EBID PROJECT WATER

We are fast approaching the point where our water supply will be critically examined to determined quantity, use, and waste. Plans must, therefore, be formulated for extending the use of our present supply.

One way to increase the quantity of water is to find new water sources. This is not always possible and is usually cost prohibitive. Another method is to conserve and equitably distribute the water presently available. In order to accomplish the latter a Water Management Program must be implemented. In the implementation of a Water Management Program there are two phases of development:

(1) Measurement of Water , and

(2) Use of the Water.

The first step in management of water is to establish how much water or flow is available for use. Once flows are defined, the use of the water can equitably be distributed based on the demands.

There are four categories in which the Measurement of Water consist of:

River Flows

Diversions

Deliveries

Return Flows

while the use of the water can be outlined as:

Demands

Consumptive use

Conservation

Water measurement and water use are dependent of each other, therefore, in order to have an efficient Water Management Plan, both phases, the use and measurement, require parallel development and implementation.

Within our region, water resource planning has been undertaken by various agencies and or organizations, in effect there is a need to coordinate our efforts to share each of our resources and data in order to ensure greater efficiencies in our water supply and management of that supply. In the management of the water supply the following work has been addressed at the District:

- Established real-time flow acquisition systems on River, Diversions, and Deliveries.
- Coordinated surface and ground water demands with geographic information system application.
- Established link with ground water model to surface water demand and flows.
- Quantify surface and ground water use with crop and soil characteristics.
- Identified areas of surface and ground water losses and or gains.
- Developed automated database of District infrastructure, including parcels, canals, drains, water wells, utilities, and district structures.
- Established automated data base link with local agencies on water planning activities and other shared resources.

With the responsibility of providing surface water for the irrigation of 90,640 acres of water righted farmland through our existing system the measurement of water is crucial for the successful management of the District. Several forms of water measurement structures have been implemented within our system, these structures include Weirs, Broad Crest Weirs (RBC's), and Submerged Orifices. As each water measurement site must be evaluated to determine which flume will be the most effective hydrological while ensuring acceptable accuracy in flow measurement. Sedimentation, low availability of head, and construction cost have prompted the development of other water measuring flume in particular the Samani Circular and Trapezoidal flumes and the Samani-Magallanez (S-M) flume. In addition to progressing on the development of water measuring structures the District has taken great strides in initiating data acquisition systems. In the development of out data acquisition system, hardware and software has been specifically designed to facilitate the monitoring and control our irrigation facilities including river/canal gates and stilling wells. Additionally, the District is taking steps to install Radio Telemetry Units to enhance the management of Project water.

"The West is defined… by inadequate rainfall. We cannot create it, but only hold it back and redistribute what there is."

