

# Water Quality, California, 2009

In this paper, DWR has consolidated the major water quality sections from the various volumes of California Water Plan Update 2009. It presents an overview of the legal and regulatory framework for protecting water quality, then discusses statewide water quality issues, and concludes with regional profiles of water quality around California. It also includes a section describing the Water Boards and their role in water quality, which is not found elsewhere in Water Plan Update 2009. The remaining information is a brief description of what can be found in the other portions of this California Water Plan Update, with reference to the specific location where you can find more information.

## Legal and Regulatory Framework for Protecting Water Quality

### Clean Water Act-National Pollutant Discharge Elimination System

Section 402 of the Clean Water Act established a permit system, the National Pollutant Discharge Elimination System (NPDES), to regulate point sources of discharges in navigable waters of the United States. USEPA was given the authority to implement the NPDES, although the Act also authorizes states to implement the NPDES program in lieu of the USEPA, provided the state has sufficient authority.

After the Clean Water Act was enacted in 1972, USEPA and the states focused primarily on implementing technology-based controls for “point” sources (for example, discharges from pipes of factories and municipal sewage treatment plants). Today, those controls are largely in place, and the focus is beginning to shift to “non-point source” pollution, such as runoff from cities and farms.

### Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act is California's comprehensive water quality control law and is a complete regulatory program designed to protect water quality and beneficial uses of the state's water. It requires the adoption of water quality control plans (basin plans) by the State's nine Regional Water Quality Control Boards (Regional Water Boards) for watersheds in their regions. The basin plans are reviewed every third year and amended as necessary by the Regional Water Boards, subject to the approval of the California Office of Administrative Law, the State Water Board and ultimately the federal EPA. Moreover, pursuant to Porter-Cologne, these basin plans shall become part of the California Water Plan, when such plans have been reported to the Legislature (Section 13141, California Water Code).

In 1972, the Legislature amended the Porter-Cologne Act to give California the authority and ability to operate the federal NPDES permits program. Before a permit may be issued, Section 401 of the Clean Water Act requires that the RWQCB certify that the discharge will comply with applicable water quality standards. In addition, under Porter-Cologne, the RWQCB may also issue waste discharge requirements, that set conditions on the discharge of a waste. These requirements must be consistent with the water quality control plan for the body of water that receives the waste discharge, as well as protect the beneficial uses of those receiving waters.

The Regional Water Boards also implement Section 402 of the federal Clean Water Act, which allows the State to issue a single discharge permit for stormwater runoff for the purposes of both State and federal law.

## **Federal Safe Drinking Water Act**

The Safe Drinking Water Act (SDWA), enacted in 1974 and significantly amended in 1986 and 1996, directed the USEPA to set national standards for drinking water quality. It required the USEPA to set maximum contaminant levels for a wide variety of constituents. Local water suppliers are required to monitor their water supplies to assure that regulatory standards are not exceeded.

A Maximum Contaminant Level (MCL) is the maximum concentration of a contaminant that is allowed in public drinking water systems. The 1986 amendments set a timetable for the USEPA to establish standards for specific contaminants and increased the range of contaminants local water suppliers were required to monitor to include contaminants that did not yet have an MCL established. The 1986 Safe Drinking Water Act Amendments also led to the USEPA's adoption of the Surface Water Treatment Rule, which addresses filtration and disinfection of surface waters. The amendments included a wellhead protection program, a grant program for designating sole-source aquifers for special protection, and grant programs and technical and financial assistance to small systems and states.

The 1996 amendments included stronger regulation of microbial contaminants (i.e., cryptosporidium) while managing levels of disinfection byproducts, source water assessment programs, and establishment of a drinking water state revolving fund. The source water assessment and protection programs offer tools and opportunities to build a prevention barrier to drinking water contamination. Under the Safe Drinking Water Act, the state is required to develop comprehensive Source Water Assessment Programs that will identify the areas that supply public tap water, inventory contaminants and assess water system susceptibility to contamination, and inform the public of the results.

For every new standard, USEPA conducts an analysis to determine if the benefits of the standard justify the costs. If not, USEPA may adjust the MCL to a level that “maximizes the health risk reduction benefits at a cost that is justified by the benefits.”

