# Contents

Chapter # Pollution Prevention................................................................. 1
  Status of Pollution Prevention in California ............................................ 1
  Antidegradation Policy ............................................................................. 1
  Total Maximum Daily Loads (TMDLs) ...................................................... 2
  Management Practices and Land Uses ...................................................... 2
  Surface Water Quality ............................................................................. 2
  Clean Beaches ......................................................................................... 3
  Agriculture ............................................................................................. 4
  Urban ........................................................................................................ 4
  Marinas ..................................................................................................... 5
  Hydromodification .................................................................................. 5
  Wetlands ................................................................................................. 5
  Forestry .................................................................................................... 6
  Groundwater Quality ............................................................................... 6
Costs Associated with Pollution Prevention .............................................. 6
Major Issues ............................................................................................. 6
  Agricultural Impacts ............................................................................... 6
  Urban Impacts ....................................................................................... 7
  Natural impacts & Legacy pollutants ...................................................... 8
  Emerging issues .................................................................................... 8
  Climate Change .................................................................................... 9
  Monitoring and Assessment .................................................................. 9
Recommendations ..................................................................................... 10
Selected References .................................................................................. 12

## Box
PLACEHOLDER Box [#]-1 Abbreviations and Acronyms Used in This Chapter........ 1
Subgroup: Improve Water Quality

Chapter # Pollution Prevention

Pollution prevention can improve water quality for all beneficial uses by protecting water at its source, reducing the need and cost for other water management and treatment options. By preventing pollution throughout a watershed, water supplies can be used, and reused, for a broader number and types of downstream water uses. Improving water quality by protecting source water is consistent with a watershed management approach to water resources problems. In addition, the legal doctrine of “public trust” demands that the State protect certain natural resources for the benefit of the public, including uses such as fishing, protection of fish and wildlife, and commerce, all of which are affected by pollution.

Status of Pollution Prevention in California

Pollution can enter a water body from point sources like wastewater treatment facilities, industrial, construction, or municipal discharges storm water runoff, but also from nonpoint sources such as agricultural runoff, forestry practices, or grazing lands. There are many tools — regulatory, self-determined, or incentive-based — currently available for preventing water pollution. The U.S. Environmental Protection Agency (EPA), State Water Resources Control Board (SWRCB), California Coastal Commission (CCC), and Regional Water Quality Control Boards (RWQCBs) have permitting, enforcement, remediation, monitoring, and watershed-based programs to prevent pollution. The SWRCB currently funds many water quality projects throughout the state through bond funds; however, these bond fund monies will be depleted.

PLACEHOLDER Box [#]-1 Abbreviations and Acronyms Used in This Chapter

Antidegradation Policy

The EPA required each state to adopt a statewide antidegradation policy and establish procedures for its implementation. The State and federal antidegradation policies require, in part, that where surface waters are of higher quality than necessary to protect beneficial uses, the high quality of those waters must be maintained unless otherwise provided by the policies. The federal antidegradation policy prohibits any activity or discharge that would lower the quality of surface water that does not have assimilative capacity with limited exceptions. The State’s Antidegradation Policy was adopted by the State Water Board in 1968 as Resolution No. 68-16 which establishes the requirement that discharges to waters of the State be regulated to achieve the “highest water quality consistent with maximum benefit to the people of the State.” The State’s Antidegradation Policy applies more comprehensively to water quality changes than the federal policy, because it also applies to groundwater, not just surface water.

The Antidegradation Policy has been incorporated into all Water Quality Control Plans (Basin Plans). A Basin Plan establishes a comprehensive program of actions designed to preserve, enhance, and restore water quality in all water bodies within the State of California. The Basin Plan is each RWQCB’s master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. Title 40, Code of Federal Regulations, Part 131 requires each State to adopt water
quality standards by designating beneficial uses to be protected and promulgating water quality criteria that protect the designated uses. In California, the beneficial uses and water quality objectives are the State’s water quality standards.

