Colorado Main Stem South Planning Area

Background

The Colorado Main Stem South Planning Area is located in the far southwest corner of the state along the Colorado River sharing political boundaries with the State of California to the west and the international border with the Mexican states of Baja California Norte and Sonora at the southwest corner and along the southern boundary, respectively. The Planning Area lies within Yuma and La Paz counties. The Planning Area consists of two groundwater basins, the Yuma Basin to the south and the Parker Basin to the north. Communities in the Colorado Main Stem South Planning Area include the cities of Yuma, San Luis, Parker, Quartzsite, and Ehrenberg. There are three Indian Reservations within the Planning Area, the Cocopah, Fort Yuma Quechan, and the Colorado River Indian Tribes[1].

The majority of the land within Colorado Main Stem South Planning Area is owned and managed by federal agencies (over 80 percent), dominated by the Department of Defense (over 35 percent) operating the Barry M. Goldwater Air Force Range, the Yuma Marine Corps Air Station and the Yuma Proving Ground (*see Figure P.A. 8-1*). The US Bureau of Land Management (BLM) has nearly 29 percent of the lands in the Planning Area, including portions of three Wilderness areas; the land use is primarily resource conservation, recreation, irrigated agriculture and livestock grazing. The remaining federal lands are controlled by the US Fish and Wildlife Service (FWS) - 4.65 percent; the US Bureau of Reclamation (Reclamation) - 2.5 percent; and three Indian communities - 8.95 percent. Approximately 14.55 percent of the land is in private ownership and State Trust Lands comprise approximately 4.8 percent, primarily in agricultural production. These private and State controlled lands are concentrated together in the central and western portions of the Yuma Basin, near the existing population centers, and in the northern portion of the Parker Basin east of the Colorado River Indian Tribe lands.

Water Supply Conditions

Water supplies in the Colorado Main Stem South Planning Area are dominated by the Colorado River. As such, this section will first focus on the Colorado River, as it impacts the availability and operation of all other available water supplies.

Colorado River

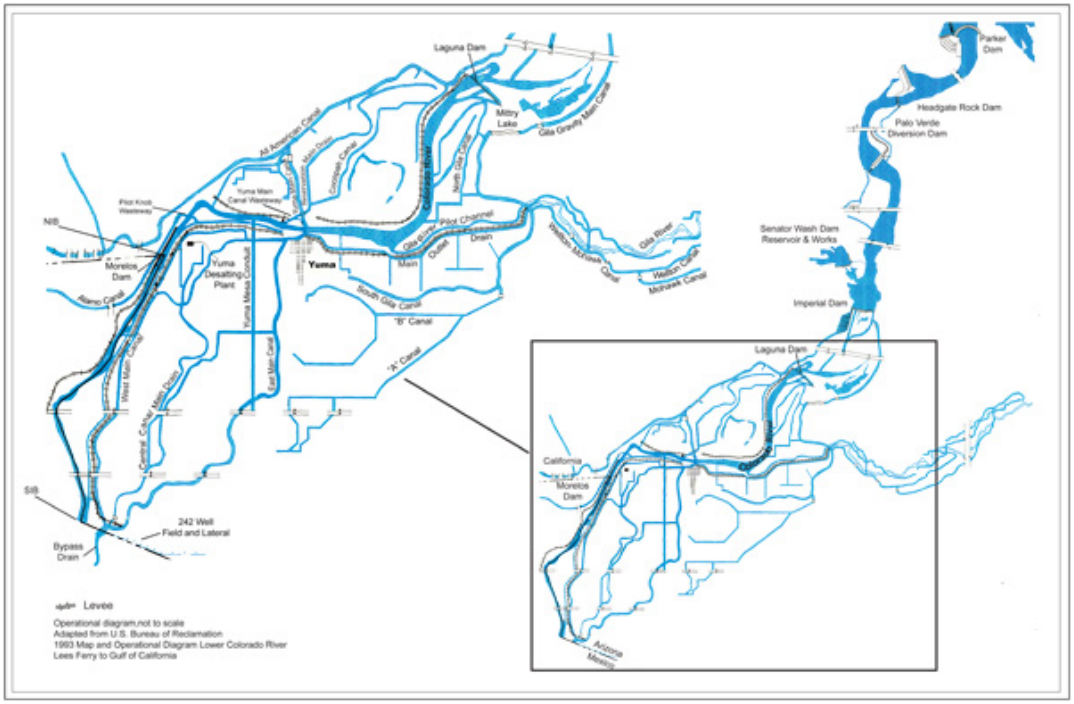
The Colorado River flows through the Planning Area for about 200 miles south from Parker Dam to Mexico at the Southerly International Boundary (SIB) within the Planning Area. Four large dams on the River significantly impact the river's flow within the Planning Area (*see Figure P.A. 8-2- Operational Diagram of the Colorado River – Colorado Main Stem South Planning Area*). These dams are, from north to south, Parker, Imperial, Laguna and Morelos. Additionally, there are major diversions at Imperial Dam to the All-American Canal, which delivers agricultural water to California and Arizona water users and to the Gila Gravity Main Canal for use in Arizona (in both the Colorado Main Stem South and the Lower Gila Planning Areas). Additional smaller dams and check structures are present in this reach.

[1] The Colorado River Indian Tribes include the Mohave, Chemehuevi, Hopi and Navajo.

Median and mean flow at the gage below Parker Dam is 7.2 and 8.9 MAF, respectively. The highest maximum annual flow (20.4 MAF) in the watershed was reported at this gage in 1984.

The majority of the flow in the Colorado River is diverted at Imperial Dam. The three operating gages below the Imperial Dam diversions report mean flows substantially greater than median flows. For example, the median and mean flow on the Colorado River below Laguna Dam is 0.39 MAF and 1.8 MAF, respectively. Tributary drainages to the Colorado River in the Planning Area are ephemeral and contribute little to River flow, with the occasional exception of the Gila River, which flows only in response to significant precipitation events, irrigation return flow or releases from upstream dams.

Figure P.A. 8- 2. Operational Diagram of the Colorado River – Colorado Main Stem South Planning Area



The right or authorization to beneficially use Colorado River water is defined as an entitlement created by decree of the United States Supreme Court in Arizona v. California[2] (Decree), through a contract with the U.S. Secretary of the Interior (Secretary) under Section 5 of the Boulder Canyon Project Act (1928), or by Secretarial Reservation[3]. Because the direction and occurrence of groundwater is strongly influence by the amount of streamflow in the Colorado River, the US Bureau of Reclamation (Reclamation) has made a preliminary delineation of the lateral and vertical extent of the Colorado River aquifer to provide a basis for accounting of withdrawals against River water allocations. On July 16, 2008, Reclamation proposed to develop a rule for *Regulating Non-Contract Use of Colorado River Water in the Lower Basin* (Federal Register 40916, et. seq.) to prevent non-contract Colorado River water use from depleting the River and reducing water supplies available to holders of Colorado River

[2] 373 U.S. 546 (1963)
[3] Secretarial Reservation" means water rights created by the Interior Secretary for the use of federal establishments under federal law. Examples of Secretarial Reservations are mainstem water rights reserved for National Wildlife Refuges, Indian Tribes and certain public lands administered by the Bureau of Land Management.

entitlements. Reclamation's most current assessment indicates that most existing non-contract use is through water withdrawn from wells located in the hydraulically connected aquifer of the Colorado River or direct diversion via river pumps. The proposed rule would establish a methodology for Reclamation to determine if a well is pumping Colorado River water and a process for a water user to appeal such a finding. At present, Reclamation has not adopted the proposed rule.

