

Chapter 2

MAJOR THEMES IN ARIZONA'S WATER FUTURE

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Seven major themes or overarching concerns regarding Arizona's water future are discussed in succeeding chapters. Information and discussion about each of these topics is found in several places throughout the text; the themes are previewed in this chapter. They include:

- Drought, climate variability and change
- Rural water supply
- Growth, water supply and meeting management goals within the Active Management Areas
- Surface water adjudications
- Riparian protection and endangered species
- Water quality as a water management issue
- Economics as a water management issue

Drought, Climate Variability and Change

Arizona currently is affected by a severe drought that is nearing a decade in length, with the El Nino year of 1998 being an exception. Although some portions of the state have received near-normal rainfall during the past year, experts believe that Arizona may be in the beginning stages of a longer-term drought than has been experienced in the last 40 years. Part of the significance of this drought is its regional nature. It is affecting the entire Colorado River watershed, and consequently both Arizona's in-state and Central Arizona Project (CAP) supplies are affected. Reservoir conditions on the Colorado River and throughout the state have been at or near record low levels in the last two years. In addition to increased wildfires—the Rodeo-Chediski fire in 2002 was the largest in the state's history—the drought has resulted in significant economic impacts on rural areas (particularly in the ranching, recreation and forest products sectors) that generally do not have supplemental water supplies. Water supply conditions have been critical in the summer months in Flagstaff, Prescott, Williams, Mayer, Payson, Pine-Strawberry and other

communities on the Mogollon Rim as well as elsewhere in the state.

Although the extensive investments in water supply infrastructure for the Phoenix and Tucson areas have provided substantial protection from the current drought, there are concerns about the future in the case of continued droughts simultaneously affecting the Salt River-Verde River system and the Colorado River system. Governor Napolitano has established a Task Force to develop a state drought plan that would limit the state's vulnerability to drought in the future. The Arizona Drought Preparedness Plan is expected to be adopted in early fall of 2004. Drought also has raised the stakes in: (1) negotiations with other Colorado River basin states, (2) shortage sharing agreements, (3) long-term supply reliability discussions and (4) relations between the United States and Mexico.

In addition to concerns about the effects of climate variability on water use and supply, there is substantial scientific evidence that longer-term changes in climate conditions are occurring. Scientists have observed that increases in average global temperatures already are affecting water supply availability in the Colorado basin (Christensen *et al.*, 2004). There also are concerns about the implications of higher temperatures because they reduce soil moisture, increase evaporation and transpiration by plants, and change snowpack and runoff volumes and timing. Climate and drought considerations are further discussed in Chapters 3 and 4.

Rural Water Supply

Even in the absence of drought, water supply conditions in some communities of rural Arizona are a serious problem. Growth rates are very high, with projected continued growth in many communities that may not have water supplies or financial resources to sustain that growth. There are inadequate mechanisms to ensure availability of water supplies to support growth in the rural areas of the state. In addition, increasing demands for groundwater are very likely to affect important springs and surface water flows that support riparian areas and recreation.

The portions of the state outside the Active Management Areas (AMAs) encompass 87 percent of the land area and almost a million people. According to Arizona Department of Eco-

conomic Security data, the population in these areas is expected to nearly double in the next 50 years, but these projections probably are low, as discussed in Chapter 3. High population growth rates, in combination with water supplies that often are susceptible to drought, increase the likelihood that there will be water supply shortages in rural communities.

Areas of the state beyond the boundaries of the AMAs have significant challenges in meeting their water supply needs because (1) many of these areas do not have adequate water supply and demand data and (2) they, unlike the major metropolitan areas, generally are dependent on a single water source. Lack of information is a major frustration for jurisdictions, watershed groups and land managers because they cannot make informed decisions without good water supply data. From a data availability and water supply perspective, there are essentially two Arizonas: the major metropolitan areas and irrigation districts served by the Colorado River and the rest of the state, which has limited water supply alternatives and even more limited planning information. These issues are discussed further in Chapters 3 and 7 and Appendix G.

