CHAPTER 5 – FUTURE TRENDS ANALYSIS

INTRODUCTION

This chapter examines each of the study areas in central Arizona and discusses the potential impact of continued importation of Colorado River and Salt River water and the salts associated with that water. Many different assumptions can be made about the future, but one of the certainties in central Arizona's future is a continued rapid growth in population. Another is that municipal effluent will continue to grow in importance as a supplemental water source.

PHOENIX METROPOLITAN AREA

With regard to salinity, the Phoenix metropolitan area is the most highly impacted area in central Arizona. This trend will continue for a number of reasons. First, a large volume of surface water from both the Salt River and the Colorado River will continue to be imported into the Phoenix area. In the future, the annual influx of salts entering the Phoenix area is expected to increase beyond current rates. The increase will be due to two factors: an increase in the importation of Colorado River water and the increasing contribution of salt from society.

Second, the concentration of salts at Phoenix-area reclamation and wastewater treatment plants will also increase, driven by four main factors: the growing population, an increase in the number of cooling towers, groundwater quality degradation due to salt importation, and expanded water conservation measures. The result will be a less "valuable" effluent coming out of the wastewater treatment plants.

Maricopa County is one of the fastest growing counties in the United States. During the 1990s, approximately 900,000 people moved into Maricopa County. The 2000 census recorded Maricopa County's population at 3,072,149. The Maricopa Association of Governments (MAG), drawing upon research conducted by Arizona State University and the University of Arizona for the Department of Commerce State Economic Strategies Study, developed an updated set of population projections (Maricopa Association of Governments, 2003). Projections up to the year 2040 are shown in Table 5-1. MAG examined land use data provided by the various communities in the Phoenix metropolitan area to estimate how many people may eventually reside in the Phoenix area. Using that data, MAG estimated population at total buildout in the Phoenix area at 12,000,000, but did not specify when total build out would occur.

Table 5-1. MAG Projections of Population Growth in Phoenix Metro Area

2000	2010	2020	2030	2040	Buildout
3,072,149	4,145,000	5,210,000	6,241,000	7,326,000	12,000,000

Most of the salts entering the Phoenix metropolitan area are transported by either the Colorado River or Salt River. An estimate of the year 2000 annual salt flux for the Phoenix area, based on a population of 3 million using 238 gallons per capita per day (gpcd), is shown in Table 5-2.

Table 5-2. Year 2000 Estimated Annual Salt Flux for the Phoenix Metro Area[a]

Entering Phoenix Metro	Volume (ac-ft)	TDS (mg/L)	Salt (tons)
Groundwater	37,000	680	34,218
SRP	810,000	480	528,768
CAP	752,000	650	664,768
Gila River	90,000	550	67,320
Agua Fria River	50,000	400	27,200
Society	290,000[b]	300[c]	118,320
Agricultural fertilizer			17,800
Turf fertilizer			4,700
Total			**1,463,094**

Exiting Phoenix Metro	Volume (ac-ft)	TDS (mg/L)	Salt (tons)
Groundwater	28,000	1,100	41,888
Gila River	100,000	2,370	322,320
Total			**364,208**

Residual Salt Load			**1,098,886**

Notes:

[a] Estimate assumes population of 3 million and water use of 238 gpcd
[b] Water entering sewer after use
c Salts added by society

The Colorado River has increased in salinity over time with the increased population and re-use along the river. In the early 1900s the salinity level at Yuma was around 400 mg/L TDS, but is presently around 800 mg/L TDS. Salinity levels also increase as the Colorado flows from its headwaters to the sea. The Green River in Wyoming, which feeds the Colorado, measures about 50 mg/L TDS. Moving downstream, the Colorado at Lake Havasu City carries approximately 650 mg/L TDS and, as mentioned, about 800 mg/L TDS at Yuma.

