Glossary

Acre-foot
Volume of water needed to cover one acre to a depth of one foot. It equals 325,851 gallons.

Aquifer
Geologic formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs. The formation could be sand, gravel, limestone, sandstone, or fractured igneous rocks.

Availability
Maximum amount of raw water available from a source during the drought of record, regardless of whether the supply is physically or legally available to water user groups.

Brackish water
Water containing total dissolved solids between 1,000 and 10,000 milligrams per liter.

Capital cost
Portion of the estimated cost of a water management strategy that includes both the direct costs of constructing facilities, such as materials, labor, and equipment, and the indirect costs associated with construction activities, such as engineering studies, legal counsel, land acquisition, contingencies, environmental mitigation, interest during construction, and permitting.

Conjunctive use
Combined use of surface water, groundwater, and/or reuse sources that optimizes the beneficial characteristics of each source.

County-other
Aggregation of utilities that provide less than an average of 100 acre-feet per year, as well as rural areas not served by a water utility in a given county.

Desalination
Process of removing salt and other dissolved solids from seawater or brackish water.

Desired future condition
Desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint planning process.

Drought
Generally applied to periods of less than average precipitation over a certain period of time. Associated definitions include meteorological drought (abnormally dry weather), agricultural drought (adverse impact on crop or range production), and hydrologic drought (below-average water content in aquifers and/or reservoirs).

Drought of record
The period of time when historical records indicate that natural hydrological conditions provided the least amount of water supply.

Environmental flows
Amount of water that should remain in a stream or river for the benefit of the environment of the river, bay, and estuary, while balancing human needs.

Estuary
Bay or inlet, often at the mouth of a river and may be bounded by barrier islands, where freshwater and seawater mix providing for economically and ecologically important habitats and species and that also yields essential ecosystem services.

Existing water supply
Maximum amount of water that is physically and legally accessible from existing sources for immediate use by a water user group under a repeat of drought of record conditions.

Firm yield
Maximum water volume a reservoir can provide each year under a repeat of the drought of record using anticipated sedimentation rates and assuming that all senior water rights will be totally utilized and all applicable permit conditions met.

Groundwater availability model
Regional groundwater flow model approved by the TWDB executive administrator.

Groundwater management area
Geographical region of Texas designated and delineated by the TWDB as an area suitable for management of groundwater resources.

Industrial conservation
An aggregate presentation of anticipated water savings from conservation activities in the manufacturing, mining, and electric power generation sectors of water use.

Infrastructure
Physical means for meeting water and wastewater needs, such as dams, wells, conveyance systems, and water treatment plants.

Instream flow
Water flow and water quality regime adequate to maintain an ecologically sound environment in streams and rivers.

Interactive state water plan
TWDB website that lets water users statewide take an up-close look at data in the 2022 State Water Plan. Users can see how water needs change over time by showing projected water demands, existing water supplies, relative severity and projected water needs (potential shortages), water management strategies recommended to address potential shortages, and recommended capital projects and their sponsors. 2022.texasstatewaterplan.org

Interbasin transfer of surface water
Defined and governed in Texas Water Code § 11.085 (relating to interbasin transfers) as the diverting of any state water from a river basin and transfer of that water to any other river basin.

Major reservoir
Reservoir having a storage capacity of 5,000 acre-feet or more.

Major water provider
Water user group or wholesale water provider of particular significance to the region's water supply as determined by the regional water planning group. This may include public or private entities that provide water for any water use category.

Modeled available groundwater
Amount of water the TWDB executive administrator determines may be produced on an average annual basis to achieve a desired future condition.

Modeled available groundwater peak factor
A percentage that is applied to a modeled available groundwater value reflecting the annual groundwater availability that, for planning purposes, is considered temporarily available for pumping consistent with desired future conditions. The modeled available groundwater peak factor is not intended as a limit to permits or as guaranteed approval or pre-approval of any future permit application.

Needs
Projected water demands in excess of existing water supplies for a water user group or a wholesale water provider.

Recharge
Water that infiltrates to the water table of an aquifer.

Regional water planning group
Group designated pursuant to Texas Water Code § 16.053. There are 16 water planning groups in Texas responsible for developing regional water plans that are guided by statute, rules, contracts, members of the planning groups, and the general public. Each group has diverse members with various economic, social, and environmental interests in their areas.

Relevant aquifer
Aquifers or parts of aquifers for which groundwater conservation districts have defined desired future conditions.

Reuse
Use of surface water that has already been beneficially used under a water right or the use of groundwater that has already been used (for example, using municipal reclaimed water to irrigate golf courses).

Run-of-river diversion
Water right permit that allows the permit holder to divert water directly out of a stream or river.

Safe yield
Identified annual volume of water held in reserve to account for droughts worse than the drought of record.

Sedimentation
Action or process of depositing sediment in a reservoir, usually silts, sands, or gravel.

Storage
Natural or artificial impoundment and accumulation of water in surface or underground reservoirs, usually for later withdrawal or release.

Unmet needs
Amount of water demand that will still exceed the water supply after applying all recommended water management strategies in a regional water plan.

Water availability model
Numerical computer program used to determine the availability of surface water within each river basin for permitting in the state.

Water management strategy
Plan by a discrete water user group to meet a need for additional water, which can mean increasing the total water supply or maximizing an existing supply, including through reducing demands.

Water Service Boundary Viewer
Statewide public water system service area mapping application used to collect accurate retail water service boundaries to better estimate and project utility population for the regional water plans and the state water plan. The Viewer also helps in estimating the rural population not served by a system and strives to provide the most up-to-date and best data available on the service areas for all community public water systems within Texas. www3.twdb.texas.gov/apps/waterserviceboundaries

Water user group
Identified user or group of users for which water demands and existing water supplies have been identified and analyzed and plans have been developed to meet water needs. These include: privately-owned utilities that provide an average of more than 100 acre-feet per year for municipal use for all owned water systems; water systems serving institutions or facilities owned by the state or federal government that provide more than 100 acre-feet per year for municipal use; all other retail public utilities that provide more than 100 acre-feet per year for municipal use; collective reporting units or groups of retail public utilities that have a common association and are requested for inclusion by the regional water planning group; municipal and domestic water use, referred to as county-other; and non-municipal water use, including manufacturing, irrigation, steam-electric power generation, mining, and livestock watering for each county or portion of a county in a regional water planning area.

Wholesale water provider
Person or entity, including river authorities and irrigation districts, that delivers or sells water wholesale (treated or raw) to water user groups or other wholesale water providers or that the regional water planning group expects or recommends to deliver or sell water wholesale to water user groups or other wholesale water providers during the period covered by the plan. The regional water planning groups identify the wholesale water providers within each region to be evaluated for plan development.

Appendices

- Appendix A Background on Texas' water planning history, institutions, and laws
  - A.1 Texas water planning, 1904–1957
  - A.2 State water planning, 1957–1997
  - A.3 Regional and state water planning, 1997–present
  - A.4 State and federal water supply institutions
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- Appendix B Water availability and existing supplies
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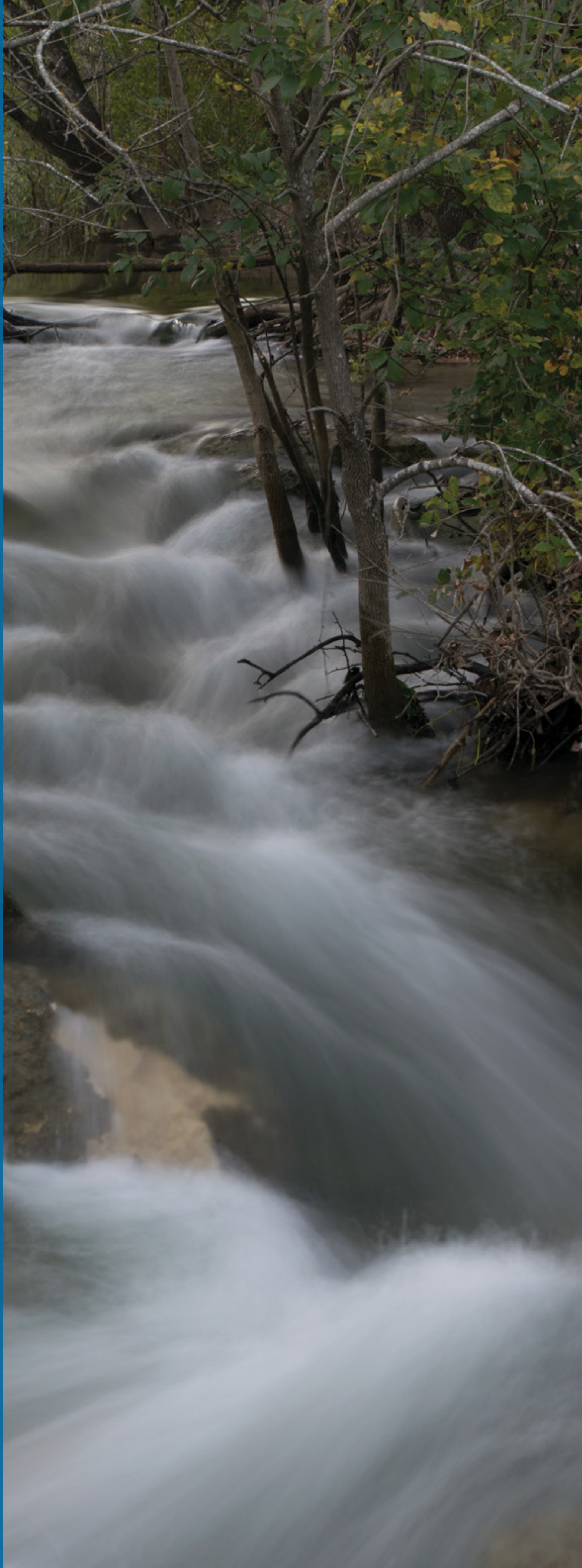
  - B.2 Groundwater
- Appendix C Annual water needs by region and water use category
- Appendix D Socioeconomic impact regional summary and dashboards



Appendix A Background on Texas' water planning history, institutions, and laws

A.1 Texas water planning, 1904–1957

While formal statewide water planning did not begin until the 1950s, the Texas Legislature began assigning responsibility for managing and developing the state's water resources in the early 20th century. A series of devastating droughts and floods in the early 1900s magnified the need for water management. In 1904, a constitutional amendment was adopted authorizing the first public development of water resources (Figure A-1). The legislature authorized the creation of drainage districts in 1905; the Texas Board of Water Engineers in 1913; conservation and reclamation districts (later known as river authorities) in 1917; freshwater supply districts in 1919; and water control and improvement districts in 1925.

The creation of the Texas Board of Water Engineers, a predecessor agency to both the Texas Water Development Board and the Texas Commission on Environmental Quality, played a significant role in the early history of water management in the state. The major duties of the Board of Water Engineers were to approve plans for developing irrigation and water supply districts, issue water right permits for storing and diverting water, and plan for storing and using floodwater. Later, the legislature authorized the agency to define and designate groundwater aquifers; establish underground water conservation districts; conduct groundwater and surface water studies; and approve federal projects, including those constructed by the U.S. Army Corps of Engineers.

In 1949, Lyndon Johnson, then a U.S. Senator, wrote to the U.S. Secretary of the Interior requesting federal assistance to help guide Texas in achieving "a comprehensive water program that will take into account the needs of the people of my state." The U.S. Bureau of Reclamation responded by publishing "Water Supply and the Texas Economy: An Appraisal of the Texas Water Problem" (USBR, 1953). The report divided the state into four planning regions and evaluated existing and projected municipal and industrial water requirements up to the year 2000. The study recommended that Texas consider forming a permanent water planning agency to guide state water policy going forward.

