

# Agricultural Irrigation and Water Conservation in Texas

## **Cameron G. Turner, CAIS**

Texas Water Development Board, Austin, TX, [cameron.turner@twdb.texas.gov](mailto:cameron.turner@twdb.texas.gov)

## **Mindy M. Conyers, PhD**

Texas Water Development Board, Austin, TX, [mindy.conyers@twdb.texas.gov](mailto:mindy.conyers@twdb.texas.gov)

**Abstract.** *According to the 2012 State Water Plan, irrigated agriculture is the largest water use sector in Texas. Increased municipal demands following tremendous urban population growth are projected to surpass the agricultural sector within the next 50 years. Conservation of agricultural irrigation water is expected to create 17% of water management strategies needed to meet this growth.*

*The Texas Water Development Board provides financial assistance and educational outreach for the conservation of water across all sectors. Our grant funded Agricultural Water Conservation Demonstration Initiative projects in the High Plains and Lower Rio Grande Valley showcase best management practices and enable the transfer of proven, efficient, and innovative irrigation technologies to area producers. The threat of continual drought conditions highlights the importance of water conservation throughout the state, and maximizing irrigation efficiency while maintaining agricultural productivity is essential to ensuring the viability of water resources in Texas now and into the future.*

**Keywords.** water conservation, agricultural irrigation, Texas, water use efficiency, regional water planning, best management practices.

## **The Texas Water Development Board**

The Texas Water Development Board (TWDB) is the state's water planning and water project financing agency. The TWDB's main responsibilities are threefold: collecting and disseminating water-related data; assisting with regional water planning and preparing the state water plan for the development of the state's water resources; and administering cost-effective financial programs for constructing water supply, wastewater treatment, flood control, and agricultural water conservation projects. In response to the drought of the 1950s and in recognition of the need to plan for the future, the legislature created the TWDB to develop water supplies and prepare plans to meet the state's future water needs. Since 1957, the TWDB has been charged with addressing the state's water needs. The TWDB has both leadership and support roles in ensuring that sufficient, clean, and affordable water supplies are available to the citizens of Texas and that those water supplies foster a healthy economy and environment.

### **Water Planning**

The TWDB supports the development of regional water plans and incorporates them into a state water plan for the orderly and responsible development, management, and conservation of the state's water resources. In 1997, the legislature established a new water planning process, based on a "bottom-up," consensus-driven approach. Coordinating this water planning process are sixteen planning groups, one for each regional water planning area (Figure 1). The planning groups, each made up of about twenty members, represent a variety of interests, including agriculture, industry, environment, public, municipalities, business, water districts, river authorities, water utilities, counties, groundwater management areas, and power generation. Each planning group approved bylaws to govern its methods of conducting business and designated a political subdivision, such as a river authority, groundwater conservation district, or council of governments, to administer the planning process and manage any contracts related to developing regional water plans.

The ongoing work of the regional water planning process consists of 10 tasks:

1. describing the regional water planning area;
2. quantifying current and projected population and water demand over a 50-year planning horizon;
3. evaluating and quantifying current water supplies;
4. identifying surpluses and needs;
5. evaluating water management strategies and preparing plans to meet the needs;
6. evaluating impacts of water management strategies on water quality;
7. describing how the plan is consistent with long-term protection of the state's water, agricultural, and natural resources;
8. recommending regulatory, administrative, and legislative changes;
9. describing how sponsors of water management strategies will finance projects; and
10. adopting the plan, including the required level of public participation.

Once the planning group adopts its regional water plan, the plan is sent to the TWDB for approval. The TWDB then compiles information from the approved regional water plans and other sources to develop the state water plan, which is presented to TWDB's governing Board for adoption. The final adopted plan is then submitted to the Governor, Lieutenant Governor, and the Texas Legislature. The latest state water plan, *Water for Texas 2012*, summarizes the dedicated efforts of about 450 planning group members, numerous technical experts, the public, and several state agencies (the TWDB, Texas Parks and Wildlife Department, Texas Department of Agriculture, and Texas Commission on Environmental Quality) between 2007 and 2012. This process has resulted in greater public participation, public education, and public awareness, underscoring the benefits of directly involving local and regional decision makers and the public in water planning.