## **California Safe Drinking Water Act**

In 1976, California enacted its own Safe Drinking Water Act, requiring the Department of Health Services (DHS) to regulate drinking water, including: setting and enforcing federal and State drinking water standards; administering water quality testing programs; and administering permits for public water system operations. In 1989, significant amendments to the California act incorporated the new federal safe drinking water act requirements into California law, gave DHS discretion to set more stringent MCLs, and recommended public health levels for contaminants.

## **California Government**

Beyond DWR, many State departments and agencies oversee California's water quality. For example, the State Water Board integrates water rights and water quality decision-making authority. The State Water Board and the nine Regional Water Boards are responsible for protecting California's water resources. Other State agencies and their roles in water quality management follow:

- California Bay-Delta Authority—Oversees the 23 State and federal agencies working cooperatively through the CALFED Bay-Delta Program to improve the quality and reliability of California's water supplies while restoring the Bay-Delta ecosystem.

- California Environmental Protection Agency—Restores, protects, and enhances the environment to ensure public health, environmental quality, and economic vitality.
- Department of Fish and Game—Regulates and conserves the state’s wildlife.
- Department of Food and Agriculture—Supports California’s agricultural economy.
- Department of Health Services—Oversees programs to protect and improve the health of all Californians, regulates and permits drinking water.
- Department of Pesticide Regulation—Regulates pesticide sales and use and plays a significant role in monitoring for the presence of pesticides and in preventing further contamination of the water resource.
- Department of Toxic Substances Control—Provides technical oversight for the characterization and remediation of soil and water contamination.

### **Federal Government**

The federal government also has an important role in protecting the state’s water quality, particularly the USEPA, which protects human health and the natural environment. Other federal agencies with water quality roles include:

- US Army Corps of Engineers—Plans, designs, builds, operates, and regulates water resources projects (e.g., navigation, flood control, environmental protection, disaster response). The Corps is also responsible for 404 dredge and fill permits that will then result in a need for Regional Water Board water quality certification.
- US Bureau of Reclamation—Constructs federal water supply projects and is the nation’s largest wholesaler of water and the second largest producer of hydroelectric power.
- US Department of Agriculture (USDA)—Manages forests, watersheds, and other natural resources.
- Natural Resource Conservation Service (within USDA)—Provides technical and financial assistance to conserve, maintain and improve natural resources on private lands.
- U.S. Fish and Wildlife Service—Conserves, protects, and enhances fish, wildlife, and plants and their habitats.
- U.S. Geological Survey—Provides water measurement and water quality research.

### **Public Agencies, Districts, and Local Governments**

Local city and county governments and special districts have ultimate responsibility for providing safe and reliable water to their customers. Cities and counties, which may also provide domestic water, are also the land and resource management agencies and planning entities that most influence the location and amount of population growth in the state.

### **Private Entities**

In addition to public agencies, private entities may also supply water. Mutual water companies, for example, are private corporations that perform water supply and distribution functions similar to public water districts. Sometimes investor-owned utilities are also involved in water supply activities as an adjunct of hydroelectric power development. These investor-owned water companies are regulated by the California Public Utilities Commission.

## Individual Water Users

Collectively, the millions of urban businesses, individual households, and farms fund the operation and maintenance of California's water systems through payment of taxes and water bills. Each makes decisions on water use and conservation for its own circumstances. Individual water users must dispose of used water, usually through a sewer or gutter, which in turn can create water pollution. This return flow can provide water to downstream water users. During drought periods, many households modify outdoor watering to conserve water. Each year, farmers make decisions on planting and water application based on weather conditions, forecasted water supply, and individual tolerance for market risk. Taken together, these individual decisions about water use have an enormous impact on both water demand and water quality and present many opportunities for individuals to play positive roles in better managing California's water quantity and quality.

## Water Quality and the Water Boards

Water is California's most precious resource, providing an essential lifeline between agriculture, industry, the environment and urban and rural interests throughout the state. With a growing population of more than 38 million and a limited supply of fresh water, the protection of water for beneficial uses is of paramount concern for all Californians. The State Water Board and the Regional Water Boards, under the umbrella of the California Environmental Protection Agency, are responsible for protecting California's water resources.

Created by the Dickey Water Pollution Act, the Regional Water Boards have been responsible for protecting the surface, ground and coastal waters of their regions since 1949. In 1967, the State Water Rights Board and the State Water Quality Control Board were merged to create the State Water Resources Control Board, integrating water rights and water quality decision-making authority. The nine Regional Water Boards are semi-autonomous and comprised of up to nine part-time Board members appointed by the governor. Regional boundaries are based on watersheds. Together, the Regional Water Boards have about 875 staff members in 12 regional offices. Each Regional Water Board makes critical water quality decisions for its region. These decisions include setting standards, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions.