The Colorado River Basin Salinity Control Forum (Forum) has as one of its goals to prevent any further increase in the overall salinity of the Colorado River. The Forum has in many respects succeeded—despite increased river usage—through implementation of an aggressive farm irrigation improvement program and other programs. If the Forum continues with its aggressive programs to control salinity entering the Colorado River, salinity levels should remain relatively constant over the long term. However, for the near term, the salinity concentration in the river will fluctuate following the drought cycles, rising during dry years and declining during wet years. Nonetheless, as the population in the Phoenix area continues to increase, greater quantities of available Colorado River water will be imported and with it additional salts.

Like the Colorado River, the Salt River also exhibits cyclic behavior in salinity concentration with respect to dry and wet years. The greatest contributor of salts are the natural salt springs located along the White River and upper reaches of the Salt River. Society is a very small factor in introducing salts into the Salt River, and the general increase in the population of central Arizona is not expected to add significantly to the TDS levels of this waterway. Furthermore, in contrast to the Colorado, the Salt River already delivers the maximum of available water to the Phoenix metropolitan area. As a result, there will not be an increase in salinity loading associated with continued deliveries of Salt River water to the Phoenix area.

One sector of society, agriculture, has been declining in Maricopa County for the last 50 years as farmers sell their farm properties to developers for residential and other construction. SRP began with 238,400 acres of irrigable land in 1904. By 2000, 194,180 acres of SRP land had been urbanized. Western portions of the Phoenix metropolitan area have shown a similar decline in irrigated acreage. As the agricultural acreage decreases, the contribution of salts into the groundwater from fertilizers will similarly decrease. This trend may be offset to a certain extent, however, by an expansion of urban agriculture, including parks, baseball fields, soccer fields, greenbelts, and lawns.

An estimate of the annual salt flux into the Phoenix metropolitan area in 2040, when MAG projects the population will be 7.3 million, is shown on *Table 5-3*. This is more than double the current population, and is certain to place great demands on water providers. Due to the greater demands, the use of CAP water will shift from agriculture to municipal uses. It is likely that CAP water will be leased from Native American tribes and the increased importation of CAP water will be the primary contributor of additional salts, but society's contribution of salts will also increase simply as a result of the growth in population.

In this analysis, it is assumed the current water usage of 238 gallons per capita per day (gpcd) is reduced to 200 gpcd mandated by law because of the greater demand on limited water supplies. It is also likely that salts will be more concentrated due to water conservation measures as society adds the same amount of salts but returns less water to the sewer system.

The decline in irrigated agriculture will lead to a corresponding reduction in fertilizer use, thereby reducing that source of salts but on the other hand, salts transported out of the Phoenix area will decrease with reduced agriculture return flows and increased recharge of effluent and urban agriculture will expand with a corresponding increase in salts from urban fertilizer.

With these assumptions, the estimate of salts remaining in the Phoenix metropolitan area may increase to 1.6 million tons annually. While this analysis can not done predict an precise value, it is based on reasonable assumptions, and the sum of those assumptions indicate the annual salt influx will increase in the future.

Table 5-3. Year 2040 Estimated Annual Salt Flux for the Phoenix Metro Area[a]

Entering Phoenix Metro	Volume (ac-ft)	TDS (mg/L)	Salt (tons)
Groundwater	37,000	680	34,218
SRP	810,000	480	528,768
CAP	1,000,000[b]	650	884,000
Gila River	90,000	550	67,320
Agua Fria River	50,000	400	27,200
Society	593,000	360	290,333
Agricultural fertilizer			8,700[c]
Turf fertilizer			9,400
Total			**1,849,938**

Exiting Phoenix Metro	Volume (ac-ft)	TDS (mg/L)	Salt (tons)
Groundwater	28,000	1,100	41,888
Gila River	50,000[d]	2,370	161,160
Total			**203,048**

Residual Salt Load (tons)	**1,646,890**

Notes:

[a] Estimate assumes population of 7.3 million and water use of 200 gpcd

[b] New demands met by Indian lease, CAGRD, and by decline of agriculture

c Agriculture reduced by 1/2 (assumed value)

d Reduced agricultural return and increased recharge from 91st Ave WWTP

An estimate of salt flux into the Phoenix metropolitan area at projected maximum buildout of 12 million people is provided in Table 5-4. There will likely be significant changes in the way our society functions when or if this population level is reached. For example, at the projected buildout population, water conservation efforts would most likely need to be maximized, and therefore in Table 5-4 the projected water usage was reduced to an assumed 150 gpcd. CAP importation is assumed to be at the maximum available through Indian leases, municipal demands and Central Arizona Groundwater Replenishment District (CAGRD) commitments, with the remainder of the CAP allocations going to the Tucson metropolitan area and Indian commitments. New sources of water will also need to be found and imported into the Phoenix area, to include projects such as importing water from McMullen Valley in western Arizona. To sustain projected buildout in the Phoenix metropolitan area it is assumed that there would be no agricultural irrigation, that Gila River water would be devoted exclusively to municipal rather than agricultural uses, and that all waste water area-wide would be reused (i.e., no water would be “wasted” by allowing it to flow out of the area via the Gila River channel). Again it is assumed that society will add additional salts because of a larger population, but that salts would be added at the same relative rate. Under these assumptions, the salts remaining in the Phoenix metropolitan area would surpass 2 million tons annually.

Table 5-4. Estimated Annual Salt Flux for the Phoenix Metro Area at Buildout[a]

Entering Phoenix Metro	Volume (ac-ft)	TDS (mg/L)	Salt (tons)
Groundwater	37,000	680	34,218
SRP	810,000	480	528,768
CAP	1,200,000	650	1,060,800
Gila River	90,000[b]	550	67,320
Agua Fria River	50,000	400	27,200
Society	731,000	475	472,226
New Water	50,000[c]	400	27,200
Turf fertilizer			11,280
Total			**2,229,012**

Exiting Phoenix Metro	Volume (ac-ft)	TDS (mg/L)	Salt (tons)
Groundwater	28,000	1,100	41,888
Gila River	0[d]	2,370	0
Total			**41,888**

Residual Salt Load (tons)			**2,187,124**

Notes:

[a] Estimate assumes population of 12 million and water use of 150 gpcd

[b] Gila River now used for human consumption, not agriculture

c New water sources (McMullen Valley-type projects), TDS assumed

d Due to new demands all water is re-used, and no water exits via Gila River

The introduction of more total salts into the Phoenix metropolitan area would be followed by an increase in salt concentrations at area wastewater and reclamation facilities. This would occur for a number of reasons.

The increased use of membrane technology, specifically RO and nanofiltration membranes, will also contribute to higher salinity levels. Before 1993, there were 134 RO or nanofiltration plants in operation across the United States; currently 471 plants are in operation, and more are in the planning or construction phase. Although, planners from the cities of Phoenix, Mesa and Tempe have stated they do not anticipate the need for membrane treatment plants at this time there is a possibility that brackish groundwater RO plants may be built to utilize an unused water source. An analysis of the future trends of this technology is included as Technical Appendix S. RO concentrates salts in brine that is sometimes discharged to the sewer system. Greater use of RO will further increase the salinity concentration at wastewater treatment plants.

Another factor likely to increase salinity concentrations at wastewater treatment and reclamation plants is a predicted slow, long-term rise in groundwater salinity levels. Agricultural and urban irrigation practices and the importation of salts from the surface waters will, over a period of time, increase the salinity of groundwater. This more saline groundwater will be pumped back up, used and sent to the wastewater treatment plants.