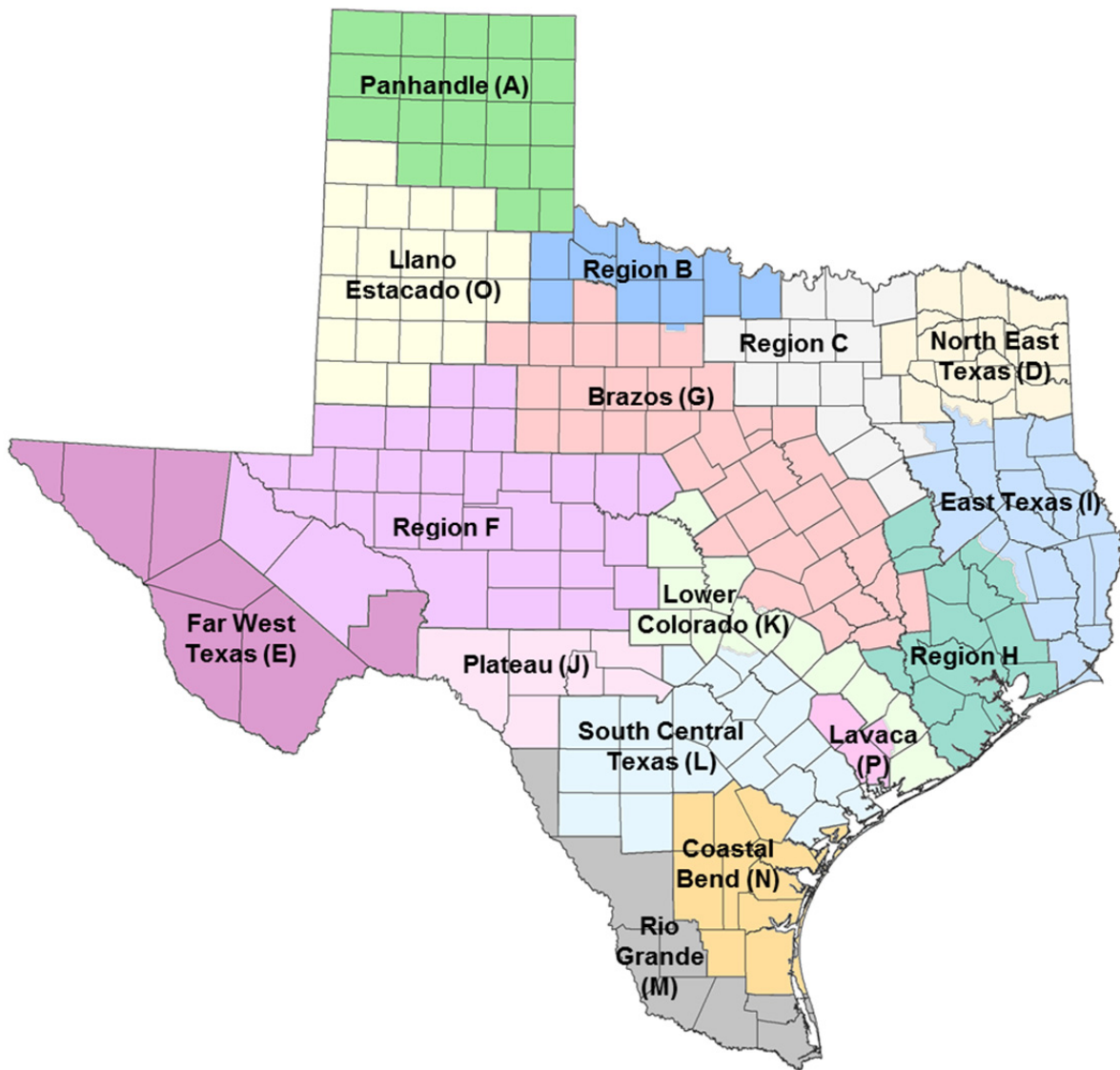


Figure 1. Regional Water Planning Areas of Texas.

## **Water Project Financing**

The Texas Water Development Board administers cost-effective financial programs for constructing water supply, wastewater treatment, flood control, and agricultural water conservation projects. Financial assistance programs can be grouped into three broad categories: federally subsidized programs, state programs, and programs for specific needs. Federally subsidized loan programs include the Clean Water State Revolving Fund and the Drinking Water State Revolving Fund. State programs include the Texas Water Development Fund, the State Participation Program, the Water Infrastructure Fund, and the Rural Water Assistance Fund. The financing for specific needs category includes the Economically Distressed Areas Program and the Agricultural Water Conservation Grant and Loan Program.

### **The Agricultural Water Conservation Grant and Loan Program**

Through the Agricultural Water Conservation Grant and Loan Program, the Texas Water Development Board provides agricultural water conservation loans to political subdivisions either to improve their facilities or to lend to individuals for conservation activities. The TWDB also provides grants to state agencies and political subdivisions for agricultural water conservation initiatives including demonstration projects, technology transfers, and educational programs.

