

Water Management Study: Upper Rio Grande Basin

Final Report

Prepared For:

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Executive Summary

In September, 1996, the Western Water Policy Review Advisory Commission contracted with ECONorthwest to study the major problems associated with the growing competition for scarce water and related resources in the Upper Rio Grande Basin, and to make recommendations for appropriate federal policies and actions for addressing the problems. This is our final report. The study covers the area from the headwaters, in Colorado, to Ft. Quitman, Texas (see map).

AN IMPORTANT MESSAGE FOR THE READER

In this report we identify problems and make recommendations associated with the growing competition for scarce water and related resources in the Upper Rio Grande Basin. Our definition of problems has a specific meaning. A problem exists if the Basin's water and related resources are not used in the optimal manner that meets the three economic criteria described in the text. In identifying the problems we are not making any evaluation, positive or negative, of any individuals, laws, institutions, or activities, associated with the problems. Our recommendations apply solely to federal policies, agencies, and activities. We make no recommendations whatsoever regarding the Rio Grande Compact, state and local laws, the responsibilities and rights of resource owners, the substantive merits of disputants' claims to resources, or changes in specific resource uses.

A. BACKGROUND

Precipitation in the Basin is limited and highly variable. Most of the Basin receives 7–15 inches annually, on average. Half of the precipitation occurs as snowfall in the high mountains of Colorado and New Mexico and the other half as intense, summer thunderstorms. The Colorado portion of the Basin produces about 975,000 acre-feet (af) of water annually, but, because of agricultural production and transportation “losses” from evaporation and seepage, only 325,000 af reach the Colorado-New Mexico border.¹ Streamflows in New Mexico add another 650,000 af and about 100,000 af are imported from the San Juan Basin, a part of the Colorado River Basin. About two-thirds (on average, 700,000 af/yr) of the water entering the Middle Rio Grande Valley surrounding Albuquerque reaches Elephant Butte Reservoir. The U.S. must deliver 60,000 af of this to Mexico. Heavy agricultural use in southern New Mexico and western Texas, together with growing municipal consumption in the El Paso–Ciudad Juarez area, deplete the river so that it generally goes dry before reaching Ft. Quitman.

¹ An acre-foot of water is the amount of water that would cover one acre of land one foot deep. It is equivalent to 326,000 gallons and 43,560 cubic feet of water.

Agriculture accounts for about 89 percent of the major water uses (typically associated with withdrawals or diversions) in the Basin. The remainder goes to municipal and industrial use, primarily in the Middle Rio Grande Valley and in the El Paso area. The Basin's cities have relied on groundwater but El Paso (population about 650,000) and her Mexican neighbor, Ciudad Juarez (more than 1.5 million), as well as Albuquerque (about 650,000) recently recognized they cannot long continue mining groundwater at historical rates. El Paso has begun using surface water from the Rio Grande and Albuquerque is examining similar options.

Sediment levels in the river are high for most of its length. Intense agricultural use in the southern parts of the Basin increase the water's salinity and add nutrients and agricultural chemicals. The shallow aquifers near urban centers, which provide water for many low-income households, exhibit pollution from septic systems and hazardous-chemical spills. Effluent from municipal wastewater-treatment plants frequently fails to meet water-quality standards and surface water near urban centers is not potable and often not suitable for human contact. Water from the deep aquifers under Albuquerque and El Paso-Ciudad Juarez often includes elevated levels of dissolved solids, such as arsenic.

Human settlements in the Basin have diverted water from the river for centuries, and competition for water has long been intense. Friction among the states led to the 1938 Rio Grande Compact, which stipulates the fractions of available water that Colorado must deliver to New Mexico, and New Mexico to Texas. The allocations in the Compact reflect the agrarian economy and the distribution of agricultural activity that existed at the end of the 1920s, not today's highly urbanized economy. Much of the agricultural development reflected in the Compact occurred in the upper end of the Basin, but most of today's economic growth is occurring farther south, in El Paso-Ciudad Juarez and Albuquerque.

