CHAPTER | TWO

Ballona Creek

CHAPTER TWO

existing conditions

A. WATERSHED BOUNDARY

The Ballona Creek Watershed, located in the western portion of the Los Angeles Basin, is a drainage area of approximately 130 square miles. The general boundaries of the watershed (Figure 2-1) include Mulholland Highway in the Santa Monica Mountains and the ridgeline in the Hollywood Hills on the north, the western portion of Silverlake (west of the reservoir) and Echo Park (west of Echo Park Lake), and the I-110 freeway (and the southwestern portion of downtown Los Angeles) on the east, and Manchester Boulevard and the Westchester Bluffs on the south. The western boundary begins just west of Sepulveda Boulevard in the Santa Monica Mountains, and generally follows Bundy/ Centinela Avenue to approximately Venice Boulevard, and then zigzags southwest towards Marina del Rey and the Ballona Creek Channel. The watershed planning area includes the coastal interface zone and coastal waters of Marina del Rey, the Venice Canals, Ballona Lagoon, Del Rey Lagoon, and Oxford Lagoon (also known as the Oxford Flood Control Basin) as water quality in these areas are interrelated.

B. GEOLOGY AND FAULTING

The Ballona Creek Watershed is located on the coastal plain of the Los Angeles basin, with the Santa Monica Mountains on the north and the Baldwin Hills on the south. The Santa Monica Mountains form the central portion of the Transverse Ranges of Southern California, running from Point Arguello (north of Santa Barbara) into the Mojave Desert. The Transverse Ranges consist of several large areas of seismically active uplifted basement rocks. The Baldwin Hills represent a surface expression of the Newport/Inglewood Fault, formed over the past several million years. West of the Baldwin Hills, the Ballona Escarpment, created over time by erosional activity of Ballona Creek, generally forms the southern edge of the Watershed. The topography of the Watershed is shown in Figure 2-2.

The Watershed is generally located on what is known as the Southwestern Block of the Los Angeles basin (the portion of the basin south of the Santa Monica Mountains), which consists chiefly of marine clastic[1] and organic sedimentary strata of middle Miocene to recent epoch (from 14.5 to 1.7 million years ago), including igneous rocks of middle Miocene epoch. The lower sequence generally consists of marine sandstone, siltstone, and minor amounts of conglomerate, deposited in a shallow marine environment.

[1] *Clastic* refers to a rock or sediment composed primarily of broken fragments derived from preexisting rocks or minerals that have been transported some distance from their place of origin.

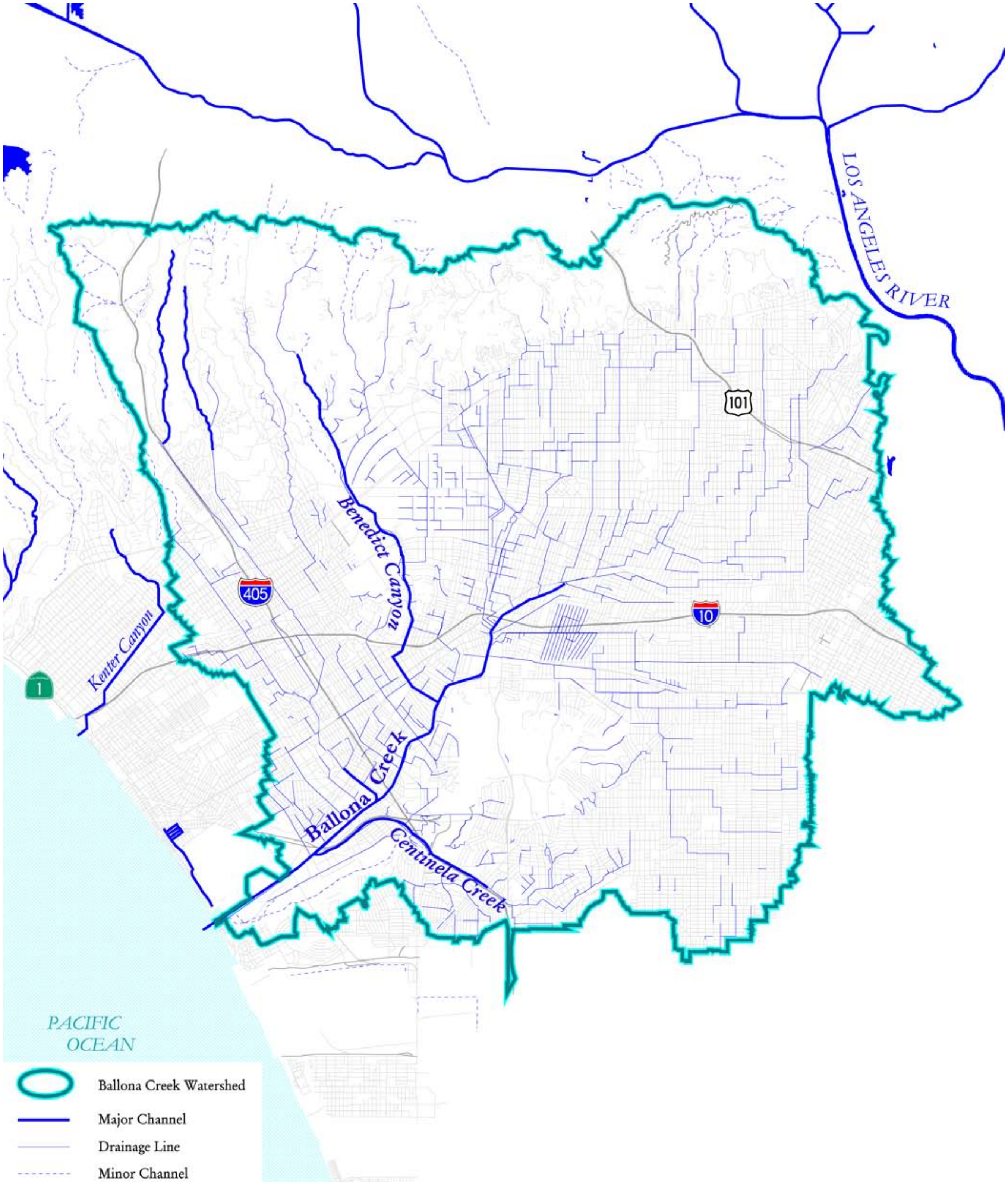


Figure 2-1 **Ballona Creek Watershed**

SOURCE: LA County, Department of Public Works, Watershed Boundaries, Channels, and Roads, May 2003; EIP Associates, GIS, June 9, 2003

Figure 2-2 **Ballona Creek Watershed Topography**

SOURCE: LA County, Department of Public Works, Watershed Boundaries, Channels, Roads, and Topography May 2003; EIP Associates, GIS, March 17, 2004

At the base of the Santa Monica Mountains (and the Baldwin Hills), these deposits are overlain by gently rolling terrain consisting of alluvial deposits, deposited as alluvial fan material resulting from erosion of the southern slopes of the Santa Monica Mountains and the slopes of the Baldwin Hills, respectively. In some locations south of the Santa Monica Mountains, these alluvial surface deposits were incised by stream channels, which generally faded across the broad coastal plain. Along the coast, the marine deposits are generally covered by windborne sand (deposited during the Pleistocene) or alluvial materials deposited by Ballona Creek.

The Ballona Creek Watershed includes two major fault systems, the Santa Monica Fault zone and the Newport Inglewood fault zone, and numerous smaller faults. The Santa Monica Fault zone is comprised of several major active faults, including the Malibu Coast and Santa Monica–Hollywood Faults, which runs along the southern edge of the Santa Monica Mountains. The active Newport-Inglewood Fault runs from off the coast of Newport Beach to Culver City, and is responsible for the chain of low hills extending from Signal Hill to the Baldwin Hills. Each of these fault zone systems is capable of producing large earthquakes, with a maximum credible earthquake[2] estimated as a magnitude 7.5 event on the Santa Monica–Hollywood Fault and a 7.4 event on the Newport-Inglewood Fault. Both of these would result in severe earthshaking in most of the Watershed. Major faults in the vicinity of the Watershed are depicted on Figure 2-3.

Portions of the watershed are underlain by oil deposits, created by organic matter deposited long ago and subsequently covered by layers of rock and other sediments. Although Native Americans, and later Spanish settlers, utilized tar from La Brea Tar Pits to waterproof baskets and other materials, it was not until 1892 that extraction of oil began in the watershed, with the discovery of oil in Echo Park. In the coming decades, oil wells were drilled throughout portions of the watershed. Initially, production was generally limited to downtown Los Angeles and the area to the west, but exploration continued to move west. With the discovery of the Inglewood oil field in 1924, production began in and around the Baldwin Hills. Oil was discovered in the Venice area in 1930, which initiated an oil boom along the coast. Today, oil extraction continues in the Baldwin Hills, with more limited production at scattered locations throughout the Watershed.

[2] *Maximum credible earthquake* is the largest earthquake (measured in magnitude on the Richter Scale) that appears to be reasonably capable of occurring under the presently known geologic framework.

