

**Appendix C6**  
**Arizona Water Demand**  
**Scenario Quantification**

---



# Appendix C6 – Arizona Water Demand Scenario Quantification

## 1.0 Introduction

This appendix summarizes the data sources used in scenario quantification for Colorado River demand<sup>1</sup> for the state of Arizona and presents the results of quantification. As presented in figure C6-1, Arizona is divided into six planning areas, all of which are in the Colorado River hydrologic basin: Mainstem, Central Arizona, North Central, Central Yavapai Highlands, Upper San Pedro, and San Juan. Data collection and development were completed at the planning-area level.

The following sections present background information that summarizes the state's planning areas as well as data sources used to quantify demand scenarios by category. Following the background section, results of demand scenario quantification are presented. The results section is broken out into an Arizona Study Area summary, followed by Colorado River demand by geography, and finally by category.

## 2.0 Background

The Arizona Department of Water Resources (ADWR) is the agency given authority to protect the interests and rights of the State and its citizens in matters pertaining to interstate waters. ADWR developed information intended to capture Arizona's demands on the Colorado River for use in the Colorado River Basin Water Supply and Demand Study (Study). In order to develop demands for the Study, ADWR used data from the *Arizona Water Atlas* (ADWR, 2010a), groundwater active management area assessments, the Water Resources Development Commission, Arizona Department of Commerce population projections, Reclamation's Mainstem Water Use Accounting Reports, and Bureau of Reclamation's (Reclamation) planning studies for the North Central, Central Yavapai Highlands, and Upper San Pedro areas. In addition, for the purpose of this study, ADWR developed a Central Arizona model to project demands for Phoenix, Pinal, and Tucson. New demand data were also developed for Upper San Pedro River area, the Central Yavapai Highlands area, and the North Central Arizona area. Quantification of the Basin Study scenarios used these base data.

### 2.1 Data Sources for Quantification

This section discusses data sources for demand quantification by use category. Some category projections were based on relevant parameter data, while other category projections were developed directly as water demand. Sources included state, regional, and national agency reports.

---

<sup>1</sup> Colorado River demand as computed by Study Area demand minus other supplies.

Colorado River Basin  
Water Supply and Demand Study

FIGURE C6-1  
Colorado River Hydrologic Basin and Export Service Areas in Arizona



- **Agricultural Demand:** Irrigated acreage, consumptive factors, and agricultural demands were derived by ADWR using various studies and reports shown in the references section (ADWR, 2005, 2010b, 2010c, 2011b; Reclamation, 1964–2002, 1996–2008, 2003–2009, 2006, 2007a, 2009; USGS, 2007, 2009). Agricultural applied water use was calculated based on irrigated acreage, consumptive factors, and consumptive demands.
- **Municipal and Industrial (M&I): Population estimates were disaggregated from** Arizona state population (ADWR, 2011a). Demand and consumptive factors were derived by ADWR using various studies and reports (ADWR, 2005, 2010b, 2010c, 2011b; Reclamation, 1964–2002, 1996–2008, 2003–2009, 2006, 2007a, 2009; USGS, 2007, 2009), and per capita usage was calculated based on population estimates, demand, and consumptive factors.
- **Energy:** Energy demands were derived by ADWR using various studies and reports (Water Resources Development Commission, Arizona, 2011).
- **Minerals:** Minerals demands were derived by ADWR using various studies and reports (ADWR, 2010b, 2010c, 2011b).
- **Fish, Wildlife, and Recreation:** Fish, wildlife, and recreation demands were derived by ADWR using various studies and reports (ADWR, 2005; Reclamation, 1964–2002, 2003–2009, 2006; USGS, 2007, 2009).
- **Tribal:** Tribal demands were derived with input from the tribes and ADWR (ADWR, 2010b, 2010c, 2011b; Reclamation, 1964–2002, 1996–2008; Reclamation, 2003–2009, 2006).

### 3.0 Results of Water Demand Scenario Quantification

This section summarizes Arizona’s Colorado River water demand trends by category across the scenarios. The purpose of this section is to describe changes in demands, both temporally and geographically, parameters that influence changes in demands, and how the parameters and demands differ amongst scenarios.

Demands were first developed for areas that may be potentially served by Colorado River water (Study Area demands), independent of the source of supply. However, a portion of the Study Area demand, particularly in the Central Arizona planning area, is satisfied from other supplies such as surface water, groundwater, and reclaimed water/effluent. To develop estimates of the Colorado River demand, the Study Area demand was reduced by estimates of available supply from other sources. This appendix focuses on Colorado River demands, but includes discussion of the Study Area parameters that led to these demands. Gila River Basin demands are not included. The Colorado River Simulation System model would need to be extended, and natural flow data sets would need to be developed in order to include the Gila River Basin tributaries in the analysis.

The following sections summarize the results of demand scenario quantification, presenting Study Area demand and Colorado River water demand, Colorado River Demand for the state and individual planning areas across the six scenarios, and Colorado River water demand by category across the six scenarios. Parameters and demands for all categories and all scenarios, along with references for data sources, are included.

### 3.1 Summary Results of Scenario Quantification

Values were developed for Study Area parameters to quantify Study Area demand for each of the scenarios. Colorado River demand was calculated as Study Area demand minus other supplies. Tables C6-1A, B, and C present summary results for the demand scenarios considered in the Study for Arizona's Study Area, the Upper Basin, and Lower Basin in Arizona, respectively. The tables present agricultural and M&I demand parameters for the entire Study Area that distinguish the scenarios, the resulting Study Area demands, and finally the Colorado River demands by category. Because other supplies may vary among scenarios, trends observed in the parameters and Study Area demands may not be reflected identically in Colorado River demand trends.

Arizona estimates that about 7 million people will be in Arizona's Study Area by 2015. This number is expected to increase to 9.8 to 16.0 million by 2060. The greatest population growth is associated with the Rapid Growth (C1 and C2) scenarios and the Enhanced Environment (D2) scenario. The Slow Growth (B) scenario has the lowest population growth of the scenarios (9.8 million by 2060), but still represents a growth of about 45 percent over 2015 estimates.

The growing municipal population, however, will continue to be more efficient in its per capita water use than today. Per capita water use, based solely on passive or existing conservation targets, is expected to be 4 to 23 percent less in 2060 than in 2015 in all scenarios except for Slow Growth (B) scenario, where it is expected to increase by about 1 percent. Usage rates and per capita reductions vary across Arizona's planning areas.

Irrigated acreage is projected to decrease through 2060 under all scenarios. Decrease in irrigated acreage varies by scenario, and ranges from a 30 percent decrease in the Slow Growth (B) scenario to a 48 percent decrease in the Rapid Growth (C1 and C2) and Enhanced Environment (D2) scenarios. In each case, the bulk of the decrease comes from Central Arizona. The effect of decreased irrigated acreage is offset by an increase in water delivery per acre across all scenarios. The increase in water delivery per acre ranges from 14 percent Slow Growth (B) scenario to 25 percent Rapid Growth (C2) scenario.

Study Area demand for energy is projected to increase under all scenarios due to the growing need for electricity generation, including solar. Most of the energy demands are met by local supplies. The portion of Study Area demand for energy met by the Colorado River is forecast to increase modestly, from about 1,100 acre-feet per year (afy) in 2015 to between 1,400 and 1,900 afy in 2060.

Study Area demand for minerals is projected to increase across all scenarios, from 42,000 afy in 2015 to between 53,000 and 60,000 afy in 2060.

Study Area demand for tribal use is projected to increase across all scenarios, with demand increasing between 21 and 34 percent by 2060.

Figure C6-2 presents demands across the scenarios in three panels as follows: 1) Study Area demand with other supplies and Colorado River demand identified, 2) Colorado River demand, and 3) change in Colorado River demand by demand category.

TABLE C6-1A  
Summary Results of Arizona Water Demand Scenario Quantification by 2060

<b>Key Study Area Demand Scenario Parameters</b>							
	2015 <sup>1</sup>	2060 Scenario Parameters					
		A	B	C1	C2	D1	D2
Population (millions)	6.7–7.5	12.5	9.8	16.0	16.0	12.5	16.0
Change in per capita water usage (%), from 2015	—	-4%	+1%	-5%	-22%	-23%	-23%
Irrigated acreage (millions of acres)	0.62	0.36	0.45	0.31	0.31	0.36	0.31
Change in per acre water delivery (%), from 2015	—	+16%	+14%	+21%	+25%	+16%	+19%
<b>Study Area Demand (thousand acre-feet [kaf])</b>							
	2015 <sup>1</sup>	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	2,056–2,342	1,314	1,759	1,161	1,196	1,314	1,101
M&I demand	1,855	3,099	2,587	3,857	3,158	2,475	3,110
Energy demand	78–87	137	109	188	133	106	133
Minerals demand	42	58	60	58	58	58	58
FWR demand	27–91	27.0	27.7	27.0	30.2	89.7	90.9
Tribal demand	1,015–1,141	1,311	1,224	1,453	1,422	1,287	1,450
<b>Total Study Area Demand<sup>2</sup></b>	<b>5,315</b>	<b>5,945</b>	<b>5,766</b>	<b>6,744</b>	<b>5,997</b>	<b>5,330</b>	<b>5,943</b>
<b>Colorado River Demand (kaf)</b>							
	2015 <sup>1</sup>	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	1,007–1,145	703	724	703	763	703	668
M&I demand	762	1,460	1,164	2,060	1,357	1,337	1,609
Energy demand	1.1	1.6	1.6	1.9	1.6	1.4	1.6
Minerals demand	42	55	60	54	53	53	54
FWR demand	16–80	15.9	16.6	15.9	19.1	78.6	79.8
Tribal demand <sup>2</sup>	924–1,051	1,258	1,143	1,408	1,406	1,257	1,408
<b>Total Colorado River Demand<sup>2</sup></b>	<b>2,985</b>	<b>3,493</b>	<b>3,109</b>	<b>4,243</b>	<b>3,600</b>	<b>3,431</b>	<b>3,821</b>

<sup>1</sup> If range across scenarios is less than 10 percent, Current Projected (A) is presented. Otherwise, range (min – max) is presented.

<sup>2</sup> Excludes potential losses (reservoir evaporation, phreatophytes, and/or operational inefficiencies) that may be charged to state.

TABLE C6-1B  
Summary Results of Arizona Water Demand Scenario Quantification by 2060 for the Upper Basin

<b>Key Study Area Demand Scenario Parameters</b>							
	2015 <sup>1</sup>	2060 Scenario Parameters					
		A	B	C1	C2	D1	D2
Population (millions)	0.012	0.020	0.020	0.020	0.020	0.020	0.020
Change in per capita water usage (%), from 2015	—	-30%	-30%	-30%	-30%	-30%	-30%
Irrigated acreage (millions of acres)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in per acre water delivery (%), from 2015	—	—	—	—	—	—	—
<b>Study Area Demand (thousand acre-feet [kaf])</b>							
	2015 <sup>1</sup>	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	0	0	0	0	0	0	0
M&I demand	1.68	1.96	1.96	1.96	1.96	1.96	1.96
Energy demand	0	0	0	0	0	0	0
Minerals demand	0	0	0	0	0	0	0
FWR demand	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Tribal demand	38–44	43.3	43.3	70.9	70.9	43.3	70.9
<b>Total Study Area Demand<sup>2</sup></b>	<b>40–46</b>	<b>46</b>	<b>46</b>	<b>73</b>	<b>73</b>	<b>46</b>	<b>73</b>
<b>Colorado River Demand (kaf)</b>							
	2015 <sup>1</sup>	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	0	0	0	0	0	0	0
M&I demand	1.68	1.96	1.96	1.96	1.96	1.96	1.96
Energy demand	0	0	0	0	0	0	0
Minerals demand	0	0	0	0	0	0	0
FWR demand	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Tribal demand <sup>2</sup>	38–44	43.3	43.3	70.9	70.9	43.3	70.9
<b>Total Colorado River Demand<sup>2</sup></b>	<b>40–46</b>	<b>46</b>	<b>46</b>	<b>73</b>	<b>73</b>	<b>46</b>	<b>73</b>

<sup>1</sup> If range across scenarios is less than 10 percent, Current Projected (A) is presented. Otherwise, range (min – max) is presented.

<sup>2</sup> Excludes potential losses (reservoir evaporation, phreatophytes, and/or operational inefficiencies) that may be charged to state.

