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EXECUTIVE SUMMARY

California Health and Safety Code section 115910 requires local health officers to submit to the State Water Resources Control Board (SWRCB) by the 15th of each month a survey documenting all beach postings and closures that occurred during the preceding month due to threats to the public health. The law also requires SWRCB to: (1) make available this information to the public by the 30th of each month, (2) publish a statewide annual report documenting the beach posting and closure data provided by health officers for the preceding calendar year by July 30, and (3) distribute this report to the Governor, Legislature, major media organizations, and public within 30 days of publication of the annual report.

SWRCB publishes the monthly beach posting and closure reports produced from the data provided by the local health officers on its Web site (http://www.swrcb.ca.gov/beach/index.html) for easy public access. The coastal Regional Water Quality Control Boards (RWQCBs) also post this information on their Web sites or link to SWRCB's Web site.

This annual beach closure report summarizes the beach posting and closure information submitted by local health officers for the year 2002. It also includes a brief description of SWRCB and RWQCBs activities that are targeted to keep the beaches clean and healthy. Detailed beach posting/closure data received from local health officers are provided in Appendix A to this report. Calendar year 2002 saw a 33 percent decrease in the number of beach closures, while the number of beach postings remained approximately the same. However, it is important to note that calendar year 2000 was the first year that full-year beach monitoring data were reported by local health officers and compiled by SWRCB, and it is still too early to do any type of trend analysis of these data.

Many projects aimed at improving coastal water quality are currently underway as part of the Governor's Clean Beaches Initiative (CBI). These projects were funded with Proposition 13 bond funds, totaling approximately $32 million for Fiscal Year (FY) 2001-02. Additionally, the FY 2002-03 budget includes $46 million in Proposition 40 funds to continue the funding for CBI projects. (See Appendix B for CBI projects.) It is expected that these, as well as future projects, will have a positive effect on the state's coastal water quality and reduce the health risk to the public wishing to use one of the state's most valuable resources.

INTRODUCTION

Economic Impact of California Beaches

California's coastline is one of its most important natural features. It extends over 1,000 miles from the rocky cliffs of the north coast to the sandy, sun-drenched beaches in the south. The coastal areas represent a desirable place to live. Approximately 80 percent of California's 33 million residents live within a 30-mile drive of its coastline. Millions of visitors come to see its beauty and play on the shores and in its waters. California's beaches generate $1 billion per year in direct revenue. When indirect benefits are added, California's beaches contribute $73 billion to the national economy and generate 883,000 jobs nationwide. (King, Philip, *The Fiscal Impact of Beaches in California,* Public Research Institute, San Francisco State University, September 1999.)

Increasingly, the public is becoming concerned about beach closures, swimmers' illnesses, and the lack of public confidence due to the up and down nature of posted warning signs. When a beach is closed due to contamination, the economic effect can be devastating to local business owners.

Causes of Beach Closures

Beach closures that are included in this report are caused by water contamination by pathogens, which can potentially impact the health of the beachgoers when they are exposed to the contaminated water through skin contact (swimming or surfing) or ingestion. Fever, flu-like symptoms, ear infection, respiratory illness, gastroenteritis, cryptosporidiosis, hepatitis, and other illnesses have been associated with waterborne pathogens. Table 1 lists a number of pathogenic bacteria, protozoa, and viruses; their observed effects on exposed population; and the diseases commonly associated with them.

A 1996 epidemiological study sponsored by the Santa Monica Bay Restoration Project and partially funded by SWRCB validated the cause and effect relationship between elevated levels of bacteria in beach water and health problems observed in exposed beachgoers. Beach closures can also result from other events, such as a leaking sewage pipe or an oil spill.

Sources of Beach Pollution

The ocean is the final deposition site for most land-based pollutants entering California's coastal watersheds. Nearshore impairments can result from discharges of industrial waste, dredge spoils, agricultural and urban runoff, and municipal sewer discharges. Although this impairment has been controlled to a great extent in recent years, the increases in population and development offer a constant challenge to those federal, state, and local agencies responsible for water quality control. As California's coastal

population increases, the number and volume of discharges from industrial and municipal facilities into our coastal waters also increase.

