has only monitored semi-volatile organics (including PAHs) since 1999, and therefore continued tracking is needed to elucidate sources of identified sediment and tissue contamination.

SOURCES OF POLLUTION AND SPATIAL DISTRIBUTION OF MONITORING EFFORTS

SCCWRP and LACDPW have implemented numerous land use runoff characterization studies. As part of SCCWRP's study of wet weather runoff loads to Santa Monica Bay, numerous parameters are not only sampled in Ballona Creek, but at representative, homogeneous land use sites in the Ballona watershed as well. These parameters include indicator bacteria, total metals, nutrients, and organics (PAHs, organophosphate pesticides and chlorinated organics). LACDPW also samples runoff from eight different land use types throughout the County. Samples are analyzed for the full suite of priority pollutants, with most parameters being analyzed since 1994 (although most metals and pesticides were not added until 1996/97 and PAHs were not added until 1999).

The spatial distribution of monitoring efforts was reviewed for data gaps. Well-distributed monitoring efforts aid in source identification. Figure 5-1 shows the location of the most frequent monitoring efforts in the Ballona Creek Watershed.

In addition to the specific points shown in Figure 5-1, the Baykeeper regularly performs dry weather sampling events on every flowing drain in the main channel. With assistance from LACDPW, the Baykeeper is able to sample upstream of where the bike path ends to the

point where Ballona Creek daylights. The parameters monitored by the Baykeeper are spatially well distributed. Those parameters are bacteria, dissolved and total metals, total suspended solids, flow, pH, and trash. The remaining water quality impairments that are not measured at storm drains are enteric viruses and water column toxicity.

BMP EFFECTIVENESS

Many stormwater BMPs have been installed in the watershed. In most cases, the BMP installation has been combined with studies to evaluate the effectiveness of the BMPs. Therefore, no data gaps regarding existing BMPs have been identified. However, the pilot sites proposed as part of the Management Plan do not have monitoring plans. The lack of monitoring plans for the Management Plan pilot sites is a data gap.

LACDPW has recently installed 200 catch basin debris excluder devices and 16 vortex separation systems in the Ballona watershed, and will analyze trash collected from various land use types. The SMBRC has a project with GeoSyntec in which several stormwater structural BMPs are to be installed and monitored in the watershed. The City of Los Angeles has installed trash collection devices at four locations in South Central Los Angeles, and a gravity system in an industrial land use area of Manchester. North East Trees has installed a bioswale at the Bimini Slough Ecology Park in Hollywood which will be monitored by the County of Los Angeles. The City of Santa Monica will install a 2-stage filter system to remove pollutants from a drainage area discharging to Ballona Creek—a stage 1 gross solids removal device and a stage 2 StormFilter. The City of West Hollywood will install and monitor 20 catch basin debris excluder devices. Finally, Culver City will install a CDS unit at a storm drain outlet tributary to Ballona Creek, west of Overland Avenue.

The pilot sites listed in the Management Plan that include water quality BMPs should be monitored for their effectiveness. According to the project descriptions available at this time the pilot sites each include water quality BMPs. The water quality portions of the pilot sites are summarized in Table 5-14. The proposed pilot projects have not yet been implemented. When the pilot projects are implemented, there will be a need for information on their water quality improvement efficiency.

Baykeeper has also documented which drains flow during dry weather. No organization has documented which drains never flow. If drains are identified that do not flow even in wet weather, these drains may be removed so that they cannot be a location for future illicit discharges.

SUMMARY OF WATER QUALITY DATA GAP ANALYSIS

The identified water quality monitoring gaps include the following:

- Sediment sampling in Ballona Creek and in Estuary upstream of the mouth for toxicity, organic chemicals, PAHs, and metals
- Tissue sampling in Ballona Creek and Estuary for PAHs, PCBs, and chlorinated pesticides
- Sampling and source identification for enteric viruses in Ballona Creek and Estuary
- Emerging chemicals in Ballona Creek and Estuary
- VOCs in Ballona Creek and Estuary
- Water quality effectiveness of BMPs at pilot sites
- Identification of storm drains that never flow

WATER QUALITY REDUNDANCY ANALYSIS

There was no redundancy found in existing water quality monitoring efforts. Even with the large number of organizations involved, the Creek is large enough, approximately 9 miles long, that no overlap can be identified. Bacteria are the most commonly monitored parameter. Monitoring efforts for bacteria are dispersed throughout the watershed as shown in Figure 5-1. There

are no organizations that monitor bacteria at the same time and same place on an ongoing basis. All of the remaining parameters of interest are monitored less frequently than bacteria and are not monitored at the same place at the same time.