TABLE C6-1C  
Summary Results of Arizona Water Demand Scenario Quantification by 2060 for the Lower Basin

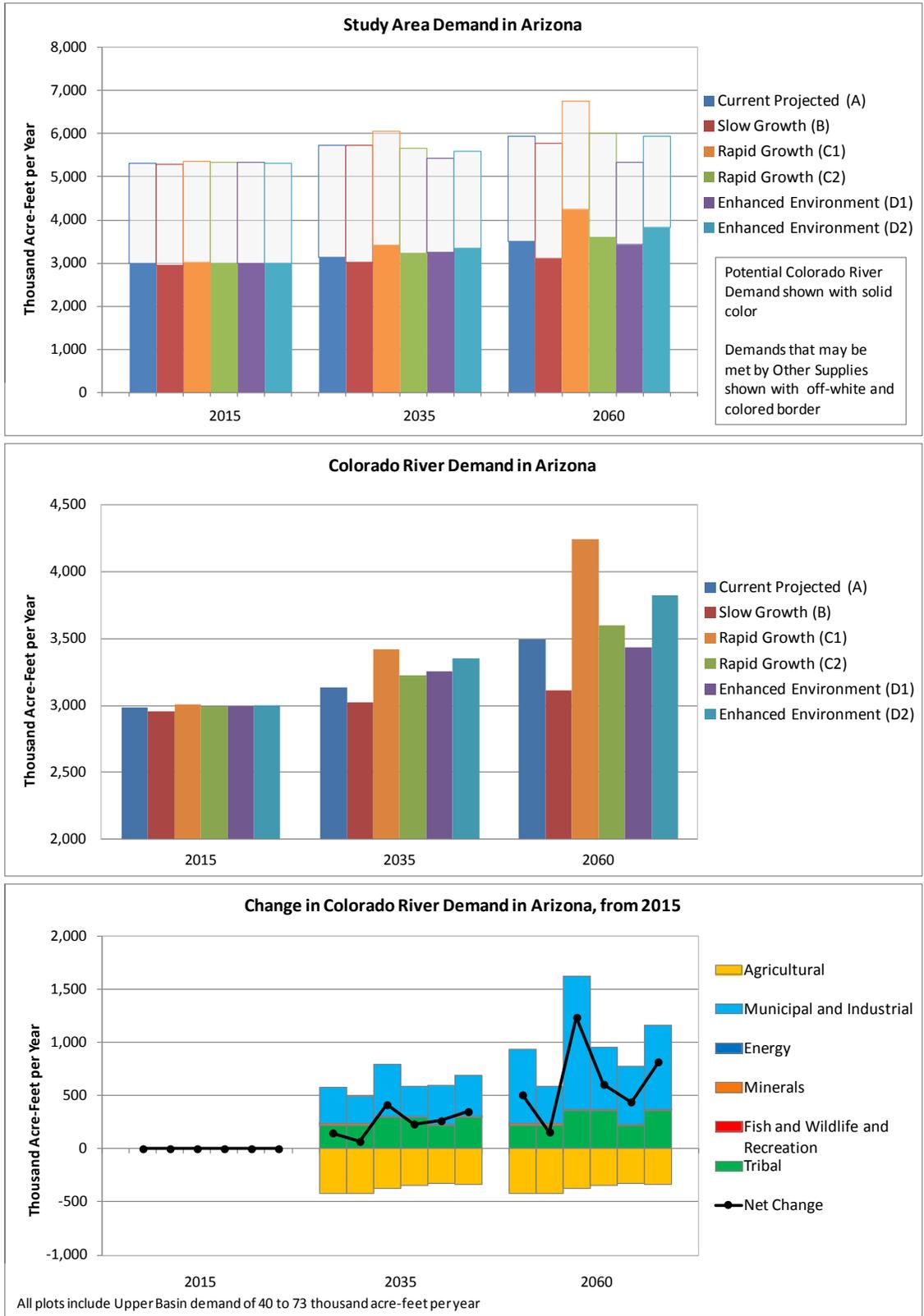
<b>Key Study Area Demand Scenario Parameters</b>							
	2015 <sup>1</sup>	2060 Scenario Parameters					
		A	B	C1	C2	D1	D2
Population (millions)	6.7–7.5	12.5	9.8	16.0	16.0	12.5	16.0
Change in per capita water usage (%), from 2015	—	–4%	+1%	–5%	–22%	–23%	–23%
Irrigated acreage (millions of acres)	0.62	0.36	0.45	0.31	0.31	0.36	0.31
Change in per acre water delivery (%), from 2015	—	+16%	+14%	+21%	+25%	+16%	+19%
<b>Study Area Demand (thousand acre-feet [kaf])</b>							
	2015 <sup>1</sup>	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	2,056–2,342	1,314	1,759	1,161	1,196	1,314	1,101
M&I demand	1,854	3,097	2,585	3,855	3,156	2,473	3,108
Energy demand	78–87	137	109	188	133	106	133
Minerals demand	42	58	60	58	58	58	58
FWR demand	27–91	26.7	27.4	26.7	29.9	89.4	90.6
Tribal demand	971–1,103	1,267	1,180	1,382	1,351	1,244	1,379
<b>Total Study Area Demand<sup>2</sup></b>	<b>5,270</b>	<b>5,900</b>	<b>5,720</b>	<b>6,671</b>	<b>5,924</b>	<b>5,284</b>	<b>5,870</b>
<b>Colorado River Demand (kaf)</b>							
	2015 <sup>1</sup>	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	1007–1145	703	724	703	763	703	668
M&I demand	760	1,458	1,162	2,058	1,355	1,335	1,607
Energy demand	1.1	1.6	1.6	1.9	1.6	1.4	1.6
Minerals demand	42	55	60	54	53	53	54
FWR demand	16–79	15.5	16.3	15.5	18.8	78.3	79.5
Tribal demand <sup>2</sup>	881–1013	1,215	1,100	1,337	1,335	1,213	1,337
<b>Total Colorado River Demand<sup>2</sup></b>	<b>2,940</b>	<b>3,447</b>	<b>3,064</b>	<b>4,170</b>	<b>3,527</b>	<b>3,385</b>	<b>3,747</b>

<sup>1</sup> If range across scenarios is less than 10 percent, Current Projected (A) is presented. Otherwise, range (min – max) is presented.

<sup>2</sup> Excludes potential losses (reservoir evaporation, phreatophytes, and/or operational inefficiencies) that may be charged to state.

Colorado River Basin  
Water Supply and Demand Study

FIGURE C6-2  
Study Area, Colorado River, and Change in Colorado River Demand



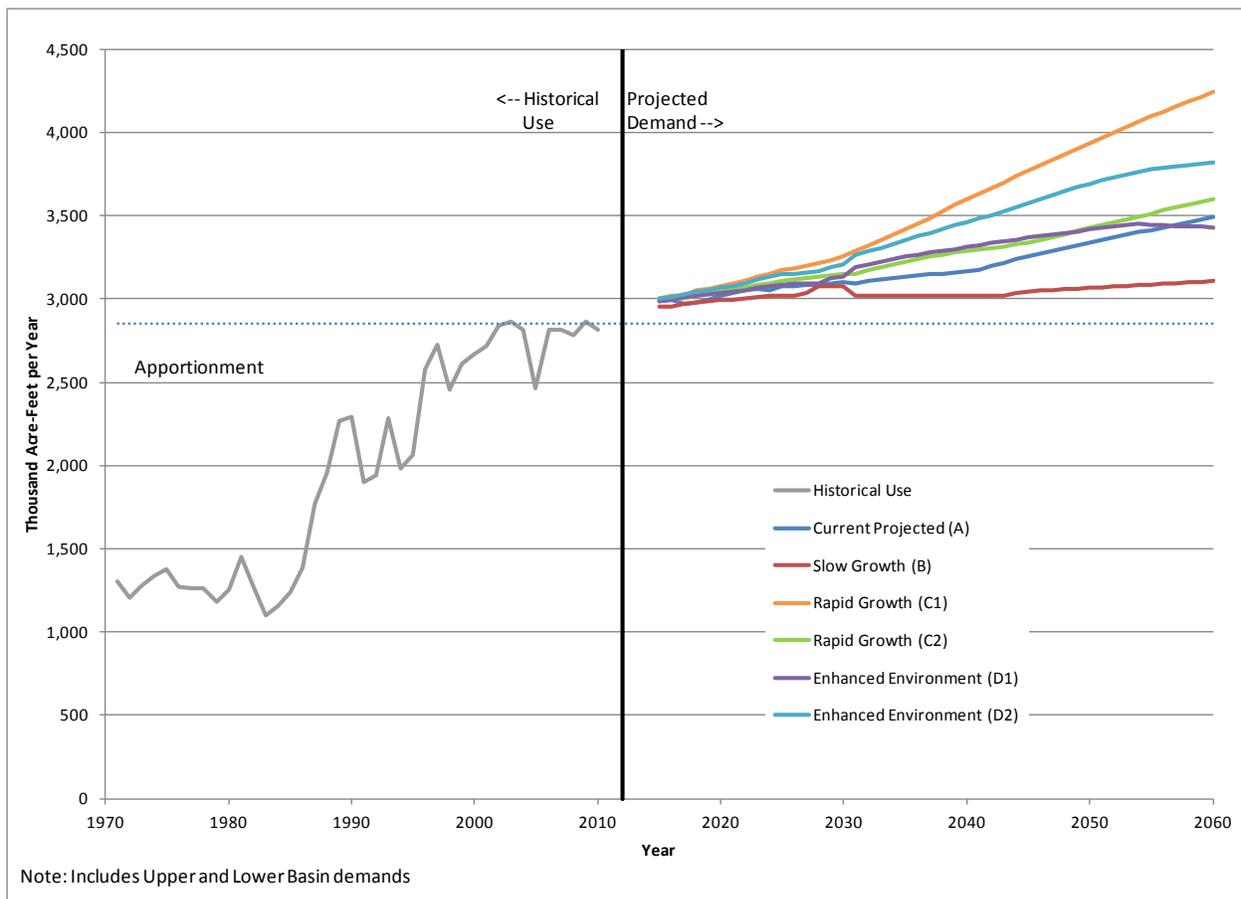
From panel one it can be seen that Study Area demand increases from about 5.3 million acre-feet (maf) in 2015 to between 5.3 and 6.7 maf in 2060. The range in Study Area demand growth across scenarios in 2060, however, is projected to be as low as 14 kaf or as high as 1,429 kaf. About 36 to 46 percent of the Study Area demand is expected to be met by other supplies.

Panel two provides a view of the range across scenarios of Colorado River demand. This demand changes from about 3.0 maf in 2015 to between 3.1 and 4.2 maf in 2060 (or 5 to 41 percent) depending on the scenario. This difference results in a Colorado River demand range of about 1.1 maf across the scenarios in 2060, or 36 percent.

Panel three shows how specific categories affect the projected change in Colorado River demand by scenario. Growth in M&I demand across all scenarios results in the greatest increase in demand, followed by tribal demand and minerals demand. Agricultural demand decreases across all scenarios.

Figure C6-3 ties historical water use to the range of Colorado River demand in the quantified scenarios. The 1.1 maf range across scenarios in 2060 is easily discernible, with a relatively even spread over the range across the scenarios.

FIGURE C6-3  
Historical Use and Future Projected Demand



### 3.2 Colorado River Water Demand by Geography

Colorado River water demand for areas served by the Colorado River is presented in figures C6-4 and C6-5. These figures show two geographic levels: Study Area in Arizona, and individual planning areas. Demands at each geographic level are shown across the scenarios. The columns to the right show Colorado River demand at a point in time (2015, 2035, or 2060) by relative contribution of the categories.

Colorado River demand<sup>2</sup> in Arizona is primarily in the Mainstem and Central Arizona planning areas. Demands in the Mainstem are primarily agricultural and tribal, whereas demands in Central Arizona are primarily M&I, with some tribal and agricultural.

Figure C6-6 shows the change in Colorado River demand by category from 2015 across the scenarios. Change in Colorado River demand is dominated by the Central Arizona planning area, with a large increase in M&I demands and a smaller increase in tribal demands, offset by a decrease in agricultural demands.

### 3.3 Colorado River Demand by Category

#### 3.3.1 Agricultural

Agricultural water demand is driven by irrigated acreage and water delivery per acre. Water delivery per acre is the amount of water diverted per irrigated acre. Components of this use include transmission and delivery losses (surface evaporation, riparian demand, and seepage), and on-farm losses that are made up of evaporation, crop irrigation requirements, and tail water (return). Each of these factors will vary by location (precipitation, growing season, etc.), irrigation method, and crop type.

Figure C6-7 presents the following by scenario in 2015, 2035, and 2060:

- Change in agricultural demand for Colorado River water
- Change in agricultural demand for Colorado River water by planning area
- Agricultural demand as a portion of Colorado River water demand (right hand side of graph)

As can be seen from figure C6-7, agricultural water demand makes up 34 to 39 percent of Colorado River demand in Arizona in 2015, and drops to 17 to 23 percent of Colorado River demand in 2060. This drop results from both a decrease in agricultural water demand and an increase in other categories of demand.

There are two Arizona planning areas with significant agricultural water use: the Mainstem and the Central Arizona planning areas. Mainstem users hold senior water rights and have the greatest demand. Lower priority water rights supply the Central Arizona planning area. Agricultural demand is forecast to decrease over the Study period by varying amounts in the Central Arizona planning area, ranging from about 330 kaf to 420 kaf, depending on the efficiency and acreage assumptions in each scenario. Some decreases are assumed to result from the conversion of agricultural lands to urban development as the Central Arizona Project agricultural pool decreases over time until it is eliminated in 2030.

---

<sup>2</sup> Potential Colorado River demand is based on changes in parameters such as population and for the purpose of the Study is not limited by apportionment.

