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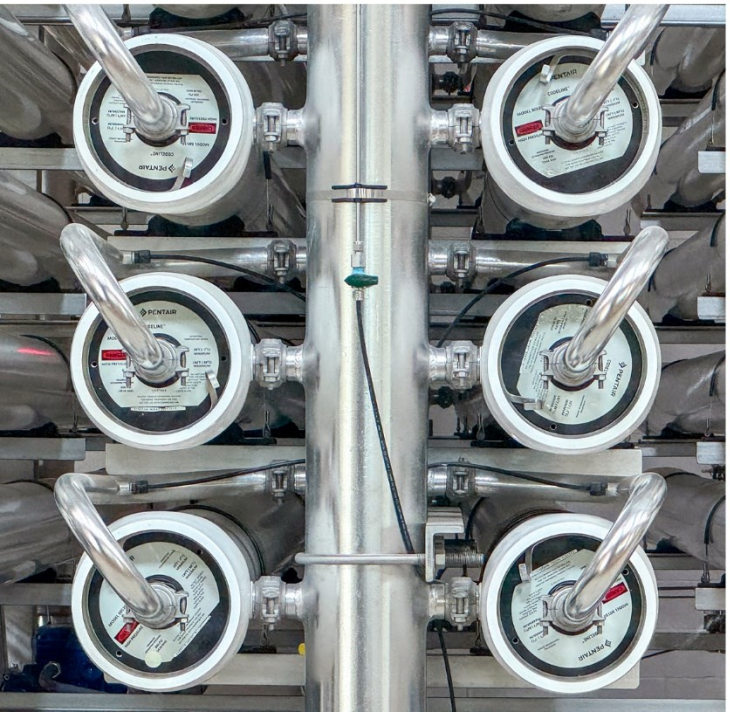
WATER FOR TEXAS

State Water Plan

2027



2027 State Water Plan

Water
— *for* —
Texas

Texas Water Development Board Members
L'Oreal Stepney, Chairwoman
W. Brady Franks, Member
Ashley Morgan, Member

Texas Water Development Board
www.twdb.texas.gov

2027 State Water Plan
www.twdb.texas.gov/waterplanning/swp/2027

Interactive State Water Plan
2027.texasstatewaterplan.org

IMPORTANT READER NOTE REGARDING THIS DOCUMENT

The 2027 State Water Plan was developed using a two-phased approach to meet the 2026 State Water Implementation Fund for Texas (SWIFT) commitment deadline, while also preserving additional time and resources to produce a more robust final plan by the statutory deadline of January 5, 2027. The initial 2027 State Water Plan document, adopted in July 2026, provided a streamlined set of core elements required by statute and administrative rule.

This document represents the enhanced version of the 2027 State Water Plan, which will serve as the first amendment to the plan. It provides more expansive and informative content and is intended to replace the Phase 1 document in its entirety.

This draft is being made available for public comment before the Board considers its adoption at a regularly noticed Texas Water Development Board meeting tentatively scheduled to be held in December 2026.

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To all who call Texas home:

Alongside my fellow Board members Brady Franks and Ashley Morgan, and the dedicated staff of the Texas Water Development Board (TWDB), I am honored to present the 2027 State Water Plan. The TWDB understands the importance and responsibility of publishing the state water plan every five years to help ensure sufficient water supplies during drought-of-record conditions, recognizing that water is essential to communities, households, agriculture, businesses, and many other uses.

Fulfilling this obligation requires a disciplined approach grounded in the best available science, data, and analysis, as well as a commitment to produce demand projections that support a credible plan. Adoption of this plan marks the sixth state water plan developed using our unique and widely recognized regional water planning process.

More than 52 million people are expected to live in Texas by 2080. As our state continues to grow, our water planning approach must remain dynamic. Fortunately, Texas designed its water planning process to allow flexibility so the TWDB and regional water planning groups can respond to Texas communities as their needs evolve.

The 2027 State Water Plan was developed in two phases. Phase I was completed on an accelerated timeline to support 2026 financial assistance commitments for the State Water Implementation Fund for Texas (SWIFT)—which has committed more than $17 billion in financial assistance and generated over 2 million acre-feet of new water supplies since the program began in 2015. Phase II incorporates additional and more robust analysis, in line with previous plans, that decision-makers rely upon at the local, regional, and state levels.

Developing the state water plan is truly a collaborative effort that is only possible through the support of our sister agencies, regional water planning group sponsors and staff, technical consultants, water providers, water districts, and professionals representing diverse interest groups. I am especially grateful to the more than 500 regional water planning group members who volunteered their time and expertise throughout the process to help ensure water is available for Texans in the years to come.

I extend my sincere appreciation to the many Texans who offered their time and energy to participate in our bottom-up planning process. Their collective effort and engagement contributed to thousands of recommended strategies and projects that will serve as a roadmap for how Texas will effectively navigate future droughts and water challenges.

Through the vision and leadership of the Texas Legislature, the dedication of our partners, and the support of the people of Texas, together we can ensure a secure water future for Texas.

L'Oreal Stepney, Chairwoman

Acknowledgments

The 2027 State Water Plan would not have been possible without the time, dedication, guidance, and expertise of numerous contributors and organizations throughout Texas. The Texas Water Development Board (TWDB) would like to extend its sincere gratitude and appreciation to everyone who participated in developing the 16 regional water plans and this state water plan: the more than 500 regional water planning group voting members (listed below), their consultants, and their administrative agents (also listed below); staff of the TWDB, Texas Parks and Wildlife Department, Texas Department of Agriculture, Texas Commission on Environmental Quality, Texas State Soil and Water Conservation Board, and other state and federal agencies; and individuals and organizations that provided public input throughout the planning process.

The TWDB would also like to thank the leadership of the State of Texas for their continued support of the state's water planning process.

Regional water planning group voting members

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A - Clark, Nolan
A - Coleman, P.E., Jason
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Administrative agents (Sponsors)

A – Panhandle Regional Planning Commission
B – Red River Authority of Texas
C – Trinity River Authority
D – Riverbend Water Resources District
E – Rio Grande Council of Governments
F – Colorado River Municipal Water District
G – Brazos River Authority
H – San Jacinto River Authority
I – City of Nacogdoches
J – Upper Guadalupe River Authority
K – Lower Colorado River Authority
L – San Antonio River Authority
M – Lower Rio Grande Valley Development Council
N – Nueces River Authority
O – South Plains Association of Governments
P – Lavaca-Navidad River Authority

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Executive summary

Quick facts

Planning framework and assumptions

Texas' state water plans are based on future conditions in the event of a recurrence of the worst recorded drought—known as the "drought of record"—a time when water supplies are generally lowest and water demands are highest.

The state water plans do not include strategies, projects, or costs for replacing[1], rehabilitating, or maintaining existing water supply infrastructure. All future supplies recommended in these plans are additional water supply volumes beyond what is currently legally and physically connected to water users.