In the 1950s, Texas experienced its worst drought in recorded history. The drought began in 1950 and by the end of 1956, all but one of Texas' 254 counties were classified as disaster areas. The drought ended in 1957 with massive rains that resulted in the flooding of every major river and tributary in the state. This drought represents the driest seven-year period in the state's recorded history and is still considered the statewide "drought of record" upon which state and regional water supply planning in Texas is based.

The drought of the 1950s was unique in that most Texans felt the impacts of water scarcity at some point. Small and large cities alike faced dire situations. By the fall of 1952, the City of Dallas faced a severe water shortage and prohibited all but necessary household use of water. In 1953, 28 municipalities were forced to use emergency sources of water supply, 77 were rationing water, and 8 resorted to hauling in water from neighboring towns or rural wells. The development of additional water infrastructure during the drought reduced the number of communities with shortages during later years of the drought, but many municipalities continued to be forced to haul in water before it was over (TBWE, 1959). The drought also had significant impacts to agriculture and livestock production and led tens of thousands of Texans to resettle from farms to cities. All told, the drought of the 1950s cost the state hundreds of millions of dollars and was

Figure A-1. Texas water planning timeline

Texas Water Planning Timeline, 1904–2019

Pre-State Water Plan Era

1904
A constitutional amendment authorized the first public development of water resources.

The Texas Supreme Court adopted the rule of capture for groundwater.

1913
The Texas Legislature adopted laws for irrigation and created the Board of Water Engineers.

1917
Senate Joint Resolution 12 created conservation and reclamation districts, later known as river authorities, and declared the preservation and conservation of Texas natural resources as public rights and duties.

1949
The Texas Groundwater Act provided for under-ground water conservation districts.

1951
The first groundwater conservation district, the High Plains Underground Conservation District No. 1, was created.

1950s
Texas experienced its worst drought in recorded history from 1950 to 1957. Most water supply planning in Texas is based on this statewide "drought of record."

1957
The Texas Legislature created the TWDB, and voters authorized $200 million in bonds for water project loans.

The Water Planning Act created the Texas Water Resources Planning Division of the Board of Water Engineers, which was assigned the responsibility of water supply planning.

Centralized Water Planning Era

1961
The first state water plan was published, projecting the 1980 municipal, agricultural, and industrial water requirements and providing a plan to meet them.

1968
The Water Rights Adjudication Act consolidated all previously held surface water rights into a unified system of "certificates of adjudication."

The TWDB published a state water plan identifying and planning for needs through 2030.

1984
The TWDB published a state water plan identifying and planning for needs through 2030.

1990
The TWDB published a state water plan that emphasized improved overall management of existing and future water infrastructure systems.

1992
The TWDB published a state water plan formatted as an amendment to the more detailed 1990 plan.

1993
Following the *Sierra Club v. Lujan* decision, the legislature created the Edwards Aquifer Authority to regulate withdrawals from the aquifer.

Regionalized Water Planning Era

1997
Senate Bill 1 created 16 RWPGs, updated the laws relating to priority GMAs, and identified GCDs as the preferred method of groundwater management. The TWDB, TPWD, and TCEQ produced the first state water plan that organized the state into 16 regions.

2001
Senate Bill 2 made significant amend-ments to regional water planning, established the Water Infrastructure Fund, directed the TWDB to delineate groundwater management areas, and empowered TCEQ to recommend groundwater conservation districts.

2002
The TWDB produced the first state water plan based on regional planning.

2005
The Texas Legislature established a requirement that groundwater conservation districts within 16 groundwater management areas conduct joint planning and establish desired future conditions.

2007
Senate Bill 3 established a stakeholder process to develop environmental flow standards for Texas' major river basins and bay systems. The TWDB produced a state water plan.

2012
The TWDB produced a state water plan.

2013
House Bills 4 and 1025 created the State Water Implementation Fund for Texas (SWIFT) and the State Water Implementation Revenue Fund for Texas (SWIRFT) to fund state water plan projects.

2017
The TWDB produced a state water plan and accompanying interactive website.

2019
House Bill 807 created the Interregional Planning Council to report planning process improvements to the TWDB.

RWPG = regional water planning group, GMA = groundwater management area, GCD = groundwater conservation district, TPWD = Texas Parks and Wildlife Department, TCEQ = Texas Commission on Environmental Quality followed by floods that caused an additional $120 million in damages (TBWE, 1958).

A.2 State water planning, 1957–1997

The Texas Legislature responded to the drought of record by establishing the Texas Water Resources Committee in 1953 to survey the state's water problems (UTIPA, 1955). As a result of the committee's recommendations, the legislature passed a resolution authorizing $200 million in state bonds to fund water supply projects and created the Texas Water Development Board (TWDB) to administer funds from the bond sale. In a special legislative session called by Governor Price Daniel, the legislature passed the Water Planning Act of 1957, which created the Texas Water Resources Planning Division of the Board of Water Engineers and assigned it the responsibility of statewide water supply planning. Texas voters subsequently approved a constitutional amendment authorizing the TWDB to administer a $200 million water development fund to help communities develop water supplies.

In June of 1960, Governor Daniel called a meeting in Austin to request that the Board of Water Engineers prepare a planning report with recommended projects to meet the projected municipal and industrial water requirements of the state in 1980. Work quickly began on statewide studies to develop the first state water plan. The first plan, *A Plan for Meeting the 1980 Water Requirements of Texas*, was published in 1961. The plan described historical and present uses of surface water and groundwater by municipalities, industries, and irrigated agriculture; summarized the development of reservoirs; projected the 1980 municipal and industrial requirements of each area of the state; provided a plan for how to meet those requirements by river basin; and discussed how the plan could be implemented. The 1961 plan recommended 45 new reservoirs. During this era, reservoirs reigned supreme in water resource management, providing water supply, flood control, and electricity, as well as recreational opportunities.

In 1962, the Board of Water Engineers was reorganized, renamed the Texas Water Commission, and given specific responsibilities for water planning by the 57th Texas Legislature. The Texas Legislature again restructured the state water agencies in 1965 and transferred water resource planning functions to the TWDB and renamed the Texas Water Commission to the Texas Water Rights Commission.

Later plans were developed by the state and adopted in 1968, 1984, 1990, 1992, and 1997. Each of these plans recognized the state's steady population growth and the need to develop additional water supplies. Earlier plans placed more reliance on the federal government, while later plans developed at the state level increasingly emphasized the importance of conservation and natural resource protection. For example, the 1968 State Water Plan recommended the federal government continue to fund feasibility studies on importing surplus water from the Mississippi River (a later study determined that this proposed idea was not economically feasible). Less than 20 years later, the 1984 State Water Plan was the first to address water quality, water conservation, water use efficiency, and environmental water needs.

The first three plans were organized by river basin, but the 1990 State Water Plan projected water demand, supply, and facility needs for eight regions in the state. The 1997 State Water Plan—developed by the TWDB in coordination with the Texas Parks and Wildlife Department and the Texas Commission on Environmental Quality—was the first to organize the state into 16 water planning regions.

A.3 Regional and state water planning, 1997–present

Drought conditions in the mid-1990s spurred action in Texas water planning efforts, just as in the 1950s. In 1996, Texas suffered an intense 10-month drought. Reservoirs and aquifer levels declined sharply, and farmers suffered widespread crop failure, with estimated economic losses in the billions of dollars. Some cities had to ration water for several months, and others ran out of water entirely.

The drought of 1996 was short-lived, but its consequences were severe enough to remind Texans of the importance of water planning to ensure dependable water supplies. When the legislature convened in 1997, Lieutenant Governor Bob Bullock declared water the primary issue for the 75th Legislative Session. After lengthy debate and numerous amendments, the Texas Legislature passed Senate Bill 1 to improve the development and management of water resources in the state. Among other provisions relating to water supplies, financial assistance, data collection and dissemination, the bill established the regional water planning process, which directed state water planning to begin at the local (regional) level.

Senate Bill 1 outlined a new planning process in which every five years, local and regional stakeholders would develop consensus-driven regional plans for how to meet their water needs during times of drought. The TWDB would then develop a comprehensive state plan based on the regional water plans. The legislation also specified that the TWDB could only provide financial assistance for water supply projects if they were consistent with the regional water plans and the state water plan. The same provision also applied to the Texas Commission on Environmental Quality's granting of water right permits. The 2022 State Water Plan is the fifth plan completed under the Senate Bill 1 planning process and comprises the 16 regional water plans due to the TWDB January 5, 2021.

A.4 State and federal water supply institutions

Although the TWDB is the state's designated water planning agency, several state and federal agencies in Texas are responsible for managing water resources and participate in the regional planning process. The Texas Parks and Wildlife Department, Texas Department of Agriculture, and Texas State Soil and Water Conservation Board all have non-voting representatives on each regional water planning group. The Texas Parks and Wildlife Department, Texas Department of Agriculture, and Texas Commission on Environmental Quality are also directly involved in developing population and water demand projections and are consulted in developing and amending rules governing the planning process. The water-related responsibilities of these agencies, along with other state and federal entities that indirectly participate in the regional water planning process, are described in the following sections.

State entities

The TWDB is the state's primary water science, planning, and financing agency and is led by three appointed Board members. It supports the development of the 16 regional water plans and is responsible for developing a state water plan every five years. The TWDB provides financial assistance to local governments for projects that support water supply, wastewater treatment, flood mitigation, and agricultural water conservation. The TWDB also collects data annually through the Water Use Survey, Water Loss Audit, and Water Conservation Plan Annual Reports. The TWDB provides scientific information on state water resources by collecting data, developing models, and conducting studies of surface water and groundwater availability and quality, all of which undergirds the state water planning process. The TWDB uses and shares this information through a variety of avenues, including overseeing the joint planning process carried out by groundwater management areas and providing technical support to both the environmental flows process and the regional water planning process. The TWDB also participates in many committees and serves as a member of the Water Conservation Advisory Council, Drought Preparedness Council, and the Emergency Drinking Water Task Force, to name a few. The TWDB houses the **Texas Natural Resources Information System (TNRIS)**, which provides high-quality historic and current geospatial data products. The Deputy Executive Administrator of TNRIS acts as the state's Geographic Information Officer.

The State Parks Board, originally created in 1923, was later merged with other state entities and renamed the **Texas Parks and Wildlife Department**. Today the agency, led by nine commissioners appointed by the governor, is primarily responsible for conserving, protecting, and enhancing the state's fish and wildlife resources. It maintains a system of public lands, including state parks, historic sites, fish hatcheries, and wildlife management areas; regulates and enforces commercial and recreational fishing, hunting, boating, and nongame laws; and monitors, conserves, and enhances aquatic and wildlife habitats. It reviews and makes recommendations to minimize or avoid impacts on fish and wildlife resources resulting from water projects. Additionally, the Texas Parks and Wildlife Department works with stakeholders participating in regional water planning and the environmental flows process, as well as with regulatory agencies to protect and enhance water quality and to ensure adequate environmental flows for rivers and estuaries.

