

Long River, Short Water: The Rio Grande Water Development Story

Steve Harris, *Rio Grande Restoration*

The rich alluvial valleys of the Rio Grande have supported agriculture for nearly a millennium. In a semiarid land, through capricious swings of drought and flood, the soils and water of the river have nurtured substantial civilizations and inspired cultural traditions that continue to enrich modern New Mexico.

The river's first farmers were Pueblo people. One scholar estimates sixteenth century Pueblo populations as great as 80,000 persons, in 100 villages, making the Rio Grande Pueblo civilization the greatest concentration of settled farming villages in the American Southwest. The first farmers were irrigators, though they appear to have relied more upon such elegant moisture-conserving techniques as water-retaining terraces, cobble mulches, and self-contained "waffle gardens" than on intensive dam and canal systems. Because labor requirements were high, Puebloan agriculture was a necessarily cooperative venture. Their use of resources was likely governed less by political control than by traditional sacred relationships to land, sky, and river.

Though at times as many as 30,000 acres may have been cultivated, Pueblo impacts to the stream would seem modest to modern-day farmers. European explorers marveled at the quality and abundant yields of Pueblo plantings. Indeed, the earliest Spanish colonists might have perished without the surpluses of corn and beans laid up by the first farmers.

THE SPANISH ENTRADA

In 1591 the frontier of European expansion reached the Rio Grande. Driven hither by the quest for wealth and Christian evangelism, Spanish conquistadors found both minerals and souls were hard to come by. Still, compared with the expanse of desert to the south, the *Rio Bravo del Norte* offered rich soils and abundant water. Encouraged by grants of land from the royal government, a stream of Spanish immigrants, mainly impoverished exiles, flowed into the region over a 250-year period and conquered the north.

An advanced irrigation technology came with them, in the form of acequia agriculture. Headings of rock and brush and hand dug canals served to turn water onto pastures and cultivated fields. In the few large towns royal governments, *alcaldes* and *ayuntamientos*,

governed colonial affairs, including the division of water, whereas in the many small villages an indigenous water democracy maintained a cooperative governance by acequia *majordomos* and *comisionados*.

Spanish traditions, grafted onto new world realities, suggest that water users shared the benefits and losses of the variable supply. Priority of first use was respected, though not with such exclusivity as in the modern appropriation doctrine. When water was scarce, demonstrated needs (especially for drinking water and stock watering) and concepts of fairness were often the basis for an allocation decision. These traditions continue to carry legal weight, as formalized in the 1907 Territorial Water Code.

By 1821 acequia agriculture, both Pueblo and Hispanic, had grown until it involved no more than 150,000 scattered acres between Taos and Tome. Possessed of pragmatic technologies for water control, acequia irrigators relied on cooperation, hard labor, and the will of God to bestow the blessings of the river to their land.

ANGLO-AMERICAN CONQUEST

The United States' conquest of Mexico's northern territories in 1848 signaled a profound transformation of the localized, cooperative traditions of water development and governance on the Rio Grande. In their place, industrial technologies and the U.S. doctrine of "Manifest Destiny" established a model for national possession of western lands. Henceforth, a restless hoard of speculators swept over North America's vast western empire to turn minerals, timber, grass, and water into dollars.

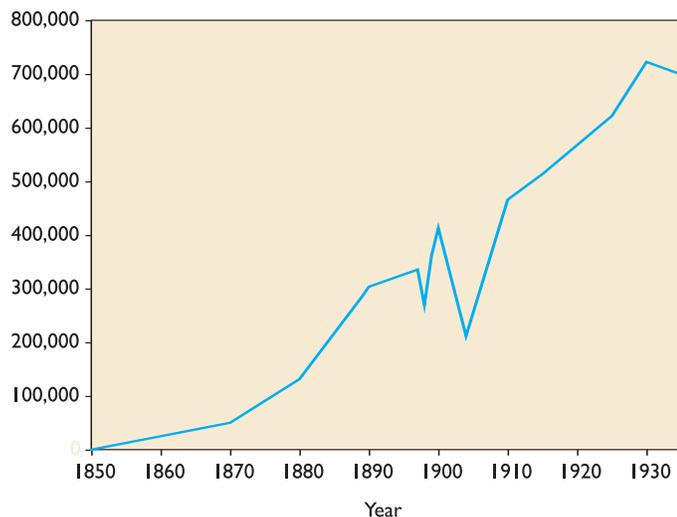
Agriculture was a key part of the U.S. national policy of rapid immigration and development of the West's natural resources. However, to farm successfully beyond the one hundredth meridian required irrigation. From a few successful experiments with large-scale irrigated farming, ambitious water diversion projects spread like prairie fire to every river valley in the West. Quickly, possession of western rivers was granted not to the owners of the land or the communities through which they flowed, but to the persons who built the works that diverted them.