**Total Maximum Daily Loads (TMDLs)**

The federal Clean Water Act’s (CWA) section 305(b) requires each state to report biennially on the quality and condition of its waters. The SWRCB/RWQCBs conduct physical, chemical, and biological monitoring of the waters of the State and prepare an assessment report for EPA. The reports submitted by states serve as the basis for EPA’s *National Water Quality Inventory Report* to Congress. The California CWA section 303(d) (CWA 303d) Listing Policy sets the rules to identify which waters do not meet water quality standards, even after point sources of pollution have installed the required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called Total Maximum Daily Loads (TMDLs) for specific pollutants to improve water quality. TMDLs are typically adopted through the Basin Planning process. The RWQCBs conduct triennial reviews of the basin plans to solicit input from interested parties and assist staff in prioritizing Basin Plan amendment projects.

Water bodies are most often listed as impaired for pathogens, nutrients, pesticides, metals, and organic chemicals. The resulting TMDLs are then implemented through the point source and nonpoint source (NPS) regulatory programs, such as the National Pollutant Discharge Elimination System (NPDES) permits for point sources (e.g.; wastewater treatment facilities, storm water runoff); State waste discharge requirements (WDRs) permits for both point and NPS discharges not subject to NPDES permit program, and NPS agricultural waivers. Additionally, the EPA and the Department of Health Services (DHS) have sanitary survey and source water assessment programs specifically for drinking water sources. Beyond these State and federal efforts, many local agencies, businesses, farmers, non-governmental organizations, and watershed-based groups are preventing pollution directly, on their own or through partnerships.

**Management Practices and Land Uses**

The State NPS program addresses NPS pollution by promoting management practices for each of 6 separate land use categories: agriculture, urban, forestry, marinas, hydromodification, and wetlands. Management practices can be institutionalized in waivers and waste discharge requirements. Some emerging issues include the effects of climate change, air deposition of pollutants onto water bodies, nano-pollutants, and water and energy conservation.

**Surface Water Quality**

Throughout California, water quality impairments threaten beneficial uses of surface waters such as domestic, riparian, and aquatic habitats, and in some cases are major impediments to ecosystem restoration. Urban, military, industrial, hydropower, mining, logging, agriculture, grazing, and recreational activities can potentially degrade water quality. Depleted freshwater flows as a result of upstream dams, diversions, interbasin transfers, and increased urbanization also affect the quality of water downstream, and have public trust doctrine implications. Other water management actions and projects, such as conjunctive use, conveyance, transfers, and conservation, can also affect water quality, both positively and negatively. Many significant

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3. Please refer to Volume 1, Chapter 3, for a more detailed discussion of the legal and regulatory framework for protecting ambient water quality.
pollution problems today are the result of persistent “legacy” pollutants, such as mercury, extracted from the Coast Range and used to process gold in the Sierra mines in the 19th century; industrial chemicals such as polychlorinated biphenyls (PCBs), used in electrical transformers; and pesticides such as dichloro-diphenyl-trichloroethane (DDT). These pollutants also contaminate sediments, making ecosystem restoration efforts more difficult. Hydraulic mining during the 1900s still has an adverse impact on numerous Central Valley rivers, as well as San Francisco Bay. Some environmental contaminants of concern, such as mercury and selenium, are persistent or bioaccumulative - that is, their concentration and toxicity magnifies in the food chain - and can be toxic to key food chain links, such as aquatic invertebrates, and negatively impact communities and native American tribes dependent upon subsistence fisheries.

Assessments based on EPA’s Environmental Monitoring and Assessment Program (EMAP) for Coastal Waters, and data collected in California from 1999 through 2000 suggest that most of the state’s coastal waters appear to be in “fair” to “good” condition based on the water and sediment quality indicators used. EMAP data collected in California from 1999 through 2003 suggest that 67-78 percent of wadeable perennial streams statewide are in “good” condition based on two benthic macroinvertebrate indicators. The 2006 California CWA 303(d) List of Water Quality Limited Segments specified 691 water bodies which exceeded established water quality objectives. In some cases, a water body is listed for more than one pollutant, and in total, there are currently 1,780 pollutant-waterbody listings. The listings are primarily driven by the lack of attainment or maintenance of water quality to support aquatic organisms. The listing not only assures protection of public water supplies, but also assures the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife and allows for recreational activities such as swimming, wading, and fishing. The criteria set to protect aquatic plants and animals are more stringent in most cases than the criteria set to protect drinking water. Exceptions include pollutants which are potential human carcinogens, teratogens, and reproductive toxicants.