The State Water Board's role in protecting water quality includes setting statewide policy, coordinating and supporting the Regional Water Board efforts, and reviewing petitions contesting Regional Water Board actions. The State Water Board is also solely responsible for allocating surface water rights. Today, the State Water Board, with roughly 600 staff members, is organized into four divisions that address water quality, water rights, financial assistance, and administrative functions. These functions not only support the State Water Board, but also the nine Regional Water Boards. Five full-time Board members, appointed by the Governor, are responsible for setting statewide water policy.

The Water Boards completed their most recent strategic plan in 2008. The 2008 Strategic Plan updates the mission, vision, values, operating principles, goals, objectives, performance measures and key strategic projects of the California Water Boards. The Water Boards' overall mission is to preserve, enhance and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations. The Strategic Plan highlights critical water resource issues to be addressed over the next five years, while considering our progress to date.

Since the passage of the federal Clean Water Act in 1972, California has made great strides in cleaning up its rivers, lakes, groundwater aquifers, and coastal waters. The primary focus of that effort, both in California and nationally, has been on wastewater discharged from "point sources" – sewer outfalls and other easily identifiable sources such as pipes. Much of that progress resulted from a regulatory effort that required a permit for each distinct point of discharge, combined with a sizable loan and grant program to help fund the facilities needed to clean up discharges to permit levels.

Despite this progress, significant challenges remain. For example, the permitting of point sources is becoming more complex and contentious as new state and federal mandates affect standards and enforcement. An even greater challenge is pollution resulting from "nonpoint sources" – runoff from urban areas, agriculture, timber operations, mine drainage and other sources for which there is no single point of discharge. Nonpoint source (NPS) pollution is the most significant California water quality challenge today, and requires flexible and creative responses. The challenge of NPS pollution lies in its very nature: diffuse, sporadic and difficult to trace to its sources, and thus more difficult to regulate through a permitting process. Because treatment to remove NPS pollutants is an expensive and potentially endless task, it is essential to keep these pollutants from reaching the water. Effective water quality protection requires a comprehensive approach to managing nonpoint sources. Prevention needs to be emphasized, and the cumulative effects of NPS pollution on entire watersheds must be considered.

More than 20 state departments and agencies, in addition to the California Water Boards, have authorities, programs, or responsibilities relating to the control of NPS pollution. Coordinating and focusing such a large number of entities to produce an effective NPS program in a state as large and geomorphologically diverse as California poses unique and difficult challenges. A NPS Program Plan, developed in coordination with the California Coastal Commission and other responsible State agencies, was approved in 2000 and has been updated to include implementation measure through 2008. Updates to carry implementation out through 2013 are being developed now. The NPS Program Plan includes a program strategy, implementation plan, and management measures to control NPS pollution. A NPS Implementation and Enforcement Policy, adopted in 2004, explains how the NPS Program Plan will be implemented and enforced. In addition, the California Water Boards have implemented a broad program of outreach, education, technical assistance and financial incentives. This program is supplemented by collaborative efforts with other agencies and non-governmental organizations. The goal is to provide an integrated statewide approach to controlling NPS pollution.

Total Maximum Daily Loads (TMDLs) is a tool used by the California Water Boards to address both point source and nonpoint source pollution. Federal law requires states to identify all water bodies that do not meet water quality standards. For those "impaired" water bodies failing to meet standards, the states must establish TMDLs. TMDLs define how much of a specific pollutant a water body can tolerate and still meet relevant water quality standards. The establishment of TMDLs in California is one of the most significant and controversial efforts undertaken by the California Water Boards. Not only do the TMDLs have to be established, but they must also be implemented by allocating responsibility for corrective measures among a variety of dischargers.

The 2006 303(d) list identifies more than 2000 water body-pollutant combinations requiring TMDL development. The California Water Boards have developed guidance for this new and complex program, and are working with stakeholders to adopt and implement TMDLs. Many TMDLs are already well under way. In the long-term, additional resources will be required to accurately monitor and assess water bodies

and subsequently determine the success of the TMDLs in restoring the state's water to meet relevant standards.

