EBID: Water Management, Measurement, and Drought

Henry Magallanez and Valerie Beversdorf – Elephant Butte Irrigation District

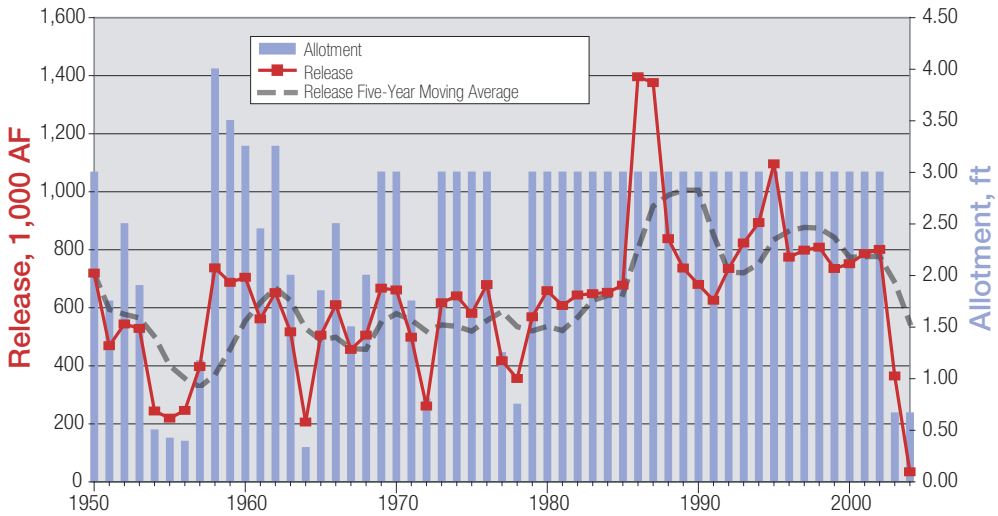
The Elephant Butte Irrigation District (EBID) is located in the Rio Grande Project of south-central New Mexico. Elephant Butte and Caballo reservoirs provide water storage for a combined capacity of about 2.3 million acre-feet for allocation to EBID, El Paso Water Improvement District No. 1 in Texas, and the Republic of Mexico. EBID's allocated water is diverted at three dams into its irrigation system. This water is used on crops (mainly alfalfa, cotton, and pecans) grown by flood irrigation in the Rincon and Mesilla valleys.

EBID's delivery system comprises 357 miles of canals and laterals. Water not consumed by crops is returned to the Rio Grande through a system of approximately 400 miles of drains and wasteways. Nearly all of the EBID irrigation system is unlined, consisting of open, earthen channels constructed during the early 1900s by the U.S. Bureau of Reclamation. While this is generally thought to be wasteful, seepage from the irrigation system has actually maintained the health of the underlying aquifer. The aquifer provides reserve storage that has allowed agriculture to survive through extended droughts.

Radial gate check with telemetry.

Water Monitoring and Data Management

Accurate measurement of flow is a critical factor in EBID's successful provision of surface water to irrigate the 90,640 acres of water-righted land in the district. During the past decade, EBID has developed means to measure flow at all levels of operation, including river and canal flows, diversions, farm deliveries, and return flows. Several forms of water measurement structures have been installed, including weirs, broad-crest weirs, and submerged orifices. Each water measurement site is evaluated to determine which type of flume will be most hydrologically effective, while ensuring acceptable accuracy in flow measurement. Sedimentation, low availability of head, and construction cost have prompted the development of additional water measuring structures, such as the Samani Circular and Trapezoidal flumes and the Samani-Magallanez flume. Currently about 200 water measurement devices have been installed throughout the district.



Rio Grande Project allotments and releases, 1950 to 2004.

The district has also made substantial progress in developing automated data acquisition systems. Hardware and software have been designed to facilitate monitoring and control of irrigation facilities, including river/canal gates and stilling wells. Additionally, about 150 radio telemetry units have been installed at certain checks, turnouts, well

discharge pipes, and other structures to collect and transmit real-time data to EBID headquarters. EBID anticipates that within three years, a total of about 750 sites will be installed. Funds were recently awarded for this effort by the U.S. Bureau of Reclamation through the Water 2025 Challenge Grants for water conservation projects in the West.

Photo: James Hogan

Manual and automated methods are utilized to monitor the flow of water through gauging and radio telemetry stations in EBID. These provide data for efficient management within the system and accurate accounting for deliveries that allow farmers to benefit from conservation measures. Sixty test wells were drilled throughout the district to monitor the depth to groundwater; they are equipped with telemetry so that groundwater levels can be monitored in real-time. Water quality monitoring for temperature and specific conductance has been added to the data acquisition system, starting with surface water flows crossing the state line into Texas.

The Global Water Flow Probe, a commercially available propeller meter, is the primary device used to meter turnouts. This device measures the velocity of water through the turnout gate and the height of the water. Staff gauges are being installed, one upstream and one downstream of each turnout gate, to allow efficient measurement of water flow using a submerged orifice equation. In-stream metering is also used in on-farm ditches or supply laterals. EBID is working with New Mexico State University to refine and publish a calibrated rating table of submerged orifice equations. Radio telemetry transmits real-time data to EBID headquarters for processing and archiving.