About XX percent of the total miles of California’s rivers and streams, and about XX percent of its lake acreage are now listed as limited under the 2006 California CWA 303(d) List. As of 2006, advisories warning against fish consumption, an indirect indicator of surface water quality, were posted for 18 percent of California’s lakes, while less than 1 percent of the state’s rivers were similarly posted. (Note: These percentages will be updated to the most recent values consistent with the 2006 California CWA 303(d) List.)

**Clean Beaches**

Runoff from urban areas can contain heavy metals, pesticides, petroleum hydrocarbons, trash, and animal and human waste. This urban runoff can have a detrimental impact on one California’s greatest natural and economic resources, its world-renowned beaches. This natural resource attracts millions of tourists and locals alike each year. The direct revenues generated by the California beach economy amounted to nearly $12 billion in 2004. Unfortunately, runoff from creeks, rivers, and storm drains creates the largest source of water pollution for the beaches. Often the currents in the bays, around offshore islands, and along sections of the coast can exacerbate pollution by trapping or directing pollutant to a particular area along the coast. Some stretches of beaches in Southern California are permanently posted by local health departments as unsafe for swimming and surfing or periodically posted after storm events. It is recommended that no one

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7 [Source: Heal the Bay’s 12th Annual Beach Report Card. Heal the Bay, Santa Monica, CA, May, 2002.](http://www.healthebay.org)
swim in the ocean during and for at least three days after a significant rain event because of contaminated urban storm water runoff draining directly into the ocean. During dry weather, California beaches experience much better water quality, although sewer spills that result in beach closures and other sources of pollution exist year round.

In response to protecting the state’s beach resources, the Governor identified $32.3 million of grant funding in the 2001 state budget to help fund the Clean Beaches Initiative (CBI). The water quality goal of the CBI is to make beaches safe for recreational ocean water-contact. The projects being funded through the CBI include capital improvements to divert storm water to wastewater treatment plants rather than allowing the runoff to go onto the beaches and into the ocean. Since 1998 through June 2002, the SWRCB approved 12 storm water diversion or treatment projects to receive grant funds, totaling approximately $7.2 million. The beaches are located from the Monterey Bay (Pacific Grove) to just north of the US-Mexico border (Imperial Beach).

Storm water diversions on Southern California beaches have historically cost approximately $500,000 to over $1,000,000. However, they are extremely effective in reducing bacterial levels in the water, as well as the other pollutants associated with urban runoff. A success story is the Santa Monica Bay beaches in Los Angeles County. Some beaches on the Bay were either permanently posted or regularly posted prior to the diversions until many of the storm water drains were diverted to a nearby wastewater treatment facility. After the diversions, beaches near the Santa Monica Pier are now off the permanently posted list and are only rarely posted. The beaches on the Bay can get well over a million visitors over the course of a summer weekend. This level of visitation implies a high level of direct and indirect economic benefits gained by the beach community and high indirect economic benefits experienced by surrounding areas.

California beaches are an important environmental and economic resource for the state and the Nation. Efforts such as the Clean Beaches Initiative to fund storm water diversions and other water quality improvement projects are creating benefits that are likely to far outweigh their costs.

Agriculture
According to EPA (1993), agriculture contributes more than half of the pollution entering the Nation's water bodies; recent studies have identified it as the greatest source of water pollution in the United States. The primary agricultural NPS pollutants are nutrients, sediment, animal wastes, pesticides, and salts. Agricultural activities may also affect habitat through physical disturbances caused by livestock or equipment or through the management of water.

Urban
With approximately 80 percent of the nation’s population living in coastal areas, controlling polluted runoff in urban areas is a challenge. Negative impacts of urbanization on coastal and estuarine waters are well documented in a number of sources, including California’s CWA section 305(b) and section 319 reports and the Nationwide Urban Runoff Program. Major pollutants found in runoff from urban areas include sediment, nutrients, oxygen-demanding substances, road salts, heavy metals, petroleum hydrocarbons, pathogenic bacteria, and viruses. Suspended sediments constitute the largest mass of pollutant loadings to receiving waters from urban areas. Construction is a major source of sediment erosion. Petroleum hydrocarbons result mostly from automobile sources. Nutrient and bacterial sources include garden fertilizers, leaves, grass clippings, pet wastes, and faulty septic tanks. As population densities increase, a corresponding increase occurs in pollutant loadings generated from human activities. Many of these pollutants enter surface waters via runoff without undergoing treatment.
Marinas