HABITAT MONITORING DATA GAP/ REDUNDANCY ANALYSIS

Existing habitat monitoring is focused on aquatic and wetlands habitats in the lower portion of the Ballona Watershed. The existing habitat monitoring programs are not redundant as each is monitoring a different area. No existing monitoring program has been identified for uplands habitats in the Ballona Watershed. At a minimum, habitat monitoring should be conducted in the Baldwin Hills and the Santa Monica Mountains. The lack of monitoring in these areas appears to be a major data gap. In addition, there is no habitat monitoring at the pilot project sites because they are not constructed. The lack of pilot project monitoring is a data gap.

D. PROPOSED COMMUNITY-BASED WATERSHED MONITORING PROGRAM

1. Proposed Community-Based Water Quality Monitoring

Certain data gaps identified can be filled through community-based monitoring. Volunteers can assist by doing at least part of the needed monitoring. The proposed monitoring program below is based on filling the data gaps and continuing existing monitoring efforts organized by the Baykeeper.

Table 5-15 presents the water quality data gaps that are appropriate for volunteer monitoring.

Volunteers can be an integral part of monitoring water quality by taking water samples at drains during dry weather and from bridges during wet and dry weather. In addition, volunteers can monitor the efficiency of pilot site water quality BMPs through visual inspection. It is assumed that professionals will perform water sampling at the pilot sites because upstream flow and downstream flow may require access through manholes. Specific monitoring tasks to be performed by volunteers at pilot sites can be defined during detailed design.

TABLE 5-15
Suitability of Volunteer Efforts for Collection of Data to Fill Data Gaps

Data Gap	*Potential Volunteer Efforts*
Sediment sampling in Ballona Creek and in Estuary upstream of the mouth for toxicity, organic chemicals, PAHs, and metals	*Not recommended*
Tissue sampling in Creek and Estuary—PAHs, PCBs, and chlorinated pesticides	*Not recommended*
Enteric viruses in Creek and Estuary	Water sampling
Water column toxicity upstream of LACDPW mass emissions station and between mass emissions station and estuary	Water sampling
Emerging chemicals in Ballona Creek and Estuary	Water sampling
VOCs in Ballona Creek and Estuary	Water sampling
Water quality efficiency of BMPs at pilot sites	Visual inspection

It is also possible for volunteers to perform sediment and tissue monitoring, but it can be difficult (Burres 2003). Sediment monitoring can require specialized equipment and requires channel access. Tissue monitoring can be unpleasant for volunteers because it requires capturing aquatic life. Sediment and tissue monitoring are not recommended as part of the community-based monitoring program based on the challenges presented by these two monitoring types. It is recommended that the City and County of Los Angeles assume responsibility for sediment and tissue sampling.

Water quality and flow parameters that are measured through the Baykeeper's current efforts should be continued. Table 5-16 summarizes the proposed Monitoring Program including parameters that are not currently monitored by volunteers and parameters that are already monitored by volunteers.

Sampling of new parameters is generally suggested at low frequency and limited locations. The proposed new parameters, except wet weather flow, involve expensive analyses. Water column toxicity and enteric viruses are known impairments that should be measured on an ongoing basis. The presence of emerging chemicals and VOCs should be determined before ongoing sampling is established. Determining which storm drains do not flow can probably be accomplished in one storm season.

The parameters that are already analyzed on an approximately quarterly basis through Baykeeper's program should continue. The Baykeeper has found significant variation in water quality results from quarterly monitoring efforts in drains and in Ballona Creek. Increasing the sampling frequency to monthly will provide more information on the variability of water quality in drains and in Ballona Creek (Bera 2003).