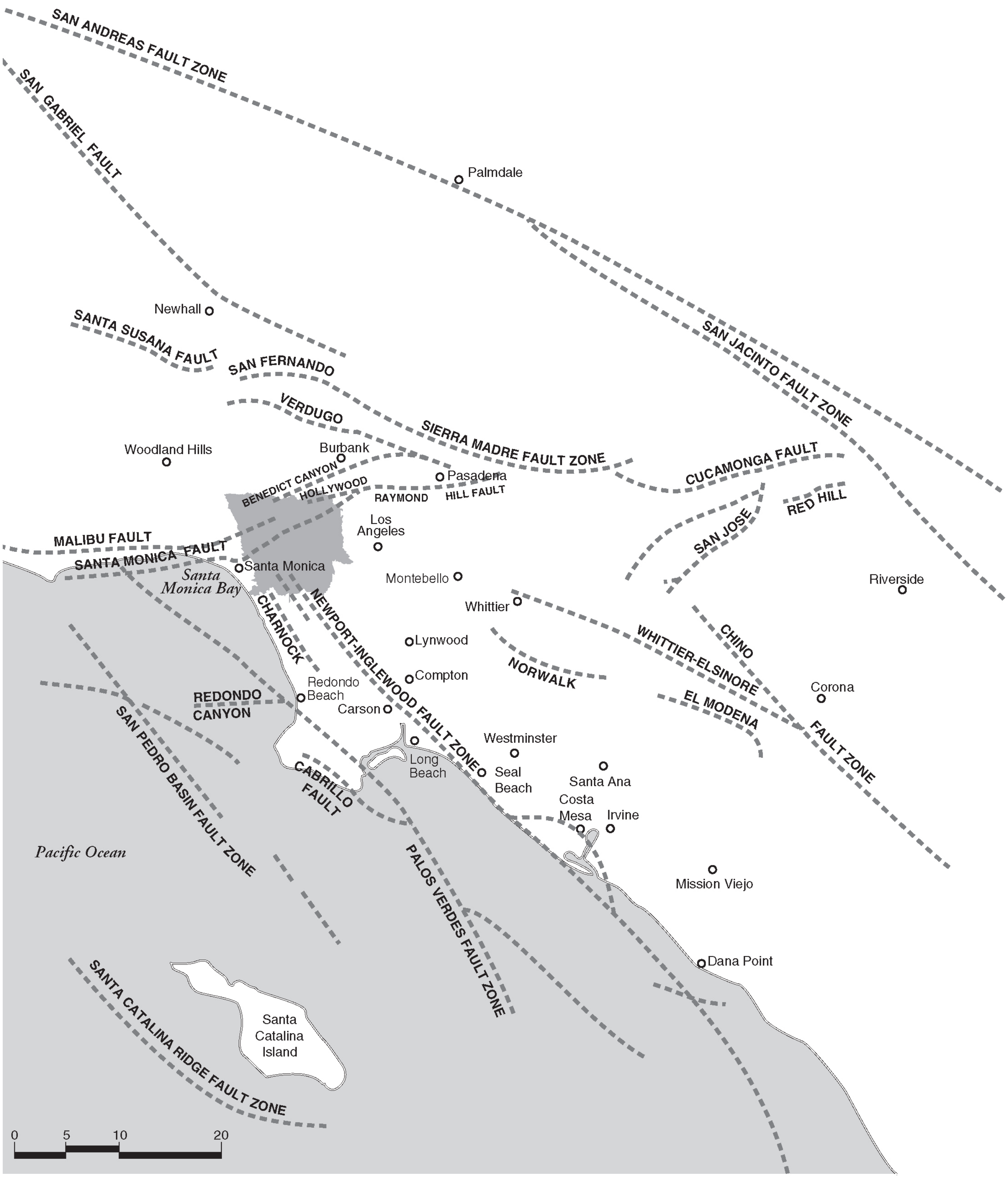


Figure 2-3 **Major Faults in the Watershed Vicinity**

SOURCE: CDMG OFR 92-03 (1992), USGS MFI-512 (1965)

C. CLIMATE

The Ballona Creek Watershed is within the Mediterranean climate zone of California, which extends from Central California to San Diego and is characterized by wet winters and long dry summers. Other than California, this climate type only occurs in coastal zones along the Mediterranean Sea, Western and Southern Australia, the Chilean coast, and the Cape Town region of South Africa.

The topography of the Los Angeles region results in a great deal of spatial variation in the local climate. The proximity and steep rise of the San Gabriel Mountains from the coast creates a barrier that traps moist ocean air against the mountain slopes and partially blocks summer heat from the desert and winter cold from the interior northeast. Average daytime summer and winter temperatures range from 71/63F° at the coast to 83/66F° downtown. Figure 2-4 shows the variation in annual monthly temperatures in Culver City.

Long-term annual rainfall averages vary from 12.5 inches along the coast to 15.5 inches in downtown Los Angeles, with most precipitation falling in a few major storm events between November and March. The seasonal distribution of rainfall is provided in Figure 2-5. For any given storm event, rainfall totals vary across the Watershed. The maximum recorded 24-hour rainfall in the Watershed ranges from 4.5 inches in Culver City to 5.88 inches at downtown Los Angeles.

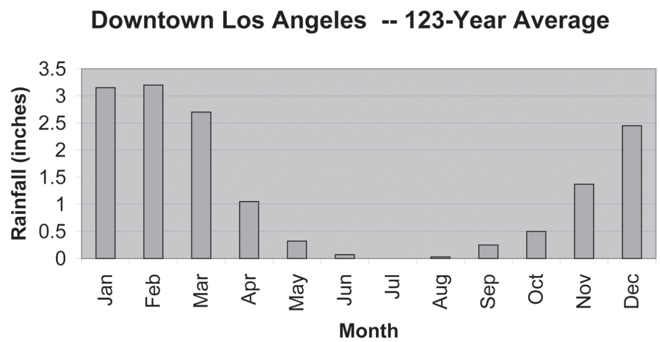


Figure 2-5 **Seasonal Distribution of Rainfall**

SOURCE: *Common Ground, from the Mountains to the Sea*, per data from the Western Regional Climate Center

Most winter storms come from the northwest, moving across Southern California into Arizona. Typical storms in the Watershed bring ¾ inch or less of rainfall. Storms from the south or southwest are less common, but because they may stall off the coast, they may bring 3 to 6 inches of rain over portions of the Watershed. Summer rains are rare, but when they occur they are a result of tropical thunderstorms originating in the Gulf of Mexico or late summer hurricanes off the West Coast of Mexico.

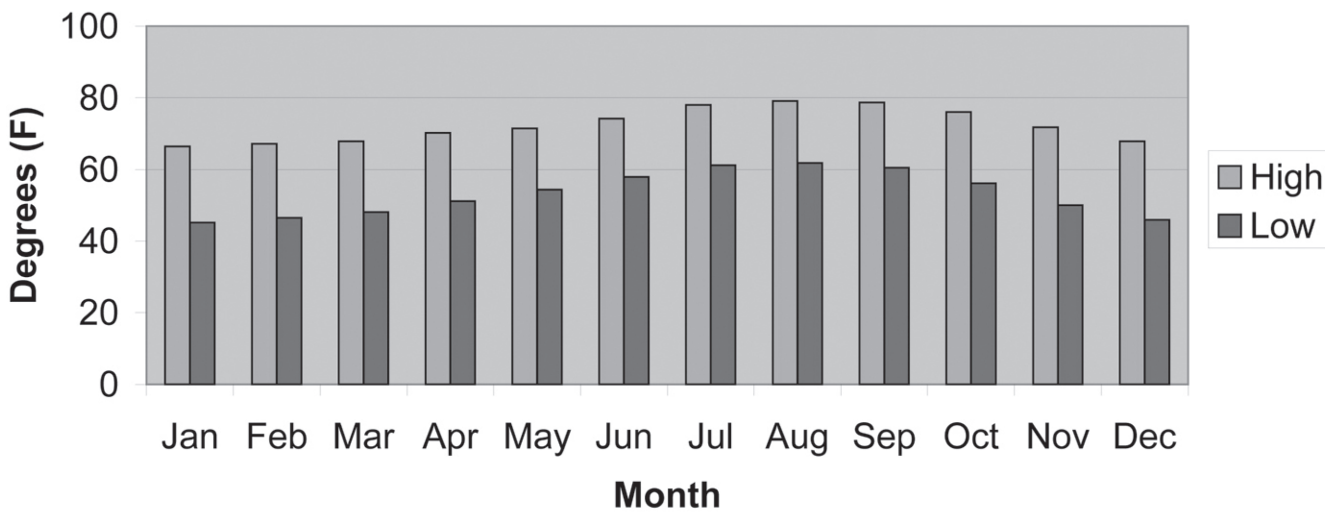


Figure 2-4 **Seasonal Variation in High and Low Temperatures, Culver City**

SOURCE: Western Regional Climate Center

EXISTING CONDITIONS

D. HYDROLOGY

Historically, Ballona Creek was a meandering stream, lined with dense vegetation that met the Pacific Ocean in a broad expanse of tidal lagoons and wetlands. Various perennial and intermittent streams were located in the canyons of the Santa Monica Mountains; however, according to historical maps, many of these tributaries disappeared as they crossed the coastal plain (presumably due to percolation of instream flow to groundwater). High groundwater in West Hollywood and the area known as La Cienega (e.g., including present day Hancock Park) resulted in surface seeps and springs, which resulted in the formation of marshland and swamps. At times, runoff from these areas may have been sufficient to feed a perennial tributary to Ballona Creek. Another area of marshland and swamps was located northeast of the Baldwin Hills, possibly due to the Newport-Inglewood Fault serving as a barrier to groundwater movement. Various intermittent streams were also found in the area around the Baldwin Hills, along with Centinela Creek, which drained the southern portion of the Watershed. In some areas, winter rains transformed surface depressions and areas with dense clay soils into seasonal vernal pools. Because tidal flushing was not constrained, the estuary of Ballona Creek and the associated tidal wetlands trapped sediment eroded from upland areas and collected runoff behind barrier beaches. Figure 2-6 overlays the historic stream patterns over current development, depicting the general location of these streams.

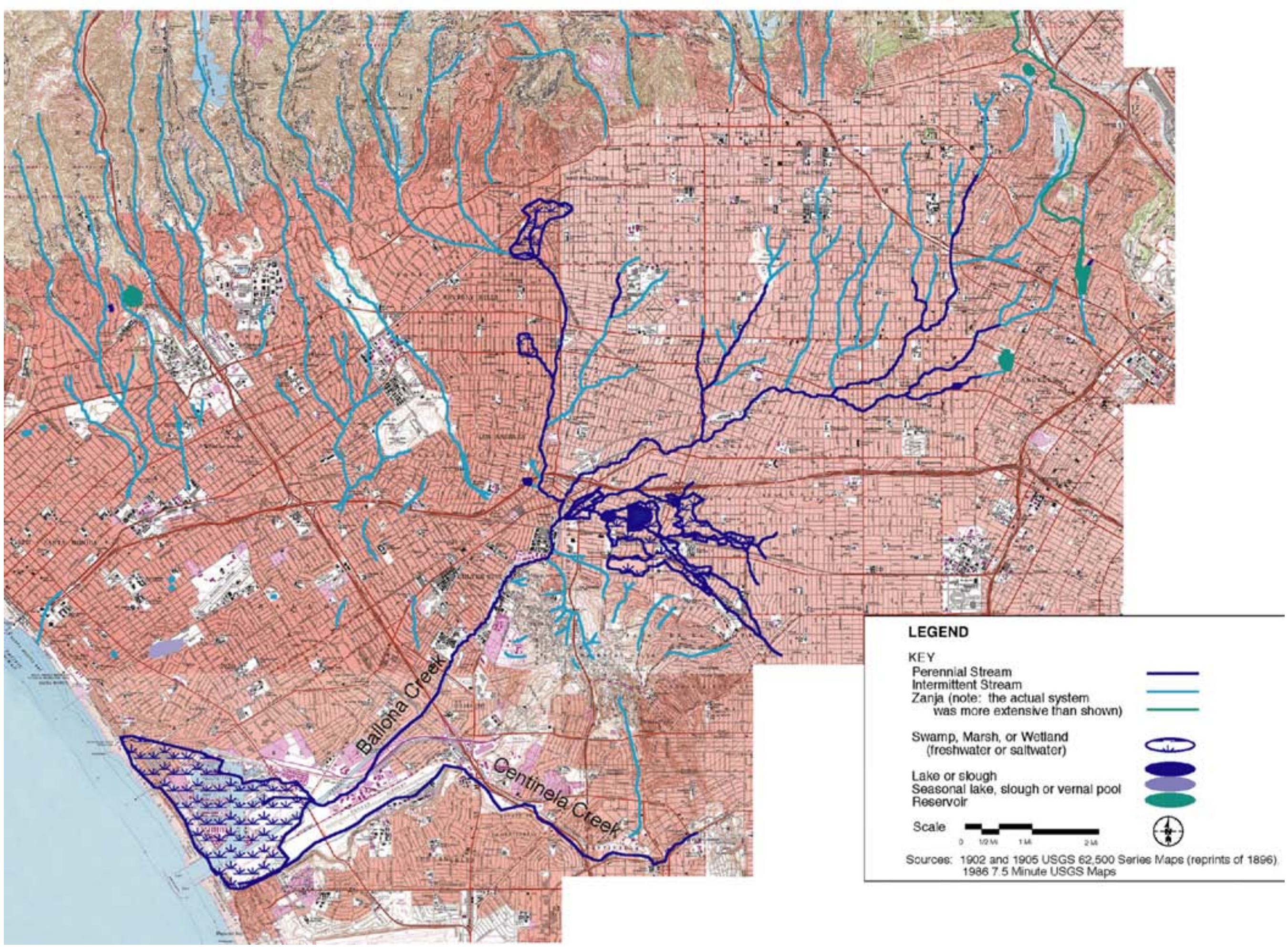


Figure 2-6 **Historic Ballona Creek Watershed Drainage Area Overlay Map, 1896 and 1986**