Recreational boating and marinas are increasingly popular uses of coastal areas and inland surface water bodies (e.g., lakes and delta). As they are an important means of public access, California must balance the need for protecting the environment and the need to provide adequate public access. Because marinas and boats are located at the water’s edge, pollutants generated from these sources are less likely to be buffered or filtered by natural processes. When boating and adjunct activities (e.g., marinas and boat maintenance areas) are poorly planned or managed, they may pose a threat to water quality and the health of aquatic systems and may pose other environmental hazards. Sources of pollution associated with marinas and boating include: Poorly flushed waterways; pollutants discharged from boats (recreational boats, commercial boats, and “live-aboards”); pollutants carried in storm water runoff; physical alteration of wetlands and of shellfish/other benthic communities during construction of marinas, ramps, and related facilities; and pollutants generated from boat maintenance activities on land and in the water.

Hydromodification

Channel modification activities are undertaken in rivers or streams to straighten, enlarge, deepen, or relocate the channel. These activities can affect water temperature, change the natural supply of fresh water to a water body, and alter rates and paths of sediment erosion, transport, and deposition. Hardening the banks of waterways with shoreline protection or armor also accelerates the movement of surface water and pollutants from the upper reaches of watersheds into coastal waters. Channelization can also reduce the suitability of instream and streamside habitat for fish and wildlife by depriving wetlands and estuarine shorelines of enriching sediments, affecting the ability of natural systems to filter pollutants, and interrupting the life stages of aquatic organisms (EPA 1993).

Dams can adversely impact hydrology and the quality of surface waters and riparian habitat in the waterways where the dams are located. A variety of impacts can result from the siting, construction, and operation of these facilities. For example, improper siting of dams can inundate both upstream and downstream areas of a waterway. Dams reduce downstream flows, thus depriving wetlands and riparian areas of water. During dam construction, removal of vegetation and disturbance of underlying sediments can increase turbidity and cause excessive sedimentation in the waterway.

The erosion of shorelines and streambanks is a natural process that can have either beneficial or adverse impacts on riparian habitat. Excessively high sediment loads resulting from erosion can smother submerged aquatic vegetation, cover shellfish beds and tidal flats, fill in riffle pools, and contribute to increased levels of turbidity and nutrients.

Wetlands

Wetlands and riparian areas reduce polluted runoff by filtering out runoff-related contaminants, such as sediment, nitrogen, and phosphorus, thus maintaining the water quality benefits of these areas is important. These areas also help to attenuate flows from higher-than-average storm events. This protects downstream areas from adverse impacts, such as channel scour, erosion, and temperature and chemical fluctuations. Changes in hydrology, substrate, geochemistry, or species composition can impair the ability of wetland or riparian areas to filter out excess sediment and nutrients and therefore can result in deteriorated water quality. The following activities can cause such impairment: drainage of wetlands for cropland, overgrazing, hydromodification, highway construction, deposition of dredged material, and excavation for ports and marinas.
The management practices for wetlands promote protecting and restoring wetlands and riparian areas and using vegetated treatment systems to control nonpoint source pollution from these sources.

**Forestry**

Silviculture contributes pollution to 17 percent of the polluted rivers and 21 percent of the polluted lakes in California (as of 1996). Without adequate controls, forestry operations may degrade the characteristics of waters that receive drainage from forest lands. Sediment concentrations can increase due to accelerated erosion, water temperatures can increase due to removal of over-story riparian shade, dissolved oxygen can be depleted due to the accumulation of slash and other organic debris, and concentrations of organic and inorganic chemicals can increase due to harvesting and fertilizers and pesticides.

**Groundwater Quality**

Man-made contamination from agricultural practices and septic tanks, nitrate, which presents a known, short-term health risk, has closed more public water wells statewide than any other contaminant. Nitrates that have contaminated groundwater from agricultural practices is the single largest threat to groundwater quality in the State of California, particularly in the Central Valley growing areas.

**Costs Associated with Pollution Prevention**

An assessment of water quality conditions in California shows that nonpoint sources of pollution have the greatest effect on water quality. They affect some of the largest economic segments of the State’s economy, such as agricultural development and timber harvest activities. Nonpoint sources are not readily controlled by conventional means. Instead, they are controlled with preventive plans and practices used by those directly involved in those activities and by those overseeing such activities. (Note: Developing an example with RWQCBs for costs associated with the implementation of the irrigated agricultural waiver program and funding provided to dischargers through state and federal funding sources.)