Cost estimates are planning level estimates developed using a standardized methodology to ensure consistent treatment of key cost components across regions and project types. They provide a comparable statewide basis for evaluating strategies but are not equivalent to project-specific engineering estimates.

Actual project costs may vary—potentially significantly—based on factors such as project design, site-specific conditions, permitting requirements, market conditions, procurement approach, and timing of implementation. Accordingly, these estimates should be interpreted as order of magnitude planning values, not precise forecasts.

The Texas Water Development Board (TWDB) has no regulatory authority related to the issuance of permits or groundwater management decisions or enforcement of drought contingency plans. The TWDB does not allocate or regulate water resources or supplies, nor is it involved in utility water supply contract decisions with their customers. The TWDB does not provide wholesale or retail water service, nor does it operate water supply infrastructure. The Board provides financial assistance for infrastructure development, collects water-related data, and administers the state's water supply planning process.

Population, water demands, water supplies, and potential shortages

Texas' population is anticipated to increase 53 percent between 2030 and 2080—from 34.2 million to 52.3 million—with more than 80 percent of this growth occurring within Regions C, G, H and L.

Total water demands for all use categories, including municipal, are projected to increase less significantly—by approximately 6 percent between 2030 and 2080, from nearly 17.4 million to nearly 18.4 million acre-feet per year. This slower rate of growth for total demands, as compared to population growth, is influenced by declining irrigation demand projections over the planning horizon.

Heightened interest in potential water use associated with data centers arose later in this five-year planning cycle. In response, the TWDB is enhancing its data collection and analysis efforts to improve our projections of digital infrastructure facility water demands for future state water planning cycles. As this sector and our understanding of it grows, this water use category will report and fall more comprehensively within our manufacturing water use projections largely because of direct use reporting by the facilities themselves rather than a utility from which they may purchase water.

Texas' existing water supplies—those that can already be relied on in the event of drought—are projected to decline by approximately 10 percent between 2030 and 2080. This comprises a decline from 15.5 million to nearly 14 million acre-feet per year primarily due to aquifer depletion, with comparatively smaller losses in reservoir yield due to sedimentation.

Absent the development of new water supplies or implementation of water management strategies, such as conservation, Texas water users could face water shortages of approximately 3.6 million acre-feet per year by 2030, growing to 5.8 million acre-feet per year by 2080, if drought conditions comparable to the drought of record recur. For scale, Toledo Bend Reservoir, the largest reservoir in Texas, has a maximum storage capacity of

[1] With the exception of water loss mitigation projects that include replacement of portions of an existing leaking water transmission or distribution network and result in an immediate, quantifiable increase in water supply.

about 4.5 million acre-feet, meaning projected annual shortages could exceed the full capacity of the state's largest reservoir.

Municipal shortages, which account for 20 percent of statewide needs in 2030, are projected to represent 57 percent of statewide needs by 2080 under drought-of-record conditions.

Strategies and projects, unmet needs, and impacts of not meeting needs

Approximately 6,700 water management strategies recommended in this plan would provide 2.7 million acre-feet per year in additional water supplies to water user groups by 2030 and almost 7.6 million acre-feet per year by 2080.

Conservation strategies represent approximately 30 percent, or 2.2 million acre-feet per year, of recommended strategy volumes in 2080 and were recommended for over half of the water user groups in the plan.

The estimated capital cost to design, construct, and implement the more than 3,000 recommended projects by 2080 is $174 billion in 2023 dollars, without accounting for future inflation—more than double the cost of the 2022 State Water Plan.

If strategies are not implemented over the next 50 years, approximately one out of four Texans in 2080 would have less than half the municipal water supplies required during a drought of record.

If Texas does not implement the water supply strategies and projects in the state water plan, an intense drought could cause an estimated $91 billion in annual economic damages in 2030, increasing to $177 billion per year by 2080.

Funding and implementation

As of July 2026, the State Water Implementation Fund for Texas (SWIFT) program, created specifically to fund state water plan projects, has committed nearly $16.9 billion since its inaugural cycle in 2015.

Through the SWIFT program and other financial assistance programs, the TWDB has delivered to project sponsors more than $6.4 billion toward the implementation of 68 projects recommended in the 2022 State Water Plan. These projects represent approximately 1.6 million acre-feet of water supplied, conserved, or maintained. [2]

Based on the relative severity of potential shortages, a greater share of Texans appear better positioned to withstand drought-of-record conditions in the near-term decades compared to the 2022 State Water Plan. However, a substantial share of the state's population could still experience severe shortages exceeding 25 percent or more of demand, demonstrating that drought vulnerability remains a significant concern especially if recommended water management strategies are not implemented.

Why do we plan?

Planning is necessary for the responsible management and development of Texas' water resources to support its robust economy, agricultural and natural resources, and rapidly growing population. By 2080, 52.3 million people are expected to live in the state, and they all require water to live and work.

The goal of the state's water planning process is to ensure adequate water supplies for all Texans in times of drought. Texas has a long history of droughts, and recent droughts remind us that severe drought conditions are likely to continue occurring in the future. The state relies on the 1950s drought as the *statewide* drought of record, but this benchmark changes at regional levels based on more recent basin-specific droughts of record where local hydrologic conditions have exceeded the severity of the

[2] The above supplies are planned supply volumes. Supplies may change for various reasons once a project is complete.

1950s event. Together, these historic droughts form the fundamental basis for statewide water planning, under the principle that preparing for a repeat of the most intense drought conditions that have already been recorded will improve the state's resilience to future events.

