Chapter 11  Colorado River Hydrologic Region

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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). The region includes all of Imperial County, about the eastern one-fourth 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. The lowest areas in this region are more than 200 feet below mean sea level in the Coachella and Imperial valleys. Mountain peaks attain elevations of 6,000 to 7,000 feet. Many of these arid valleys contain playas (dry lake beds), some of which are quite large. Bristol Dry Lake, near the Mojave National Preserve, is a playa that covers more than 50 square miles. [From CWP 2005]

[Watersheds]
[Text to come from flood team]:

- Introduction of principal streams of the region,
  - Subject: Colorado River, Whitewater R near Mecca, Alamo R near Niland, New R near Westmoreland,

- Origin of floods in the region.
  - Subject: Rainfall
  - Source: (DWR 1980), GK.

- Table, “Flood Parameters for Principal Streams” outlined in General Instructions.doc (GI).
  - Source: (USGS 2001).
Salton Sea Transboundary

The Salton Sea Transboundary watershed (USGS Hydrologic Unit 18100200) 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 water bodies. Most of the watershed is in Imperial County. The watershed has been identified as a Category I (impaired) watershed under the 1998 California Unified Watershed Assessment (UWA). The California UWA was developed and implemented in response to the Clean Water Action Plan. The UWA was a collaborative process between California and the US Environmental Protection Agency and was developed to guide allocation of new federal resources for watershed protection. (See Box 11-1)

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

The watershed contains five main surface water bodies: 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 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 232 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. Executive Order of Withdrawal (Public Water Reserve No. 114, California No. 26), signed in 1928, designated lands within the Salton Basin below elevation 220 feet below mean sea level as storage for wastes and seepage from irrigated lands in the Imperial Valley. Approximately 75 percent of the freshwater inflow to the sea is agricultural drain water from Imperial Valley. Because the sea has no outlets, salts concentrate in it, and nutrients enhance the formation of eutrophic conditions. Currently, the sea is 25 percent saltier than the ocean, with salinity increasing at approximately 1 percent per year. 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. The Salton Sea National Wildlife Refuge was established in 1930 to preserve wintering habitat for waterfowl and other migratory birds. 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 River

The New River originates in Mexico. It flows approximately 20 miles through the City of Mexicali, Mexico, crosses the International Border, continues through the City of Calexico in the United States, and travels northward about 60 miles until it empties into the Salton Sea. Its flow at the International Border is about 150 to 200 cubic feet per second (108,400 to 145,000 acre-feet per year). The New River carries urban runoff, untreated and partially treated municipal wastes, untreated and partially treated industrial wastes, and agricultural runoff from the Mexicali Valley, Mexico across the International Border 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 carries approximately 6 to 11 cubic feet per second (4,350 to 7,970 acre-feet per year) of treated wastewater from point sources.
in Imperial Valley. The New River flow at the Salton Sea is about 600 cubic feet per second (430,000 acre-feet per year).

The Alamo River originates approximately 2 miles south of the International Border with Mexico, and flows northward across the border for about 50 miles until it empties into the Salton Sea. The Alamo River is dominated by agricultural return flows from Imperial Valley. It also carries approximately 15 to 27 cubic feet per second (10,867 to 19,200 acre-feet per year) of treated wastewater from point sources in Imperial Valley. Its flow at the International Border is 3 to 5 cubic feet per second (2100 to 3620 acre-feet per year), whereas at its delta with the Salton Sea is about 800 to 1000 cfs (600,000 to 800,000 acre-feet per year).

The Ag Drain system comprises over 1,450 miles of surface drains, which discharge into the Alamo and New Rivers and the Salton Sea. The Ag Drain system primarily carries agricultural runoff from the Imperial Valley. Agricultural discharges in the Imperial Valley average about 830,000 acre-feet per year. Of this amount, approximately 36 percent is tailwater; 33 percent is seepage; 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.

http://www.swrcb.ca.gov/rwqcb7/wmi/priority_watershed.html

**Lower Colorado River Watershed**

The Lower Colorado River Watershed is in the southeast corner of California and includes portions of San Bernardino, Riverside, and Imperial counties. It is bordered to the east by the Colorado River, to the south by the International Border, and to the west by the New York, Hack Berry, Sacramento, Step Ladder, Turtle, Arica, Granite, Little Maria, McCoy, Mule, Chocolate, and Cargo Muchacho 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 includes the region south of Lee Ferry (near Glen Canyon Dam). http://www.swrcb.ca.gov/rwqcb7/wmi.html.