Finally, adequate and accurate monitoring and assessment is the cornerstone to preserving, enhancing, and restoring water quality. The information gathered from these monitoring activities is critical for: determining the effects of point and nonpoint source pollution; protection of drinking water supplies; conducting federal Clean Water Act assessments; determining trends in water and habitat quality; and developing water quality standards and then determining if they are being met. In 2007, a Memorandum of Understanding was signed by the Secretaries of California Environmental Protection Agency and the California Natural Resources Agency in response to Senate Bill (SB) 1070 (Kehoe, 2006) that requires these agencies to integrate and coordinate their water quality and related ecosystem monitoring, assessment, and reporting. Also created was the California Water Quality Monitoring Council to develop specific recommendations to improve the coordination and cost-effectiveness of water quality and ecosystem monitoring and assessment, enhance the integration of monitoring data across departments and agencies, and increase public accessibility to monitoring data and assessment information. As a result of the Council's guidance, the My Water Quality portal (<http://www.waterboards.ca.gov/mywaterquality/>) was created to provide the public easy access to the major water quality questions such as:

- is our water safe to drink,
- is it safe to swim in our waters,
- is it safe to eat fish and shellfish from our waters,
- are our aquatic ecosystems healthy, and
- what stressors and stressors and processes affect our water quality?

## **Summary of Water Quality contained in the California Water Plan, Update 2009**

A central feature of this update is the oversight of a 21-member State agency Steering Committee, which included active participation from the State Water Resources Control Board as well as the California Department of Public Health. These two agencies provided significant staff resources in preparing content which is integrated throughout this Update. The following table provides an abridging document to provide a guide to where aspects of water quality are discussed in this document.

## Summary of Water Quality in the California Water Plan, Update 2009

This table is intended to provide the reader with the locations in the California Water Plan, Update 2009 where discussion or tie to water quality has been included. The page number, general subject and where appropriate a description of the discussion is included. Hyperlinks are also provided to navigate the reader to the pertinent portion of the document.

### Volume 1 Strategic Plan

Water quality is included throughout the strategic plan which is outlined in this chapter. It is included within each of the Strategic Plan Elements: Vision, Mission, Goals, Guiding Principles, and Objectives

#### Chapter 1 Introduction

Introduction outlines the process for preparing California Water Plan Update 2009: Integrated Water Managements and its new features. It also explains the organization of all five volumes of Update 2009 and its Highlights brochure.

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 1-7</a>	Inclusive Water Planning

#### Chapter 2 Imperative to Act

Imperative to Act lays out the urgent course California must take to ensure enough safe and clean water through year 2050 for California's cities and towns, farms and businesses, and plants and animals when and where they need it.

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 2-6</a>	Impaired Water Bodies
<a href="#">Page 2-7</a>	Paramount Challenges
<a href="#">Page 2-10</a>	Fundamental Lessons
<a href="#">Page 2-12</a>	Box 2-3 Update 2009 Strategic Plan Elements Vision, Mission, Goals, Guiding Principles, and Objectives
<a href="#">Page 2-15</a>	Key Initiatives
<a href="#">Page 2-17</a>	Box 2-5 Strategic Growth Council
<a href="#">Page 2-18</a>	Box 2-6 Integrated Regional Management
<a href="#">Page 2-22</a>	Reducing Uncertainty and Risk
<a href="#">Page 2-24</a>	Multiple Future Scenarios
<a href="#">Page 2-26</a>	Conclusion
<a href="#">Page 2-27</a>	Recommendations Each of the nine recommendations in this chapter includes a water quality component.

#### Chapter 3 Companion State Plans

The Steering Committee of 21 state agencies helped identify companion State plans that have a direct connection with this water plan. Of the companion state plans listed are 2 which have direct bearing on water quality.

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 3-8</a>	California Government Describes the California Water Board and Regional Water Boards
<a href="#">Page 3-10</a>	Federal Government Describes the role of the United States Geologic Survey in conducting research for water quality.
<a href="#">Page 3-11</a>	State Agency Steering Committee Included members were the State Water Board and the Department of Public Health.
<a href="#">Page 3-19</a>	Regional Water Quality Control Plans
<a href="#">Page 3-19</a>	Water Boards Strategic Plan Update
<a href="#">Page 3-21</a>	Resource Management Strategies Describes the connections between the Resource Management Strategies and the Companion State Plans

#### Chapter 4 California Water Today

Challenges of managing California's extreme and variable resources are outlined in this chapter

