## Contents

### Chapter 11  Colorado River Hydrologic Region

**Setting** .......................................................................................................................... 11-1  
**Watersheds** .................................................................................................................. 11-1  
**Salton Sea Transboundary Watershed** ........................................................................ 11-1  
**Lower Colorado River Watershed** ............................................................................... 11-3  
**Desert Aquifers Watershed** ......................................................................................... 11-3  
**Ecosystems** .................................................................................................................. 11-3  
**Coachella Valley Multiple Species Habitat Conservation Plan** .................................. 11-3  
**Lower Colorado River Basin Multi-Species Conservation Program** ......................... 11-3  
**Environmental and Habitat Protection and Improvement** ........................................ 11-4  
**Climate** ......................................................................................................................... 11-4  
**Demographics** ............................................................................................................. 11-4  
**Land Use Patterns** ....................................................................................................... 11-6  
**Tribal Lands** .................................................................................................................. 11-8  
**Regional Water Conditions** .......................................................................................... 11-8  
**Environmental Water** ................................................................................................ 11-8  
**Water Supplies** ........................................................................................................... 11-9  
**Water Uses** .................................................................................................................. 11-12  
**Water Quality** .............................................................................................................. 11-14  
**Overarching Water Quality Issues** ............................................................................. 11-14  
**Imperial Irrigation District** .......................................................................................... 11-14  
**Coachella Valley Storm Water Channel** ................................................................... 11-15  
**Mission Springs Water District** .................................................................................. 11-15  
**Water Governance** ..................................................................................................... 11-15  
**Flood Management** .................................................................................................... 11-16  
**Historic Floods** ........................................................................................................... 11-16  
**Flood Hazards** ............................................................................................................. 11-16  
**Flood Governance** ..................................................................................................... 11-17  
**Flood Risk Management** ............................................................................................ 11-17  
**Structural Approaches** ............................................................................................... 11-17  
**Land Use Management** .............................................................................................. 11-18  
**Disaster Preparation, Response, and Recovery** ........................................................... 11-19  
**Relationship with Other Regions** .............................................................................. 11-19  
**Regional Water and Flood Planning and Management** .............................................. 11-19  
**Integrated Regional Water Management** ................................................................... 11-19  
**Accomplishments** ...................................................................................................... 11-22  
**Canal Linings** ............................................................................................................. 11-22  
**Water Transfer** ............................................................................................................ 11-22  
**Groundwater Storage** ............................................................................................... 11-23  
**Water Supplies** ........................................................................................................... 11-23  
**Water Quality** ............................................................................................................. 11-24  
**Flood Control** ............................................................................................................ 11-24  
**Challenges** .................................................................................................................. 11-25  
**Colorado River Water and Groundwater** ................................................................ 11-25  
**Urban Wastewater Treatment** .................................................................................... 11-26  
**Drought and Flood Planning** ....................................................................................... 11-26  
**Looking to the Future** .................................................................................................. 11-27  
**Future Scenarios** ......................................................................................................... 11-28  
**Climate Change** .......................................................................................................... 11-28  
**Response Strategies** .................................................................................................... 11-28  
**Additional Storage/Operational Flexibility** ................................................................. 11-28  
**Landscape Water Conservation** .................................................................................. 11-28  
**Desert Landscape Workshops** ................................................................................... 11-28  
**Implementation Next Steps** ....................................................................................... 11-28
Appendix
Appendix 11A Flood Management

Tables
Table 11-1 Granted tribal lands with acreage, Colorado River Hydrologic Region......11-8
Table 11-2 Annual apportionment of use of the Colorado River Water.........................11-10
Table 11-3 Annual intrastate apportionment of water from the Colorado River mainstream within California under the Seven Party Agreement a .................................................................11-10
Table 11-4 Colorado River water delivery agreement: Federal Quantification Settlement Agreement of 2003 for Priorities 1 – 3. Annual use of Colorado River water by California agencies .........11-11
Table 11-5 SWP contractors in the Colorado River region ..............................................11-11
Table 11-6 Water sales, Imperial Irrigation District...............................................................11-12
Table 11-7 Key elements of the Law of the River...............................................................11-15
Table 11-8 Strategies for integrated regional water management efforts, Colorado River Hydrologic Region ..........................................................................................................................11-20
Table 11-9 Existing Colorado River Hydrologic Region water conservation actions/agreements since 1980 .................................................................................................................11-24
Table 11-10 Colorado River Hydrologic Region water balance summary (taf), 1998—2005.................................................................................................................................11-28
Table 11-11 Colorado River Hydrologic Region water use and distribution of dedicated supplies (taf), 1998—2005 ..........................................................................................11-29
Table 11-12 Colorado River Hydrologic Region water portfolio (taf) .........................11-29

Figures
Figure 11-1 Colorado River Hydrologic Region .................................................................11-1
Figure 11-2 Watersheds and ecosystems in the Colorado River Hydrologic Region ..........11-1
Figure 11-3 Colorado River Hydrologic Region population ..............................................11-5
Figure 11-4 Irrigated crop acres for the Colorado River Hydrologic Region .................11-7
Figure 11-5 Colorado River Hydrologic Region water balance for water years 1998–2005.................................................................................................................................11-12
Figure 11-6 Areas within Colorado River Hydrologic Region covered by IRWM planning efforts (map) 11-21
Figure 11-7 Colorado River Hydrologic Region—illustrated water flow diagram ..........11-29
Figure 11-8 Colorado River Hydrologic Region—schematic flow diagram .................11-29

Boxes
Box 11-1 Acronyms Used in the Colorado River Hydrologic Region........................11-1
Box 11-2: Flood Management Agencies ........................................................................11-17
BOX 11-3 Implementation of the Federal QSA .................................................................11-26
Chapter 11  Colorado River Hydrologic Region

Setting
The Colorado River hydrologic region covers the southeast portion of California and contains 12 percent of the state’s land area. The Colorado River forms most of the region’s eastern boundary and the International Border with Mexico forms its southern boundary (Figure 11-1). It includes Imperial County, the northeastern corner of San Diego County, the eastern two-thirds of Riverside County, and the southeastern one-third of San Bernardino County. It has a variety of arid desert terrain that includes many bowl-shaped valleys, broad alluvial fans, sandy washes, and hills and mountains.

PLACEHOLDER Figure 11-1 Colorado River Hydrologic Region
The Colorado River Region includes a large portion of the Mojave Desert, primarily in that part of the region in San Bernardino County and eastern Riverside County. The area to the east and south of the Mojave Desert is a portion of the Sonoran Desert. Elevations in the region generally range from 1,000 to 3,000 feet in the Mojave Desert to less than 1,000 feet along the Colorado River. Three distinct broad valleys are in the southern portion of the region. These are the Imperial, Coachella, and Palo Verde Valleys. Most of the region’s agricultural and urban land uses occur in these valleys. Portions of the Coachella Valley and most of the Imperial Valley have land surfaces that are below sea level, reaching nearly 230 feet below mean sea level (MSL) at the Salton Sea. Some of the peaks in the mountain ranges that bound the region have elevations of 10,000 feet or more above sea level. Many of the arid valleys contain dry lake beds called playas, some of which are quite large. Bristol Dry Lake, near the Mojave National Preserve, is a playa that covers more than 50 square miles.

PLACEHOLDER Box 11-1 Acronyms Used in the Colorado River Hydrologic Region

Watersheds
Three watershed areas are in the Colorado River region (Figure 11-2). These are the Salton Sea Transboundary Watershed, Lower Colorado River, and Desert Aquifer Watersheds.

PLACEHOLDER Figure 11-2 Watersheds and ecosystems in the Colorado River Hydrologic Region.

Salton Sea Transboundary Watershed
The Salton Sea Transboundary Watershed is the Priority Watershed in the Colorado River Basin Region. It encompasses one-third of the region (about 8,360 square miles) and contains five (out of a total of six) of the region’s impaired surface waterbodies. The watershed has been identified as a Category 1 (impaired) Watershed under the 1997 California Unified Watershed Assessment (UWA). The UWA was a collaborative process between the State and the United States Environmental Protection Agency (USEPA) and was developed to guide allocation of new federal resources for watershed protection.

Several adjacent groundwater basins are the primary source of water for the larger cities and communities in the watershed. It also contains five main surface waterbodies: the Salton Sea, the New River, the Alamo River, the Imperial Valley Agricultural Drains, and the Coachella Valley Stormwater Channel.
Salton Sea
The Salton Sea is California's largest lake and, before 2000, was famous for its sport fishery and recreational uses. It is about 35 miles long and 9 to 15 miles wide with approximately 360 square miles of water surface and 105 miles of shoreline. The surface of the sea lies approximately 229 feet below sea level. One of the major functions of the Salton Sea is to serve as a sump for agricultural wastewater for the Imperial and Coachella Valleys. Approximately 75 percent of the freshwater inflow to the Sea is agricultural drain water from Imperial Valley. As the sea has no outlets, salts concentrate in it and nutrients enhance the formation of eutrophic conditions. The sea supports a National Wildlife Refuge and is a critical stop on the Pacific Flyway for migrating birds, including several state- and federal-listed endangered and threatened species. However, catastrophic die-off of birds and fish between 1992 and 1997 indicate the sea is in serious trouble and may be unable to support these beneficial uses in the future.

New and Alamo Rivers
Before European settlement, the Alamo and New rivers were overflow channels of the Colorado River and transmitted high flows from the Colorado northwest to the Salton Sea. Today, the Alamo and New rivers primarily convey return water from agricultural lands in Imperial Valley. The New River originates in Mexico, flowing approximately 20 miles through the City of Mexicali, Mexico, crossing the border, continuing through the City of Calexico in the United States, and traveling northward about 60 miles until it empties into the Salton Sea near Westmorland.