SOURCE: Braa et al. 2001, *Seeking Streams: A Landscape Framework for Urban and Ecological Revitalization in the Upper Ballona Creek Watershed*

Until the twentieth century, Ballona Creek and the various tributaries were largely unconstrained. When winter rains swelled the creeks, they often changed course, flooding farms, homes and businesses. As urban development moved west of downtown Los Angeles, various tributaries began to be channelized or filled in. The increasing urban and suburban development also increased the extent of impervious surfaces, increasing runoff volumes from storm events. A flood in 1914 resulted in considerable property damage and left areas near the coast flooded for many months.

Channel confluence

The City of Los Angeles began to straighten portions of Ballona Creek in the 1920s. Following a subsequent flood in 1934, the U.S. Army Corps of Engineers (USACE), in conjunction with the Los Angeles County Flood Control District (LACFCD), lined the lower portions of the creek channel with large rocks (quarried from Santa Catalina Island) and channelized the upper portions in concrete between 1935 and 1939. The major tributaries to the Creek were channelized starting in 1950, with the Sawtelle-Westwood system built between March 1950 and February 1960, Centinela Creek channel between 1960 and 1962, and the Benedict Canyon system channels (including Higgins and Coldwater Canyon Channels), between December 1962 and January 1964. Between 1959 and 1965, in response to the 1941 Flood Control Act, the USACE and the LACFCD modified the existing Ballona Creek channel by dredging silt deposits, raising walls and levees, and grouting the levee facing. Currently, Ballona Creek is designed to discharge approximately 71,400 cubic feet per second into Santa Monica Bay from a 50-year frequency storm event. Two sections of Ballona Creek are still maintained by USACE, seaward of Pacific Avenue (near the mouth) and between La Cienega Boulevard and La Salle Avenue (upstream). The Los Angeles County Department of Public Works (LACDPW) maintains other portions of the Creek.

Today, most of the drainage network in the Ballona Creek Watershed is controlled by structural flood control measures, including debris basis, storm drains, underground culverts, and open concrete channels. Ballona Creek remains underground in the eastern portion of the Watershed, becoming an open channel near Venice Boulevard and Pickford Street (about six blocks west of La Brea Avenue), before continuing approximately nine miles to Santa Monica Bay. Only a few channels remain open for major portions of their length, including the Sepulveda Wash (also known as Walnut Creek) and Centinela Creek. Very few natural stream channels remain, mostly in the Santa Monica Mountains and Baldwin Hills. Some former streams in the major canyons have been channelized and remain open channels at some locations, including Stone Canyon Creek and Benedict Canyon Creek. A few remnant channels also exist on the coastal plain, in some parks (such as Pan Pacific Park in the Fairfax area), on the UCLA campus, and on private land, including some backyards along former drainage courses, and at least two golf courses, including the Wilshire Country Club and Los Angeles Country Club.

Due to the extensive modification of the creek and tributaries, natural hydrologic functions have been significantly reduced in the Watershed. With approximately 40 percent of the Watershed covered with impervious surfaces (Stolzenbach 2001), runoff enters the creek and tributaries more quickly, and in greater volume than occurred prior to development. Extreme runoff flow conditions for the Creek (at Sawtelle Boulevard), is provided in Table 2-1. Infiltration of precipitation to groundwater has been reduced and riparian vegetation and aquatic habitat has been eliminated from most channels. As most channels are now lined with concrete, the natural processes of erosion and sedimentation have been altered, with eroded sediment now transmitted to the mouth of Ballona Creek (where it periodically results in partial closure of the boat entrance to Marina del Rey). The construction of levees on Ballona Creek, coupled with construction of Marina del Rey significantly reduced the extent of tidal wetlands, and reduced the extent of tidal flushing in the estuary and associated lagoons (including Del Rey Lagoon and Ballona Lagoon). With the introduction of imported water and extensive landscaping, runoff from landscape irrigation has created year-round flows in most channels, which historically were dry most of the year.

TABLE 2-1
Ballona Creek Extreme Runoff Flow Conditions

Return Period (year)	Discharge (cubic meters per second)
1	220
5	500
10	623
50	910
100	1,020
200	1,079
500	1,254

Source: U.S. Army Corps of Engineers, *Marina del Rey and Ballona Creek Feasibility Study*, 2003

E. GROUNDWATER

Groundwater is located under most of the Ballona Creek Watershed, which is primarily underlain by a groundwater formation known as the West Basin (comprised of the Hollywood and Santa Monica subbasins) and a small portion of the Central Basin under the southeastern portion of the Watershed. The Hollywood subbasin is bounded on the north by Santa Monica Mountains and the Hollywood Fault, on the east by the Elysian Hills, on the west by the Inglewood Fault zone, and on the south by a surface divide known as the "La Brea high," formed by an anticline[3] that brings impermeable rocks close to the surface. The Santa Monica subbasin is bounded by the Santa Monica Mountains on the north, the Ballona escarpment on the south, the Inglewood Fault zone on the east, and the Pacific Ocean on the west. The Central Basin is bounded on the north by the La Brea high, and on the northeast and east by less-permeable rocks of the Elysian, Repetto, Merced, and Puente Hills. The southeast boundary of the Central Basin roughly follows Coyote Creek, while the southwest boundary is formed by the Newport-Inglewood Fault system.

Groundwater in the Ballona Creek Watershed is replenished by percolation of rainfall and stream flow from the Santa Monica Mountains to the north and the Baldwin Hills to the south. With approximately 40 percent of the watershed covered by impervious surfaces and concrete lining most tributary channels, the land area open to direct infiltration of rainfall and percolation from stream channels has been substantially reduced.

[3] An *anticline* is a surface rise where the underlying rocks dip on either side of the rise.

Where groundwater levels are high, permeable rocks or confining structures, such as faults, may result in groundwater reaching the surface as areas of moist soil, a seep, or a spring. Historically, high groundwater levels in some portions of the Watershed resulted in marshes and surface springs. In general, most of these surface springs have ceased or been capped (such as the former Centinela Springs in Inglewood). However, natural springs still exist at various locations in the Santa Monica Mountains and at a few locations on the coastal plain, including the Kuruvungna Springs on the grounds of University High School near the western boundary of the Watershed. High groundwater levels still exist in many of the same locations where they were historically found, including West Hollywood, La Cienega, Venice, and portions of Culver City. In these areas, the high groundwater table may pose issues for building foundations, result in seepage into below-grade spaces, and increase the risk of liquefaction during seismic events.

Drain clogged with debris

F. WATER QUALITY

REGULATORY BACKGROUND

The quality of water in Ballona Creek reflects the extent of human modification of the Watershed. As settlement of the area began, issues associated with human occupation, including animal waste and the disposal of sewage, also became concerns. Once the creek was channelized, as urban development became extensive, the discharge of chemical contaminants from industrial uses became an issue.

The Dickey Water Pollution Control Act of 1949 established a State Water Pollution Control Board (later renamed the State Water Quality Control Board) and nine regional water pollution control boards that roughly corresponded to the major watersheds in the state. In 1967, the State Water Rights Board merged with the State Water Quality Control Board to create the State Water Resources Control Board. The Porter-Cologne Water Quality Control Act (of 1969) conferred broad powers to the State and Regional boards to protect the beneficial uses of water, and established a requirement for water quality control plans (or Basin Plans, which identify beneficial uses for water bodies) for each region. The Porter-Cologne Act served as a model for the Federal Water Pollution Control Act Amendments of 1972 (commonly referred to as the Clean Water Act).

In the Ballona Creek Watershed, primary authority for surface water quality rests with the Los Angeles Regional Water Quality Control Board (LARWQCB). The Board has the authority to issue permits for discharge from point sources and stormwater under the National Pollutant Discharge Elimination System. The first NPDES countywide permit for stormwater was issued in 1990.

The 1994 *Water Quality Control Plan, Los Angeles Region (Basin Plan)*, prepared by the LARWQCB, noted that the water quality in Ballona Creek was impaired by pollutants from industrial effluent, illegal dumping of sewage, historical overflows of untreated sewage into Ballona Creek during the storm events, and pollutants from nonpoint sources. (With recent upgrades to the Hyperion Sewage Treatment Plant, overflows to Ballona Creek have been substantially curtailed.)

Per the (federal) Clean Water Act the State Water Resources Control Board adopts a list of impaired water bodies (the "303(d)" list) for the State of California, which currently includes Ballona Creek, Ballona Wetlands, and Marina del Rey (back basin). The list was amended and updated most recently in 2002 (and adopted in February 2003) and identifies water quality impairments (including trash, metals, pathogens, and organic pesticides) that restrict the beneficial uses identified in the Basin Plan.

To preserve the beneficial uses identified in the Basin Plan, the LARWQCB has the responsibility to identify the Total Maximum Daily Load (TMDL) for each pollutant of concern (identified on the list of impaired water bodies) and identify a conceptual implementation strategy to achieve the relevant water quality standard. Although a TMDL for trash in Ballona Creek has already been established (along with a wet-weather pathogen TMDL for Santa Monica Bay and a bacteria TMDL for Mother's Beach in Marina del Rey) the majority of TMDLs for Ballona Creek and the Watershed have yet to be established.