FIGURE C6-4  
Colorado River Demand in Arizona

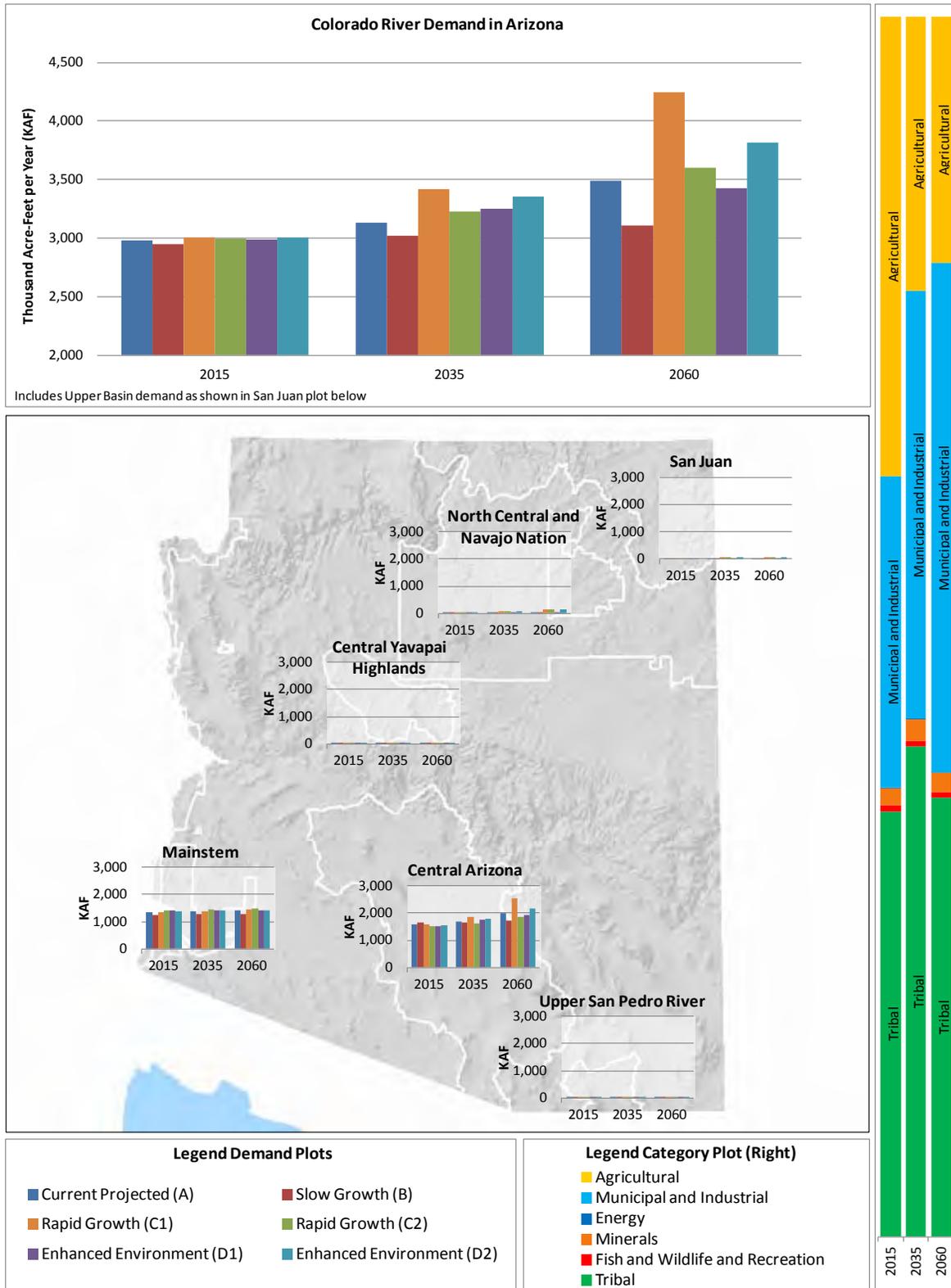


FIGURE C6-5  
Colorado River Demand by Category

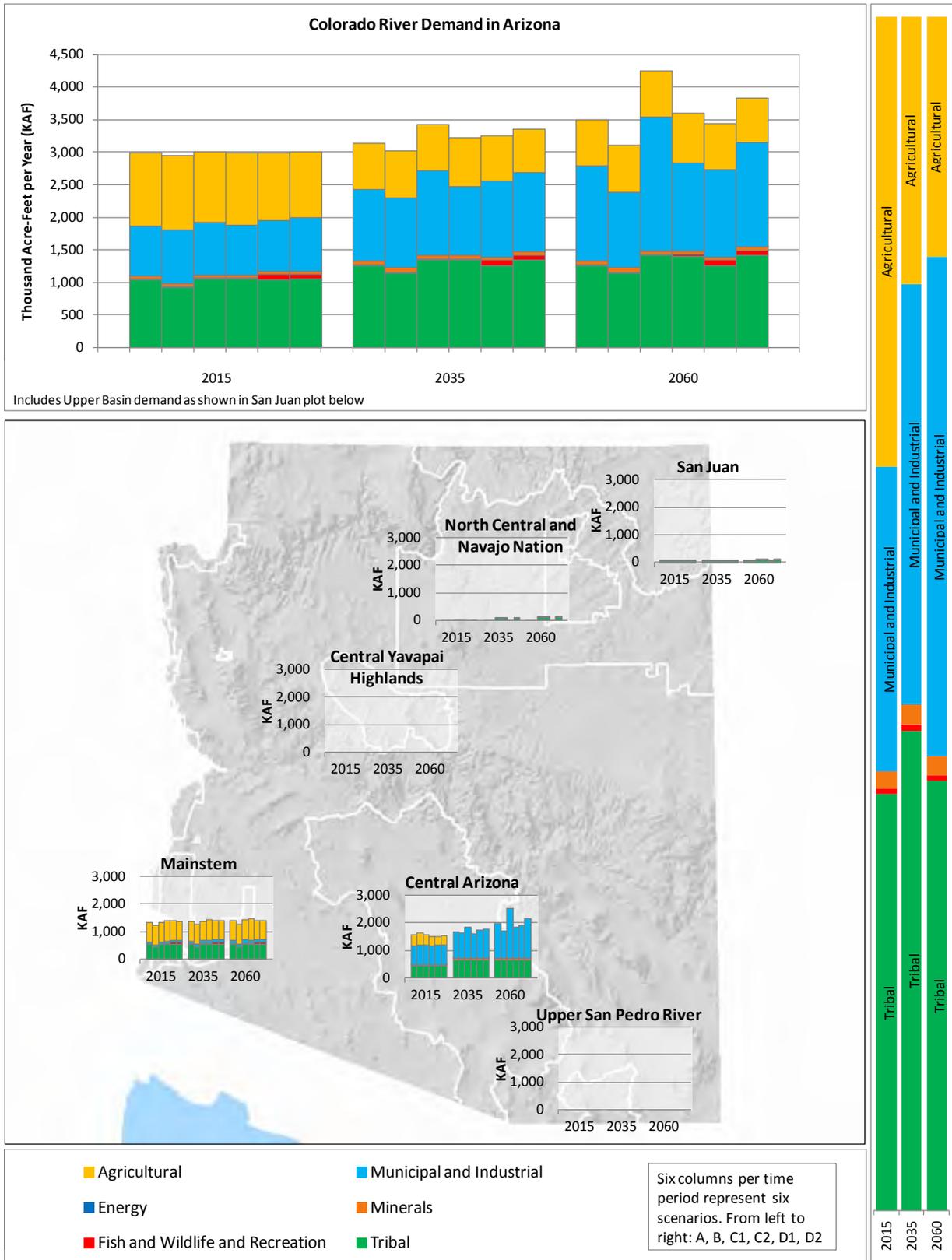


FIGURE C6-6  
Change in Colorado River Demand in Arizona from 2015 by Category

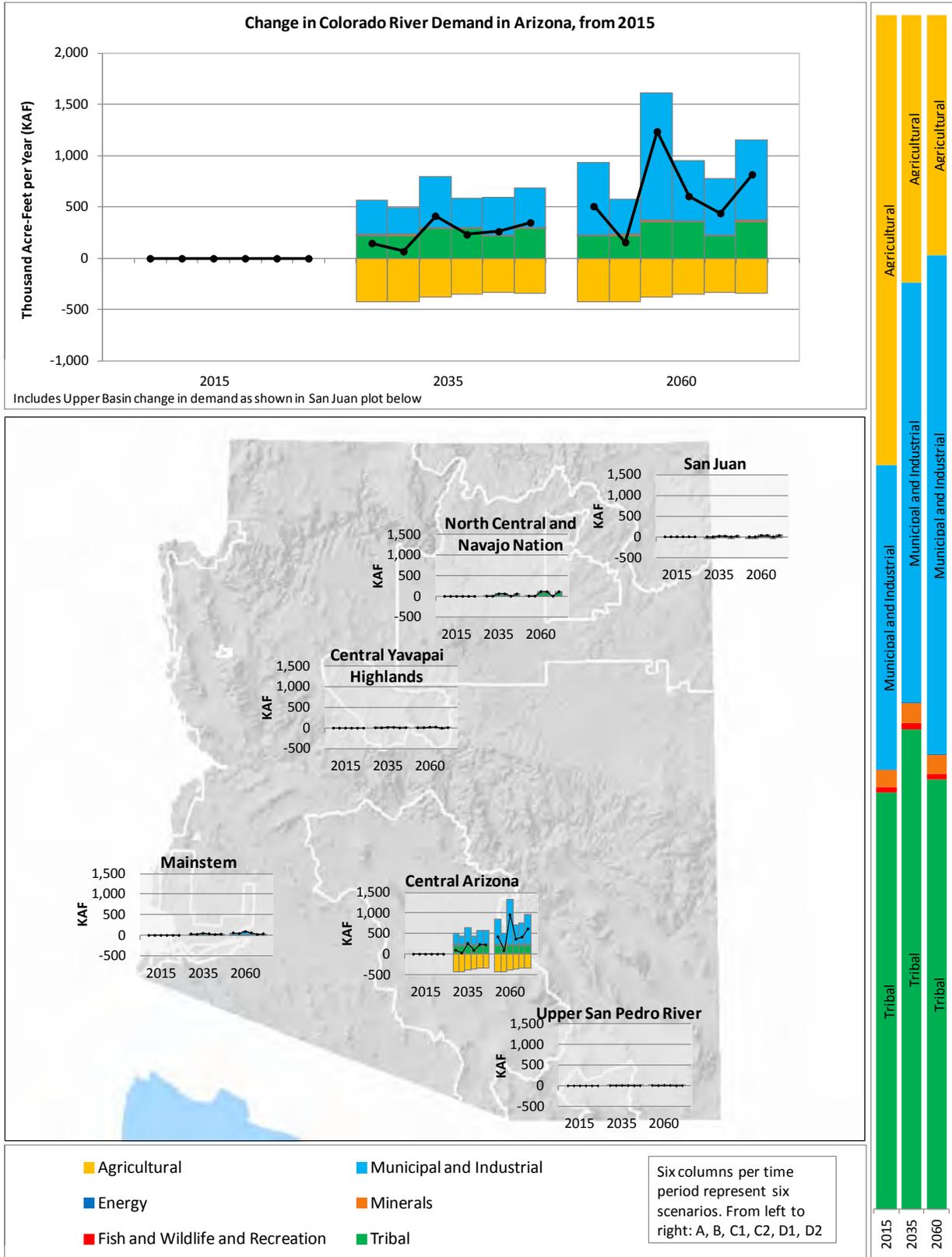
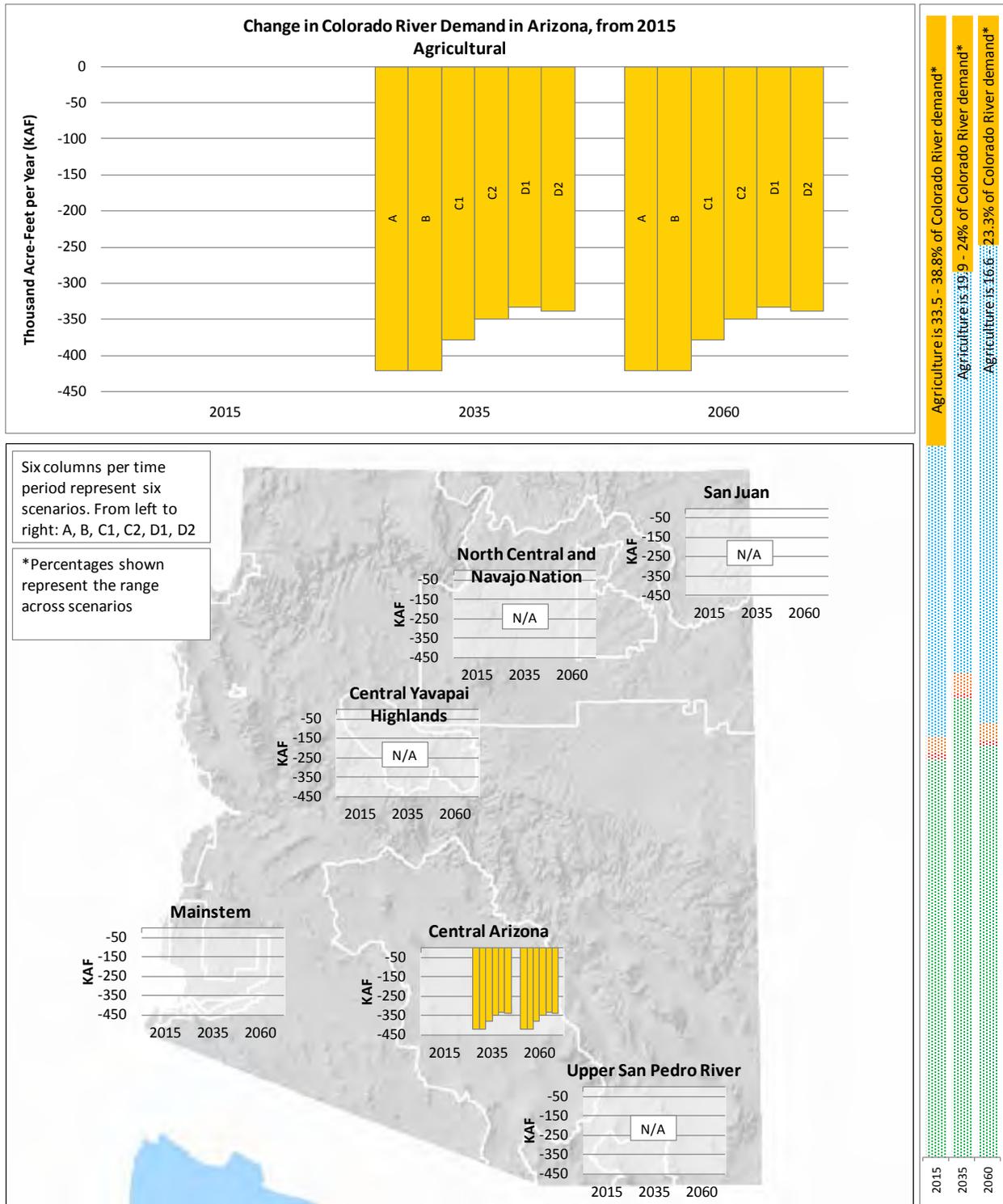


FIGURE C6-7  
Change in Colorado River Demand in Arizona from 2015 for Agriculture



### **3.3.2 Municipal and Industrial**

M&I water demand can be estimated from population and M&I per capita water use, with the addition of self-served industrial (SSI) demand. Municipal per capita water demand calculations include industrial, commercial, institutional, and residential water demand. A number of factors may influence the M&I per capita water use of a given community, including the amount of industrial demand, climate, number of institutional facilities, and number of visitors.

SSI users are industries located in a given area that have their own water supply systems and are therefore not directly related to local measures of population and M&I per capita water use.

Figure C6-8 presents the following by scenario in 2015, 2035, and 2060:

- Change in M&I demand for Colorado River water
- Change in M&I demand for Colorado River water in individual planning areas
- M&I demand as a portion of Colorado River water demand (right hand side of graph)

As can be seen from figure C6-8, M&I water demand is the one of the largest components of Colorado River demand, changing from 26 to 28 percent in 2015 to between 37 and 49 percent of Colorado River demand in 2060, depending on which scenario is considered.