Hydrology Overview

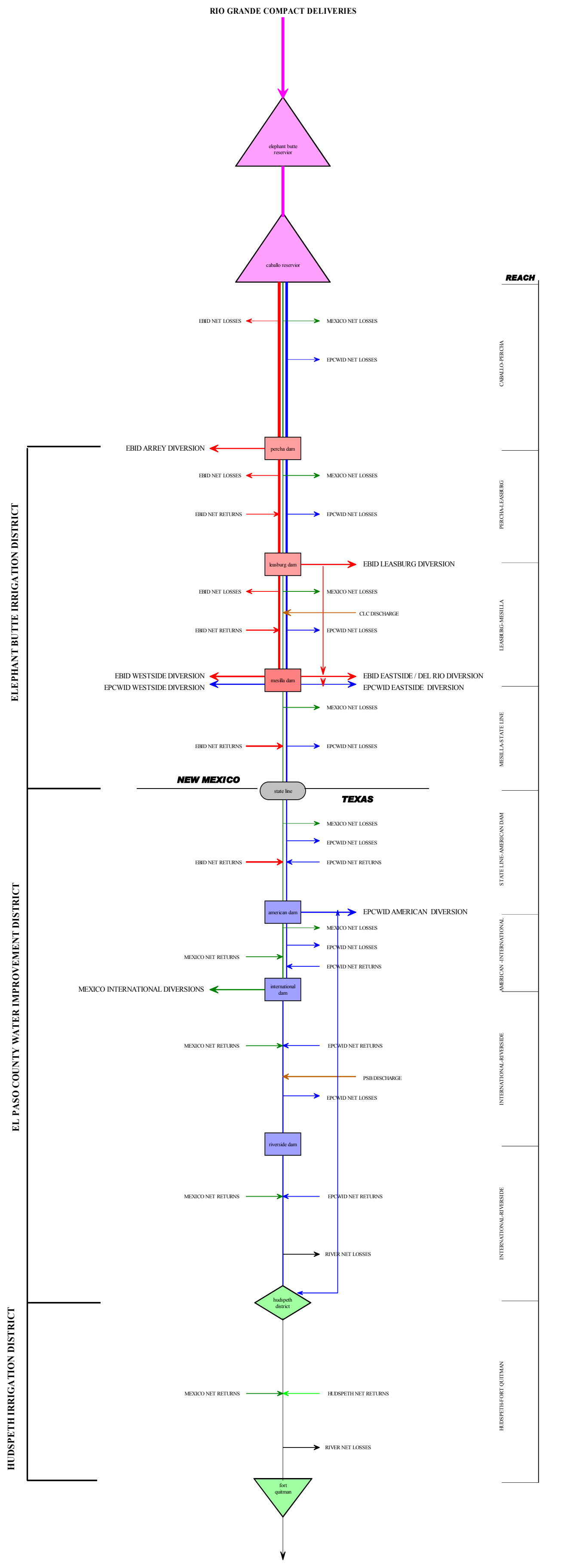
Caballo Dam Release Order

The EBID and EP#1 districts use a portion of their allocated water each time the districts request a release from the storage dam. The amount of the release is determined by the amount of acreage that are on order from the previous order day to the deadline of the new order day. The EBID and EPCWID #1 cooperatively determine the release amount in cubic feet per second (cfs) and send an order requesting the water to the Bureau of Reclamation who is the agency charged with regulating the dam and reservoir.

EBID then monitors the status of the facilities and reports flows at diversions, River stations, drains, and canals daily to account for the portion of the allocation being released. Flow is being monitor by Hydrology Technicians or obtained by telemetry units of data acquisition system. The data is analyzed and reports are created detailing daily flows for over 40 locations in the EBID.

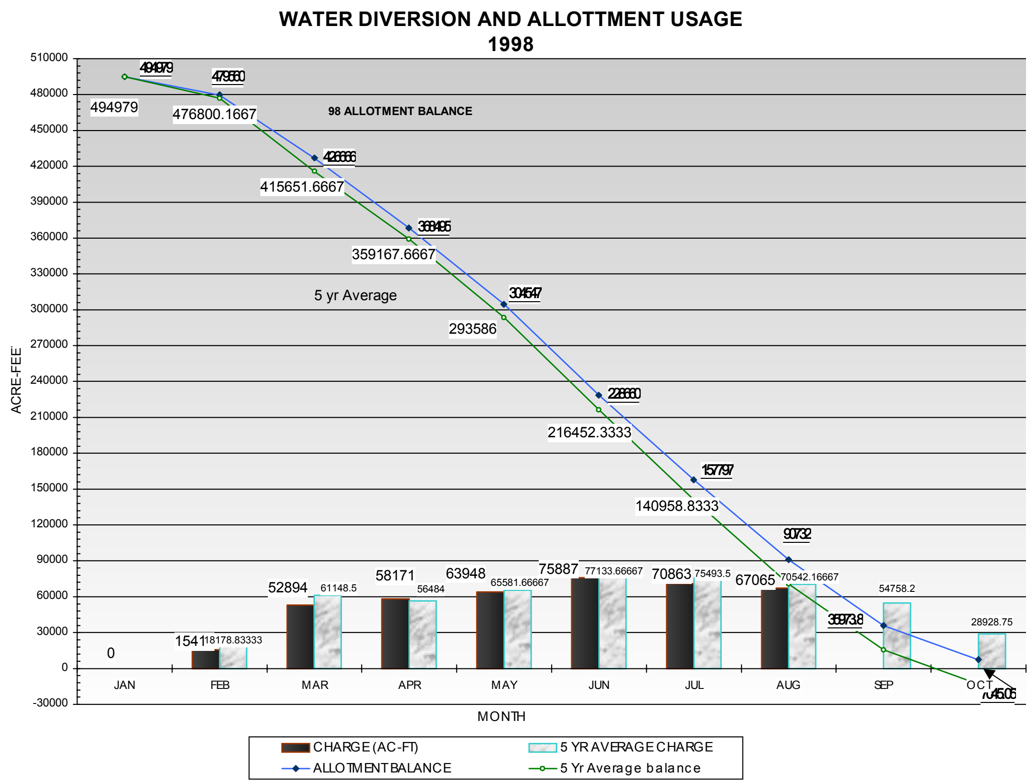
Water Quality is also being monitor by the District. Salinity of the water is closely monitored in that salinity limits the ability of plants to adsorb water and the effects of salinity are related to poor crop production . The District is developing more areas of water quality monitoring to better understand the suitability of water for irrigation and the environment. Other water qualities currently being monitored include temperature, amount of dissolved Oxygen, and pH.