**Ecosystems**

[Will collect information and develop text for later draft.]

**Climate**

Nearly all of the Colorado River Hydrologic Region has a subtropical desert climate with hot summers and generally mild winters. Average annual rainfall is very low, and precipitation ranges between 3 to 6 inches per year, most of which occurs in the winter months. However, summer storms do occur 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. Winter maximum temperatures are mild, but summer conditions are generally very hot, with more than 100 days with temperatures of higher than 100 degrees Fahrenheit each year in the Imperial Valley. [From CWP 2005]
Demographics

In 2005, the population for the region was about 711,000, which represented an increase of 18 percent from the 2000 population. More than half of the region’s population resides in the Coachella Valley, where significant urbanization has occurred. Most of the remaining population is in the Imperial Valley and in the corridor between the cities of Yucca Valley and Twentynine Palms along Highway 62. From 2000 to 2030, the California Department of Finance projects that the regional population will almost double to 1,166,550 people. Figure 11-2 provides a graphical depiction of the Colorado River region’s total population from 1960 through 2005, with projections to 2050. [From CWP 2005; additional information to be collected and text update.]

PLACEHOLDER Figure 11-2 Colorado River Hydrologic Region population, 1960 to projected 2050

[Develop tribal content: Include, enumerate (somehow acknowledge tribal communities). All federally recognized tribes have sovereign governments. BIA map indicates locations of landless tribes, which may be in process of acquiring land. Many non-federally recognized tribes are petitioning for federal status, but may be harder to identify and locate. Contact the California Native American Heritage Commission for a lists of tribal governments in a given area (county, zip codes, etc.).]

Land Use Patterns

The region is a land of unequalled agricultural bounty with a growing urban sector, and large expanses of open, wild terrain. The US Bureau of Land Management (BLM) administers a large portion of the region’s land, but many other entities also oversee significant areas.

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. There are also several areas set aside for preservation or other land management purposes, including national recreation and wilderness areas, wildlife refuges, Indian tribal reservations, and US Navy facilities.

Despite the arid conditions, significant areas of agricultural and urban land use exist in the region. Agriculture is the most prominent land use, with farming activities occurring on almost 600,000 acres annually. The largest agricultural area occurs in the Imperial Valley where more than 430,000 acres of land are farmed annually. More than 75,000 acres are farmed in the Palo Verde Valley, followed by 60,000 acres in the Coachella Valley. Smaller, but equally important agricultural operations also exist in the Bard and Mojave valleys.

[Text to follow regarding agricultural land uses in area, crop acreage, types, cattle industry etc. Update text under Update 2005’s Land Use.]

Urban land uses and acreage are expanding and co-exist with agriculture in the region. In the northern Coachella Valley, urbanization continues to expand between the cities of Palm Springs and Indio. Continued growth is also noted in other cities in the Coachella Valley, including Palm Desert, Rancho Mirage, and La Quinta. This corridor is characterized by numerous and extensively landscaped residential developments, the expansion of local business and consumer service centers, construction of luxury hotels and resort properties, and the operation of more than 100 private and public golf courses. Upscale commercial and residential expansion, which has been underway for several decades, is continuing at a robust pace. This continued growth
parallels the region’s expanding recreation and tourism industry and its growing number of retirees and part-time residents.

Smaller in scale, the region’s urban areas in the corridor between the cities of El Centro and Imperial and around the city of Calexico have also been expanding. Business and consumer services there support the population of the Imperial Valley and the neighboring Mexicali Valley.

In the Imperial and Palo Verde valleys and the southern one-half of the Coachella Valley, small to moderately sized cities and communities provide support for the surrounding agricultural and non-agricultural activities. Also, numerous single-family residential dwellings are scattered throughout the region. Many of the business and industrial sectors in the cities of Blythe, Brawley, and Indio provide services that also support this type of lifestyle.

[From CWP 2005; update.]