Table 1. Waterborne Pathogens, Diseases They Cause, and the Effects on Exposed Populations.

PATHOGEN		DISEASE	EFFECTS
BACTERIA	*Escherichia coli* (*enteropathogenic*)	Gastroenteritis	Vomiting, diarrhea, death in susceptible populations
	Legionella pneumophila	Legionellosis	Acute respiratory illness
	Leptospira	Leptospirosis	Jaundice, fever (Weil's disease)
	Salmonella typhi	Typhoid fever	High fever, diarrhea, ulceration of the small intestine
	Salmonella	Salmonellosis	Diarrhea, dehydration
	Shigella	Shigellosis	Bacillary dysentery
	Vibrio cholerae	Cholera	Extremely heavy diarrhea, dehydration
	Yersinia enterolitica	Yersinosis	Diarrhea
PROTOZOANS	*Balantidium coli*	Balantidiasis	Diarrhea, dysentery
	Crytosporidium	Cryptosporidiosis	Diarrhea
	Entamoeba histolytica	Amedbiasis (amoebic dysentery)	Prolonged diarrhea with bleeding, abscesses of the liver and small intestine
	Giardia lamblia	Giardiasis	Mild to severe diarrhea, nausea, indigestion
	Naegleria fowleri	Amoebic meningoencephalitis	Fatal disease; inflammation of the brain
VIRUSES	Adenovirus (31 types)	Respiratory disease	
	Enterovirus (67 types, e.g., polio, echo, and Coxsackie viruses)	Gastroenteritis	Heart anomalies, meningitis
	Hepatitis A	Infectious hepatitis	Jaundice, fever
	Norwalk agent	Gastroenteritis	Vomiting, diarrhea
	Reovirus	Gastroenteritis	Vomiting, diarrhea
	Rotavirus	Gastroenteritis	Vomiting, diarrhea

Another primary source of coastal water impairment comes from the runoff flowing from the land through storm drains and hundreds of natural stream courses. Runoff from creeks, rivers, and storm drains is a significant source of impairment to California's beaches. This runoff may come from rooftops, streets, yards, gardens, open spaces, parking lots, animal yards, construction sites, logging roads, and any other surface exposed to rain or snow. It collects human and animal waste, oil and rubber residue from cars, asbestos and metals from brake linings, pesticides, silt, and various types of vegetable matter. It may contain high bacterial counts and viruses, may be toxic to marine life, and may carry tons of garbage and silt that litter the ocean and beaches and kill or injure marine life. Since this runoff does not come from a discrete source, such as a pipe, it is regarded as "nonpoint source pollution." Some of these types of wastes are collected in urban storm drains. Storm drain discharges are considered "point source" under the federal Clean Water Act's (CWA) Storm Water Program and require National Pollutant Discharge Elimination System (NPDES) permits for discharges to surface waters.

State Water Resources Control Board (SWRCB) Projects to Improve Coastal Water Quality

Clean Beaches Initiative (CBI)

In January 2001, Governor Gray Davis proposed CBI to combat the problem of contaminated ocean water and beach postings/closures. The Governor's CBI enables state and local agencies to address this contamination, making California beaches safer and ensuring the economic vitality of coastal areas. CBI provides financial assistance to local agencies in areas that have chronic beach contamination problems and high beach usage. CBI also provided funding for research to develop rapid, inexpensive methods for detecting and analyzing indicator bacteria. Thirty-seven projects were funded by Proposition 13 in Fiscal Year (FY) 2001-02, totaling approximately $32 million, as part of CBI. A list of these projects is provided in Appendix B to this report. In addition, FY 2002-03 budget includes $46 million in Proposition 40 funds to continue the funding for CBI projects. The deadline for submitting project proposals for Proposition 40 funding was October 18, 2002. As of May 2003, approximately 251 projects, totaling about $400 million, were being evaluated for funding. A final list of projects to be funded by Proposition 40 is scheduled for SWRCB approval in July 2003. It is expected that these, as well as future projects, will have a positive effect on the state's coastal water quality and reduce the health risk to the public wishing to use one of the state's most valuable resources.