Sources of the flow in the river include urban runoff, untreated and partially treated municipal wastes, untreated and partially treated industrial wastes, and agricultural runoff from Mexicali Valley, Mexico, into the United States. In addition, the river carries urban runoff, agricultural runoff, treated industrial wastes, and treated, disinfected and non-disinfected domestic wastes from the Imperial Valley. It also transports between 6 and 11 cfs of treated wastewater from point sources in Imperial Valley.

The Alamo River originates approximately 2 miles south of the border with Mexico and flows northward through the Imperial Valley for about 50 miles until it empties into the Salton Sea near Niland. The Alamo River is dominated by agricultural return flows from Imperial Valley; however it does carry between 15 and 27 cfs of treated urban wastewater flows from point sources in the Imperial Valley. At the border, Alamo River flows were about 2 to 3 cfs. Since 2002, however, flows in the river at the border have been between 0.2 and 0.7 cfs (between 175 and 530 af/yr). Since 2005, the average flow of the river as it enters the Salton Sea is 850 cfs (600,000 af/yr).

Agricultural Drains
The network of agricultural drains in the Imperial Valley is important for the flows in the New and Alamo rivers. There are over 1,450 miles of surface drains that discharge into the rivers and ultimately into the Salton Sea; the drains primarily carry agricultural runoff from the Imperial Valley. The runoff averages about 830,000 af/yr. Of this amount, approximately 36 percent is tailwater; 33 percent is seepage, operational spill, M&I return flow, and deep percolation; and 30 percent is tilewater. The resulting mix of tailwater, tilewater, and seepage contains pesticides, nutrients, selenium, and silt in amounts that violate water quality standards.

Salt Creek
Salt Creek drains parts of the Orocopia and Chuckwalla mountains and enters the Salton Sea near Bombay Beach.
**Whitewater River**

The Whitewater River originates in the southeastern portion of the San Bernardino Mountains and intersects the San Gorgonio River just east of San Gorgonio Pass. It trends in a southeasterly direction as it meanders through the Coachella Valley before terminating at the Salton Sea near Mecca. Palm Canyon Wash is tributary to the Whitewater near Cathedral City. To mitigate property damage and protect the public, a 24.5 mile portion of the Whitewater River in the Coachella Valley was channelized for flood-control purposes. The channel extends from the City of La Quinta to the Salton Sea and is fed by a series of smaller flood control channels, dikes, and levees that capture storm runoff from the surrounding mountains and hills.

**Lower Colorado River Watershed**

The Lower Colorado River Watershed is located in the southeast corner of California, and it includes portions of San Bernardino, Riverside, and Imperial counties. It is bordered to the east by the Colorado River, to the south by the US-Mexico border, and to the west by the New York, Hack Berry, Sacramento, Step Ladder, Turtle, Arica, Granite, Little Maria, McCoy, Mule, Chocolate, and Cargo Muchachos mountain ranges. The Lower Colorado River Watershed is 200 miles long, with a maximum east-west width of 70 miles. The watershed comprises only a small part of the entire Colorado River drainage area, and it includes the region along the Colorado River south of Lee Ferry (near Glen Canyon Dam).

**Colorado River**

The Colorado River begins at Los Poudre Pass Lake high in the Colorado Rocky Mountains, and generally flows southwest across Colorado, New Mexico, Utah, and Arizona before turning south just east of Henderson, Nevada. It then straddles the border between California and Arizona, finally entering Mexico and emptying into the Gulf of California.

**Desert Aquifers Watershed**

The Desert Aquifers Watershed includes the Twentynine Palms-Lanfair and Chuckwalla Planning Areas. Small mountain ranges provide the boundaries for this watershed except to the west where the San Bernardino, San Jacinto, and Laguna mountains are. Much of the watershed is devoid of urban and agricultural land uses. The exceptions are the Lucerne Valley, which had urban areas and agriculture, and the Yucca Valley, which has urban areas exclusively.

The only reported water quality issue occurs in the Lucerne Valley, which has nitrate plumes in the groundwater. Past agricultural operations, septic tanks, and the disposal of wastewater through evaporation and percolation ponds by the Big Bear Area Regional Wastewater Agency have collectively been identified as the factor behind the quality problem.

**Ecosystems**

**Coachella Valley Multiple Species Habitat Conservation Plan**

The Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) is a strategic plan that will protect over 240,000 acres of open space and 27 species. It is designed to meet State and federal endangered species laws, will assist in the construction of transportation improvement projects, and will offer opportunities for recreation, tourism, and economic growth.

**Lower Colorado River Basin Multi-Species Conservation Program**

The Lower Colorado River Basin Multi-Species Conservation Program (LCR-MSCP) is a long-term, multi-agency comprehensive program that manages and assists with the recovery of endangered species and wildlife habitat along the Colorado River. Specific projects to be
undertaken include the establishment of slightly more than 8,100 acres of new aquatic, wetland, and native broadleaf riparian habitat along the Lower Colorado River, from Lake Mead to the border with Mexico. These new habitats are expected to provide ecological benefits and mitigate potential impacts to 26 federal and state-listed candidate and sensitive species and their associated habitats. In addition, the LCR-MSCP stakeholders plan to produce 660,000 razorback sucker and 620,000 bonytail to enhance existing populations.

**Environmental and Habitat Protection and Improvement**

Elements of the biological mitigation measures from the Imperial Irrigation District’s (IID) 2002 draft Habitat Conservation Plan are being utilized as the agency implements its Water Conservation and Transfer Project in compliance with the provisions of the Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement of 2003 (federal QSA). The measures are required under the existing incidental take authorizations pursuant to the ESA and CESA. The IID is now preparing the Habitat Conservation Plan (HCP) and Natural Communities Conservation Plan (NCCP) that will contain modified or new mitigation and conservation measures not included in the 2002 Draft HCP and not evaluated in the Transfer Project Final EIR/EIS.

Although the draft HCP/NCCP is still being developed, IID is required to begin establishing a managed marsh complex pursuant to the existing biological mitigation measures and Endangered Species Act (ESA)/California Endangered Species Act (CESA) approvals. The IID has prepared a Supplement to the Transfer Project Final EIR/EIS to provide any additional environmental assessment required to designate, construct, and manage a specific site for the expanded marsh complex. However, the implementation of the project is contingent on final approval of the HCP/NCCP by IID, US Fish and Wildlife Service, and the Department of Fish and Game (DFG).

**Climate**

Most of the Colorado River Hydrologic Region has a subtropical desert climate with hot summers and short, mild winters. The mountain ranges, including the San Bernardino and San Jacinto Mountains, on the northern and western borders create a rainshadow effect for most of the region. Annual rainfall amounts range between a little over 6 inches to less than 3 inches. Most of the precipitation for the region occurs in the winter and spring. However, monsoonal thunderstorms, spawned by the movement of subtropical air from the south, do occur in the summer and can generate significant rainfall in some years. Clear and sunny conditions typically prevail, and the region receives from 85 to 90 percent of the maximum possible sunshine each year; the highest value in the United States.

From 1999 to the present, the Colorado River watershed has experienced dry hydrologic conditions. These prolonged conditions have impacted the availability of water supplies for the region. Annual maximum and minimum temperatures were slightly higher than long-term averages at many weather stations between 2000 and 2005. Precipitation amounts were generally lower-than-average between 2000 and 2003; with ____ being extremely dry. However, rainfall totals were above average for 2004 and 2005.

**Demographics**

In 2005, the population in the region was about 711,000, which represented an increase of 18 percent from the 2000 population. Nearly 85 percent of the region’s population resides in the Coachella Valley, which has been urbanizing at a rapid pace since the 1980s. Most of the remaining population is in Imperial County in the corridor anchored by the Cities of El Centro and Imperial, in the corridor between the cities of Yucca Valley and Twentynine Palms along
Highway 62, and along the Colorado River (cities of Blythe and Needles. From 2000 to 2030, the California Department of Finance projects that regional population will almost double to 1,166,550 people. Figure 11-3 provides a graphical depiction of the Colorado River region’s total population from 1960 through 2005, with projections to 2050.

Native American Tribes with territory in the Colorado River Region include the Agua Caliente Band of Cahuilla Indians, Augustine Band of Mission Indians (Cahuilla), Cabazon Band of Mission Indians, Chemehuevi Tribal Council, Fort Mohave Tribe, Morongo Band of Mission Indians, Torres-Martinez Band of Desert Cahuilla Indians, and the Twenty-Nine Palms Band of Mission Indians. In the Coachella Valley, tribal land alternates with those that are publicly and privately-owned. One-mile square tribal parcels alternate with one-mile square municipal parcels.

PLACEHOLDER Figure 11-3 Colorado River Hydrologic Region population

Senate Bill 18 (Chapter 905, Statutes of 2004) requires cities and counties to consult with Native American Indian Tribes during the adoption or amendment of local general plans or specific plans. A contact list of appropriate Tribes and representatives within a region is maintained by the Native American Heritage Commission. The following is a list of the Tribes in this region, according to the commission. A Tribal Consultation Guideline, prepared by the Governor’s Office of Planning and Research, is available online at http://www.opr.ca.gov/programs/docs/09_14_05%20Updated%20Guidelines%20(922).pdf.

- Agua Caliente Band of Cahuilla Indians
- Augustine Band of Cahuilla Mission Indians
- Barona Group of the Capitan Grande
- Benton Paiute Reservation
- Big Pine Band of Owens Valley
- Big Pine Band of Owens Valley THPO
- Bishop Paiute Tribe
- Bishop Paiute Tribe THPO
- Bridgeport Paiute Indian Colony
- Cabazon Band of Mission Indians
- Cahuilla Band of Indians
- Campo Kumeyaay Nation
- Chemehuevi Reservation
- Ewiaapaayp Tribal Office
- Fort Mojave Indian Tribe
- Fort Yuma Quechan Indian Nation
- Gabrieleno/Tongva San Gabriel Band of Mission Indians
- Gabrieleno Band of Mission Indians of CA
- Gabrieleno/Tongva Council / Gabrieleno Tongva Nation
- Inaja Band of Mission Indians
- Jamul Indian Village
- Juaneno Band of Mission Indians
- Juaneno Band of Mission Indians Acjachemen Nation
Land Use Patterns

Agriculture accounts for the majority of land uses for the Colorado River Hydrologic Region. It is dominant in the Imperial Valley in the south and in the Palo Verde and Bard valleys along the Colorado River in the east. Urban and agricultural uses co-exist in the Coachella Valley, mostly in the northern portion of that valley.