As the population increases, additional water conservation measures will be implemented. When indoor water conservation measures (such as low-flow toilets) are implemented, less water per person is returned to the sewer. Assuming that society still contributes salts at the same relative rate per person, more salts and proportionally less water will enter the system. Another factor will be the increased need for cooling towers to maintain workplaces at an acceptable level of comfort for the larger workforce. Temperatures in the Phoenix metropolitan area will increase as concrete and blacktop replaces agricultural areas. Currently, there is a 10 degree temperature differential on a summer night between downtown city streets and downtown park areas. With future increased water conservation measures, there may be fewer parks, lawns, golf courses and greenbelts. Without the cooling effect of the grassy open areas, a higher percentage of cooling towers will need to be built to keep workplaces comfortable. Cooling towers create a brine which is disposed into the sewer. Increasing the percentage of cooling towers will increase the overall concentration of salts at area wastewater treatment plants.

Table 5-2, representing the current annual salt flux for the Phoenix metropolitan area, shows the concentration of salts added by society to be 300 mg/L. This is in addition to the base level of the source water. In Table 5-4, representing annual salt flux for the Phoenix area at projected buildout, the value of salts added by society has increased to 475 mg/L. This increase was calculated by assuming that the rate of salts introduced into the sewer system remains at the same relative rate per person, even with a lower water usage. But it must be considered that a portion of the source water (groundwater) will also have a higher salt concentration, and that cooling towers and membrane plants will discharge brine but less water to the sewers. With these assumptions, 475 mg/L is probably conservative. The projected 175 mg/L rise in concentration is an educated estimate and not an exact value.

In summary, the volume of salts imported and retained in the Phoenix metropolitan area will in the future increase significantly, potentially by as much as double the present rate. It should also be noted that the current annual retention of approximately 1.1 million tons of salts within the area is a very recent phenomenon—one that has only been occurring since the mid-1980s. Within the next 40 years, this salt influx could increase by another 500,000 tons annually. The concentration of salts in effluent will also continue to rise, although this rise is not likely to be as dramatic (a projected increase of another 150 mg/L TDS concentration is possible within the next 40 years). The ultimate consequences of both these actions will be continued degradation of Phoenix-area groundwater and an increase in economic damages.

TUCSON METROPOLITAN AREA

The Tucson metropolitan area currently has good quality groundwater. As Tucson increasingly utilizes its CAP allocation, however, the area will begin to see the effects of importing high-TDS Colorado River water. The Tucson metropolitan area has 215,333 af of CAP water allocated to various water providers. Of that total, the City of Tucson has the largest single allocation at 138,920 af. The City initiated direct delivery of CAP water in November 1992 with plans to ramp up to full utilization of the allocation over several years. But problems with corrosion leading to rust-colored water and breaking mains due to the different chemical composition of the water (as well as overdue main replacements) quickly became apparent. This led the City to halt direct delivery in October 1994, when the canal was temporarily shut down for scheduled maintenance. A citizens' initiative resulted in the 1995 passage of Proposition 201, the Water Consumer Protection Act, prohibiting direct delivery of CAP water for a 5-year period and establishing specific uses for CAP water within Tucson Water's service area. In addition, the Act required all CAP water for direct delivery to be equal to or better in quality (i.e., salinity, hardness, and dissolved organic material) than the 1995 quality of groundwater from Tucson Water's Avra Valley well field. As a result of the problems experienced with direct CAP delivery and the ensuing Act, the City of Tucson launched a massive main replacement and lining project and began exploring recharge possibilities to utilize CAP and enable compliance with state regulations requiring renewable water resources.

In 1996, Tucson Water began a recharge and recovery pilot project in Avra Valley called the Central Avra Valley Storage and Recovery Project (CAVSARP). In 1999, Tucson Water began delivering a blend of recovered CAP water and groundwater to four neighborhoods in a series of pilot projects to demonstrate that the blended water would be acceptable to area residents and would not cause the same corrosion problems as before. The demonstration projects were successful, and Tucson Water began system-wide delivery of the blended groundwater/recovered CAP water in May of 2001 through the Clearwater Renewable Resources Facility. CAVSARP is the primary structural element of the larger Clearwater facility. Full-scale recharge operations were initiated in 2003 with expected annual recharge and recovery of about 60,000 af. The recharge component of the Clearwater facility will soon be increased to 80,000 af/yr, which will provide capacity for long-term water banking.