Groundwater

The Colorado Main Stem South Planning Area is located in the Basin and Range Physiographic Province. This province is characterized by long broad alluvial valleys separated by mountain ranges, with thick productive regional alluvial aquifers. Groundwater within the Parker Basin is largely found within recent stream alluvium and sedimentary rock formations. Groundwater in storage is estimated to be 14 MAF. Groundwater within the Yuma Basin is usually found within productive basin-fill with relatively shallow groundwater levels. Groundwater in storage is estimated to be 49 MAF.

Significant drainage infrastructure is operated in the Yuma Basin to control groundwater levels and salinity which facilitates utilization of Colorado River water for production agriculture (*see Figure P.A. 8-3 - Yuma area drainage fields and conduit systems*). In order to keep salts from accumulating in the root zone of crops, drainage wells to pump excess irrigation water have been installed throughout the Yuma Basin. Roughly 140,000 acre-feet of groundwater is pumped annually and flows in drainage canals into and through the Colorado Main Stem South Planning Area to Mexico. Groundwater pumped from the less saline Minute 242 Well Field is used, as needed, to reduce the salinity of the drainage water delivered to Mexico at the Boundary Pumping Plant (*described in more detail below in Characteristics Affecting Projected Water Demands and Supply Availability – Salinity*).

Reclaimed Water

There are numerous waste water treatment plants (WWTP) within the Planning Area. In total, 15,200 acre-feet per year of reclaimed water is generated. Reuse in the Planning Area is limited, with less than 700 acre-feet used annually as a partial water supply for six golf courses in the Yuma Basin and one golf course in the Parker Basin. The remaining reclaimed water is either discharged into the Colorado River or disposed of through pond evaporation/infiltration basins. The City of Yuma is the largest potable water provider, with Priority 1 and Priority 3 Colorado River water annual consumptive use entitlements totaling 50,000 acre-feet. The City increases its Colorado River diversions by generating return flow credits through the discharge of reclaimed water to the River following treatment.

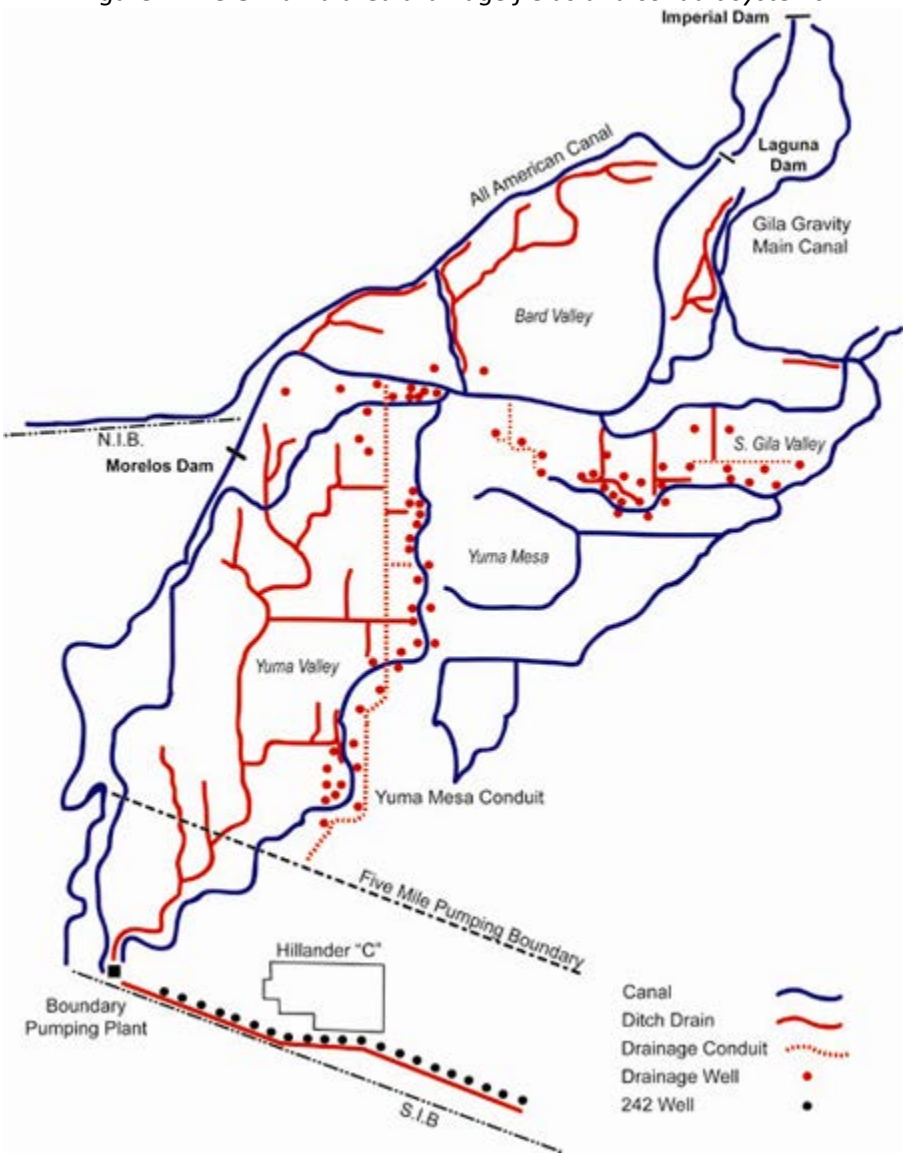
Ecological Resources

There are several protected and wilderness areas, as well as, significant stretches of designated critical habitat within the Planning Area (*see Figure P.A. 8-4*). Protected areas in this Planning Area include:

- Portions of the Cibola National Wildlife Refuge, which straddles the Colorado River, with almost 13,000 acres located in the Parker Basin and the remainder in California;
- Portions of the National Wildlife Refuge, at 665,400 acres, primarily designated as wilderness (including lands within the West Basins and Lower Gila Planning Areas); and
- A significant portion of the Imperial National Wildlife Refuge, at almost 25,800 acres, of which 15,000 acres is designated wilderness (including lands within the Lower Gila Planning Area).

Additional BLM wilderness areas include the Trigo Mountain, Gibraltar Mountain and Cactus Plain Wilderness.