Colorado River demand for M&I use increases over time from 2015 to 2060 across all scenarios. The increase is primarily due to population increase as M&I per capita water use decreases over time across all scenarios; SSI demand also increases across all scenarios.

In examining the planning areas, population growth from 2015 to 2060 drives the increase in M&I demand for Colorado River water in the Central Arizona planning area and to a lesser extent in the Mainstem planning area. Colorado River water allocations and the availability of other supplies also affect M&I Colorado River water demand.

Increases in population are somewhat tempered by decreases in M&I per capita water use. Per capita water use is expected to be 4 to 23 percent less in 2060 than in 2015 in all scenarios except for Slow Growth (B) scenario, where it is expected to increase by about 1 percent.

### **3.3.3 Energy**

Water demand for energy can be estimated through known plans for new power plants or through applying a per capita energy water use factor. Power facilities often serve areas remote from their locations and therefore potentially represent exports or imports of water from the Study Area to meet these distributed needs.

Figure C6-9 presents the following by scenario in 2015, 2035, and 2060:

- Change in energy demand for Colorado River water
- Change in energy demand for Colorado River water in individual planning areas
- Energy demand as a portion of Colorado River water demand (right hand side of graph)

As can be seen from figure C6-9, energy water demand is a small fraction of Colorado River demand, making up less than 0.1 percent of Colorado River demand in 2060.

FIGURE C6-8  
Change in Colorado River Demand in Arizona from 2015 for M&I

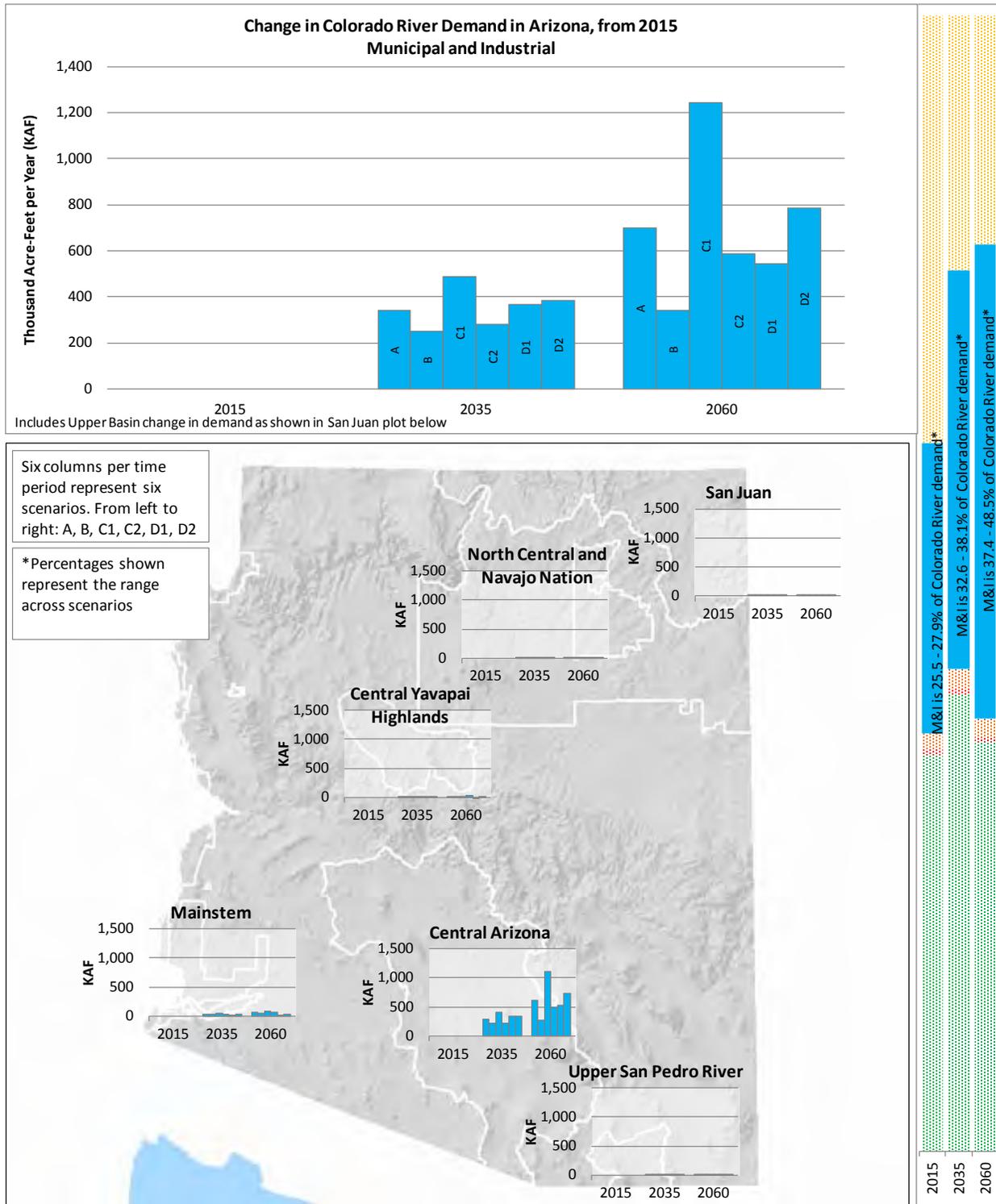
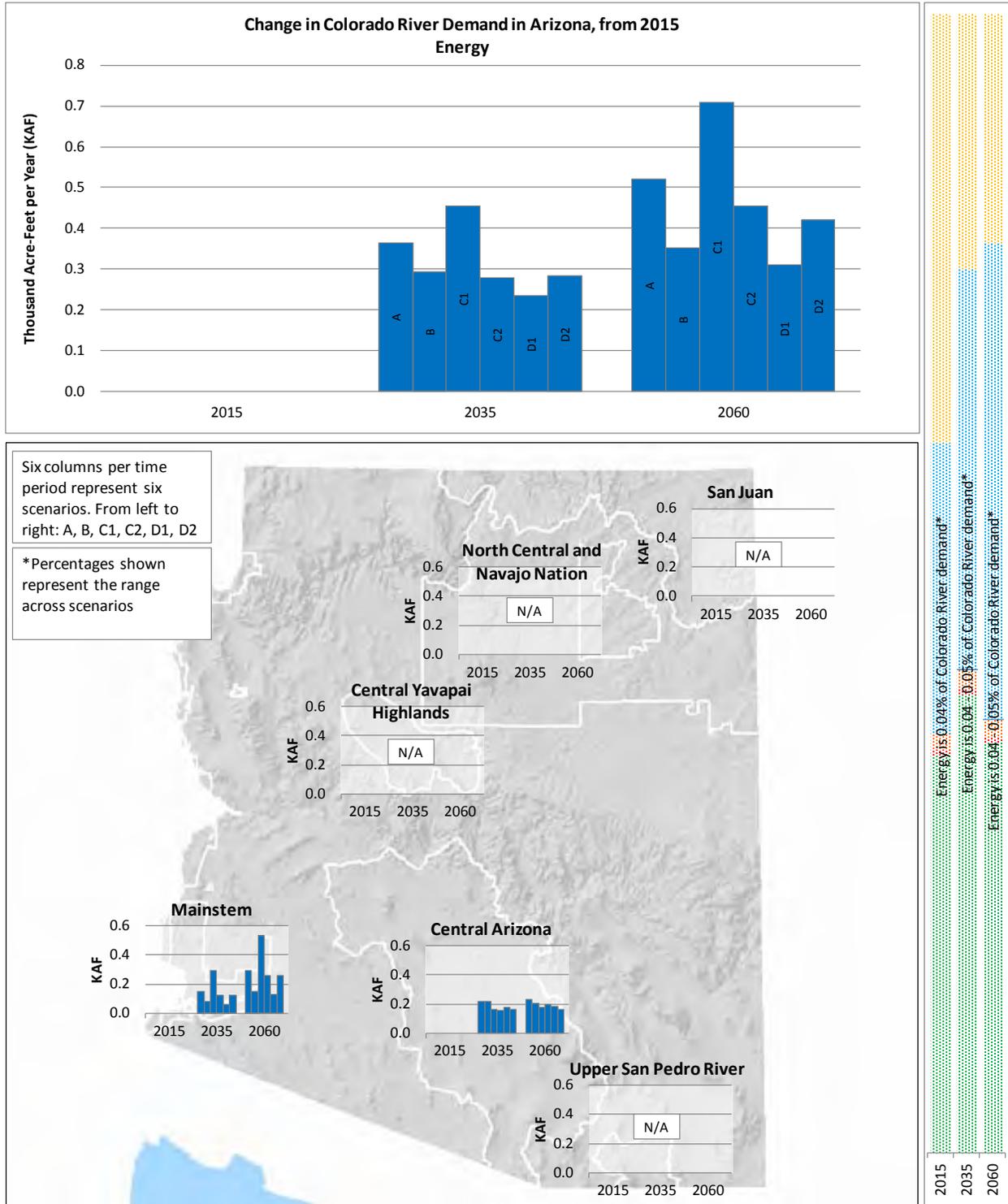


FIGURE C6-9  
Change in Colorado River Demand in Arizona from 2015 for Energy



Energy demand for Colorado River water increases over time from 2015 to 2060 across all scenarios, with the increase ranging from about 0.3 to 0.7 kaf.

Water use associated with energy demand is estimated on a per capita basis for the Mainstem and Central Arizona planning areas, and is estimated to increase as the population increases over time. Other planning area water use related to energy demand is estimated based on existing power generation facilities use.

### **3.3.4 Minerals Extraction**

Water demand for mineral production can be estimated through existing uses and known plans for extraction in the Study Area. Water demand for mineral production can vary significantly, based on market prices for a given product.

Figure C6-10 presents the following by scenario in 2015, 2035, and 2060:

- Change in mineral production demand for Colorado River water
- Change in mineral production demand for Colorado River water in individual planning areas
- Minerals production demand as a portion of Colorado River demand (right hand side of graph)

As can be seen from figure C6-10, minerals water demand is a small fraction of Colorado River demand, changing from 1.4 percent in 2015 to between 1.3 and 1.9 percent of Colorado River demand in 2060, depending on which scenario is considered.

Minerals demand for Colorado River water increases through time by about 13 kaf from 2015 to 2060 across all scenarios.

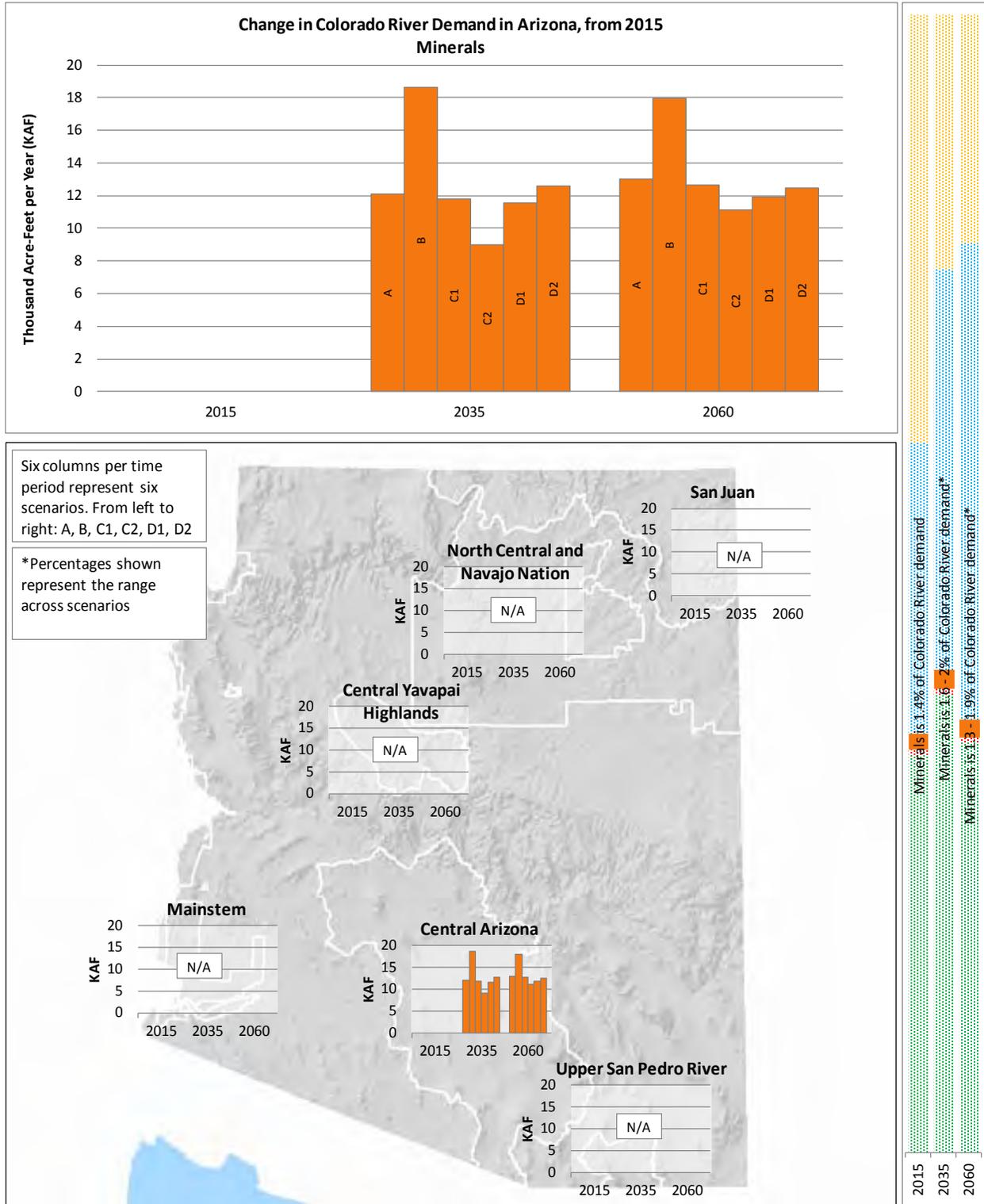
Demand for Colorado River water for minerals extraction is present only in the Central Arizona planning area; accordingly, all of the increase occurs in the Central Arizona planning area.