It is anticipated that the salinity level of the recovered water will gradually rise over time as a larger percentage of the recovered water is CAP water. Tucson Water's current water quality policy limits maximum salinity in the delivered water to 450 mg/L TDS. Groundwater modeling indicates that this salinity level will be reached by the year 2010. In time, the City of Tucson will have to address how it will meet its long-term water quality objectives. Depending on what the City's future water quality goals and policies will be, it may be necessary to desalinate a portion of the delivered water, blend more native groundwater with CAP water, and/or change the policy.

The CAP also delivers Colorado River water to three other recharge facilities near the Tucson metropolitan area: the Pima Mine Road recharge facility, the Avra Valley recharge facility, and the Lower Santa Cruz recharge facility. Each of these plants will influence the salinity level of the native groundwater. Eventually, this water will be used by municipal users. The economic study prepared for this report indicates that the tangible costs caused by higher salinity can be absorbed by society. What may be more of a problem in the Tucson metropolitan area is the public's perception of CAP or a CAP/groundwater blend as poorer quality water.

Just north of Tucson, the communities served by Marana, Oro Valley, and the Metropolitan Domestic Water Improvement District (MDWID) are analyzing options to use their allocations of CAP water directly. One plan under review involves using slow sand filtration for water treatment, a small reservoir for storage, and a pipeline to deliver CAP water to their customers. Because of the very good quality water that is now delivered to these customers, if it is at all economically possible, the plan would also include an RO membrane facility to remove salts. A plan to dispose of the concentrate will also be necessary if this treatment plan moves forward.

The City of Tucson projects that it will utilize its full allocation of CAP water by 2015. With that CAP water will come large amounts of salts. The projected amount of salts entering into the study area through CAP allocations, groundwater, and society will be approximately 260,000 tons. Of that amount, approximately 55,000 tons are projected to leave the study area, resulting in a buildup of just over 200,000 tons of salts annually in the Tucson metropolitan study area. The projected salt balance for the Tucson area is shown in Figure 5-1.