Agricultural activities occur year-round in the region. Although the hot temperatures in the summer do impose some limitations, reliable water supplies and good soils allow the cultivation of a wide range of permanent and row crops the year-round. This includes table grapes, dates, citrus fruit, fresh market vegetables, grains, forage crops, and specialty crops such as bamboo, sugar cane, and mangoes. Total crop harvested acres in the region in 2005 was 650,000 acres, a slight increase from the 2000 total of 638,000 acres.

Multiple-cropping is prevalent in all of the major agricultural areas. In some years, upwards of 100,000 acres are multi-cropped. The Imperial Valley is not only the largest agricultural area in the region; it is one of the important agricultural areas in the country. Over 400,000 acres of land are utilized each year to grow a wide variety of fresh market vegetables and field crops. In 2005,
approximately 467,000 acres of crops were harvested. From early fall through spring, almost 100,000 acres of fresh market vegetables are planted and harvested annually in Imperial Valley. Major vegetables include lettuce, broccoli, cauliflower, melons, onions, and carrots.

Field crops are also important in Imperial Valley. This includes alfalfa, sudan grass, bermuda grass, sugar beets, and durum wheat. Alfalfa leads all crops in the acres planted and harvested each year. In 2005, slightly more than 190,000 acres of alfalfa was cultivated, about 30 percent of total crop acres for the region. Most of the alfalfa grown is used to support the valley’s livestock industry. Several large cattle feedlots are in operation and handle about 360,000 head each year. The grazing of sheep on alfalfa fields is also a component of the local livestock industry, with 190,000 head passing through in 2005.

Other major areas for agriculture are the Palo Verde, Coachella, and Bard valleys, similar crops grown in Imperial Valley. However, the most of the cotton and pasture grass in the region is planted and harvested in the Palo Verde Valley. Coachella Valley has the largest acres of table grapes, citrus fruit, and date orchards; while Bard Valley has citrus fruits, dates, and vegetables.

Smaller agricultural operations are scattered throughout the remainder of the region. About 1,000 acres of grape and citrus crops are still farmed in the Cadiz Valley. The acreage was established nearly 20 years ago largely to demonstrate the reliability of the local groundwater basin for supplies; however, the agricultural operations have remained static recently. There are also 4,000 acres of mostly field crops north of the City of Needles in the Mohave Valley.

Land fallowing programs are impacting the acres of the land that are being farmed in the region. In the past, almost 440,000 acres of land were farmed annually, but that figure has declined in recent years. In 2005, about 432,000 acres were cultivated and decreased to about 423,000 acres in 2007. (Figure 11-4) The decrease is due to land fallowing in Imperial Valley, which helps IID meet water transfer obligations from the federal QSA. Land fallowing also occurs in the Palo Verde Valley as a result of an agreement between the Metropolitan Water District of Southern California (MWDSC) and the Palo Verde Irrigation District.

**PLACEHOLDER Figure 11-4 Irrigated crop acres for the Colorado River Hydrologic Region**

Most of the urban land uses in the Colorado River region occur in the Coachella Valley. For the past two decades, the urban area has shown remarkable growth in support of the local recreation and tourism industries. However, not all urban development has been for these industries. New residential housing, consumer services, and businesses are being established to support the local population and people from outside the region seeking less expensive housing.

Other important, but smaller, urban areas are the corridor between the Cities of Imperial and El Centro and the City of Calexico in Imperial Valley, the City of Blythe in Palo Verde Valley, the City of Borrego Springs in Borrego Valley, and the community of Winterhaven in Bard Valley. These areas have experienced either a much slower pace of expansion or have remained unchanged over the same period of time.

Naval and military training facilities and other preserved or managed public lands are conspicuous in the region, including several large national and state parks, recreation and wilderness areas, and wildlife refuges. Indian tribes and associated reservations also maintain a significant presence. They operate casinos and resorts along the Colorado River north of Needles, and near the community of Cabazon.
Nationally known parks in the region include Joshua Tree National Park, the Mojave National Scenic Preserve, Anza-Borrego Desert State Park, and the Salton Sea and Picacho State recreation areas. Several areas are also set aside for preservation or other land management purposes, including national recreation and wilderness areas, wildlife refuges, Indian tribal reservations, and US Navy facilities.

**Tribal Lands**

<table>
<thead>
<tr>
<th>Tribal Lands</th>
<th>Acres</th>
<th>Tribal owner(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morongo Reservation (Splits with SC Region, but almost entirely in CR Region, Appears to have some alternating land sections)</td>
<td>32,362</td>
<td>Cahuilla, Serrano, and Cupeño Indians</td>
</tr>
<tr>
<td>Twenty-Nine Palms Reservation (4 separate locations)</td>
<td>160</td>
<td>Luiseño Indians</td>
</tr>
<tr>
<td>Agua Caliente Reservation</td>
<td>31,610</td>
<td>Agua Caliente Band of Cahuilla Indians (Mission Indians)</td>
</tr>
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<td>Torres-Martinez Reservation (Appears to be mostly alternating land sections)</td>
<td>24,024</td>
<td>Cahuilla Indians</td>
</tr>
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<td>Fort Yuma Reservation (Reservation is located in both California and Yuma County, Arizona along the Colorado River and appears to also border Mexico - Total acres in California unknown at this time)</td>
<td>43,942</td>
<td>Quechan Indians</td>
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<td>Colorado River Reservation (Majority of Reservation is in Arizona - 226,000 acres in Arizona, and 42,700 acres in California)</td>
<td>42,700 in CA only</td>
<td>Mohave, Chemehuevi, Hopi and Navajo Indians</td>
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<td>Chemehuevi Reservation (Borders AZ)</td>
<td>30,653</td>
<td>Chemehuevi Indians</td>
</tr>
<tr>
<td>Fort Mojave Reservation (Majority of the reservation appear to be in Arizona and/or Nevada - Total California acres unknown at this time)</td>
<td>33,000</td>
<td>Fort Mohave Indian Tribe</td>
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<tr>
<td>Campo Reservation (Splits with SC Region, but mostly in SC)</td>
<td>See SC Region for acres</td>
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<tr>
<td>Manzanita Reservation (Splits with SC Region, but mostly in CR)</td>
<td>3,579</td>
<td>Kuyumeyaay (Diegueño) Indians</td>
</tr>
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<td>Cuyapaipie Reservation (Splits with SC Region, but appears to have the majority of land in the CR Region)</td>
<td>4,103</td>
<td>Kumeyaay (Diegueño) Indians - Cuyapaipie General Council administers the land</td>
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<td>Los Coyotes Reservation (Splits with CR Region, but mostly in SC Region)</td>
<td>See SC Region for acres</td>
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<td>Augustine Reservation (Splits with CR Region, but mostly in SC)</td>
<td>500</td>
<td>Augustine Band of Cahuilla Indians</td>
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<td>18,884</td>
<td>Cahuilla Indians</td>
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<td>11,092</td>
<td>Cahuilla Indians</td>
</tr>
<tr>
<td>Santa Ysabel Reservation (Splits with SC Region, but almost entirely in SC Region)</td>
<td>See SC region for acres</td>
<td></td>
</tr>
</tbody>
</table>

**Regional Water Conditions**

**Environmental Water**

The largest water body in the region is the Salton Sea, a saline body of water about 50 feet deep. Today’s surface water elevation is about 229 feet below mean sea level. The Salton Sea has a concentration of total dissolved solids of about 46,000 milligrams per liter, which is about 40 percent greater than that of ocean water. Most of the environmental applied water demands in the region are for the Sonny Bono Salton Sea National Wildlife Refuge, DFG’s Imperial Wildlife Area, and wetland areas on the shore of the Salton Sea; and to maintain the viability of the sea...
under the federal QSA through 2017. IID will fallow ground to meet Salton Sea mitigation conditions for the Imperial Irrigation District/San Diego County Water Authority (IID/SDCWA) Water Transfer, which was approved under the federal QSA. From 2003 through 2017, IID will fallow enough ground to provide 800,000 acre-feet (af) of water to the Salton Sea as mitigation for transferring water to San Diego.

The Salton Sea ecosystem is considered a critical link on the international Pacific Flyway, providing wintering habitat for migratory birds, including some species whose diets are based exclusively on fish. The expected average annual inflows to the Salton Sea during the 25-year time frame of the California Water Plan Update 2009 are expected to be about 962,000 af per year, based on estimates using the Salton Sea Accounting Model (SSAM).

**Water Supplies**

Water demands in the Colorado River Region are met through a combination of imported surface water, supplies from the Colorado River, local groundwater basins, and recycled water supplies. Most of the agricultural water demands are largely met with Colorado River water supplies. However, groundwater is used by farmers in the Coachella Valley to supplement the imported surface water, by the agricultural operation in the Cadiz Valley, near the community of Desert Center, and in Borrego Springs. Most of the urban demands in the region are met with groundwater supplies. Colorado River supplies are used to meet most of the urban uses in the Imperial Valley and for some of the communities along the river. Recycled water supplies are used in the Coachella Valley for non-potable water uses such as landscaping.

In addition, many of the alluvial valleys in the region are underlain by groundwater aquifers that are the sole source of water for local communities. For example, Mission Springs Water District (MSWD) relies completely on groundwater from the Mission Creek and Garnet Hill Subbasins to serve customers its service area. Other alluvial valleys have poor quality water that is not suitable for potable use.