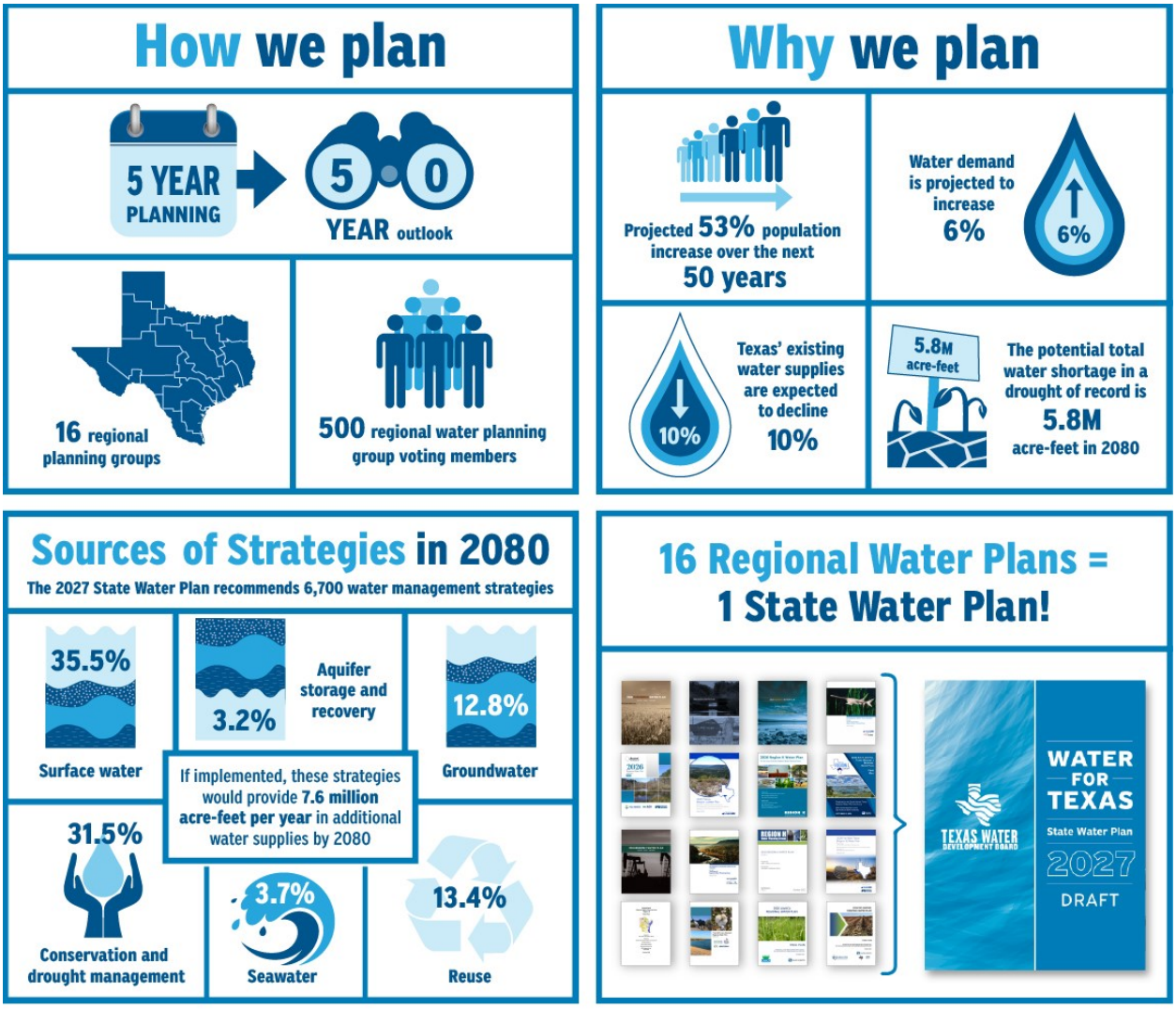
Because the state water plan is designed to meet demands under benchmark drought conditions—when water demands are usually highest and supplies are lowest—it also generally supports water demands under average or wetter hydrologic conditions. Many identified water needs are not solely attributable to the onset of drought and would persist even under average hydrologic conditions. Municipal water needs due to population growth, for example, will exceed available existing supplies in many locations regardless of drought conditions unless additional water supplies are developed. Irrigated agriculture, in particular, requires significant water supplies, and sizable portions of those irrigation demands will likely be unmet outside of drought periods, largely due to the depletion of aquifers.

Ensuring adequate and affordable water supplies for all Texans to withstand future droughts requires advance planning and water supply project implementation *prior to the onset of drought*. The TWDB is the state's lead water planning and infrastructure financing agency and is statutorily responsible for administering the regional water planning process and preparing and adopting the state water plan every five years. As illustrated in Figure ES-1, each new state water plan considers a 50-year horizon and reflects

- changes in population,
- changes to existing water supplies,
- shifts in the desired mix of viable water supply strategy types being pursued,
- impacts of the state's economy, and
- shifts in both state and local water resources policies.

The Texas Legislature has long recognized that water is critical to the future of Texas and, in 1997, created a strong state and regional framework for responsibly planning to address both the short- and long-term water needs of the state. However, implementing projects remains challenging—particularly as project costs increase, uncertainty regarding future drought severity persists, and many of the least expensive water supply options have already been developed.

Figure ES-1. 2027 State Water Plan overview



How do we plan?

Since 1997, water planning in Texas has been based on local involvement at the regional level, but with interregional cooperation. For administrative planning purposes only, the state is divided into 16 regional water planning areas (Figure ES-2). Each planning area is represented by a planning group that, on average, consists of approximately 22 members representing at least 12 statutorily required interests: the public, counties, municipalities, industries, agriculture, environment, small businesses, electric-generating utilities, river authorities, water districts, water utilities, and groundwater management areas (where applicable).

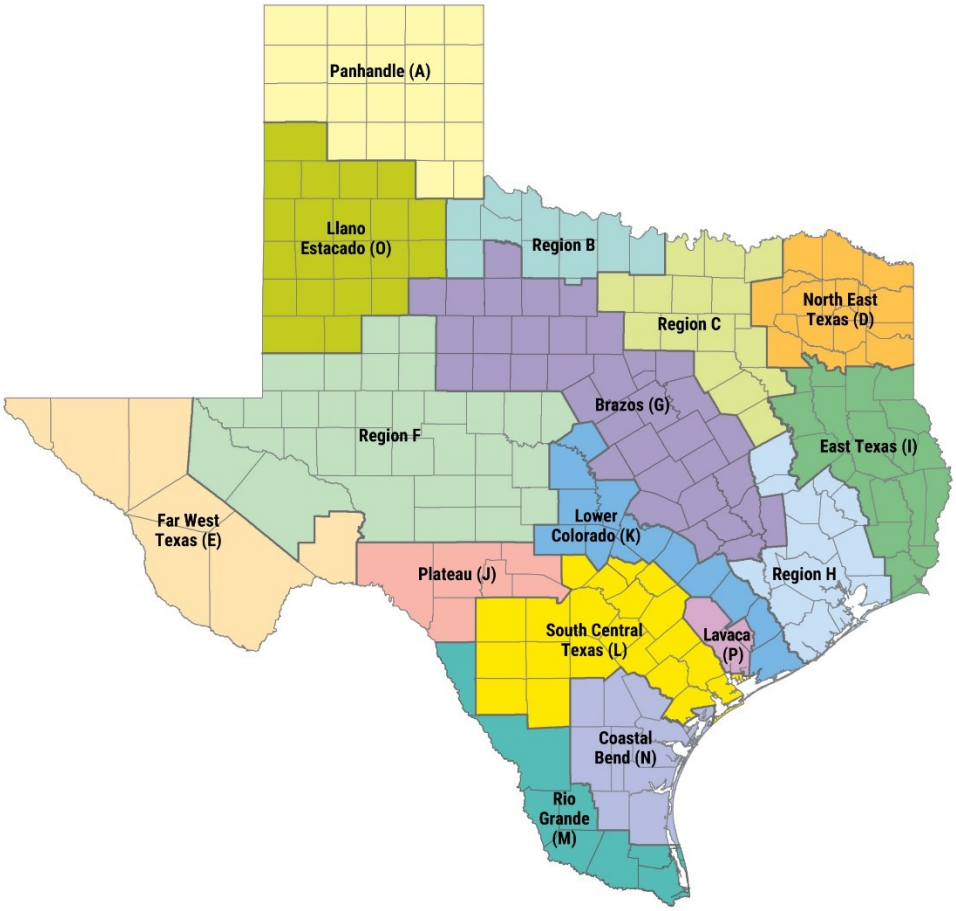
During each five-year planning cycle, regional water planning groups evaluate population projections, water demand projections, and existing water supplies for individual water user groups in six water use categories: municipal, irrigation, livestock, manufacturing, mining, and steam-electric power. Planning groups then identify potential water shortages (water needs) that individual water user groups would face if drought-of-record conditions reoccurred. The planning groups then recommend water management strategies and projects (with associated cost estimates) to address those potential shortages.