Figure P.A. 8-3. Yuma area drainage fields and conduit systems



Water Demands

Table P.A. 8-1 below illustrates the baseline and projected demands for the Colorado River Main Stem South Planning Area. The Planning Area contains one of the largest agricultural areas in Arizona and the Nation. Over 150,000 acres in the Planning Area are in agricultural production, primarily irrigated by water diverted from the Colorado River to: the Colorado River Indian Tribes, Cibola Valley Irrigation and Drainage District (IDD), the Cocopah Tribe, Fort Yuma Quechan Tribe, Yuma-Mesa IDD, North Gila Irrigation District (ID), Yuma ID, Yuma County Water Users Association, Unit B, Gila Monster Farms, and Highlander C (groundwater). Yuma County, which contains most of the privately owned agricultural lands in the Planning Area, is considered the nation's winter vegetable capital. Crops include head and leaf lettuce, romaine, broccoli, cauliflower, honeydew, cantaloupe, watermelon, cabbage, spring mix,

celery, endive/escarole, as well as citrus including lemons, oranges, grapefruit, and tangerines. Many seed crops are also grown including broccoli, cauliflower, grasses, and onions. In Yuma County, annual agricultural sales in 2011 were reported to total just under $1.3 billion (including WMIDD in the Lower Gila Planning Area) and account for 29 percent of the State's total cash receipts from the agricultural sector[4]. In La Paz County, upland cotton is the largest crop, followed by Durum wheat, barley, corn for grain, and alfalfa. Other crops include onions, honeydews, cantaloupe and watermelon. Annual agricultural sales in LaPaz County are reported to total over $178 million, four percent of Arizona's agricultural cash receipts (2011)[5]. Much of this irrigation occurs on the lands of the Colorado River Indian Tribe. Agricultural demands are expected to remain stable through the planning period[6].

Municipal and Industrial demands rely on a combination of Colorado River water and groundwater. The City of Yuma is the largest water provider, with 50,000 acre-feet of Priority 1 and Priority 3 Colorado River water annual consumptive use entitlements. Parker's Municipal System pumped almost 1,000 acre-feet in 2006 from three wells pumping Colorado River water. The town has 630 acre-feet of Priority 1 entitlement and a combined volume of 3,030 acre-feet of 4th, 5th and 6th Priority water. Brooke Water LLC is the largest water provider in the Parker Strip and has an entitlement for 360 acre-feet of Priority 1 and 440 acre-feet of Priority 4 water. Municipal demands are expected to grow through the planning period, including demands associated with significant seasonal population (wintertime "residents") and recreational tourism at the Colorado River.

Industrial demands are anticipated to increase given water supply availability and the anticipated demand for new electrical power production and rock product mining to meet construction needs for new growth.

Characteristics Affecting Projected Water Demands and Supply Availability

Land Ownership

Because of the large areas of land in federal ownership, it is not anticipated that significant development will occur outside of the current population and agricultural centers. There is some potential for growth on the remaining undeveloped private lands and State Trust lands. Additionally, many of the federally-owned lands provide habitat for both listed and non-listed species as well as recreational opportunities that are increasingly important to the economy of this region. As projected growth occurs, it will have to do so in a manner that is compatible with these resources and uses.

Colorado River Entitlement Priority

Rights to Colorado River water in Arizona are based on the following priority levels:

a. 1st Priority: Satisfaction of Present Perfected Rights as defined in the Arizona v. California decree (pre-1928);
b. 2nd Priority: Satisfaction of Secretarial Reservations and Perfected Rights established prior to September 30, 1968;

[4] AZ Department of Agriculture
[5] AZ Department of Agriculture
[6] Demands are expressed in consumptive use of Colorado River supplies and groundwater which differs from the WRDC projections which were expressed as diversions.

c. 3rd Priority: Satisfaction of entitlements pursuant to contracts between the United States and water users in Arizona executed on or before September 30, 1968 (2nd and 3rd priority are coequal);
d. 4th Priority: i) Contracts, Secretarial Reservations and other arrangements between the U.S. and water users in Arizona entered into after September 30, 1968, for a total quantity not to exceed 164,652 acre-feet of diversions annually and ii) contract No. 14-06-W-245, dated December 15, 1972, as amended, between the United States and the Central Arizona Project (CAP). Entitlements having a 4th priority as described in (i) and (ii) are coequal;
e. 5th Priority: Unused Arizona entitlement; and
f. 6th Priority: Surplus water

Table P.A. 8-1. Projected Demands (in acre feet) – Colorado River Main Stem South

Sector	2010	2035	2060
Agriculture	900,500	900,500	900,500
Dairy	0	0	0
Feedlot	0	0	0
Municipal	49,480	81,635	99,444
Other Industrial	1,178	1,178	1,178
Mining	0		
High		300	300
Low		300	300
Power Plants	658		
High		9,763	16,173
Low		7,624	12,599
Rock Production	238		
High		3,931	4,790
Low		1,638	1,995
Turf	441		
High		756	794
Low		476	584
Total (High)	**952,495**	**998,063**	**1,023,179**
Total (Low)	**952,495**	**993,351**	**1,016,600**

Within the Planning Area, entitlement holders with a 1st Priority or Present Perfected Rights include: the Cocopah Indian Reservation; Colorado River Indian Tribes Reservation; Fort Yuma Indian Reservation; Yuma County Water Users' Association; North Gila Valley Irrigation District; Unit "B" Irrigation and Drainage District; the City of Yuma and the Town of Parker. Second and 3rd priority entitlement holders (which are coequal), include the Imperial and Cibola National Wildlife Refuges,

Yuma Proving Grounds, the Marine Corps Air Station–Yuma, and others. Fourth priority entitlement holders include the Town of Parker and Brooke LLC, and are, like the CAP, junior in priority to California and subject to possible reductions in the event of a shortage on the River.

Salinity

As a result of operation of the Colorado River, including construction of dams along the mainstem and the need to dewater the highly productive agricultural regions, salinity levels have increased in the river. To address the on-going salinity issue, in 1974 Congress enacted the Colorado River Salinity Control Act, which authorized the construction, operation, and maintenance of works in the Colorado River Basin to control the salinity of water delivered to Mexico – including the Yuma Desalination Plant (YDP) and the Minute 242 Well Field in Arizona[7].

The Yuma Desalination Plant (YDP) was constructed to desalinate the drainage water from the Yuma area so that it could be returned to the mainstem and accounted for as deliveries towards Mexico's apportionment. The YDP was completed in 1992 and designed to treat up to 96,000 acre-feet per year. It operated briefly in 1993 and was then placed on standby status because high flows in the Colorado River made it unnecessary to operate the plant. A 90-day demonstration run was conducted in 2007 and an additional year-long pilot run of the YDP at one-third capacity was conducted in May 2010 to assess the suitability of the treatment process and define its long-term design. The pilot run included a monitoring program that evaluated impacts to the wildlife and habitat associated with the Cienega de Santa Clara. Today, the YDP remains on standby status and WMIDD drainage water is discharged to the Main Outlet Drain Extension and its bypass extension in Mexico and delivered to the Santa Clara Slough (Cienega de Santa Clara).

The Protective and Regulatory Pumping Unit, consisting of the "242 Well Field and Lateral" is located east of San Luis in a five-mile wide protected and regulated zone and consists of 35 wells, the 242 Lateral and other connecting laterals. The well field intercepts part of the groundwater flow, including irrigation drainage water flowing south towards Mexico from the Yuma Mesa. Water pumped from the well field is delivered at the Boundary Pumping Plant (Southerly International Boundary or "SIB") to Mexico through the 242 Lateral and other laterals in partial fulfillment of international treaty obligations for Colorado River water deliveries.