The growth of irrigation from the Rio Grande typifies

the explosiveness of this process. In 1850 Rio Grande farms from San Luis Valley of Colorado to El Paso Valley, Texas, totaled less than 200,000 acres. By the time the temporary Rio Grande Compact was signed in 1929, irrigation in the basin encompassed more than 1,000,000 acres.

COLORADO DEVELOPMENT

The vast, fertile, high-elevation San Luis Valley was not settled until 1851, when Hispano settlers spilled northward from the Taos region and were soon joined in 1878 by westering Mormon farmers. The opening of the Denver and Rio Grande Railroad to Alamosa in 1878 ignited the biggest of the Rio Grande's "big barbecues." Between 1880 and 1890 British speculators financed five large canals dug by mule-drawn scrapers. Cumulatively these canals could divert almost 5,000 cubic feet per second, virtually the entire spring runoff of the main river. Colorado attempted to secure legally the natural advantage of its location at the top of the hydraulic system, claiming an unimpeded right



Irrigated acreage in San Luis Valley, Colorado, illustrating the growth in upstream water diversions, which has dramatically impacted New Mexico water supplies from the Rio Grande.

to the waters that arose within the state. Though disabused of their "doctrine of sovereignty" by the Supreme Court in 1917, the great deeds of irrigation development were largely already done. A general stream adjudication completed in 1891 showed that more than 300,000 acres had been placed under ditch. The impact of this rapid and extensive development would be immediately felt by downstream water

users and would impact the course of Rio Grande history for more than a century to come.

NEW MEXICO

Meanwhile and farther south, expansion of irrigation was also occurring, though at a more restrained pace. In the Rio Arriba (that stretch of the river north of La

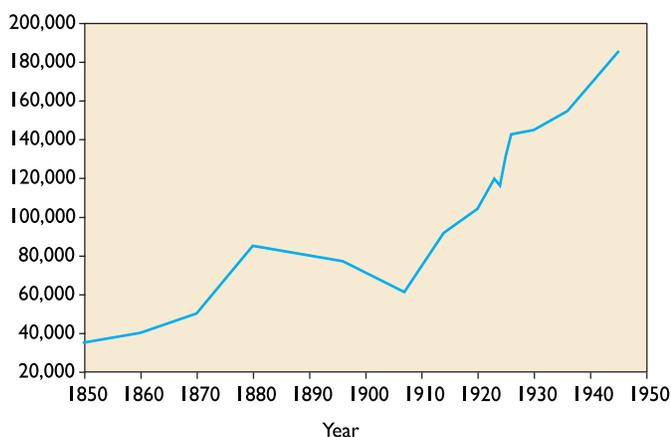


"The Big Barbecue"—a term applied by historian Charles Wilkinson to the rapid conversion of Western resources into wealth in the late nineteenth century. This log jam is on Embudo Creek, circa 1915. The timber was headed to the Rio Grande, through White Rock Canyon, and ultimately by rail to Albuquerque.

Bajada), irrigation had long since reached its full development, with perhaps 100,000 acres applying water from the several hundred acequias originating in tributary streams. In the Rio Abajo (middle Rio Grande), after the settling of Tome in 1739, Spanish–Mexican farming grew continuously until 1880, when it comprised about 124,000 acres, irrigated by more than 70 traditional acequias.