The Colorado River is an interstate and international river with use apportioned among the seven Colorado River Basin states and Mexico by a complex body of statutes, decrees, and court decisions known collectively as the “Law of the River.” (Table 11-7 Key elements of the Law of the River). Local surface water, groundwater, and the State Water Project (SWP) provide the remainder of water to the region. The SWP supplies are obtained through an exchange agreement between the Coachella Valley Water District, Desert Water Agency, and MWDSC.
### Table 11-2 Annual apportionment of use of the Colorado River Water

(Amounts represent consumptive use)

<table>
<thead>
<tr>
<th>Interstate/International</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Basin. Required to deliver 75 maf over a 10-year period measured at Lee Ferry. (small portion of Arizona, Colorado, New Mexico, Utah, and Wyoming)</td>
<td>7.5 maf</td>
</tr>
<tr>
<td>Lower Basin. (portions of Arizona, Nevada, California, and Utah draining below Lee Ferry)</td>
<td>7.5 maf Plus 1 maf</td>
</tr>
<tr>
<td>Republic of Mexico a</td>
<td>1.5 maf</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17.5 maf</strong> b</td>
</tr>
</tbody>
</table>

a. Plus 200 taf of surplus water, when available as determined by the United States. Water delivered to Mexico must meet specified salinity requirements. During an extraordinary drought or other cause resulting in reduced uses in the United States, deliveries to Mexico would be reduced proportionally with uses in the United States.

b. The total volume is \((7.5 + 7.5 + 1.0 + 1.5) = 17.5\) maf/yr. Note that this total refers to all waters of the Colorado River System, which is defined as that portion of the Colorado River and its tributaries in the United States.

### Table 11-3 Annual intrastate apportionment of water from the Colorado River mainstream within California under the Seven Party Agreement a

(amounts represent consumptive use)

| Priority 1 | Palo Verde Irrigation District (based on area of 104,500 acres). |
| Priority 2 | Lands in California within USBR’s Yuma Project (not to exceed 25,000 acres). |
| Priority 3 | Imperial Irrigation District and lands served from the All American Canal in Imperial and Coachella Valleys, and Palo Verde Irrigation District for use on 16,000 acres in the Lower Palo Verde Mesa. |
| Priorities 1 through 3 collectively are not to exceed 3.85 maf/yr. The Seven Party Agreement did not quantify the division of this volume among the three parties. Priorities 1 -3 were further defined in the 2003 Quantification Settlement Agreement. |
| Priority 4 | MWDSC for coastal plain of Southern California-550,000 af/yr. |
| Priority 5 | An additional 550,000 af/yr to MWDSC, and 112,000 af/yr for the City and County of San Diego. b |
| Priority 6 | Imperial Irrigation District and lands served from the All American Canal in Imperial and Coachella Valleys, and Palo Verde Irrigation District for use on 16,000 acres in the Lower Palo Verde Mesa, for a total not to exceed 300 taf/yr. |
| Total of Priorities 1 through 6 is 5.362 maf/yr. |
| Priority 7 c | All remaining water available for use in California, for agricultural use in California’s Colorado River Basin. |

a. Indian tribes and miscellaneous present perfected right holders that are not encompassed in California’s Seven Party Agreement have the right to divert up to approximately 90 taf/yr (equating to about 50 taf/yr of consumptive use) within California’s 4.4 maf basic apportionment. Present consumptive use under these miscellaneous and Indian present perfected rights is approximately 15 taf/yr.
b. Subsequent to execution of the Seven Party Agreement, MWDSC, SDCWA, and the city of San Diego executed a separate agreement transferring its apportionment to MWDSC.
c. Under the Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement of 2003, MWD (and SDCWA) gained access to water that may be available under Priority 6 and 7.
Table 11-4 Colorado River water delivery agreement: Federal Quantification Settlement Agreement of 2003 for Priorities 1 – 3. Annual use of Colorado River water by California agencies

(amounts represent consumptive use)

<table>
<thead>
<tr>
<th>Priority 3 Quantiﬁcation</th>
<th>Approved Net Consumptive Use in 2003 a/</th>
<th>Approved Net Consumptive Use in 2003 b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority 1, 2, and 3b. Based on historical average use; deliveries above this amount in a given year will be deducted from MWD’s diversion (order) for the next year; as agreed by MWD, IID, CVWD, and Secretary of the Interior (PVID and the Yuma Project are not signatories to the federal QSA.)</td>
<td>420.0 taf</td>
<td>420.0 taf</td>
</tr>
<tr>
<td>Imperial Irrigation District</td>
<td>3,100.0 taf</td>
<td>2,972.2 taf</td>
</tr>
<tr>
<td>Coachella Valley Water District</td>
<td>330.0 taf</td>
<td>347.0 taf</td>
</tr>
<tr>
<td>Total Priority 1 - 3 Use</td>
<td>3,850.0 taf</td>
<td>3,745.0 taf</td>
</tr>
<tr>
<td>Remainder of 3.85 taf for used by MWD (and SDCWA) through priority rights and transfer agreements.</td>
<td>0.0 taf</td>
<td>105.0 taf</td>
</tr>
</tbody>
</table>

a. Consumptive use is defined in the federal QSA as “the diversion of water from the main stream of the Colorado River, including water drawn from the main stream by underground pumping, net of measured and unmeasured return flows.”
b. Includes miscellaneous present perfected rights, federal rights reserved, and decreed rights.

PLACEHOLDER Table 11-5 SWP contractors in the Colorado River region

Groundwater provides about 7.5 percent of the region’s applied water supply in normal years and about 7.7 percent in drought years. Groundwater storage capacity has been estimated for 40 of the region’s 57 groundwater basins and totals more than 175 million acre-feet (maf). The groundwater beneath the agricultural area of the Imperial Valley is too saline to be used.

Local water districts in the Coachella Valley have been working to address the decline in groundwater levels. The agreement between CVWD and DWA to bring SWP supplies into the valley was an important step. In 1984, another agreement was reached among CVWD, DWA, and MWDSC for water banking which allowed for advanced deliveries of Colorado River water into the Coachella Valley during periods of high flows on the river. These supplies helped speed the pace of groundwater replenishment of the basin and provided water for future uses. However, groundwater levels still continue to decline in much of the basin.

Under the 1984 agreement, MWDSC was permitted to bank up to 600 thousand acre-feet (taf) of surface water in the groundwater basin. When withdrawals were required, MWDSC would use its Colorado River surface water along with SWP allocations from CVWD’s and DWA’s, and CVWD and DWA would use the banked groundwater until the volume stored under this agreement was depleted.

The Warren Valley Basin had also seen significant groundwater overdraft and declining groundwater levels. The Mojave Water Agency constructed a 71-mile pipeline from the California Aqueduct near the City of Hesperia to serve the communities of Landers, Yucca Valley, and Joshua Tree. The Hi-Desert Water District has been taking water from the pipeline since 1995 to recharge the previously overdrafted Warren Valley Basin. The area had been under court ordered development limitations before the pipeline was completed.
The Borrego Valley Basin in San Diego County is the sole source of supply for the local urban and agricultural water users. Groundwater levels have been falling steadily since the 1950s.

The Twenty-nine Palms Groundwater Basin lies beneath the City of Twentynine Palms, the US Marine Corps facility, and Mesquite Lake. Groundwater levels are generally stable.

**Water Uses**

In 2005, the estimated applied water demands for urban, agriculture, and the environment for the Colorado River region totaled _______ taf. The estimated applied water demand for agriculture was _______ taf, or about 85 percent of the total. In accordance with the terms of the October 2003 CRWDA: Federal QSA, IID delivery for agricultural water use is expected to be reduced in future years. (Figure 11-__)

PLACEHOLDER Figure 11-5 Colorado River Hydrologic Region water balance for water years 1998–2005

Almost all of the agricultural demands in the region occur in three major agricultural areas: the Imperial, Palo Verde, and Coachella valleys. The Imperial Valley, which harvested 587,000 acres of crops in 2005, accounts for almost 70 percent of the total applied water demands. In 2005, total agricultural applied water demands were _____ taf. For Imperial Valley, those demands required a diversion of 2,932 taf from the Colorado River.

Urban applied water demands account for about 15 percent of the overall totals for the region. In 2005, total urban applied water was estimated to be _______ taf. Most of these urban demands occur in the Coachella Valley, amounting to _______ taf in year 2005, which is almost ___ percent of the total urban applied water for the region. Established housing and commercial uses have been augmented by large housing tracts with intensive landscaping, hotels, shopping centers, country clubs, golf courses, and polo fields. Landscape irrigation demands in the Coachella Valley are large because of the expanse of turf grass and landscaping that have occurred in the past two decades.

Table 11-6 has a breakdown of water sales within the Imperial Irrigation District water service area for 2005.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Water Sales (in acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>County Land</td>
<td>2,433,012.6</td>
</tr>
<tr>
<td>City Land (water sales)</td>
<td>34,987.4</td>
</tr>
<tr>
<td>Industrial</td>
<td>19,078.4</td>
</tr>
<tr>
<td>Small Acres</td>
<td>0.0</td>
</tr>
<tr>
<td>Pipe Services</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,519,078.4</strong></td>
</tr>
</tbody>
</table>

For agriculture, irrigation operations in the region use surface, sprinkler, and micro-irrigation systems. For the Imperial and Palo Verde valleys, border-strip systems are used to irrigate most of the field and forage crops. This system is also used to irrigate the grains and pasture grasses. In addition to meeting the crop evapotranspiration requirement, these systems are excellent for removal of salts that accumulate in the root zones.

Furrow systems are used for winter and spring vegetables and some of field and forage crops in Imperial and Palo Verde valleys. Some of the alfalfa is irrigated with furrows as well. Hand-move sprinklers are used mostly in conjunction with furrow systems. Vegetables and some forage crops
are irrigated with sprinklers in the early stages of growth. Soon after the seedlings emerge, furrow irrigation systems are used to finish growing the crop.