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 4-15</a>	Water Supplies and Uses
<a href="#">Page 4-19</a>	Ground Water Quality
<a href="#">Page 4-26</a>	Water Conditions - Water Quality
<a href="#">Page 4-27</a>	Water Governance
<a href="#">Page 4-29</a>	Critical Challenges
<a href="#">Page 4-31</a>	Floods and Flooding
<a href="#">Page 4-37</a>	Sea Level Rise
<a href="#">Page 4-40</a>	Contamination of Surface and Groundwater
<a href="#">Page 4-40</a>	Delta Vulnerabilities
<a href="#">Page 4-41</a>	Deferred Maintenance and Aging Infrastructure
<a href="#">Page 4-43</a>	Data Gathering and Sharing

### Chapter 5 Managing an Uncertain Future

Managing our resources such that our investments account for and reduce uncertainty and risk in our water management systems, flood protection systems, and ecosystems more sustainable.

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 5-5</a>	Planning Approach
<a href="#">Page 5-6</a>	Traditional Planning Approach
<a href="#">Page 5-7</a>	New Planning Approach
<a href="#">Page 5- 11</a>	Box 5-3 Sources of Future Change and Uncertainty
<a href="#">Page 5-18</a>	Sustainability Indicators
<a href="#">Page 5- 19</a>	Box 5-5 Sustainable Water Resources Roundtable Sustainability Indicators
<a href="#">Page 5-20</a>	Examples of Managing for Sustainability
<a href="#">Page 5-20</a>	Strategic Growth Council
<a href="#">Page 5-21</a>	ACWA - Sustainability Principals

### Chapter 6 Integrated Data and Analysis

The need for the water community to have improved water resources information and analysis is detailed in this chapter.

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 6-5</a>	Improving Technical Support for Integrated Regional Water Management
<a href="#">Page 6-7</a>	Specific Water Management Information and Analytical Needs
<a href="#">Page 6-7</a>	Information Gaps and Limitations
<a href="#">Page 6-8</a>	Technical Challenges of Integrated Water Management
<a href="#">Page 6-14</a>	Develop Strategic Plan to Improve Water Management
<a href="#">Page 6-16</a>	Develop Common Schematic of the Water Management System

### Chapter 7 Implementation Plan

The implementation plan for California Water Plan Update 2009 presents 13 objectives and their 110 related actions. Water quality is specifically mentioned in 11 of the 13 objectives with Objective 4 being specific to Water Quality and Objectives 2 and 9 having significant bearing on Water Quality due to the inclusion of Water Recycling related actions.

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 7-8</a>	Objective 1- Promote, improve, and expand integrated regional water management to create and build on partnerships that are essential for California water resources planning, sustainable watershed and floodplain management, and increasing regional self-sufficiency.
<a href="#">Page 7-11</a>	Objective 2 - Use water more efficiently with significantly greater water conservation, recycling, and reuse to help meet future water demands and adapt to climate change. This objective with its water recycling component makes for a large nexus with water quality. See related action #4.
<a href="#">Page 7-14</a>	Objective 3 - Advance and expand conjunctive management of multiple water supply sources with surface and groundwater storage to prepare for future droughts, floods, and climate change.
<a href="#">Page 7-18</a>	Objective 4 - Protect and restore surface water and groundwater quality to safeguard public and

	environmental health and secure California’s water supplies for beneficial uses. This objective is the main water quality objective.
<a href="#">Page 7-21</a>	Objective 5 - Practice, promote, improve, and expand environmental stewardship to protect and enhance the environment by improving watershed, floodplain, and instream functions and to sustain water and flood management systems.
<a href="#">Page 7-23</a>	Objective 6 - Promote and practice integrated flood management to provide multiple benefits including better emergency preparedness and response, improve flood protection, more sustainable flood and water management systems, and enhanced floodplain ecosystems.
<a href="#">Page 7-33</a>	Objective 9 - Reduce the energy consumption of water and wastewater management systems to mitigate greenhouse gas emissions. By its very nature, this objective has a large nexus with water quality.
<a href="#">Page 7-35</a>	Objective 10 - Improve and expand monitoring, data management, and analysis to support decision-making in light of uncertainties that support integrated regional water management and flood and water resources management systems
<a href="#">Page 7-39</a>	Objective 11 - Identify and fund applied research on new water technology to help carry out water programs and better manage water systems.
<a href="#">Page 7-41</a>	Objective 13 - Provide safe drinking water and wastewater treatment to all California communities. Increase the participation of small and disadvantaged communities in State processes and programs to achieve fair and equitable distribution of benefits, to consider mitigation of impacts from the implementation of State government programs and policies, and to ensure that these programs and policies address the most critical public health threats in disadvantaged communities.