Diversions of water from the river, construction of dams and other structures in the river bed, manipulation of the hydrograph, modification of the channel, and control of vegetation have extensively modified the riverine-riparian ecosystem. The reach below Elephant Butte Dam is largely a network of canals and 71 percent of the native fish species no longer can be found in this area. Only one portion of the Basin's ecosystem, the riparian cottonwood forest known as the bosque in the Middle Rio Grande Valley, has been examined extensively. The forest no longer is dispersed throughout the historical floodplain, much of it is disconnected hydrologically from the river, and significant changes in ecological structure and function are expected to occur if current management regimes continue. In 1994, the U.S. Fish & Wildlife Service listed the Rio Grande silvery minnow as an endangered species.

The prior-appropriation doctrine underlies most water movement in the Basin, but it does not apply uniformly to all resources or in all areas. Also important is the influence of aboriginal rules and custom, Spanish and Mexican laws antedating the 1848 Treaty of Guadalupe Hidalgo that ceded much of the Basin to the U.S., international treaties, the Rio Grande Compact, the federal government's trust responsibilities for Pueblo tribes and as stewards of many resources, and the unique laws and institutions of the three states.

Water-management issues are especially complex in New Mexico. The state does not recognize instream flows as a beneficial use and, hence, it does not protect instream flows. Furthermore, it has not adjudicated most water rights in the Basin and there is little infrastructure for measuring flows and diversions. Particularly disturbing to many is the lack of adjudication for Pueblo water rights which, at some places and times of the year, probably would embrace all surface flows.

Competition for the Basin's water and related resources is far more intense and complex than in the past. Decades ago, demand came primarily from agriculture, but it now competes with demands reflecting the spiritual value Indians and others place on the river, the contributions the river makes to the Basin's quality of life, and the myriad uses of water in a modern metropolitan city. Some of the competition manifests itself through market mechanisms, but most does not. Powerful economic forces are changing the character of the competition for resources by reducing the ability of traditional resource-intensive industries, such as agriculture, and increasing the ability of non-consumptive and passive uses, such as recreation, to generate new jobs and higher incomes. Increasingly, the economic prospects of communities are determined by their ability to produce, attract, and keep a highly qualified workforce and, as both firms and households become more footloose, communities that offer a high quality of life outperform those that do not. Water-related recreational opportunities and aesthetics are important elements of the quality of life in the Basin, where economic activity is concentrated near the narrow ribbon of water flowing through the desert.

Throughout the report, we use the term "value" to mean more than just price. We take a broad view of the term, employing it to refer not just to goods and services associated with the Basin's water and related resources that are measured in monetary terms, such as bales of hay produced from irrigated fields, but also to those that are not measured in monetary terms, such as recreational opportunities, protection of endangered species, and maintenance of cultural traditions. Consistent with this approach, we also employ the term "use" to refer both to conventional uses associated with physical manipulation of the Basin's water and related resources, such as withdrawing water from a stream for irrigation, and to more passive or nonquantifiable uses, such as dilution of pollutants or maintaining riparian habitat. We recognize that individuals have multiple perspectives on the "values" and "uses" associated with the Basin's resources. These multiple perspectives give support to a central message of the report—the competition for the resources is complex.

Much of the water in the Basin is not being used in the manner that would generate the bundle of goods and services with the greatest value or the highest levels of jobs, incomes, and standards of living. The prices of water and related resources generally do not reflect these resources' scarcity and, hence, resources often are put to a low-value use while other uses with a higher value go unsatisfied. Much of the water used at the economic margin for irrigation yields crops whose value is less than the cost of growing them. The fundamental legal and institutional structure overseeing water uses tends to favor agricultural and other diversionary uses, however, and does not facilitate voluntary transactions that would release resources from low-value uses and direct them toward high-value ones.

Much of the emphasis on diversionary uses stems from traditions that see irrigation not in economic terms but as a necessary support for human life and an essential

element of local cultures. These traditions are being challenged, especially near metropolitan centers, where many farmers see the inevitability, if not the economic advantage, of transferring water to municipal-industrial users.