Despite the availability of a reliable and inexpensive water supply, water districts and users are intensely well aware of the importance of water conservation programs to efficiently use and manage water. Farmers and growers in all of the districts do precision land forming for specific crops and use plastic and other mulches to reduce evapotranspiration and improve productivity. In addition, to meet the terms of the federal QSA and related agreements, IID will modify its delivery system starting in 2007 and growers will be able to participate voluntarily to modify their irrigation operations to be more efficient.

The use of surface and subsurface micro-irrigation hardware continues to expand. In the Coachella Valley, surface and sub-surface drip irrigation systems are becoming more commonplace in the vegetable operations. Traditional surface and sprinkler systems are still used in about 75 percent of operations, but farmers are not hesitating to use drip systems for the remainder.

Almost all citrus and table grapes in Coachella Valley are grown using drip and micro-sprinkler systems. Drip systems are used for the grapes because they provide the most uniform and efficient method of delivering water to the individual plant. Micro-sprinkler systems are being used for the citrus trees because they deliver larger volumes of water with a larger wetted area compared to the standard drip emitter.

In ____, Palo Verde Irrigation District (PVID) and MWDSC entered into a 35-year agreement for land fallowing and water supply transfers. The program will develop up to 111 taf/yr of flexible reliable water supply for MWDSC, help stabilize the economy of the Palo Verde Valley, and provide financial assistance for specific local community improvement programs. The quantity of land to be fallowed ranges from 7 to 29 percent (district-wide) of 120,500 acres served. The amount of land included in the program will be a factor in the applied water requirements for agriculture in the valley.

Water agencies and the appropriate governmental agencies in the region continue to provide technical services in irrigation management to the local agricultural water users. IID and CVWD collaborate with DWR in operating the network of California Irrigation Management Information System (CIMIS) stations in the region. Data from these stations are used by water users and districts, both agricultural and urban, to manage irrigation activities.

IID, PVID, and CVWD are signatories to the 1999 Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California. By signing the MOU, the districts demonstrated their intention to adopt agricultural water management plans and to implement Efficient Water Management Practices (EWMPs) within their service areas that: 1) optimize net water management benefits, 2) provide a significant financial benefit, and 3) do not have negative third party or environmental impacts. The Agricultural Water Management Council (AWMC) oversees the MOU and has endorsed the Agricultural Water Management Plans developed by IID and CVWD.

Water use efficiency programs are equally important for the urban users in the region. Many of the water districts are implementing or investigating the feasibility of implementing water use efficiency (WUE) programs within their service areas. Many of the urban suppliers in the region are members of the California Urban Water Conservation Coalition (CUWCC), which promotes the use of Best Management Practices (BMPs).
These conservation programs disseminate public information dissemination, assist customers, and implement building codes. Many of the water districts provide information on the status and issues about statewide and local water resources. They publish literature on landscape and general conservation tips, homeowner workshops, and demonstration gardens. MSWD has provided extensive outreach to public schools through its Groundwater Guardian program at the high school, middle school, and elementary school level. It also sponsors water education events that include residential retrofit programs.

Customer assistance programs are also being implemented. CVWD provides water audit services for large landscape areas within its service area, including golf courses and parks. During the audit, the efficiency and uniformity of the irrigation systems are determined and recommendations are offered for improvements on the design, operation, and maintenance of these systems; potential energy and water savings that could be achieved with these modifications; and irrigation scheduling.

Amendments to local building codes have been made to conserve water supplies in landscaping. Since 2003, new housing developments in most valley cities have been subject to landscape ordinances. These ordinances limit the amount of turf that can be used in new developments. For example, MSWD restricts turf in residential landscaping to about 30 percent of the front yard. Build-out of these new developments over the next 15 years should show a diminishing amount of landscape irrigation demands. MSWD’s water use per capita is less than that of other districts in the valley and the district’s goal is to maintain that efficiency as future growth occurs.

**Water Quality**

**Overarching Water Quality Issues**

The Colorado River Basin Region (State Water Resources Control Board Region 7)\(^1\) includes 28 major watersheds or “hydrologic units,” and has water bodies of statewide, national, and international significance (such as the Salton Sea and the Colorado River).

Water quality concerns exist in all of the watersheds in the Colorado River Region. This section is intended to identify the highest priority water quality issues in the watersheds within this region. Some of the regional specific issues that have been identified, but not prioritized, are:

- Surface water quality monitoring
- Quality of imported water
- On-site treatment systems
- Nitrates
- Leaking underground storage tanks (USTs)
- Water quality impacts of animal feeding and dairy operations

**Imperial Irrigation District**

Water quality is tested throughout IID’s water delivery and drain systems. Since 2004, the IID has added 26 Total Maximum Daily Load (TMDL) sampling to comply with its Drain Water Quality Improvement Plan. IID collects samples of its water supply at numerous sites. Drain water is monitored at several sites and on the Alamo and New rivers.

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\(^1\) Same geographic configuration as DWR’s Colorado River Hydrologic Region
**Coachella Valley Storm Water Channel**

On May 16, 2007, the Colorado River Basin Regional Water Quality Control Board (Regional Board) adopted Resolution No. R7-2007-0039 amending the basin plan to establish a TMDL and implementation plan for bacterial indicators in the Coachella Valley Storm Water Channel. This channel stretches from near Indio to the Salton Sea and does not meet federal water quality standards due to elevated pathogen levels. The beneficial uses most sensitive to pathogen impairment in the channel are contact and non-contact water recreation uses. Potential pathogen sources include urban runoff, natural background, agricultural runoff, bacteria regrowth, and septic system discharges.

**Mission Springs Water District**

The US Geological Survey (USGS) conducted a Groundwater Ambient Monitoring and Assessment (GAMA) study of the Coachella Valley aquifer system; MSWD participated in the study. The USGS will release the report in 2008. The USGS has recently released its study on subsidence in other parts of the Coachella Valley.

**Water Governance**

Two groundwater basins in the region are bounded by adjudication judgments: the Warren Valley Groundwater Basin and the Beaumont Groundwater Basin.

The Warren Valley Groundwater Basin adjudication judgment was finalized in 1977. The court appointed Hi-Desert Water District as the Watermaster and ordered the agency to develop a plan to halt the overdraft of the basin. In 1991, the Warren Valley Basin Management Plan was released with recommendations that included managing extractions, importing water supplies, conserving stormwater flows, encouraging water conservation and recycling, and protecting the quality of the groundwater supplies.

The Beaumont (Groundwater) Basin adjudication judgment was finalized in 2004. The Superior Court appointed a committee to serve as the Watermaster. The committee includes representatives from the Cities of Banning and Beaumont, Beaumont-Cherry Valley Water District, South Mesa Mutual Water Company, and the Yucaipa Valley Water District. The judgment established the annual extraction quantities for the parties which were classified as either overlying owners or appropriators.

**Table 11-7 Key elements of the Law of the River**

(also in chapter 5)

<table>
<thead>
<tr>
<th>Document</th>
<th>Date</th>
<th>Main purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado River Compact</td>
<td>1922</td>
<td>The Upper Basin and the Lower Basin are each provided a basic apportionment of 7.5 maf annually of consumptive use. The Lower Basin is given</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the right to increase its consumptive use by an additional 1 maf annually.</td>
</tr>
<tr>
<td>Boulder Canyon Project Act</td>
<td>1928</td>
<td>Authorized USBR to construct Boulder (Hoover) Dam and the All-American Canal (including the Coachella Canal), and gave congressional consent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to the Colorado River Compact. Provided that all users of Colorado River water stored in Lake Mead must enter into a contract with USBR for use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of the water.</td>
</tr>
<tr>
<td>California Limitation Act</td>
<td>1929</td>
<td>Limited California’s share of the 7.5 maf annually apportioned to the Lower Basin to 4.4 maf annually, plus no more than half of any surplus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>waters.</td>
</tr>
</tbody>
</table>
### Seven Party Agreement 1931
An agreement among seven California water agencies/districts to recommend to the Secretary of Interior how to divide use of California's apportionment among the California water users.

### US - Mexican Treaty 1944
Apportions Mexico a supply of 1.5 maf annually of Colorado River water except under surplus or extraordinary drought conditions.

### US Supreme Court Decree in Arizona v. California, et al. 1964
Apportions water from the mainstream of the Colorado River among the Lower Division states. When the Secretary determines that 7.5 maf of mainstream water is available, it is apportioned 2.8 maf to Arizona, 4.4 maf to California, and 0.3 maf to Nevada. Quantifies tribal water rights for specified tribes, including 131.4 taf for diversion in California.

### Colorado River Basin Project Act 1968
Authorized construction of the Central Arizona Project. Requires Secretary of the Interior to prepare long-range operating criteria for major Colorado River reservoirs.

Quantifies Colorado River mainstream present perfected rights in the Lower Basin states.

### Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement of 2003 2003
Complex package of agreement that, in addition to many other important issues, further quantifies priorities established in the 1931 Seven-Party Agreements and enables specified water transfers in California.

## Flood Management

### Historic Floods
Of California’s 12 hydrologic regions, the Colorado River Hydrologic Region has the lowest annual precipitation. Consequently, all of the natural streams are ephemeral; the exceptions being the Colorado, New, and Alamo rivers. The low annual rainfall amounts and the sparse vegetation in the region’s watersheds give rise to braided streams with steep channel slopes. In these watercourses, short-duration, high intensity rainfall from summer monsoonal thunderstorms or winter storms can result in flash floods and debris flows. Table 11-__ in Appendix 11-A lists flood parameters for the major streams in the region.

Damaging floods have occurred in the area since at least 1916. Recent notable events have been in 1927, 1938, 1965, 1969, 1976, and 1995. For more information on these floods see Appendix 11-A, “Flood Management”.