HYDROLOGIC BUDGET FOR RIO GRANDE PROJECT



EBID

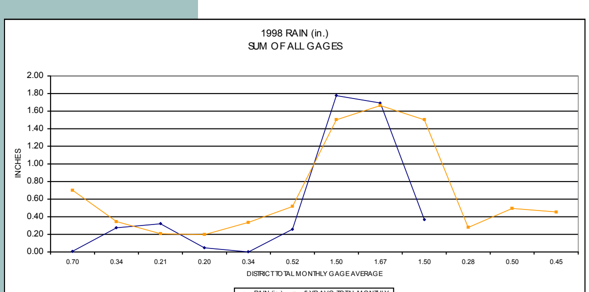
ELEPHANT BUTTE IRRIGATION DISTRICT



	Forage/Grains	Cotton	Corn	Vegetables	Orchards
February	0.75	0.75	0.75	0.75	0.75
March	0.59	0.75	0.75	0.59	0.59
April	0.50	0.75	0.75	0.42	0.50
May	0.50	0.59	0.59	0.34	0.50
June	0.50	0.59	0.50	0.25	0.42
July	0.50	0.50	0.42	0.25	0.42
August	0.50	0.42	0.34	0.17	0.42
September	0.50	0.34	0.25	0.17	0.42
October	0.50	0.34	0.25	0.17	0.42

ELEPHANT BUTTE IRRIGATION DISTRICT
RAIN GAGE SUMMARY
Elephant Butte Irrigation District
Hydrology Department
Rain Gage Summary by Monthly total and Location

	ARREY	GARFIELD	HATCH	RINCON	LEASBURG	PICACHO	LAS CRUCES	SAN MIGUEL	MESQUITE	CHAMBERINO	LA UNION	ANTHONY
JAN	0.03	0.01	0.01	0.01	0	0	0.01	0	0	0	0	0
FEB	0.24	0.27	0.19	0.08	0.45	0.4	0.38	0.33	0.27	0.22	0.13	0.32
MAR	0.34	0.32	0.33	0.35	0.03	0.39	0.52	0.35	0.4	0.44	0.37	0
APR	0.15	0.11	0.11	0	0	0	0	0.07	0.01	0.1	0.01	0.01
MAY	0	0	0	0	0	0	0	0	0	0	0	0
JUN	0	0	0	0.01	0.19	0.26	0.25	0.49	0.55	0.45	0.4	0.5
JUL	2.03	3.21	3.18	1.78	0.82	0.97	0.95	1.86	0.5	2.27	2.83	0.91
AUG	1.72	2.69	1.57	3.06	2	1.32	0.98	1.07	1.13	0.94	2.62	1.2
SEP	0.19	0.27	0.68	0.53	0.25	0.81	0.04	0.18	0.48	0.24	0.38	0.35
OCT												
NOV												
DEC												



The above water charge chart represents the estimated crop water consumption for the specified time of year for the given crops. This chart is used by the Water Records and the Operations personnel to charge out individual irrigations. These charges may not reflect the actual use of water used or assessed.