### **3.3.5 Fish, Wildlife, and Recreation**

Water demand for fish, wildlife, and recreation is estimated from existing agreements or known consumptive use associated with this demand category. Non-consumptive demands associated with fish, wildlife, and recreation, including in-stream flow requirements, are represented through the metrics portion of the Study presented in *Technical Report D – System Reliability Metrics*.

Fish, wildlife, and recreation demands are forecast to remain constant through time, although the demands are variable among different scenarios. All scenarios have fish, wildlife, and recreation demands between about 16 and 19 kaf, except the Enhanced Environment (D1 and D2) scenarios which have demands at about 80 kaf. All fish, wildlife, and recreation demands are in the Mainstem planning area.

FIGURE C6-10  
Change in Colorado River Demand in Arizona from 2015 for Minerals



### **3.3.6 Tribal**

Water demand for federally recognized tribes in Arizona with rights to Colorado River water relied on information submitted by the Ten Tribes Partnership for use in the *Colorado River Interim Surplus Criteria Final Environmental Impacts Statement* (Reclamation, 2000) and used in the more recent *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations of Lake Powell and Lake Mead Final Environmental Impact Statement* (Reclamation, 2007b), information from ADWR, input from the individual tribes, and Reclamation's 2005 to 2009 Decree Accounting Report (Reclamation, 2007 and 2010). The projected Navajo Nation demands were provided by the Navajo Nation Department of Water Resources and modified to fit the storyline narratives regarding tribal use under each scenario.

Figure C6-11 presents the following by scenario in 2015, 2035, and 2060:

- Change in tribal demand for Colorado River water
- Change in tribal demand for Colorado River water in individual planning area
- Tribal demand as a portion of Colorado River demand (right hand side of graph)

As can be seen from figure C6-11, tribal water demand is one of the larger components of Colorado River demand in Arizona, increasing slightly from 31 to 35 percent in 2015 to between 33 and 39 percent of Colorado River demand in 2060, depending on which scenario is considered.

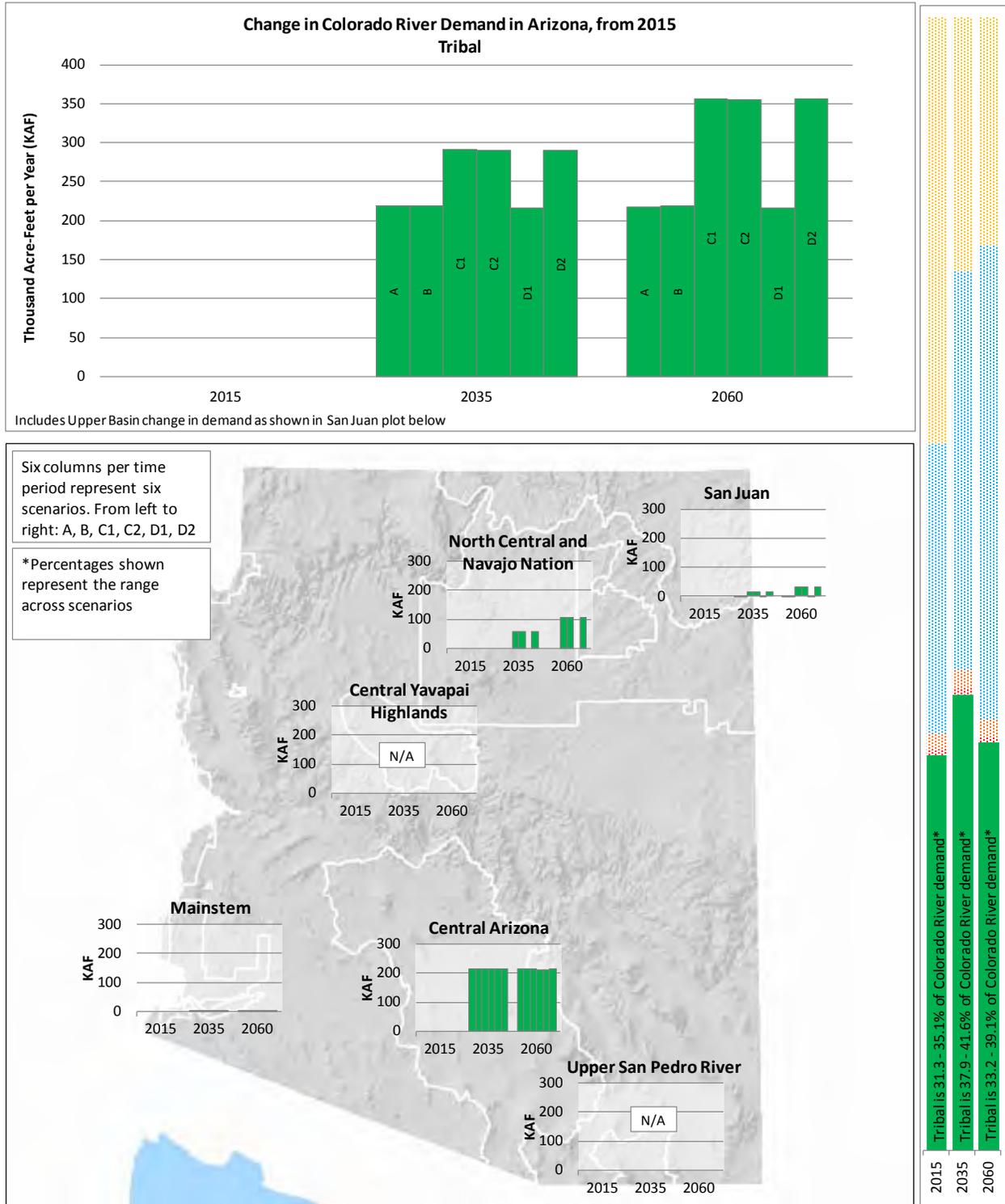
Colorado River tribal demand increases over time by 217 to 357 kaf (about 21 to 34 percent) from 2015 to 2060 across all scenarios. These increases are primarily due to development of demands under existing water rights and the realization of new tribal claims and settlements. Increases occur mostly in the Central Arizona planning area, but there is also some increase in the Mainstem planning area. The rate of increase is greatest in Rapid Growth (C1 and C2) and Enhanced Environment (D2) scenarios.

For additional information on tribal demands, see appendix C9.

### **3.4 Summary Tables of Parameters and Demands by Category**

Tables C6-2 to C6-7 present the specific parameter data collected by planning area. Each table is a complete set of data for a given scenario. These data were used to develop Study Area demands and subsequently Colorado River demands once other supplies were considered. These tables provide the specific information used in the creation of the summary and category plots previously discussed and provide reference information for the data provided.

FIGURE C6-11  
Change in Colorado River Demand in Arizona from 2015 for Tribal



Colorado River Basin  
Water Supply And Demand Study

TABLE C6-2  
Total Demand within Study Area under Current Projected (A) Scenario

ARIZONA		LEGEND: 999 From States 999 Calculated 999 From State Plans 999 From Study Team																		Notes									
Units are thousand acre-feet per year, unless otherwise noted		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			
Hydrologic Basin	Planning Area	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	Notes
Agricultural	Irrigated Acreage [thousands]	168	168	168	447	288	189	0	0	0	7	6	4	0.1	0.1	0.1	623	462	361	0	0	0	0	0	0	623	462	361	1
	Per-Acre Water Delivery (Diversion) [af/ac/yr]	6.85	6.85	6.85	3.2	3.2	3.2				3.6	3.6	3.6	2.9	2.9	2.9	4.22	4.54	4.88							4.22	4.54	4.88	
	Consumptive factor [%]	61%	61%	61%	100%	100%	100%				100%	100%	100%	100%	100%	100%	83%	79%	75%							83%	79%	75%	
	Demand (Consumptive)	703	703	703	1,449	924	596	0	0	0	27	22	15	0.4	0.4	0.4	2,179	1,649	1,314	0	0	0	0	0	0	2,179	1,649	1,314	3
Municipal and Industrial (M&I)	Population [thousands]	298	434	528	6,348	9,086	11,305	101	116	125	250	340	402	94	116	134	7,091	10,091	12,493	12	16	20	12	16	20	7,103	10,107	12,513	4
	M&I Per Capita Use (Diversion) [gpcd]	271	271	277	215	209	207	126	127	127	151	138	121	187	187	187	214	208	206	123	111	86	123	111	86	214	208	206	5, 6
	Consumptive factor [%]	66%	68%	70%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	M&I Demand (Consumptive)	59	90	115	1,532	2,131	2,622	14	16	18	42	53	55	20	24	28	1,668	2,314	2,838	2	2	2	2	2	2	1,670	2,316	2,840	2
Self Served Industrial Demand (Consumptive)		5	6	6	170	220	233	0	0	0	9	13	18	1	2	2	186	242	259	0	0	0	0	0	0	186	242	259	3
	Demand (Consumptive)	65	96	121	1,702	2,351	2,855	14	16	18	51	66	72	21	27	30	1,854	2,555	3,097	2	2	2	2	2	2	1,855	2,557	3,099	
Energy	Demand (Consumptive)	0.4	0.6	0.7	81	112	136	0	0	0	0	0	0	0	0	0	81	113	137	0	0	0	0	0	0	81	113	137	7
Minerals	Demand (Consumptive)	0	0	0	42	58	58	0	0	0	0	0	0	0	0	0	42	58	58	0	0	0	0	0	0	42	58	58	8
Fish, Wildlife, and Recreation	Demand (Consumptive)	16	16	16	0	0	0	0.3	0.3	0.3	0	0	0	11	11	11	27	27	27	0.3	0.3	0.3	0.3	0.3	0.3	27	27	27	9
Tribal	Demand (Consumptive)	552	556	556	535	735	711	0.7	0.8	0.8	0	0	0	0	0	0	1,087	1,291	1,267	44	43	43	44	43	43	1,131	1,334	1,311	10
Total Hydrologic Basin Demand (Consumptive)		1,336	1,370	1,396	3,808	4,180	4,356	15	17	19	79	87	87	32	38	42	5,270	5,692	5,900	46	46	46	46	46	46	5,315	5,738	5,945	
Adjacent Areas																													
Agricultural	Irrigated Acreage [thousands]																												
	Per-Acre Water Delivery (Diversion) [af/ac/yr]																												
	Consumptive factor [%]																												
	Demand (Diversion)																												
Municipal and Industrial (M&I)	Population [thousands]																												
	M&I Per Capita Use (Diversion) [gpcd]																												
	Consumptive factor [%]																												
	M&I Demand (Diversion)																												
Self Served Industrial Demand (Diversion)																													
	Demand (Diversion)																												
Energy	Demand (Diversion)																												
Minerals	Demand (Diversion)																												
Fish, Wildlife, and Recreation	Demand (Diversion)																												
Tribal	Demand (Diversion)																												
Total Adjacent Areas Demand (Diversion)																	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Demand in the Study Area		1,336	1,370	1,396	3,808	4,180	4,356	15	17	19	79	87	87	32	38	42	5,270	5,692	5,900	46	46	46	46	46	46	5,315	5,738	5,945	11
Demand that may be met by Other Supplies		0	0	0	2,233	2,508	2,359	11	10	8	72	72	72	14	14	14	2,330	2,604	2,453	0	0	0	0	0	0	2,330	2,604	2,453	12
Potential Colorado River Demand		1,336	1,370	1,396	1,575	1,671	1,997	4	8	11	6	15	15	18	24	28	2,940	3,088	3,447	46	46	46	46	46	46	2,985	3,134	3,493	13
Agricultural	Colorado River Demand	703	703	703	421	0	0	0	0	0	0	0	0	0	0	0	1,124	703	703	0	0	0	0	0	0	1,124	703	703	
Municipal and Industrial	Colorado River Demand	65	96	121	667	957	1,283	4	8	11	6	15	15	18	24	28	760	1,099	1,458	2	2	2	2	2	2	762	1,101	1,460	
Energy	Colorado River Demand	0.4	0.6	0.7	0.7	0.9	0.9	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	1	1	2	
Minerals	Colorado River Demand	0	0	0	42	54	55	0	0	0	0	0	0	0	0	0	42	54	55	0	0	0	0	0	0	42	54	55	
Fish, Wildlife, and Recreation	Colorado River Demand	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0	16	16	16	0.3	0.3	0.3	0.3	0.3	0.3	16	16	16	
Tribal	Colorado River Demand	552	556	556	445	660	659	0	0	0	0	0	0	0	0	0	997	1,216	1,215	44	43	43	44	43	43	1,041	1,259	1,258	

**Notes**

- 1) Personal communication, ADWR, Aug. 26, 2011 (ADWR, 2011c).
- 2) Mainstem: 61 percent based Personal communication, ADWR, Oct. 21, 2011 (ADWR, 2011c); Non-mainstem: 100 percent based on consumptive need equaling diversion from mainstem.
- 3) Personal communication, ADWR, Aug. 26, 2011; non-mainstem areas.
- 4) Personal communication, ADWR, Aug. 26, 2011. Population figures for each planning area are disaggregated from total Arizona state population. See *Draft Arizona Demand Narrative*, Aug. 2011.
- 5) In mainstem, gallons per capital per day (gpcd) increase due to the addition of Arizona's unallocated Priority 4 entitlement, which is assumed to be allocated after 2020; no population has been associated with this allocation.
- 6) In North Central, municipal gpcds based on non-tribal population estimates; 2015–100,580; 2035–118,010; and 2060–131,450. Tribal population estimates are: 2015–17,890; 2035–20,990; and 2060–23,380.
- 7) Personal communication, ADWR, Aug. 26, 2011. Mainstem and Central based on per capita energy factor of 18.4 megawatt hours per person per year, and 650 gallons per megawatt hour.
- 8) Personal communication, ADWR, Aug. 26, 2011.
- 9) Personal communication, ADWR, Aug. 26, 2011. Mainstem: 2005–2009 average. Upper San Pedro: Use based on *Water Management of the Regional Aquifer in the Sierra Vista Subwatershed, Arizona–2007* report to Congress.
- 10) Personal communication, ADWR, Oct. 21, 2011. Tribal demands include agricultural, M&I, and other uses. There are approximately 82,000 acres of tribal agricultural lands in the mainstem and 180 acres in North Central.
- 11) Calculated from the sum of Hydrologic Basin (Consumptive) Demand and Adjacent Areas (Diversion) Demand.
- 12) Personal communication, ADWR, Oct. 21, 2011. Other local supplies include surface water, groundwater, groundwater mining, and effluent re-use.
- 13) For planning areas other than Central AZ, all Colorado River demand is municipal. For Central AZ, based on recent distribution of Central Arizona Project (CAP) water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for current trends only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also were checked to make sure Colorado River demand was not greater than total demand for each category—if so, M&I makes up the difference.