**Major Issues**

**Agricultural Impacts**

Senate Bill 390 (SB 390) signed into law on October 6, 1999, required the RWQCBs to review their existing waivers of WDRs and to either renew them or replace them with WDRs. Waivers not reissued automatically expired on January 1, 2003 and the dischargers were then to be regulated with general or individual WDRs. To comply with SB 390, the RWQCBs adopted conditional waivers for agricultural discharge categories: irrigation return flow, flows from tile drains, and storm water runoff. These discharges affect water quality by transporting pollutants such as pesticides, sediment, nutrients, salts (including selenium and boron), pathogens, and heavy metals from cultivated fields into surface waters. Many surface water bodies are impaired because of pollutants from agricultural sources. Groundwater bodies have also suffered pesticide, nitrate and salt contamination. Statewide, approximately 9,493 miles of rivers/streams and some 513,130 acres of lakes/reservoirs are listed on the 303(d) list as being impaired by irrigated

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9 Senate Bill No. 390 CHAPTER 686 An act to amend Sections 13269 and 13350 of the Water Code, relating to water. [Approved by Governor October 6, 1999. Filed with Secretary of State October 10, 1999 and subsequent amendments.
agriculture. Of these, approximately 2,800 miles, or approximately 28 percent, have been identified as impaired by pesticides.

To control and assess the effects of discharges from irrigated agricultural lands, the Los Angeles (LARWQCB), Central Coast (CCRWQCB), Central Valley (CVRWQCB), and San Diego (SDRWQCB) Regional Boards have adopted comprehensive conditional waivers. The Colorado River Basin Regional Board (CRRWQCB) has adopted a Conditional Prohibition as a TMDL implementation plan incorporated into their Basin Plan. An estimated 80,000 growers, who cultivate over 9 million acres, are subject to conditional waivers in these regions. These RWQCBs have made significant strides to implement their waiver programs and are committed to continue their efforts to work with the agricultural community to protect and improve water quality. RWQCBs 1, 2, 6, and 8 have no immediate plans to adopt waivers for agricultural discharges, but may do so eventually to implement TMDLs.

California has approximately 2,200 dairies with an average size of about 700 milk cows. There are also several hundred feedlots, poultry operations, and other animal feeding operations (AFOs) in the state. California regulations refer to these operations, including concentrated animal feeding operations (CAFOs), as “confined animal facilities” (CAFs). The exact number of facilities that are CAFs based on animal populations is unknown, but is estimated at between 1,000 and 1,200. Most of the commercial CAFs are in the Central Valley Region, including over 80 percent of the dairies. There are also about 150 dairies and feedlots in the Santa Ana Region, and about 200 dairies (mostly smaller facilities with less than 300 milk cows) in the North Coast and San Francisco Bay Regions.

Each Regional Water Board develops the regulatory program it uses for CAFs. Dairies and feedlots in the Santa Ana Region operate under a General NPDES permit that requires preparation of an engineered waste management plan. The CVRWQCB was developing a general NPDES permit for dairies, but stopped when the Second Circuit Court of Appeals ruled that only facilities discharging to a water of the United States require a permit. Subsequently, the CVRWQCB adopted Order No. R5-2007-0035: Waste Discharge Requirements General Order for Existing Milk Cow Dairies\(^\text{10}\) on May 3, 2007. This Order requires the dairies to develop and implement nutrient management plans and to submit annual reports. The permitted facilities will pay an annual fee that is based on animal population and ranges from $200 to $4,000 plus a surcharge to support the SWRCB’s Surface Water Ambient Monitoring Program (SWAMP). Since impact to groundwater is the major concern at these CAFs, the Order requires groundwater monitoring in some instances.

**Urban Impacts**

Urban stormwater runoff washes pollutants such as nutrients (lawn fertilizers and pet wastes), pesticides, oil and grease, metals, organic chemicals, human pathogens, and debris from city streets and other hard surfaces into surface waters (including beaches), and negatively impact existing and future groundwater replenishment projects that use stormwater for recharge (see Urban Runoff Management, and Recharge Area Protection strategies). Runoff from municipalities has been regulated by the NPDES Municipal Separate Sewer Stormwater (MS4) Permit since 1992. The MS4 permits require the discharger to develop and implement a Storm Water Management Plan/Program with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). The management programs specify what best management practices (BMPs) will be used to address certain program areas. The program areas include public education and outreach, illicit discharge detection and elimination, construction and post-

construction, and good housekeeping for municipal operations. Medium and large municipalities are required to conduct chemical monitoring, though small municipalities are not.