Baykeeper has already developed sampling procedures for drains and Ballona Creek. The Baykeeper uses recognized laboratory procedures at the Baykeeper facility for parameters including bacteria and pH and have an outside lab perform analysis for parameters such as metals. This division of lab analysis keeps costs low without compromising data quality objectives. Baykeeper does not have enough meters to give to volunteers so analysis for pH, conductivity, and turbidity is performed at the Baykeeper facility. Supplying volunteers with field meters can increase the quality of the data. Heal the Bay's Stream Team evaluated different types of field meters. If funding is available, the Monitoring Program could adopt the Stream Team's standard meters.

For the new parameters, Baykeeper and the Ballona Creek Task Force Monitoring Committee should determine data quality objectives and chose test methods and an analyzing laboratory based on those objectives. Test methods for the new parameters should be sensitive enough that results can be compared with established water quality objectives.

2. Proposed Community-Based Habitat Monitoring

It is recommended that a community-based monitoring program for habitat be initiated, at a minimum, in the parts of the Baldwin Hills and the Santa Monica Mountains that are within the Ballona Creek Watershed. Once the pilot sites are identified, habitat monitoring can be performed at the pilot sites. As described below, monitoring should be conducted of birds, large mammals, and vegetation. Ideally, monitoring should be conducted monthly. At a minimum monitoring should be conducted quarterly, once in each season.

BIRDS

Terrestrial birds are best surveyed using the point count method. This method requires that the observer have considerable experience in bird identification. The observer must be able to accurately identify birds both visually and by ear. It is suggested that bird monitoring be done under the direction of the Audubon Society with experienced birders making the observations. Inexperienced birders can participate as data recorders.

TABLE 5-16
Preliminary Volunteer Water Quality Sampling Schedule

Parameter	*Frequency*	*Location*	*Comment*
New Volunteer Monitoring Parameters			
Enteric viruses	Two dry weather, one wet weather sample annually	Snapshot bridges (12 bridges, see Figure 4-1)	Volunteers perform sampling, outside lab performs analysis
Water Column Toxicity	Two dry weather, one wet weather sample annually	Snapshot bridges	Volunteers perform sampling, outside lab performs analysis
Emerging Chemicals: Perchlorate, NDMA, PBDE, and pharmaceuticals	Two dry weather, one wet weather sample to determine positive results, then reevaluate	Sepulveda Bridge (upstream of tidal influence)	Volunteers perform sampling, outside lab performs analysis
MTBE	Two dry weather, one wet weather sample to determine positive results, then reevaluate	Sepulveda Bridge (upstream of tidal influence)	Volunteers perform sampling, outside lab performs analysis
Flow—wet weather	Two storm events, then reevaluate	Every drain	Inspect storm drains from safe location to determine flowing drains
Continuing Volunteer Monitoring Parameters			
Site conditions	Monthly	Every drain and snapshot bridges	Volunteers document site conditions through field data sheets and photo documentation
Flow—dry weather	Monthly	Every flowing drain and snapshot bridges	Volunteers estimate flow and use photo documentation
Trash	Monthly	Every drain and snapshot bridges	Volunteers characterize trash and use photo documentation
Bacteria: *Enterococci*, total coliform, fecal coliform, *E. coli*.	Monthly	Every flowing drain and snapshot bridges	Volunteers perform sampling, and Baykeeper analyzes
Metals—total and dissolved	Monthly	Every flowing drain and snapshot bridges	Volunteers perform sampling, outside lab performs analysis
pH	Monthly	Every flowing drain and snapshot bridges	Volunteers perform sampling, and Baykeeper analyzes
Turbidity	Monthly	Every flowing drain and snapshot bridges	Volunteers perform sampling, and Baykeeper analyzes
Conductivity	Monthly	Every flowing drain and snapshot bridges	Volunteers perform sampling, and Baykeeper analyzes
Total Suspended Solids	Monthly	Every flowing drain and snapshot bridges	Volunteers perform sampling, and Baykeeper analyzes

The point count method of bird census establishes a series of permanent points or locations along a set route in each area to be censused. On each survey the observer returns to the same locations in the same order. Surveys should be done between sunrise and 11 A.M. to census the birds when they are most active. At each point the observer records the number of individuals of each species that he sees or hears during a standardized observation period (usually either 5 minutes or 10 minutes). Birds generally are recorded either as within 50 meters of the point, greater than 50 meters from the point, or flying over. Birds also usually are recorded as seen but not heard, calling but not singing, or singing. Points should be located far enough away from each other that the same bird will not be heard or seen from two different points. In general, the distance between points should be greater than 200 meters.