Colorado River Basin  
Water Supply And Demand Study

TABLE C6-3  
Total Demand within Study Area under Slow Growth (B) Scenario

ARIZONA		LEGEND: 999 From Current Projected Data Sheet 999 Computed 999 Input Parameter																														
Units are thousand acre-feet per year, unless otherwise noted		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			Notes			
Hydrologic Basin	Planning Area	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060				
Agricultural	Irrigated Acreage [thousands]	168	168	168	464	346	273	0	0	0	7	6	4	0.1	0.1	0.1	640	520	446	0	0	0	0	0	0	640	520	446	1			
	Per-Acre Water Delivery (Diversion) [af/ac/yr]	7.18	7.18	7.18	3.41	3.73	3.72	0.00	0.00	0.00	4.37	4.37	4.37	3.57	3.57	3.57	4.41	4.86	5.03	0.00	0.00	0.00	0.00	0.00	0.00	4.41	4.86	5.03	2			
	Consumptive factor [%]	60%	60%	60%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	83%	81%	78%	0%	0%	0%	0%	0%	0%	83%	81%	78%				
	Demand (Consumptive)	724	724	724	1,585	1,291	1,017	0	0	0	33	26	18	0.5	0.5	0.5	2,342	2,041	1,759	0	0	0	0	0	0	2,342	2,041	1,759				
Municipal and Industrial (M&I)	Population [thousands]	283	367	412	6,026	7,679	8,831	96	98	105	237	288	314	89	98	104	6,731	8,529	9,766	12	16	20	12	16	20	6,743	8,545	9,787	3			
	M&I Per Capita Use (Diversion) [gpcd]	274	282	302	219	220	218	128	133	139	156	162	171	189	196	207	218	219	219	123	111	86	123	111	86	217	219	219	4			
	Consumptive factor [%]	66%	67%	69%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%				
	M&I Demand (Consumptive)	57	78	96	1,480	1,890	2,156	14	15	16	41	52	60	19	22	24	1,611	2,056	2,353	2	2	2	2	2	2	1,613	2,058	2,355				
	Self Served Industrial Demand (Consumptive)	5	6	6	165	203	206	0	0	0	9	13	18	1	2	2	182	224	232	0	0	0	0	0	0	182	224	232	5			
	Demand (Consumptive)	62	84	103	1,645	2,093	2,362	14	15	16	51	65	78	20	24	26	1,792	2,280	2,585	2	2	2	2	2	2	1,794	2,282	2,587				
Energy	Demand (Consumptive)	0.4	0.5	0.5	77	96	108	0	0	0	0	0	0	0	0	0	78	97	109	0	0	0	0	0	0	78	97	109	6			
Minerals	Demand (Consumptive)	0	0	0	42	60	60	0	0	0	0	0	0	0	0	0	42	60	60	0	0	0	0	0	0	42	60	60	7			
Fish, Wildlife, and Recreation	Demand (Consumptive)	16	16	16	0	0	0	0.3	0.3	0.3	0	0	0	0	0	0	11	11	11	27	27	27	0.3	0.3	0.3	0.3	0.3	0.3	28	28	28	8
Tribal	Demand (Consumptive)	436	439	439	535	740	740	0.7	0.8	0.8	0	0	0	0	0	0	971	1,180	1,180	44	43	43	44	43	43	1,015	1,224	1,224	9			
<b>Total Hydrologic Basin</b>	<b>Demand (Consumptive)</b>	<b>1,239</b>	<b>1,264</b>	<b>1,283</b>	<b>3,884</b>	<b>4,280</b>	<b>4,287</b>	<b>15</b>	<b>16</b>	<b>18</b>	<b>83</b>	<b>91</b>	<b>95</b>	<b>32</b>	<b>35</b>	<b>38</b>	<b>5,252</b>	<b>5,686</b>	<b>5,720</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>5,298</b>	<b>5,731</b>	<b>5,766</b>				
<b>Adjacent Areas</b>																																
Agricultural	Irrigated Acreage [thousands]																															
	Per-Acre Water Delivery (Diversion) [af/ac/yr]																															
	Consumptive factor [%]																															
	Demand (Diversion)																															
	Demand (Consumptive)																															
Municipal and Industrial (M&I)	Population [thousands]																															
	M&I Per Capita Use (Diversion) [gpcd]																															
	Consumptive factor [%]																															
	M&I Demand (Diversion)																															
	Self Served Industrial Demand (Diversion)																															
	Demand (Diversion)																															
	Demand (Consumptive)																															
Energy	Demand (Diversion)																															
Minerals	Demand (Diversion)																															
Fish, Wildlife, and Recreation	Demand (Diversion)																															
Tribal	Demand (Diversion)																															
<b>Total Adjacent Areas</b>	<b>Demand (Diversion)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>			
<b>Total Demand in the Study Area</b>		<b>1,239</b>	<b>1,264</b>	<b>1,283</b>	<b>3,884</b>	<b>4,280</b>	<b>4,287</b>	<b>15</b>	<b>16</b>	<b>18</b>	<b>83</b>	<b>91</b>	<b>95</b>	<b>32</b>	<b>35</b>	<b>38</b>	<b>5,252</b>	<b>5,686</b>	<b>5,720</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>5,298</b>	<b>5,731</b>	<b>5,766</b>				
Demand that may be met by Other Supplies		0	0	0	2,250	2,616	2,563	11	9	8	72	72	72	14	14	14	2,346	2,711	2,657	0	0	0	0	0	0	2,346	2,711	2,657	10			
<b>Potential Colorado River Demand</b>		<b>1,239</b>	<b>1,264</b>	<b>1,283</b>	<b>1,634</b>	<b>1,664</b>	<b>1,725</b>	<b>4</b>	<b>7</b>	<b>9</b>	<b>11</b>	<b>19</b>	<b>23</b>	<b>18</b>	<b>21</b>	<b>24</b>	<b>2,906</b>	<b>2,975</b>	<b>3,064</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>2,952</b>	<b>3,020</b>	<b>3,109</b>				
Agricultural	Colorado River Demand	724	724	724	421	0	0	0	0	0	0	0	0	0	0	0	1,145	724	724	0	0	0	0	0	0	1,145	724	724	11			
Municipal and Industrial	Colorado River Demand	62	84	103	726	942	1,003	4	7	9	11	19	23	18	21	24	821	1,073	1,162	2	2	2	2	2	2	823	1,075	1,164				
Energy	Colorado River Demand	0.4	0.5	0.5	0.8	1	1	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	1	1	2				
Minerals	Colorado River Demand	0	0	0	42	60	60	0	0	0	0	0	0	0	0	0	42	60	60	0	0	0	0	0	0	42	60	60				
Fish, Wildlife, and Recreation	Colorado River Demand	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0	16	16	16	0.3	0.3	0.3	0.3	0.3	0.3	17	17	17				
Tribal	Colorado River Demand	436	439	439	445	661	661	0	0	0	0	0	0	0	0	0	881	1,100	1,100	44	43	43	44	43	43	924	1,143	1,143				

## Notes

- 1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: higher utilization rate (up < 10 percent), slower land conversion (driven by population); Other areas: no change from Current Projected.
- 2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona and mainstem: 5 percent increase relative to Current Projected. Note that 5 percent is applied to each of 3 different Active Management Areas (AMAs) in Central Arizona, which, combined with changes in acreage, results in an average difference from Current Projected that does not equal 5 percent. Other areas: 20 percent increase from Current Projected.
- 3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is reduced by 35 percent relative to Current Projected.
- 4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: increase system loss to 10 percent (cannot exceed 10 percent in AMAs); All other areas: increase gpcd by 10 percent to 2060 due to increased system loss.
- 5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population.
- 6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change in per-capita energy water use values from Current Projected (Water Resources Development Commission "moderate"). However, total energy use is reduced due to population reduction.
- 7) No change from Current Projected.
- 8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: National Wildlife Refuges increased use of 5 percent relative to Current Projected; Other areas: no change from Current Projected.
- 9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: use ADWR tribal projection, which is less than the "Ten Tribes Partnership" assumption used in Current Projected; Central Arizona: no change from Current Projected; North Central and Navajo Nation: based on population estimates for the portions of the Navajo and Hopi Reservations located within the North Central portion of the Study Area.
- 10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate its demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
- 11) For planning areas other than Central AZ, all Colorado River demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for Current Projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also were checked to make sure Colorado River demand was not greater than total demand for each category—if so, M&I makes up the difference.

Colorado River Basin  
Water Supply And Demand Study

TABLE C6-4  
Total Demand within Study Area under Rapid Growth (C1) Scenario

ARIZONA		LEGEND: 999 From Current Projected Data Sheet 999 Computed 999 Input Parameter																												
Units are thousand acre-feet per year, unless otherwise noted		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			Notes	
Hydrologic Basin	Planning Area	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060		
Agricultural	Irrigated Acreage [thousands]	168	168	168	429	231	141	0	0	0	7	6	4	0.1	0.1	0.1	605	405	314	0	0	0	0	0	0	605	405	314	1	
	Per-Acre Water Delivery (Diversion) [af/ac/yr]	6.85	6.85	6.85	3.24	3.17	3.14	0.00	0.00	0.00	3.64	3.64	3.64	2.95	2.95	2.95	4.25	4.70	5.14	0.00	0.00	0.00	0.00	0.00	0.00	4.25	4.70	5.14	2	
	Consumptive factor [%]	61%	61%	61%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	83%	76%	72%	0%	0%	0%	0%	0%	0%	83%	76%	72%		
	Demand (Consumptive)	703	703	703	1,389	731	443	0	0	0	27	22	15	0.4	0.4	0.4	2,120	1,456	1,161	0	0	0	0	0	0	2,120	1,456	1,161		
Municipal and Industrial (M&I)	Population [thousands]	313	513	675	6,685	10,738	14,452	106	137	159	263	402	514	99	137	171	7,467	11,926	15,971	12	16	20	12	16	20	7,479	11,942	15,991	3	
	M&I Per Capita Use (Diversion) [gpcd]	271	269	272	214	206	203	126	127	127	151	138	121	187	187	187	213	206	203	123	111	86	123	111	86	213	205	202	4	
	Consumptive factor [%]	66%	70%	72%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%		
	M&I Demand (Consumptive)	63	108	149	1,603	2,481	3,290	15	19	23	45	62	70	21	29	36	1,746	2,699	3,567	2	2	2	2	2	2	1,748	2,701	3,569		
	Self Served Industrial Demand (Consumptive)	5	6	7	174	237	261	0	0	0	9	13	18	1	2	2	190	259	288	0	0	0	0	0	0	190	259	288	5	
	Demand (Consumptive)	68	114	156	1,777	2,718	3,551	15	19	23	54	75	88	22	31	38	1,936	2,957	3,855	2	2	2	2	2	2	1,938	2,959	3,857		
	Demand (Consumptive)	0.4	0.7	1.0	86	143	187	0	0	0	0	0	0	0	0	0	87	144	188	0	0	0	0	0	0	87	144	188	6	
Minerals	Demand (Consumptive)	0	0	0	42	58	58	0	0	0	0	0	0	0	0	0	42	58	58	0	0	0	0	0	0	42	58	58	7	
Fish, Wildlife, and Recreation	Demand (Consumptive)	16	16	16	0	0	0	0.3	0.3	0.3	0	0	0	11	11	11	27	27	27	0.3	0.3	0.3	0.3	0.3	0.3	0.3	27	27	27	8
Tribal	Demand (Consumptive)	552	556	556	535	732	703	17	73	124	0	0	0	0	0	0	1,103	1,360	1,382	38	55	71	38	55	71	1,141	1,415	1,453	9	
<b>Total Hydrologic Basin</b>	<b>Demand (Consumptive)</b>	<b>1,339</b>	<b>1,389</b>	<b>1,431</b>	<b>3,829</b>	<b>4,382</b>	<b>4,942</b>	<b>32</b>	<b>92</b>	<b>147</b>	<b>81</b>	<b>97</b>	<b>102</b>	<b>33</b>	<b>42</b>	<b>49</b>	<b>5,315</b>	<b>6,002</b>	<b>6,671</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>5,355</b>	<b>6,059</b>	<b>6,744</b>		
<b>Adjacent Areas</b>																														
Agricultural	Irrigated Acreage [thousands]																													
	Per-Acre Water Delivery (Diversion) [af/ac/yr]																													
	Consumptive factor [%]																													
	Demand (Diversion)																													
	Demand (Consumptive)																													
Municipal and Industrial (M&I)	Population [thousands]																													
	M&I Per Capita Use (Diversion) [gpcd]																													
	Consumptive factor [%]																													
	M&I Demand (Diversion)																													
	Self Served Industrial Demand (Diversion)																													
	Demand (Diversion)																													
	Demand (Consumptive)																													
Energy	Demand (Diversion)																													
Minerals	Demand (Diversion)																													
Fish, Wildlife, and Recreation	Demand (Diversion)																													
Tribal	Demand (Diversion)																													
<b>Total Adjacent Areas</b>	<b>Demand (Diversion)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<b>Total Demand in the Study Area</b>		<b>1,339</b>	<b>1,389</b>	<b>1,431</b>	<b>3,829</b>	<b>4,382</b>	<b>4,942</b>	<b>32</b>	<b>92</b>	<b>147</b>	<b>81</b>	<b>97</b>	<b>102</b>	<b>33</b>	<b>42</b>	<b>49</b>	<b>5,315</b>	<b>6,002</b>	<b>6,671</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>5,355</b>	<b>6,059</b>	<b>6,744</b>		
Demand that may be met by Other Supplies		0	0	0	2,250	2,541	2,405	12	12	10	72	72	72	14	14	14	2,347	2,638	2,501	0	0	0	0	0	0	2,347	2,638	2,501	10	
<b>Potential Colorado River Demand</b>		<b>1,339</b>	<b>1,389</b>	<b>1,431</b>	<b>1,579</b>	<b>1,841</b>	<b>2,536</b>	<b>21</b>	<b>81</b>	<b>137</b>	<b>9</b>	<b>25</b>	<b>30</b>	<b>20</b>	<b>28</b>	<b>35</b>	<b>2,967</b>	<b>3,364</b>	<b>4,170</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>3,007</b>	<b>3,421</b>	<b>4,243</b>		
Agricultural	Colorado River Demand	703	703	703	379	0	0	0	0	0	0	0	0	0	0	0	1,082	703	703	0	0	0	0	0	0	1,082	703	703	11	
Municipal and Industrial	Colorado River Demand	68	114	156	713	1,127	1,823	4	9	14	9	25	30	20	28	35	814	1,303	2,058	2	2	2	2	2	2	816	1,305	2,060		
Energy	Colorado River Demand	0.4	0.7	1.0	0.7	0.9	0.9	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0	1	2	2		
Minerals	Colorado River Demand	0	0	0	42	53	54	0	0	0	0	0	0	0	0	0	42	53	54	0	0	0	0	0	0	42	53	54		
Fish, Wildlife, and Recreation	Colorado River Demand	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0	16	16	16	0.3	0.3	0.3	0.3	0.3	0.3	16	16	16		
Tribal	Colorado River Demand	552	556	556	445	660	659	16	72	123	0	0	0	0	0	0	1,013	1,288	1,337	38	55	71	38	55	71	1,051	1,342	1,408		