Development of Rapid Indicators and Sources Tracking Methods

The 2001 Budget Act provided $1.5 million in General Fund contract support to initiate the development of rapid indicators. Subsequently, the Legislature passed Assembly Bill 639 (Chapter 502, Statutes of 2001) requiring SWRCB, in conjunction with the California Department of Health Services (DHS), to develop reliable, rapid, and

affordable diagnostic tests for indicator organisms and report to the Legislature on the progress to date on or before July 1, 2003. SWRCB has contracted with the Southern California Coastal Water Research Project (SCCWRP), with the goal of developing analytical methods that can be completed within one day, ideally within several hours. SCCWRP has subcontracted with five experts in the field who have been developing rapid microbiological measurement methods for other industries, such as drinking water, food service, counter-terrorism, or freshwater ambient monitoring. Under these subcontracts, the researchers are adapting their methods for detection of total and fecal coliform and enterococcus bacteria in salt water. A workshop was conducted on May 14–16, 2003, to identify the steps necessary to enhance the development of these rapid methods and how to make these methods available to local water quality agencies.

The development of rapid indicators will reduce the lag time between the time when a sample is taken and analyzed and the time when warning signs are posted at a contaminated beach. The reduction in lag time will better protect the public by keeping them out of the water when conditions are known to be a threat to human health, rather than allowing the public to swim in possibly contaminated water while health officials wait several days for lab results before they post or close a beach.

Total Maximum Daily Loads (TMDLs) Development

Two TMDLs have recently been approved by SWRCB (pending U.S. Environmental Protection Agency [U.S. EPA] approval), which, once implemented, will have a significant positive effect on coastal water quality in southern California. The Santa Monica Bay Beaches Dry-Weather TMDL (approved by SWRCB September 19, 2002) and the Santa Monica Bay Beaches Wet-Weather TMDL (approved by SWRCB March 19, 2003) encompass 44 beaches and over 50 miles of coastline in Los Angeles County. This entire segment of coastline, which has water contact recreation designated as a beneficial use, is listed pursuant to section 303(d) of the federal CWA as being impaired due to bacteria.

Responsibilities of SWRCB and RWQCBs

One of the primary responsibilities of SWRCB is to protect California's valuable coastal waters by controlling discharges. The six RWQCBs bordering the coastline have prime responsibility for protecting coastal waters. Anyone wishing to discharge waste to the ocean from a pipe or waste facility (a "point source") must obtain an NPDES permit from the appropriate RWQCB. RWQCBs establish monitoring programs to be conducted by the discharger as a way of measuring compliance with permit provisions. RWQCBs currently issue NPDES permits for discharges from municipal storm sewer systems serving a population of 100,000 or more. SWRCB has also adopted two statewide general storm water permits for industrial and construction activities and a statewide permit to address all road construction activities of the California Department of Transportation. In compliance with the requirements of Phase II of the federal storm water program, SWRCB in 2003 adopted a statewide general storm water permit for smaller municipalities and revised its existing general permit for construction activities to cover smaller construction sites. These permits require the storm water dischargers to implement programs to reduce and/or eliminate pollution from storm water runoff to the

maximum extent possible. If nonpoint source discharges cause serious pollution, RWQCBs work with the dischargers to require the application of measures to control the waste (known as management practices or MPs) and prevent pollution. If those measures are not carried out effectively, RWQCBs may issue waste discharge requirements or take enforcement action. When necessary, RWQCBs also establish TMDLs to control discharges into impaired beach waters.

Responsibilities of Local Health Officers

California law (Health and Safety Code section 115880 et. seq.) requires local health officers to conduct weekly bacterial testing between April 1 and October 31 of waters adjacent to public beaches which have more than 50,000 visitors annually and are near storm drains which flow in the summer. Local health officers are required to test for three indicator organisms: total coliform, fecal coliform, and enterococci. If any one of these indicator organisms exceeds the standards (Table 2) established by DHS, the county health officer is required to post warning signs at the beach and make a determination whether to close that beach in the case of extended exceedances.