ACRES IRRIGATED PER CORP GROWN PER YEAR

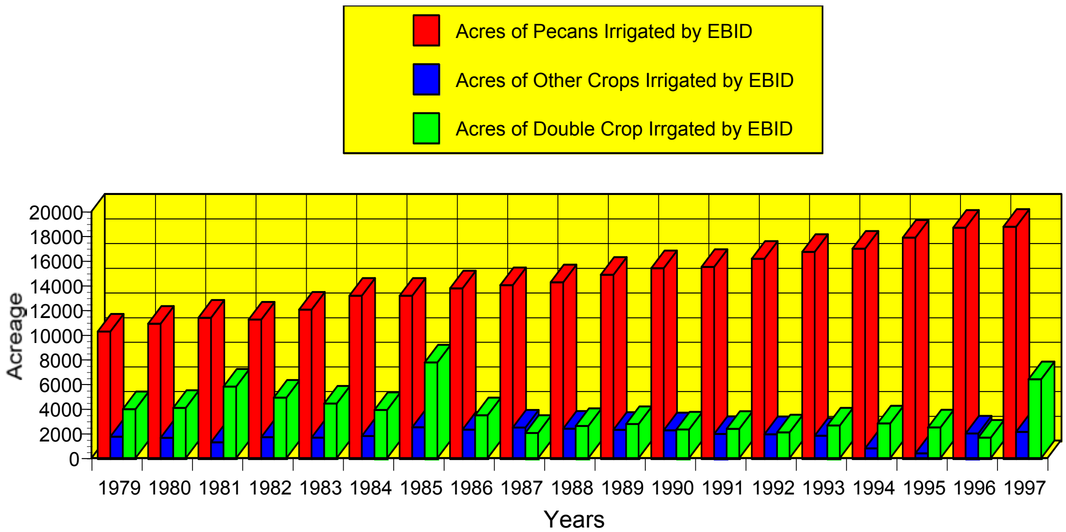
EBID

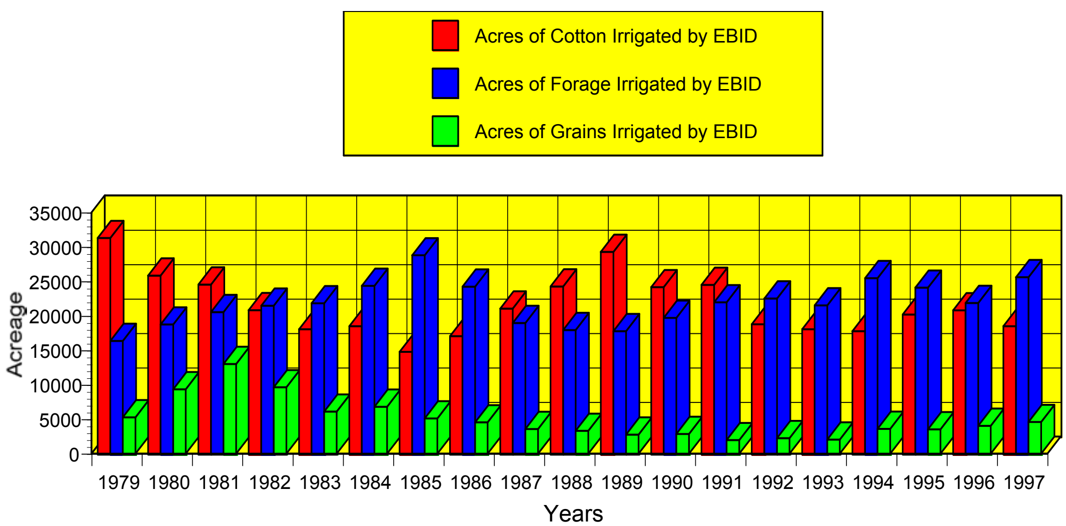
ELEPHANT BUTTE IRRIGATION DISTRICT

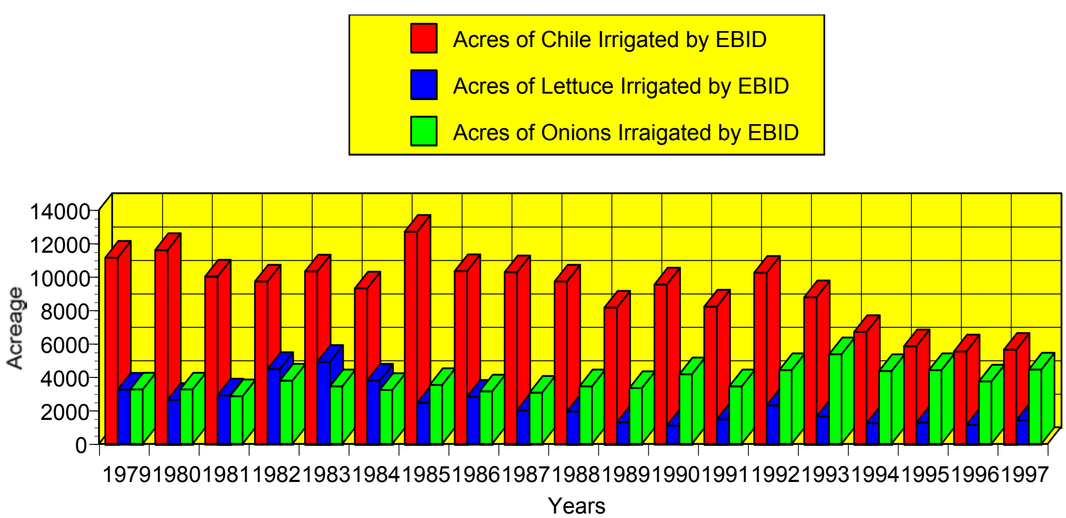
ANNUAL WATER ALLOTTED ACRE-FT PER ACRE

YEAR	ALLOTMENT
1950	3.00
1951	1.75
1952	2.50
1953	1.90
1954	0.50
1955	0.42
1956	0.39
1957	1.17
1958	4.00
1959	3.50
1960	3.25
1961	2.45
1962	3.25
1963	2.00
1964	0.33
1965	1.85
1966	2.50
1967	1.50
1968	2.00
1969	3.00
1970	3.00
1971	1.75
1972	0.80
1973	3.00
1974	3.00
1975	3.00
1976	3.00
1977	1.25
1978	0.75
1979	3.00
1980	3.00
1981	3.00
1982	3.00
1983	3.00
1984	3.00
1985	3.00
1986	3.00
1987	3.00
1988	3.00
1989	3.00
1990	3.00
1991	3.00
1992	3.00
1993	3.00
1994	3.00

Data represented in these graphs are complied from the records of Elephant Butte Irrigation District







Water Measurement / Water Quality

Where we have been

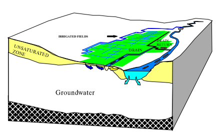
Measuring Station for the
La Union East and West Canal System

These structures were developed to provide for constant water flow to Texas. The Data Acquisition System allows for measurement to both systems to be sampled every ten minutes.

The La Union West gate is automated in order to provide constant flow. Presently, based on demand, the La Union East gate is manually set. Once set, monitoring flow can be determined in that a constant upstream and downstream level is maintained. The upstream level is maintained by the automation of the West gate and the downstream level is maintained by the automation of Wasteway 31 which is controlled by the El Paso Water District.