Any political subdivision such as a city, county, soil and water conservation district, underground water conservation district, or irrigation district can apply for an agricultural water conservation loan. Conservation programs or projects are eligible. This includes a conservation program that funds a political subdivision or person for a conservation project.

A conservation program is

- an agricultural water conservation technical assistance program, including a program for an on-farm soil and water conservation plan developed jointly by a landowner, an operator, and a local soil and water conservation district as provided by the Agriculture Code, Chapter 201, Subchapter H;
- a research, demonstration, technology transfer, or educational program relating to agricultural water use and conservation;
- a precipitation enhancement program in an area of the state where the program, in the TWDB's judgment, would be most effective; and
- a water conservation program administered by a state agency or political subdivision to provide loans to persons for conservation projects.

A conservation project

- improves the efficiency of water delivery to and application on existing irrigation systems;
- prepares irrigated land for conversion to dry land conditions;

- prepares dry land for more efficient use of natural precipitation;
- purchases and installs on public or private property devices designed to indicate the amount of water withdrawn for irrigation purposes; or
- prepares and maintains land to be used for brush control activities in areas of the state where those activities, in the TWDB's judgment, would be most effective, including activities conducted under Chapter 203 of the Agriculture Code.

The grant portion of the program provides funding to state agencies and political subdivisions for agricultural water conservation projects. Applications are normally accepted once each year. Grants may be awarded for demonstrations, education, research, technical assistance, and technology transfer. Grants may also be made to political subdivisions to purchase and install, on either public or private property, metering devices to measure agricultural irrigation water use and to quantify water savings resulting from different agricultural water conservation strategies. In reviewing applications for agricultural water conservation grants, the TWDB considers the following:

- the commitment of the entity to water conservation;
- the benefits that will be gained by awarding the grant;
- the degree to which the political subdivision has pursued other available resources to finance the use for which the application is being made;
- the willingness and ability of the political subdivision to raise revenue;
- a finding that the grant will supplement rather than replace finances of the applicant;
- a finding that the grant will serve the public interest. In making this finding, the TWDB will include a finding that the grant will assist in implementing a water conservation management strategy identified in the most recently approved regional water plan or state water plan; and
- the contribution to advancing water conservation in the state.

Of particular importance for recipients of an agricultural water conservation grant are the requirements to document and report actual water savings as a result of the project and to implement a water conservation management strategy from the regional water plan. Each regional water plan presents information regarding the recommended conservation and other types of water management strategies that would be necessary to meet the state's needs in drought conditions, the cost of such strategies, and estimates of the state's financial assistance that would be required to implement these strategies. The conservation strategies can vary greatly depending on the region (Figure 2). In areas of Texas where irrigated agriculture relies primarily on groundwater (such as the High Plains, or Regions A and O), conservation strategies include improvements to on-farm water delivery systems such as low pressure center pivot irrigation systems or installation of drip irrigation systems where applicable. Regions that rely on surface water allocations for agricultural irrigation (such as the Lower Rio Grande Valley, or Region M) might recommend increasing water conservation through land leveling or improvements to water distribution and conveyance systems. According to *Water for Texas 2012*, almost seventeen percent of future water supply volumes

resulting from recommended strategies should come from agricultural irrigation conservation.



Figure 2. General location of major irrigated agricultural regions and major rivers in Texas. Map reproduced by TWDB from figure originally published by Texas Society of Professional Engineers (1954).

### Agricultural Water Conservation Demonstration Initiatives

In order to increase water conservation efforts in the agricultural sector, the Texas Water Development Board initiated a program in 2004 called the Agricultural Water Conservation Demonstration Initiatives. The purpose of this program is to evaluate and demonstrate the integration of enhanced irrigation water management techniques and diversified farming systems to advance water conservation while maintaining or increasing farm profitability. Demonstrating the appropriate use of this scarce resource and adopting water conservation practices within important economic regions is of

paramount importance in maintaining the viability of our agricultural communities. The following is a brief narrative of the two active projects.

### **Texas Alliance for Water Conservation**

In 2004, an eight-year grant of up to \$6.2 million was awarded to Texas Tech University for “An Integrated Approach to Water Conservation in the Texas Southern High Plains.” This project is designed to identify, demonstrate, and quantify water-saving agricultural production practices and technologies that will reduce the depletion of groundwater from the Ogallala Aquifer. Twenty-six established demonstration sites exhibit techniques ranging from monoculture cropping systems to fully integrated crop/livestock/forage systems with a broad range of dry land and irrigation technologies, including subsurface drip irrigation and low-pressure center pivot irrigation systems.