**Notes**

- 1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: faster land conversion (driven by population); Other areas: no change from Current Projected.
- 2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from Current Projected (note that this is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in acreage, results in an average applied water rate that is slightly different from Current Projected).
- 3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is increased by 35 percent relative to Current Projected.
- 4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: no change relative to Current Projected. Note that this is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in population, results in an average gpcd that is slightly different from Current Projected; similarly, in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slight change from Current Projected.
- 5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population.
- 6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Water Resources Development Commission "high" energy use value used—increased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population.
- 7) No change from Current Projected.
- 8) No change from Current Projected.
- 9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem and Central Arizona: no change from Current Projected; Personal communication, Navajo Nation, Apr 16, 2012. North Central and Navajo Nation and San Juan: Nation provided demand schedules.
- 10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate its demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
- 11) For planning areas other than Central AZ, all Colorado River demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for Current Projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also were checked to make sure Colorado River demand was not greater than total demand for each category—if so, M&I makes up the difference.

Colorado River Basin  
Water Supply And Demand Study

TABLE C6-5  
Total Demand within Study Area under Rapid Growth (C2) Scenario

ARIZONA		LEGEND: 999 From Current Projected Data Sheet 999 Computed 999 Input Parameter																								Notes			
Units are thousand acre-feet per year, unless otherwise noted		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			
Hydrologic Basin	Planning Area	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	
Agricultural	Irrigated Acreage [thousands]	168	168	168	429	231	141	0	0	0	7	6	4	0.1	0.1	0.1	605	405	314	0	0	0	0	0	0	605	405	314	1
	Per-Acre Water Delivery (Diversion) [af/ac/yr]	7.92	7.92	7.92	3.19	3.01	2.98	0.00	0.00	0.00	2.91	2.91	2.92	2.33	2.33	2.33	4.50	5.05	5.63	0.00	0.00	0.00	0.00	0.00	0.00	4.50	5.05	5.63	2
	Consumptive factor [%]	57%	57%	57%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	79%	72%	68%	0%	0%	0%	0%	0%	0%	79%	72%	68%	
	Demand (Consumptive)	763	763	763	1,366	695	421	0	0	0	22	17	12	0.3	0.3	0.3	2,152	1,476	1,196	0	0	0	0	0	0	2,152	1,476	1,196	
Municipal and Industrial (M&I)	Population [thousands]	313	513	675	6,685	10,738	14,452	106	137	159	263	402	514	99	137	171	7,467	11,926	15,971	12	16	20	12	16	20	7,479	11,942	15,991	3
	M&I Per Capita Use (Diversion) [gpcd]	280	251	228	209	177	162	123	113	101	151	138	124	183	167	150	208	178	163	123	111	86	123	111	86	208	178	163	4
	Consumptive factor [%]	66%	69%	71%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	M&I Demand (Consumptive)	65	100	122	1,563	2,124	2,628	15	17	18	44	62	71	20	26	29	1,708	2,329	2,868	2	2	2	2	2	2	1,709	2,331	2,870	
	Self Served Industrial Demand (Consumptive)	5	6	7	174	237	261	0	0	0	9	13	18	1	2	2	190	258	287	0	0	0	0	0	0	190	258	287	5a, 5b
	Demand (Consumptive)	70	106	129	1,737	2,361	2,889	15	17	18	54	75	89	22	28	31	1,897	2,588	3,156	2	2	2	2	2	2	1,899	2,590	3,158	
	Demand (Consumptive)	0.4	0.5	0.7	82	107	132	0	0	0	0	0	0	0	0	0	82	107	133	0	0	0	0	0	0	82	107	133	6
Minerals	Demand (Consumptive)	0	0	0	42	58	58	0	0	0	0	0	0	0	0	0	42	58	58	0	0	0	0	0	0	42	58	58	7
Fish, Wildlife, and Recreation	Demand (Consumptive)	19	19	19	0	0	0	0.3	0.3	0.3	0	0	0	0	0	0	11	11	11	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	8
Tribal	Demand (Consumptive)	552	555	555	535	712	672	17	73	124	0	0	0	0	0	0	1,103	1,340	1,351	38	55	71	38	55	71	1,141	1,395	1,422	9
<b>Total Hydrologic Basin</b>	<b>Demand (Consumptive)</b>	<b>1,405</b>	<b>1,444</b>	<b>1,467</b>	<b>3,761</b>	<b>3,932</b>	<b>4,172</b>	<b>32</b>	<b>90</b>	<b>142</b>	<b>75</b>	<b>93</b>	<b>101</b>	<b>33</b>	<b>39</b>	<b>42</b>	<b>5,306</b>	<b>5,598</b>	<b>5,924</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>5,346</b>	<b>5,655</b>	<b>5,997</b>	
<b>Adjacent Areas</b>																													
Agricultural	Irrigated Acreage [thousands]																												
	Per-Acre Water Delivery (Diversion) [af/ac/yr]																												
	Consumptive factor [%]																												
	Demand (Diversion)																												
	Demand (Consumptive)																												
Municipal and Industrial (M&I)	Population [thousands]																												
	M&I Per Capita Use (Diversion) [gpcd]																												
	Consumptive factor [%]																												
	M&I Demand (Diversion)																												
	Self Served Industrial Demand (Diversion)																												
	Demand (Diversion)																												
	Demand (Consumptive)																												
Energy	Demand (Diversion)																												
Minerals	Demand (Diversion)																												
Fish, Wildlife, and Recreation	Demand (Diversion)																												
Tribal	Demand (Diversion)																												
<b>Total Adjacent Areas</b>	<b>Demand (Diversion)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<b>Total Demand in the Study Area</b>		<b>1,405</b>	<b>1,444</b>	<b>1,467</b>	<b>3,761</b>	<b>3,932</b>	<b>4,172</b>	<b>32</b>	<b>90</b>	<b>142</b>	<b>75</b>	<b>93</b>	<b>101</b>	<b>33</b>	<b>39</b>	<b>42</b>	<b>5,306</b>	<b>5,598</b>	<b>5,924</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>5,346</b>	<b>5,655</b>	<b>5,997</b>	
Demand that may be met by Other Supplies		0	0	0	2,254	2,332	2,303	11	10	8	72	72	72	14	14	14	2,351	2,428	2,397	0	0	0	0	0	0	2,351	2,428	2,397	10
<b>Potential Colorado River Demand</b>		<b>1,405</b>	<b>1,444</b>	<b>1,467</b>	<b>1,507</b>	<b>1,601</b>	<b>1,869</b>	<b>20</b>	<b>80</b>	<b>134</b>	<b>3</b>	<b>20</b>	<b>29</b>	<b>19</b>	<b>25</b>	<b>28</b>	<b>2,955</b>	<b>3,170</b>	<b>3,527</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>40</b>	<b>57</b>	<b>73</b>	<b>2,995</b>	<b>3,227</b>	<b>3,600</b>	
Agricultural	Colorado River Demand	763	763	763	349	0	0	0	0	0	0	0	0	0	0	0	1,112	763	763	0	0	0	0	0	0	1,112	763	763	11
Municipal and Industrial	Colorado River Demand	70	106	129	671	890	1,158	4	8	11	3	20	29	19	25	28	768	1,050	1,355	2	2	2	2	2	2	769	1,052	1,357	
Energy	Colorado River Demand	0.4	0.5	0.7	0.7	0.9	0.9	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	1	1	2	
Minerals	Colorado River Demand	0	0	0	42	51	53	0	0	0	0	0	0	0	0	0	42	51	53	0	0	0	0	0	0	42	51	53	
Fish, Wildlife, and Recreation	Colorado River Demand	19	19	19	0	0	0	0	0	0	0	0	0	0	0	0	19	19	19	0.3	0.3	0.3	0.3	0.3	0.3	19	19	19	
Tribal	Colorado River Demand	552	555	555	445	659	657	16	72	123	0	0	0	0	0	0	1,013	1,286	1,335	38	55	71	38	55	71	1,051	1,341	1,406	

## Notes

- 1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: faster land conversion (driven by population); Other areas: no change from Current Projected.
- 2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: 5 percent decrease in water duties, but overall higher water duties result from consumptive use being higher for the same acreage. Central Arizona: 5 percent decrease relative to Current Projected (note that 5 percent is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in acreage, results in an average difference from Current Projected that does not equal 5 percent). Other areas: 20 percent decrease from Current Projected.
- 3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is increased by 35 percent relative to Current Projected.
- 4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: gpcd reduced annually by 0.44 percent. Note that this is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in population, results in an average gpcd that changes at a slightly different rate than 0.44 percent; similarly, in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slightly different rate than 0.44 percent.
- 5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population.
- 6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Water Resources Development Commission "low" energy use value used—decreased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population.
- 7) No change from Current Projected.
- 8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: recreation contractors use full entitlement, no change to National Wildlife Refuges; Other areas: no change from Current Projected.
- 9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem and Central Arizona: no change from Current Projected; Personal communication, Navajo Nation, Apr 16, 2012. North Central and Navajo Nation and San Juan: Nation provided demand schedules.
- 10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate its demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
- 11) For planning areas other than Central AZ, all Colorado River demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for Current Projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also were checked to make sure Colorado River demand was not greater than total demand for each category—if so, M&I makes up the difference.

Colorado River Basin  
Water Supply And Demand Study

TABLE C6-6  
Total Demand within Study Area under Enhanced Environment (D1) Scenario