In 1992, to make natural resource protection more efficient, the legislature consolidated several programs into one large environmental agency now known as the **Texas Commission on Environmental Quality**. The Texas Commission on Environmental Quality, led by three commissioners appointed by the governor, is the environmental regulatory agency for the state. Focusing on water quality and quantity through various state and federal programs, the Commission issues permits for the treatment and discharge of industrial and domestic wastewater and stormwater; reviews plans and specifications for public water systems; and conducts assessments of surface water and groundwater quality. The Texas Commission on Environmental Quality regulates retail water and sewer utilities and administers a portion of the Nonpoint Source Management Program. In addition, it administers the surface water rights permitting program and maintains the water availability modeling programs that are the basis for the state's water rights permitting and water supply planning efforts (see Section A.5). It also administers a dam safety program, delineates and designates priority groundwater management areas, creates some groundwater conservation districts, and enforces the requirements of groundwater management planning. It regulates public drinking water systems, is the primary agency for enforcing the federal Safe Drinking Water Act, provides support to the environmental flows process, and adopts rules for environmental flow standards.

The **Texas Department of Agriculture**, established by the Texas Legislature in 1907, is led by the Texas Commissioner of Agriculture, an elected official of the state. It supports protection of agricultural crops and livestock from harmful pests and diseases; facilitates trade and market development for agricultural commodities; provides financial assistance to farmers and ranchers; and administers consumer protection, economic development, infrastructure grants to rural communities, and healthy living programs.

The **Public Utility Commission of Texas**, established in 1975, is led by three commissioners appointed by the governor and regulates the state's electric, telecommunication, and water and sewer utilities. In 2013, the Texas Legislature transferred the economic regulation of water and sewer utilities from the Texas Commission on Environmental Quality to the Public Utility Commission. The agency regulates water and sewer rates and services, Certificates of Convenience and Necessity, and sales, transfers, and mergers.

Created in 1939, the **Texas State Soil and Water Conservation Board**, led by seven board members composed of two governor appointees and five elected officials, administers Texas' soil and water conservation laws and coordinates conservation and nonpoint source pollution abatement programs. It also administers water quality and water supply enhancement programs and maintains flood control structures across the state.

First authorized by the legislature in 1917, **river authorities** are assigned the conservation and reclamation of the state's natural resources, including the development and management of water. They generally operate on utility revenues generated from supplying energy, water, wastewater, and other community services. There are 16 river authorities in Texas (Figure A-2), along with similar special law districts authorized by the legislature.

The formation of **groundwater conservation districts** was first authorized by the legislature in 1949 to manage and protect groundwater at the local level. Groundwater conservation districts are governed by a local board of directors, which develops a management plan for the district with technical support from the TWDB, the Texas Commission on Environmental Quality, and other state agencies. Because most groundwater conservation districts are based on county lines and do not manage an entire aquifer, one aquifer may be managed by several groundwater districts. Each district must plan with the other districts within their common groundwater management areas to determine the desired future conditions of the relevant aquifers within the groundwater management areas. As of 2020, there are 98 confirmed groundwater conservation districts (excluding the two subsidence districts and the Edwards Aquifer Authority) located partially or fully within 176 of 254 Texas counties (Figure A-3). A map of these districts may also be found on the TWDB website.

Other entities at the regional and local levels of government construct, operate, and maintain water supply and wastewater infrastructure. These include municipalities; water supply, irrigation, and municipal utility districts; flood and drainage districts; subsidence districts; and nonprofit water supply and sewer service corporations.

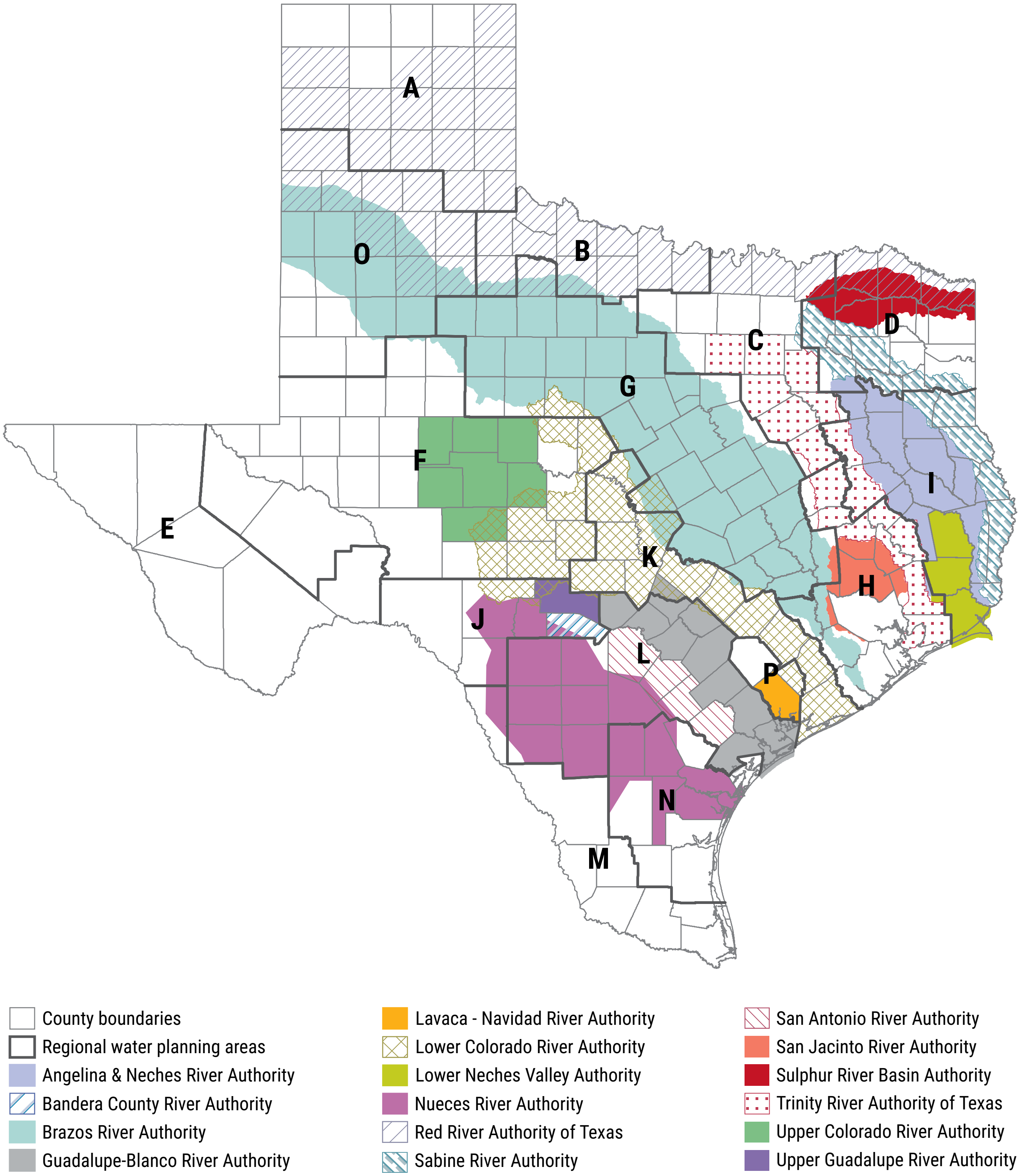
Federal agencies

Federal civil works projects played a major role in the early development of the state's water resources (TBWE, 1958). Historically, Texas relied heavily on federal funds to finance water development projects, with local commitments used to repay a portion of the costs. Federal agencies, such as the **Soil Conservation Service**, the **U.S. Bureau of Reclamation**, and the **U.S. Army Corps of Engineers**, constructed several surface water reservoirs in Texas. These reservoirs were built for the primary purpose of flood control but provide a large portion of the state's current water supply. The pace of federal spending on reservoir construction has declined considerably since the 1960s, and current federal policy recognizes a declining federal interest in the long-term management of water supplies.

Several federal agencies are responsible for managing the nation's water resources. The U.S. Army Corps of Engineers investigates, develops, and maintains the nation's water and related environmental resources. Historically, the U.S. Army Corps of Engineers has been responsible for flood protection, dam safety, and the planning and construction of water projects, including reservoirs. Pursuant to the Clean Water Act and the Rivers and Harbors Act, the U.S. Army Corps of Engineers operates a program that regulates construction and other work in the nation's waterways.

Within the **U.S. Department of the Interior**, the **U.S. Geological Survey** conducts natural resources studies and collects water-related data, and the **U.S. Bureau of Reclamation** conducts

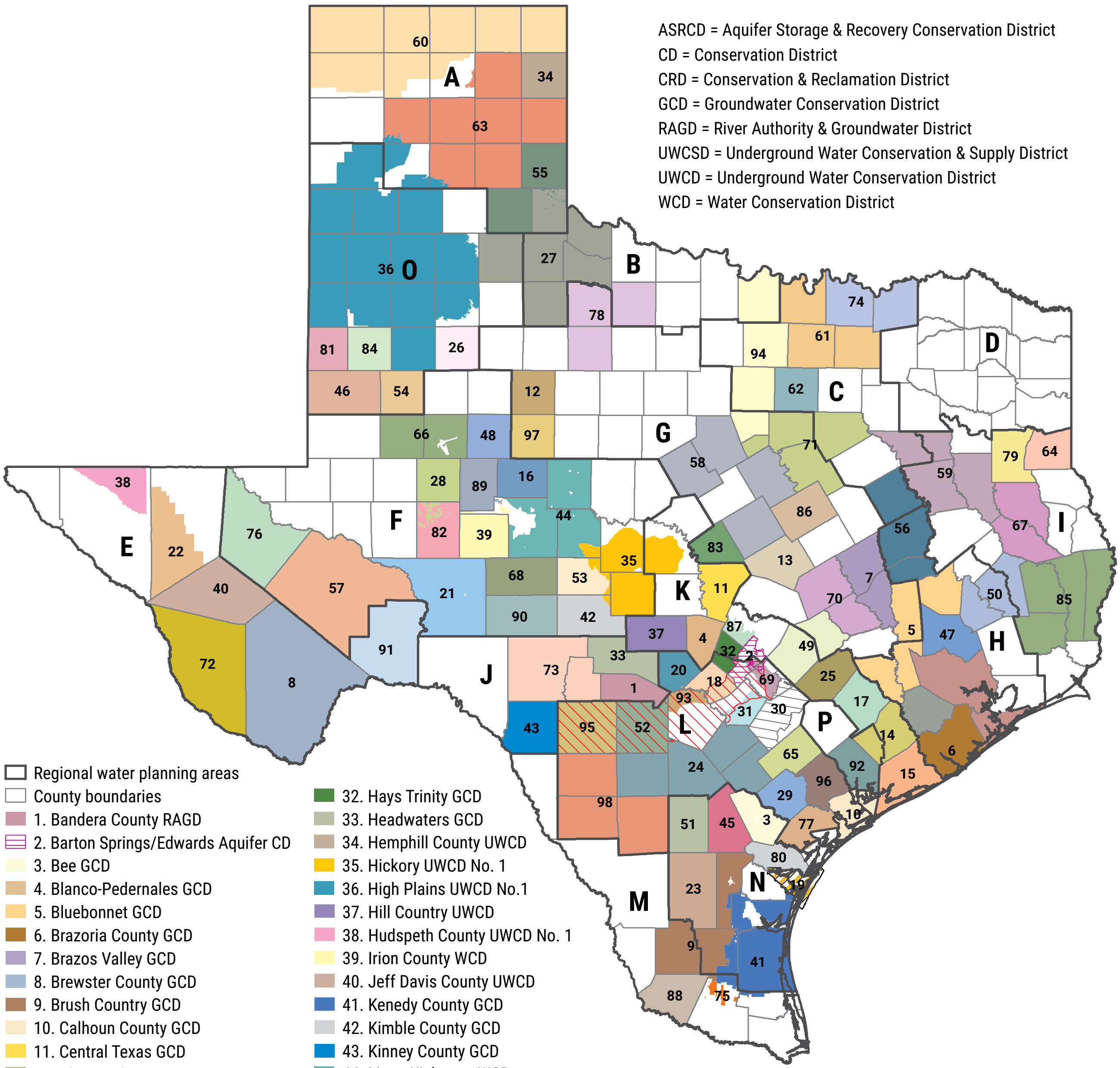
Figure A-2. Locations of river authorities and regional water planning area boundaries



water resource planning studies and manages water resources primarily in the western United States. The **U.S. Fish and Wildlife Service**, also part of the Department of the Interior, protects fish and wildlife resources through various programs and carries out provisions of the Endangered Species Act.