### Volume 2 Resource Management Strategies

Volume 2 describes 27 resource management strategies that can help meet various water plan objectives including seven which are directly aimed at improving water quality, and eighteen which have described benefits to improving water quality. Of the 27 resource management strategies 7 are strategies which have a primary goal of improving water quality and 18 have included discussion of identified water quality improvements which could result from implementation of the strategy even though the primary goal is something other than water quality. New for Water Plan 2009 is the Salt and Salinity Management Resource Management Strategy.

#### Seven RMS Strategies have primary goal of improving water quality:

- Chapter 14 Drinking Water Treatment and Distribution
- Chapter 15 Groundwater/Aquifer Remediation
- Chapter 16 Matching Quality to Use
- Chapter 17 Pollution Prevention
- Chapter 18 Salt and Salinity Management
- Chapter 19 Urban Runoff Management

#### Eighteen RMS Strategies which have identified and discussed water quality benefits:

##### Chapter 2 Agricultural Water Use Efficiency

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 2-5</a>	Introduction
<a href="#">Page 2-6</a>	Ag WUE in California
<a href="#">Page 2-21</a>	Implementation
<a href="#">Page 2-23</a>	Measurements and Evaluation
<a href="#">Page 2-27</a>	Recommendations: 1,6,7

##### Chapter 3 Urban Water Use Efficiency

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 3-5</a>	Introduction
<a href="#">Page 3-8</a>	Water Quality
<a href="#">Page 3-22</a>	Sustainability

<a href="#">Page 3-24</a>	Environmental Benefits
<a href="#">Page 3-25</a>	Recommendation 14 - Grey Water & Rain Water Capture
<a href="#">Page 3-39</a>	Recommendation 37 - DWR Near Term Core Programs

#### Chapter 4 Conveyance Delta

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 4-5</a>	Introduction
<a href="#">Page 4-8</a>	Potential Benefits of Delta Conveyance
<a href="#">Page 4-10</a>	Major Issues and Considerations Facing Conveyance
<a href="#">Page 4-10</a>	Major Issues - Science and Planning
<a href="#">Page 4-13</a>	Major Issues - Climate Change
<a href="#">Page 4-13</a>	Major Issues - Water Supply Reliability
<a href="#">Page 4-15</a>	Recommendation Number 3

#### Chapter 5 Conveyance Regional/Local

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 5-7</a>	Potential Benefits of Reg/Local Conveyance
<a href="#">Page 5-10</a>	Major Issues - Science and Planning
<a href="#">Page 5-11</a>	Major Issues - Regulatory Compliance
<a href="#">Page 5-12</a>	Major Issues - Climate Change
<a href="#">Page 5-12</a>	Recommendation Number 2

#### Chapter 6 System Reoperation

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 6-6</a>	Reoperation to Address Specific Needs Discusses the Delta Cross Channel Reoperation
<a href="#">Page 6-7</a>	Reoperation to Improve Efficiency and Water Supply Reliability Focus Based Operations
<a href="#">Page 6-8</a>	Reoperation in Anticipation of Future Change
<a href="#">Page 6-13</a>	Institutional Constraints
<a href="#">Page 6-14</a>	Recommendations

#### Chapter 8 Conjunctive Management and Groundwater Storage

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 8-5</a>	Introduction
<a href="#">Page 8-10</a>	Box 8-1 Importance of GW to California Water Supply
<a href="#">Page 8-14</a>	Current Status of RMS
<a href="#">Page 8-18</a>	Potential Benefits
<a href="#">Page 8-21</a>	Table 8-1 Potential Benefits
<a href="#">Page 8-23</a>	Cost of Conjunctive Management and Groundwater Storage
<a href="#">Page 8-24</a>	Major Issue - Effects of Land Use
<a href="#">Page 8-24</a>	Major Issue - Commingling of Different Quality Water
<a href="#">Page 8-25</a>	Major Issue - Lack of Data and Tools
<a href="#">Page 8-26</a>	Major Issue - Infrastructure and Operational Criteria
<a href="#">Page 8-27</a>	Major Issue - Surface and Groundwater Management
<a href="#">Page 8-29</a>	Major Issue - Water Quality (Section)
<a href="#">Page 8-29</a>	Major Issue - Environmental Concerns
<a href="#">Page 8-29</a>	Major Issue - Climate Change
<a href="#">Page 8-30</a>	Recommendations 1,2, & 3