ARIZONA		LEGEND: 999 From Current Projected Data Sheet 999 Computed 999 Input Parameter																											
Units are thousand acre-feet per year, unless otherwise noted		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			Notes
Hydrologic Basin	Planning Area	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	Notes
Agricultural	Irrigated Acreage [thousands]	168	168	168	447	288	189	0	0	0	7	6	4	0.1	0.1	0.1	623	462	361	0	0	0	0	0	0	623	462	361	1
	Per-Acre Water Delivery (Diversion) [af/ac/yr]	6.85	6.85	6.85	3.24	3.21	3.16	0.00	0.00	0.00	3.64	3.64	3.64	2.95	2.95	2.95	4.22	4.54	4.88	0.00	0.00	0.00	0.00	0.00	0.00	4.22	4.54	4.88	2
	Consumptive factor [%]	61%	61%	61%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	83%	79%	75%	0%	0%	0%	0%	0%	0%	83%	79%	75%	
	Demand (Consumptive)	703	703	703	1,449	924	596	0	0	0	27	22	15	0.4	0.4	0.4	2,179	1,649	1,314	0	0	0	0	0	0	2,179	1,649	1,314	
Municipal and Industrial (M&I)	Population [thousands]	298	434	528	6,348	9,086	11,305	101	116	125	250	340	402	94	116	134	7,091	10,091	12,493	12	16	20	12	16	20	7,103	10,107	12,513	3
	M&I Per Capita Use (Diversion) [gpcd]	260	221	186	210	181	163	121	101	94	148	124	100	179	150	120	209	180	161	123	111	86	123	111	86	208	179	161	4
	Consumptive factor [%]	66%	67%	67%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	M&I Demand (Consumptive)	57	72	74	1,497	1,843	2,064	14	13	13	41	47	45	19	19	18	1,627	1,995	2,214	2	2	2	2	2	2	1,629	1,997	2,216	
Self Served Industrial Demand (Consumptive)		5	6	6	170	220	233	0	0	0	9	13	18	1	2	2	186	242	259	0	0	0	0	0	0	186	242	259	Sa, 5b
	Demand (Consumptive)	62	78	80	1,666	2,063	2,297	14	13	13	51	60	63	20	22	20	1,813	2,236	2,473	2	2	2	2	2	2	1,814	2,238	2,475	
Energy	Demand (Consumptive)	0.4	0.5	0.5	78	91	105	0	0	0	0	0	0	0	0	0	78	92	106	0	0	0	0	0	0	78	92	106	6
Minerals	Demand (Consumptive)	0	0	0	42	58	58	0	0	0	0	0	0	0	0	0	42	58	58	0	0	0	0	0	0	42	58	58	7
Fish, Wildlife, and Recreation	Demand (Consumptive)	78	78	78	0	0	0	0.3	0.3	0.3	0	0	0	11	11	11	89	89	89	0.3	0.3	0.3	0.3	0.3	0.3	90	90	90	8
Tribal	Demand (Consumptive)	552	556	556	535	694	688	0.7	0.8	0.8	0	0	0	0	0	0	1,087	1,251	1,244	44	43	43	44	43	43	1,131	1,294	1,287	9
Total Hydrologic Basin Demand (Consumptive)		1,396	1,415	1,418	3,769	3,831	3,743	15	14	14	78	82	77	31	33	31	5,289	5,375	5,284	46	46	46	46	46	46	5,334	5,421	5,330	
Adjacent Areas																													
Agricultural	Irrigated Acreage [thousands]																												
	Per-Acre Water Delivery (Diversion) [af/ac/yr]																												
	Consumptive factor [%]																												
	Demand (Diversion)																												
Municipal and Industrial (M&I)	Population [thousands]																												
	M&I Per Capita Use (Diversion) [gpcd]																												
	Consumptive factor [%]																												
	M&I Demand (Diversion)																												
Self Served Industrial Demand (Diversion)																													
	Demand (Diversion)																												
Energy	Demand (Diversion)																												
Minerals	Demand (Diversion)																												
Fish, Wildlife, and Recreation	Demand (Diversion)																												
Tribal	Demand (Diversion)																												
Total Adjacent Areas Demand (Diversion)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Demand in the Study Area		1,396	1,415	1,418	3,769	3,831	3,743	15	14	14	78	82	77	31	33	31	5,289	5,375	5,284	46	46	46	46	46	46	5,334	5,421	5,330	
Demand that may be met by Other Supplies		0	0	0	2,248	2,074	1,807	11	8	6	72	72	72	14	14	14	2,344	2,168	1,899	0	0	0	0	0	0	2,344	2,168	1,899	10
Potential Colorado River Demand		1,396	1,415	1,418	1,521	1,757	1,936	4	6	8	6	10	5	18	19	18	2,945	3,208	3,385	46	46	46	46	46	46	2,990	3,253	3,431	
Agricultural	Colorado River Demand	703	703	703	333	0	0	0	0	0	0	0	0	0	0	0	1,036	703	703	0	0	0	0	0	0	1,036	703	703	11
Municipal and Industrial	Colorado River Demand	62	78	80	701	1,045	1,224	4	6	8	6	10	5	18	19	18	791	1,158	1,335	2	2	2	2	2	2	792	1,160	1,337	
Energy	Colorado River Demand	0.4	0.5	0.5	0.7	0.9	0.9	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	
Minerals	Colorado River Demand	0	0	0	42	53	53	0	0	0	0	0	0	0	0	0	42	53	53	0	0	0	0	0	0	42	53	53	
Fish, Wildlife, and Recreation	Colorado River Demand	78	78	78	0	0	0	0	0	0	0	0	0	0	0	0	78	78	78	0.3	0.3	0.3	0.3	0.3	0.3	79	79	79	
Tribal	Colorado River Demand	552	556	556	445	658	658	0	0	0	0	0	0	0	0	0	997	1,214	1,213	44	43	43	44	43	43	1,041	1,257	1,257	

## Notes

- 1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: no change from Current Projected.
- 2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from Current Projected. Note that this is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in acreage. Results in an average applied water rate that is slightly different from Current Projected.
- 3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from Current Projected.
- 4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: gpcd reduced annually by 0.88 percent, with lower limit of 100 gpcd. Note that this is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in population, results in an average gpcd that changes at a slightly different rate than 0.44 percent; similarly, in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slightly different rate than 0.44 percent. There is an exception for Central Arizona and North Central and Navajo Nation in 2060, where gpcd was calculated as a 22.5 percent reduction from 2015 levels.
- 5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population.
- 6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Water Resources Development Commission "low" energy use value used—decreased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population. There is an exception for Central Arizona, where a 5.6 percent reduction from the Scenario A is realized in 2035 and a 10 percent reduction in 2060.
- 7) No change from Current Projected.
- 8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: National Wildlife Refuges use full entitlement; Other areas: no change from Current Projected.
- 9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from Current Projected.
- 10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate its demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
- 11) For planning areas other than Central AZ, all Colorado River demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for Current Projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also were checked to make sure Colorado River demand was not greater than total demand for each category—if so, M&I makes up the difference.

Colorado River Basin  
Water Supply And Demand Study

TABLE C6-7  
Total Demand within Study Area under Enhanced Environment (D2) Scenario

ARIZONA		LEGEND: 999 From Current Projected Data Sheet 999 Computed 999 Input Parameter																											
Units are thousand acre-feet per year, unless otherwise noted		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			Notes
Hydrologic Basin	Planning Area	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	
Agricultural	Irrigated Acreage [thousands]	168	168	168	429	231	141	0	0	0	7	6	4	0.1	0.1	0.1	605	405	314	0	0	0	0	0	0	605	405	314	1
	Per-Acre Water Delivery (Diversion) [af/ac/yr]	6.51	6.51	6.51	3.19	3.01	2.98	0.00	0.00	0.00	2.91	2.91	2.92	2.33	2.33	2.33	4.11	4.46	4.87	0.00	0.00	0.00	0.00	0.00	0.00	4.11	4.46	4.87	2
	Consumptive factor [%]	61%	61%	61%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	83%	76%	72%	0%	0%	0%	0%	0%	0%	83%	76%	72%	
	Demand (Consumptive)	668	668	668	1,366	695	421	0	0	0	22	17	12	0.3	0.3	0.3	2,056	1,380	1,101	0	0	0	0	0	0	2,056	1,380	1,101	
Municipal and Industrial (M&I)	Population [thousands]	313	513	675	6,685	10,738	14,452	106	137	159	263	402	514	99	137	171	7,467	11,926	15,971	12	16	20	12	16	20	7,479	11,942	15,991	3
	M&I Per Capita Use (Diversion) [gpcd]	261	220	182	209	177	162	121	101	100	148	124	100	179	150	120	207	176	160	123	111	86	123	111	86	207	175	160	4
	Consumptive factor [%]	66%	68%	69%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	M&I Demand (Consumptive)	60	85	94	1,563	2,124	2,628	14	15	18	44	56	58	20	23	23	1,701	2,304	2,821	2	2	2	2	2	2	1,703	2,306	2,823	
Self Served Industrial Demand (Consumptive)		5	6	7	174	237	261	0	0	0	9	13	18	1	2	2	190	258	287	0	0	0	0	0	0	190	258	287	5a, 5b
	Demand (Consumptive)	65	91	101	1,737	2,361	2,889	14	15	18	53	69	75	21	25	25	1,891	2,562	3,108	2	2	2	2	2	2	1,892	2,564	3,110	
Energy	Demand (Consumptive)	0.4	0.5	0.7	82	107	132	0	0	0	0	0	0	0	0	0	82	107	133	0	0	0	0	0	0	82	107	133	6
Minerals	Demand (Consumptive)	0	0	0	42	58	58	0	0	0	0	0	0	0	0	0	42	58	58	0	0	0	0	0	0	42	58	58	7
Fish, Wildlife, and Recreation	Demand (Consumptive)	79	79	79	0	0	0	0.3	0.3	0.3	0	0	0	11	11	11	91	91	91	0.3	0.3	0.3	0.3	0.3	0.3	91	91	91	8
Tribal	Demand (Consumptive)	552	555	555	535	702	700	17	73	124	0	0	0	0	0	0	1,103	1,330	1,379	38	55	71	38	55	71	1,141	1,385	1,450	9
Total Hydrologic Basin Demand (Consumptive)		1,365	1,395	1,405	3,761	3,923	4,200	31	88	142	74	86	87	32	36	36	5,264	5,529	5,870	40	57	73	40	57	73	5,305	5,586	5,943	
Adjacent Areas																													
Agricultural	Irrigated Acreage [thousands]																												
	Per-Acre Water Delivery (Diversion) [af/ac/yr]																												
	Consumptive factor [%]																												
	Demand (Diversion)																												
Municipal and Industrial (M&I)	Population [thousands]																												
	M&I Per Capita Use (Diversion) [gpcd]																												
	Consumptive factor [%]																												
	Self Served Industrial Demand (Diversion)																												
Energy	Demand (Diversion)																												
Minerals	Demand (Diversion)																												
Fish, Wildlife, and Recreation	Demand (Diversion)																												
Tribal	Demand (Diversion)																												
Total Adjacent Areas Demand (Diversion)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Demand in the Study Area		1,365	1,395	1,405	3,761	3,923	4,200	31	88	142	74	86	87	32	36	36	5,264	5,529	5,870	40	57	73	40	57	73	5,305	5,586	5,943	
Demand that may be met by Other Supplies		0	0	0	2,204	2,138	2,029	11	9	7	72	72	72	14	14	14	2,301	2,233	2,122	0	0	0	0	0	0	2,301	2,233	2,122	10
Potential Colorado River Demand		1,365	1,395	1,405	1,557	1,785	2,171	20	79	134	2	14	15	19	23	23	2,963	3,296	3,747	40	57	73	40	57	73	3,003	3,353	3,821	
Agricultural	Colorado River Demand	668	668	668	339	0	0	0	0	0	0	0	0	0	0	0	1,007	668	668	0	0	0	0	0	0	1,007	668	668	11
	Municipal and Industrial	65	91	101	731	1,071	1,457	4	7	12	2	14	15	19	23	23	821	1,206	1,607	2	2	2	2	2	2	823	1,208	1,609	
	Energy	0.4	0.5	0.7	0.8	0.9	0.9	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	1	1	2	
	Minerals	0	0	0	42	54	54	0	0	0	0	0	0	0	0	0	42	54	54	0	0	0	0	0	0	42	54	54	
	Fish, Wildlife, and Recreation	79	79	79	0	0	0	0	0	0	0	0	0	0	0	0	79	79	79	0.3	0.3	0.3	0.3	0.3	0.3	80	80	80	
	Tribal	552	555	555	445	659	658	16	72	123	0	0	0	0	0	0	1,013	1,286	1,337	38	55	71	38	55	71	1,051	1,341	1,408	
	Colorado River Demand	552	555	555	445	659	658	16	72	123	0	0	0	0	0	0	1,013	1,286	1,337	38	55	71	38	55	71	1,051	1,341	1,408	

**Notes**

- 1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: faster land conversion (driven by population); Other areas: no change from Current Projected.
- 2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona and Mainstem: 5 percent decrease relative to Current Projected. Note that 5 percent is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in acreage, results in an average difference from Current Projected that does not equal 5 percent. Other areas: 20 percent decrease from Current Projected.
- 3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is increased by 35 percent relative to Current Projected.
- 4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: gpcd reduced annually by 0.88 percent, with lower limit of 100 gpcd. Note that this is applied to each of 3 different AMAs in Central Arizona, which, combined with changes in population, results in an average gpcd that changes at a slightly different rate than 0.44 percent; similarly, in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slightly different rate than 0.44 percent.
- 5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population.
- 6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Water Resources Development Commission "low" energy use value used—decreased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population.
- 7) No change from Current Projected.
- 8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: National Wildlife Refuges use full entitlement; Other areas: no change from Current Projected.
- 9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem and Central Arizona: no change from Current Project; Personal communication, Navajo Nation, Apr 16, 2012. North Central and Navajo Nation and San Juan: Nation provided demand schedules.
- 10) Personal communication, ADWR Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate its demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
- 11) For planning areas other than Central AZ, all Colorado River demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for Current Projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also were checked to make sure Colorado River demand was not greater than total demand for each category—if so, M&I makes up the difference.

## 4.0 References

- Arizona Department of Water Resources (ADWR). 2005. *Upper San Pedro Basin, Active Management Area Review Report*.
- Arizona Department of Water Resources (ADWR). 2010a. *Arizona Water Atlas*.
- Arizona Department of Water Resources (ADWR). 2010b. *Draft Demand and Supply Assessment, Tucson Active Management Area*.
- Arizona Department of Water Resources (ADWR). 2010c. *Draft Demand and Supply Assessment, Phoenix Active Management Area*.
- Arizona Department of Water Resources (ADWR). 2011a. *Draft Arizona Demand Narrative*, August.
- Arizona Department of Water Resources (ADWR). 2011b. *Draft Demand and Supply Assessment, Pinal Active Management Area*.
- Arizona Department of Water Resources (ADWR). 2011c. Personal communication with Reclamation.
- Bureau of Reclamation (Reclamation). 1964–2002. Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in Arizona v. California Et. Al., Dated March 9, 1964.
- Bureau of Reclamation (Reclamation). 1996–2008. *Lower Colorado River Accounting System Evapotranspiration and Evaporation Calculations*.
- Bureau of Reclamation (Reclamation). 2000. *Colorado River Interim Surplus Criteria Final Environmental Impacts Statement*.
- Bureau of Reclamation (Reclamation). 2003–2009. *Colorado River Accounting and Water Use Report, Arizona, California, and Nevada*.
- Bureau of Reclamation (Reclamation). 2006. *North Central Water Supply Study, Report of Findings*.
- Bureau of Reclamation (Reclamation). 2007a. *Appraisal Report, Augmentation Alternatives for the Sierra Vista Sub-watershed, Arizona*.
- Bureau of Reclamation (Reclamation). 2007b. *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead Final Environmental Impact Statement*.
- Bureau of Reclamation (Reclamation). 2007 and 2010. 5 year reports. *Provisional Upper Colorado River Basin Consumptive Uses and Losses Report 2001–2008*. Retrieved from <http://www.usbr.gov/uc/library/envdocs/reports/crs/crsul.html>.
- Bureau of Reclamation (Reclamation). 2009. *Central Yavapai Highlands Water Resources Management Study, Appraisal Level Phase I*.

U.S. Geological Survey (USGS). 2007. *Water Management of the Regional Aquifer in the Sierra Vista Subwatershed, Arizona – 2009 Report to Congress*, prepared in response to Public 108-136, Section 321.

U.S. Geological Survey (USGS). 2009. *Water Management of the Regional Aquifer in the Sierra Vista Subwatershed, Arizona – 2009 Report to Congress*, prepared in response to Public 108-136, Section 321.

Water Resources Development Commission, Arizona. 2011. *Water Supply and Demand Working Group Report*.