When the Atchison, Topeka, and Santa Fe Railroad reached Santa Fe in 1880, New Mexico also connected to commerce with the wider nation. Industrial-scale grazing began to make economic sense, and the north experienced a sheep-grazing boom. Likewise, thousands of acres of Sangre de Cristo forests were harvested and boomed down the Rio Grande to Embudo Station for use as railroad ties. A result of this large-scale timber development, abetted by a national policy of fire suppression, was that the Rio Grande's high-elevation watersheds, upon which the region's acequias depended, were rapidly transformed. Snowmelt in the Rio Grande's tributaries began to come more

quickly and in reduced volume, its hydrographs less attenuated into the summer season. Sediments released by logged-off forests and grazed-off grasslands aggraded river channels, which, with reduced peak flows from Colorado diversion, were less able to maintain themselves.



Irrigated acreage in Mesilla, Rincon, El Paso, and Juarez valleys, New Mexico, Texas, and Mexico, illustrating the sharp growth in irrigated acreage after construction of Rio Grande Project canals below Elephant Butte.

THE RIO GRANDE PROJECT

Water development in the Mesilla and El Paso/Juarez Valleys followed the pattern of the Middle valley, up to a point. An 1858 survey portrayed acequia farming in the region utilizing about 10,000 acres. By 1880 as many as 25,000 acres may have been irrigated, and speculators had their eyes on more.

But in 1890 what would become a nine-year drought descended on the Rio Grande. The years of low snowpack dampened the onrush of development and led to substantial, if temporary, declines in irrigated acreage. The San Luis Valley took whatever water it could, and the middle valley often diverted what remained of the river. In the El Paso/Juarez Valley, these upstream diversions compounded the drought and caused the region's famous vineyards to wither and die. About the same time, and far downstream, steamboat navigation of the Rio Grande below Laredo ceased forever.

In 1889 the Rio Grande Dam and Irrigation Company of Mesilla, New Mexico, was incorporated and proposed the construction of a reservoir and canal system to irrigate 530,000 acres in Mesilla Valley. By 1895 the company had received approval for a reservoir

right of way from the Secretary of Interior. El Paso/Juarez farmers responded to the impending, profound water shortage with outrage, leading Mexico to file damage claims for \$35,000,000 against the United States. Here was a serious diplomatic breach, and the International Boundary Commission was assigned to study the problem. The problem, their report concluded, was that the border area "suffered from the increased use of water in Colorado."

After a decade of diplomatic wrangling border officials in the two countries determined that the solution was to build a storage dam at the El Paso Narrows. Suddenly there were two conflicting reservoir proposals on the table. El Paso/Juarez interests were utterly opposed to the Elephant Butte Project; it was too far away, and the speculators were geographically too well-positioned to intercept and control the water. New Mexico strenuously opposed the El Paso dam, which provided no water storage for proposed developments around Mesilla.

By 1906 an unlikely, but momentous, series of events had occurred, resulting in resolution of the 18-year-old problem:

- First, a territorial court rejected U.S./Mexico arguments that the private dam would illegally interfere with navigation of the river. Resolving the litigation in the case's third review, the U.S. Supreme Court ruled that the Rio Grande Dam and Irrigation Company had waited too long to begin construction on the Elephant Butte Project. Its patent was thereby repealed, clearing the way for a single federal project.
- The International Treaty of 1906 "to equitably distribute the waters of the Rio Grande" was signed by both nations, who assented to a three-way split of the lower Rio Grande. In the 1906 treaty, Mexico settled for a 60,000 acre-feet guarantee, delivered from the reservoir each year "except in times of extraordinary drought."
- After more than twenty years of stormy debate on how best to advance western irrigation, Congress passed the landmark Reclamation Act of 1902, creating a firm policy of federal financing (and control) of irrigation development. In exchange for the territorial engineer's granting 730,000 acre-feet of water rights to the federal Rio Grande Project, New Mexico induced its border neighbors to accept the Elephant Butte Reservoir site.
- In 1908 "all the unappropriated waters of the Rio

Grande and its tributaries” were decreed to the Reclamation Service. In 1911 construction began on the project; by 1916 a completed Elephant Butte Reservoir, one of the Reclamation Service’s first projects, began to store the 2.6 million acre-foot for which it was designed.