This bottom-up approach allows the planning groups to assess specific risks and uncertainties within their regions and evaluate water management strategies most appropriate to address those risks. Importantly, Texas' planning framework relies directly on the entities—regional water providers, cities, or water utilities—that are responsible for developing and delivering those future water supplies.

Once the planning groups adopt their regional water plans, the plans are sent to the TWDB for review and approval. The TWDB prepares the state water plan based on the regional water plans and serves as a guide for state water policy, including TWDB legislative recommendations. Each step of the water planning process is open to the public and provides numerous opportunities for public input.

The TWDB does not have statutory authority to add or remove projects from the regional or state water plans if the associated water planning statute, rules, and technical guidance requirements have been met. In addition, the TWDB has no regulatory authority related to the issuance of permits or groundwater management decisions or enforcement of drought contingency plans. The TWDB does not allocate or regulate water resources or supplies, nor is it involved in utility water supply contract decisions with their customers. The TWDB does not provide wholesale or retail water service, nor does it operate water supply infrastructure. The Board provides financial assistance for infrastructure development, collects water-related data, and administers the state's water supply planning process.

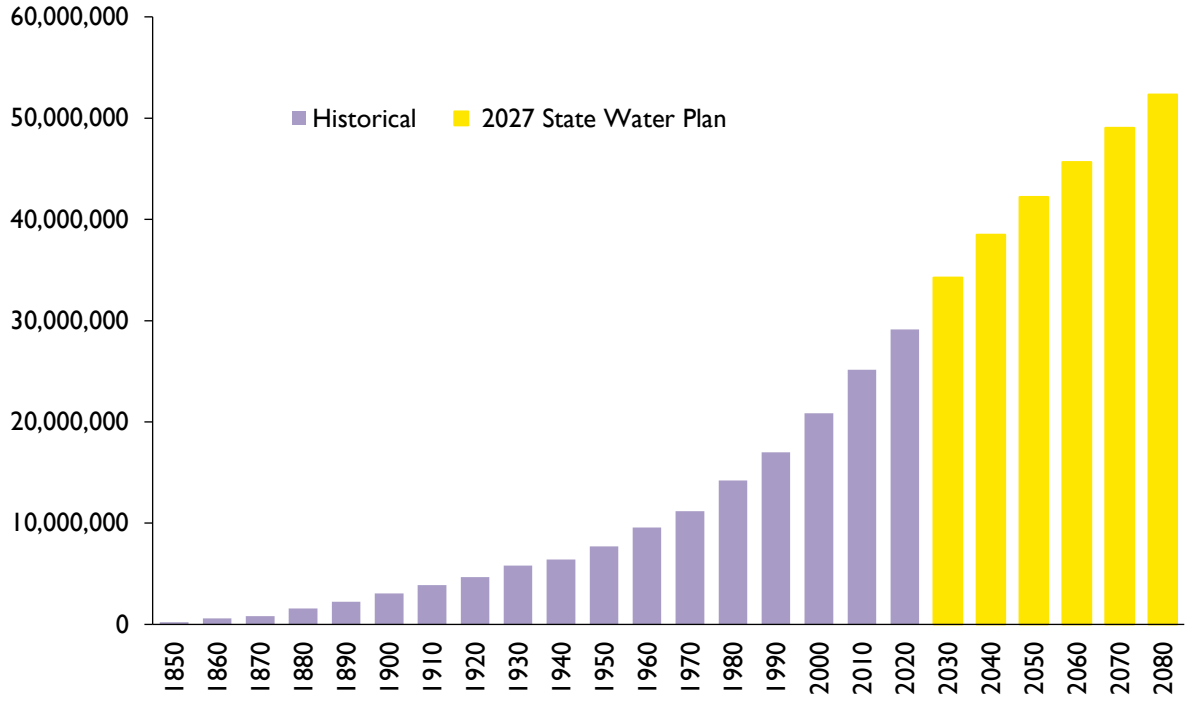
Figure ES-2. Regional water planning areas



How many Texans will there be?

The population in Texas is projected to increase 53 percent between 2030 and 2080, from approximately 34.2 million to 52.3 million people (Figure ES-3). The distribution of this net growth varies across the state. For example, 19 counties are projected to at least double their population by 2080, while the others are expected to experience modest growth, remain the same, or decline. Approximately half of the statewide population growth between 2030 and 2080 is projected to occur within Regions C (which includes the Dallas-Fort Worth metropolitan area) and H (which includes the Houston metropolitan area).

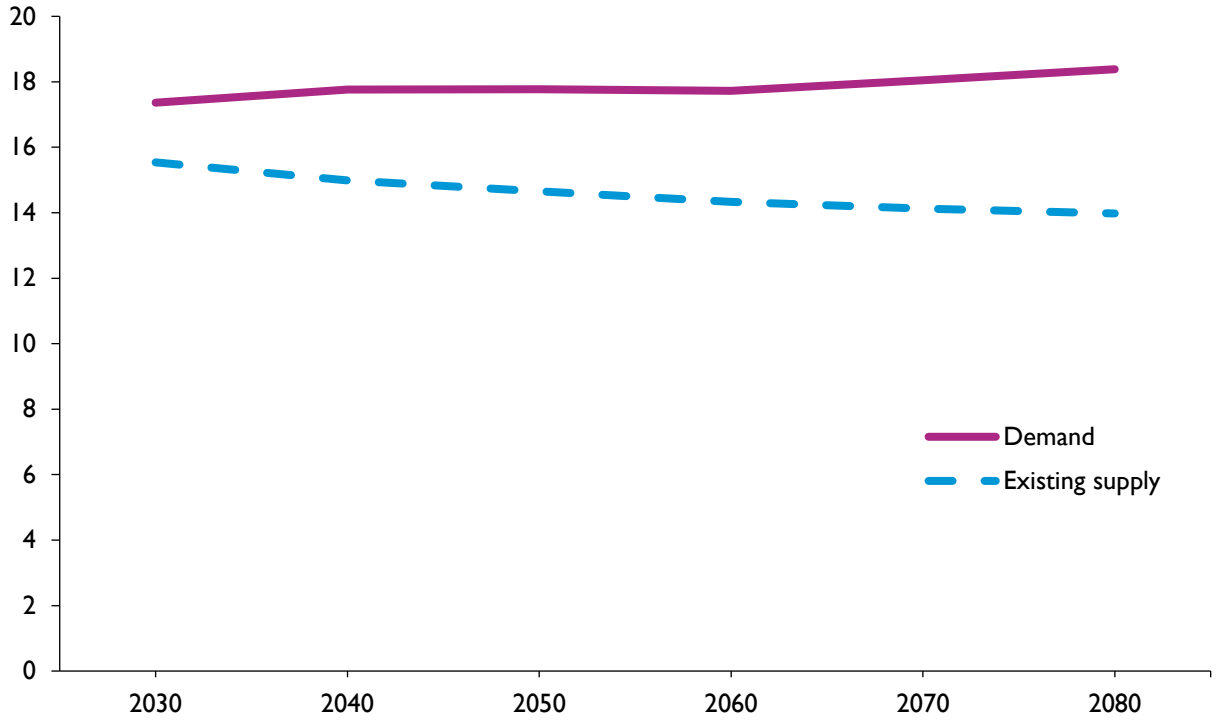
Figure ES-3. Historical and projected population growth in Texas (1850–2080)