Water Accountability

- Releases
  - River Losses
- Diversions
  - System Losses
- Deliveries
  - Assessment Discrepancies
- Operation Returns
  - Efficiencies



Measuring Station Below Mesilla Dam

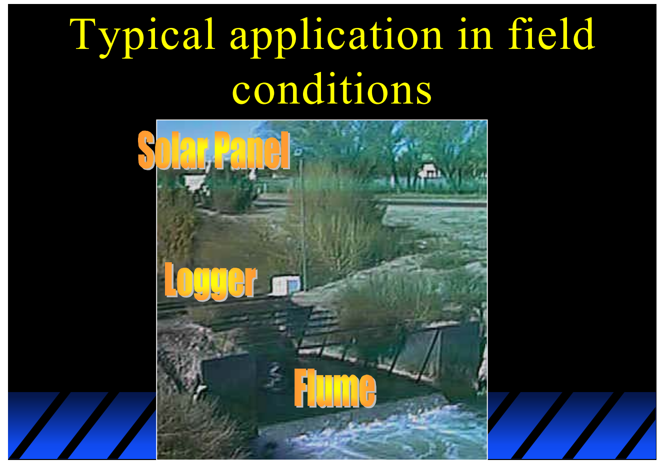
This measuring station is located approximately three-fourths of a mile downstream of Mesilla Diversion Dam. The station contains a cable way with metering cart. The cable way is no longer used for safety reasons.
The recording station is located 0.25 miles downstream of the cable way and records continuous water level measurements. To complete this measuring process manual measurements by staff gauges are carried out at the Stahman Bridge on Highway 28.

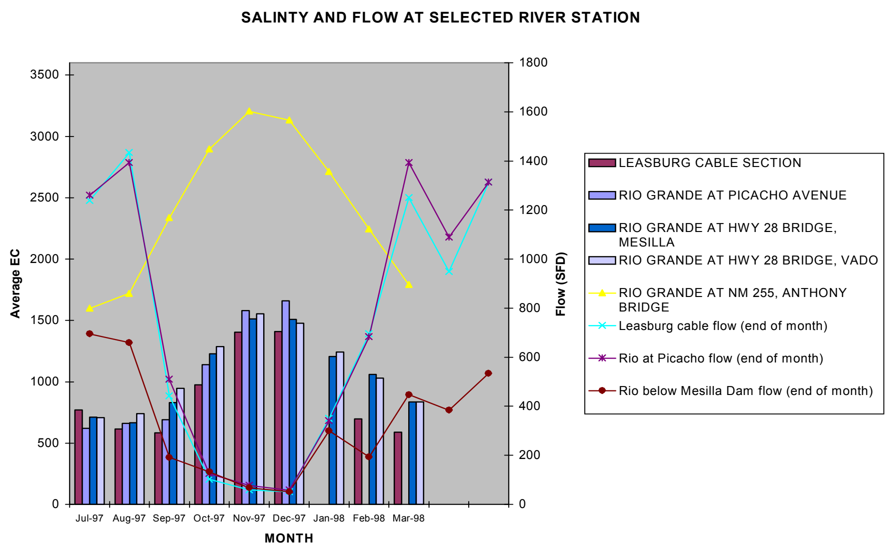
Main System Measurement and Control

- Overall EBID Water Balance
- Diversions from the Rio Grande
- Return Flows
- Deliveries to Texas
- Water Quantity and Quality
- Automation to Support Operations

Three Saints Lateral

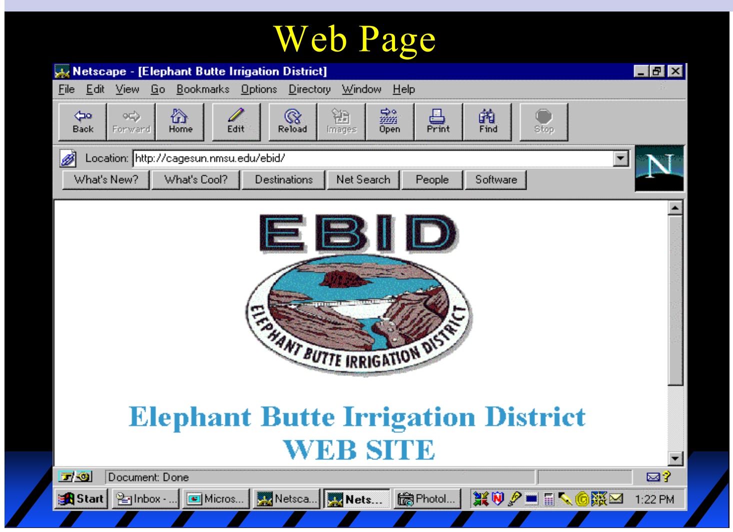
This station is located approximately 0.30 miles upstream of the intersection of the Three Saints East Lateral and New Mexico State Road 225 from Anthony, New Mexico. This station contains a ramp flume, data logger with solar panel and cmp shelter with recorder. Stage and flows are continuously measured and recorded.





IN 1999 EBID'S WEB SITE WAS LAUNCHED FOR USE BY OUR CONSTITUENTS AND THE GENERAL PUBLIC.