Regional Water Conditions

Water in the Environment

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 sea level. The Salton Sea has a concentration of total dissolved solids of about 46,000 milligrams per liter, which is about 33 percent greater than that of ocean water. Most of the environmental water demands in the region are for the Sonny Bono Salton Sea National Wildlife Refuge, California Department of Fish and Game (DFG) Imperial Wildlife Area, wetland areas on the shore of the Salton Sea, and to maintain the viability of the sea under the Quantification Settlement Agreement (QSA) through 2017. To meet conditions for the Imperial Irrigation District/San Diego County Water Authority (IID/SDCWA) transfer approved under the 2003 Colorado River QSA, from 2003 through 2017, IID will fallow enough ground to provide 800,000 acre-feet 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 2005 are expected to be about 962,000 acre-feet per year, based on estimates using the Salton Sea Accounting Model (SSAM). [From CWP 2005; update.]

[Need to collect information and develop text on the wildlife preserves around the Salton Sea for the next draft.]

Water Supplies

About 85 percent of the region’s urban and agricultural water supply comes from surface water deliveries from the Colorado River. Water from the river is delivered into the region through the All-American and Coachella canals, local diversions, and the Colorado River Aqueduct by means of an exchange for State Water Project (SWP) water. The Colorado River is an interstate and international river whose use is 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 11-1 Key elements of the Law of the River). Local surface water, groundwater, and the SWP provide the remainder of water to the region. 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. There are other alluvial valleys that have poor quality water that is not suitable for potable use.

**PLACEHOLDER Table 11-1 Key elements of the Law of the River**

In California, the Seven Party Agreement of 1931 established local agencies’ apportionments of Colorado River water, which were further defined in the Quantification Settlement Agreement of 2003 (Table 11-2, Table 11-3, Table 11-4, Table 11-5). The Secretary of the Interior apports water to California water users according to the Seven Party and the QSA. Water use that occurs within a state is charged to that state’s Colorado River apportionment. Thus, federal water uses, including uses associated with federal reserved rights (for example, tribal water rights), must also be accommodated within California’s basic apportionment of 4.4 million acre-feet per year plus one-half of any available surplus water.

[Develop tribal content: Is this where pending water rights issues to be discussed? BIA knows what tribal water rights proceedings are in progress, for example Cahuilla Band of Mission Indians (Riverside County.)]

**PLACEHOLDER: Table 11-2 Annual apportionment of use of Colorado River water**

**PLACEHOLDER: Table 11-3 Annual apportionment of water from the Colorado River mainstream to the Lower Basin**

**PLACEHOLDER: Table 11-4 Annual intrastate apportionment of water from Colorado River instream within California under the Seven Party Agreement**

**PLACEHOLDER: Table 11-5 Annual use of Colorado River water by California agencies, Quantification Settlement Agreement for priorities 1-3**

Neither Coachella Valley Water District (CVWD) nor Desert Water Agency (DWA) has facilities to take direct delivery of SWP water. Instead, both agencies have entered into exchange agreements with MWD, whereby MWD releases water from its Colorado River Aqueduct into the Whitewater River for storage in the upper Coachella Valley groundwater basin. In exchange, MWD takes delivery of an equal amount of the agencies’ SWP water. San Gorgonio Pass Water Agency (SGPWA), which serves the Banning-Beaumont area, also lacks the facilities to take delivery of SWP water into the portion of its service area that is within the Colorado River region. However, SGPWA is currently delivering SWP water into the Santa Ana planning area of the South Coast Hydrologic Region. When Phase 2 of the East Branch Extension is eventually completed, SWP water will be delivered into the Colorado River Hydrologic Region. However, the California Department of Water Resources (DWR) is still developing plans for this Phase 2 extension project (Table 11-6). (Update)

**PLACEHOLDER: Table 11-6 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. The largest water-using area in the region, the agricultural area of the Imperial Valley, is located mostly over a saline basin and therefore lacks usable groundwater.

In the Coachella Valley, groundwater levels began declining in the late 1920s due to extensive pumping. Since 1948, imported water supplies have been brought into this area from the
Colorado River via the Coachella Canal. These surface water deliveries have enabled decreased pumping of groundwater in the southeastern portion of the valley and have thus helped recharge the basin. As a result, groundwater levels rose in this part of the valley until the 1980s. Since then the groundwater levels have again declined because of urban development and increased groundwater pumping.

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 first step. In 1984, another agreement was reached among CVWD, DWA, and MWD which allowed for the 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, MWD was also permitted to bank up to 600,000 acre-feet of surface water in the groundwater basin. When withdrawals are needed, MWD will use its Colorado River surface water along with CVWD’s SWP allocations, and CVWD will then use the banked groundwater until the volume stored under this agreement is gone.

[From CWP 2005; update.]