WATER QUALITY MONITORING

Water quality in Ballona Creek is monitored by a variety of local agencies, including the cities of Los Angeles, Santa Monica, Culver City and West Hollywood, the County of Los Angeles (Department of Beaches and Harbors and Department of Public Works), the Los Angeles Regional Water Quality Control Board, the Santa Monica Bay Restoration Commission and the U.S. Army Corps of Engineers. Heal the Bay and Santa Monica Baykeeper conduct volunteer monitoring. Occasional monitoring is also performed in conjunction with research projects conducted by the Southern California Coastal Water Research Project, UCLA, and Loyola Marymount University. The frequency of monitoring varies considerably from daily monitoring by Los Angeles City, monthly monitoring by the Los Angeles County Department of Public Works, and quarterly monitoring by Santa Monica Baykeeper. In addition, three snapshot sampling events were conducted during the dry season in 2003 and additional sampling in 2004 to provide baseline data for TMDL development is anticipated. The County conducts water sampling at two locations on Ballona Creek: at Fairfax Avenue and Sawtelle Boulevard. The Fairfax Avenue location is used for dry weather flow samples only, while the Sawtelle Boulevard location is used for collection of both dry weather and storm flow samples. Although Santa Monica Baykeeper began monitoring relatively recently, the program samples most of the publicly accessible tributary storm drains in the lower portion of Ballona Creek. The County of Los Angeles has installed a trash net near the mouth of Ballona Creek, to reduce the amount of trash entering Santa Monica Bay. The trash is removed periodically and the amount of trash removed is recorded, although the net is designed to catch larger items and give way during high flow events and, thus, does not capture all of the trash in the Creek. For more information on water quality monitoring, refer to Chapter 5 (Community Based Monitoring Program).

SURFACE WATER QUALITY

The 303(d) list of water quality impairments in the Watershed is provided in Table 2-2 along with the regulatory standards used to identify those impairments (in Table 2-3). The amount of trash removed by the County of Los Angeles from the net at the mouth of Ballona Creek during 2002 is illustrated in Figure 2-7. The amount of sediment discharged by Ballona Creek has been estimated at a total of approximately 44,615 m^3 (with 39,760 m^3 of sand and 4,855 m^3 of silt), although sediment production is highly variable due to the relationship with land use, water management, and hydrological conditions within the Ballona Creek Watershed (USACE 2003).

TABLE 2-2
Ballona Creek Watershed 2002 CWA Section 303(d) List of Water Quality Limited Segments

Name	*Pollutant/Stressor*	*Potential Sources*	*TMDL Priority*	*Est. Size Affected*	*Proposed TMDL Completion*
Ballona Creek	Cadmium (sediment)	Nonpoint/Point Source	High	6.5 miles	2004
	Chem A* (tissue)	Source Unknown	High	6.5 miles	2004
	Chlordane (tissue)	Nonpoint/Point Source	High	6.5 miles	2004
	Copper, Dissolved	Nonpoint Source	High	6.5 miles	2004
	DDT (tissue)	Nonpoint/Point Source	High	6.5 miles	2004
	Dieldrin (tissue)	Nonpoint/Point Source	High	6.5 miles	2004
	Enteric Viruses	Nonpoint/Point Source	High	6.5 miles	2003
	High Coliform Count	Nonpoint/Point Source	High	6.5 miles	2003
	Lead, Dissolved	Nonpoint Source	High	6.5 miles	2004
	PCBs (tissue)	Nonpoint/Point Source	High	6.5 miles	2004
	pH	Urban Runoff/Storm Sewers/ Nonpoint Source	Low	6.5 miles	
	Sediment Toxicity	Nonpoint/Point Source	High	6.5 miles	2004
	Selenium, Total	Urban Runoff/Storm Sewers/ Nonpoint Source	Low	6.5 miles	
	Silver (sediment)	Nonpoint Source	Low	6.5 miles	
	Toxicity	Nonpoint/Point Source	High	6.5 miles	2004
	Zinc, Dissolved	Urban Runoff/Storm Sewers/ Nonpoint Source	Low	6.5 miles	
Ballona Creek Estuary	Chlordane (tissue & sediment)	Nonpoint/Point Source	High	2.3 miles	2004
	DDT (sediment)	Nonpoint/Point Source	High	2.3 miles	2004
	High Coliform Count	Nonpoint/Point Source	High	2.3 miles	2004
	Lead (sediment)	Nonpoint/Point Source	High	2.3 miles	2004
	PAHs (sediment)	Nonpoint/Point Source	Low	2.3 miles	
	PCBs (tissue & sediment)	Nonpoint/Point Source	High	2.3 miles	2004
	Sediment Toxicity	Nonpoint/Point Source	High	2.3 miles	2004
	Shellfish Harvesting Advisory	Nonpoint/Point Source	High	2.3 miles	2003
	Zinc (sediment)	Nonpoint/Point Source	High	2.3 miles	2004

TABLE 2-2 (continued)
Ballona Creek Watershed 2002 CWA Section 303(d) List of Water Quality Limited Segments

Name	*Pollutant/Stressor*	*Potential Sources*	*TMDL Priority*	*Est. Size Affected*	*Proposed TMDL Completion*
Ballona Creek Wetlands	Exotic Vegetation	Nonpoint Source	Low	315 acres	
	Habitat Alterations	Nonpoint Source	Low	315 acres	
	Hydromodification	Nonpoint Source	Low	315 acres	
	Reduced Tidal Flushing	Nonpoint Source	Low	315 acres	
	Trash	Nonpoint Source	Low	315 acres	
Marina del Rey Harbor--Back Basins	Chlordane (tissue & sediment)	Nonpoint Source	Medium	391 Acres	
	Copper (sediment)	Nonpoint Source	Low	391 Acres	
	DDT (tissue)	Nonpoint Source	Medium	391 Acres	
	Dieldrin (tissue)	Nonpoint Source	Medium	391 Acres	
	Fish Consumption Advisory	Nonpoint Source	Medium	391 Acres	
	High Coliform Count	Nonpoint Source	High	391 Acres	2004
	Lead (sediment)	Nonpoint Source	Medium	391 Acres	
	PCBs (tissue & sediment)	Historical use of pesticides, stormwater runoff/aerial deposition	Medium	391 Acres	
	Sediment Toxicity	Nonpoint Source	Medium	391 Acres	
	Zinc (sediment)	Nonpoint Source	Medium	391 Acres	
Marina del Rey Harbor Beach	Beach Closures	Nonpoint Source	High	0.29 miles	2003
	High Coliform Count	Nonpoint Source	High	0.29 miles	2003

Source: U.S. Army Corps of Engineers, *Marina del Rey and Ballona Creek Feasibility Study*, 2003

TABLE 2-3
Associated Environmental Regulatory Thresholds for Ballona Creek Watershed 303(d) Impairments

Impairment	Media	Beneficial Use	Indicator Parameter	Value	Units	Source	Notes
Ballona Creek							
Cadmium	Sediment	Aquatic Life	cadmium	9.6 / 41.6	ppm (dry wt.)	NOAA ERM / FI PEL	1
Chem A	Tissue	Aquatic Life	any Chem A constituent	100	ppb (wet wt.)	NAS Guideline	2
Chlordane	Tissue	Aquatic Life	chlordane	8.0	ppb (wet wt.)	SWRCB MTRL	
Dissolved Copper	Water	Aquatic Life	dissolved copper	9	ug/L	CTR CCC	3
DDT	Tissue	Aquatic Life	p,p'-DDT	32.0	ppb (wet wt.)	SWRCB MTRL	
Dieldrin	Tissue	Aquatic Life	dieldrin	0.65	ppb (wet wt.)	SWRCB MTRL	
Enteric Viruses	Water	REC-1	?	?	?	?	
High Coliform Count	Water	REC-1	fecal coliform	200	MPN/100ml	BP WQO	4
Dissolved Lead	Water	Aquatic Life	dissolved lead	2.5	ug/L	CTR CCC	5
PCBs	Tissue	Aquatic Life	total PCBs	5.3	ppb (wet wt.)	SWRCB MTRL	
pH	Water	Aquatic Life	pH	6.5-8.5	--	BP WQO	
Sediment Toxicity	Sediment	Aquatic Life	amphipod survival	--	--	BP WQO	6
Total Selenium	Water	Aquatic Life	total selenium	5.0	ug/L	CTR CCC	
Silver	Sediment	Aquatic Life	silver	3.7 / 1.77	ppm (dry wt.)	NOAA ERM / FI PEL	6
Toxicity	Water	Aquatic Life	toxicity assessment	--	--	BP WQO	7
Trash	Water	Aquatic Life, REC2	--	--	--	BP WQO	8
Dissolved Zinc	Water	Aquatic Life	dissolved zinc	118	ug/L	CTR CCC	9
Ballona Estuary							
Chlordane	Tissue	Aquatic Life	chlordane	8.3	ppb (wet wt.)	SWRCB MTRL	
Chlordane	Sediment	Aquatic Life	chlordane	6 / 4.79	ppb (dry wt.)	NOAA ERM / FI PEL	10
DDT	Sediment	Aquatic Life	p,p'-DDT	45.1 / 51.7	ppb (dry wt.)	NOAA ERM / FI PEL	11
High Coliform Count	Water	REC-1	fecal coliform	200	MPN/100ml	BP WQO	12
Lead	Sediment	Aquatic Life	lead	218 / 112.2	ppm (dry wt.)	NOAA ERM / FI PEL	13
PAHs	Sediment	Aquatic Life	total PAHs	44,792 / 16,771	ppb (dry wt.)	NOAA ERM / FI PEL	14
PCBs	Tissue	Aquatic Life	total PCBs	5.3	ppb (wet wt.)	SWRCB MTRL	
PCBs	Sediment	Aquatic Life	total PCBs	180 / 188.8	ppb (dry wt.)	NOAA ERM / FI PEL	15

TABLE 2-3 (continued)
Associated Environmental Regulatory Thresholds for Ballona Creek Watershed 303(d) Impairments

Impairment	*Media*	*Beneficial Use*	*Indicator Parameter*	*Value*	*Units*	*Source*	*Notes*
Sediment Toxicity	Sediment	Aquatic Life	amphipod survival	--	--	BP WQO	16
Shellfish Harvesting Advisory	Water	Shellfish Harvesting	fecal coliform	70	MPN/100ml	BP WQO	17
Zinc	Sediment	Aquatic Life	zinc	410 / 271	ppm (dry wt.)	NOAA ERM / Fl PEL	18
Ballona Wetlands							
Exotic Vegetation	--	Wetland Habitat	--	--	--	BP WQO	19
Habitat Alterations	--	Wetland Habitat	--	--	--	BP WQO	20
Hydromodification	--	Wetland Habitat	--	--	--	BP WQO	21
Reduced Tidal Flushing	--	Wetland Habitat	--	--	--	BP WQO	22
Trash	Water	Wetland Habitat	--	--	--	BP WQO	23

NOTES
1. Lower of two thresholds used to determine impairment
2. Chem A group of pesticides includes aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, HCH (including lindane), endosulfan and toxaphene
3. CCC assumes hardness of 100 mg/L
4. 30-day log mean; REC-1 designation subject to change
5. CCC assumes hardness of 100 mg/L
6. Based on Narrative Objective
7. Lower of two thresholds used to determine impairment
8. Based on Narrative Objective
9. TMDL complete; Based on Narrative Objective
10. CCC assumes hardness of 100 mg/L
11. Lower of two thresholds used to determine impairment
12. Lower of two thresholds used to determine impairment
13. 30-day log mean
14. Lower of two thresholds used to determine impairment
15. Lower of two thresholds used to determine impairment
16. Lower of two thresholds used to determine impairment
17. Based on Narrative Objective
18. 30-day median
19. Lower of two thresholds used to determine impairment
20. Based on Narrative Objective
21. Based on Narrative Objective
22. Based on Narrative Objective
23. Based on Narrative Objective
24. Based on Narrative Objective

DEFINITION OF TERMS
BP WQO = Basin Plan Water Quality Objective

CTR CCC = California Toxics Rule Criteria Continuous Concentration (freshwater)

NOAA ERM = NOAA Effects Range-Median values, based on Long et. al., 1995, Predicting Toxicity in Marine Sediments with Numerical Sediment Quality Guidelines, Environmental Toxicology and Chemistry, 17(4):714-727

Fl PEL = Florida Probable Effects Level, based on MacDonald et. al., 1994, Approach to the Assessment of Sediment Quality in Florida Coastal Waters, Prepared for the Fl DER, MacDonald Environmental Services, Ltd., Ladysmith, B.C.