Figure A-3. Locations of groundwater conservation districts and regional water planning area boundaries

ASRCD = Aquifer Storage & Recovery Conservation District
CD = Conservation District
CRD = Conservation & Reclamation District
GCD = Groundwater Conservation District
RAGD = River Authority & Groundwater District
UWCSD = Underground Water Conservation & Supply District
UWCD = Underground Water Conservation District
WCD = Water Conservation District



- Regional water planning areas
- County boundaries
- 1. Bandera County RAGD
- 2. Barton Springs/Edwards Aquifer CD
- 3. Bee GCD
- 4. Blanco-Pedernales GCD
- 5. Bluebonnet GCD
- 6. Brazoria County GCD
- 7. Brazos Valley GCD
- 8. Brewster County GCD
- 9. Brush Country GCD
- 10. Calhoun County GCD
- 11. Central Texas GCD
- 12. Clear Fork GCD
- 13. Clearwater UWCD
- 14. Coastal Bend GCD
- 15. Coastal Plains GCD
- 16. Coke County UWCD
- 17. Colorado County GCD
- 18. Comal Trinity GCD
- 19. Corpus Christi ASRCD
- 20. Cow Creek GCD
- 21. Crockett County GCD
- 22. Culberson County GCD
- 23. Duval County GCD
- 24. Evergreen UWCD
- 25. Fayette County GCD
- 26. Garza County UWCD
- 27. Gateway GCD
- 28. Glasscock GCD
- 29. Goliad County GCD
- 30. Gonzales County UWCD
- 31. Guadalupe County GCD
- 32. Hays Trinity GCD
- 33. Headwaters GCD
- 34. Hemphill County UWCD
- 35. Hickory UWCD No. 1
- 36. High Plains UWCD No.1
- 37. Hill Country UWCD
- 38. Hudspeth County UWCD No. 1
- 39. Irion County WCD
- 40. Jeff Davis County UWCD
- 41. Kenedy County GCD
- 42. Kimble County GCD
- 43. Kinney County GCD
- 44. Lipan-Kickapoo WCD
- 45. Live Oak UWCD
- 46. Llano Estacado UWCD
- 47. Lone Star GCD
- 48. Lone Wolf GCD
- 49. Lost Pines GCD
- 50. Lower Trinity GCD
- 51. McMullen GCD
- 52. Medina County GCD
- 53. Menard County UWCD
- 54. Mesa UWCD
- 55. Mesquite GCD
- 56. Mid-East Texas GCD
- 57. Middle Pecos GCD
- 58. Middle Trinity GCD
- 59. Neches & Trinity Valleys GCD
- 60. North Plains GCD
- 61. North Texas GCD
- 62. Northern Trinity GCD
- 63. Panhandle GCD
- 64. Panola County GCD
- 65. Pecan Valley GCD
- 66. Permian Basin UWCD
- 67. Pineywoods GCD
- 68. Plateau UWCSD
- 69. Plum Creek CD
- 70. Post Oak Savannah GCD
- 71. Prairielands GCD
- 72. Presidio County UWCD
- 73. Real-Edwards CRD
- 74. Red River GCD
- 75. Red Sands GCD
- 76. Reeves County GCD
- 77. Refugio GCD
- 78. Rolling Plains GCD
- 79. Rusk County GCD
- 80. San Patricio County GCD
- 81. Sandy Land UWCD
- 82. Santa Rita UWCD
- 83. Saratoga UWCD
- 84. South Plains UWCD
- 85. Southeast Texas GCD
- 86. Southern Trinity GCD
- 87. Southwestern Travis County GCD
- 88. Starr County GCD
- 89. Sterling County UWCD
- 90. Sutton County UWCD
- 91. Terrell County GCD
- 92. Texana GCD
- 93. Trinity Glen Rose GCD
- 94. Upper Trinity GCD
- 95. Uvalde County UWCD
- 96. Victoria County GCD
- 97. Wes-Tex GCD
- 98. Wintergarden GCD
- Edwards Aquifer Authority
- Harris-Galveston Subsidence District
- Fort Bend Subsidence District

The **Natural Resources Conservation Service**, part of the U.S. Department of Agriculture and successor to the Soil Conservation Service, implements soil conservation programs and works at the local level through conservation planning and assistance programs. The **U.S. Environmental Protection Agency** regulates and funds federal water quality, solid waste, drinking water, and other programs pursuant to the Clean Water Act, Safe Drinking Water Act, and other federal laws and regulations. The **International Boundary and Water Commission** manages the waters of the Rio Grande between the United States and Mexico.

A.5 Management of water in Texas

Texas water law divides water into several categories for the purpose of regulation. Different rules apply to surface water and groundwater, determining who is entitled to use the water, in what amount, and for what purpose. This system stems from Spanish and English common laws, the laws of other western states, and state and federal case law and legislation. The following sections briefly describe how the state manages surface water and groundwater resources, water quality, drinking water, and interstate waters, all important considerations when planning for drought.

Surface water

In Texas, all surface water is held in trust by the state, which grants permission to use the water to different groups and individuals. Texas recognizes two basic doctrines of surface water rights: the riparian doctrine and the prior appropriation doctrine. Under the riparian doctrine, landowners whose property is adjacent to a river or stream have the right to make reasonable use of the water. The riparian doctrine was introduced in Texas more than 200 years ago with the first Spanish settlers. In 1840, the state adopted the common law of England, which included a somewhat different version of the riparian doctrine (Templer, 2011). In response to the scarcity of water in the western United States, Texas began to recognize the need for a prior appropriation system (Kaiser, n.d.). The prior appropriation system, first adopted by Texas in 1895, has evolved into the modern system used today. Landowners who live on many of the water bodies in the state are allowed to divert and use water for domestic and livestock purposes, but these are some of the last riparian rights still in place.

In 1913, the legislature extended the prior appropriation system to the entire state. It also established the Texas Board of Water Engineers, the agency that had original jurisdiction over all applications for appropriated water. Because different laws governed the use of surface waters at different times in Texas history, claims to water rights often conflicted with one another. In 1967, as a result of these historic conflicts, the state began to resolve claims for water rights. A “certificate of adjudication” was issued for each approved claim, limiting riparian and other unrecorded rights to a specific quantity of water. The certificate also assigned a priority date to each claim, with some dates going back to the time of the first Spanish settlements (TCEQ, 2009).

The adjudication of surface water rights gave the state the potential for more efficient management of surface waters (Templer, 2011). With only a few exceptions, surface water users today need a permit in the form of an appropriated water right from the Texas Commission on Environmental Quality. The prior appropriation system recognizes the “priority doctrine,” which gives superior rights to those who first used the water, often known as “first in time, first in right.” In most of the state, water rights are prioritized only by the date assigned to them and not by the purpose for which the water will be used. Only water stored in Falcon and Amistad reservoirs in the middle and lower Rio Grande Basin is prioritized by the purpose of its use, with municipal and industrial rights having priority over irrigation rights during times of drought.

When issuing a new water right, the Texas Commission on Environmental Quality assigns a priority date, specifies the volume of water that can be used each year, and may allow users to divert or impound the water. Water rights do not guarantee that water will be available, but they are considered property interests that may be bought, sold, or leased. The agency also grants term permits and temporary permits, which do not have priority dates and are not considered property rights. The water rights system works hand-in-hand with the regional water planning process; the Texas Commission on Environmental Quality may not issue a new water right unless it addresses a water supply need that is consistent with the regional water plans and the state water plan.

Texas relies on the honor system in most parts of the state to protect water rights during times of drought. But in some areas, the Texas Commission on Environmental Quality has appointed a watermaster to oversee and continuously monitor streamflows, reservoir levels, and water use. There are three watermasters in Texas: the Rio Grande Watermaster, who coordinates releases from the Amistad and Falcon reservoir system; the Brazos Watermaster, who serves the middle and lower portions of the Brazos River Basin; and the South Texas Watermaster, who serves the Nueces, San Antonio, Guadalupe, and Lavaca river and coastal basins. The South Texas Watermaster also serves as the Concho Watermaster, overseeing the Concho River and its tributaries in the Colorado River Basin.

Groundwater

Groundwater in Texas is managed differently than surface water. Historically, Texas has followed the English common law rule that landowners have the right to capture or remove all the water that can be captured from beneath their land. In part, the rule was adopted because the science of quantifying and tracking the movement of groundwater was so poorly developed at the time that it would have been practically impossible to administer any set of legal rules to govern its use. A 1904 case and later court rulings established that landowners, with few exceptions, may pump as much water as they choose without liability. Today, Texas is the only western state that continues to follow the rule of capture.

In 1949, in an attempt to balance landowner interests with limited groundwater resources, the legislature authorized the creation of groundwater conservation districts to manage groundwater locally. Although the science of groundwater is much better developed (the TWDB has groundwater availability models for all the major aquifers and most of the minor aquifers in the state), groundwater is still governed by the rule of capture, unless under the authority of a groundwater conservation district. Senate Bill 1 in 1997 reaffirmed state policy that groundwater conservation districts are the state's preferred method of groundwater management.

Groundwater conservation districts can be created by four possible methods: (1) action of the Texas Legislature, (2) petition by property owners, (3) initiation by the Texas Commission on Environmental Quality, or (4) addition of territory to an existing district. Districts may regulate both the location and production of wells, with certain voluntary and mandatory exemptions. They are also required to adopt management plans that include goals to provide the most efficient use of groundwater. The goals must also address drought, other natural resource issues, and adopted desired future conditions. The management plan must include estimates of modeled available groundwater based on desired future conditions and must address water supply needs and water management strategies in the state water plan.

Texas groundwater law continues to evolve through recent court cases and ongoing litigation. It is unclear exactly how these recent cases will affect the broad scope of groundwater law as appeals are decided and new litigation is introduced.

The TWDB and the Texas Commission on Environmental Quality are the primary state agencies involved in supporting groundwater conservation districts to implement groundwater management plan requirements. Along with determining values for modeled available groundwater based on desired future conditions of the aquifer, the TWDB provides technical and financial support to districts, reviews and administratively approves management plans, performs groundwater availability and water-use studies, and is responsible for the delineation and designation of groundwater management areas.

Galveston Island, Texas

In 2015, the 84th Texas Legislature passed House Bill 30, directing the TWDB to conduct studies to identify and designate local or regional brackish groundwater production zones in areas of the state with moderate to high availability and productivity of brackish groundwater. To date, the TWDB has designated a total of 31 such brackish groundwater production zones that meet statutory criteria. In 2019, the 86th Texas Legislature passed House Bill 722, creating a framework for groundwater conservation districts to establish permitting rules for producing brackish groundwater from the TWDB-designated brackish groundwater production zones for municipal drinking water projects or electric generation projects. The statute further directed the TWDB to conduct technical reviews of operating permit applications submitted to groundwater conservation districts and, when requested by a district, investigate the impacts of brackish groundwater production as described in the annual reports of the permitted production.