RIO GRANDE COMPACTS

A federal embargo, declared by the Secretary of Interior in 1896, prevented Colorado from constructing the dam it desired at Wagon Wheel Gap but otherwise did little to reduce the development of new irrigation. While Supreme Court cases, international treaties, and major reservoirs were being negotiated, the sovereign state of Colorado continued expanding its exploitation of the Rio Grande. In 1924 San Luis Valley water commissioners reported a total of 621,826 acres under irrigation, up from 213,210 in 1896.

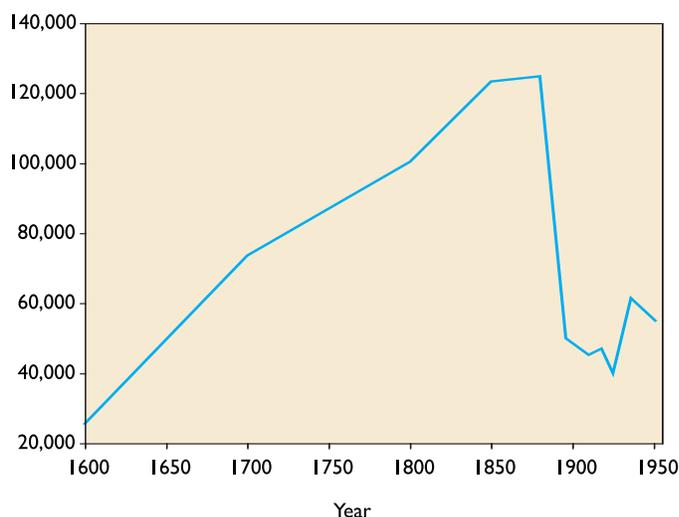
Fervid ambition was the only factor governing either the Rio Grande Project or San Luis Valley development, as by 1929 irrigation had increased dramatically, both downstream of Elephant Butte and in Colorado. Even with a period of abundant snows in the 1920s, the Rio Grande regularly disappeared at late season in the middle valley. It was becoming clear that only an interstate agreement could bank the fires of the Rio Grande’s big barbecue.

In 1925 the embargo was lifted, as Colorado, New Mexico, and Texas agreed to seek an interstate compact equitably dividing the Rio Grande among them. A temporary compact was put into effect in 1929 to freeze the apportionment at then-current levels. To effect a permanent agreement, and to determine the nature of the water supply and the relationship of each segment’s demands, required the collection and analysis of water-use data. Under auspices of the National Resources Committee, national and state scientists conducted an exhaustive joint investigation to determine the facts needed to equitably balance each section’s inflow, outflow, and demand.

Completed in 1935, the National Resources Committee’s regional planning report provided the foundation for a definitive negotiation among the states. The report acknowledged that the Rio Grande was at or beyond the limits of the water it could be expected to provide: “...with the available water resources of the Rio Grande apparently fully appropriated, the approval of any new projects involving additional drafts upon those resources seem to point inevitably to further conflict...”

The three sections’ bottom line for negotiations to

resolve the conflict was clear. Colorado would consolidate the dramatic gains it had made and perhaps be allowed to build a storage reservoir. The middle valley, too, would need its own reservoir to regulate late season supplies. Rio Grande Project users wanted assurance that the others would leave enough water to supply their needs and aspirations. Thus informed, the compact commissioners and their legal and technical advisers negotiated, over three years, a set of delivery schedules and various caveats to fix their irrigation demands to the fluctuating supply, resulting in the present Rio Grande Compact.



Irrigated acreage in Middle Rio Grande, Cochiti to San Marcial, New Mexico, illustrating precipitous declines in irrigation when sediment burdens and aggrading channels combined to waterlog more than half of the historically irrigated lands. Note also the partial reclamation resulting from MRGCD and federal projects.

MIDDLE RIO GRANDE PROJECTS

With or without interstate accords, the Middle Rio Grande valley increasingly found itself in a desperate position: bracketed by two thirsty, fast-moving competitors, one of which had recently vouchsafed a claim to virtually the entire flow of the river. Its organizing principle, the acequia system, isolated it from the power politics of large-scale irrigation. It had no reservoir to regulate a diminishing river. Its economy was also declining in lockstep with intensifying competition from the other two regions and the deteriorating condition of its lands.