SWRCB MTRL = Ca SWRCB Max. Tissue Residue Levels developed for the State Mussel Watch and Toxic Substance Monitoring Program

NAS Guideline = NAS/NAE 1973 Recommended Maximum Tissue Concentrations

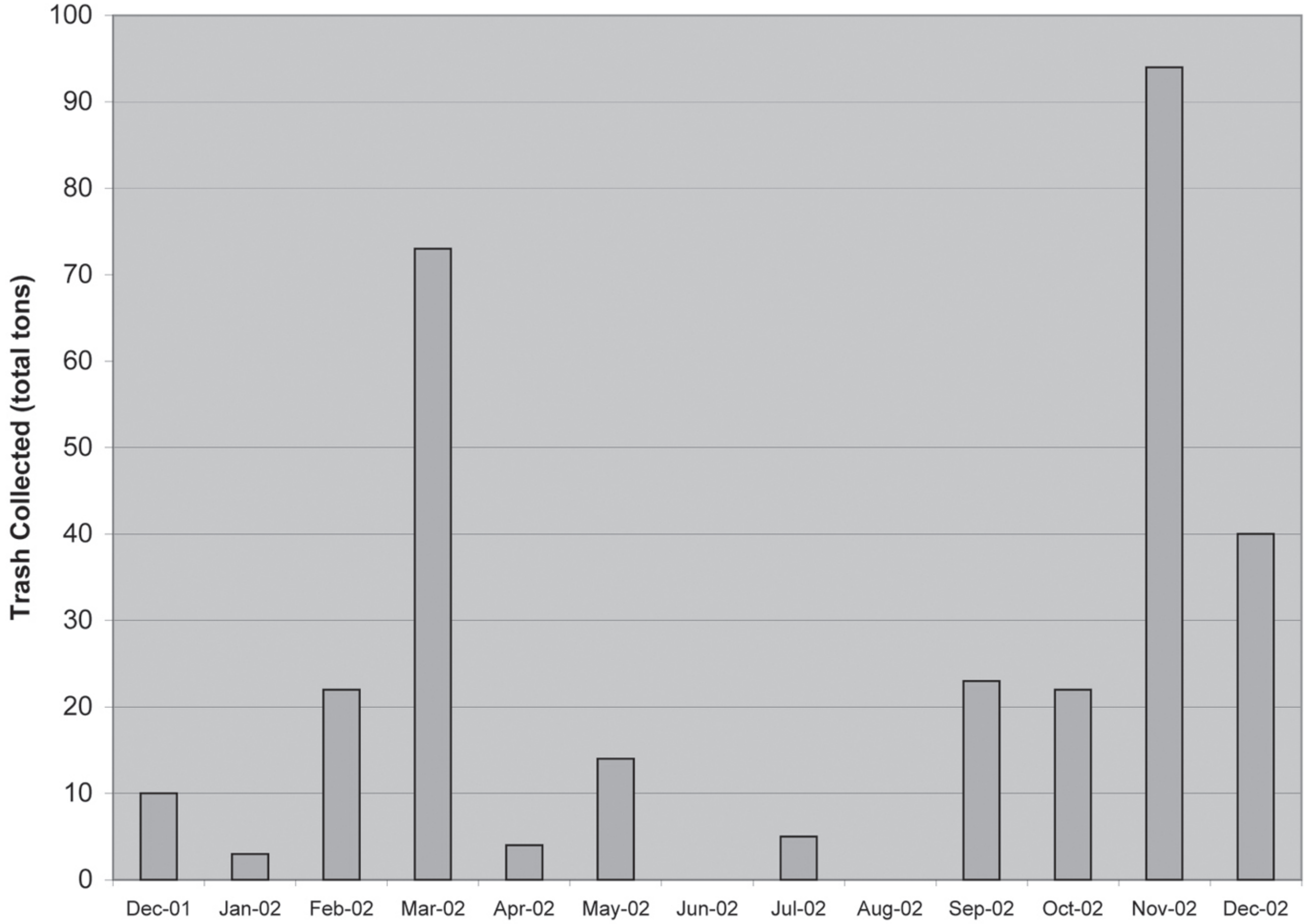


Figure 2-7 **Trash Removed from Mouth of Ballona Creek, 2002**

SOURCE: Debris Collection Report as M.H. email attachment. Provided by Brian White, Watershed Management Division, LADPW

TABLE 2-4
Typical Wet Weather Pollutant Loading Ballona Creek Watershed

Contaminant	*Annual Load (Kg)*
Cadmium	7
Chromium	162
Copper	1,081
Lead	381
Mercury	18
Nickel	184
Selenium	16
Suspended Solids	3,522 (Metric Tons)
Zinc	6,901

Source: Watershed-based Sources of Contaminants to San Pedro bay and Marina del Rey: Patterns and Trends, 2003

Based on the water quality impairments identified above and the results of various monitoring efforts, the Southern California Coastal Water Research Project (SCCWRP) has modeled wet weather pollutant loadings for various contaminants, as shown in Table 2-4.

Sediment testing has been conducted numerous times in Marina del Rey and the entrance channel. Although no sediments have been measured that have levels of chemical contaminants high enough to qualify as hazardous to humans under the California Hazardous Waste Control Law, some pollutant levels may be high enough to have negative effects on aquatic organisms. Elevated levels of chemicals were generally highest in the areas with finest particle size, particularly near the center of the main entrance channel and the shoals near the foot of the breakwater in front of and at the Ballona Creek mouth.

Based on data collected during snapshot dry weather sampling events in 2003, the mean concentration and load, temporal variability, and spatial distribution of metals and bacteria in the open portion of Ballona Creek have been analyzed by SCCWRP. Although metals concentrations were below chronic criteria (for a human health hazard) under the California Toxics Rule, in almost all of the in-river samples, bacteria concentrations at the majority of storm drains and in-river sites were consistently above applicable standards. In general, the Creek was found to exhibit a bimodal distribution of elevated metals and bacteria, with the highest levels occurring immediately upstream of the tidal portion of the Creek and another area of elevated levels below the location where Ballona Creek daylights from an underground storm drain to an exposed channel (with lower levels in between). These two portions of Ballona Creek correspond to locations where storm drains with consistently high concentrations and loads discharge to the Creek (e.g., Sepulveda Channel and Benedict Canyon). Modeling performed for the Army Corps of Engineers suggests that elevated hydrocarbon levels are found in the Sepulveda Wash (although elevated levels would also be expected in areas with current and/or historic oil production). This suggests for some pollutants, source reduction and treatment efforts could be focused on subwatersheds drained by specific tributaries.

A study of the effect of stormwater and urban runoff discharge into Santa Monica Bay (Bay 1999) found the following:

- Virtually every sample of Ballona Creek stormwater tested was toxic to sea urchin fertilization.
- The first storms of the year produced the most toxic stormwater in Santa Monica Bay during the study.
- The toxic portions of the stormwater plume were variable in size, extending from ¼ to 2 miles offshore of Ballona Creek.
- Surface water toxicity caused by unidentified sources was frequently encountered during dry weather in Santa Monica Bay.
- Copper and other unidentified constituents may also be responsible for some of the toxicity measured in Santa Monica Bay.
- The measured concentrations of zinc and copper in Ballona Creek stormwater were estimated to account for only 5 to 44 percent of the observed toxicity.
- Sediments offshore of Ballona Creek generally had higher concentrations of urban contaminants, including common stormwater constituents such as lead and zinc.
- Sediments offshore of Ballona Creek showed evidence of stormwater impacts over a large area.

A study by the County of Los Angeles found that in 1995/96, the highest fecal coliform readings at five stations coincided with the largest storm of the season, while in 1996/97, the highest fecal coliform readings at two stations coincided with the first storm of the season greater than 0.1 inch rainfall (LACDPW 2000). These observations suggest that peak fecal coliform levels may be related to hydrologic conditions that occur across the watershed (e.g., rainfall patterns), and not just land use or other conditions in individual tributaries.

GROUNDWATER QUALITY

Information on groundwater quality under most of the Watershed is limited, as only the cities of Beverly Hills and Santa Monica use groundwater for domestic water supplies. In the Hollywood subbasin, water from one public supply (tested in 1998) showed a Total Dissolved Solid (TDS) content of 526 mg/L. In the Santa Monica subbasin, water samples from 7 public supply wells indicate an average TDS content of 916 mg/L and a range of 729 to 1,156 mg/L. High TDS levels begin to interfere with the use of water between 500 and 1,000 mg/L. At 1,000 mg/L, water is considered brackish and unusable. High TDS levels are commonly referred to as "hard" water, which contributes to the formation of calcium and other deposits on shower walls and other surfaces regularly exposed to water. Sometimes, high TDS water is mixed with low TDS sources (such as imported water) to make the water more usable for domestic purposes.

In addition to high levels of dissolved solids (common throughout most of Southern California), other contaminants from urban land uses may be present in groundwater. In urbanized areas, these may include volatile organic compounds, hexavalent chromium (or Chromium 6), and N-nitrosodimethylamine (NDMA) from industrial activities and nitrates from the use of fertilizers and septic tanks. In the early 1990s, the State of California mandated upgrades to underground gasoline storage systems to prevent leakage of gasoline and migration to groundwater. In 1996, the discovery of a gasoline additive, Methyl Tertiary Butyl Ether (MTBE) in groundwater extracted from wells in the City of Santa Monica indicated that such systems may not always be effective. The contamination prompted a shutdown of city wells and ultimately resulted in legislation mandating the removal of MTBE from gasoline. However, the extent of possible MTBE contamination in soil and/or groundwater in the Watershed is currently unknown.

SOURCES OF WATER POLLUTION

As indicated in the Los Angeles Regional Board's 1994 Basin Plan, pollutants degrading the beneficial uses can be categorized into point source pollutants and nonpoint source pollutants. Pollutants from point sources are transported to water bodies in controlled flows at well-defined locations, such as discharges from wastewater treatment facilities or industrial sites. Pollutants from nonpoint sources are diffuse, both in terms of their origin and mode of transport to surface and ground waters. These pollutants are transported to waters by runoff from precipitation, irrigation, and atmospheric deposition.