The SWRCB and other federal, state, and local agencies have been actively involved in a statewide organization called the California Water and Land Use Partnership (CaWALUP). This is a local affiliate of the National NPS Education for Municipal Officials (NEMO) Network, which is dedicated to protecting natural resources through better land use and land use planning. CaWALUP has participated in education and outreach, Low Impact Development (LID) training workshops, and collaborated on the development of an Impervious Surface Analysis for California. The SWRCB has also funded the Center for Water and Land Use (Center), an affiliate of UC Davis Extension. The Center's mission is to increase awareness and understanding of the relationships between water resources and land use policies and practices through education, training, applied research, collaboration and dissemination of information.

**Natural impacts & Legacy pollutants**

Arsenic, asbestos, radon, minerals, and sometimes microbes and sediment are examples of naturally occurring contaminants for which a pollution prevention approach is obviously infeasible. Furthermore, some contaminants that are concerns specifically for drinking water, such as organic carbon from watershed runoff, and bromide—a component of ocean salinity, are a result of natural processes for which a pollution prevention approach is not possible.

Abandoned mines, former industrial and commercial sites, and leaking underground storage tanks often leave behind toxic pollution problems without a clear link to any legally responsible or financially viable party or entity to pay for cleanup. The State and federal governments and potentially responsible parties often wind up in extensive regulatory and legal proceedings determining legal and financial responsibility while hazardous waste sites remain.

**Emerging issues**

Traditionally, water agencies focus on pathogens (disease-causing microorganisms), chemicals, and disinfectant by-products (potential cancer-causing contaminants), that are regulated or will be regulated in near future. Recently, though, other unregulated chemicals and pollutants are being discovered to have unexpected health and environmental effects. Chemicals found in pharmaceuticals and personal care products, by-products of fires and fire suppression, and discarded elements of nano-technology are emerging as actual or potential water contaminants. Air deposition of a whole host of pollutants is now seen as a significant contributor to water pollution. Most of these emerging pollutants have not yet been subject to a rigorous assessment, or to regulatory action.

Institutional barriers continue to contribute to the difficulty of addressing pollution from uncontrolled runoff, especially as the State moves towards a broader watershed approach to pollution prevention and regulatory action. Various state, local and Federal agencies have divided jurisdiction over groundwater versus surface waters, polluted runoff versus point source discharges, water quantity versus water quality issues, and even over monitoring and assessing pollutants. These various “stovepipes” of regulatory authority hamper the more holistic watershed commons.

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11 http://nemo.uconn.edu/about/national_network.htm
12 http://cawalup.usc.edu:3455/cawalup/admin/download.html?attachid=13546&view=1
13 http://www.oehha.ca.gov/ecotox/isc031006.html
14 http://extension.ucdavis.edu/
approach to water quality management, and will need to be addressed in the coming years. Management and regulation of water quality in California is fragmented among at least eight State and federal agencies, with no one agency looking after water quality from source to tap. For example, the SWRCB and RWQCBs (Water Boards) regulate ambient water quality, while DHS primarily regulates treatment and distribution of potable water. Further, surface water in California is mostly managed by DWR and the U.S. Bureau of Reclamation, while groundwater is usually not managed at all. Moreover, actually serving drinking water to Californians is an obligation of cities, water districts, and private water companies that were generally not formed in any comprehensive pattern.

Finally, the diffuse nature of nonpoint source pollution and the need to control sources on private and public land adds to the difficulties of instituting pollution prevention measures.

Climate Change
It is widely recognized that changes in temperature and precipitation patterns will impact water availability and quality. Higher air temperatures lead to increases in water demand and changes in hydrologic conditions, resulting in drought and greater threats of wildfires, and reduced snow pack, earlier snowmelt, and a rise in sea level that may cause more seawater intrusion. Also, higher water temperatures reduce dissolved oxygen levels, which can have an adverse effect on aquatic life. Where river and lake levels fall, there will be less dilution of pollutants; however, increased frequency and intensity of rainfall will produce more pollution and sedimentation due to runoff. In addition, more frequent and intense rainfall may overwhelm pollution control facilities that have been designed to handle sewage and storm water runoff under assumptions anchored in historical rainfall patterns.