In the event of a known discharge of untreated sewage, the health officer is required to immediately test the waters adjacent to the public beach and take the appropriate action. If the discharge of untreated sewage is known to have reached recreational waters, then the health officer is required to close the beach until the waters meet the established bacterial standards. The law also requires the county health officer to establish a telephone hotline to inform the public of all beaches that are closed, posted, or otherwise restricted.

Table 2. DHS' Bacteriological Standards for Water-Contact Sports.

SAMPLE TYPE	INDICATOR	STANDARD[1]
Single	Total Coliform[2]	1,000
	Total Coliform	10,000
	Fecal Coliform	400
	Enterococci	104
30-day Log Mean	Total Coliform	1,000
	Fecal Coliform	200
	Enterococci	35

[1] Number of organisms or colonies forming per 100 ml of water.
[2] If the ratio of fecal to total coliform exceeds 0.1.

Ten coastal counties (Sonoma, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, and San Diego) and one city (Long Beach) have reported that they have beaches that are near storm drains and are visited by more than 50,000 people annually. Those beaches have been tested regularly for bacterial contamination as required by law, and each month the counties submit the information of beach postings and closures to SWRCB for publication on its Web site. Additionally, the county of San Francisco also regularly submits its posting and closure information even though it has no beaches that meet the requirement of Health and Safety Code section 115880.

Indicator Organisms

Since identification and enumeration of pathogens (such as viruses in water) are difficult, time consuming, and expensive, laboratory methods have been developed to measure the presence and density of "indicator" organisms. The indicator organisms may not cause human health impacts, but their presence indicate the potential for water contamination with other pathogens that are harmful, such as bacteria, viruses, and protozoa. Indicator bacteria are carried to coastal waters in a variety of ways. Bacteria typically enter coastal waters from sewage spills, such as overflows of sanitary sewers and storm water runoff from urban, suburban, and rural areas. An ideal indicator would indicate when disease-causing agents were present at densities that could cause problems. As the coliform bacteria group (total, fecal, E. coli, and enterococci) is found in the intestines and feces of warm-blooded animals, its presence indicates that pathogens from untreated or partially treated sewage or contaminated runoff may be present in water. Other advantages of using the coliform bacteria group as indicator organisms include: (1) it is easily detected by simple laboratory methods; (2) it is not usually present in unpolluted waters; (3) its concentration in water can be correlated with the extent of contamination; and (4) it is safe to work with in the laboratory.

The drawback of using this "indicator" is that it may not accurately represent the actual health risk to swimmers. Even though the indicator group is present in the intestines and feces of many warm-blooded animals, the specific pathogens that are hazardous to human health may not be present. For example, large flocks of birds or migrating whales may contribute high levels of indicator bacteria to the waters adjacent to a public beach, but these animals may not be carrying any pathogens that are a threat to humans. At the present time, the potential health risk to humans from pathogens carried by animals is unknown. Additionally, the technology is not available to positively distinguish between animal and human-borne indicator bacteria. More research is needed on both of these topics.

Beach Closure, Beach Posting (Warning Sign), and Rain Advisory

County health officers may take three discrete actions based on beach water quality monitoring data, sewage spills, and storm events. Beaches or, more precisely, the ocean waters adjacent to the beaches are posted with warning signs or are closed when water samples that are collected in the surf zone have indicator levels which

exceed DHS standards. The beach is reopened to the public once further sampling confirms that bacteria levels no longer exceed health standards.

A “Beach Closure” occurs as a result of a sewage spill or repeated incidences of exceedances of bacterial standards from an unknown source. A closure is a notice to the public that the water is unsafe for contact and that there is a high risk of getting ill from swimming in the water. Closures are mandatory in the event of a known untreated sewage discharge reaching recreational waters; otherwise, the decision to close the beach is at the discretion of the local health officer. A beach closure does not necessarily result in the closure of the entire beach for recreational activities. In most cases, the ocean is closed to swimming and other water contact recreation while the beach area is open for sunbathing, volleyball, and other activities that do not involve water contact.