As there are no wastewater treatment facilities in the Watershed, even with approximately 150 point sources in the Watershed, nonpoint sources are the primary contributor to most of the water quality impairments in the Creek and associated water bodies. Occasional overflows from the Hyperion treatment system (greatly reduced in recent years) and illicit sewer connections to the storm drain system contribute to the presence of contaminants in both stormwater and dry season flows. Typical pollutants in runoff include urban debris (or trash), suspended solids, bacteria, viruses, heavy metals, pesticides, petroleum hydrocarbons, and other organic compounds (LARWQCB 1994).

The sources of contaminants in stormwater and dry weather runoff vary widely, from industrial and commercial uses, fueling and maintenance facilities, transportation facilities (including highways and streets), maintained open spaces (such as parks and golf courses) and residential land uses. In addition, sediment from exposed land surfaces (such as vacant land and construction sites) and atmospheric deposition of pollutants (from vehicles and aircraft, construction activities, and industrial sources) represent additional sources of contaminants.

The County of Los Angeles has identified light industrial, transportation, and retail/commercial land uses as producing the highest median concentrations for total and dissolved zinc in runoff. Light industrial and transportation land uses displayed the highest median concentrations for total and dissolved copper, and light industrial produced the highest concentrations of suspended solids. Runoff concentrations from the remaining land use types (high-density single-family residential, education, multifamily residential, and mixed residential) were significantly less. As part of this effort, metal fabrication businesses were identified as producing the highest median concentrations for zinc, copper, and suspended solids (LACDPW 2000).

Pesticides and insecticides that find their way into the waters often stem from their use in lawns and gardens throughout the cities in the watershed. Similar to metals, the introduction of pesticides and insecticides into the waters of the watershed via urban runoff can result in sediment and water column toxicity. Pesticides that mix or dissolve in the water often remain toxic and can adversely affect the health of organisms living in the water such as fish, shrimp, and algae.

Organic compounds affecting the beneficial uses of the waters in the Watershed include polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), and dichloro-diphenyl-trichloroethane (DDT). PCBs were used in transformer oils as a heat-exchange medium in the past and have since been banned from use due to their toxic, bioaccumulative, and extremely stable properties in the environment. Although there are still many transformers currently in use that contain PCBs, over time, these transformers will be replaced in response to regulatory mandates and/or routine replacement activities. PAHs are the byproducts of the combustion of refined petroleum products or the burning of biomass fuels (e.g., wood fires), or leach from refined petroleum products (e.g., asphalt, creosote, or spilled motor oils). The primary sources of PAHs in the Watershed are vehicles, aircraft, and other engines fueled with gasoline or diesel fuel, which results in aerial emissions. DDT, a widely used and long-lasting pesticide that was banned in 1972, still remains present in stormwater and dry-weather runoff in the Creek.

Coliforms serve as indicator organisms for water quality sampling. Indicator organisms are nonharmful organisms that are associated with disease-producing or pathogenic organisms (Stenstrom 1999). High coliform counts can indicate the presence of high concentrations of pathogenic bacteria, viruses, and protozoans. As water from Ballona Creek discharges into Santa Monica Bay, beach closures may occur when bacterial indicator levels at the beaches are too high, which may present a serious health risks to swimmers. In addition, high levels of pathogenic organisms can also result in health risks to humans associated with the consumption of the local seafood. According to the draft bacteria TMDL for Santa Monica Bay, elevated levels of bacterial indicators may be due to sanitary sewer leaks and spills, illicit connections of sanitary lines to the storm drain system, runoff from homeless encampments, illegal discharges from recreational vehicle holding tanks, malfunctioning septic tanks, and fecal matter from animals and birds.

Urban debris, or trash, may be present in both stormwater and urban runoff and includes material suspended in the water column and floating material. Floatables can inhibit the growth of aquatic vegetation, decrease habitats for fish and other living organisms, and cause harm to wildlife through ingestion of, or entanglement with these materials. Some debris, including diapers, medical and household waste, and chemicals, are also a source of bacteria and toxic substances. The source of these materials is human activity, in the form of litter, and the deposition of leaves and grass clippings on sidewalks and gutters and their subsequent transport into the storm drain system.

Studies of Marina del Rey indicate that Ballona Creek is the largest contributor of sediments and associated chemicals in the marina, with minor contributions from Oxford Basin, the Washington Boulevard drain, and marine activities. Oxford Basin discharges into Basin E at the back of the marina, while the Washington Boulevard drain empties into the harbor via Ballona Lagoon. Basin E has been found to have elevated levels of contaminants, which could come directly from the discharges of Oxford Basin or could have originated from Ballona Creek and were carried back into Basin E with fine sediments. The primary source of chemicals to the marina during the dry season is from marine activities such as boating, oil spills, overboard waste disposal, antifouling paint (which contain copper and are designed to slough off over time), and sacrificial zinc anodes (USACE 2003), which suggests changes in boating and maintenance practices can reduce these sources.

Because much of the monitoring to date has been limited in a spatial or temporal sense, many of the conclusions regarding the sources of contaminants are rather general.

View across Ballona Wetlands

Although sources of some contaminants have been suggested, identification of the specific location of these sources is hampered by a lack of definitive monitoring data and an inadequate understanding of the storm drain system. As a result, although individual drains that discharge into the Ballona Creek channel have been identified as a source of elevated levels of contaminants, an understanding of the precise area drained by each drain varies by jurisdiction and location, and thus identifying sources of contamination along individual tributaries will be important to developing source reduction and/or treatment programs.

G. HABITAT

Because of extensive urbanization, few natural areas remain within the Ballona Creek Watershed. Over the past two centuries, common practices in ranching, farming, and landscaping have resulted in the introduction of a vast array of nonnative plants and animals. As a result, most natural or vacant areas in the Watershed include a mix of native and nonnative species. The proximity of undeveloped and natural spaces to humans can result in regular or occasional disturbance (including pets, passive recreation and brush clearance for fire safety), which further reduces the value of these spaces as habitat, particularly to sensitive native plant and animal species.

Historically, plant communities within the Watershed included coastal dunes, salt marsh, native grasslands, coastal sage scrub, chaparral, coast live oak woodland, California walnut woodlands, freshwater marsh, and riparian woodlands. Given the wide range of plant communities, native fish, birds, mammals, reptiles, amphibians, and insects were abundant. Fossils recovered from La Brea Tar Pits provide ample evidence of many such creatures in the Watershed over the millennia.

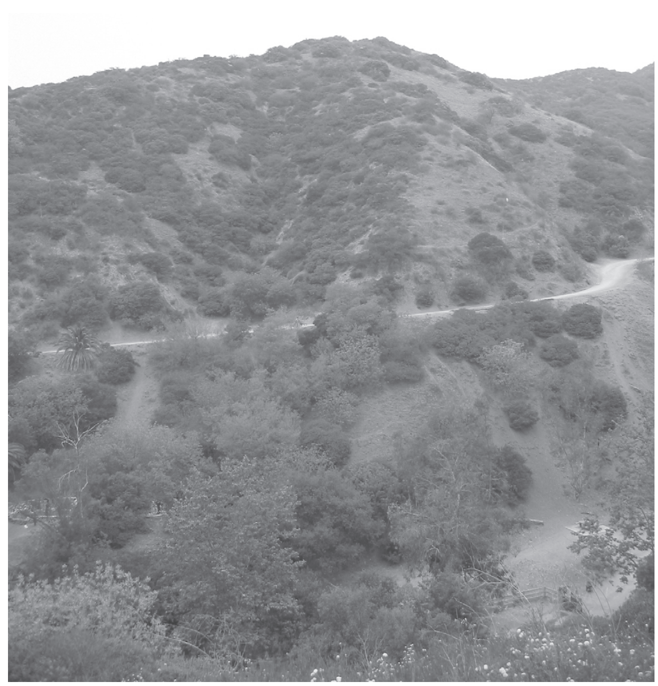
Remnants of historically occurring plant communities can be seen in the natural and semi-natural areas of the Watershed, including the Ballona Wetlands, the Ballona Lagoon complex, the Baldwin Hills, and the undeveloped portions of the Santa Monica Mountains (including several mostly natural parks, such as Griffith Park and Runyon Canyon Park). Small pockets of undeveloped land also provide home to naturally occurring plants, but the extent of human disturbance often limits the value of these spaces as habitat. Fragmentation of habitat creates substantial barriers to the migration of plants and animals, which over time can reduce species diversity and populations.

Invasive species are found throughout the Watershed. An "invasive species" may be defined as a nonnative species that causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and other organisms (e.g., microbes). Human actions are the primary means of invasive species introductions. In the Watershed, nearly all of the annual grasses on undeveloped lands are nonnative species that replaced native perennial grasses long ago. Other common invasive species in the Watershed include tree tobacco *(Nicotiana glauca)*, a native of Argentina, and several species of nonnative weeds including Russian thistle *(Salsola tragus)*, castor bean *(Ricinus communis)*, broom *(Spartium* sp.*)*, and pampas grass *(Cortaderia sellanoa)*. One highly invasive species commonly found in streams in the region, giant reed *(Arundo donax)*, is found in only limited locations in the Watershed, probably due to the lack of riparian habitat.

The last remaining areas of native habitat in the Watershed are summarized below.

1. Santa Monica Mountains

Part of the Transverse Ranges, the Santa Monica Mountains stretch from Point Mugu in Ventura County to the Hollywood and Elysian Hills. Historically, the mountains supported a diverse range of habitats, including coastal sage scrub, chaparral, coast live oak woodland, riparian woodlands, and freshwater marshes adjacent to perennial springs. Given the diversity of habitats and microclimates, a diverse array of bird, mammals, reptiles, amphibians, and insects would have been found in the headwaters of the Ballona Creek Watershed.



Runyon Canyon Park

In 1896, Colonel Griffith J. Griffith deeded 3,015 acres of his Rancho Los Feliz estate to the City of Los Angeles (the park was later expanded to 4,107 acres). Development of the Hollywood Hills began early in the twentieth century. The Hollywood (land) sign was erected in 1923 and the Mulholland Highway completed in 1924, making most of the southern slope of the Santa Monica Mountains (within the Watershed) accessible for residential development. Residential development required roads, building pads, and utilities, including water. Over time, the remaining undeveloped areas in the mountains were limited to steep slopes and remote canyons. The modification of hillslopes, filling of canyons, and the increased extent of impervious surfaces altered runoff patterns, leading to channelization of streams in the canyons to protect lives and property. Widespread landscaping introduced nonnative and invasive species throughout the mountains, including plants that thrive on the year-round runoff created by irrigation of yards and gardens.