### Flood Hazards
Many areas in the region are still vulnerable to flood-caused damages. Following is a list of hazards that currently require attention:

- The Whitewater River near Thousand Palms lacks the channel capacity to contain a 100-year flood.
- The towns of Ocotillo and Nomirage in southwestern Imperial County are menaced by flooding from Myer Creek, upon whose alluvial fan the towns are built.
- Drains and culverts do not have the capacity to convey high floodwaters in northern El Centro, threatening agricultural lands.
- Floodwaters north of Bombay Beach become trapped by dikes protecting the town from flooding by the Salton Sea, potentially damaging both residences and Highway 111.
- Growth of the town of Brawley will result in a greater area of impervious surfaces, increasing flooding risks to agricultural, commercial, and residential properties.
Flood Governance

Flood management is a cooperative effort for which federal, state, and local agencies all play significant parts. The principal participants are listed in Box 11-2 Flood Management Agencies. For more information on the agencies’ roles, see Table 11A-2 Flood management participants in Appendix 11A.

Box 11-2: Flood Management Agencies

<table>
<thead>
<tr>
<th>Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Emergency Management Agency</td>
</tr>
<tr>
<td>Natural Resources Conservation Service</td>
</tr>
<tr>
<td>US Geological Survey</td>
</tr>
<tr>
<td>US Army Corps of Engineers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Conservation Corps</td>
</tr>
<tr>
<td>Department of Corrections</td>
</tr>
<tr>
<td>Department of Forestry and Fire Protection</td>
</tr>
<tr>
<td>Department of Water Resources</td>
</tr>
<tr>
<td>Office of Emergency Services</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>County emergency services units</td>
</tr>
<tr>
<td>County planning departments</td>
</tr>
<tr>
<td>County building departments</td>
</tr>
<tr>
<td>Local conservation corps</td>
</tr>
<tr>
<td>Local initial response agencies</td>
</tr>
<tr>
<td>Riverside County FCWCD</td>
</tr>
<tr>
<td>San Bernardino County Flood Control District</td>
</tr>
<tr>
<td>San Diego County Flood Control District</td>
</tr>
</tbody>
</table>

Flood Risk Management

Flood risk management includes a wide variety of projects and programs, which may be grouped as structural approaches (Constructed facilities, coordination of flood operations, maintenance), land use management (Floodplain function restoration, regulation, flood insurance), and disaster preparedness, response, and recovery (Information and education, disaster preparedness, emergency response, post-flood recovery).

Of three water management plans in the region, one addresses flood control. By planning projects that would stabilize the elevation of the Salton Sea (via pumps, outlet streams, reservoirs, and berms), the Salton Sea Authority Plan for Multi-Purpose Project could decrease the risk of flooding from the sea to the communities of Bombay Beach and Desert Shores.

Structural Approaches

**Constructed Facilities**—Imperial Irrigation District built dikes along the shores of the Salton Sea to protect shoreline towns and roads from flooding due to high lake levels; however, with implementation of the federal QSA, this threat is greatly diminished. Riverside County Flood Control District constructed Wide Canyon Dam and flood control basin to control flash floods at Desert Hot Springs and Cathedral City. The Deep Canyon and Palm Valley stormwater channels—constructed by Coachella Valley Water District with participation of developers and
adjacent cities—direct floodwaters away from developed areas in Palm Desert, Rancho Mirage, and Indian Wells.

To mitigate property damage and protect the public, a 24.5-mile portion of the Whitewater River in the Coachella Valley was channelized to provide flood-control. The channel extends from the City of La Quinta to the Salton Sea and is fed by a series of smaller flood control channels which capture storm runoff from the surrounding mountains and hills.

The 945-acre-foot-capacity Tahchevah Creek Detention Basin, the Baristo Creek Flood Control Channel, and the Tahquitz Creek Debris Basin are designed to reduce flood damage in Palm Springs. The Banning Levee and the Chino Canyon Improvements along the San Gorgonio and Whitewater rivers have spared Banning and Palm Springs from damaging floods. The West Magnesia Canyon Improvement Project, a debris basin and concrete channel, protects Rancho Mirage from flooding and debris flows. Levees and engineered channels constructed at Quail wash near Joshua Tree and S Street and Sidewinder washes at Needles have reduced the flooding risk to those towns. A grouted stone revetment protects the Palm Springs Aerial Tramway from debris movement and erosion. Local agencies are responsible for maintaining the integrity of levees, channels, and detention basins. The region also has reservoirs with flood control reservations; these reservoirs are listed in Table 11A-___ in Appendix 11-A.

Coordination of Flood Operations—Currently, there are no formal forecast-coordinated reservoir operations agreements between agencies with flood control duties within the hydrologic region.

Maintenance—[Placeholder]

Land Use Management

Floodplain Function Restoration—[Placeholder]

Regulation—Throughout the region most of the streams with flood control infrastructure have been designated floodways. Regulated floodways include the San Gorgonio, Whitewater, New, and Alamo rivers; Little Berdo, Lower Berdo, Gilman Home, and Indian Canyon channels; West Pershing, Mission, Tahquitz, and Tachevah Creeks; Lucerne and Rabbit Lakes; and Morongo, Palm Pipes, Airport, S Street, Fox, and Sidewinder Washes. Imperial County requires a permit for construction below the negative 220-ft contour near the Salton Sea; the county, and three of its incorporated cities, also regulate construction on the New and Alamo rivers and El Centro drain floodplains. San Bernardino and Riverside counties both regulate development within floodways through county ordinances.

Flood Insurance—Accurate floodplain mapping is paramount for establishing sound flood insurance policies. While many areas of San Bernardino and Riverside counties have been mapped for flood insurance rates, several have not been updated since the 1980s. Of seven cities in Imperial County, two have been mapped by the Federal Emergency Management Agency (FEMA). However, all areas should have revised Flood Insurance Rate Maps (FIRMs) effective by the end of 2008. [Eastern San Diego County?]

DWR’s Awareness Floodplain Mapping project, which provides a simple computer interface for viewing hazardous floodplains, has completed maps for all of Riverside County, including the Palm Springs area. Lands west of the Salton Sea and adjacent to the Colorado River in Imperial County have also been mapped; however, floodplains in Imperial County along the New and
Alamo rivers and Myer Creek and all of San Bernardino County have yet to be delineated. These maps should be drawn and available by 2012.

**Disaster Preparation, Response, and Recovery**

**Information and Education**—A few models are available that could provide information for flood management. The Salton Sea Analysis (SALSA) model predicts water surface elevation of the Salton Sea based on flows from rivers, drains, canals and channels, and water storage in relevant reservoirs. The Variable Infiltration Capacity (VIC) model has been used to estimate flows in the Colorado River Basin by inputting results from climate and land-surface models. There are currently no hydrologic models that describe the relationship between meteorological conditions and flow for the Whitewater River.

California Data Exchange Center (CDEC) provides information on monthly precipitation amounts; however, CDEC contains no real-time monitoring stage or discharge data for the region’s streams.

**Event Management**—In general, flood emergency response proceeds from the local level through the county (Operational Area), Office of Emergency Services (OES) region, and OES headquarters, with DWR and USACE supporting throughout. Details of the procedures for flood preparedness, emergency response, and recovery are discussed in Chapter [Insert Reference]. Table 11A-x, “Flood Emergency Response Organizations” in Appendix A lists specific response organizations.

Recovery after a moderate flood event may involve the funding and construction services of the USACE if the facilities are parts of federal projects. Availability of resources to repair local and private facilities, remove flood waters, and restore housing, business, and infrastructure often depends on the severity of the event and the allocation of event-specific federal or State funds.

**Relationship with Other Regions**

**Regional Water and Flood Planning and Management**

The Coachella Valley’s two main outside water resources, northern California and the Colorado River, are in jeopardy. The valley’s share of SWP water from northern California is being temporarily reduced by up to one-third after a 2008 federal court ruling affecting 25-million Californians. Simultaneously, the worst drought in 500 years has reduced flows on the Colorado River to about half of normal.

Years after desert farmers reduced their water use, CVWD is building the $70-million Mid-Valley Pipeline. The pipeline will provide about 50 of the valley’s 124 golf courses with Colorado River water for irrigation, leaving higher-quality aquifer water for drinking use. Another $40 million project to build a new groundwater recharge facility south of La Quinta will use Colorado River water to replenish the east valley portion of the underground aquifer.

**Integrated Regional Water Management**

The region is actively engaged in Integrated Regional Water Management (IRWM) planning efforts that empower stakeholders to develop integrated solutions and diversify water management portfolios to meet regional water management challenges. In combination with local
and statewide planning, IRWM efforts serve a vital role to provide for sustainable water use, water quality, and environmental functions.

In addition to the IRWM efforts in Table 11-8, other planning efforts are at varying stages of function and development (Figure 11-6). The efforts cover approximately one-half of the Colorado River Hydrologic Region with the eastern portion currently void of IRWM planning efforts. Efforts include:

- Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement (CRWDA: Federal QSA) among the United States, IID, CVWD, MWDSC, and SDCWA.\(^2\)
- Mojave Water Agency IRWM
- Salton Sea Water Authority
- Coachella Valley Regional Water Management Group (CVRWMG)
- Borrego Water District

The Mojave Water Agency IRWM covers the northwestern corner of the Colorado River Hydrologic Region, while the majority of the management area in the South Lahontan Hydrologic Region. It has a developed IRWM plan and is implementing projects. Coachella Valley Water District, Coachella Water Authority, Desert Water Agency, Indio Water Authority, and Mission Springs Water District have been engaged in discussions to issue an MOU to establish the ground rules for working towards an IRWM plan for their region. The Salton Sea effort is currently focused on the restoration of the Salton Sea, and will eventually work towards an IRWM plan. Their IRWM could be a separate effort or molded into the CVRWMG’s effort. Borrego Water District, on the other hand, has been attempting to coordinate with other neighboring agencies towards an IRWM, but their effort is not yet mature.