How much water will we require?

While population is projected to increase 53 percent over the next 50 years, total water demand for all sectors in Texas, including municipal, is projected to increase by only 6 percent—from about 17.4 million acre-feet per year in 2030 to about 18.4 million in 2080 (Figure ES-4). Municipal demand is projected to increase in greater proportion and total volume over the next 50 years than any other water use category, from almost 6 million acre-feet per year in 2030 to 8.8 million in 2080. Agricultural irrigation demand is projected to decrease—from almost 8.4 million acre-feet per year in 2030 to about 6.2 million in 2080—due to more efficient irrigation systems, reduced groundwater availability, and the anticipated transfer of surface water rights from agricultural to municipal users. Manufacturing and livestock demands are projected to increase, while mining demand is projected to decline. In this plan, water demands for steam-electric power generation project a relatively constant profile over the next 50 years, primarily due to a combination of anticipated factors like a projected increase in wind and solar power generation and increased water efficiencies at existing facilities.

Figure ES-4. Projected total annual water demand and existing water supply for all sectors in Texas (millions of acre-feet)



How much water do we have now?

Existing water supply is connected water supply that can readily be delivered to water user groups in a drought from sources that include surface water, groundwater, reuse, and aquifer storage and recovery storage. The connected existing water supply of water user groups relies on, and is limited to, water being "available" from a source, such as an aquifer or surface water reservoir. Existing supply is projected to decline approximately 10 percent, from 15.5 million acre-feet per year in 2030 to about 14 million in 2080. For planning purposes, existing supply represents water supplies that are physically and legally available—with current permits, contracts, and existing infrastructure—to be produced and delivered immediately in the event of drought-of-record conditions.

Existing surface water supplies are projected to decrease by about 2 percent—from 7.2 million acre-feet per year in 2030 to 7.0 million in 2080—primarily due to changes in water contracts and sedimentation decreasing the storage capacity of many reservoirs.

Groundwater supplies are projected to decrease 19 percent, from 7.5 million acre-feet per year in 2030 to 6.1 million in 2080. This decline is due primarily to reduced availability from the Ogallala Aquifer based on groundwater conservation district policy decisions to manage depletion of the aquifer.

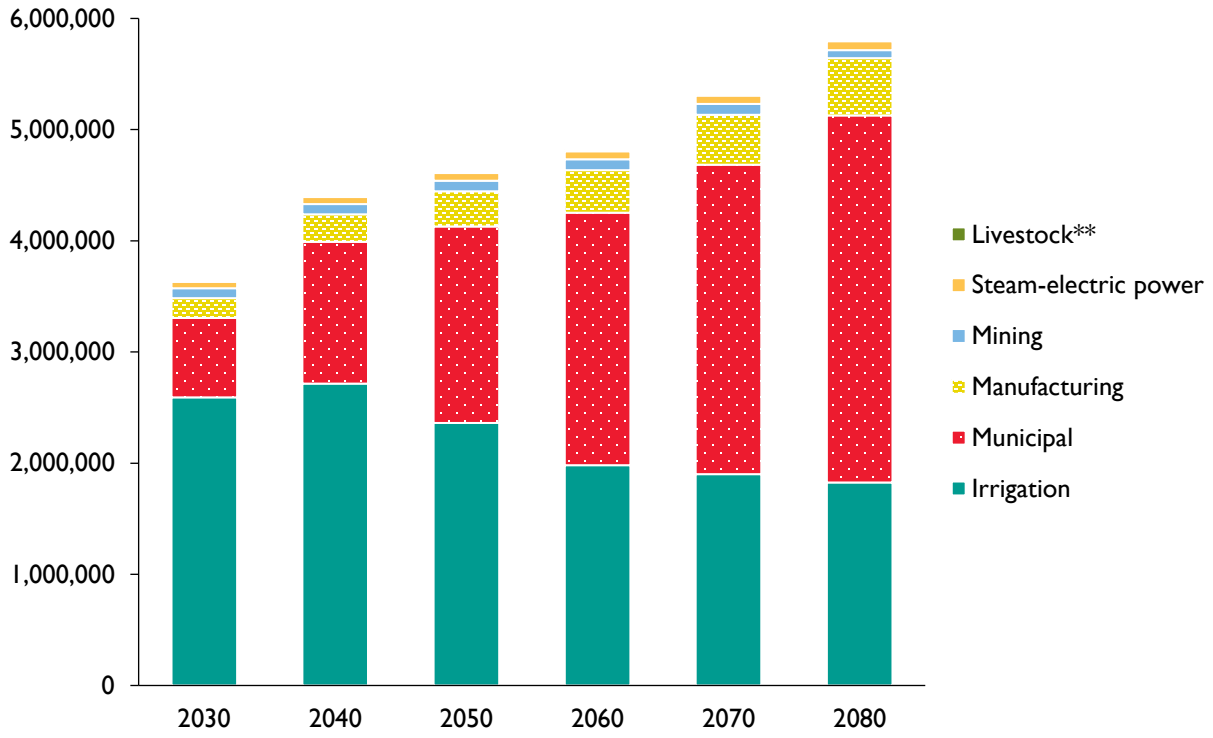
Total reported annual existing reuse supply makes up 5 percent of total supplies in 2030, with over one-third of this supply occurring in Region C. Existing reuse supplies are estimated to increase statewide by 5 percent from 2030 to 2080.

Existing aquifer storage and recovery supplies account for less than one percent of statewide total existing supply and can provide approximately 51,000 acre-feet per year during drought to water user groups located in Regions J, K, and L.

Do water user groups have enough water for the future?