Today, because of the extensive residential development, natural habitat in the Santa Monica Mountains within the Ballona Creek Watershed is limited and fragmented. Natural areas include large portions of Griffith Park and Runyon Canyon Park, and portions of Laurel Canyon Park and Beverly Glen Park. A large area around Upper and Lower Franklin Canyon Reservoirs is preserved as part of the Santa Monica Mountains National Recreation Area. In addition, the City of Los Angeles manages undeveloped areas around the Hollywood and Stone Canyon Reservoirs. Remaining natural areas are located on private land, much of which may be too steep for development.

That portion of the Santa Monica Mountains within the Watershed provides habitat for many mammals, birds, reptiles, and invertebrates. Larger mammals, including the coyote and deer are limited to more remote areas, while rabbits, ground squirrels, mice, and the opossum are found throughout the area. Birds include warblers, sparrows, hawks, owls, and jays, along with species found throughout the coastal plain, such as the northern mockingbird, house finch and spotted and mourning doves.

The Santa Monica Mountains Conservancy territory includes that portion of the Watershed generally north of Sunset Boulevard, except for that portion within the City of Beverly Hills. The Conservancy has acquired parkland and open space and preserved remaining habitat in several locations in the mountains. In 2002, residents of the City of Los Angeles that reside in the Santa Monica Mountains approved the formation of the Santa Monica Mountains Open Space Preservation Assessment Districts (Nos. 1 and 2). The districts will acquire and preserve additional open space, wildlife areas, and natural lands and protect important habitat and wildlife corridors in the Santa Monica Mountains in the City of Los Angeles.

2. Baldwin Hills

The undeveloped areas of the Baldwin Hills cover an area of approximately 1400 acres of which one-third is currently developed as parkland and two-thirds (950 acres) is in private ownership, primarily supporting oil and gas production. Existing parks include the Kenneth Hahn State Recreation Area, the Ladera Ball Fields, the Vista Pacifica Scenic Site, Culver City Park, and Norman O. Houston Park.

The major plant communities in the Baldwin Hills include coastal scrub,[4] annual grasslands, and some limited riparian areas. The coastal scrub community lacks some of the typical plant species found in the coastal sage scrub community, which may suggest this plant community is in decline, with nonnative species replacing historically occurring plants. The annual grasslands are primarily composed of nonnative and

[4] Due to the absence of a dominant sage species of the genus *Salvia* in the Baldwin Hills, this community is termed coastal scrub, instead of the more common coastal sage scrub.

invasive species, typical of most grasslands in Southern California. The riparian areas are very limited and include only a limited number of plant species typically associated with riparian vegetation in the region. Riparian vegetation may be supported by runoff from landscape irrigation, although some areas could be supported by groundwater seeps. Invasive plants also represent an issue in this area, with pampas grass the most visible.

Animal populations in the Baldwin Hills reflect the degraded nature of existing vegetation and the extent of human disturbance. The coastal California gnatcatcher *(Polioptila californica)*, a Federal listed threatened species, was reported in the Baldwin Hills in 1980. The Tricolored Blackbird (a California State Species of Special Concern) has been observed recently and the Pallid Bat, Western Mastiff Bat and the Los Angeles Pocket Mouse (also State Species of Special Concern), may be found in the Baldwin Hills (Molina 2001). The absence of the coyote from the Baldwin Hills and the presence of feral dogs and cats have altered traditional predation patterns, which in turn have adversely affected small birds and other small vertebrates.

Because remaining habitat is generally limited to the eastern and western edges of the Baldwin Hills (in areas in both public and private ownership), fragmentation of this habitat represents an issue for long-term genetic diversity and population viability. The Baldwin Hills Conservancy, created in 2000, is charged to acquire and direct the management of public lands within the Baldwin Hills area. Existing biological resources have been cataloged in the *Biota of the Baldwin Hills*, published by the Natural History Museum of Los Angeles County. The Baldwin Hills Park Master Plan identifies opportunities for restoration of habitat, including the creation of wildlife corridors within the Baldwin Hills and to Ballona Creek, which runs just north of the Baldwin Hills Scenic Overlook.

Bronson Canyon, Griffith Park

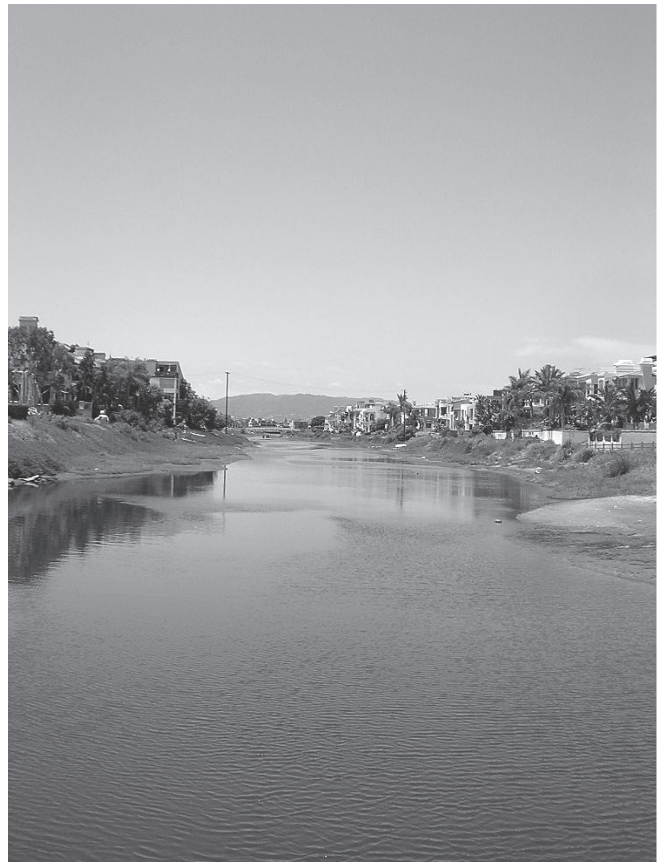
3. Riparian

Due to the extensive hydrologic modification of the Watershed, riparian vegetation along Ballona Creek and tributary streams is virtually nonexistent on the coastal plain. Concrete lined storm drains provide no opportunities for the establishment of historically occurring trees and plants that supported birds, mammals, insects, amphibians and fish (in locations with perennial water). Thus, existing riparian habitat in the Watershed is limited to small areas in the Baldwin Hills, primarily in canyon bottoms, along the base of slopes (where heavy soils retain moisture) and along tributary streams in upper portions of the Santa Monica Mountains.

4. Vacant/Undeveloped Lands

As noted above, historical practices in ranching, farming and landscaping have introduced a wide array of nonnative and invasive species in the Watershed. As a result, most undeveloped or vacant land supports both native and nonnative species representative of two plant communities: ruderal and annual grasslands. The ruderal plant community is also known as a weedy plant community. It is characterized by periodic or constant disturbances such as weed control, heavy vehicle use, disking, controlled or uncontrolled burning, and similar disruptive activities. Ruderal plant communities are generally found in flat open areas, with the plant species dominated by native and introduced weed species highly adapted to disturbance. The annual grassland plant community occurs primarily on heavy soils and generally flat topography. Because annual grasslands include species introduced long ago, it is considered an invasive plant community that has replaced the perennial grasslands formerly found in California. As an invasive plant community, it is tolerant of disturbance, and is generally found in areas that are similar to ruderal habitats but that are undergoing fewer disturbances.

Undeveloped areas on the coastal plan provide foraging habitat for various birds, including raptors such as hawks or owls (especially in areas close to the hills) various reptiles and small mammals. However, most wildlife species found in these areas are tolerant of human activity and may also occur in landscaped areas such as parks and in backyards.



Ballona Lagoon

5. Ballona Wetlands / Lagoon Complex

Historically, Ballona Creek met the Pacific Ocean in a mosaic of marine tidal channels and lagoons, coastal dunes, brackish pools, perennial riparian habitat, freshwater marshes, and dry upland areas. This complex covered more than 3,000 acres, of which about 1,000 acres were lagoons that were heavily influenced by tidal regimes and flood flows. This diverse and productive range of habitats would have supported a wide array of aquatic and terrestrial plants and animals.

Human impacts on the wetlands/lagoon complex began in the late 1800s, with the development of several hunting lodges, resorts, and a railroad. In the early 1900s, the Pacific Electric Railroad (the "red cars") was extended to Playa del Rey and road development began in the area. Real estate developments in Venice and Playa del Rey began to encroach upon the wetlands. The channelization of Ballona Creek in 1935 restricted water flow, and the wetlands and lagoons began to dry up. From the 1930s into the 1950s, oil derricks were constructed throughout the area and large portions of the wetlands were diked, drained, or developed into artificial ponds. The development of Marina del Rey in the late 1950s removed a large portion of the remaining wetlands. As a result, the wetlands shrank to less than 200 acres, about 10 percent of the original area.

The State-listed endangered Belding's savannah sparrow *(Passerculus sandwichensis beldingi)* breeds in the Ballona wetlands. The Federal and State listed endangered California least tern *(Sterna antillarum browni)* breeds on nearby Venice Beach (within a fenced reserve area) and forages in the lagoons and channels of the Ballona wetlands. Other listed species that do not breed in the area but forage in the Ballona wetlands include the Federal listed threatened western snowy plover *(Charadrius alexandrinus nivosus)*, the State listed endangered American peregrine falcon *(Falco peregrinus anatum)*, and the California brown pelican *(Pelecanus occidentalis californicus)*.

The precise current extent of the Ballona Wetlands is complicated. Until recently, only one parcel of undeveloped land (Area B, south of Ballona Creek and north of Culver Boulevard) was usually identified as the Ballona Wetlands. Tidal flushing was recently restored to the central portion of this area. In 2001, the State of California chose to retain Area C (north of Ballona Creek and east of Lincoln Boulevard) as part of a tax settlement. Fill material was deposited in Area C during construction of the flood control channel in the 1930s and again during construction of Marina del Rey. In 2003, a freshwater marsh was completed (south of Jefferson Boulevard and west of Lincoln Boulevard), into which stormwater runoff from Playa Vista and the Jefferson Drain is discharged. The State of California recently purchased 483 acres, which could further expand the area of former wetlands available for restoration. A map showing the recent land acquisition in the Ballona Wetlands is provided in Figure 2-8.

The bluffs above the Ballona Wetlands historically supported coastal prairie habitat, which has been mostly eliminated in coastal Los Angeles. The slopes (also known as the Ballona Escarpment) support degraded stands of coastal sage scrub, although invasive species and ornamentals introduced to control erosion have greatly limited the extent of native vegetation.

Historic development in the area has also greatly reduced the extensive network of tidal lagoons, leaving only Ballona Lagoon (which provides a water connection to the Venice Canals) and Del Rey Lagoon, south of the Ballona Creek channel. Tidal flushing to both lagoons is constrained to reduce high water during flood events. Del Rey Lagoon is located within Del Rey Lagoon Park, and is mostly surrounded by lawn areas, although a proposed project would remove invasive plants and replant native vegetation on the east and west banks of the lagoon.