The Texas Commission on Environmental Quality provides technical assistance to districts and is responsible for enforcing the adoption, approval, and implementation of management plans. The agency also evaluates designated priority groundwater management areas—areas that are experiencing or are expected to experience critical groundwater problems within 50 years, including shortages of surface water or groundwater, land subsidence resulting from groundwater withdrawal, and contamination of groundwater supplies.

Seawater (Gulf of Mexico)

The diversion, treatment, and use of marine seawater, as well as the discharge of the treated water and associated waste, is permitted by the Texas Commission on Environmental Quality. State-sponsored studies for seawater desalination plants were initiated in the 2000s, and in 2015 the 84th Texas Legislature passed House Bill 2031, directing the development of seawater desalination permitting rules in Chapter 18 of the Texas Water Code. The overall goal of the bill was to streamline and expedite the regulatory and permitting processes associated with seawater desalination. In addition, the Texas Parks and Wildlife Department and General Land Office have identified zones for both the diversion of marine seawater and discharge of the desalination waste, which are only applicable when using the Texas Commission on Environmental Quality expedited permitting process for seawater desalination. No zones are located within the state's bays and estuaries. The map of zones is available at the General Land Office Coastal Resource Management Viewer (cgis.glo.texas.gov/rmc/index.html).

Surface water quality

The Texas Commission on Environmental Quality is charged with managing the quality of the

Trinity Bay, Texas

state's surface water. Guided by the federal Clean Water Act and state law and regulations, the agency classifies water bodies and sets water quality standards. Water quality standards consist of two parts: the purposes for which surface water will be used (aquatic life, contact recreation, water supply, or fish consumption) and criteria to determine if the use is being supported. Water quality data is gathered regularly to monitor the condition of the state's surface waters and to determine if standards are being met. Through the Texas Clean Rivers Program, the Texas Commission on Environmental Quality works in partnership with state, regional, and federal entities to coordinate water quality monitoring, assessment, and stakeholder participation to improve the quality of surface water within each river basin.

Every two years, Texas submits a report to the U.S. Environmental Protection Agency that lists the status of all the waters in the state and identifies those not meeting water quality standards. When water bodies do not meet standards, the Texas Commission on Environmental Quality may develop a restoration plan, evaluate the appropriateness of the standard, or collect more data and information. For water bodies with significant impairments, the agency must develop a scientific allocation called a "total maximum daily load" to determine the maximum amount of a pollutant that a water body can receive from all sources, including point and nonpoint sources, and still maintain water quality standards set for its use.

Drinking water

The Texas Commission on Environmental Quality is also responsible for protecting the quality and safety of drinking water through primary and secondary standards. In accordance with the federal Safe Drinking Water Act and state law and regulations, primary drinking water standards protect public health by limiting the levels of certain contaminants, and secondary drinking water quality standards address taste, color, and odor. Public drinking water systems must comply with certain construction and operational standards, and they must continually monitor water quality and file regular reports with the Texas Commission on Environmental Quality.

Interstate waters

Texas is a member of five interstate river compacts with neighboring states to manage the Rio Grande, Pecos, Canadian, Sabine, and Red rivers. The compacts, as ratified by the legislature of each participating state and the U.S. Congress, represent agreements that establish how water should be allocated. Each compact is administered by a commission of state representatives and, in some cases, a representative of the federal government appointed by the president. Compact commissions protect states' rights and work to prevent and resolve any disputes over water. The compact commissions are authorized to plan for river operations, monitor activities affecting water quantity and quality, and engage in water accounting and rulemaking. To administer the five compacts in Texas, the Texas Commission on Environmental Quality provides administrative and technical support to each commission and maintains databases of river flows, diversions, and other information.

A.6 Key water planning statute and administrative rules

Texas Water Code §§ 16.012, 16.051, 16.052, 16.053, 16.054, and 16.055.

31 Texas Administrative Code Chapters 355, 356, 357, and 358.

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Appendix B Water availability and existing supplies

B.1 Surface water

As discussed in Chapter 5, hydrologic variances from the use of firm yield determined by the default water availability model (WAM Run 3) may be justified for drought planning purposes. For example, in regions where droughts are more frequent, it is reasonable to plan with a more conservative measure of reliability, such as a one- to two-year safe yield, because some reservoirs in more arid regions of the state have extended periods between filling.

Of the 16 planning regions, six requested and were authorized to use safe yield for the surface water availability analysis in their plan development. Authorization was granted based upon assurances and evidence that the resulting estimates of alternative water availability are reasonable for drought planning purposes and will reflect conditions expected in the event of near-term, actual drought conditions. Additionally, planning groups must also report the standard firm yield value. These authorizations are summarized in Table B-1. For presentation purposes, only approved safe yield hydrologic variance assumptions for reservoir sources are summarized. Run-of-river sources also have hydrologic variance assumptions approved, and the specifics may be reviewed (along with reservoir variance assumptions) in Chapter 3 or the associated appendix in each regional water plan.

Beyond the use of safe yield, other authorized surface water variances included

- extension of the hydrology beyond the water availability model period of record (Regions A, B, C, F, G, H, K, N, and O);
- modifications to water availability models to more accurately reflect operational or contract agreements, subordination agreements, correct known errors in the models, or remove canceled water rights (all regions); and
- modifications to a water availability model to utilize return flows (Regions C, D, G, H, J, K, M, and O).

Playa lake in the Texas Panhandle

Table B-1. Summary of safe yield hydrologic variances used in the 2022 State Water Plan

River basin	Reservoir source	Region(s) utilizing reservoir as current source	Region(s) utilizing reservoir as future source	Safe yield additional period assumption (years)	2020 Firm yield (ac-ft/yr)	2020 Safe yield (ac-ft/yr)	Percent difference between firm and safe yield availability 2020	2070 Firm yield (ac-ft/yr)	2070 Safe yield (ac-ft/yr)	Percent difference between firm and safe yield availability 2070
Brazos	Cisco Lake/ Reservoir	G	None	1	1,300	1,075	-17	1,300	1,075	-17
Brazos	Daniel Lake/ Reservoir	G	None	1	250	175	-30	225	150	-33
Brazos	Fort Phantom Hill Lake/ Reservoir	G	None	2	7,500	4,800	-36	6,900	3,600	-48
Brazos	Graham/ Eddleman Lake/Reservoir	B; C; G	None	1	1,800	1,275	-29	1,125	675	-40
Brazos	Hubbard Creek Lake/Reservoir	G	G	2	26,900	20,000	-26	26,300	19,500	-26
Brazos	McCarty Lake/ Reservoir	G	None	1	100	75	-25	0	0	0
Brazos	Millers Creek Lake/Reservoir	B; G	None	1	125	75	-40	0	0	0
Brazos	Palo Pinto Lake/Reservoir	C; G	C; G	0.5	9,800	7,800	-20	8,950	7,100	-21
Brazos	Stamford Lake/Reservoir	G	None	1	4,400	2,600	-41	4,050	2,200	-46
Canadian	Meredith Lake/ Reservoir	A; O	A	1	28,221	24,669	-13	28,326	24,501	-14
Colorado	Brownwood Lake/Reservoir	F; G; K	F	1	24,000	18,900	-21	23,100	18,200	-21
Colorado	O.H. Ivie Lake/ Reservoir Non-System Portion	F; G	F; G	1	18,314	16,065	-12	15,536	13,491	-13
Nueces	Corpus Christi-Choke Canyon Lake/Reservoir System	N	N	1	173,154	111,560	-36	168,239	100,560	-40
Red	Greenbelt Lake/Reservoir	A; B	None	1	3,964	3,112	-22	3,276	2,256	-31
Red	Kemp-Diversion Lake/Reservoir System	B	None	1	44,000	29,000	-34	22,800	14,500	-36
Red	Little Wichita River Lake/ Reservoir System	B	B	1	31,770	16,900	-47	28,960	11,000	-62
Red	Olney-Cooper Lake/Reservoir System	B; G	None	1	268	194	-28	229	130	-43
Red	Santa Rosa Lake/Reservoir	B	None	1	3,075	50	-98	3,075	50	-98
Rio Grande	Red Bluff Lake/ Reservoir	F	None	1	38,630	30,050	-22	38,220	29,700	-22
Trinity	Amon G. Carter Lake/Reservoir	B	None	1	1,689	1,270	-25	1,185	830	-30
Trinity	TRWD Lake/ Reservoir System	C; D; G	C; D; G; I	1	517,349	451,094	-13	500,647	412,135	-18

ac-ft/yr = acre-feet per year

Table B-2. Annual surface water availability by river and coastal basin (acre-feet)

Surface water basin	2020	2030	2040	2050	2060	2070	Percent change
Brazos	1,457,019	1,452,479	1,447,935	1,443,413	1,438,849	1,433,608	-2
Brazos-Colorado	21,299	21,299	21,299	21,299	21,299	21,299	0
Canadian	41,802	41,726	41,651	41,576	41,500	41,425	-1
Colorado	956,710	954,837	952,913	951,091	949,178	947,235	-1
Colorado-Lavaca	4,852	4,852	4,852	4,852	4,852	4,852	0
Cypress	294,482	293,908	289,372	286,966	283,557	280,417	-5
Guadalupe	179,887	179,743	179,599	179,454	179,310	179,166	0
Lavaca	79,710	79,710	79,710	79,710	79,710	79,710	0
Lavaca-Guadalupe	297	297	297	297	297	297	0
Neches	2,342,466	2,340,310	2,338,353	2,336,570	2,334,215	2,330,521	-1
Neches-Trinity	90,555	90,555	90,555	90,555	90,555	90,555	0
Nueces	121,519	119,619	117,419	115,219	113,019	110,519	-9
Nueces-Rio Grande	8,807	8,807	8,807	8,807	8,807	8,807	0
Red	314,001	309,737	306,050	302,376	298,705	292,707	-7
Rio Grande	1,235,141	1,234,865	1,234,588	1,234,312	1,234,035	1,233,759	0
Sabine	2,013,544	2,009,131	2,003,908	1,999,215	1,994,420	1,989,632	-1
Sabine-Louisiana	343	343	343	343	343	343	0
San Antonio	52,984	52,984	52,984	52,984	52,984	52,984	0
San Antonio-Nueces	993	993	993	993	993	993	0
San Jacinto	269,297	265,297	261,497	257,597	252,997	244,997	-9
San Jacinto-Brazos	38,827	38,827	38,827	38,827	38,827	38,827	0
Sulphur	463,523	450,321	436,374	422,875	409,425	395,669	-15
Trinity	2,674,184	2,648,707	2,634,977	2,563,513	2,543,176	2,521,365	-6
Trinity-San Jacinto	5,537	5,537	5,537	5,537	5,537	5,537	0
Texas	**12,667,779**	**12,604,884**	**12,548,840**	**12,438,381**	**12,376,590**	**12,305,224**	**-3**

Table B-3. Annual surface water existing supplies by river and coastal basin (acre-feet)