Water Management

The Colorado River Main Stem South Planning Area is not within any State administered water management area, such as an Active Management Area or Irrigation Non-expansion Area that requires additional water management or reporting. Water use along the main stem of the Colorado River is administered by the US BOR under contract with Arizona water users.

Because of the relatively high priority Colorado River entitlements held by the agricultural districts in the Planning Area, entities may be exploring the potential for water transfers for use within other parts of the State. While it is legal to transfer Colorado River water within Arizona, it does require consultation with ADWR, a recommendation from ADWR to the Secretary of the Interior, and approval of the transfer by the Secretary. Consultation and recommendations by ADWR are required by A.R.S. §45-107(D) and

[7] *Public Law 93-320*

are executed through its *Policy and Procedures for Transferring an Entitlement of Colorado River Water*[8]. Generally the policy requires that if the proposed transfer involves water associated with lands located within an irrigation district, the district must approve the transfer; city and/or county economic impacts should be considered; and environmental compliance may be required.

Within the Planning Area, the Cibola Valley Irrigation and Drainage District has assigned a portion of its entitlement to the Mohave County Water Authority for the Hopi Tribe (Colorado River Main Stem North Planning Area), and to Cibola Resources, LLC for municipal use at Ehrenberg (within the Planning Area). Additionally, the Yuma Mesa Irrigation District entered into a short-term, pilot program with the Central Arizona Groundwater Replenishment District in 2013 to analyze land fallowing and development of water supplies for possible future transfers. Colorado River water developed through this pilot-program will remain in Lake Mead and is not considered a transfer.

Proactive Environmental Compliance

Actions related to operation of the Lower Colorado River water delivery and electrical power generation systems by both federal and non-federal entities may affect listed species and habitat, or contribute to the listing of additional species in the future. The Endangered Species Act (ESA) directs federal agencies to support the conservation of listed threatened and endangered species and to make sure that their actions do not jeopardize the continued existence of listed species or result in adverse modification of critical habitat. To comply with the requirements of the ESA, state and federal water, power and wildlife interests voluntarily created the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). The LCR MSCP is a cooperative, habitat conservation program (HCP) that identifies specific measures to address the needs of 26 threatened, endangered and other species that rely on habitat associated with the lower Colorado River. Its purposes include: 1) protection of habitat while ensuring current Colorado River water and power operations; 2) addressing the needs of listed species under the ESA; and 3) reduction of the likelihood of listing additional species along the Colorado River.

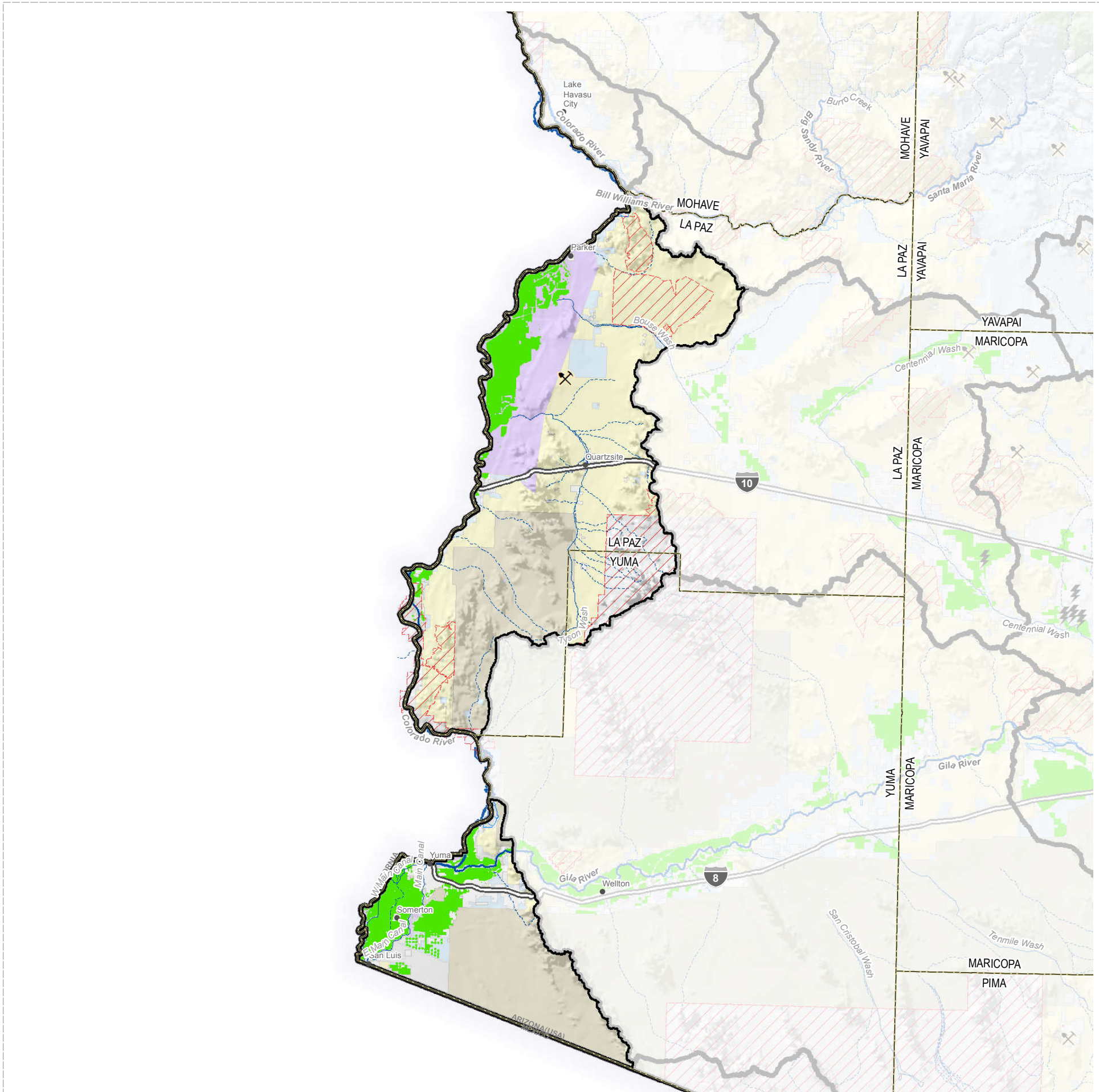
Implementation of the LCR MSCP began in 2005. The program area extends from the full pool elevation of Lake Mead to the Southerly International Boundary with Mexico, a distance of 400 river miles, and includes the historical floodplain of the Colorado River. The LCR MSCP is intended to serve as a coordinated and comprehensive conservation approach for a 50-year period and, therefore, includes measures for species not currently listed that may become listed in the future. Implementation of the program is funded by a partnership of state, federal and other public and private stakeholders in Arizona, California and Nevada. The plan will create riparian, marsh and backwater habitat for six federally listed species, and 20 other native species, including conservation programs for razorback sucker and bonytail chub, both federally listed endangered species.