Growth, Water Supply and Meeting Management Goals Within the Active Management Areas

Concerns about whether the AMAs are on track to meet their management goals were among the reasons that Governor Hull established the Governor's Water Management Commission in 2000. An extensive evaluation of the ability of the AMAs to meet their management goals resulted from that Commission's activities. Regarding conditions of the individual AMAs, the Commission (2000) concluded:

In the Phoenix and Tucson AMAs, water budgets based on current supply availability projections indicate that achieving safe-yield may not be as difficult as maintaining that condition . . . the expected population growth beyond 2025, particularly in the major metropolitan areas, may ultimately exceed the availability of renewable supplies and result in increasing costs for providing renewable water supplies and again put pressure on groundwater availability. This situation may occur earlier in the Prescott AMA, where renewable supplies are not as abundant or as readily available . . .

The Santa Cruz AMA goal of preventing long-term declines in local water table levels provides the means to deal with "sub-area" issues and physical water

supply conditions, which does not exist in the others AMAs . . . Management of the water levels is an important objective due to the desire to protect the surface water flows and riparian habitat along the river while maximizing available supplies . . .

In the past the water management goal of the Pinal AMA was referred to as “planned depletion.” However, this characterization has recently been identified as encompassing only one aspect of the management goal. Preserving water supplies for non-irrigation users is also an important part of the Pinal AMA management goal. Because agriculture can use mined groundwater supplies in the Pinal AMA until they are no longer affordable, and sufficient groundwater appears to be available based on projected needs, the goal of preserving the agricultural economies for as long as feasible is achievable well beyond 2025. With regard to achieving the goal for non-irrigation uses and accommodating projected population increases, strategies must be identified and implemented to lower overall water use, specifically the non-residential component, and/or secure additional renewable supplies.

The ability to achieve and maintain the long-term management goals within the AMAs is a key water management consideration for Arizona. Substantial progress has been made to date through use of renewable supplies, conservation programs and conversion of rights. Continued efforts will be required, but projections by the Arizona Department of Water Resources (ADWR) show shortfalls in those efforts (Tables 6.1 through 6.5). In many cases ADWR's ability to influence critical water management decisions is both indirect and insufficient. Cooperative efforts with regional entities and technically sophisticated long-term planning are likely to be critical to achieving the AMAs' water management goals.

Decisions related to acquiring sufficient water supplies to meet the rapidly growing water demands in the AMAs will need to be made in the context of ever-increasing competition for water. Competition exists at multiple levels, both within Arizona and between the Colorado River basin states and Mexico, particularly in the context of shortages. Recent discussions related to ensuring reliable long-term water supplies for Assured Water Supply purposes in the context of the Central Arizona Groundwater Replenishment District show that water interests are becoming more aware of the risks of future shortages and are always vigilant about protecting their own water rights. These topics are reviewed in Chapters 3 and 6.

Surface Water Adjudications

A key variable in Arizona's water supply picture is that most of the surface water rights in the state have not been legally quantified and prioritized. Only the water rights that have been established by court decree in separate legal actions have set volumes and priority dates. Because the surface water rights system is based on prior appropriation ("first in time, first in right"), a determination of the amount and priority of each right is required in order to manage the system. Although formal court adjudications of the surface water rights are ongoing for the Gila River and Little Colorado River, there is no indication that these proceedings will be completed in the near future. Tribal claims generally have senior priority to state-based claims and could have a significant impact on Arizona's water supply picture. Chapters 5 and 8 and Appendix P discuss this theme.

Riparian Protection and Endangered Species

Most of the state's free-flowing streams that existed prior to the last century have been affected by dams and diversions as well as by groundwater pumping that depletes the base flow. The remaining free-flowing streams and shallow groundwater tables of the state support riparian habitats that are the locations of Arizona's greatest biodiversity. The riparian corridors are of particular importance to migratory birds. These areas also are major contributors to Arizona's economy because they are destinations for recreation and tourism as well as contributors to the quality of life in Arizona. Finding a balance between the needs of protected species through the Endangered Species Act and the water supply needs of growing communities will be an ongoing debate. A multi-species conservation plan for endangered species along the Colorado River, mitigation requirements related to willow flycatcher habitat at Roosevelt Lake and issues associated with managing the San Pedro River are examples of ways in which habitat conservation efforts will affect water supply availability in the future. These issues are discussed further in Chapters 5 and 9.