#### Chapter 9 Desalination - Brackish and Seawater

<i>Page</i>	<i>General Subject and Description</i>
-------------	--

<a href="#">Page 9-5</a>	Desalination in California
<a href="#">Page 9-9</a>	Potential Benefits of Desalination

### Chapter 11 Recycled Municipal Water

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 11-5</a>	Introduction
<a href="#">Page 11-8</a>	Box 11-2 - Definitions
<a href="#">Page 11-10</a>	Benefits of Water Recycling
<a href="#">Page 11-10</a>	Potential Costs of Water Recycling
<a href="#">Page 11-11</a>	Major Issue Facing More Recycled Water Use
<a href="#">Page 11-15</a>	Recycled Water Use Policies
<a href="#">Page 11-16</a>	Recycled Water Use Regulations
<a href="#">Page 11-18</a>	Status of Recycled Water Task Force Recommendations

### Chapter 12 Surface Storage - CALFED

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 12-5</a>	Introduction
<a href="#">Page 12-8</a>	Table 12-1 CALFED surface storage initial alternatives' benefit summary
<a href="#">Page 12-9</a>	Potential Benefits of CALFED Surface Storage
<a href="#">Page 12-13</a>	Major Issues - Effects
<a href="#">Page 12-16</a>	Linkages to Other Strategies

### Chapter 13 Surface Storage - Regional /Local

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 13-7</a>	Potential Benefits of Surface Storage
<a href="#">Page 13-7</a>	Potential Costs of Surface Storage
<a href="#">Page 13-8</a>	Major Issues - Impacts

### Chapter 20 Agricultural Lands Stewardship

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 20-5</a>	Introduction
<a href="#">Page 20-13</a>	Potential Benefits of Ag Land Stewardship
<a href="#">Page 20-15</a>	Table 20-1 Annotated List of Ag Land Stewardship BMP's
<a href="#">Page 20-16</a>	Potential Economic Costs of Ag Land Stewardship
<a href="#">Page 20-18</a>	Major Issues - Landowner Confidentiality and Privacy Protection
<a href="#">Page 20-20</a>	Major Issues - Outreach and Information
<a href="#">Page 20-23</a>	Major Issues - Lack of Information
<a href="#">Page 20-23</a>	Major Issues - Complex Regulations and Programs
<a href="#">Page 20-24</a>	Major Issues - Regional Cooperation
<a href="#">Page 20-25</a>	Regulatory Process Recommendations
<a href="#">Page 20-27</a>	Data and Research Recommendations
<a href="#">Page 20-29</a>	Education and Outreach Recommendations

### Chapter 21 Economic Incentives (Loans, Grants, Water Pricing)

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 21-7</a>	Financial Assistance - Incentives
<a href="#">Page 21-8</a>	Potential Benefits of Economic Incentives
<a href="#">Page 21-11</a>	Funding for Loans and Grants

### Chapter 22 Ecosystem Restoration

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 22-5</a>	Overview
<a href="#">Page 22-8</a>	Water Quality (Section)

<a href="#">Page 22-15</a>	Major Issues - Mercury Contamination
----------------------------	--------------------------------------

### Chapter 23 Forest Management

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 23-5</a>	Introduction
<a href="#">Page 23-5</a>	Forest Management in California
<a href="#">Page 23-9</a>	Potential Benefits of Forest Management
<a href="#">Page 23-11</a>	Meadow Groundwater Storage
<a href="#">Page 23-14</a>	Riparian Forests
<a href="#">Page 23-17</a>	Fuels and Fire Management
<a href="#">Page 23-19</a>	Road Management
<a href="#">Page 23-20</a>	Urban Forestry
<a href="#">Page 23-22</a>	Major Issues - Information Needs
<a href="#">Page 23-23</a>	Major Issues - Coordination Needs
<a href="#">Page 23-24</a>	Major Issues - Regulatory Requirements
<a href="#">Page 23-25</a>	Monitoring and Research Recommendation
<a href="#">Page 23-26</a>	Coordination Recommendation