### **The Texas Project for Ag Water Efficiency**

A 10-year grant of up to \$3.8 million was awarded in 2004 to the Harlingen Irrigation District in the Lower Rio Grande Valley for implementing “Maximization of On-Farm Surface Water Use Efficiency by Integration of On-Farm Application and District Delivery Systems.” The objective of the project is to integrate state-of-the-art irrigation water distribution network control and management techniques with on-farm irrigation management. During the initial phase of the project, a flow meter calibration facility, the Rio Grande Center for Ag Water Efficiency, was constructed in Cameron County. The facility is used for calibrating metering equipment and for training irrigation district personnel from across the state. The facility is also used extensively by Texas A&M AgriLife Extension experts for conducting educational workshops benefiting area producers. An internet based water delivery and tracking system, which can monitor real-time water flow, weather, and water use, was installed at the center. The facility also houses the Harlingen Irrigation District’s pumping plant. District staff can monitor real-time information at the center from their main office in Harlingen and also from the web using mobile applications. This project also oversees demonstration projects aimed at disseminating knowledge of on-farm irrigation water conservation technologies and adaptive management strategies.

### **TWDB Agricultural Water Conservation Programs**

Agriculture in Texas has a long history of providing food and fiber to the people of Texas, the nation, and the world. Population growth is expected to continue resulting in an increased demand for agricultural products even as competition for scarce water resources increases. The economic viability of many regions of the state depends upon a strong agricultural economy. To remain competitive in these markets and to ensure the future of irrigated agriculture in the state, all Texans must continue to conserve our limited water resources. As the largest water use sector in the states, conservation by agricultural irrigators is increasingly the focus of nationwide attention. Working in conjunction with the United States Department of Agriculture Natural Resources Conservation Service, the Texas State Soil and Water Conservation Board, local soil

and water conservation districts, and local groundwater conservation districts, TWDB Agricultural Conservation staff assists agricultural producers in maximizing irrigation efficiency.

Agricultural Water Conservation staff distributes funding and manages contracts related to water conservation grants and demonstration initiatives. These projects document actual water savings throughout the state by implementing water conservation strategies identified in regional water plans. Between 2004 and 2013, TWDB agricultural water conservation grants funded over fifty projects covering such topics as efficiency improvements to irrigation conveyance systems, installation and automation of canal check gate structures, irrigation metering equipment, technology transfer, educational outreach and training on irrigation scheduling, irrigation system audits, and demonstrations of irrigation efficiency improvements and soil moisture monitoring.

Agricultural conservation staff also provides agricultural water conservation outreach and educational activities. Through invited speaking presentations, technical assistance, and exhibitions at farm and ranch shows across the state, staff conveys the importance of agricultural water conservation while showcasing those Texas producers already implementing regional water planning strategies to address future water needs. TWDB conservation staff also creates and distributes educational literature to inform producers and the public about not only the importance of water conservation but also best management practices and realistic strategies to accomplish actual water savings.

TWDB agricultural water conservation staff also assists with collection and distribution of water-related data while assisting with regional water planning through development of annual irrigation water use estimates. In Texas, surface water use is permitted by the state and water use is reported by each water right holder. Groundwater withdrawals in Texas are not required to be reported on a statewide level and are managed at a local level by groundwater conservation districts. Because not all agricultural irrigation water use is measured directly, in order to accurately account for water use across all sectors in Texas, agricultural irrigation water use must be estimated.

Staff has developed irrigation water use estimates for Texas by county annually since 1985. These estimates are a key component in the creation of irrigation demand projections as part of the regional water planning process. An estimated 6 million acres of cropland in Texas are irrigated with almost 9 million acre-feet of applied water annually. Because irrigation water supplements effective rainfall, a “wet” year such as 2010 had relatively low statewide irrigation water use versus a “dry” year like 2011. The process of estimating irrigation water use is complex and has evolved over time to include the best data and methods available. Fluctuations in irrigation water use related to local climate, weather patterns, and individual planting decisions complicate the estimation process.



## Conclusion

According to *Water for Texas 2012*, irrigated agriculture is the largest water use sector in Texas. Population growth in urban areas of the state is leading to an increase in municipal demands, which are projected to surpass the agricultural sector in the next 50 years. New water supplies are needed to meet this growth and agricultural irrigation conservation is projected to create 17% of the new water supplies in Texas by 2060.

In a time when the forecast for Texas calls for continuing drought conditions, the importance of water conservation has never been more evident. Agricultural producers must maximize irrigation efficiency to maintain productivity and economic viability while the amount of water available for irrigation in Texas declines. The Texas Water Development Board's mission is to provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas. Awareness of our most vital resource and the importance of conservation continues to grow throughout the state. By providing financial assistance, educational outreach, and technical guidance to producers, the TWDB agricultural water conservation staff works to ensure the viability of water resources in Texas now and into the future.

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