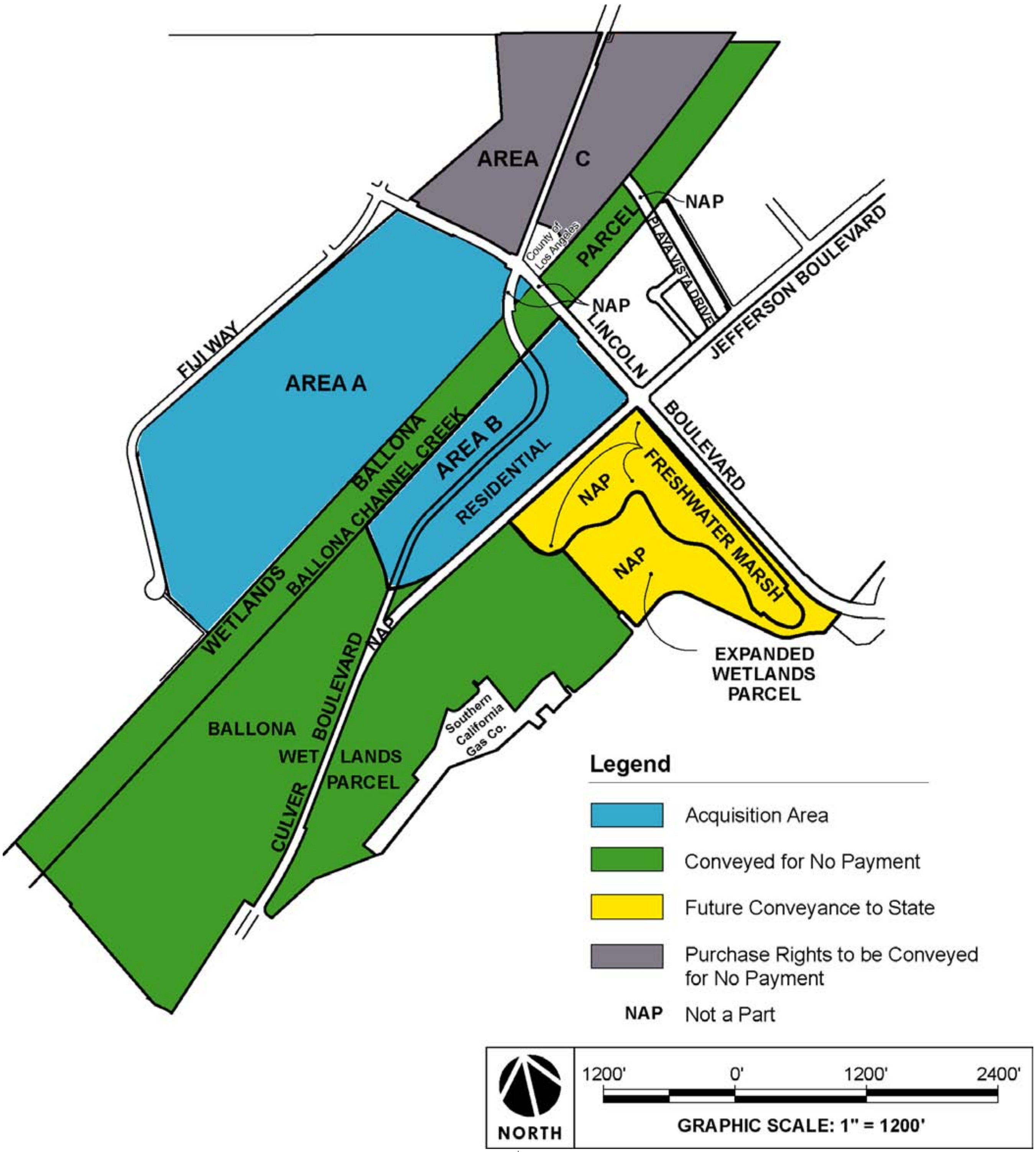


Figure 2-8 **Ballona Wetlands Acquisition**

ADAPTED FROM: California Coastal Conservancy

Ballona Lagoon and the Venice Canals are generally lined by residential development. Vegetative restoration work along the east bank of Ballona Lagoon has replaced nonnative vegetation; however, restoration work remains to be completed along the western bank. Other recent improvements in the lagoon have expanded the area of mudflats and limited public access. The City of Los Angeles has also proposed improvements to the Grand Canal (the connection between Ballona Lagoon and the Venice Canals), including new storm drains, planting of native vegetation and improved walkways.

Along the northern edge of Marina del Rey, Oxford Lagoon (also known as the Oxford Flood Control Basin) was designed as a stormwater detention basin with a tidal gate to restrict tidal interchange. The lack of tidal flushing results in poor water quality and high bacteria levels, which then impacts water quality in the adjacent Basin E in Marina del Rey. The Oxford Lagoon is fenced to limit public access and is generally surrounded by nonnative trees and shrubs. The lack of public access and presence of year-round water attracts a wide range of bird species.

Marina del Rey, the adjacent lagoons, the central portion of Area B of the Ballona Wetlands (where partial tidal flushing was recently restored) and Ballona Creek provide a variety of salt-water, estuarine, and mudflat habitats, which support shore birds and migratory waterfowl (some of which were noted above) and a variety of fish and invertebrates. However, the lack of tidal flushing in the lagoons and associated water bodies, and poor water quality in Marina del Rey and Ballona Creek, limits the number and diversity of fish, birds, and other creatures supported by these aquatic habitats.

Oxford Flood Control Basin

The discharge of stormwater and urban runoff from Ballona Creek into Santa Monica Bay reduces water quality and clarity within the nearshore areas of the bay and results in the deposition of sediment (with varying toxicity) at the mouth of the creek. Stormwater and urban runoff may also be toxic to some forms of aquatic life in Santa Monica Bay, due to the presence of metals, such as zinc, and other urban contaminants.

H. LAND USE

The Watershed is comprised of the Cities of Beverly Hills, Culver City, and West Hollywood and parts of Inglewood, Los Angeles and Santa Monica and small-unincorporated areas of Los Angeles County. The population in the Watershed is approximately 1.6 million people (Braa *et al*. 2001).

Caltrans estimated land uses in the Watershed based upon information from the Southern California Association of Government (SCAG). As shown in Table 2-5, the predominant land use in the Ballona Creek Watershed is residential, representing 63.7 percent of the total land area, including multi-family residential uses covering 18 percent of the area. Although open areas represent 16.7 percent, this category may include parks and other open areas not generally open to the public, including vacant land and golf courses. Figure 2-9 shows land use in the Watershed.

TABLE 2-5
Land Use within the Ballona Creek Watershed

Land Use	*Total Acres*	*Percent of Total Acres*
Single-Family	38,049	45.7%
Multi-Family	14,996	18.0%
Commercial	6,664	8.0%
Public	3,048	3.7%
Light Industrial	3,371	4.0%
Other Urban	2,929	3.5%
Open	13,874	16.7%
Unknown	356	0.4%
Total	83,287	100.0%

Source: Caltrans, Financial and Economic Impacts of Storm Water Treatment, Ballona Creek Watershed, 1998

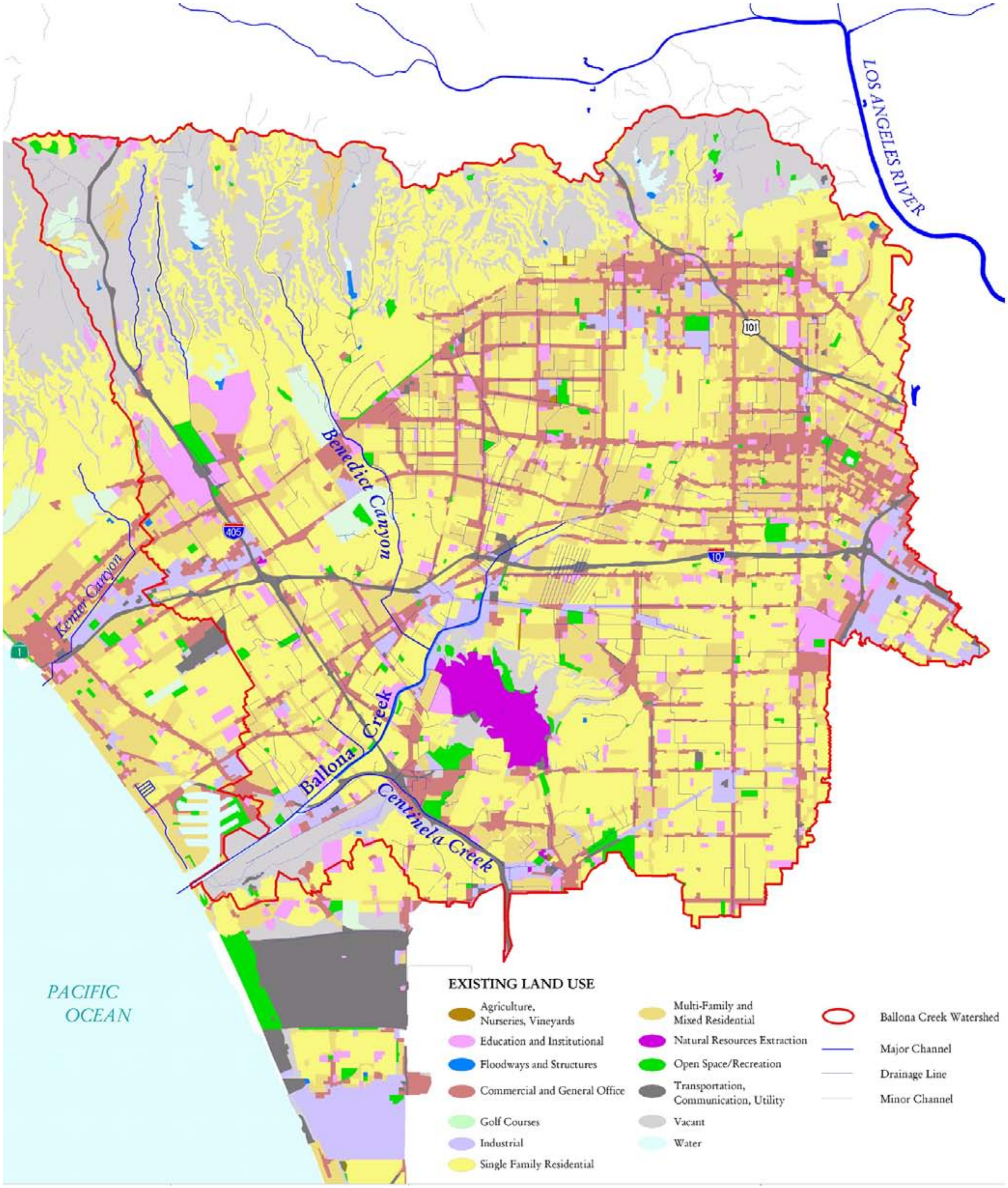


Figure 2-9 **Land Use in the Ballona Watershed**

SOURCE: SCAG 1993 Land Use, 1996; EIP Associates, GIS, July 14, 2003