Visit our Web Site at: www.ebid-nm.org



Elephant Butte Irrigation District is currently planning tremendous upgrades to our existing computer network. Probably the largest project is connectivity with the City of Las Cruces, to gain access to GIS information. This link has allowed us to host our own web site. Another large scale project is collaborating information for the Stream Adjudication. And finally, our new database allows sharing records across the network between three main departments. This alone has revolutionized our ability to update land, tax and water records with minimal paper shuffling.

WATER CONSERVATION

Since the first agriculturalists, water conservation and ecosystem preservation has been one of the major building blocks for successful farming in the Mesilla Valley. Located within the Chihuahuan section of the North American desert region, water is a very valuable commodity, which must be used with reverence in order to maintain an ecosystem balance between its inhabitants and their survival needs. Today's modern farmers are still using many of the conservation practices used by the first agriculturalists centuries ago.

The Elephant Butte Irrigation District is the steward of the annual use of approximately one-third of a million acres of surface water diverted from the Rio Grande. Since there is no large industrial base within the Mesilla Valley which requires significant amounts of water, agriculture and the local municipalities are the major users of water resources.

The Elephant Butte Irrigation District's distribution system is about 75 years old. Although the engineering design of the distribution system was sound at the time of construction, the system is increasingly overtaxed in meeting today's modern agricultural demands. At the time of construction, many century old ditches and acequias were tied together. These ditches together with their appurtenant structures have continued to serve their intended purpose but, nevertheless, have capacity and operational problems.

In June of 1987, Elephant Butte Irrigation District outlined plans for stage reconstruction of its irrigation system over a period of years in order to conserve the District's water supply. With the rehabilitation, modernization, and the overall betterment of the distribution system, the end result would be more efficient use of water resources. District lands provide about 100,000 acres of green belt. Irrigation water percolates into underground aquifers and is available for use by municipalities and private land owners. Recreational use of District reservoirs, waterways, and the Rio Grande River is extensive and on going. These same facilities also host a myriad of wildlife species.

From an environmental and ecological perspective, the District affords the opportunity to host a variety of flora and fauna to flourish within its boundaries. In some places irrigated lands are used as a migratory flyway for over 200 bird species, including popular game birds, bald eagles, and the great horned owl. In the flora category, the Creosote bush dominates the bluffs overlooking the Rio Grande flood plain while salt cedar is most ubiquitous along the watercourses. Within the District's boundaries, small mammals such as the black-tail jackrabbit, desert cottontail, kangaroo rat, and the pocket mouse dominate the area while becoming a daily staple for coyotes living in the area. In some of these areas, mule deer also reside within reservoir boundaries. Ditches and drains, have become excellent environments for beavers, muskrat, and gophers. In addition, Elephant Butte and Caballo Reservoirs support a variety of fish, including bass, catfish, crappie, walleye, carp, and northern pike. Since the inception of the Elephant Butte Irrigation District, species that were once on the verge of extinction are now making a comeback thanks to the efforts of the District and its members.

THE TIME HAS COME FOR A NEW HOLISTIC APPROACH TO WATER AND NATURAL RESOURCE MANAGEMENT WHICH WORKS TOWARD A SET OF MUTUALLY AGREED UPON GOALS.

In recognition of this priceless commodity and its impact on the environment, the main goal of the District is to make every reasonable effort to conserve, extend, and efficiently utilize available water within its boundaries. As our farming technology evolves, so does our awareness in maintaining equilibrium between man and nature for all future inhabitants.

Surface water alternatives and water management strategies for municipal water use continue to develop. As the Las Cruces and El Paso area continue to grow, municipal water use of project water will become a critical issue in the future. Surface water is a replenishable resource which can be utilized to meet current needs. Surpluses used to recharge ground water supplies which are finite and exhaustible. The cost of surface water rights and the facilities necessary to transport and treat the water will be substantial. However, in a semi-arid region an assured water supply can never be cheap.

The District along with the cities of El Paso and Las Cruces , Dona Ana County, and New Mexico State University have formed a joint water commission to promote coordination and cooperation with respect to common water resource interests and conservation measures that will benefit all parties involved.

New Mexico State University has joined with the District and other agricultural engineering firms to develop better operation efficiencies through data acquisition, metering and use of automation. This has led to automation of gates at Mesilla Diversion Dam to provide better upstream water level control, automate sluicing of sediment from upstream of the dam and to quantify the amount of water flow to downstream users. Another benefit arising from this collaboration has been the development and implementation of relatively inexpensive portable metering devices and high flow turn-outs and flumes. These developments have led to greater accuracy in determining water flows and crop water consumption.

Other types of water conservation that have been implemented by constituents have been laser leveling, soil moisture sensing devices, and drip irrigation systems. Some of the technologies being currently used are on an experimental basis, but have shown great promise. Water conservation for agricultural use will benefit the community at large by making more water available to municipal users as well as furnishing a continual rechargeable supply to the aquifer system in the area.

Agriculture accounts for well over 80% of the total water used in New Mexico. By reducing agriculture consumption by 10%, one could conclude that an amount equal to all other uses could be made available. By eliminating evaporation losses which are proven to be the only "true" losses to the system, significant savings can be realized. It has been shown that the present sprinkler systems now in use lose annually over one-half an acre-foot per acre of water through evaporation. Standard flood irrigation loses approximately a tenth on an acre-foot per acre annually. A buried drip irrigation experiences virtually no losses.