SALT BALANCE
TUCSON ACTIVE MANAGEMENT AREA
2015

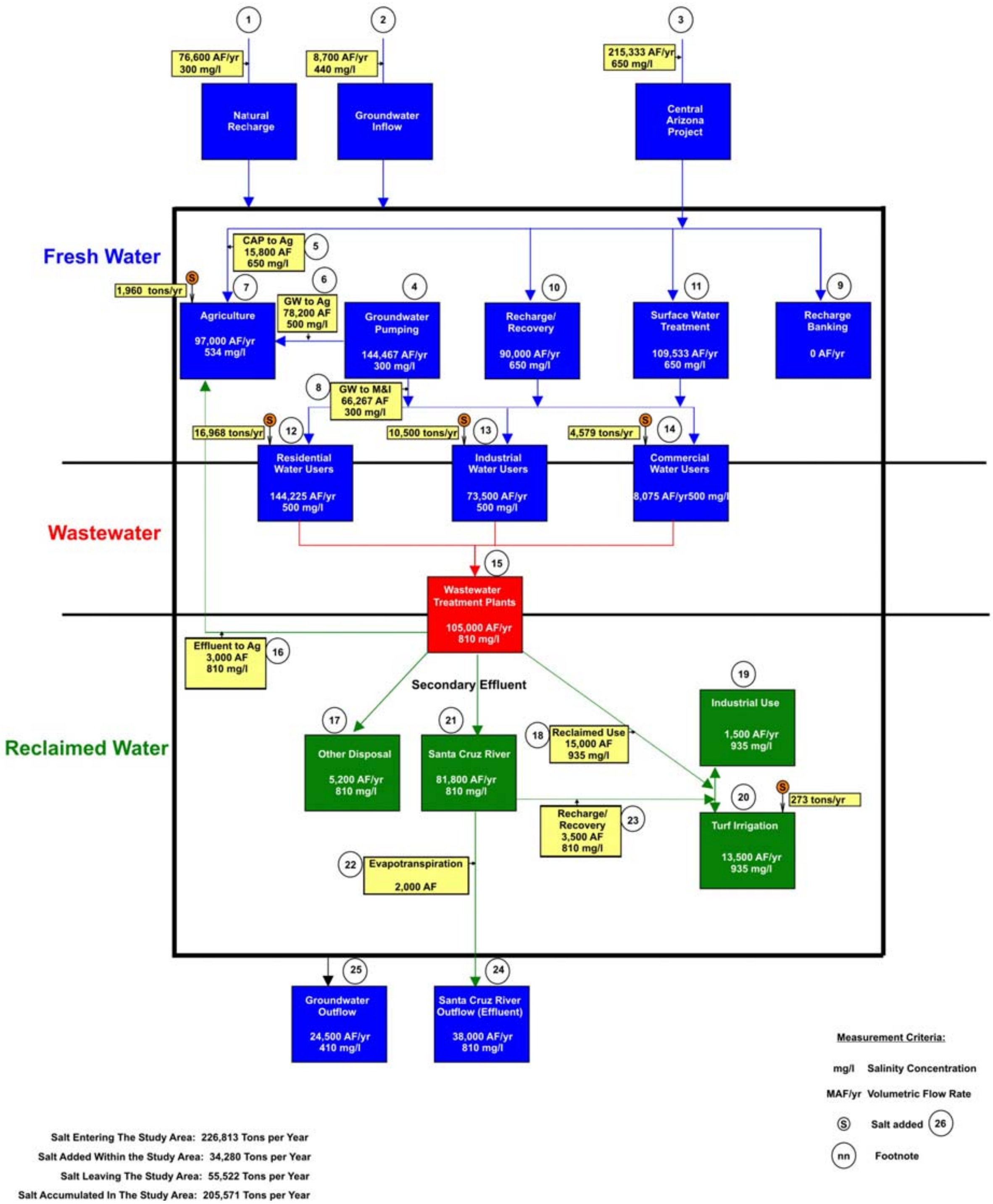

Figure 5-1. Year 2015 Salt Balance in the Tucson Active Management Area

GILA RIVER INDIAN COMMUNITY

The economy of the Gila River Indian Community (GRIC), though supplemented by tourism and gaming, will continue to have a significant agricultural component.

The aquifer beneath the GRIC is continuous and characterized by relatively shallow depths to water, ranging from approximately 25 feet to 150 feet. The total size of the aquifer is small compared to the Phoenix or Tucson metropolitan areas because bedrock is only a few hundred feet below the surface. Elevated concentrations of TDS and nitrates occur in the groundwater underlying agricultural areas. Distribution of TDS in the groundwater is, as with all the study areas, complex in location and depth. Generally speaking, lower TDS concentrations are located in the eastern half of the GRIC and higher TDS concentrations are in the central, northern, and northwest areas. TDS levels commonly range from 500 to 2,000 mg/L, but are as high as 3,500 mg/L in some areas. A substantial volume of groundwater now moves out of the GRIC to the south due to cones of depression in Pinal County. Groundwater also flows in the traditional direction to the northwest, downstream along the Gila River. The salts associated with this groundwater movement contribute to the high concentration of salts in the southwest Phoenix metropolitan area.

If the Indian water rights settlement and the CAP re-allocation is approved by Congress, GRIC will have 328,000 af of CAP water in their total 653,500 af water portfolio (U.S. Bureau of Reclamation, 2000). GRIC has negotiated a contract with Chandler and Mesa to trade 32,500 af of CAP water in exchange for 40,600 af of effluent on an annual basis. GRIC will use the effluent for agriculture. Effluent already being delivered to GRIC is high in TDS, averaging approximately 1,200 mg/L, and most likely the new effluent will be high in TDS also. As noted earlier in this chapter, agricultural irrigation has a tendency to concentrate salts in the root zone as water is consumed by plants. The salts are then flushed from the root zone with additional water. The flushing water with the concentrated salts eventually makes its way to the groundwater table. The groundwater table on GRIC lands may rebound or rise with the importation of Gila River water, CAP water, and effluent.