Because the existing water supply is not enough to meet the future demand for water during times of drought, Texas would need 5.8 million acre-feet of *additional* water supplies, including water savings through demand reduction, to meet the current projected demand for water in 2080. If the drought of record reoccurred in 2030, the state would face an immediate need for 3.6 million acre-feet per year in additional water supplies (Figure ES-5). Of that potential water supply need, 20 percent (714,000 acre-feet) would be required for municipal water users, who face the largest water demand increase over the next 50 years. Total water needs (potential shortages) are projected to increase by 59 percent between 2030 and 2080, from 3.6 million to 5.8 million acre-feet per year. In 2080, 3.3 million acre-feet per year, or 57 percent of the total projected needs, is associated with municipal users.

Figure ES-5. Annual water needs (potential shortages) by water use category (acre-feet) *



** Water use categories are presented in the order listed in the legend.*
*** Livestock water needs account for less than one percent of needs in each decade and are at a scale not visible in the figure.*

What can we do to get more water?

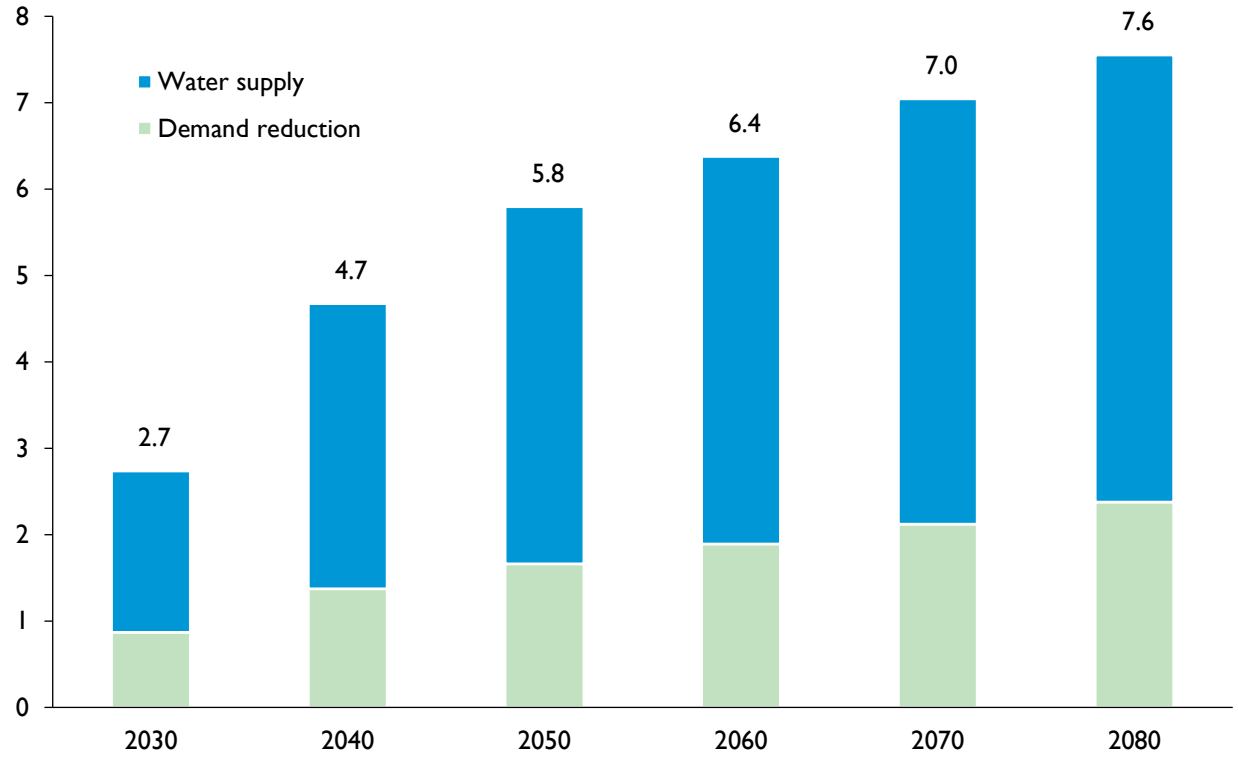
When projected demand for water exceeds existing supply, planning groups recommend water management strategies—specific efforts and associated projects—to address the gap, either by providing additional water supply or by reducing water demand. Water management strategies include reduction in water use through conservation, including water loss mitigation, or additional water supply from new reservoirs, groundwater wells, water reuse, seawater and groundwater desalination plants, and more.

In the 2027 State Water Plan, planning groups recommended approximately 6,700 water management strategies and more than 3,000 specific water management strategy projects to increase water supply. Strategies may or may not require developing new water infrastructure—referred to as water

management strategy projects. If implemented, these strategies would provide approximately 7.6 million acre-feet per year in additional water supplies to water user groups by 2080 (Figure ES-6).

The full capacity of all recommended projects and strategies that are included in the approved regional water plans is also considered to be part of the state water plan, including any associated capacities or volumes of water that may not yet be assigned to a specific water user group.

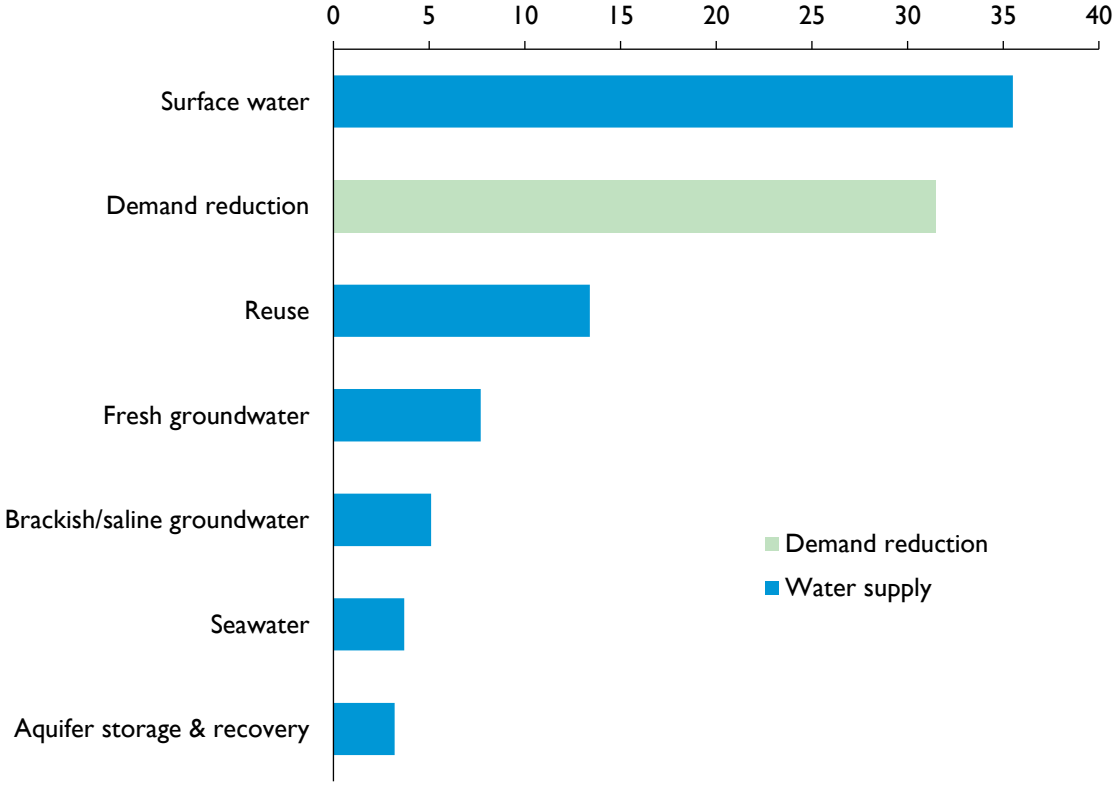
Figure ES-6. Annual volume of recommended water management strategies (millions of acre-feet)



By 2080, about 32 percent of the total volume of these strategies would be in the form of demand reduction. Demand reduction refers to measures that reduce the need for additional water, such as long-term conservation and short-term drought management measures. Drought management includes activities that temporarily restrict water use for certain types of activities and businesses.