### Table 11-8 Strategies for integrated regional water management efforts, Colorado River Hydrologic Region

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Salton Sea: Water Quality Improvement of Inflows</th>
<th>Mojave Water Agency IRWM Plan</th>
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<tbody>
<tr>
<td>Desalination</td>
<td>(no date)</td>
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<tr>
<td>Describe current and projected water demands</td>
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<tr>
<td>Develop computer model for water management and Watershed planning</td>
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<tr>
<td>Ecosystem Restoration</td>
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<tr>
<td>Environmental and habitat protection and improvement</td>
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<tr>
<td>Implement Groundwater Management Plan</td>
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<tr>
<td>Implement Urban Water Management Plan</td>
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<tr>
<td>Land use planning</td>
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<tr>
<td>NPS pollution control</td>
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<tr>
<td>Recreation and public access</td>
<td>√</td>
<td></td>
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<tr>
<td>Storm water capture and management</td>
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<tr>
<td>Study natural and imported water supplies</td>
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<td></td>
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<tr>
<td>Summarize water shortage contingency plan</td>
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<td></td>
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<tr>
<td>Surface storage</td>
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<td></td>
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<tr>
<td>Take 60 regional water management actions</td>
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</tbody>
</table>

\(^2\) This agreement, including efficiency requirements on the part of IID and CVWD, is an agreement among IID, CVWD, MWD, SDCWA and the federal government; related agreements include the state of CA and San Luis Rey Settlement Agreements. Although not titled IRWM (it was negotiated and signed before the term came into effect), it surely functions as such.
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Salton Sea: Water Quality Improvement of Inflows</th>
<th>Mojave Water Agency IRWM Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and wastewater treatment</td>
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<tr>
<td>Water conservation</td>
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<tr>
<td>Water quality protection and improvement</td>
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<td>Water recycling</td>
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<td>Water transfers</td>
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<tr>
<td>Watershed planning</td>
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<td></td>
</tr>
<tr>
<td>Wetlands enhancement and creation</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Figure 11-6 Areas within Colorado River Hydrologic Region covered by IRWM planning efforts (map)
Accomplishments

Canal Linings
The concrete lining of 34.8 miles of the Coachella Valley Canal was completed; it saved 26 taf/yr of Colorado River water supplies that would otherwise have seeped from the canal. The water supplies saved goes to the SDCWA. Total cost of the project was in excess of $90 million.

Concrete lining of a 23-mile section of the All-American Canal is scheduled to be completed by March 2010. Upon completion, the project will conserve 67 taf/yr of Colorado River water supplies that would have seeped from the canal. The water supplies saved goes to the SDCWA. The approximate cost of the project is $250 million.

Water Transfer
In 2003, IID implemented a land fallowing program within its service area to generate water to fulfill the SDCWA water transfer and the Salton Sea mitigation delivery schedules. In 2006-2007, 169 fields (17,984.4 acres) were fallowed which yielded just over 96 taf. For 2006-2007, 150 fields (16,172 acres) were fallowed which yielded over 89 taf.

IID has implemented a seepage recovery project to generate early year – 2008 through 2010 – water savings. The Main Canal Seepage Interception project is IID’s first step to meet its efficiency conservation water transfer obligations under the federal QSA. It is anticipated that the Main Canal Seepage Recovery program will yield approximately 40 taf/yr. Expected design and construction cost is $7.5 million.

PLACEHOLDER Box 11-1 Salton Sea Ecosystem System Draft Programmatic Environmental Impact Report. Preferred Alternative

[Reference – www.saltonsea.water.ca.gov]

Lower Colorado River Multi-Species Conservation Program
Progress is being made to implement the $26 million Lower Colorado River Multi-Species Conservation Program. LCR-MSCP activities are separated into nine different categories which include fish augmentation, species research, and system monitoring. Work has been initiated on a number of programs including those involving system monitoring and Conservation Area Development and Management.

IID Efficiency Conservation Definite Plan
IID completed and released its Efficiency Conservation Definite Plan (Definite Plan) in 2007. The document identifies on-farm programs, delivery system improvements, and financial incentive packages that are intended to yield conserved water supplies for transfer under the provisions of the CRWDA: Federal QSA. Recommended programs that would help IID meet its objectives include:

- Target on-farm savings in the range of 180 to 210 taf/yr and delivery system savings ranging from 93 taf to 123 taf at program build-out.
- Use the Scaled Pay-for-Measures Hybrid Incentive approach to attract growers (farmers) voluntarily into the efficiency conservation program and to achieve the targeted on-farm savings.
• Implement seepage recovery and Integrated Information Management (IIM) to achieve the targeted delivery system savings and to enable the targeted on-farm savings.

• Implement improved measurement of farm deliveries

• Rely on selected seepage recovery projects and on-farm and delivery system pilot projects to generate early year – 2008 through 2010 – water savings.

• IID should take a series of steps to ensure it is ready to meet its near-term water transfer obligations.

In 2008, IID will implement a program to test and finalize details in three areas to meet the water conservation efficiency ramp-up schedule: 1) On-farm conservation program, 2) Identification and testing of system improvements, and 3) Improved delivery measurement. Over a period of 2-½ years, work will be carried out to set up the programs that will ultimately be used to create the 303 taf/yr of transferred water by efficiency conservation. The anticipated cost to complete the Near-Term actions is $5.74 million.

On-Farm Program. The objective of the on-farm program is to create conserved water through voluntary participation of IID landowners and growers. Details of the program as identified by the Definite Plan as near-term actions need to be developed and finalized. Once the details are finalized and incorporated into an on-farm program, a small-scale enrollment and implementation test will be completed to validate the program details.

Identification and Testing of System Improvements. To facilitate water user participation and on-farm conservation efforts, components of the IID delivery system will need to be improved and re-operated to offer additional flexibility to the water users while maintaining existing levels of service and increased reliability.

Improved Delivery Measurement. Improved delivery measurement is a key part of on-farm conservation verification and payment.

Groundwater Storage
CVWD and IID have entered into a 75-year agreement that allows the IID to store a portion of its Colorado River water supply in the Coachella Valley groundwater basin. The water would be delivered to existing or proposed CVWD facilities through direct or in-lieu recharge methods. CVWD would return the stored supplies to IID by decreasing its consumptive use of Colorado River water by the quantity requested by IID or the amount in storage.

Water Supplies
Water recycling continues to expand in the region. CVWD is currently operating six wastewater treatment plants. Flows from three of the facilities used for the irrigation of greenbelts and golf courses, while some of the supplies are used for groundwater recharge. In 2005, total recycled water use was slightly less than 15 taf. The district projects recycled water use to increase to slightly below 30 taf/yr by 2030.

CVWD is implementing some of the recommendations from its 2002 Water Management Plan. The plan established goals for the conservation of water supplies for urban and agricultural users, golf courses, management of the Coachella Valley Groundwater Basin, maintaining water quality, and searching for firm imported supplies. CVWD is exercising its authority to levy and collect replenishment assessments for the purpose of replenishing the groundwater supplies within its service area. It has done so in the Upper Whitewater River basin since 1973 and began to collect assessments in the Mission Creek and lower Whitewater River basins.
CVWD and DWA have jointly and separately entered into agreements to obtain additional SWP supplies. The 2003 Exchange Agreement will permit CVWD and DWA to obtain an additional 100 taf/yr in an exchange with MWDSC. CVWD entered into an exchange agreement with the Tulare Lake Basin Groundwater Storage District for an additional 9.9 taf/yr.

An EIR has been released for the proposed transfer of the Table A SWP water supplies from the Berenda Mesa Water District in the Central Valley to CVWD and DWA. The proposed amount for the transaction would be 16 taf/yr; 12 taf/yr for CVWD; and 4 taf/yr for DWA.

Urban Water Conservation

CVWD has updated and approved a revised landscape ordinance for customers within its service area. With this update, the CVWD hopes to decrease overall water use, eliminate the runoff of irrigation water into the streets, and limit turf grass allowance for golf courses.

The Twentynine Palms Water District has been implementing very aggressive water audit, leak detection, and water main replacement programs for the past decade. The agency conducts a very efficient preventive maintenance program and detects and repairs leaks in its distribution system quickly. Annual unaccounted water losses have been reduced by over 90 percent.

Water Quality

MSWD has successfully completed several phases of its Groundwater Protection Project connecting about 2,500 parcels to its wastewater collection system and abating about 1,750 on-site (septic) systems.

Cathedral City has completed three and is currently implementing a fourth septic-to-sewer project to address water quality problems for the Whitewater Municipal Groundwater Basin. The completed projects have replaced about 2,600 septic tanks and have extended sewer service to more than 3,000 parcels. The current project will eliminate 500 septic tanks and provide sewer service for 650 parcels.

Due to changes in the federal and state Safe Drinking Water acts, IID water users who receive canal water at their homes or businesses must have an alternate source of water for drinking and cooking purposes. If users not currently receiving water from one of the Department of Health Safety (DHS) Approved Providers, a municipal (city) water system, or a private permitted water system (not a point-of-entry filtration system), they must arrange to have water delivered to their home or business or the domestic canal water connection will be terminated IID strictly enforces this rule to avoid penalties that could exceed $25,000 a day.

PLACEHOLDER Table 11-9 Existing Colorado River Hydrologic Region water conservation actions/agreements since 1980

Flood Control

Major flood control accomplishments in the Colorado Desert Hydrologic Region since 2000 include:

- Imperial County Multi-Hazard Mitigation Plan, [pending as of 1/2007]
- Multi-Jurisdictional Hazard Mitigation Plan, San Diego County, California, adopted in 2004
- Riverside County Operational Area Multi-Jurisdictional Local Hazard Mitigation Plan, approved in 2005
Urban Wastewater Treatment

Important steps were taken to improve the quality of the urban wastewater flows entering into the United States through the New River from Mexico. Financed largely by the United States, a new wastewater treatment facility, the Las Arenitas plant, was constructed in the Mexicali Valley and began treating New River water in November 2006. Treated flows from the plant are moved southward through a new pipeline to the Hardy River.