With the new CAP water allocated to them through the Indian water rights settlement, GRIC plans to convert approximately 53,000 acres of desert to agricultural use. Reclamation estimates that 800,000 tons of salts will be flushed from the soils when these new acres are put into agricultural production. GRIC can expect continued reduction in the groundwater quality with continued use of CAP, additional use of Gila River water, the concentrating effect of agricultural irrigation, and the importing of high-TDS effluent. Reducing or eliminating groundwater pumping may also lead to concerns with potential waterlogging in these areas. Waterlogging and drainage will present challenges that must be managed in the future.

As the population continues to increase in central Arizona, the need to purchase CAP water to meet customer demand and the appeal of additional revenue may put great pressure on GRIC and other Indian communities to lease their water. GRIC may choose to lease a portion of their CAP allocations to municipalities, deciding that this is a more profitable use of a valuable resource than diversion to agricultural irrigation. A leasing agreement may be a win-win situation, because the municipalities will need additional water and GRIC can gain revenues for capital improvements from the leased water.

PINAL COUNTY

The economy of Pinal County is primarily agricultural; in 1995, 75 percent of the water use in the county was for agriculture. The local agricultural economy has historically relied on groundwater supplemented by Gila River water. Years ago the groundwater table began to drop rapidly due to large-scale irrigation, but with the introduction of CAP water the water table rebounded in those areas receiving CAP allocations.

The salts follow the water. Importation of salts into Pinal County come from the Gila River, Santa Cruz River, CAP water, and fertilizers. Approximately 600,000 tons of salts are currently imported into Pinal County (Table 2-3), with approximately half these salts entering the basin from the CAP.

The future use of CAP water for Pinal County non-Indian agriculture is difficult to project. Most of the irrigation districts with an allotment of CAP have switched to using excess CAP water because it is much cheaper than their allotted water as there are no capital charges and the rate is reduced as an incentive to use Arizona's entire Colorado River allotment.

A plan recently put forward by the CAWCD, the operators of the CAP, will set aside a pool of excess water reserved for non-Indian agriculture. This set-aside will commence in 2004 with 400,000 af/yr, be reduced to 300,000 af/yr in 2017, then to 225,000 af/yr in 2024, and end in 2030. If this plan is implemented, the majority of non-Indian agricultural use of CAP water will conclude at that point. As CAP water use in Pinal County diminishes, farmers are left with the choice of using more groundwater or retiring the land. The State's groundwater management goal for the Pinal AMA is to extend the life of the agricultural economy for as long as is feasible, while retaining adequate water supplies for non-agricultural uses.

Groundwater will be used as long as it remains economical. Rising costs to pump groundwater in some irrigation districts will render certain crops uneconomical and lead to those crops no longer being grown. It is generally accepted that at about 1,000 feet of head it is not economically feasible to pump groundwater to grow lower-valued crops. The water below 1,000 feet will be used for future municipal purposes.

Agricultural practices generally lead to a decline in the groundwater quality by concentrating salts and as a result of the effects of fertilizers (see Chapter 3, *Effects of Salinity in Central Arizona*). In several locations within Pinal County, groundwater use for potable purposes is already limited by excessive levels of nitrates. Groundwater quality, however, is not a limiting factor for irrigated agriculture in all areas of Pinal County. In locations where salinity of the groundwater is excessive, leaching and the cultivation of more salt-tolerant crops have helped mitigate the problem.