CONSERVATION IN AGRICULTURE HAS ENVIRONMENTAL TRADEOFFS AND ALL ISSUES NEED TO BE CLOSELY EXAMINED PRIOR TO IMPLEMENTATION AS CONSERVATION EFFORTS. HOWEVER, WHAT CONSERVATION SHOULD BE UNDERTAKEN BY THE AGRICULTURAL SECTION IS, AGAIN, A DECISION THAT MUST BE MADE AT THE LOCAL LEVEL

However, from a constituent's standpoint, switching to a buried drip irrigation system is an extremely costly venture. It necessitates a large capital outlay as well as retraining of managerial skills and maintenance techniques. At present, there is very little incentive for most farmers to adopt this type of irrigation. To quote Tom Bahr, Director of New Mexico Water Resources Research Institute, *"A major perceived threat to the agricultural community is that an irrigator would be pressured by the government to reduce water consumption in order to make more water available for other users. The concern is that he would have to bear the costs of the technology conversion and receive no compensation for that investment nor compensation for the loss of revenues from the possible sale of saved water."*

Agricultural conservation practices at present are not done with other users in mind, but rather to reduce high ground water pumping costs, accommodation of special soil conditions, extension of limited water supplies, etc. With few exceptions, utilization of irrigation technologies which reduce evaporation losses will be the only true way to develop water conservation methods that are beneficial to all users involved. In the future some form of economic incentives for both (1) helping to reduce the capital outlay for the conversion to a more water conservative irrigation system than is presently in use and (2) by far perhaps the more important from the farmer's standpoint, an economic incentive to compensate for the water right attached to any "saved" water, will most probably need to be implemented in order to foster a purpose of conservation with broader range and benefits to a greater number of users than is already in place within the agricultural community. This second incentive will in all probability necessitate new policy as regards the Office of the State Engineer and may even require a change in state water law.

The District itself has implemented several programs in the effort to develop water conservation practices within the District itself. As a result of these accomplishments, the District received the Distinguished Water Conservation Award for outstanding water conservation achievement from the Bureau of Reclamation in 1998. There are only 10 such awards given each year across the nation. Some of these include (1) replacement of older irrigation facilities, (2) canal and drain cleaning and restoration, (3) reduction of seepage losses through concrete lining of piping of earthen canals, (4) reduction of delivery time of water through replacement of older check structures and the replacement of undersized turnouts with high-flow turnouts, (5) the implementation of computerized data acquisition and dissemination of information, (6) ongoing training of personnel, and (7) the ongoing and future research and development of water conservation overall.

Elephant Butte Irrigation District in cooperation with other agencies is involved in many different programs aimed at water conservation practices and developmental guidelines. Following are just a few and an overall view of what each groups' goals are:

Water Conservation, Water Accountability, and Water Quality Projects are the central theme for all projects that the Elephant Butte Irrigation District has been involved with past and present. This is the philosophy that sets the foundation for the **Elephant Butte Irrigation District's Agricultural Water Demonstration Project**. This is a cooperative effort started in 1994, between the Natural Resource Conservation Service, New Mexico State University, local Mesilla Valley farmers, and Elephant Butte Irrigation District. The aim of this Agricultural Water Demonstration Project was to determine the most efficient uses for surface irrigation water by utilizing irrigation schedules, irrometers, and high flow turn-outs. Following the 1995 irrigation season, farmers within the Mesilla Valley experienced a reduced irrigation water usage, shorter irrigation events, reduced fertilizer applications. This in turn, reduces the amount of leaching into the aquifers, and led to a higher potential profit margin.

Started in 1994, the **Farm Water Conservation Reloan Program** to which Elephant Butte Irrigation District is a member, allows the District to administer money from the New Mexico Interstate Stream Commission. This is low interest money which is used for land leveling, lining of irrigation ditches and reservoirs, construction of irrigation return flow conservation systems, drilling and equipping irrigation wells, flow meter installation, and similar water conservation projects.

Under the **New Mexico Regional Water Planning Program,** Elephant Butte Irrigation District is a participant in developing a regional plan for the wisest use of local water resources. This effort on the District's part will insure the protection of quality and quantity of water.

Started in 1992, the **Las Nutrias Ground Water Project** allows Elephant Butte Irrigation District to sponsor the Jornada Resource Conservation & Development, Inc. Under this project data is being collected in an effort to determine if agriculture is the biggest Non-Point Source Polluters. By analyzing captured tail water from a tile drain system in the field, researchers are in the process of determining the effects that various agricultural practices have on shallow groundwater tables.

In 1993, the **Rincon Valley Agricultural Land Use Study** began with the support of Elephant Butte Irrigation District and the United States Geological Service. The sole purpose of the project was to determine the spreading and levels of herbicides and pesticides in the surface water of the Rio Grande, drains, and shallow groundwater wells. This project was conducted during the irrigation and non-irrigation seasons. When the project was completed in 1994, water samples, which were analyzed proved that the levels of herbicides and pesticides did not meet the maximum, contaminate levels as specified by the Environmental Protection Agency.