**Water Uses**

In 2005, the estimated applied water demands for urban, agriculture, and the environment for the Colorado River region totaled______ thousand acre-feet (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 QSA and related agreements, actual agricultural water use is expected to be reduced in future years. (Figure 11-3)

PLACEHOLDER Figure 11-3 Colorado River Hydrologic Region water balance for water years 1998–2005

Almost all of the agricultural demands in the region occur in the three major agricultural areas previously described, the Imperial, Palo Verde, and Coachella valleys. The Imperial Valley, with more than 500,000 acres of crops harvested each year (including double-cropping), accounts for almost 70 percent of the total applied water demands for the region. In the Imperial and Palo Verde valleys, all agricultural demands are met with water from the Colorado River. In the Coachella Valley, agricultural demands are supplied by a combination of Colorado River surface water and groundwater. [From CWP 2005; update.]

Urban applied water demands account for about 15 percent of the overall totals for the Colorado River 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. [From CWP 2005; update.]

Despite the availability of a reliable and inexpensive water supply, water districts and users are well aware of the importance of water conservation programs to efficiently use and manage
water. The agricultural 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. [From CWP 2005; update.]

For the past 50 years, IID, the region’s largest irrigation district, has implemented programs and completed projects designed to improve the efficiency of its water conveyance system. Under the 1988 IID/MWD Water Conservation Agreement and the Approval Agreement in 1989, 15 new projects were completed. These included the construction of three lateral interceptors serving more than 83,400 acres, the building of two regulatory reservoirs and four interceptor reservoirs, concrete-lining of nearly 200 miles of lateral canals, installation of new hardware and software to upgrade the existing telemetry control on the IID conveyance system, and completion of a new, state-of-the-art Water Control Center. These infrastructure upgrades complemented existing IID programs including farmer-initiated measures, canal lining, canal seepage recovery, and regulatory reservoirs. [From CWP 2005; update.]

In addition to the improvements to its water conveyance system, IID continues to implement the 13-Point and 21-Point Water Conservation Programs. IID also provides training and technical assistance to its agricultural customers through its Irrigation Management and Monitoring program. Its most valued service has been the dissemination of information to farmers and irrigation personnel about methods to improve their irrigation operations. These programs actively promote the use of technical methods and instruments to improve irrigation efficiencies; including level basin drip systems, level basin laser-leveling, irrigation scheduling, portable pump-back and tailwater return systems, salinity assessment, and soil moisture sensors. IID also has a training program that it uses to provide growers with flow records, based on metering of the water delivered and tailwater runoff, for any particular irrigation site. [From CWP 2005; update.]

In addition to the water supply savings in the IID/MWD agreement, improvements to IID’s water distribution system and other water conservation activities conserve more than 525,000 acre-feet of water annually. Of this amount, the IID estimates that 385,000 acre-feet of the savings are attributable to the efforts by its agricultural customers. [From CWP 2005; update.]

CVWD has also made important improvements to its water conveyance system. Water is delivered to its agricultural customers through metered, underground pipelines. The conveyance system is computerized, which adds to the system’s efficiency. In addition to the infrastructure improvements, CVWD provides technical services in efficient irrigation management to its agricultural and residential customers. [From CWP 2005; update.]

The districts have also examined their water operation policies and procedures. This review has resulted in modifications in the delivery procedures that have improved efficiencies and assisted farmers in their irrigation scheduling. [From CWP 2005; update.]

PVID has installed telemetry controls for more than 132 key control structures, which has improved the management of water in its canals. Most of the fields in the PVID and other district service areas have been laser-leveled. Flattened fields help improve the uniform distribution of water. All deliveries to the PVID’s retail agricultural customers are measured, as are IID’s and CVWD’s. [From CWP 2005; update.]

PVID, IID, and CVWD, in cooperation with the University of California Cooperative Extension and DWR, have installed California Irrigation Management Information System (CIMIS) stations to collect the climatological data that agricultural water users need to estimate crop evapotranspiration of applied water (ETAW) and to develop irrigation schedules. Water users are
made aware of improvements in irrigation management and crop growing procedures through local water conservation boards and farm advisory boards. [From CWP 2005; update.]

IID, PVID, and CVWD signed a 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 and use agricultural water management plans that would improve agricultural water management and have beneficial environmental impacts within their service areas. The Agricultural Water Management Council oversees the MOU and has endorsed IID’s 2002 Agricultural Water Management Plan. [From CWP 2005; update.]