A “Beach Warning” sign means that at least one bacterial standard has been exceeded, but there is no known source of human sewage. The posting of warning signs alerts the public of a possible risk of illness associated with water contact. The placement of signs may be short term when a single bacterial indicator standard is exceeded, or more permanent where monitoring indicates repeated contamination (e.g., from a storm drain). Warnings may also be posted where sources of contamination are identifiable and can be explained as not of human origin (e.g., resident marine mammals or seabirds).

A “Rain Advisory” is issued during and for a period of 72 hours after a storm event. Past experience has shown that indicator levels generally exceed state standards during and after storm events. The runoff generated by the storm event brings with it pollution from the surrounding urban and rural areas and with that pollution comes high numbers of indicator bacteria. Rain advisories are typically issued to the public through various media outlets (television, radio, newspapers, etc.). These advisories are preemptive in nature and may not be based on actual water quality data. Since there is no consistency among counties of when and if they issue rain advisories, the discussions below do not include the numbers of advisories issued for each county. Rain advisory information reported by counties is included in Appendix A.

Beach-Mile Days (BMDs)

BMD is used to express the magnitude of a beach closure or posting incident. It is the product of the number of days a beach was posted/closed and the length of impacted coastline (in miles). For example, if a particular beach was closed for five days and for a distance of 200 yards, the number of BMDs for this incident would be 0.57 (200 yards/1 mile X 5 days). BMD is a useful measure for comparing the health of beaches from year to year. It is a more meaningful measure of comparison than the number of incidences or the number of days of postings or closures.

BEACH POSTING AND CLOSURE INFORMATION FOR THE YEAR 2002

Calendar year 2002 saw a decrease in the number of beach closures, while the number of beach postings remained approximately the same. However, it is important to note that calendar year 2000 was the first year that full-year beach monitoring data were reported by local health officers and compiled by SWRCB, and it is still too early to do any type of trend analysis of these data.

The information presented in this report is derived from SWRCB's Beach Posting and Closure Database, which identifies the beach name, type of event (closure/posting/rain advisory), dates of the event, and length of affected coastline. The database calculates the number of BMDs associated with each posting or closure. Reports detailing the events that were reported in 2002 for each county can be found in Appendix A. The reports are grouped by closures, postings, and rain advisories and then grouped in order beginning with the northernmost county and ending with the southernmost county. At the end of each individual county report, the total of the incidences of closures/postings/rain advisories, days (duration), and BMDs is specified.

Table 3. Beach Closures for 2000, 2001, and 2002 by County.

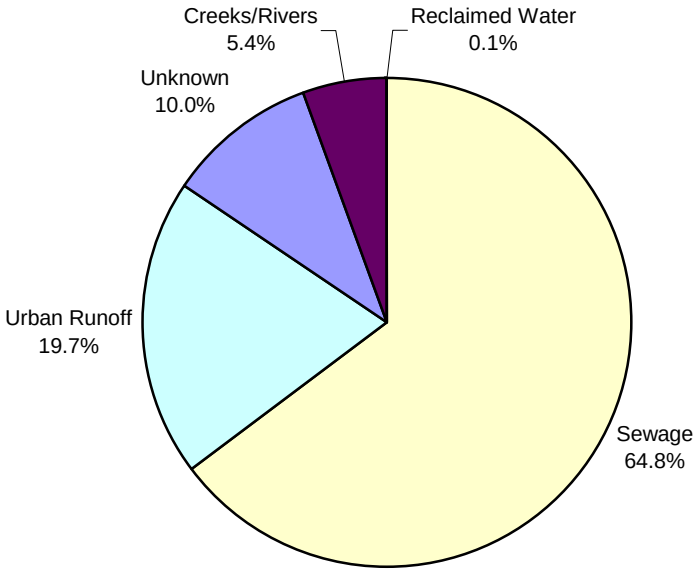
COUNTY	NUMBER OF INCIDENCES			NUMBER OF DAYS			BEACH-MILE DAYS CLOSED		
YEAR	2000	2001	2002	2000	2001	2002	2000	2001	2002
Del Norte	0	0	0	0	0	0	0	0	0
Humboldt	0	0	0	0	0	0	0	0	0
Mendocino	1	1	0	15	12	0	2.6	2.7	0
Sonoma	2	2	0	4	37	0	0.4	3.7	0
Marin	0	0	0	0	0	0	0	0	0
Contra Costa	0	1	1	0	10	7	0	0.9	0.6
Alameda	0	0	0	0	0	0	0	0	0
San Francisco	0	0	0	0	0	0	0	0	0
San Mateo	9	6	6	217	38	35	41.9	21.2	10.3
Santa Cruz	0	2	1	0	4	13	0	0.2	3.3
Monterey	6	6	10	16	39	32	3.9	6.8	8.5
San Luis Obispo	1	0	0	1	0	0	0.1	0	0
Santa Barbara	0	1	0	0	7	0	0	1.6	0
Ventura	4	16	6	12	78	18	0.7	37.7	2.7
Los Angeles	7	6	0	45	12	0	33.6	34.1	0
Long Beach (City)	0	1	2	0	9	7	0	0.5	20.8
Orange	40	51	39	152	182	159	53.4	53.1	29.8
San Diego	47	59	37	310	362	166	187.0	362.4	87.6
TOTAL	117	152	102	772	790	437	323.6	524.9	163.6