Not only were its supplies of river water diminishing, but in the mid-river, the Rio Grande was leaking into the fields. By 1896 irrigated agriculture had declined from a high of 125,000 acres to 50,000

acres. The deadly combination of silt from deteriorating watersheds being deposited in the channel, reduced channel-forming flows from water intercepted by upstream irrigators, and its own flood irrigation practices clogging the Rio Grande, raised its channel above the elevation of the surrounding floodplain and seeped into much previously productive land. A 1918 state engineer inventory of middle valley conditions revealed nearly 60,000 acres of waterlogged and alkali-salted former farmland. In addition, the aggrading river flooded with increasing frequency, playing havoc with earthen irrigation works and cutting sandy channels across the beleaguered farms.

Following several abortive local efforts to finance a drainage system, a joint Bureau of Reclamation–state engineer commission proposed a solution: a comprehensive plan for drainage, flood control, and channel



The same bend in the Rio Grande near San Acacia in 1905 (left), showing a broad channel, flood-swept sandbar, and large wetland in distance, and again in 1989 (right). By 1989 the river flowed only partly in its native channel, with a levee, riverside drain,

rectification, complete with a (180,000 acre-foot) storage dam, and a consolidated series of diversion dams and main canals to replace the primitive diversions and ditches. Because such a project promised to be extremely costly, farmers hoped that it might be financed through the federal Reclamation Fund. However, because New Mexico had already received a substantial share of such funds in the lower river, another mechanism would have to be found.

An intensive lobbying effort by Albuquerque and rural leaders convinced the state legislature to approve the Conservancy District Act of 1923. Districts created pursuant to this act were to be organized and administered by a state district court, upon petition by 100 landowners. After two petitions to the district court, the Middle Rio Grande Conservancy District was suc-

cessfully organized in 1925. The Middle Rio Grande Conservancy District was to serve all lands in the floodplain of the Rio Grande between Cochiti and San Marcial and thus could add its assessments for flood protection to the property taxes collected from residents of Sandoval, Bernalillo, Valencia, and Socorro Counties. The 130,000-plus acres projected to receive irrigation water from the district would be levied additional assessments to construct and maintain those works. Included in the conservancy district were 28,500-plus acres of Pueblo Indian lands, for which Congress appropriated more than \$1.5 million to cover construction costs on Indian lands.

At the outset, some of the district's intended beneficiaries opposed creation of the district, and many remained suspicious of its subsequent arrangements. The Middle Rio Grande Conservancy District was a



and main canal joining the Santa Fe railroad along its neatly engineered course. A thicket of invasive salt cedar now covers the floodplain and confines the river channel, which has narrowed by 200 feet and aggraded 15 feet in the 84-year interval.

new and powerful political subdivision of the state, with extensive powers to make regulations, levy taxes, condemn and own lands and water rights, salvage water, remove or relocate structures, fill lands, retard silt, re-engineer stream channels, construct drains, dams, levees, canals, roads, bridges, stream gages, and electric power plants. Its water rights were to be exempt from forfeiture under state law or taking by other political subdivisions. As it condemned existing acequias, the conservancy was required to supply its parciantes (shareholders) with the water entitlements to which they had become accustomed.

In 1928 the Middle Rio Grande Conservancy District submitted its "Official Plan for Flood Control, Drainage and Irrigation" to the district court. Construction soon began on four diversion dams,

their connecting main canals, a valley-wide system of riverside and interior drains, and El Vado Reservoir. Initial tax assessments appeared to be substantial enough to satisfy court-appointed appraisers that the district could service the bonds it let to finance the estimated \$12 million cost of construction.

Unintended consequences from the conservancy district's project were substantial. Water supply to some ditches was interrupted during construction, reducing their *parciantes'* ability to farm for one or two years. Several thousand acres of farmland were condemned for rights of way to the drains and canals. A number of irrigators failed to make their annual assessment payments, resulting in foreclosure of some 34,000 acres by the state. Other ratepayers felt that the original glowing promises of project benefits had been overstated. Certainly, the flood control works did not prevent the devastation of the Socorro division by the 1937 and 1941 floods. Siltation and aggradation of the channel continued to plague the river. Additionally, there were, and continue to be, assertions that the broad powers of the Middle Rio Grande Conservancy District inhibited the state engineer's authority to administer individual water rights priorities.