Growers in the major agricultural areas use the latest irrigation hardware and management techniques to increase both the efficiencies of their operations and crop yields. In the Imperial Valley, it is common to see drip, micro-sprinklers, and drip tape systems along with the traditional systems of furrow, basin, and hand-move sprinklers. Drip tape is most commonly used for high-market value crops such as vegetables. Drip and micro-sprinkler systems are commonly used to irrigate the citrus and subtropical fruit orchards. Currently, less than 1 percent of the total orchard acreage, mainly date palms, is flood irrigated. [From CWP 2005; update.]

In the Coachella Valley most irrigation operations with vegetables and truck crops use drip tape and hand-move sprinklers. Some furrow irrigation is still used. Citrus and subtropical fruit orchard irrigation is done with drip and micro-sprinklers; although flood or basin irrigation is still used for mature date palms. Almost all the vineyards are being irrigated by some type of drip system; only a very small portion still rely on furrow irrigation. The use of overhead sprinkler systems is a common sight in vineyards throughout the valley, where they are used for frost protection and the inducement of vine dormancy for earlier fruit-sets. [From CWP 2005; update.]

Although most of the water conservation has been directed to agriculture, water districts in the Coachella Valley provide technical assistance to the managers of large landscaped areas, such as golf courses, to evaluate and offer suggestions about irrigation hardware and operations. CVWD also provides loans to its retail customers for irrigation upgrades. DWA offers classes in English and Spanish to homeowners, property managers, and government and school personnel on irrigation efficiency strategies and tools. [From CWP 2005; update.]

Water Quality

Overarching Water Quality Issues

The Colorado River Basin Region (Region 7) covers approximately 13 million acres (20,000 square miles) in the southeast corner of California and includes all of the Imperial County, and portions of San Bernardino, Riverside, and San Diego counties. Region 7 includes 28 major watersheds or “hydrologic units,” and has water bodies of statewide, national, and international significance (e.g., the Salton Sea and the Colorado River).

There are numerous water quality issues in the various watersheds within the Colorado River Region. This section is intended to identify the highest priority water quality issues and watersheds within this region. Some of the regional specific issues and watersheds that have been identified but not prioritized are:

Issues

- 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

Watersheds

• Salton Sea Transboundary Watershed
• Colorado River
• Palo Verde Valley
[Text to be developed by WQ team]

Project Operations
[Will collect information and develop text for later draft.]

Water Governance
[Will collect information and develop text for later draft.]

Flood Management
[Text to come from flood team]:

Historic Floods
• Early flooding history:
  o Subject: 1916, 1927, 1938
  o Source: (DWR 1980).
• Significant historic floods:

Flood Hazards
• Flood Hazard List:
  o Source: GK, Local Government Staff (LGS).
• List of Flood Management Challenges:
  o Subject: urban protection, Non-urban protection, floodplain regulation, mapping, uncontrolled runoff, bridge failure, alluvial fans

Institutions
• Flood Control Types
  o Subject: Structural works, hydromet networks, emergency response, recovery
  o Source: (DWR1980) pp. 194-200, DFM Hydrology staff, GK.
• Ownership, Sponsorship, Participation and Maintenance of Major Projects
Subject: Agency list summarizing role in ownership (project initiation),
financial participation, and maintenance
Source: (DWR 1980), GK.

Emergency Response
Subject: Responsibility of SEMS, Flood Center, Corps of Engineers, FEMA
Source: Flood Center, GK, reference to SS.

Existing Flood Damage Reduction Measures
Type of facilities found in the Region
Source: Author, (DWR 1980).

Constructed Flood Protection Facilities
Subject: Tahchevah Creek Project, Banning Levee Chino Canyon
Improvements, Needles Project, Quail Wash Levee Project, White Water
River Storm Channel Project, West Magnesia Canyon Channel, Reservoirs.
Need to verify post-1980, post-1995 for USACE.
Source: (DWR 1980, pp. 228-229.) (USACE 1995), LGS.

Table, "Flood Control Reservoirs", outlined in General Instructions.doc (GI).
Subject: Lake Mead, Lake Powell, Wide Canyon Dam. Need to verify post-
1980, post-1995 for USACE.

Hydromet Systems and Stations.
Subject: Stream gages as listed in Setting other stream gages, rain gages,
snow gages. Adequacy of existing gage network.

Flood Governance
List of Governance Methods
Subject: Floodplain zoning ordinances, designated floodways (CVFCB),
county floodplain management programs
Source: (DWR 1980), LGS.