Challenges

Threatened or endangered fish species on the mainstem of the Colorado River include the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub. Efforts to protect these fish may impact reservoir operations and streamflow in the mainstem and tributaries, which are critically important to California’s ability to store and divert Colorado River water supplies. Other species of concern in the basin include the bald eagle, Yuma clapper rail, black rail, southwestern willow flycatcher, yellow warbler, vermilion flycatcher, yellow-billed cuckoo, and Kanab ambersnail.

The Salton Sea is the primary focus of water quality issues within this hydrologic region. The largest sources of surface water inflow to the sea are the New and Alamo rivers and the Imperial Valley agriculture drains, all of which contribute pesticides, nutrients, selenium, and silt. The Alamo River consists mainly of agricultural drainage from the Imperial Valley. The Coachella Valley Stormwater Channel, which also drains to the sea, is heavily contaminated at its north end with pathogens from municipal wastewater plants in the Coachella Valley and agricultural drainage.

The Citizen’s Congressional Task Force on the New River was created in 1997 to improve agricultural drain water quality that flows into the New River and, ultimately, to the Salton Sea. In 2000, the task force constructed two pilot wetland projects, a 7-acre site near Brawley and a 68-acre site near Imperial, to test the effectiveness of constructed wetlands in lowering nonpoint source pollutants. With the success of the pilot sites, a total of 30 additional wetland sites were proposed on both the New and Alamo rivers. Further investigation has shown that around ten of these sites would require pumping of water into the wetland, which is why about 20 sites are now proposed.

A new treatment facility had been constructed in the Mexicali Valley that also included 17 miles of pipelines and treatment lagoons. Despite plans to send the treated waste southward through the Hardy River, treated and untreated flow continues from Mexico into the New River and the Salton Sea.

Salton Sea Restoration - funding by state of California, etc.

Colorado River Water and Groundwater

The relatively saline Colorado River provides irrigation and domestic water to much of Southern California. Of recent concern to human health is the presence of low levels of perchlorate in the Colorado River from a Kerr-McGee chemical facility in the Las Vegas Wash, the nation’s largest perchlorate contamination site. In addition, high levels of hexavalent chromium occur in groundwater wells near the town of Needles. Septic systems at recreational areas along the river are also a concern for domestic and recreational water uses. Other important water quality issues
in this region include increasing levels of salinity, nitrates, and other substances in groundwater associated with animal feeding and dairy operations and septic tank systems, especially in the Desert Hot Springs area. In the Coachella Valley, high levels of nitrates restrict the use of several domestic water supply wells.

As a result of a 1964 US Supreme Court decree in Arizona v. California, California’s basic apportionment of Colorado River water was quantified, and five lower Colorado River Indian tribes were awarded 905 taf/yr of diversions, 131.4 taf of which were allocated for diversion in and chargeable to California pursuant to a later supplemental decree. Three of the five tribes – the Fort Mojave Indian Tribe, the Fort Yuma-Quechan Indian Tribe, and the Colorado River Indian Tribe – are pursuing additional water rights related to the boundary lands claims. A settlement has been reached on the claims of the Fort Mojave Indian Tribe and the Colorado River Indian Tribe. The settlements as approved by the US Supreme Court provide 5,122 af of additional diversions to these two tribes. An agreement has also been reached to settle the claim of the Fort Yuma-Quechan Indian Tribe, which is currently before the US Supreme Court.

**Urban Wastewater Treatment**

A building moratorium was imposed by Imperial County in the community of Salton City until the existing wastewater treatment facility can be upgraded. The concern is that the plant cannot process the volume of collected wastewater. The capacity of plant will go from 200,000 gallons per day to 500,000 gallons per day.

**PLACEHOLDER BOX 11-3 Implementation of the Federal QSA**


Develop text in next draft regarding IRWM proposal located near Sonny Bono Salton Sea National Refuge/principal tributaries to Salton Sea? Reference: Proposition 50 Application.

**Drought and Flood Planning**

Imperial County has created a flood management plan in cooperation with Imperial Irrigation District, Imperial County School District, and Salton Community Services District. This plan identifies vulnerable areas (e.g., Calipatria); discusses various techniques for lessening flood risk; and contains a general implementation plan.

The Disaster Mitigation Act of 2000 provided financial incentives to states and local entities for developing Hazard Mitigation Plans (HMPs) that identify actions for mitigating disasters and contain strategies for action implementation. Currently, Riverside, San Diego, and San Bernardino counties have FEMA-approved HMPs that discuss flooding issues and measures most likely to alleviate those risks. All three plans are multi-jurisdictional and consider flood risks and mitigation at various governmental levels. Imperial County has prepared a draft plan that is available for public review. [Check status for Imperial]

Water supply shortages, both short- and long-termed, are always possible in the Colorado River region. Faced with that reality and prompted by amendments to the Urban Water Management Plan Act, water districts have developed emergency or water supply shortage plans to mitigate the consequences of the shortages.

For MSWD, procedures have been established to obtain emergency water supplies from the Coachella Valley Water District. Two inter-connections exist which could be utilized to obtain
additional emergencies supplies. MSWD’s Disaster Preparedness Plan has been updated to be compliant with both the National Incident Management System and the Standardized Emergency Management System.

In late 2006, the IID Board of Directors approved the development of an equitable distribution plan to apportion agricultural water users using the straight-line method for years that conditions trigger a supply/demand imbalance (SDI) declaration. In December 2007, the IID Board passed a resolution approving the new regulations and authorizing the General Manager to implement them. Also in December 2007, the Secretary of the Interior signed *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead*. The four key elements of the new guidelines:

- Establish rules for shortages – specifying who will take reductions and when they take them, which is essential for prudent water planning in times of drought.
- Establish new operational rules for Lake Powell and Lake Mead to allow these reservoirs to rise and fall in tandem, thereby better sharing the risk of drought.
- Establish rules for surpluses, so that if the basin has ample runoff, the Department of the Interior will have rules in place to distribute the extra water.
- Address the ongoing drought by encouraging new initiatives for water conservation.

Imperial County has created a flood management plan in cooperation with IID, Imperial County School District, and Salton Community Services District. This plan identifies vulnerable areas (e.g., Calipatria); discusses various techniques for lessening flood risk; and contains a general implementation plan.

**Looking to the Future**

A new delivery system will permit CVWD to deliver Colorado River water supplies through the Coachella Canal to golf courses in the middle of the Coachella Valley. The project is designed to supply a blend of irrigation water & recycled water to some of the over 50 golf courses in the Palm Desert, Rancho Mirage, and Indian Wells areas of the valley and encourage the golf courses to pump less groundwater annually. A new receiving reservoir near one of its recycling plants will permit CVWD to store 65 af of blended canal and recycled water.

Text may be developed for the following subjects:

- Actions and policies following Colorado River QSA, including status of land fallowing.
- Implementation by agricultural water purveyors of efficient water management practices.
- Partnerships like CVWD and DWA and groundwater recharging and Bard Water District and Quechan Indian Reservation.
- Salton Sea Authority and restoration, stabilization efforts/alternatives.
Future Scenarios

Climate Change

Response Strategies

Additional Storage\Operational Flexibility
Illustrating the growing anxiety over water across the West, MWDSC has entered into a novel tri-state agreement to build a small reservoir (8 taf) in the Imperial Valley that could stretch supplies for Phoenix, Las Vegas, and San Diego. Drop 2 Storage Reservoir is a $172 million project that would collect water allocated to California users that would otherwise flow to Mexico. The water would be diverted into the All American Canal at Imperial Dam, and from the AAC into the reservoir some 30 miles east of the City of Calexico.

Under the agreement, the stored water will be used by Imperial Valley farmers. In exchange, the three agencies that paid for the reservoir will be credited a like amount from Lake Mead.

For MWDSC, the project would provide about 100 taf over the next three years. MWDSC can take only 34 taf/yr for each of those three years, however. The Las Vegas-based Southern Nevada Water Agency, which is financing most of the project, will receive a maximum of 400 taf starting in 2011. The Central Arizona Project will receive 100 taf spread out over time. The US Bureau of Reclamation will build the project, with completion set for 2010.

Landscape Water Conservation

Indio has a new landscaping and water conservation ordinance for new development. The ordinance was written to help reduce the depletion of the valley's water supply. Stipulations are:

- Inefficient landscape irrigation that causes runoff, low head drainage and conditions where water flows onto roadways are prohibited.
- All new commercial, industrial and apartment buildings must have separate meters for landscaping installed by January 1, 2013.
- Rain sensing override devices shall be required on all irrigation systems.
- Sprinklers must be equipped with vertical stops installed just below the sprinkler head to automatically shut off water to a broken sprinkler head.

Desert Landscape Workshops

The Alliance for Water Awareness and Conservation, in partnership with Joshua Basin Water District and Hi-Desert Water District, held a series of Desert Landscape Workshops. The workshops explored and shared landscaping ideas and concepts that are best suited to high desert climates. Attendees were introduced to techniques that make the most of water efficient irrigation methods, low-maintenance and sustainable landscaping practices, and desert friendly plants in landscape design.

Implementation Next Steps

Water Portfolios from 1998–2005

PLACEHOLDER: Table 11-10 Colorado River Hydrologic Region
water balance summary (taf), 1998—2005
PLACEHOLDER Table 11-12 Colorado River Hydrologic Region water use and distribution of dedicated supplies (taf), 1998—2005

PLACEHOLDER: Table 11-13 Colorado River Hydrologic Region water portfolio (taf)

PLACEHOLDER: Figure 11-7 Colorado River Hydrologic Region—illustrated water flow diagram

PLACEHOLDER: Figure 11-8 Colorado River Hydrologic Region—schematic flow diagram