The **Mesilla Basin Ground Water Monitoring Program** is a joint team effort program which, involves the United States Geological Survey Agency, New Mexico State Engineers Office, New Mexico State University Statistical Department, Las Cruces Water Department, El Paso Water Utilities, Jornada Resource Conservation & Development Inc., International Boundary and Water Commission-US section, and Elephant Butte Irrigation District. Through the use of an observation well network and three piezometers stretching across the Mesilla Basin we are able to monitor the fluctuation of ground water due to pumping demands from municipal, industrial, and agricultural uses. In addition, water seepage from the Rio Grande and water quality is also analyzed in the monitoring program.

"As our farming technology evolves, so does our awareness in maintaining equilibrium between man and nature for all future inhabitants."

GLOSSARY

Elephant Butte Irrigation District Terminology.

- **Acre -** An acre of land represents 43,560 square feet or a square parcel of land 208 by 208 feet. Elephant Butte Irrigation District has 96, 640 water right acres of land which the District is responsible for the delivery of ll irrigation water
- **Acre-Foot -** An acre-foot is a mathematical means of measuring and charging for water delivered to an acre of land. An acre-foot of water is one foot-depth over one acre of land. An acre-foot represents 43,560 cubic feet, and/or 325,829 gallons of water.
- **Canal** - Waterway with a great water carrying capacity of 125+ cubic feet per second.
- **Check** - Water control structure used in a channel or waterway to purposely restrict the flow of water to provide adequate pressure so as to push water through the turnout which is responsible for the delivery of water to adjacent lands.
- **Cubic Foot Of Water -** A cubic foot of water is the quantity of water contained in a one foot cube, which is 7.46 gallons of water.
- **Culvert** - Conveyance structure that provides a means for the water to pass under a road or railroad. A culvert can be built out of several different structural means as Corrugated Metal Pipe (CMP), Precast Concrete Pipe (PCP), and Free Flow Box Culverts specifically made for the culvert.
- **Diversion Dam** - A structure located within the flow channel of the river in which its primary purpose is to divert river water into the canal system.
- **Drain** - A waterway used to carry or convey ground water seepage or surface run-off to a down stream location. Drains maybe either open channels or pipe conduits.
- **Drop Check** - This is a check used in conjunction to provide for a change in the bottom grade to a lower grade.
- **Feeder** - Waterway which is used to re-charge one canal from another canal.
- **Flow Meter -** This is a means of measuring the flow of water in a given parameter at a given time. The flow meter is he piece of equipment used to make the measurement.
- **Flume** - Structure which conveys water over a channel or a waterway. A flume is generally constructed out of Precast Concrete (PCP) or Corrugated Metal (CMP) pipe. The largest flume in the Elephant Butte Irrigation Project is the Picacho Flume located across the Rio Grande in New Mexico.
- **Heading** - Structure where water is introduced into a canal, feeder, or lateral. The heading usually consists of a lateral turnout structure. The heading is the beginning of any canal, feeder, or lateral.
- **Lateral** - Waterway with a carrying capacity of less than 125 cubic feet per second which is fed by a canal.
- **Left Bank -** The bank on your left-hand side facing downstream, is the left bank.
- **Primary System** - A primary system consists of canals, feeders, and diversion dams. The primary system can be compared to the major arteries and veins of the human circulatory system whereby the blood is carried in bulk to the rest of the primary or secondary systems.
- **Recorder** - An apparatus used to constantly measure the flow of water past a given point. The measurement is made on a graph and operates twenty-four hours a day.
- **Recharge -** The addition of water to an aquifer by infiltration, either directly or indirectly. It may be recharged artificially when water is injected through wells of spread over permeable basins.
- **Return Flow** - Water that finds its way back to its source of supply.
- **Right Bank -** The bank on your right-hand when facing downstream is right bank.
- **Secondary System** - A secondary system consists of laterals, wasteways, and drains. The secondary system feeds off the primary system.
- **Siphon** - Conveyance structure which is designed to be deeper in the ground than a culvert and is used to permit the crossing of the channel by minimizing the hump effect that is created whenever a culvert is used instead of a siphon.
- **Toe of a bank** - The toe is the bottom point of the bank slope whether on the outside of the bank or the inside.
- **Turnout** - Gate structure, which allows the release of irrigation water from the canal, feeder, lateral to the adjacent lands or into another waterway. There are two major types of turnouts: 1) Farm Turnout and 2) Lateral Turnout.
- **Wasteway** - Waterway used to release excess water from a canal, feeder, or lateral, into a drain, another canal, feeder, lateral or back into the river. The main purpose of a wasteway is for emergencies and/or high flows of water.
- **Waterline** - The highest and safest point in any waterway that allows the water flow.

E B I D

ELEPHANT BUTTE IRRIGATION DISTRICT

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