Water quality impairments are especially critical as droughts and expected increases in climate change impacts further limit water supplies. Changes in hydrology, such as reduced snow pack and earlier snowmelt, result in less natural water storage, and more difficulties managing reservoirs and reservoir releases to maintain river temperatures that are cool enough for anadromous fish. Moreover, lower groundwater tables resulting from less recharge and/or more extractions can reduce or eliminate base flow in creeks, severely affecting aquatic habitat. The condition of California’s fish populations reveals the need for action. Currently, 34 fish species are listed as threatened or endangered in California, including coastal and Central Valley runs of steelhead, spring-run and winter-run Central Valley Chinook salmon, a central coast population of coho salmon, Delta smelt, three species from the Colorado River, and several species from the Klamath Basin and southern deserts. Consequently, to ensure a reliable water supply and adequate aquatic habitat, California must manage water in ways that protect water supply, and protect and restore the environment.

Monitoring and Assessment
California Senate Bill 1070\textsuperscript{15} was enacted to better orchestrate the many monitoring efforts already in progress within the state, and to make that process more visible to the user population and to the entities committed to the protection, monitoring and supply of water to all its users. It provides for the creation of a structure to allow the public to access any available water quality data, current methods and research, as well as current regulations and enforcement actions. The bill also creates a California Water Quality Monitoring Council (CWQMC) to connect the myriad activities throughout the state in a more cohesive and sensible manner, with the ability to provide direction to reduce redundancies, prioritize actions and recommend funding necessary to give the

\textsuperscript{15} \url{http://info.sen.ca.gov/pub/05-06/statute/ch_0701-0750/ch_750_st_2006_sb_1070}
critical information necessary to protect California’s water. This bill specifically addresses Recommendation #3 of the California Water Plan Update of 2005.

The SWAMP is a statewide monitoring effort that provides the scientifically sound data we need to effectively manage California’s water resources. “Ambient” monitoring refers to the collection of information about the status of the physical, chemical and biological characteristics of the environment. The SWRCB and the RWQCBs introduced SWAMP in 2001. The program’s purpose is to monitor and assess water quality to determine whether we are meeting water quality standards and protecting beneficial uses. Data from SWAMP are used to improve the state’s water quality assessment and impaired water bodies list, required under CWA sections 303(d) and 305(b).

The Central Coast Ambient Monitoring Program (CCAMP) is the Central Coast’s regional component of SWAMP. CCAMP plays a key role in assessing Central Coast regional goals and has the a number of program objectives: (1) assess watershed condition on a five-year rotational basis, using multiple indicators of health; (2) assess long-term water quality trends at the lower ends of coastal creeks; (3) conduct periodic assessments of harbors, estuaries, lakes, and nearshore waters using multiple indicators of health; and (4) support investigations of other water quality problems, including emerging contaminants, sea otter health, pathogenic disease, toxic algal blooms and others.

The California Monitoring and Assessment Program (CMAP) for wadeable perennial streams was initiated in 2004. This program builds on EPA’s EMAP. A probabilistic monitoring design incorporating land use classes will allow for assessments of status and trends in aquatic life beneficial use protection in streams. Historic EMAP data were analyzed to produce assessments of the condition of streams statewide and in special study areas in northern and southern coastal California. Several assessments will also be completed focusing on providing condition assessments statewide and for the broad land use categories of urban, agriculture, and forested.

The last sampling effort was in 2007. The Perennial Streams Survey will be initiated in 2008. This effort, and expansion of CMAP, is aimed at developing a coordinated and comprehensive statewide monitoring design, that would integrate bioassessment efforts currently funded through the State’s SWAMP and the NPS Programs with existing local and regional bioassessment efforts. A key feature of the design would be to identify relationships between land-use stressors and response.

**Recommendations**

1. **In addition to regulating water quality on a pollutant-by-pollutant basis, water quality impairments should be best managed using a watershed-based approach.** The State should adopt a strategy that integrates improvements in pollution prevention, water quality matching, and, for drinking water, treatment and distribution. For pollution prevention, such a strategy would build on the urban and agricultural pollution prevention programs of the Water Boards, as well as Department of Health Service’s Source Water Assessment Program.\(^\text{16}\) The strategy would focus in particular on the prevention of nitrate pollution statewide.