Surface water basin	2020	2030	2040	2050	2060	2070	Percent change
Brazos	1,028,398	1,027,522	1,027,471	1,024,880	1,021,226	1,016,537	-1
Brazos-Colorado	18,146	18,146	18,146	18,146	18,146	18,146	0
Canadian	37,884	37,851	37,818	37,784	37,750	37,716	0
Colorado	850,792	849,674	848,806	846,861	847,167	845,952	-1
Colorado-Lavaca	4,289	4,289	4,289	4,289	4,289	4,289	0
Cypress	188,035	183,161	182,029	181,321	180,470	179,575	-5
Guadalupe	172,627	169,329	166,256	166,874	169,350	169,365	-2
Lavaca	78,055	78,136	78,136	78,136	78,136	78,136	0
Lavaca-Guadalupe	297	297	297	297	297	297	0
Neches	495,915	500,538	503,810	506,896	510,377	514,747	4
Neches-Trinity	88,962	88,962	88,962	88,962	88,962	88,962	0
Nueces	118,408	116,486	114,285	112,076	109,878	107,379	-9
Nueces-Rio Grande	926	926	926	926	926	926	0
Red	170,041	166,889	164,581	162,546	160,859	154,978	-9
Rio Grande	943,633	944,086	941,201	941,050	941,819	941,943	0
Sabine	591,377	573,717	573,540	573,113	572,665	576,570	-3
Sabine-Louisiana	343	343	343	343	343	343	0
San Antonio	52,444	52,445	52,445	52,446	52,455	52,455	0
San Antonio-Nueces	444	444	444	444	444	444	0
San Jacinto	187,038	187,816	188,218	187,201	187,441	187,646	0
San Jacinto-Brazos	35,989	35,989	35,989	35,989	35,989	35,989	0
Sulphur	121,575	121,149	121,323	121,616	121,803	121,938	0
Trinity	2,041,046	2,019,985	1,998,152	1,978,278	1,960,409	1,940,465	-5
Trinity-San Jacinto	5,537	5,537	5,537	5,537	5,537	5,537	0
Texas[a]	**7,232,201**	**7,183,717**	**7,153,004**	**7,126,011**	**7,106,738**	**7,080,335**	**-2**

[a] *Does not reflect some portions of existing supplies that are associated with purely saline water sources such as untreated seawater.*

B.2 Groundwater

As discussed in Chapter 5, the joint groundwater planning process is the basis for most groundwater availability in this plan. Desired future conditions for this plan were adopted by March 2018; however, the majority were adopted in 2016 and 2017. Desired future conditions by groundwater management area are available on the TWDB website: www.twdb.texas.gov/groundwater/dfc/2016jointplanning.asp.

The modeled available groundwater peak factor option discussed in Chapter 5 was utilized for this state water plan by Regions G and H. A modest modeled available groundwater reallocation was also approved for use by Region F, which allowed for the reallocation of modeled available groundwater values across river basins within a county.

During development of this state water plan, the reasonableness of the desired future condition adopted in 2016 for the Gulf Coast Aquifer in the Lone Star Groundwater Conservation District was challenged and determined to be no longer reasonable. Due to this decision, the modeled available groundwater volume used in this plan for Montgomery County is based on the desired future condition adopted in 2010.

Based on a policy recommendation in the 2017 State Water Plan, the timing of adopting desired future conditions was revised by House Bill 2215 from the 85th Legislative Session to set a statutory deadline for adopting desired future conditions and to better synchronize the joint planning and regional water planning cycles. For the 2026 regional water plans and 2027 State Water Plan, modeled available groundwater values will be based on desired future conditions in effect as of January 5, 2022. Where available during development of the 2027 State Water Plan, modeled available groundwater values will be utilized in developing draft irrigation demand projections in counties in which the total groundwater availability over the planning period is projected to be less than the groundwater portion of the baseline water demand projections (see Chapter 4 for methodological details). Steps in the groundwater joint planning process are outlined on the following flowchart: www.twdb.texas.gov/groundwater/docs/DFCFlowchart_May2020.pdf.

Texas windmill at sunrise

Table B-4. Annual groundwater availability by aquifer (acre-feet) *– continued on next page*

Aquifer	2020	2030	2040	2050	2060	2070	Percent change
Austin Chalk	5,704	5,704	5,704	5,704	5,704	5,704	0
Blaine	85,832	82,524	82,719	82,524	82,719	82,524	-4
Blossom	2,273	2,273	2,273	2,273	2,273	2,273	0
Bone Spring-Victorio Peak	101,400	101,400	101,400	101,400	101,400	101,400	0
Brazos River Alluvium	283,054	278,495	277,929	277,731	277,625	277,558	-2
Buda Limestone	758	758	758	758	758	758	0
Capitan Reef Complex	44,410	44,410	44,410	44,410	44,410	44,410	0
Carrizo-Wilcox	1,214,959	1,185,373	1,189,014	1,207,269	1,205,152	1,204,940	-1
Cross Timbers	13,127	13,127	13,127	13,127	13,127	13,127	0
Dockum	342,240	346,708	337,468	325,948	312,528	312,427	-9
Edwards (Balcones Fault Zone)	320,285	320,285	320,285	320,285	320,285	320,285	0
Edwards-Trinity (Plateau)/Pecos Valley[a]	420,915	420,915	420,915	420,915	420,915	420,915	0
Edwards-Trinity (Plateau)	7,390	7,390	7,390	7,390	7,390	7,390	0
Edwards-Trinity (Plateau)/Pecos Valley/Trinity[a]	479,060	479,060	479,060	479,060	479,060	479,060	0
Ellenburger-San Saba	41,141	41,095	41,141	41,095	41,141	41,095	0
Frio River Alluvium	2,145	2,145	2,145	2,145	2,145	2,145	0
Gulf Coast	1,998,403	1,880,722	1,826,411	1,874,886	1,919,628	1,947,314	-3
Hickory	56,572	56,554	56,572	56,554	56,572	56,554	0
Hueco-Mesilla Bolsons	480,000	480,000	480,000	480,000	480,000	480,000	0
Igneous	11,713	11,713	11,712	11,709	11,709	11,708	0
Leona Gravel	31,402	31,402	31,402	31,402	31,402	31,402	0
Lipan	46,539	46,539	46,539	46,539	46,539	46,539	0
Marathon	7,327	7,327	7,327	7,327	7,327	7,327	0
Marble Falls	10,443	10,415	10,443	10,415	10,443	10,415	0
Nacatoch	15,652	15,651	15,672	16,027	16,506	17,211	10
Navasota River Alluvium	2,216	2,216	2,216	2,216	2,216	2,216	0
Nueces River Alluvium	3,574	3,574	3,574	3,574	3,574	3,574	0
Ogallala/Edwards-Trinity (High Plains)[a]	3,115,814	2,086,599	1,534,371	1,246,995	1,092,489	1,002,728	-68
Ogallala/Rita Blanca[a]	804,584	576,367	452,421	332,470	221,287	221,287	-73
Ogallala	2,804,827	2,717,750	2,529,481	2,322,725	2,118,890	2,118,657	-25

[a] Noted aquifer combinations reflect specific groundwater management policy decisions based on aquifer properties. In these cases, the modeled available groundwater and existing supply values have likewise been developed to honor these aquifer combinations.

Table B-4. Annual groundwater availability by aquifer (acre-feet) – continued

Aquifer	2020	2030	2040	2050	2060	2070	Percent change
Other	258,668	258,668	258,668	258,668	258,668	258,668	0
Pecos Valley	150	150	150	150	150	150	0
Queen City	276,339	273,543	272,856	272,408	271,562	270,669	-2
Rustler	11,183	11,183	11,183	11,183	11,183	11,183	0
San Bernard River Alluvium	520	520	520	520	520	520	0
San Jacinto River Alluvium	1,450	1,450	1,450	1,450	1,450	1,450	0
San Marcos River Alluvium	271	271	271	271	271	271	0
Seymour	219,785	196,032	199,985	203,240	205,495	211,223	-4
Sparta	30,710	33,049	35,487	37,505	37,426	37,348	22
Trinity	385,697	384,923	385,302	384,288	384,924	384,243	0
Trinity River Alluvium	3,913	3,913	3,913	3,913	3,913	3,913	0
West Texas Bolsons	80,603	80,402	80,111	79,907	79,661	79,424	-2
Woodbine	30,656	30,575	30,656	30,575	30,656	30,575	0
Yegua-Jackson	113,891	111,921	111,909	111,823	111,287	111,287	-2
Texas	**14,167,595**	**12,645,091**	**11,726,340**	**11,170,774**	**10,732,380**	**10,673,867**	**-25**

Table B-5. Annual groundwater existing supplies by aquifer (acre-feet) – continued on next page

Aquifer	2020	2030	2040	2050	2060	2070	Percent change
Austin Chalk	3,618	3,618	3,618	3,618	3,618	3,618	0
Blaine	30,692	30,793	30,807	30,831	30,873	30,931	1
Blossom	723	723	722	722	722	722	0
Bone Spring-Victorio Peak	68,642	68,642	68,642	68,642	68,642	68,642	0
Brazos River Alluvium	148,920	145,718	145,392	145,303	145,262	145,239	-3
Buda Limestone	50	50	114	168	229	289	478
Capitan Reef Complex	13,629	13,629	8,104	8,104	8,104	8,104	-41
Carrizo-Wilcox	672,841	681,209	687,886	693,615	694,922	694,693	3
Cross Timbers	9,184	9,348	8,201	7,808	7,812	7,820	-15
Dockum	67,779	67,183	66,880	66,805	66,873	66,816	-1
Edwards (Balcones Fault Zone)	265,040	265,281	265,854	266,261	266,442	266,618	1
Edwards-Trinity (Plateau)/Pecos Valley[a]	175,622	168,286	172,014	170,072	167,656	164,760	-6
Edwards-Trinity (Plateau)	3,857	3,857	3,857	3,857	3,857	3,857	0
Edwards-Trinity (Plateau)/Pecos Valley/Trinity[a]	227,299	228,437	221,056	211,168	205,130	204,366	-10
Ellenburger-San Saba	21,386	21,349	20,476	19,938	19,492	19,175	-10
Frio River Alluvium	609	609	609	609	609	609	0
Gulf Coast	1,395,614	1,251,219	1,179,114	1,202,922	1,227,311	1,252,253	-10
Hickory	28,708	28,164	27,070	26,421	25,917	25,508	-11
Hueco-Mesilla Bolsons	167,028	167,028	167,028	167,028	167,028	167,028	0
Igneous	8,756	8,756	8,756	8,756	8,756	8,756	0
Leona Gravel	9,854	10,086	10,236	10,412	10,634	10,877	10
Lipan	45,696	45,703	45,702	45,702	45,701	45,701	0
Marathon	566	566	566	566	566	566	0
Marble Falls	1,826	1,826	1,826	1,826	1,826	1,826	0
Nacatoch	6,637	6,670	6,661	6,580	6,501	6,485	-2
Navasota River Alluvium	58	58	58	58	58	58	0
Nueces River Alluvium	13	13	13	13	13	13	0
Ogallala/Edwards-Trinity (High Plains)[a]	2,877,633	1,995,757	1,466,426	1,180,748	1,025,520	933,924	-68

[a] Noted aquifer combinations reflect specific groundwater management policy decisions based on aquifer properties. In these cases, the modeled available groundwater and existing supply values have likewise been developed to honor these aquifer combinations

Table B-5. Annual groundwater existing supplies by aquifer (acre-feet) – continued

