Water Supply and Costs in Operation of Rio Grande Project

By

Theodore H. Moser*

History and Development

Before beginning a discussion of the water supply and costs in operation of the Rio Grande Project, I would like to trace briefly, for those that aren't familiar with it, some of the history and development of the Project.

Irrigation in this area was initially begun by the Indians, possibly many years before the first Spanish explorers arrived. Recorded history of the valley began with its discovery by the Spanish explorers under Coronado in 1540, who reported Indians cultivating the land and bringing water to it by irrigation ditches. In the upper Rio Grande Indian Pueblos were, of course, numerous and communal life was well established at the time of Coronado's explorations.

Irrigation by Spaniards was begun on a small scale with the establishment of the Guadalupe Mission in what is now Juarez, Mexico, in 1659, although efforts to start a mission at this location were first begun in 1632 and some writers refer to a church at Cinecue, three miles east of El Paso, in 1626. Settlements in the immediate vicinity of Juarez and El Paso continued to flourish as they were a stopping station between the east coast of Mexico and the colonization that was taking place along the Rio Grande further north in New Mexico.

Colonization around El Paso was given a big boost as a result of the Pueblo Indian revolt in 1680. The Indians, under the leadership of Pope', rebelled and drove the Spaniards and Christianized Indians south to the El Paso area, and it was 12 years before the Spanish reoccupied the territory to the north.

It was not until about 1840 that the American settlers began to arrive and they also practiced irrigation. All of these early attempts at irrigation consisted of community ditches drawing from the normal flow of the Rio Grande by means of temporary diversion works.

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*Acting Chief of the Engineering Division, Bureau of Reclamation, El Paso, Texas

Further up the river, rapid development of irrigation occurred in the San Luis Valley in southern Colorado between 1880 and 1890. During this period, most of the large canal systems and other irrigation works that exist there today were built. This upstream expansion of irrigation in southern Colorado, in addition to that which had also taken place in central New Mexico, absorbed the normal summer flow of the Rio Grande, causing it to be dry in this area for longer and more frequent periods. As a result of this shortage of water, storage was first considered about 1890. Several local and smaller storage projects were proposed, but conflicting interests prevented the culmination of any of them.

Soon after the passage of the Reclamation Act of June 12, 1902, the formation of the Rio Grande Project was first considered. Investigative surveys were begun in 1903 and a feasibility report was made the next year. The Rio Grande Project was approved by the Secretary of the Interior on December 2, 1905. Also in 1905 the Reclamation Act was extended to that portion of Texas lying along the Rio Grande and in 1906 the act was extended to the whole state. A contract was entered into with the Elephant Butte and El Paso Valley Water Users' Associations in 1906 for construction of storage and diversion works on the Rio Grande.

A treaty with Mexico, providing for the distribution of Rio Grande waters, was signed on May 21, 1906, wherein it was provided that Mexico was to receive 60,000 acre-feet of water annually except during periods of water shortages, such as we have experienced the last 5 years, when they were to receive a proportionate percentage of the normal usage.

The first construction work on the Rio Grande Project began in 1906 with the construction of Leasburg Diversion Dam and 6 miles of the Leasburg Canal. This was completed in 1908 and the first water was delivered through Project works to three old community ditches, one of which is now the Las Cruces Lateral that flows through the City of Las Cruces and just west of the college.

The construction of Elephant Butte Dam was authorized by Congress on February 25, 1905. Pre-construction work began in 1908, although preparatory surveys had begun as early as 1903. Actual construction on the dam proper didn't begin until 1912. Storage was first available in 1915 with

completion and dedication of the dam being in 1916.

Considering the equipment available in those early days, the construction of Elephant Butte Dam was quite an engineering feat. It was one of the highest dams at that time, rising 301 feet above its base. It was one of the first dams built by the Bureau of Reclamation, and at the time it was built, created the largest artificial lake in the country having an initial capacity of 2,638,000 acre-feet. Even though built 40 years ago, the reservoir is still one of the five largest built by the Bureau of Reclamation, being surpassed only by the reservoirs behind Hoover, Grande Coulee, Shasta, and Hungary Horse Dams.