Beach Closures

Table 3 shows a summary of the number of closures, duration, and BMDs for each county for 2000, 2001, and 2002. The table shows a large decrease in the amount (incidences/days/BMDs) of beach closures between 2001 and 2002, and San Diego County accounted for a majority of the decrease. Since San Diego County alone accounts for over half of both the number of days and BMDs of closures in the state, much of the changes in the beach closure figures is driven by what is occurring in that county. The large increase in closures between 2000 and 2001 was due to 2001 being a rather wet year in that part of the state. Several large closure events were due to runoff (from winter storm events) originating in Mexico, which overwhelmed dry weather diversions at the border and resulted in sewage and contaminated runoff being carried by the Tijuana River to the coast. An explanation for the large drop in closures in 2002 could be the result of 2002 being an exceptionally dry year, and as such there were fewer large runoff events resulting in beach closures.

Figure 1 illustrates that the vast majority of beach closures statewide, approximately two thirds, are due to sewage discharges resulting from system failures, line breaks, and overflows. Upgrading sewer system facilities and infrastructure would result in fewer beach closures annually.

Figure 1. Sources of Contamination Resulting in 2002 Beach Closures Statewide (Based on BMDs).



Source: SWRCB Beach Closure Database.

Beach Postings

Table 4 shows a summary of the number of postings, duration, and BMDs for each county for 2000, 2001, and 2002. In general, the statewide number of incidents, their duration, and BMDs for beach postings has not notably increased or decreased over the last three years. The numbers in some counties are highly variable from year to year (Sonoma, San Luis Obispo, and Ventura), while others remain fairly constant (Los Angeles and Orange). Santa Barbara has shown the most improvement with a steady decrease in the number of postings over the last three years. However, many factors (rainfall, dry-weather diversions, etc.) can contribute to increases or decreases of the number of beaches posted. A conclusion should not be drawn solely based on these numbers as to whether water quality is improving or declining in the water adjacent to those beaches.

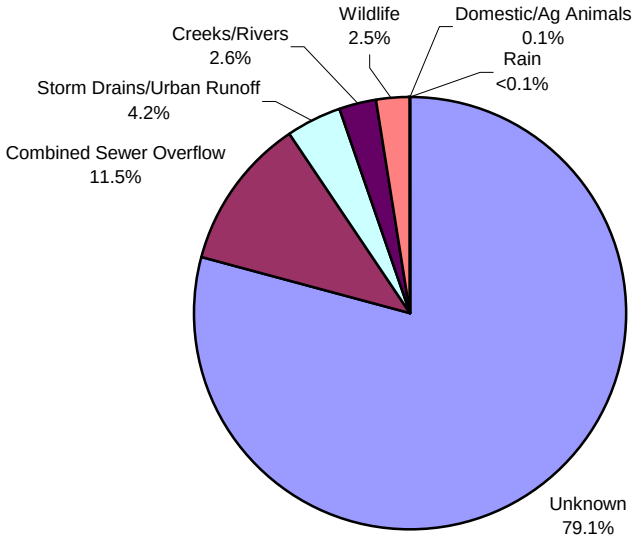
Table 4. Beach Postings for 2000, 2001, and 2002 by County.