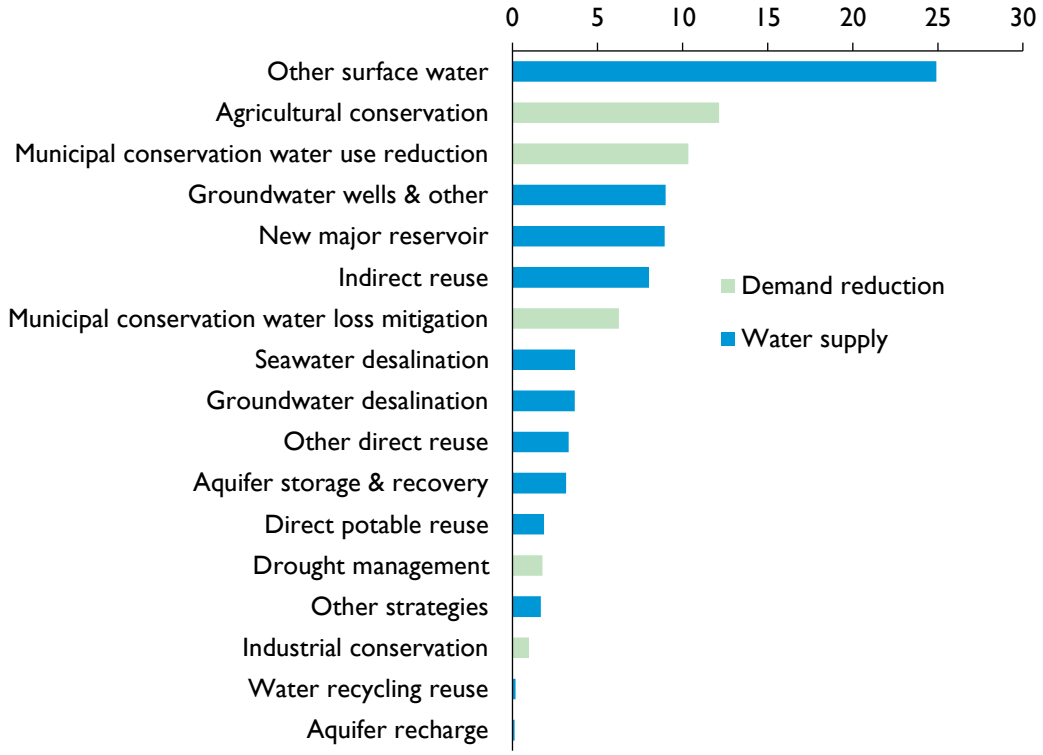
Surface water resources, including new reservoirs, comprise the largest share of recommended water management strategy supplies in 2080 at approximately 36 percent. Reuse is expected to provide about 13 percent, fresh groundwater approximately 8 percent, brackish and saline groundwater about 5 percent, seawater desalination roughly 4 percent, and aquifer storage and recovery about 3 percent of additional supplies to water user groups (Figure ES-7).

Figure ES-7. Share of recommended water management strategies by water resource in 2080 (percent)



Planning groups recommended a wide variety of water management strategies, each of which relies on a specific combination of water source(s), infrastructure, and technology (Figure ES-8). The types and range of strategies recommended by each regional planning group were influenced by geography, availability of water resources, costs, and specific water needs of each region.

Figure ES-8. Share of recommended water management strategies by strategy type in 2080 (percent)



Some planning groups recommended strategies that, if implemented, would provide more water than may be required to meet their region's water needs in a planning decade under drought-of-record conditions. This additional supply addresses risks and uncertainties that are inherent to the planning process and the operation and management of water systems, including

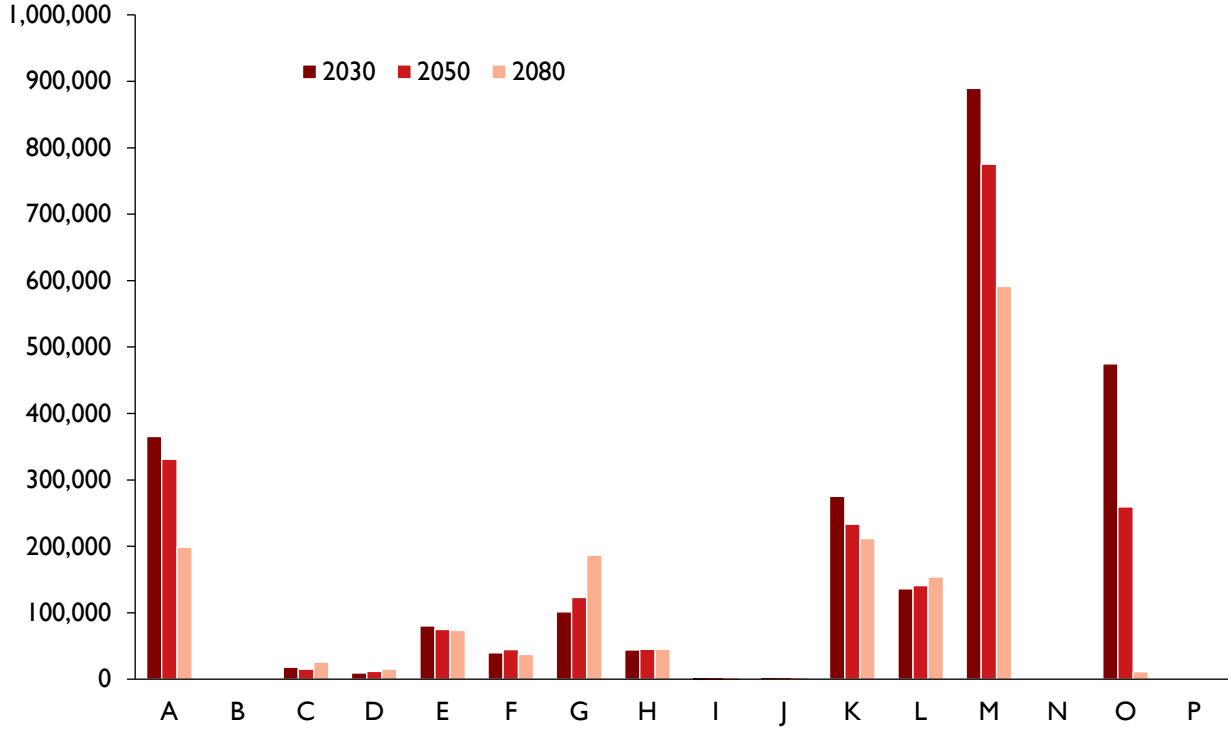
- higher population growth and/or water demands than projected;
- the occurrence of a drought worse than the drought of record;
- unanticipated reduction in existing water supplies;
- water system operation, treatment losses, and operational safety factors; and
- potential difficulties in financing and implementing water supply projects.