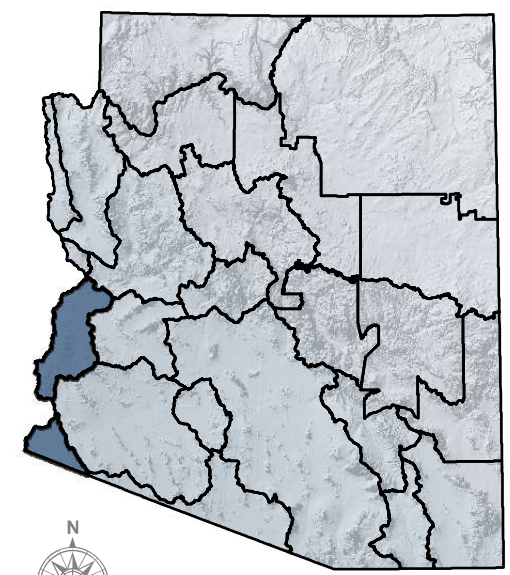
Strategies for Meeting Future Water Demands

Sufficient groundwater (that may need to be treated to meet water quality standards due to very high TDS in some parts of the Planning Area) and Colorado River supplies are expected to be available to meet the projected demands in the Colorado River Main Stem South Planning Area through the planning period.

[8] **http://www.azwater.gov/AzDWR/StateWidePlanning/CRM/documents/CR7new.pdf**

NOTE: Because GIS data for this project were acquired from multiple sources employing different land base grids and varying accuracy standards, some inconsistencies were encountered.
The user is responsible for understanding the accuracy limitations of GIS data layers and is responsible for the results of any application of the data for other than their intended purpose.





MAP LOCATION
(Planning Area Boundaries)

- Planning Area (ADWR)
- State (ALRIS)
- County (ALRIS)
- River or Stream (ASLD)
- Interstate (ADOT)
- Population Center (GNIS)
- Mine (ADMMR, ADWR)
- Hydroelectric Power Plant (ADEQ, ADWR)
- Thermoelectric Power Plant (ADEQ, ADWR)
- Agriculture (SWReGAP, 2004)
- Federal Conservation Land (USFS, BLM, NPS)
- State Managed Conservation Land (AZGFD, AZSP)
- BLM Land
- National Forest
- National Park
- Military Reserve
- Private and Other Land
- State Trust Land
- Tribal Land

Figure P.A.8-1

Colorado Main Stem South Land Ownership

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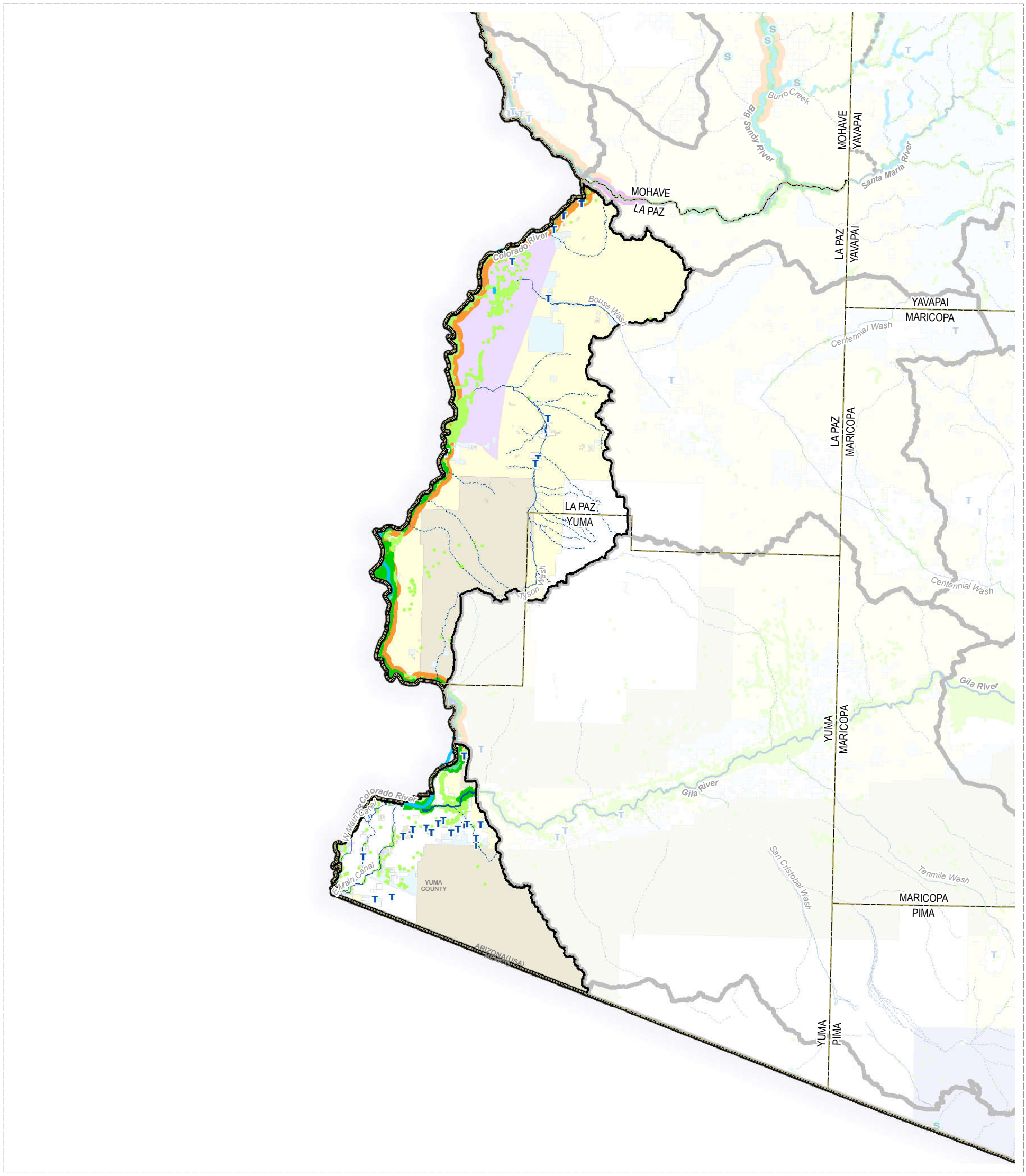
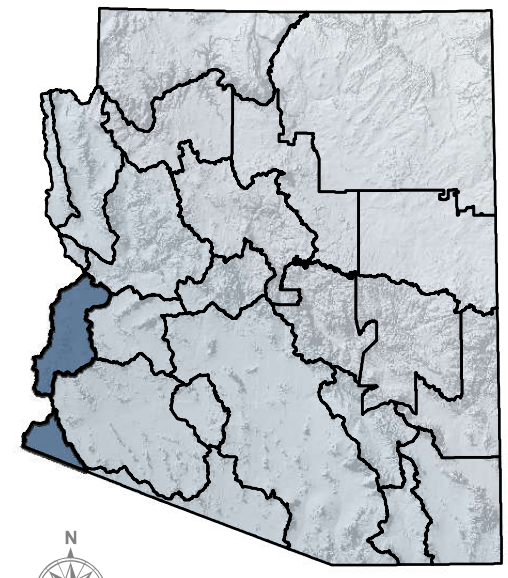