In 1917 and 1918 the Water Users' Associations, which had been created in 1906, were succeeded by the Elephant Butte Irrigation District and the El Paso County Water Improvement District No. 1, and contracts were entered into with the Government for the construction of the distribution canals and laterals and the drainage system in addition to the completion of the diversion works. During the period from 1912 to 1930, the construction of most of the canal and lateral system and the drainage system was in progress. Altogether, the Project now operates and maintains about 600 miles of canals and laterals and 470 miles of wasteways and drains. If all of these could be placed end to end in one continuous ditch, it would extend from here to Omaha, Nebraska.

Caballo Dam, located 25 miles downstream from Elephant Butte, was first conceived as a flood control structure, but additional capacity was provided to allow for year-round generation of power at Elephant Butte. It was completed in 1938 and has a total capacity of 340,000 acre-feet, 100,000 of which have been reserved for flood control by the International Boundary and Water Commission in connection with the Rio Grande Rectification program between the United States and Mexico.

Construction of the power plant at Elephant Butte began in 1938. The rated capacity of the plant is 27,000 kva. 14 substations and 500 miles of transmission lines are also part of the power system.

Cost and Repayment

Before any of these features of the Project were

approved for construction, it was necessary to determine that they were economically justified. Under Reclamation laws the cost of irrigation and power projects must be reimbursed to the Government over a period of years and contracts guaranteeing this repayment, except for certain non-reimbursable items authorized by Congress, were worked out and signed.

To date the cost of Elephant Butte Dam has been $5-1/2 million, only a small fraction of what it would cost if it were built at today's prices, and the cost of the power plant, to date, has been about $1-1/2 million. These costs are being repaid by power revenues, except for $1 million set aside as non-reimbursable to cover the allocation of a portion of the water to Mexico under the Treaty of 1906. Caballo Dam, costing a little less than $2-1/2 million, is also being repaid out of power revenues, except for $1-1/2 million paid by the Federal Government, through the International Boundary and Water Commission, for flood control features.

The cost of the irrigation and drainage systems was $10-1/2 million, and is being repaid by the water users at the rate of about $1.40 per acre per year. Repayment for the irrigation and drainage systems would have been completed in 1967 except that the Secretary of the Interior under Congressional authorization, has granted a moratorium each of the last two years due to the extreme water shortage and the resulting financial plight of the farmers of the valley. To date 71 percent of the water users' obligation has been repaid.

Physical Aspects and Organization of Rio Grande Project.

The water-right acreage under the Rio Grande Project is 155,000 acres extending 60 miles up the river north of Las Cruces and 80 miles below Las Cruces. The maximum width is only about 4-1/2 miles. You can see that the Project is long and narrow, which makes the distribution of the water quite difficult at times.

Geographically, the Project is divided into five units separated by short river canyon sections. These are the Elephant Butte Reservoir, Caballo Reservoir, and the agricultural areas in the Rincon, Mesilla, and El Paso Valleys.

For operational purposes the Project is divided

into three branches--the Power and Storage Branch at Elephant Butte, the Las Cruces Branch for the irrigated area above El Paso, and the Ysleta Branch, located at Ysleta, Texas, for that portion of the Project below El Paso. Project headquarters are in El Paso.

The water users are organized into two districts--the Elephant Butte Irrigation District with offices in Las Cruces for the portion of the Project in New Mexico, and the El Paso County Water Improvement District No. 1 with offices in El Paso for the Texas portion of the Project.

Watershed and Runoff

The drainage area of the Rio Grande above Elephant Butte contains approximately 26,000 square miles. It is long and relatively narrow, extending into the San Luis Valley in southern Colorado, a total distance of 470 miles above Elephant Butte Reservoir.