MAMMALS

The larger mammals can be censused by citizen monitors by observing mammal sign such as tracks and scat along permanently established belt transects. During each survey citizen monitors should walk the established transect routes and record all mammal sign within an established distance (usually 1 or 2 meters) of the transect. The Earth Skills organization (see references for contact information) offers excellent training in animal tracking and could be retained to train citizen monitors or, conversely, citizen monitors could enroll in the organization's classes on their own.

VEGETATION

Citizen monitors can be trained to identify the common native and nonnative plants (i.e., willows, mulefat, castor bean etc) perhaps by volunteers from the California Native Plant Society. Permanent belt transects should be established and the vegetation censused for a set width (usually 2 to 3 meters) along the transect. If the citizen monitors are fairly experienced at plant identification the number of each species of identifiable plant, the percent cover of each species, and the height of dominant species should be recorded. If the observer is inexperienced, it might be better just to record the relative dominance (abundant, common, scarce) of common species. In addition, permanent photo locations should be established along each transect. At each photo location, the observer should photograph the vegetation. Changes in vegetation, thus, will be documented in photographs, and photographs can be reviewed by experienced botanists.

INTEGRATION OF HABITAT AND WATER QUALITY MONITORING

The suggested water quality and habitat monitoring efforts are not closely related by site location or by the skills required. Therefore, two sets of volunteers—one for water quality monitoring and one for habitat monitoring—are suggested. Using two distinct groups could minimize the amount of training required of individual volunteers and reduce confusion. However, volunteers assigned to pilot sites may be trained to perform both habitat and water quality monitoring tasks.

QUALITY ASSURANCE PROJECT PLAN

A Quality Assurance Project Plan (QAPP) is a planning document that sets the general framework and requirements for a monitoring project. A QAPP describes the scope of the project, the organizations involved, the data quality objectives, the monitoring procedures, and quality control measures to be used (State Board 2003). Many of the government agencies that provide funding for monitoring programs require a QAPP. The Baykeeper has a QAPP that should be modified to include new Monitoring Program activities and methods.

The Clean Water Team Regional Manager and other technical advisors should review the QAPP. The approved QAPP should be available to interested parties.

RECRUITING AND TRAINING VOLUNTEERS

The new volunteer monitoring tasks suggested in this Monitoring Program will require recruitment of additional volunteers. Volunteers should be trained on standard operating procedures (SOPs) to be used in the field and in the laboratory. Regular training is needed to accommodate volunteer turnover and to provide refresher training. Training could be conducted on a regular basis similar to the monthly training conducted by Heal the Bay. The State Board Clean Water Team is available for training assistance.

Training volunteers educates community members of the connection between their neighborhoods and receiving waters. Recruiting and training helps fulfill the mission of instilling a sense of stewardship in community members.

DATA MANAGEMENT

The Baykeeper already has established data management practices and software. They are the logical entity to manage most of the data management tasks. The Baykeeper already has an Access database for water quality and observational data. This database can be used for future community-based monitoring data for both water quality and habitat and be made available to agencies and the public on request.

Field observations and laboratory data should go through a quality review prior to being entered into the database. The database should also house calibration records, maintenance logs and all quality control information (Burres 2003). This information can be critical to the public and agency acceptance of data obtained by volunteers.

The State Board is developing a database to house data gathered by volunteer monitoring groups (Burres 2003). When the database is completed, the benefit of submitting Monitoring Program data to the State Board database should be determined. The Monitoring Program database should at least be able to export data into a format that is compatible with State Board or RWQCB protocols.

DATA ANALYSIS

The monitoring project manager should screen all data gathered as soon as possible for water quality or habitat emergencies. The requirements for detailed data analysis will vary from year to year and project to project. Data may be compared to Basin Plan or other objectives, or may be utilized as model input. It is also expected that data analysis will be conducted by the different organizations such as SCCWRP using data gathered by volunteers. Analysis could include load estimates by the State Board and RWQCB, comparison of mass loading from different storm drains, and quantifying changes in species diversity at the pilot sites.