Status of Floodplain Mapping and FIRMs.
Subject: Mapped and unmapped areas, planned mapping projects, DFIRM
& Map Mod Status (Preliminary and Effective), Awareness Floodplain
Mapping, Levee Flood Protection Zones
Source: DFM Staff (Tom Christensen, 574-1407), (FEMA 2006), reference
SS for Awareness Mapping, Levee Flood Protection Zones,
http://www.fpm.water.ca.gov/mapping/awareness_mapping.cfm.

Local Government Participation in the NFIP Community Rating System.
Subject: Participating counties as listed in Appendices A and B to GI.
Source: DFM staff, reference to SS, GI.

Table, “Community Ratings for NFIP” outlined in General Instructions.doc (GI).
Subject: Palm Springs
Source: See General Instructions.doc (GI)

Operating Procedures
General Reservoir Operating Rules.
Subject: Wide Canyon Dam. Need to verify post-1980, post-1995 for
USACE.
Source: Flood Center (Corps O&M Manuals).
• Forecast-coordinated Operations Agreements
  o Source: DFM Staff
• Status of Response Agreements (See GI for description)
  o Source: Flood Center, LGS
• Available H&H models.
  o Subject: Streams outlined in "Setting"
  o Source: DFM Hydrology staff, LGS, reference to SS for Comp Study.

Emergency Procedures
• Formal Emergency Management Organization.
  o Subject: Agency participation and responsibility
  o Source: reference to SS (provided in this work)
• Table, “Response Organizations”, headings as listed in GI.
  o Source: DFM Staff, (DWR 2007), LGS.
• Recovery Resources
  o Subject: Agency participation and responsibility
  o Source: reference to SS (provided in this work)

Relationship with Other Regions
After eight years of negotiations, the signing of the QSA on October 10, 2003, facilitated a second long-term water transfer from the IID in the Colorado River Hydrologic Region to urban water users in the South Coast Hydrologic Region. It will also make possible the transfer of additional water to be obtained through lining of the All American and the Coachella canals. The water transfer from IID will help stabilize water supplies for MWD, SDCWA, and CVWD; satisfy outstanding miscellaneous and Indian water rights; and provide funding that IID and farmers in the Imperial Valley will use for additional water conservation measures once the required interim fallowing period is completed.

[From CWP 2005; update and will include:]

• delivery of SWP water supplies: agreements, future facilities
• water districts in both regions cooperating in water conservation and land fallowing programs.
• MWD providing technical and financial assistance to PVID

[Text to be developed by flood team:]

• inter-regional flood management coordination (Omit if none).
  o Subject: None listed at this time
Source: DFM Staff, LGS, reference to SS.

Regional Water and Flood Planning and Management
[Develop tribal content: Major issues that involve tribes may already be included, e.g, TROA, Mono Lake, and Klamath River, etc. Name tribal governments involved, as involved agencies also are named.]
An extremely fortunate, naturally occurring quirk makes the Coachella Valley an oasis in the desert. A vast underground aquifer has kept the desert wet as the water situation becomes increasingly desperate throughout California and the western United States.

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 cut by about one-third after a recent federal court ruling, affecting 25-million Californians. And the worst drought in 500 years has flows on the Colorado about half of normal.

Years after desert farmers slashed their water use, the Coachella Valley Water District is trying to do its part for water conservation by 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.

Water levels in the Borrego Valley have been declining since 1945, from 3 to 5 feet per year. Outside sources of imported water have been pursued and declined for lack of entitlement and/or funding for infrastructure.

**Integrated Regional Water Management**

[Generally describe the portions of area covered by IRWMs in this HR. Name the IRWM efforts and give short status. Discuss objectives and main water management strategies to meet objectives and then summarize to the HR level. In this HR, these are the main objectives, these are the water management strategies to meet those objectives.]

There are three Integrated Regional Water Management (IRWM) planning efforts in the Colorado River Hydrologic Region at varying stages of function and development. These IRWMs cover approximately one-half of the hydrologic region with the eastern portion currently void of IRWM planning efforts. The IRWM planning efforts in the region are:

- Mojave Water Agency IRWM
- Salton Sea
- Desert Hot Springs/Coachella Valley

The Mojave Water Agency IRWM covers the northwestern corner of the Colorado River HR with the majority of the management area in the South Lahontan HR. It is a developed IRWM that is implementing projects. The Salton Sea effort, is currently focused on the restoration of the Salton Sea, and will eventually work towards an IRWM plan. Desert Hot Springs and Coachella Valley have been engaged in discussions to form an IRWM plan.