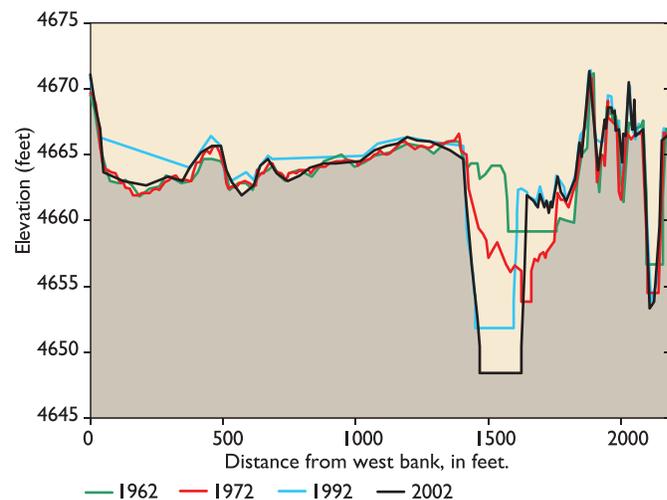
At least some of the project's benefits were realized: as many as 20,000 acres were drained and (at least temporarily) reclaimed for farming. The construction of El Vado Reservoir succeeded in extending late-season water supply to the district's four irrigation sections.

Further bedeviling the Middle Rio Grande valley, an interregional conflict erupted when the district began to fill El Vado Reservoir for the first time in 1935. Texas sued New Mexico and the Middle Rio Grande Conservancy District in the U.S. Supreme Court, claiming that the defendants were impairing the water supply in Elephant Butte, in violation of the 1929 compact. This litigation was dismissed after the 1938 compact was signed by the three states. By 1941 Congress was authorizing the Corps of Engineers to study the still-unmet drainage and flood control needs of the region.

Nor did the district quite succeed in rescuing its farmers from financial woes. In danger of defaulting on the bonds that financed the project, the district appealed to Congress in 1948 for relief of its debts and the rehabilitation and further improvement of its dam, diversions, and levees. The Flood Control Act of 1948 authorized a Middle Rio Grande Project through the U.S. Army Corps of Engineers and appropriated \$15 million through the Bureau of Reclamation to provide the district with debt relief and another round of middle valley "improvements." These improvements included 300,000 jetty jacks to straighten and confine

the river channel. Reclamation was to hold the titles to the water rights and capital works as security for repayment of this crucial federal investment.

The focus of the Middle Rio Grande Project was primarily on the worsening siltation problems. It gave the Bureau of Reclamation the authority to maintain an open river and funds to channelize 127 miles of river from Velarde to Elephant Butte, resulting in the placement of over 300,000 jetty jacks to confine the river channel over the next 20 years. The Flood Control Act of 1950 authorized more than \$50 million to the Corps of Engineers to construct flood and sediment control reservoirs, the crux of a strategy to radically reduce sediment inputs to the valley. Abiquiu Reservoir on the Rio Chama and Jemez Canyon Dam were completed for this purpose in 1954. Construction of the additionally contemplated sediment and flood control reservoirs was deferred until a Rio Grande Reservoir Regulation Plan was negotiated to the satisfaction of Colorado and Texas. In 1965 the corps began work on its own Middle Rio Grande Project, completing Galisteo Dam in 1970 and Cochiti Dam in 1975.



Time series of Rio Grande channel forms near San Acacia, showing a dramatic narrowing and incising of the river channel.

Cochiti has been a particularly significant development in the history of the Rio Grande. Its location on Cochiti Pueblo lands displaced much of the floodplain farming that was culturally and economically critical to the tribe. During its construction, a sacred site important to Cochiti and its neighboring Pueblos was carelessly destroyed. Then, when the reservoir filled, seepage below the dam waterlogged what remained of the Pueblo's farmlands. One intended benefit, sediment abatement in the middle valley, resolved itself

poorly as sediment-starved waters began to progressively scour the river channel downstream. Cochiti Reservoir's position athwart the mouth of White Rock Canyon isolated the river below from a natural refugium for aquatic species, contributing to the decline and endangered status of the Rio Grande silvery minnow. It has, however, kept its flood control promise, intercepting potentially damaging floods in 1979, 1985, and 1995.