Aquifer	2020	2030	2040	2050	2060	2070	Percent change
Ogallala/Rita Blanca[a]	626,332	432,477	337,860	252,457	176,937	177,993	-72
Ogallala	1,266,282	1,223,996	1,156,231	1,047,358	943,288	945,346	-25
Other	178,613	178,741	178,389	177,794	177,362	177,139	-1
Pecos Valley	150	150	150	150	150	150	0
Queen City	29,053	29,758	30,181	30,350	30,422	30,551	5
Rustler	4,719	4,719	4,719	4,719	4,719	4,719	0
San Bernard River Alluvium	-	-	-	-	-	-	na
San Jacinto River Alluvium	-	-	-	-	-	-	na
San Marcos River Alluvium	-	-	-	-	-	-	na
Seymour	179,391	170,041	170,638	172,210	173,061	170,176	-5
Sparta	19,058	20,218	20,414	20,527	20,655	20,806	9
Trinity	266,544	264,284	263,868	264,586	266,517	268,473	1
Trinity River Alluvium	-	-	-	-	-	-	na
West Texas Bolsons	43,620	43,620	43,620	43,620	43,620	43,620	0
Woodbine	21,740	21,221	21,224	21,206	21,210	21,202	-3
Yegua-Jackson	23,862	23,898	23,865	23,883	23,560	23,619	-1
Texas	**8,911,644**	**7,637,701**	**6,868,847**	**6,407,413**	**6,091,575**	**6,023,048**	**-32**

[a] Noted aquifer combinations reflect specific groundwater management policy decisions based on aquifer properties. In these cases, the modeled available groundwater and existing supply values have likewise been developed to honor these aquifer combinations

na = not applicable

Appendix C Annual water needs by region and water use category

***Table C-1. Annual water needs by region and water use category (acre-feet)** – continued on next page*

Region	Water use category	2020	2030	2040	2050	2060	2070
A	Irrigation	146,064	381,557	385,041	351,667	309,784	310,602
	Manufacturing	1,008	2,585	4,015	6,932	9,372	9,684
	Municipal	1,387	9,961	21,873	35,686	49,380	58,136
A total		**148,459**	**394,103**	**410,929**	**394,285**	**368,536**	**378,422**
B	Irrigation	21,165	22,979	24,793	26,606	28,419	30,233
	Manufacturing	0	0	0	0	13	145
	Mining	1,616	678	556	201	137	137
	Municipal	263	532	1,298	2,135	3,149	6,028
	Steam-electric	1,701	2,303	2,905	3,506	4,109	4,713
B total		**24,745**	**26,492**	**29,552**	**32,448**	**35,827**	**41,256**
C	Irrigation	4,584	4,654	4,712	4,757	5,042	5,395
	Livestock	478	478	478	478	478	478
	Manufacturing	402	5,350	9,072	12,148	14,601	17,532
	Mining	11,005	11,350	12,545	14,852	17,334	21,425
	Municipal	42,659	274,237	489,855	723,029	963,130	1,217,573
	Steam-electric	6,824	10,569	12,957	14,233	15,195	16,023
C total		**65,952**	**306,638**	**529,619**	**769,497**	**1,015,780**	**1,278,426**
D	Irrigation	13,188	13,206	13,208	13,209	13,211	13,213
	Livestock	14,542	14,552	14,540	14,455	14,477	14,491
	Manufacturing	2,914	5,578	5,455	5,465	5,735	5,865
	Mining	2,390	2,278	1,916	1,534	1,224	1,039
	Municipal	17,488	20,418	24,510	30,368	38,414	49,331
	Steam-electric	30,066	30,866	31,766	32,566	32,814	33,083
D total		**80,588**	**86,898**	**91,395**	**97,597**	**105,875**	**117,022**
E	Irrigation	46,737	46,737	52,262	52,262	52,262	52,262
	Manufacturing	0	860	860	860	860	860
	Mining	2,530	3,223	3,840	4,407	5,038	5,796
	Municipal	4,102	8,061	11,815	24,605	38,953	52,666
	Steam-electric	7,260	7,260	7,260	7,260	7,260	7,260
E total		**60,629**	**66,141**	**76,037**	**89,394**	**104,373**	**118,844**
F	Irrigation	13,529	17,957	19,544	21,240	24,585	27,060
	Livestock	9	17	25	39	50	60
	Manufacturing	951	1,065	1,108	1,327	1,527	1,710
	Mining	21,261	21,357	17,834	12,088	7,677	5,407
	Municipal	14,048	18,792	23,899	33,706	44,212	55,512
	Steam-electric	12,794	12,678	12,678	12,800	12,923	13,039
F total		**62,592**	**71,866**	**75,088**	**81,200**	**90,974**	**102,788**

Table C-1. Annual water needs by region and water use category (acre-feet) – continued on next page

Region	Water use category	2020	2030	2040	2050	2060	2070
G	Irrigation	75,658	81,687	76,700	75,374	76,180	78,660
	Manufacturing	1,024	3,458	3,088	2,718	2,379	1,916
	Mining	30,305	31,798	28,925	29,692	30,753	33,008
	Municipal	31,099	65,413	109,496	163,766	221,873	290,966
	Steam-electric	72,721	72,816	72,912	73,008	73,104	73,200
G total		**210,807**	**255,172**	**291,121**	**344,558**	**404,289**	**477,750**
H	Irrigation	84,455	84,455	84,455	84,455	84,455	84,538
	Livestock	1,259	1,642	1,898	1,898	1,898	1,906
	Manufacturing	32,615	63,357	64,445	65,239	64,442	63,506
	Mining	3,293	4,193	4,004	4,024	4,228	4,565
	Municipal	18,532	246,828	418,544	506,533	609,134	723,653
	Steam-electric	4,968	4,968	4,968	4,968	4,968	4,968
H total		**145,122**	**405,443**	**578,314**	**667,117**	**769,125**	**883,136**
I	Irrigation	526	526	526	526	556	576
	Livestock	23,708	26,613	30,128	34,381	39,483	40,666
	Manufacturing	102,587	145,222	145,206	145,188	145,171	145,155
	Mining	8,413	5,281	903	468	308	207
	Municipal	501	877	2,551	5,832	10,120	15,540
	Steam-electric	3,494	3,494	3,494	3,494	3,494	3,494
I total		**139,229**	**182,013**	**182,808**	**189,889**	**199,132**	**205,638**
J	Irrigation	75	75	75	75	75	75
	Livestock	357	357	357	357	357	357
	Mining	221	281	294	259	229	210
	Municipal	5,082	5,735	6,366	7,016	7,641	8,607
J total		**5,735**	**6,448**	**7,092**	**7,707**	**8,302**	**9,249**
K	Irrigation	254,364	239,922	225,869	212,193	198,886	185,938
	Manufacturing	0	40	40	40	40	40
	Mining	2,677	6,937	8,264	7,708	5,472	6,860
	Municipal	4,927	13,378	34,037	50,170	72,550	105,401
	Steam-electric	20,546	20,546	20,546	20,546	20,546	20,546
K total		**282,514**	**280,823**	**288,756**	**290,657**	**297,494**	**318,785**
L	Irrigation	131,184	131,915	134,104	136,099	137,596	140,812
	Manufacturing	10,427	12,940	13,041	13,073	13,073	13,073
	Mining	15,921	16,809	15,105	12,334	10,454	9,180
	Municipal	24,468	48,817	83,667	121,804	167,216	216,255
	Steam-electric	21,707	21,707	21,707	21,707	21,707	21,707
L total		**203,707**	**232,188**	**267,624**	**305,017**	**350,046**	**401,027**
M	Irrigation	888,896	843,532	798,075	753,082	707,399	662,060
	Manufacturing	632	851	851	851	851	851
	Mining	6,662	6,007	4,834	4,386	4,566	5,318
	Municipal	35,487	69,080	117,113	174,131	235,515	296,472
	Steam-electric	5,217	5,028	4,928	4,928	4,928	4,928
M total		**936,894**	**924,498**	**925,801**	**937,378**	**953,259**	**969,629**

Table C-1. Annual water needs by region and water use category (acre-feet) – continued

Region	Water use category	2020	2030	2040	2050	2060	2070
N	Irrigation	1,283	1,474	1,474	1,474	1,474	1,474
	Manufacturing	1,479	16,617	21,509	25,741	30,222	34,441
	Mining	2,203	2,430	2,327	2,185	2,158	2,216
	Municipal	10,235	10,571	10,769	10,931	11,107	11,233
N total		**15,200**	**31,092**	**36,079**	**40,331**	**44,961**	**49,364**
O	Irrigation	705,992	1,440,091	1,450,917	1,446,461	1,445,719	1,445,026
	Livestock	112	122	844	2,041	3,689	5,442
	Manufacturing	5,454	6,482	6,482	6,482	6,482	6,482
	Mining	10,118	10,503	9,517	8,145	6,908	6,016
	Municipal	4,345	9,345	15,418	21,861	30,062	36,931
O total		**726,021**	**1,466,543**	**1,483,178**	**1,484,990**	**1,492,860**	**1,499,897**
P	Irrigation	8,067	8,067	8,067	8,067	8,067	8,067
P total		**8,067**	**8,067**	**8,067**	**8,067**	**8,067**	**8,067**
Texas	Irrigation	2,395,767	3,318,834	3,279,822	3,187,547	3,093,710	3,045,991
	Livestock	40,465	43,781	48,270	53,649	60,432	63,400
	Manufacturing	159,493	264,405	275,172	286,064	294,768	301,260
	Mining	118,615	123,125	110,864	102,283	96,486	101,384
	Municipal	214,623	802,045	1,371,211	1,911,573	2,502,456	3,144,304
	Steam-electric	187,298	192,235	196,121	199,016	201,048	202,961
Texas total		**3,116,261**	**4,744,425**	**5,281,460**	**5,740,132**	**6,248,900**	**6,859,300**

Appendix D Socioeconomic impact regional summary and dashboards

The TWDB assists the regional water planning groups in evaluating the social and economic impacts of not meeting identified water needs for a single year drought of record. The TWDB calculated all estimates using a variety of data sources and tools, including the use of a region-specific Impact for Planning Analysis model. This appendix presents regional summaries of socioeconomic impact reports for all regions.

The regional water plan impact estimates presented in Table D-1 and the online dashboards vary from the results included in Chapter 6. This is primarily due to a difference in the quantity of water needs used to estimate the impacts.

The results presented here and included in the regional water plans and online dashboards were from the analysis conducted in September 2019 to allow for public comment in the draft regional plans. The final regional water plans included updated water need estimates, and the statewide impact estimates included in Chapter 6 were performed based upon the final needs data in November 2020.

Full socioeconomic impact reports for all 16 planning regions are available on the TWDB website, www.twdb.texas.gov/waterplanning/data/analysis/index.asp.