Issues related to perceptions of the fairness of different resource uses and competing demands abound in this Basin. Many farmers and advocates of irrigation believe those who would restrict irrigation in favor of instream flows and other environmental amenities are latecomers with no right to interfere with the activities of those with a prior claim to water. Many instream advocates counter by arguing that diversionary uses impose environmental damages on all of society and the institutional-legal framework unfairly favors such users. Public officials in Albuquerque and elsewhere are hoping that residents' sense of fairness toward future generations will encourage them to curtail their consumption of finite groundwater resources. Supporters of Indians' rights believe the federal government's failure to defend these rights as it helped finance the development of others' rights is deplorable.

B. MAJOR PROBLEMS

The problems affecting the competition for the Basin's water and related resources are so numerous and intertwined that it is impossible to demonstrate cleanly where one stops and another starts. Whatever the approach for describing and evaluating the problems, one first must define the criteria for determining if a problem exists and for measuring its severity. We use three criteria that are standard hallmarks of this nation's economic system to assess the competition for water and related resources in the Basin. These criteria also reflect three major types of arguments raised during controversies over water and other resources. This framework indicates that the outcome from this competition is optimal if: (1) the resources are used in the manner that yields the highest net value for the bundle of goods and services derived from the resources; (2) the resources are used in the manner that yields the highest standard of living; and (3) the resources are used in the manner that is perceived to be fair.

We separate the problems into two sets. We first describe two problems that represent the most serious, fundamental aspects of the past and current failure to meet the three criteria described above. We call these the bottom-line problems. One of them focuses on the resources themselves, and the other on the economies and communities dependent on the resources. We then describe several of the factors that create, exacerbate, or prevent mitigation of the bottom-line problems. We call these the contributory problems.

1. Bottom-Line Problem #1: The Resources Are Finite, but the Demands Are Not

The Basin's water and related resources are components of, and produced by an ecosystem. This ecosystem, like all others, has limits on how much water and other resources can be extracted from it to support and sustain humans. Within the past decade, the edges of the ecosystem's carrying capacity have become more clear. The designation of the Rio Grande silvery minnow as an endangered species reflects the

extreme stress within the ecosystem. The low snowpack during 1995–96 showed that the supply of water can fall far short of current consumption levels, and the prospect of global climate change promises to exacerbate the shortfall. Both the Albuquerque area and the El Paso-Ciudad Juarez area have bumped against the limits of the supply of readily accessible groundwater, and are expecting rapid population growth. Many locations within the Basin have either encountered declines in water quality or recognized that such declines may materialize in the foreseeable future.

2. Bottom-Line Problem #2: The Basin’s Water and Related Resources Are Persistently Allocated in a Manner that is Less than Ideal

If the Basin’s water and related resources reflected the nation’s ideals of competitive markets, they consistently would go to their highest-value uses. As the economy changes over time, some demands for a resource would grow, others would diminish, and the resources would shift accordingly through multiple, voluntary transactions. Reality, however, is far different from this ideal. For most, if not all, of the Basin’s water and related resources the prevailing prices do not tell the economic truth about either the overall scarcity of the resources or the strength of one demand relative to another. As a result, the local, regional, and national economies forgo valuable goods and services as well as opportunities for more jobs, larger incomes, and higher standards of living. Some groups, especially the Pueblos, assert that the system is grossly unfair.

Many additional factors contribute to the bottom-line problems. These contributory problems include:

- The Basin’s Resources Have Not Been Managed as Elements of an Ecosystem
- Past and Current Practices Have Rendered Water and Related Resources Unsuitable for Some Uses Without Corrective Action
- Resource-Demands that Come From Industrial Activities and Are Measured in Monetary Terms Are Difficult to Reconcile with Those that Are Not
- Many Groups Feel They Are Unable to Participate Effectively in Resource-Management Decisionmaking
- There Is Widespread Uncertainty about the Hydrosystem and Ecosystem of the Upper Rio Grande Basin
- The Relationship Between the Resources and the Economy Is Poorly Understood
- There Is Pervasive Distrust Among Stakeholders

C. CONCLUSIONS AND RECOMMENDATIONS

We make three major recommendations regarding federal resource-management policies and activities in the Upper Rio Grande Basin. Each embraces several components.