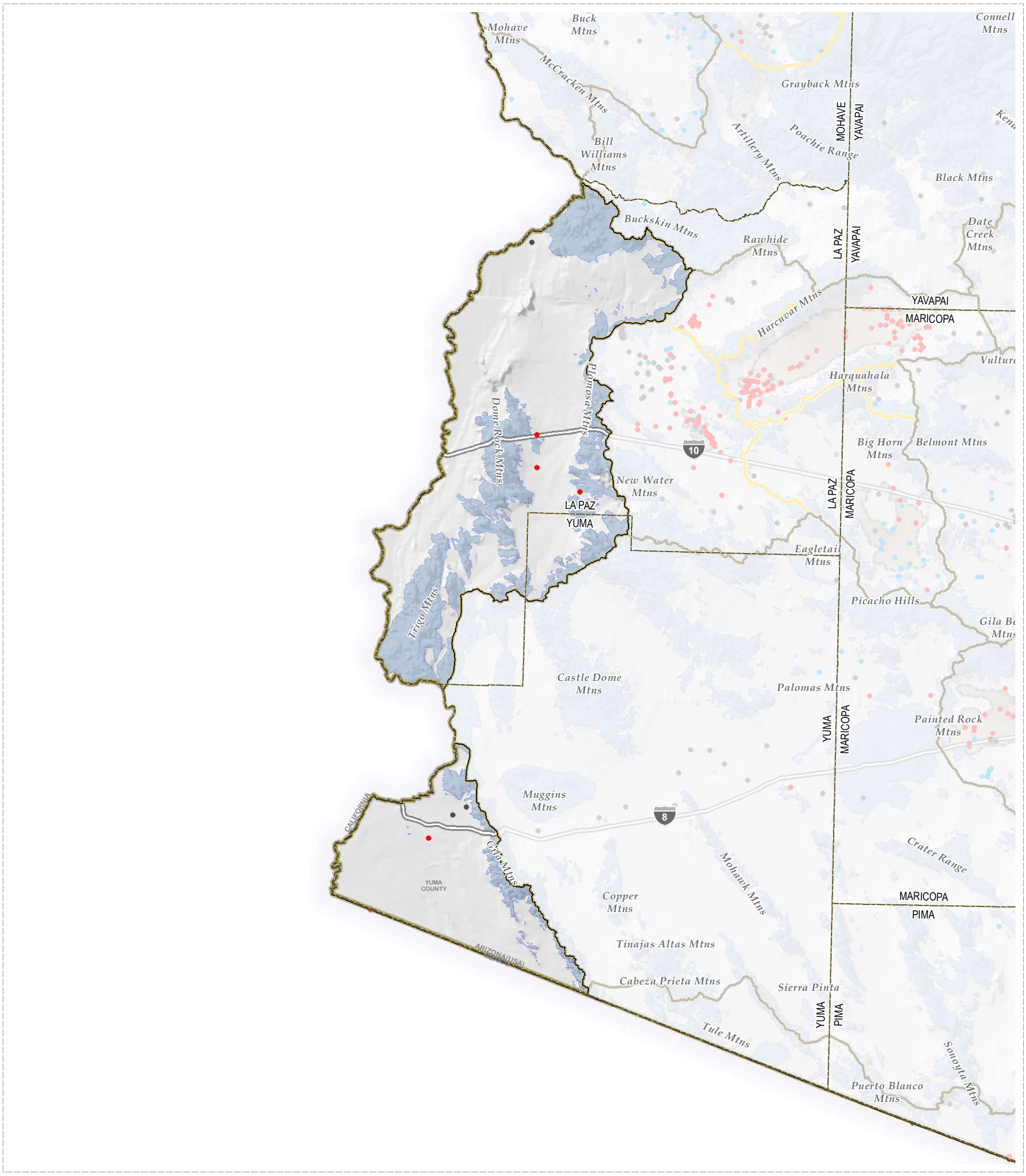
MAP LOCATION
(Planning Area Boundaries)

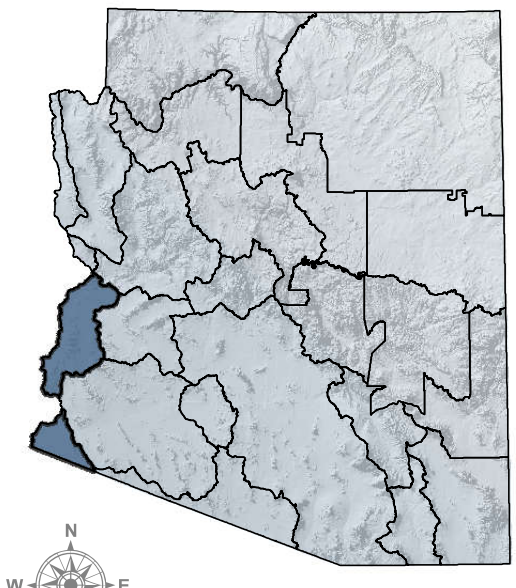
- Planning Area (ADWR)
- State (ALRIS)
- County (ALRIS)
- Reservoir or Lake (NHD)
- T Waste Water Treatment Plant (ADEQ)
- S Major Spring (ADWR, Pima County)
- Perennial Flow (ADEQ, USGS)
- River or Stream (ASLD)
- Outstanding Arizona Water (ADEQ)
- Effluent Dependent Stream (ADWR, NEMO)
- Instream Flow Certificate (ADWR)
- 1993 Riparian Inventory (AZGFD)
- Modeled Riparian Habitat (AZGFD)
- Designated ESA Critical Habitat (USFWS)
- Proposed ESA Critical Habitat (USFWS)
- Federally Designated Wild and Scenic River (USFS)
- BLM Land
- National Forest
- National Park
- Military Reserve
- Private and Other Land
- State Trust Land
- Tribal Land

ARIZONA DEPARTMENT of WATER RESOURCES EST. 1980

Figure P.A.8-4 **Colorado Main Stem South**
Surface Water and Natural Features

NOTE: Because GIS data for this project were acquired from multiple sources employing different land base grids and varying accuracy standards, some inconsistencies were encountered.
The user is responsible for understanding the accuracy limitations of GIS data layers and is responsible for the results of any application of the data for other than their intended purpose.