When agriculture is no longer economically feasible and agricultural lands are developed for urban uses, the quality of water left for those urban uses tends to range from poor to extremely poor. Vast quantities of the water will need membrane treatment to remove the salts, nitrates, and other contaminates before it can be delivered for potable use. The challenges of brine disposal, expensive water (from both RO and very deep pumps), and limited supply will not be easy to overcome.

HARQUAHALA BASIN

The Harquahala Basin is experiencing the classic case of a declining groundwater table that recovered once alternate water sources were found. Harquahala agriculture began by using groundwater in the early 1950s. Groundwater pumping from 1951 to 1985 resulted in a substantial decline in the groundwater table. With the introduction of CAP water in the mid 1980s, groundwater pumping decreased dramatically and the groundwater table recovered. But as the CAP water for agriculture is phased out, Harquahala farmers will likely once again resort to groundwater mining.

CAP water imports about 66,000 tons of salt a year into the Harquahala Basin, which far surpasses the salt load from agricultural fertilizers of about 2,000 tons annually. As the future use of CAP water for agriculture declines, the influx of salts from that source will decline as well. The Vidler Recharge Facility, however, has a permit to recharge up to 100,000 af/yr. If this facility operates at maximum capacity, it would annually bring as much as 76,000 tons of salt into the basin. Most of these salts will be returned with the water that is recovered and delivered to the Phoenix metropolitan area.

GILA BEND BASIN

The Gila Bend area is the ultimate salt sink in Central Arizona. High concentrations of salts from agricultural return and wastewater effluent are delivered into the basin via the Gila River. Additional salts are then added by agricultural fertilizers. The Gila Bend area has extremely poor groundwater. As early as 1946 the USGS had concluded that the groundwater was generally unsatisfactory for agriculture. Concentrations of salts within the majority of the basin are between 1,000 mg/L and 5,000 mg/L TDS.

As a result of agricultural practices and the present surface water quality, the groundwater in the Gila Bend area can only be expected to get worse. The Gila River consists of effluent from the 91st Avenue WWTP and return flows from Buckeye Irrigation District and Roosevelt Irrigation District, and almost all the water leaving the Phoenix metropolitan area via the Gila River is diverted for irrigation. The river averages 2,350 mg/L TDS, and the vast majority of these salts end up in the Gila Bend basin. The only time measurable quantities of salt do not remain in the basin is during a major flood event when water is released at Painted Rock Dam.

The citizens of Gila Bend have been drinking bottled water for years. The water delivered to the citizens has historically been of such poor quality that it was used only for bathing. In June 2003, Gila Bend opened a 1.2-million-gallon-per-day advanced RO water treatment facility. The TDS of water delivered to customers was reduced from between 1,200 and 1,800 mg/L to 75 mg/L. The concentrate is disposed in two evaporation ponds. This type of alternative treatment (or other emerging technology) is the likely future for all areas with significantly impaired waters.

In the relatively distant future, perhaps 80 to 100 years from now, agriculture will end in the Gila Bend area when the Gila River ceases to flow. Leaders in the Phoenix metropolitan area may decide that the water (effluent and irrigation drainage) going down the Gila River is too valuable a resource to waste. This water will be treated and reused at some point to supply the growing Phoenix metropolis. When no Gila River water reaches Gila Bend agricultural areas, agricultural production will depend on groundwater. The groundwater table will decline until it is no longer economically feasible to continue growing crops.

CONCLUSIONS

The major metropolitan areas of Phoenix and Tucson can expect to import and accumulate more salts on an annual basis in the future. Currently, the salinity problem is not preventing population growth or economic development. When the importation of salts will become a major burden is not clear at this point but the rate salts are accumulated is increasing.

The agricultural areas of Pinal County, Gila Bend, and the Harquahala Basin will reduce their rate of importation of salts as the excess pool of CAP water diminishes. As agriculture declines in these areas, the groundwater left behind will be impaired due to agriculture practices. As urban areas expand into the former agricultural areas, water providers may have to desalinate groundwater before delivering it to customers.