RECENT TIMES

The Rio Grande Compact, with its cornerstones of sound science and frank if difficult negotiations, has served to moderate the consequences of the Rio Grande's century-and-a-half-long development orgy. The compact, first administered in 1940, is the foundation of today's "law of the river," which also includes a welter of contracts between special water districts and the Bureau of Reclamation, water rights administration in three states, and the decisions made by thousands of individual water users and their districts.

Unfortunately, both Colorado and New Mexico have found that they cannot always reliably comply with the compact's downstream delivery requirements. And so, when threats of harm cannot otherwise be reconciled, the courts are standing by.

During the severe drought of the 1950s the New Mexico State Engineer and the Middle Rio Grande Conservancy District again found themselves before the U.S. Supreme Court to answer for a water debit that had exceeded its 200,000 acre-foot limit allowed by the compact. The proximate cause of this action was a renewed assertion that New Mexico was storing water in El Vado Reservoir in violation of the Rio Grande Compact. The U.S. Supreme Court dismissed this litigation, ruling that Texas had failed to name an indispensable party, the United States in its capacity as trustee for the six Middle Rio Grande Pueblos and their water rights.

By 1956 New Mexico's debit had grown to more than 500,000 acre-feet, before rehabilitation of waterlogged lands undertaken by the Middle Rio Grande Project could produce additional water flows. The Low Flow Conveyance Channel, which began operating in 1953 in an attempt to make New Mexico's compact deliveries more reliable, provided a bit of the long sought drainage objective. The channel did, in fact, produce water and reduced the state's compact debit, but today it serves mainly to drain a Rio Grande channel perched dozens of feet above the surrounding floodplain.

The San Juan–Chama Project also helped New

Mexico to become compact compliant. The project began diverting water from the San Juan River basin into Heron Reservoir in 1972, and started releases in 1974. One of its original stated purposes was to provide 42,500 acre-feet per year to "replace previous and anticipated [Rio Grande] basin depletions caused by miscellaneous uses." San Juan–Chama Project water has helped ease the state's chronic non-compliance, sending an average of 30,000 annual acre-feet downstream, effectively offsetting water sucked from the river by ground water pumping.

During the same period, Colorado's accrued debit swelled to almost 1,000,000 acre-feet. In 1966 New Mexico joined Texas in a Supreme Court suit that resulted in an agreement by Colorado to begin to reduce its huge deficit. Across-the-board curtailment of San Luis Valley irrigation forced farmers to conserve and reduce their water applications.

The federal Closed Basin Project, which began salvaging shallow ground water in 1984, was designed to reduce the state's accrued debit. Nevertheless, it was not until Elephant Butte Reservoir spilled in a very wet 1985 that Colorado's 30-year-old water debt was forgiven.

Over the past 20 years, with a blessing of abundant snowpacks, both Colorado and New Mexico have maintained compliance with the water delivery requirements of the Rio Grande Compact.

FINALE

Stretched thin by the dizzying pace and magnitude of water development, the Rio Grande/Rio Bravo basin remains enmeshed in a perpetual conundrum: there are simply more claims to Rio Grande water than the river can reasonably be expected to provide. Its core ecology, the very structure, and function of the river have been profoundly altered, with unfortunate outcomes: It ceases to flow at the behest of unrestrained economics; its leveed banks armor continuously narrowing and aggrading channels, disrupting the conveyance of water; biodiversity continues to decline. Successive engineering projects have disrupted the productivity of its adjoining lands, now beset by invading plants and, consequently, fire.

Another chapter of the saga will be written by the present generation. Access to the river by growing, thirsty urban populations and the emergence of concern for the fate of Rio Grande ecosystems have joined the perennial contenders for the limited supply. The planned use of San Juan–Chama Project water by Albuquerque, Santa Fe, and other communities suggests that a challenging new version of the intricate old balancing act lies just ahead.