Data analysis should be combined, at a minimum, with the regular updates to the Watershed Management Plan and the Baykeeper's annual report.

REPORTING

Three methods of reporting data are proposed. First, data gathered through the Monitoring Program should be summarized in the Baykeeper's annual report. Secondly, data should be supplied to organizations upon request. Finally, the SMBRC should be notified of the data that are available for inclusion in the data index. A central data index for local water quality data was created by the SMBRP (now SMBRC) data management workgroup. This index provides information regarding available water quality data in the region and instructions on how to obtain the data. The data index quickly became out of date after it was developed (Wang 2003b). If an effort to maintain the data index is conducted, the Monitoring Program data should be added to the data index.

RESPONSIBLE AGENCIES/ ORGANIZATIONS

Progress on monitoring in Ballona Creek Watershed has been aided by the recent efforts of teams of agency and environmental group personnel. SCCWRP's Bight '03 efforts involve over sixty organizations (Schiff 2003). The team that performed the recent snapshot sampling events in Ballona Creek included the following:

- Training by the Baykeeper
- Sampling personnel from the State Board, RWQCB, SMBRC, City of Los Angeles, and LACDPW
- Laboratory analysis by the City of Los Angeles
- Transportation in Ballona Creek upstream of the bike path by LACDPW
- Data analysis by SCCWRP

Teams and task forces are successful because they can use the best resources from each organization. Teaming increases efficiency and reduces redundancies and should be used as much as possible for the Monitoring Program.

The MRCA has received a grant to hire a watershed coordinator for the Ballona Creek Watershed for a three-year period. The responsibilities for this position include oversight of the community-based monitoring program. Suggestion responsibilities for different monitoring tasks under the umbrella of a watershed coordinator are listed in Table 5-17.

TABLE 5-17
Potential Responsible Agencies for Community-Based Monitoring Tasks

Task	*Responsible Agency*
Monitoring Program coordination	Ballona Watershed Coordinator*
Funding and budget coordination	Ballona Watershed Coordinator*
Recruiting	Ballona Watershed Coordinator*
Volunteer water quality monitoring and training	Santa Monica Baykeeper
Volunteer bird monitoring and training	Audubon
Volunteer vegetation monitoring and training	Ballona Watershed Coordinator*
Volunteer mammal monitoring and training	Ballona Watershed Coordinator*
Ballona Creek access and safety	LACDPW
Pilot site access and safety	Agency with jurisdiction over pilot site
QAPP Development	Ballona Watershed Coordinator*
QAPP Review	State Board Clean Water Team, RWQCB, LACDPW, City of Los Angeles
Database Management	Baykeeper
Data Index Management	SMBRC
Annual Report	Ballona Watershed Coordinator*
Management Plan updates including Monitoring Program	Ballona Creek Task Force

* Assumes grant funding can be identified to hire a Watershed Coordinator.

IMPLEMENTATION

The suggested Monitoring Program exceeds current community-based monitoring efforts. The information gathered by community members can reduce the burden on state and local agencies. Therefore, state and local agencies may be willing to assist in the implementation of the program through partnerships. Implementation can be assisted by in-kind contributions of services for lab work, vehicles for site access, other equipment, and personnel for training. Funding may also be available from local, state, and national sources to offset the costs of an expanded program.

It may not be possible to implement the suggested Monitoring Program all at one time. A phased approach may ease the transition from current programs to the suggested Monitoring Program. Monitoring that already occurs could logically continue and new monitoring elements can be added systematically. There are a number of steps that must be conducted to implement the full program. These steps are described below:

- Agree on monitoring task leaders.
- Apply for funding.
- Agree on in-kind and monetary contribution from Watershed stakeholders.
- Determine water quality objectives and methods.
- Update QAPP.
- Train task leaders and trainers on new standard operating procedures.
- Modify database to include new parameters.
- Review detailed pilot project designs to plan pilot project monitoring.

A successful implementation that meets the needs of the diverse group of stakeholders will require coordination and cooperation. The Task Force and Ballona Watershed Coordinator will play an integral role in the coordination efforts.