Table D-1. Socioeconomic impact regional summary *–* *continued on next page*

Region	Impact measures	2020	2030	2040	2050	2060	2070
A	Income losses (millions)*	$80	$432	$867	$2,262	$3,225	$3,511
A	Job losses	770	4,380	9,535	23,417	33,968	37,964
A	Tax losses on production and imports (millions)*	$4	$23	$58	$171	$249	$272
A	Population losses	141	804	1,751	4,299	6,236	6,970
B	Income losses (millions)*	$1,423	$505	$460	$320	$284	$339
B	Job losses	5,249	1,703	1,460	863	699	1,316
B	Tax losses on production and imports (millions)*	$164	$51	$43	$23	$16	$19
B	Population losses	964	313	268	158	128	242
C	Income losses (millions)*	$3,505	$8,361	$16,791	$27,127	$37,499	$48,071
C	Job losses	20,437	73,315	158,102	260,573	366,762	472,979
C	Tax losses on production and imports (millions)*	$279	$582	$1,123	$1,777	$2,461	$3,221
C	Population losses	3,752	13,461	29,027	47,841	67,338	86,839
D	Income losses (millions)*	$5,868	$7,000	$6,602	$6,211	$6,068	$6,148
D	Job losses	46,069	57,405	55,266	54,160	56,434	59,710
D	Tax losses on production and imports (millions)*	$445	$548	$500	$454	$440	$450
D	Population losses	8,458	10,540	10,147	9,944	10,361	10,963
E	Income losses (millions)*	$883	$1,143	$1,287	$1,386	$1,538	$1,753
E	Job losses	3,635	5,443	6,606	7,592	9,422	11,989
E	Tax losses on production and imports (millions)*	$58	$80	$93	$103	$118	$139
E	Population losses	667	999	1,213	1,394	1,730	2,201

** Year 2018 dollars, rounded.*

Table D-1. Socioeconomic impact regional summary – *continued on next page*

Region	Impact measures	2020	2030	2040	2050	2060	2070
F	Income losses (millions)*	$19,624	$19,720	$17,058	$13,443	$7,750	$6,356
F	Job losses	98,208	100,186	88,685	71,444	43,995	38,833
F	Tax losses on production and imports (millions)*	$2,644	$2,647	$2,266	$1,749	$937	$725
F	Population losses	18,031	18,394	16,283	13,117	8,078	7,130
G	Income losses (millions)*	$13,299	$15,465	$13,353	$12,695	$12,154	$12,080
G	Job losses	65,131	86,060	80,693	86,373	91,113	98,141
G	Tax losses on production and imports (millions)*	$967	$1,152	$932	$836	$749	$712
G	Population losses	11,958	15,801	14,815	15,858	16,728	18,019
H	Income losses (millions)*	$4,600	$8,521	$10,313	$11,301	$12,437	$13,784
H	Job losses	28,805	66,183	95,862	110,604	127,869	148,164
H	Tax losses on production and imports (millions)*	$507	$815	$944	$1,021	$1,115	$1,226
H	Population losses	5,289	12,151	17,600	20,307	23,477	27,203
I	Income losses (millions)*	$9,314	$6,786	$3,515	$3,651	$3,892	$3,920
I	Job losses	68,468	57,221	42,058	45,480	50,164	51,585
I	Tax losses on production and imports (millions)*	$1,061	$704	$248	$242	$243	$239
I	Population losses	12,571	10,506	7,722	8,350	9,210	9,471
J	Income losses (millions)*	$233	$298	$316	$289	$268	$257
J	Job losses	2,272	2,597	2,780	2,850	2,935	3,064
J	Tax losses on production and imports (millions)*	$26	$33	$35	$32	$29	$28
J	Population losses	417	477	510	523	539	563
K	Income losses (millions)*	$1,282	$1,363	$1,702	$1,986	$2,168	$2,609
K	Job losses	5,018	6,859	12,154	16,898	21,398	27,413
K	Tax losses on production and imports (millions)*	$73	$49	$67	$93	$117	$151
K	Population losses	921	1,259	2,231	3,102	3,929	5,033
L	Income losses (millions)*	$16,571	$17,246	$14,600	$11,679	$9,674	$9,384
L	Job losses	100,514	107,453	96,710	86,976	85,393	94,978
L	Tax losses on production and imports (millions)*	$1,775	$1,794	$1,433	$1,032	$740	$663
L	Population losses	18,454	19,728	17,756	15,969	15,678	17,438
M	Income losses (millions)*	$8,004	$7,273	$6,468	$6,523	$6,581	$7,355
M	Job losses	56,165	61,242	66,154	76,308	87,917	104,162
M	Tax losses on production and imports (millions)*	$771	$650	$538	$531	$522	$600
M	Population losses	10,312	11,244	12,146	14,010	16,142	19,124
N	Income losses (millions)*	$732	$1,930	$3,178	$4,662	$5,998	$6,914
N	Job losses	5,955	13,686	22,208	32,324	41,429	47,613
N	Tax losses on production and imports (millions)*	$80	$170	$259	$366	$462	$529
N	Population losses	1,093	2,513	4,077	5,935	7,606	8,742
O	Income losses (millions)*	$12,745	$15,091	$14,621	$14,075	$13,806	$13,596

** Year 2018 dollars, rounded.*

Table D-1. Socioeconomic impact regional summary – continued

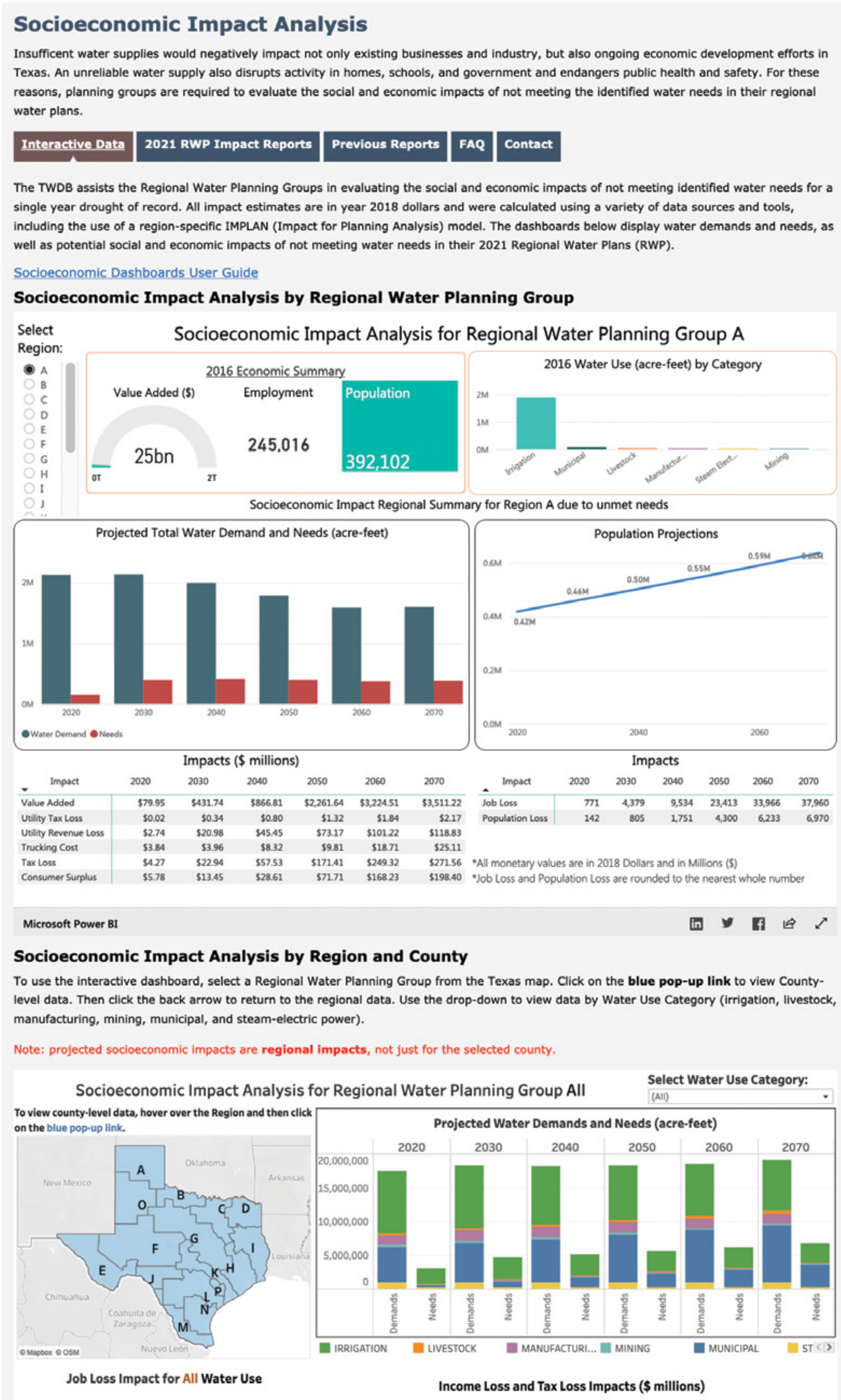
Region	Impact measures	2020	2030	2040	2050	2060	2070
O	Job losses	91,473	112,867	112,166	112,158	114,484	115,546
O	Tax losses on production and imports (millions)*	$1,076	$1,221	$1,171	$1,109	$1,076	$1,051
O	Population losses	16,794	20,722	20,594	20,592	21,019	21,214
P	Income losses (millions)*	$2	$2	$2	$2	$2	$1
P	Job losses	39	37	35	33	32	30
P	Tax losses on production and imports (millions)*	$0	$0	$0	$0	$0	$0
P	Population losses	7	7	6	6	6	5

** Year 2018 dollars, rounded.*

Interactive dashboards

The detailed socioeconomic impact data behind the summaries included in Chapter 6 are provided at the region and county level and can be explored via the TWDB's new, interactive dashboards (Figure D-1) at www.twdb.texas.gov/waterplanning/data/analysis/index.asp. The dashboards display water demands and needs, as well as potential social and economic impacts of not meeting water needs in the 2021 regional water plans.

Figure D-1. Interactive dashboards



Socioeconomic Impact Analysis

Insuffcent water supplies would negatively impact not only existing businesses and industry, but also ongoing economic development efforts in Texas. An unreliable water supply also disrupts activity in homes, schools, and government and endangers public health and safety. For these reasons, planning groups are required to evaluate the social and economic impacts of not meeting the identified water needs in their regional water plans.

Interactive Data | 2021 RWP Impact Reports | Previous Reports | FAQ | Contact

The TWDB assists the Regional Water Planning Groups in evaluating the social and economic impacts of not meeting identified water needs for a single year drought of record. All impact estimates are in year 2018 dollars and were calculated using a variety of data sources and tools, including the use of a region-specific IMPLAN (Impact for Planning Analysis) model. The dashboards below display water demands and needs, as well as potential social and economic impacts of not meeting water needs in their 2021 Regional Water Plans (RWP).

Socioeconomic Dashboards User Guide

Socioeconomic Impact Analysis by Regional Water Planning Group

Impacts ($ millions)

Impact	2020	2030	2040	2050	2060	2070
Value Added	$79.95	$431.74	$866.81	$2,261.64	$3,224.51	$3,511.22
Utility Tax Loss	$0.02	$0.34	$0.80	$1.32	$1.84	$2.17
Utility Revenue Loss	$2.74	$20.98	$45.45	$73.17	$101.22	$118.83
Trucking Cost	$3.84	$3.96	$8.32	$9.81	$18.71	$25.11
Tax Loss	$4.27	$22.94	$57.53	$171.41	$249.32	$271.56
Consumer Surplus	$5.78	$13.45	$28.61	$71.71	$168.23	$198.40

Impacts

Impact	2020	2030	2040	2050	2060	2070
Job Loss	771	4,379	9,534	23,413	33,966	37,960
Population Loss	142	805	1,751	4,300	6,233	6,970

*All monetary values are in 2018 Dollars and in Millions ($)
*Job Loss and Population Loss are rounded to the nearest whole number

Microsoft Power BI

Socioeconomic Impact Analysis by Region and County

To use the interactive dashboard, select a Regional Water Planning Group from the Texas map. Click on the **blue pop-up link** to view County-level data. Then click the back arrow to return to the regional data. Use the drop-down to view data by Water Use Category (irrigation, livestock, manufacturing, mining, municipal, and steam-electric power).

Note: projected socioeconomic impacts are **regional impacts**, not just for the selected county.