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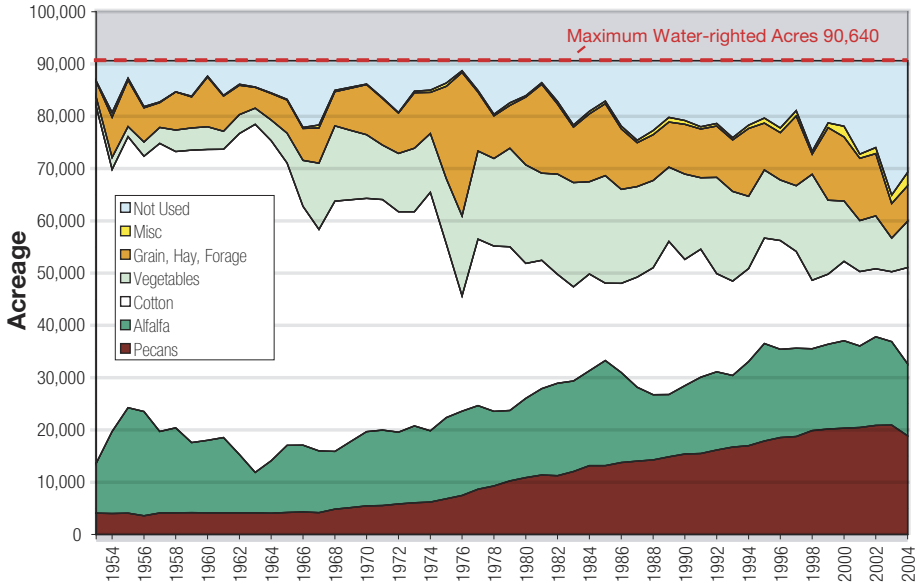

Crop history, 1954 to 2004, Elephant Butte Irrigation District.

With the rapid growth of its flow measurement system, EBID had to develop a system for managing the glut of hydrologic and operations data. The radio telemetry system brings the data to a central polling computer at EBID headquarters. From there, the data are formatted and passed to a SQL server for database storage. The data, retrievable in graph or tabular form, are accessible on the Internet at www.ebid-nm.org.

Management Practices Evolve

Under drought conditions, more work is required to equitably distribute irrigation water, and with each drought, management practices change. For an unprecedented 24 years, from 1979 to 2002, EBID enjoyed full water supply allocations with annual surface water allotments to constituents of three acre-feet per acre (36 inches) (see chart, page 18). However, EBID could allot only eight acre-inches per acre—too little for crops—during the drought-affected 2003 and 2004 irrigation seasons. How would EBID ensure delivery of

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the correct amount of water to which constituents were entitled? And how could they get more water? To address these concerns, EBID implemented permanent special procedures and policies to allow commingling of surface water and groundwater in EBID facilities, and to meter the delivery of irrigation water.

Historically, farmers have utilized groundwater to supplement surface water during periods of drought. In order to assist farmers in irrigating crops, EBID implemented a conjunctive management policy, allowing the conveyance of metered water pumped from private wells through EBID canals and laterals to supplement surface water deliveries.

Water Ordering

Crop patterns have changed significantly since the 1950s when cotton represented almost 80 percent of the district's crops (see chart, page 19). The first modern irrigation wells were drilled during that decade's drought, and higher-value, higher-investment crops such as pecans and vegetables were planted due to the reliability of supplemental groundwater. These changes in crop patterns required more flexible water management policies and procedures, leading to alterations in the water ordering process.

Formerly, charges for irrigation water were based on standard rates that reflected crop type and number of irrigated acres. Farmers irrigated without actually being metered. Now, water orders and charges are volumetrically based. Types of water orders include surface water, pumped groundwater, and commingled surface water and groundwater. Pump orders are required for well pumps discharging into EBID facilities. The amount of water released from Elephant Butte Reservoir is based on the water orders received from all EBID water users. The charge against the users' annual allotments is determined by metering at all turnouts, ensuring that constituents get their correct amount, and at well discharge pipes where groundwater discharges into EBID facilities. Calculations are performed and a metering worksheet is completed in the field when water is delivered. The delivered acre-feet on the worksheet are entered into the database and deducted from the irrigator's annual allotment.

A Farmer Services page is available on EBID's Web site, where farmers can transfer water from one farm to another, obtain transaction histories, review their tax accounts and land records, and check current water allotment balance, pending orders, and available balances. In the near future, farmers will also be able to place water orders on the Web.

Additional Efforts Benefit Region

EBID's primary mission is to equitably deliver irrigation water to its constituents, but the district continues to reach beyond traditional surface water uses to benefit the region. Nontraditional efforts include collaborating with government agencies and organizations on wetland restoration projects and development of hiking trails along EBID rights-of-way, and leveraging these resources and efforts with the infusion of grant funds.

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