COUNTY	NUMBER OF INCIDENCES			NUMBER OF DAYS			BEACH-MILE DAYS POSTED		
YEAR	2000	2001	2002	2000	2001	2002	2000	2001	2002
Del Norte	0	0	0	0	0	0	0	0	0
Humboldt	0	0	0	0	0	0	0	0	0
Mendocino	0	0	0	0	0	0	0	0	0
Sonoma	12	2	7	29	4	28	2.7	0.4	2.6
Marin	0	0	N/A[1]	0	0	N/A[1]	0	0	N/A[1]
Contra Costa	0	0	0	0	0	0	0	0	0
Alameda	0	0	0	0	0	0	0	0	0
San Francisco	13	34	21	31	70	89	49.0	104.2	136.5
San Mateo	17	17	18	387	101	186	21.5	59.0	32.8
Santa Cruz	7	14	29	44	47	119	19.8	6.1	21.5
Monterey	16	15	10	42	81	35	13.8	31.5	10.0
San Luis Obispo	6	20	5	16	68	6	2.2	11.1	0.3
Santa Barbara	152	147	103	1296	1176	524	73.5	56.3	8.9
Ventura	72	96	83	237	967	255	13.4	98.5	14.5
Los Angeles	325	263	268	1150	1204	817	126.1	93.0	83.2
Long Beach (City)	99	58	93	161	78	115	4.6	2.2	3.3
Orange	290	325	305	2055	3235	3203	595.8	646.5	712.4
San Diego	274	187	132	2450	855	752	168.9	51.5	63.4
TOTAL	1283	1178	1074	7898	7886	6129	1091.3	1160.3	1089.4

[1]No data available at the time this report was written. Marin County does not have any beaches meeting Health and Safety Code section 115880 criteria, and therefore is not required to submit posting data.

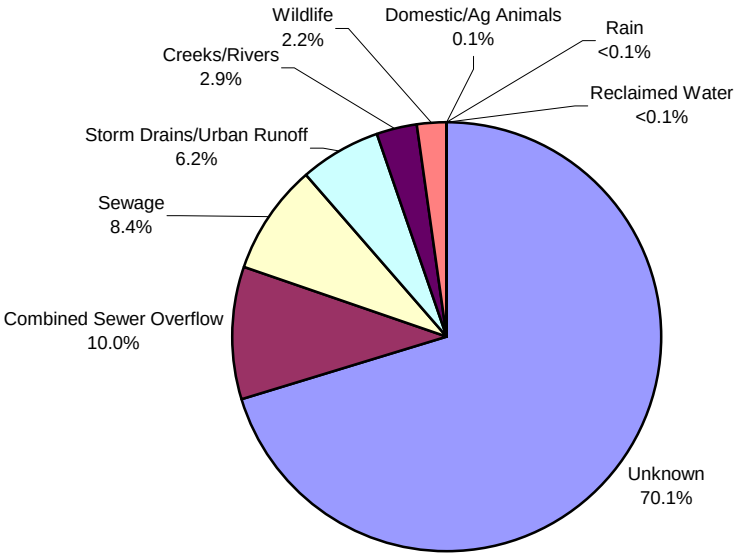
Statewide, the majority of all beach postings (almost 80 percent) are the result of unknown sources as illustrated by Figure 2. When postings and closures are combined, greater than 70 percent of all sources are unknown (Figure 3). This clearly indicates that there is a need for more research into methods that would help local health officials determine the source of coastal water contamination. If inexpensive and non labor-intensive methods were made available to county officials, many of the sources of poor coastal water quality could be diagnosed, and management steps could be taken to reduce contamination and the health risk to the public.

Figure 2. Sources of Contamination Resulting in 2002 Beach Postings Statewide (Based on BMDs).



Source: SWRCB Beach Closure Database.

Figure 3. Sources of Contamination Resulting in 2002 Beach Closures and Postings Statewide (Based on BMDs).



Source: SWRCB Beach Closure Database.