MAP LOCATION
(Planning Area Boundaries)

- Planning Area (ADWR)
- State (ALRIS)
- County (ALRIS)
- Groundwater Basin (ADWR)
- Area of Active Land Subsidence (ADWR)
- Hard Rock Geology (AZ Bureau of Mines, UofA)
- Interstate (ADOT)

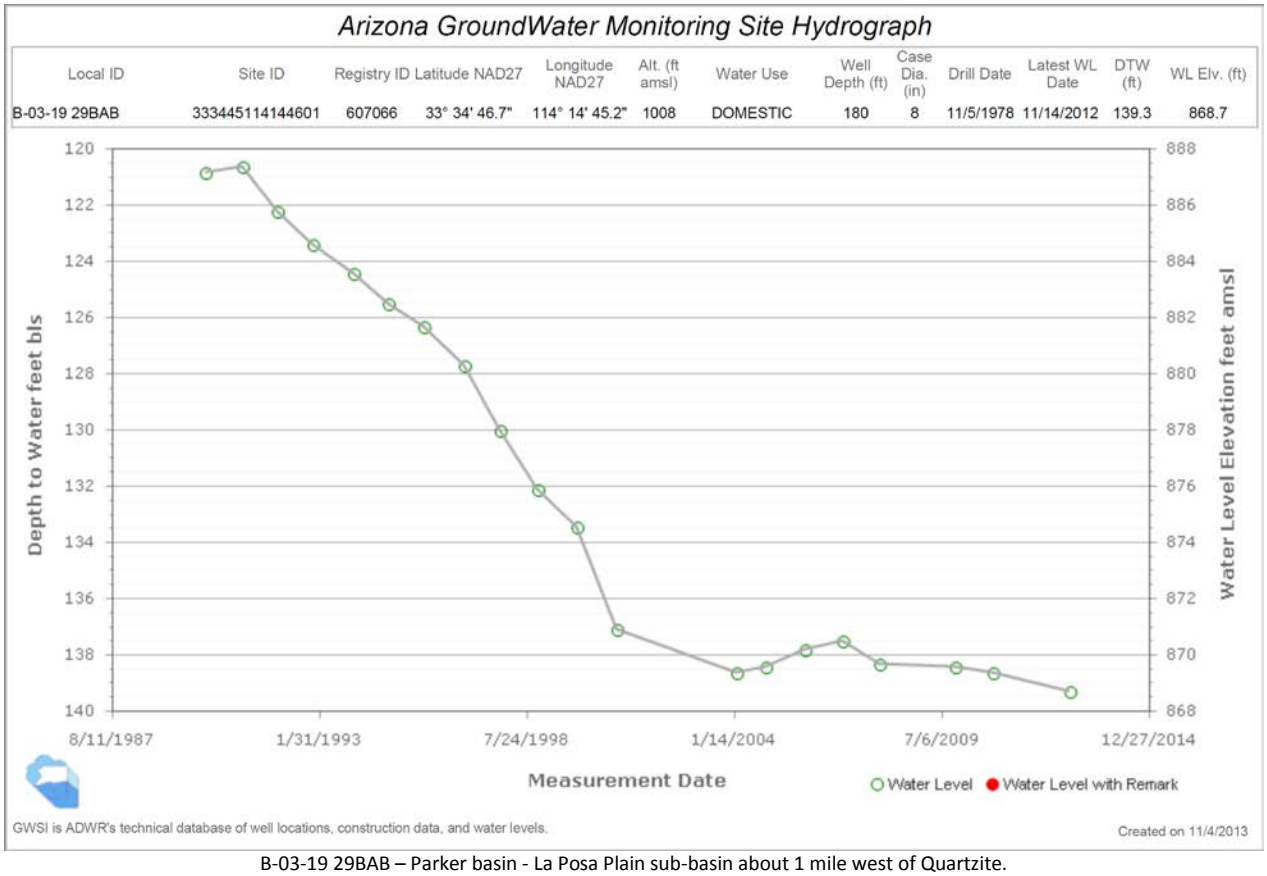
Recent Water Level Change * (1990's through 2000's)
- Minor WL Change +5' to -5'
- Negative
- Positive