1. Recommendation #1: Federal Policies and Actions Should Reflect the Ecosystem's Complex Role in a Complex Economy

We intend this recommendation to provide fundamental guidance for future federal policies and actions in this Basin. It has two essential features. The first is that federal policies and actions should view the Basin's water and related resources as elements of an ecosystem, not as independent resources separate from the ecosystem. The second is that federal policies and actions should recognize the full set of competing demands for the Basin's water and related resources and, wherever appropriate, strive to optimize these resources' contribution to the economy.

Federal policies and actions should account for the uncertainty surrounding the quantity and availability of the Basin's water and related resources and make an effort not to step beyond the bounds of current knowledge. Federal agencies should adopt the broad view of the term "use" to ensure that nonquantifiable or passive uses are not ignored in resource-management decisions. In a similar manner, we recommend that federal agencies also adopt the broad view of the term "value" to include not only the goods and services associated with the Basin's water and related resources that are measured in monetary terms, but also those that are not monetized.

We believe four changes in how federal agencies do business will expedite policies and actions with a broader view of the ecosystem and economy. Federal agencies with a significant impact on the Basin's resources should (1) promote institutions that take a broad view of the economy and environment; (2) initiate an integrated scientific assessment of ecological and economic conditions in the Basin; (3) describe tradeoffs more clearly; and (4) communicate ecological and economic issues more clearly. Effecting these changes will require funding, staff, and attention to reducing the confusion generated by various agencies' conflicting policies.

2. Recommendation #2: Strive to Mitigate or Correct Anticompetitive Factors

We recommend federal agencies in the Basin do more to mitigate the constraints to competition that keep water and other resources in low-value uses while high-value demands go unmet. We recognize, however, that the Rio Grande Compact with its preeminent legal position over interstate water decisions in the Basin is an impediment to competition across state boundaries, and will continue to be, absent change by the three signatory states and Congress. Resource managers should work to reduce the transaction costs that restrict the ability of willing "buyers" and "sellers" of resources from consummating mutually beneficial transactions. We believe they can do this by identifying "hotspots" where the discrepancy between the value of resource use and unmet demand are greatest and helping potential "buyers" and "sellers" come together.

Resource managers also should work cooperatively to curtail the externalities of federal resource-management activities. They should continue to work in multi-agency groups, recognizing that the concerns of all must be dealt with jointly. Federal resource-management agencies, acting individually or jointly, periodically should prepare a summary of how their activities affect the value of resource-related goods and services

and their impact on jobs, incomes, and other indicators of standard of living. We also recommend that the Bureau of Reclamation (BuRec), the Army Corps of Engineers (CoE), and other resource-management agencies, working with Congress, broaden the scope of activities authorized for federal dams and other facilities. Congress should specify economic and ecosystem goals for the Basin, identify priorities for how the facilities should contribute to the attainment of these goals, and give the agencies greater leeway to work toward them.

We recommend that federal agencies support institutional innovations to facilitate voluntary transfers of resources from low-value to high-value uses. In particular, we encourage federal resource managers to anticipate proposals, and even develop their own, for the devolution of resource-management responsibility and authority from federal agencies to state and local ones. To participate successfully in a devolution process, federal agencies must be prepared to specify the outcomes they want to see. Then they must have appropriate mechanisms for measuring progress toward individual outcomes, and actions for holding state and local agencies accountable.

3. Recommendation #3: Clarify Federal Interests in the Basin's Water and Related Resources

We recommend that the federal resource-management agencies initiate meaningful steps to clarify the federal interests in the Basin's water and related resources. There are at least five general categories of federal interest in the Basin's resources to be clarified: stewardship, corporate, Pueblo trust responsibilities, economic-welfare, and public-participation. Each of these is affected by risk and uncertainty, to the point that the distribution of risk, itself, constitutes a federal interest in the resources that should be clarified.

We recommend that each agency prepare a statement of its interest in the Basin's resources. This statement should be informed by the results of adopting an ecosystem-management approach, completing the assessment of the Basin's ecological and economic conditions, and setting priorities. It should explicitly address each types of potential federal interest, including those associated with risk and uncertainty. Where necessary, it should identify where the federal interest remains ambiguous and explore mechanisms for resolving the ambiguity.

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