### Chapter 24 Land Use Planning and Management

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 24-5</a>	Introduction
<a href="#">Page 24-7</a>	Box 24-2 Key RMS Crosscutting Links
<a href="#">Page 24-7</a>	Land Use Planning and Management in California
<a href="#">Page 24-7</a>	Local Planning and Land Use Regulations
<a href="#">Page 24-8</a>	State and Local Land Use Planning and Regulations
<a href="#">Page 24-9</a>	Need for Compact & Sustainable Design
<a href="#">Page 24-12</a>	Key State Legislation
<a href="#">Page 24-14</a>	Coordinating Land Use and Climate Change
<a href="#">Page 24-16</a>	Coordinating Land Use and Water Supply
<a href="#">Page 24-17</a>	Box 24-6 LEED for Neighborhood Development
<a href="#">Page 24-19</a>	Coordinating Land Use and Water Quality
<a href="#">Page 24-20</a>	Potential Benefits of Compact and Sustainable Development
<a href="#">Page 24-22</a>	Comprehensive Land Use Planning
<a href="#">Page 24-26</a>	Recommendation- Integrate Regional Water Management and Local Land Use Plans
<a href="#">Page 24-27</a>	Recommendation - Provide Funding Incentives and Technical Assistance
<a href="#">Page 24-28</a>	Recommendation - Enhance Research and Data Gathering.

### Chapter 25 Recharge Area Protection

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 25-5</a>	Introduction
<a href="#">Page 25-5</a>	Managed Recharge Areas in California
<a href="#">Page 25-9</a>	Other Methods of Enhancing Recharge
<a href="#">Page 25-10</a>	Potential Benefits of Recharge Area Protection
<a href="#">Page 25-11</a>	Major Issues Facing Recharge Area Protection
<a href="#">Page 25-12</a>	Recommendations 1, 2
<a href="#">Page 25-13</a>	Recommendation 12

### Chapter 27 Watershed Management

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 27-6</a>	State Watershed Management Chronology – Key Dates

<a href="#">Page 27-9</a>	Potential Costs of Watershed Management
<a href="#">Page 27-10</a>	Potential Benefits - Table 27-1 Typical List of Watershed Products, Goods, and Services
<a href="#">Page 27-13</a>	Major Issues – Land Use Alters Nutrient Cycle
<a href="#">Page 27-14</a>	Major Issues - Fire and Water

### Chapter 28 Flood Risk Management

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">Page 28-5</a>	Background
<a href="#">Page 28-6</a>	Structural Approaches - Channel Modification
<a href="#">Page 28-11</a>	Connections with other Resource Management Strategies - Urban Runoff Management
<a href="#">Page 28-12</a>	Potential Benefits of Flood Risk Management
<a href="#">Page 28-14</a>	Major Issues - Issues Common to all Flood Risk Approaches

## Volume 3 Regional Reports

The 12 Regional Reports each include a section discussing water quality relative to the region with some regions having more information included in an appendix where noted below.

### Chapter 2 North Coast

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">NC-19</a>	Section on Water Quality
<a href="#">Appendix NCB</a>	Appendix on Water Quality.

### Chapter 3 San Francisco

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">SF-17</a>	Section on Water Quality
<a href="#">Appendix SFB</a>	Appendix on Water Quality.

### Chapter 4 Central Coast

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">CC-20</a>	Section on Water Quality
<a href="#">Appendix CCB</a>	Appendix on Water Quality.

### Chapter 5 South Coast

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">SC-26</a>	Section on Water Quality
<a href="#">Appendix SCB</a>	Appendix on Water Quality.

### Chapter 6 Sacramento River

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">SR-17</a>	Section on Water Quality
<a href="#">Appendix SRB</a>	Appendix on Water Quality.

### Chapter 7 San Joaquin River

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">SJR-15</a>	Section on Water Quality
<a href="#">Appendix SJB</a>	Appendix on Water Quality.

### Chapter 8 Tulare Lake

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">TL-22</a>	Section on Water Quality

<a href="#">Appendix TLB</a>	Appendix on Water Quality.
------------------------------	----------------------------

**Chapter 9 North Lahontan**

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">NL-19</a>	Section on Water Quality

**Chapter 10 South Lahontan**

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">SL-19</a>	Section on Water Quality

**Chapter 11 Colorado River**

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">CR-23</a>	Section on Water Quality

**Chapter 12 Delta**

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">D-17</a>	Section on Water Quality

**Chapter 13 Mountain Counties**

<i>Page</i>	<i>General Subject and Description</i>
<a href="#">MC-19</a>	Section on Water Quality