[Discuss objectives and water management strategies in the region]

**PLACEHOLDER: Figure 11-xx Areas within Colorado River Hydrologic Region covered by IRWM planning efforts (map)**

[Text to come from flood team]:

- Flood Management provisions in IRWMs
Accomplishments

Implementation of Quantification Settlement Agreement

[Reference – Colorado River Board]

Over the past 20 years, several large-scale water conservation actions involving Colorado River water users have been completed, as shown in Table 11-7 [update]. Since 1993, development and implementation of these programs and projects have included consideration of environmental issues and environmental justice values. [From CWP 2005; update.]

PLACEHOLDER Table 11-7 Existing Colorado River Hydrologic Region water conservation actions/agreements since 1980


Coachella Valley Water District’s water conservation ordinance has reduced water used in the desert by 37 percent. It also encouraged the use of smart irrigation timers; outdoor irrigation comprises about 70 percent of home water use in the desert. Smart controllers can reduce water usage by 26 percent. The district is also encouraging customers – with monetary incentives in the case of a cooperative program in La Quinta – to replace all or part of water-guzzling lawns with desert-friendly landscaping.

[Text to come from flood team]:

• Brief descriptions of significant flood management accomplishments, particularly recent accomplishments. Include years of completion or establishment.

  o Source: Text, reference to SS.

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 is 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.

In 1993, the US Fish and Wildlife Service (USFWS) published a draft recovery implementation plan for endangered fish in the upper Colorado River Basin. The draft plan included protecting instream flows, restoring habitat, reducing impacts of introduced fish and sportsfish management, conserving genetic integrity, monitoring habitat and populations, and increasing public awareness of the role and importance of native fish.
Text under Update 2005 State of the Region/Challenges regarding Colorado River fish and habitat will be included here and updated to current status, including above program and the following:

- Problems facing native fish in the mainstem Colorado River and its tributaries
- Re-establishing wild populations from hatchery stocks will have to be managed in unison with programs that manage river habitat.
- Instream flows in the mainstem and key tributaries

In the Lower Colorado River Basin, representatives of the three states, federal agencies, several Native American tribes, and Colorado River water and power users have completed and signed the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). The LCR MSCP is intended to provide long-term compliance with the federal and California Endangered Species Acts, as well as the fully protected species statutes in California.

[From CWP 2005; update, perhaps expanded.]

The Salton Sea, with its increasing salinity, selenium contamination, and eutrophication, 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 New River has been described as the most polluted river in the United States. Originating in Mexicali, Mexico, the New River flows across the border, through the city of Calexico, and then north, and empties into the Salton Sea. It conveys urban runoff, untreated and partially treated municipal and industrial wastes from the Mexicali Valley, and agricultural runoff from the Mexicali and Imperial valleys. These pollution sources contribute pesticides, pathogens, silt, nutrients, trash, and volatile organic compounds (the latter, primarily from Mexican industry) to the sea. The Alamo River, which originates just 2 miles south of the border and also flows north to the Salton Sea, 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.

A multiagency group, The Citizen’s Congressional Task Force on the New River, was created in 1997. Its mission is to improve agricultural drain water quality that flows into the New River and, ultimately, to the Salton Sea. Participating agencies include IID, Desert Wildlife Unlimited, County of Imperial, USBR, US Geological Survey, US Forestry Service, DFG, California Regional Water Quality Control Board, EPA, Ducks Unlimited, and UC Riverside. In 2000, the task force constructed 2 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, up to 30 additional wetland sites are proposed on both the New and Alamo rivers. Additional information on this program can be found on the task force web site at http://www.newriverwetlands.com/.

Contamination in the Salton Sea presents threats to migrating birds on the Pacific Flyway. At certain times of the year, nutrient loading to the sea supports large algal blooms that contribute to odors, as well as low dissolved oxygen levels which adversely affect fisheries. Selenium is a more recent constituent of concern and has the potential to adversely affect fish and wildlife.

[From CWP 2005; update.]
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, resulting from a PG&E natural gas compressing station. 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 and in the Cathedral City Cove area. In the Coachella Valley, high levels of nitrates restrict the use of several domestic water supply wells.