Water Quality as a Water Management Issue

Water supply limitations often are created by water quality problems. If a water source is contaminated and a community cannot afford to treat the water prior to use, the water supply is essentially unavailable. Ability to pay for treating water supplies depends on local economic conditions as well as available financing mechanisms. Water quality protection programs in Arizona are based on both federal and state law and primarily are administered by either the Arizona Department of Environmental Quality or the United States Environmental Protection Agency Region IX through the Safe Drinking Water Act.

Groundwater or surface water that contains contaminants at levels that exceed the primary water quality standards must be treated prior to use. Depending on the type and concentration of contaminants, different treatment and/or blending techniques can be used to meet the standards prior to delivery to customers. Although virtually any contaminant can be removed from water, the key water supply issue is the cost of treatment. If the treatment costs exceed the willingness of the public to pay, the water supply is at least temporarily unusable.

The key water quality issues from a regulatory perspective in the state are summarized in Appendix F. Of particular concern are nitrates in groundwater, primarily associated with former agricultural and industrial sources or wastewater discharges, and arsenic, a naturally occurring metal that appears at elevated levels in some parts of the state. The standard for arsenic is changing from 50 to 10 micrograms per liter, with the new standard becoming effective in January 2006 at an estimated cost to Arizona water providers of \$100 million. The impact of this change in standards is particularly significant for 300 small water systems, *i.e.*, those systems serving less than 10,000 people, which tend to be in rural areas. An area of increasing concern is the salinity of water supplies in the AMAs since water imported from the Colorado River is higher in salinity than the groundwater in many parts of the CAP service area. Concerns also are increasing about industrial contamination of groundwater supplies in urban areas and the presence of pharmaceuticals and other substances in discharged effluent.

Economics as a Water Management Issue

Water is commonly viewed as a natural resource that is integral to supporting life, but it also is a commodity and an economic input to multiple products. The cost of water has substantial implications for influencing water management decisions and economic productivity. For example, in the absence of regulation, federal subsidies and financial incentives, many Arizonans who are customers of the CAP probably would be using groundwater today because groundwater often is cheaper than the full cost of CAP water and is in many cases of higher quality. Changes in the cost of water, caused by changes in supply and demand or changes in energy costs, have ripple effects throughout Arizona's economy.

Economists agree that market-based systems can increase the efficiency of water use because such systems result in moving the water rights to the "highest and best use," *i.e.*, to the water use that can pay the highest price. There are equity, social and environmental considerations associated with this perspective and, consequently, there are virtually no cases of a totally unregulated water market in the United States. Without an established water rights system, however, it is difficult to implement even rudimentary market-related concepts such as leasing into water management. Until the tribal claims and the surface water rights of the state are clear, it will be difficult to develop more flexible market-based water management systems to address the changing water needs of Arizona. These issues are primarily discussed further in Chapter 5.

DIFFICULT CHOICES AND HARD DECISIONS

This background report provides a context for discussing future decisions about water supply and water management in Arizona. Difficult choices and hard decisions that have economic, environmental and social consequences must be made. Tradeoffs between water quality and water quantity, growth and economic development and environmental protection, agricultural water use and municipal and industrial uses, cost of living and quality of life, private property rights and protection of public values, are all significant issues that deserve to be addressed in the public arena.

The complexity of water issues in Arizona, however, often makes it difficult for all citizens to participate in these public debates. Basic questions emerge regarding Arizona's institutional capacity to deal with the state's water problems, the potential need for additional regulation of water availability outside the AMAs, the types of new regulation and the responsible parties for their enforcement, the financial resources necessary to pay for the transportation and storage of new supplies for rural communities as well as drought and water supply planning needs.

Achieving a sustainable water future for all of Arizona is a worthy but daunting goal. The significant drought that Arizona has been experiencing has brought the issue of sustainability of our water supplies into sharper focus. Now is an excellent time to consider whether the efforts that have been made to date will be sufficient to carry Arizona into the future, or whether the dramatically expanding population, the lack of sufficient water resources in some rural areas, and the increasing competition for municipal supplies justify additional efforts to ensure that Arizona's economy and quality of life can be sustained into the future.