* Data provided by ADWR

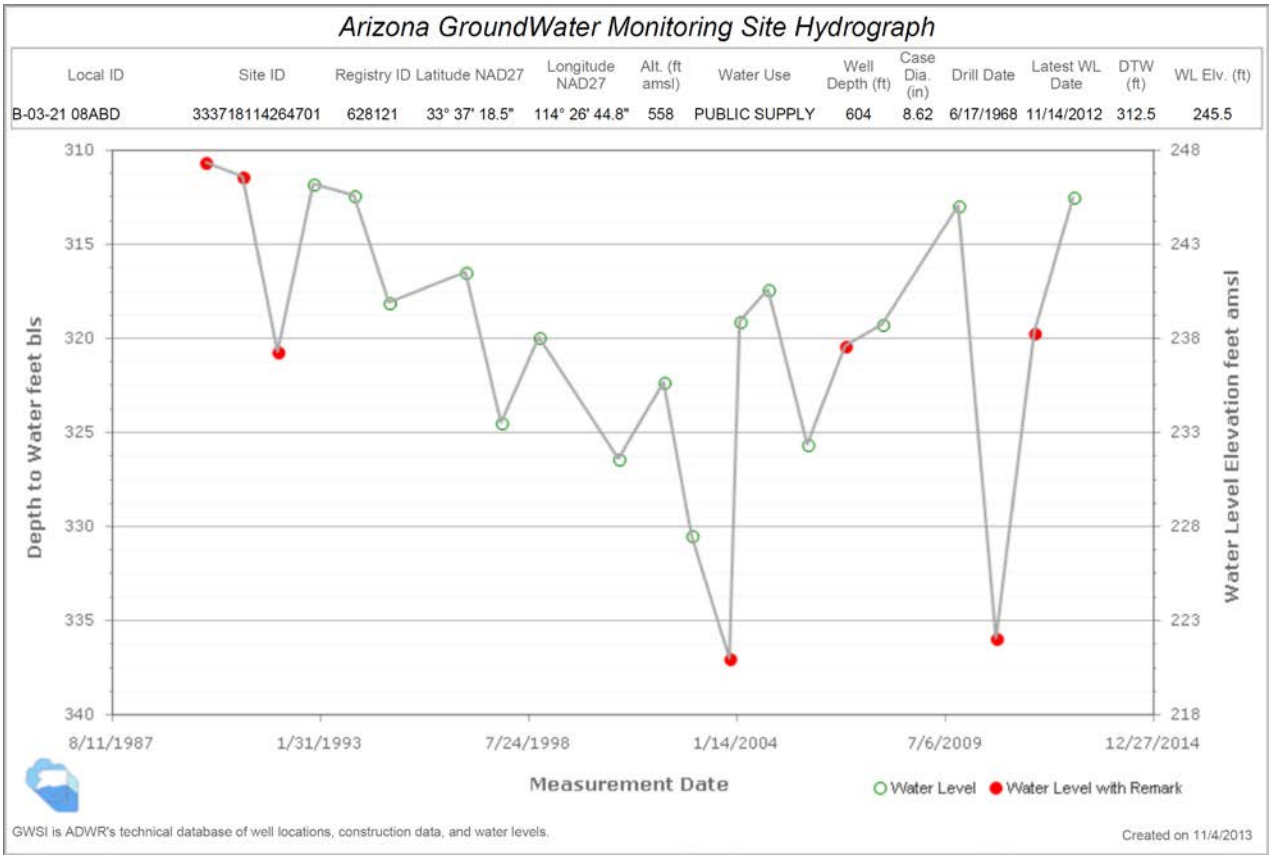
Figure P.A.8-5

Colorado Main Stem South Groundwater Hydrology

Parker Basin – Colorado River Main Stem South

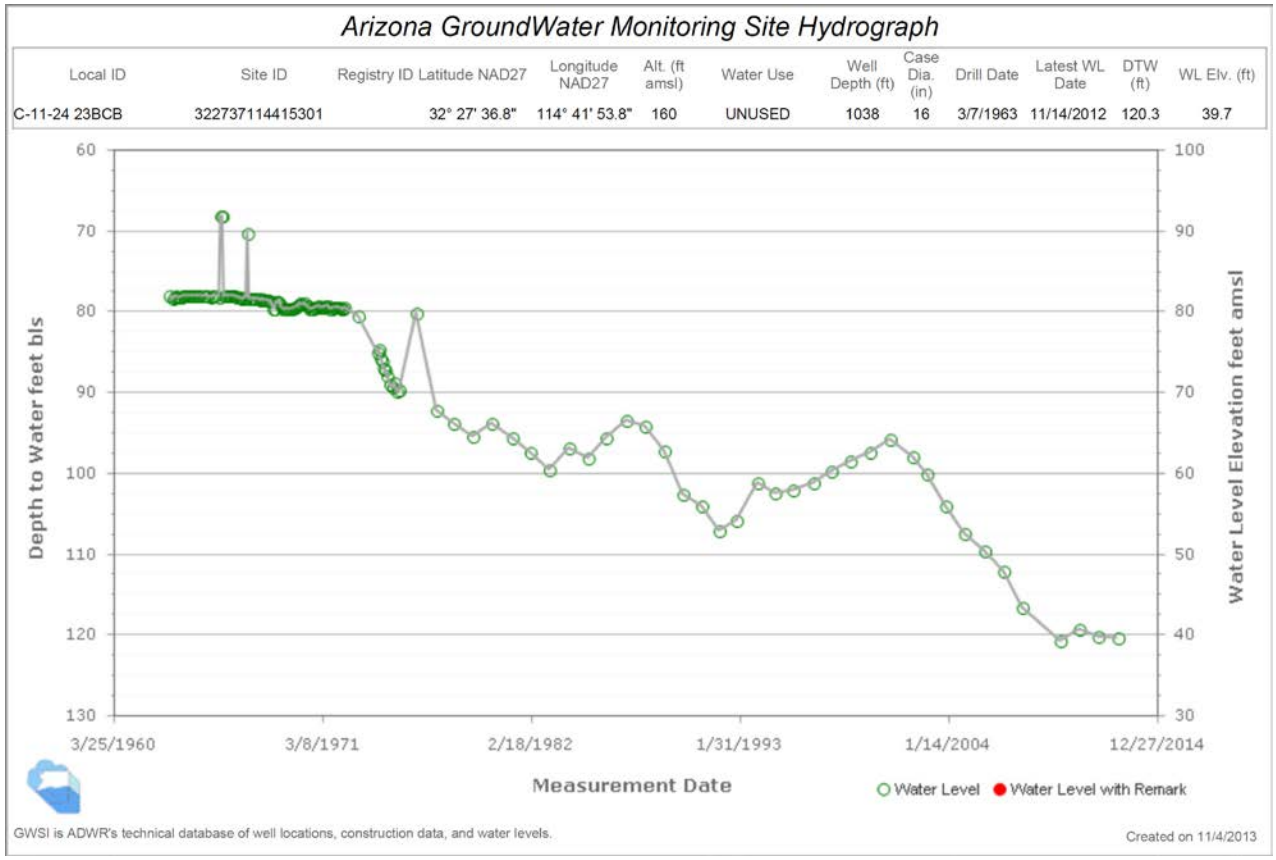


B-03-19 29BAB – Parker basin - La Posa Plain sub-basin about 1 mile west of Quartzite.

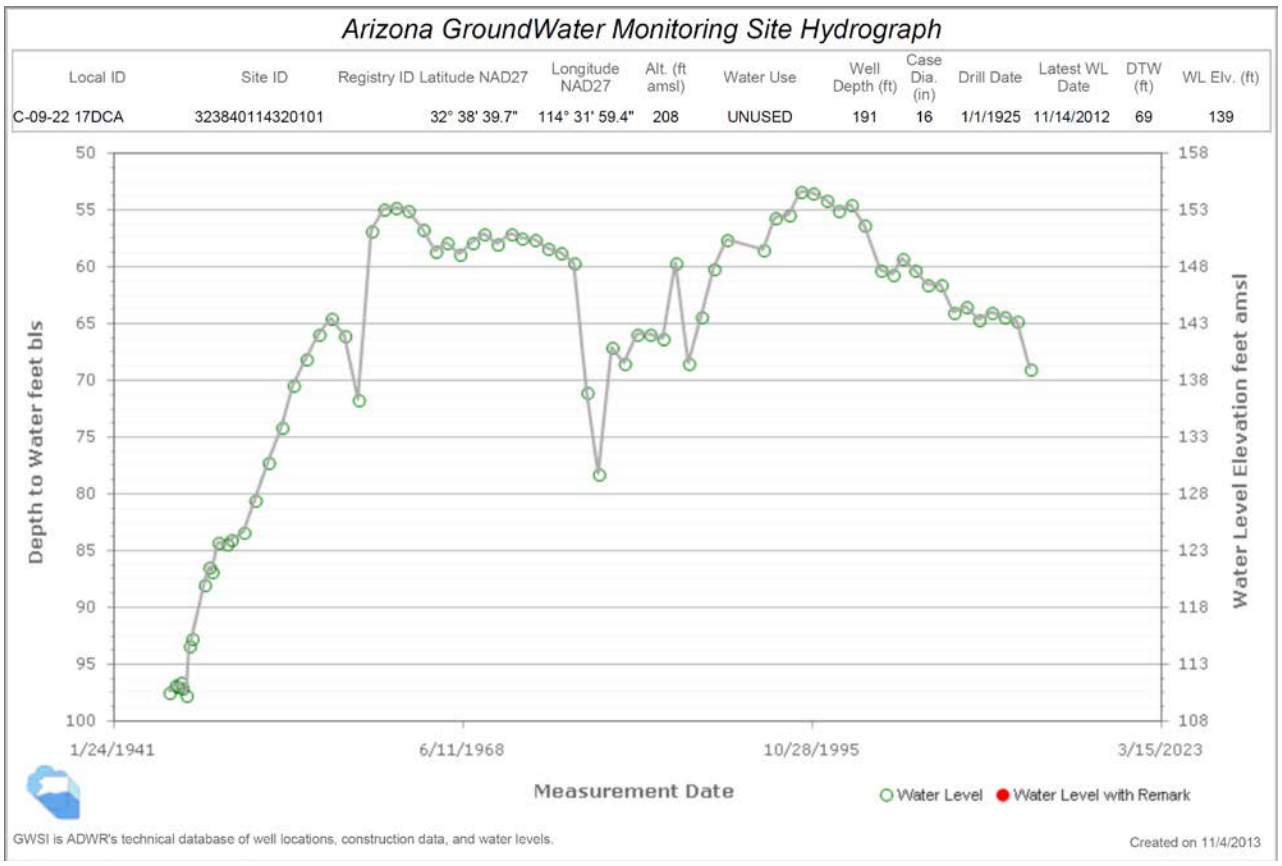


B-03-21 08ABD – Parker basin – Cibola Valley sub-basin about 5 miles east of Ehrenberg.

Yuma Basin – Colorado River Main Stem South



C-11-24 23 BCB -- Yuma basin – about 5 miles SE of San Luis along US/Mexican Border



C-09-22 17DCA Yuma basin – Yuma Mesa area.