For the fifty-year period from 1895 to 1944, the flow in the Rio Grande at San Marcial at the head of Elephant Butte Reservoir averaged about 1,100,000 acre-feet annually. Since 1944 the runoff into Elephant Butte has averaged 518,000 acre-feet annually, and for the last 3 years has been only 245,000 acre-feet, or 22% of the 50-year average before 1944. Since the construction of Elephant Butte Dam, water has flowed over the uncontrolled spillway of the dam only once and that was in 1942.

Storage in Elephant Butte has been low for the last 6 years and reached an all-time low of 9,900 acre-feet in August 1954, just 0.45 of 1 percent of its total capacity. The greatest amount of storage this spring in both Elephant Butte and Caballo was 241,000 acre-feet before water was released for irrigation on March 18th. As of today, April 5, 1956, there is only about 180,000 acre-feet left in storage in both reservoirs.

Earlier predictions for an appreciable runoff this year are apparently not going to materialize. The latest prediction by the Weather Bureau for flow into Elephant Butte for the current water year is 460,000 acre-feet; however, it may be considerably below that amount.

Because of the extreme shortage of water in recent years, deliveries to the water users have been on an allotment

basis since 1951, with the amount being considerably less than the normal requirement. The total allotment for last year was only 5 inches of water, about 14% of the normal requirement. The initial allotment last year was 2-1/2 inches while the initial allotment this year is 4 inches with no guarantee of delivery after June 15th. Any increase in the allotment that might be made during the year is dependent on runoff into Elephant Butte from the snow pack in the mountains or from spring and summer rains on the watershed. All in all, the outlook for this year is extremely poor unless relief comes in the form of rains of near-flood proportions.

Supplemental Ground Water Supply

The average amount of water applied to the land in order to grow crops in the Rio Grande valley is about 3.0 feet. In order to supplement storage water, the water users of the Project, at their own expense, have drilled about 1700 irrigation wells at a total cost of approximately $12 million. It is only because of these wells that agriculture in the valley has been able to survive the last few years. However, this is probably only a temporary solution since the water table has already dropped an average of 5 to 10 feet throughout most of the Project and the salinity of the well water in the lower end of the Project appears to be increasing. Some wells have already required lowering in order to get enough water. Some have been abandoned because of high salinity and others are approaching the limit where continued use will be detrimental to the land.

Crops and Farm Income

The effect of the drought, plus the cotton acreage limitations, reduced the total farm revenue for farms on the Rio Grande Project nearly 22% last year over the amount received the year before. The total gross income for last year's crops was a little over $32 million. Last year's total was a 45% drop from the record high of $59 million in 1952.

Cotton, the big money crop on the Rio Grande Project, accounted for 79% of the income and 61% of the total acreage last year. Because of reduced acreages, smaller yields and lower prices, it was responsible for most of the drop in farm income from the year before. Medium staple cotton

dropped from about $29 million in 1954 to about $21 million last year. The yield dropped from 1.85 bales per acre to 1.54 bales and the cash value dropped from $383 per acre to $309. Long staple cotton suffered an even greater reduction because of a substantial drop in price as well as a drop in yield. The price dropped from an average of 67½ cents per pound in 1954 to 53½ cents in 1955, and the yield dropped from 1.04 bales per acre to 0.85. This brought about a 35% reduction in the cash value per acre, dropping from $366 to $236.

The second most valuable crop was alfalfa with almost 35,000 acres planted. The yield last year, 3.6 tons per acre, was the same as the year before but the price ran a little higher, averaging about $93 per acre, an increase of about $4 per acre.

The third most valuable crop was pecans, which yielded $358 per acre. The pecan acreage of almost 4,200 acres is largely on the Stahmann Farms near here. The crop that brought the highest gross revenue per acre last year was dry onions, grossing $904 an acre on 542 acres. Other vegetables and fruits brought fairly high returns also. The average of all crops harvested was $227 last year as compared with $289 in 1954.