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\(^\text{16}\) Such a strategy would be much like the “Equivalent Level of Public Health Protection (ELPH)” process of the CALFED Drinking Water Quality Program, and similar efforts recently established by the Massachusetts Water Resources Authority (for Boston), New York City, and the national governments of...
2. In order to help implement the previous recommendation, the State should adequately fund basin plan triennial review and updates, for incorporation into the California Water Plan Update (pursuant to Section 13141 of the California Water Code). Per the CALFED Record of Decision, the State should complete the drinking water policy for the Delta and its tributaries, which as an amendment to the basin plan for the basins of the Sacramento and San Joaquin Rivers, will be an additional tool for drinking water source protection.

3. The CWQMC should coordinate and integrate all federal, State, and local water quality monitoring and assessment programs for surface water and groundwater. This program would include a focus on emerging, unregulated contaminants in order to provide an early warning system of future water quality problems, as well as identify trends in water quality. Such a program would also seek to standardize methods, especially for monitoring of emerging, unregulated contaminants, regularly monitor the quality of all waters of the state, and provide compatible data management that is accessible to a wide range of users. For drinking water supplies, this monitoring program should include a focus on outcomes-based monitoring, such as bio-monitoring and waterborne disease outbreak surveillance.  

4. Regional, tribal, and local governments and agencies should establish drinking water source and wellhead protection programs to shield drinking water sources and groundwater recharge areas from contamination. These source protection programs should then be incorporated into local land use plans and policies. Such programs would encourage or regulate land-use activities that are protective of water quality, or, alternatively, discourage or restrict land uses or activities that threaten surface and groundwater quality.

5. The Water Boards should target restoration of groundwater resources that are currently used, or that may be used in the future, as sources of drinking water whenever such restorations are practicable and attainable. By working with the DHS, DWR and other agencies, the Water Boards will be able to identify communities that rely on groundwater contaminated by anthropogenic sources as their drinking water source, and take appropriate regulatory or enforcement action against the responsible party. Working with these agencies, the Water Boards will address improperly destroyed, abandoned, or sealed wells in these communities that may serve as a potential pathways for contaminants to reach groundwater.

6. The State should prioritize grant funding for source water protection activities, including building institutional capacity for watershed planning.

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Canada and Australia. This strategy would also conform to the recommendations of the 2000 International Conference on Freshwater, held in Bonn, Germany.

17 The proposed Interagency Water Quality Program would be modeled after the existing Interagency Ecological Program. The groundwater portion of this effort should be consistent with the recommendations of AB 599 (the Groundwater Quality Monitoring Act of 2001) and DWR’s Bulletin 118 (California’s Groundwater), while the surface water aspects should be coordinated with SWRCB’s Surface Water Ambient Monitoring Program (SWAMP, AB 982)
Selected References

2002 California 305(b) Report on Water Quality, State Water Resources Control Board, March 2003
Bulletin 118, California’s Groundwater, Update 2003, Department of Water Resources
A Comprehensive Groundwater Quality Monitoring Program for California (AB 599 Report to the Governor and Legislature), State Water Resources Control Board, March 1, 2003

State Water Resources Control Board/Regional Water Quality Control Boards, Strategic Plan, November 15, 2001
Water Quality Program Plan, CALFED Bay-Delta Program, July 2000
California Coastal Commission, www.coastal.ca.gov
[EPA] US Environmental Protection Agency National Water Quality Inventory
DHS data Web site: www.dhs.ca.gov/ps/ddwem/chemicals/chemindex.htm
Interagency Coordinating Committee (for NPS Pollution Control)
Environmental Protection Indicators for California (EPIC)
Central Valley Regional Water Quality Control Board Irrigated Lands Regulatory Program
The Central Coast Regional Water Quality Control Board Ambient Monitoring Program (CCAMP)
The Central Coast Regional Water Quality Control Board Food Safety and Water Quality Issues
The Central Coast Regional Water Quality Control Board Ag Waiver Program
The Los Angeles Regional Water Quality Control Board Ag Waiver Program
The Colorado River Basin Regional Water Quality Control Board Basin Plan Prohibitions and TMDLs for agricultural discharges.

Forestry Practices Act
CAFOS/AFOS Regulations
SB 1070 Language