To address the issue of declining groundwater levels, CVWD prepared a water management plan for the lower Coachella Valley. The plan considered alternatives that include basin adjudication, water conservation, water recycling, and direct or in lieu recharge with water imported from the Colorado River or from the SWP. This plan was completed and approved in 2002.

[From CWP 2005; update.]

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 905,000 acre-feet of annual diversions, 131,400 acre-feet of which were allocated for diversion in and chargeable to California pursuant to a later supplemental decree. In 1978, the tribes asked the court to grant them additional water rights, alleging that the United States failed to claim a sufficient amount of irrigable acreage, called omitted lands, in the earlier litigation. The tribes also raised claims, called boundary land claims, for more water based on allegedly larger reservation boundaries than had been assumed by the court in its initial award. In 1982, a Special Master appointed by the Supreme Court to hear these claims recommended that additional water rights be granted to the tribes. In 1983, however, the US Supreme Court rejected the claims for omitted lands from further consideration and ruled that the claims for boundary lands could not be resolved until disputed boundaries were finally determined.

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 acre-feet 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.

[From CWP 2005; update.]

PLACEHOLDER BOX 11-XX Implementation of Quantification Settlement Agreement

[Update box information that appeared in Update 2005. New text to discuss challenges since 2005 Update and IRWM challenges]

[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.]
Flood text to come from flood team:

- Challenges in ameliorating the hazards listed above.
  - Source: DFM Staff, Author.

Drought and Flood Planning

Flood text to be added by flood team:

- Regional Flood Plans or Flood Planning Agencies
  - Subject: RFCWCD, Maricopa County Flood Control District
  - FloodSAFE regional flood management plans.
  - Source: Reference to SS
  - Multi-county projects.

Looking to the Future

Text to be developed and also updated from CWP 2005

- Actions and policies following Colorado River QSA, including status of land fallowing.
- Implementation by ag 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

[Develop tribal content: Mention if something pending in tribal water rights. Tribal water rights that have not been quantified could be the sleeping giant throughout the western states. As tribes look to the future of their communities, their own economic survival may be played out in water rights proceedings. Some may simply buy from wholesale or retail water agencies.]

Future Scenarios

Will collect information and develop text for later draft.

Climate Change

Text to come from flood team:

- Subject: Precipitation Studies.
  - Source: DFM Hydrology Staff (Tom Christiansen), reference to SS.

Response Strategies

New Water Storage and Conveyance Facilities

California, Arizona, and Nevada have agreed to share the cost in the construction of a new reservoir near the City of Yuma, on the California. The facility will capture and store, for a short-term, unused water supplies from the Colorado River before it enters into Mexico. The facility will have a capacity of 8,000 acre-feet. The water supplies diverted into the reservoir will then be delivered to users at the end of the river. It will also help keep more water in Lake Mead.
(Reference: Arizona Republic, January 12, 2008. Will collect additional information and update for next draft.)

[Flood text to come from flood team]:

- **Subject**: Studies to be developed
- **Source**: DFM Staff, Text ("Flood Hazards", "Challenges"), Author.

**Implementation Next Steps**

[Text to be developed]

[Some text to come from flood team]:

- Steps to improve any aspect of flood management in the region.
- **Source**: DFM Staff, Text ("Flood Hazards", “Challenges”, and “Response Strategies”), Author.

**Water Portfolios from 1998–2005**

[Text to be developed and updated from Update 2005]

PLACEHOLDER: Table 11-8 Colorado River Hydrologic Region water balance summary (taf), 1998–2005

PLACEHOLDER: Table 11-9 Colorado River Hydrologic Region water use and distribution of dedicated supplies (taf), 1998–2005

PLACEHOLDER: Table 11-10 Colorado River Hydrologic Region water portfolio (taf)

PLACEHOLDER: Figure 11-4 Colorado River Hydrologic Region—illustrated water flow diagram

PLACEHOLDER: Figure 11-5 Colorado River Hydrologic Region—schematic flow diagram

**Selected References**

**Watersheds**


**Water Quality**

2002 California 305(b) Report on Water Quality, State Water Resources Control Board

Strategic Plan, State Water Resources Control Board, Regional Water Quality Control Boards, November 15, 2001

Water Quality Control Plan, Regional Water Quality Control Boards

Watershed Management Initiative Chapter, Regional Water Quality Control Boards

WMI for Colorado River Water Quality Control Board - Updated October 2004

**Flood Management**