It should be remembered that these figures are gross income from crops. Not only have labor, seed and material costs risen in the last few years, but irrigation water cost the farmers considerably more money last year, due to the fact that on the average over 2-1/2 feet of water had to be supplied by the farmer himself from his own or his neighbor's well at an estimated cost of $5 to $15 an acre-foot. This added cost cut deeply into the revenue the farmer received from his crop.

The total gross income last year was the lowest since 1945 and, considering the reduced buying power and added expense, it made 1955 one of the poorest years on record.

In spite of the present period of water stress, however, the history of the Project to date is encouraging as reflected by the value of the crops produced since 1915 of $712 million.

Operation and Maintenance Costs

The cost of operation and maintenance of the irrigation and drainage facilities of the Project is advanced to the United States each year by the Irrigation Districts. Due to reduced incomes, increased costs, and water shortage, the farmers, through their irrigation districts, have asked for and received a reduction in the operation and maintenance budget of the Bureau of Reclamation, operating the Rio Grande Project. O&M charges have been reduced from about $6.50 per acre in 1954 to about $4.50 per acre this year. This reduction has meant a major curtailment of the rehabilitation program, that is, replacement of old structures such as checks and bridges, which in some instances have reached an age of forty years or more, as well as a reduction in the extent of the regular maintenance work. In spite of the small amount of Project water delivered, though, the system still has to be maintained to keep it from deteriorating. Also, the ditches have to be kept clean to handle the well water that is conveyed through the system.

In comparing the cost of maintaining and operating this Project with other projects that have been financed with Federal funds, some of which are operated by the Bureau of Reclamation and some by the irrigation districts, for the year 1954, the last year that complete figures are available, the Elephant Butte District of the Project ranked 77th and the El Paso District ranked 91st, out of 117 projects compared on cost per irrigated acre. On the basis of the ratio of O&M cost to gross crop value, however, both Districts of the Project ranked with the very best, with the Elephant Butte District 9th and the El Paso District 17th.

Future Conditions

In closing, I would like for you to think for a minute about what the future might hold in store for the irrigated lands of this valley. Some people think that if we could just get one good runoff "we would be back on our feet". Others, like Dr. Nelson Sayre, director of the ground water studies for the U. S. Geological Survey, feel that it might take five or six above-normal years in a row to bring this Project back to its 1949 condition. After 13 years of below-average inflow to

Elephant Butte, we are still hoping for improvement in the amount of runoff.

However, there are other factors that need to be considered besides runoff. Evaporation and seepage losses take a large percentage of the water that we do get. The evaporation off the surface of Elephant Butte, for example, amounts to about 6 feet of water a year. To try to reduce this amount at Elephant Butte and other reservoirs, experiments are being conducted by the Bureau of Reclamation and other agencies, both in this country and abroad, to try to reduce evaporation losses by use of a thin film over the surface of the water, using cetyl alcohol, or other chemicals which do not have an adverse effect on water, such as creating objectionable tastes or odors or an adverse effect on the biological balance of the reservoirs.

We have also begun reconnaissance studies to determine the feasibility of lining a section of the river or providing a lined conveyance channel outside the river from Leasburg Dam to El Paso to reduce seepage losses and reduce evaporation losses by cutting down the time for transporting the water. In this same connection we are also investigating the cost and the benefits of lining all the major canals and laterals on the Project. Such programs would have to be approved by the farmers before firm reports could be prepared for submission to Congress. The studies haven't progressed far enough yet to know how much it will cost or just how much water it would save.

Other studies, such as changes in methods of irrigation to conserve water, finding new crops that take less water, improving means of increasing rainfall, and finding economical methods of desalting water, still require much research and study. Such studies, as you well know, are being undertaken in virtually all the universities and colleges through out the West.

Irrigated farming is the backbone of the economy of this area. The future of the irrigated farm is the future of the Southwest and most assuredly of the Rio Grande Project area.