This supply also represents additional capacity that may be needed later as additional future demands arise over time.

Are all the water supply needs met?

Three planning groups (Regions B, N, and P) were able to recommend water management strategies that, if implemented prior to the onset of drought, could fully meet the needs of all their water user groups. The remaining 13 planning groups were unable to identify and recommend sufficient feasible strategies that could meet both Texas' regional planning requirements and all the projected needs—including associated with irrigation—within their regions (Figure ES-9).

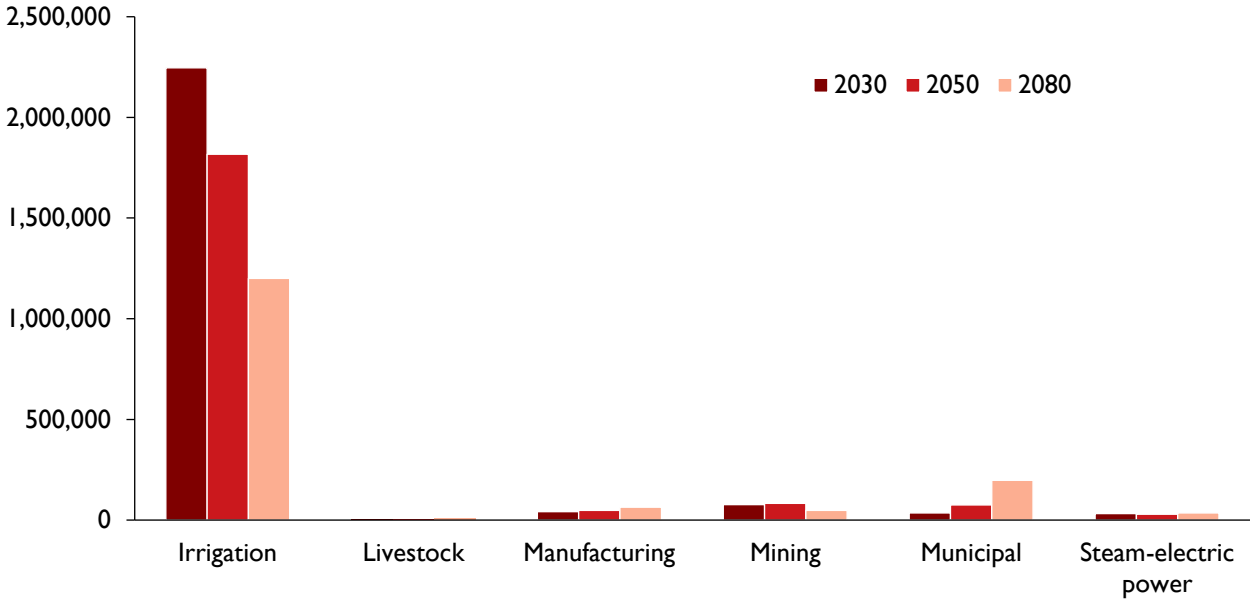
Figure ES-9. Annual unmet water supply needs by region in 2030, 2050, and 2080 (acre-feet)



** Regions B, N, and P are projected to have no unmet water supply needs if all recommended strategies are implemented. Projected unmet needs in Regions I and J remain at or below about 2,000 acre-feet per year across the planning horizon.*

Statewide, most projected water needs associated with municipal, manufacturing, livestock, and mining water user groups are met by the plan through 2080. However, approximately 2.4 million acre-feet of potential shortages across all water use categories would remain unmet by this plan in 2030, with unmet needs decreasing to approximately 1.6 million acre-feet in 2080 (Figure ES-10, Table ES-1). Irrigation represents the vast majority (ranging from 77 percent to 92 percent) of these unmet needs in all decades. At least some volume of unmet water supply needs occurs for all categories of water user groups in the plan. These unmet needs often comprise a relatively small share of an entity's total water demands, meaning that they could likely be addressed through drought contingency planning. The inability to meet a water user group's need in the plan is usually due to the lack of an economically feasible water management strategy, but an unmet need in a plan does not prevent an entity from pursuing additional water supplies to meet that need.

Figure ES-10. Annual unmet water supply needs by water use category in 2030, 2050, and 2080 (acre-feet)



** Livestock unmet needs are projected to be less than 10,000 acre-feet per year across the planning horizon and are at a scale not visible in the figure.*

Table ES-1. Statewide annual water supply needs that are unmet by the plan (acre-feet)

Water use category	2030	2040	2050	2060	2070	2080
Irrigation	2,246,993	2,208,123	1,817,168	1,435,313	1,314,403	1,200,128
Livestock	3,086	3,313	3,887	5,826	7,620	9,329
Manufacturing	41,793	43,626	47,840	53,622	58,872	64,153
Mining	77,050	81,481	82,925	82,776	79,789	47,296
Municipal	35,004	41,826	75,359	153,733	141,331	197,103
Steam-electric power	32,491	35,875	29,682	31,987	33,136	35,249
Total	**2,436,417**	**2,414,244**	**2,056,861**	**1,763,257**	**1,635,151**	**1,553,258**

How much will it cost?

The estimated total capital cost of the 2027 State Water Plan, which represents the capital costs of all recommended water management strategies and projects in the 2026 regional water plans, is $174 billion in 2023 dollars, without accounting for future inflation. These costs include the funding needed to permit and design projects, acquire water rights and land, and construct the infrastructure necessary to implement the recommended strategies. Roughly 80 percent of the plan's capital costs—about $139 billion—is associated with projects anticipated to be online by 2050 to address rapidly growing water demands, including under drought conditions.

The cost of the plan does not include expenses related to maintaining/expanding retail water system distribution facilities or replacing/rehabilitating aging infrastructure, with the specific exception of water

loss mitigation projects that include replacement of portions of an existing leaking water transmission or distribution network and result in an immediate, quantifiable increase in water supply. Texas' water planning process is based on the fundamental expectation that water providers will properly maintain their existing infrastructure so that it continues to operate at designed capacity. The purpose of the state water plan—and the associated SWIFT funding—is to increase the water supply available under severe drought conditions, not to replace aged or neglected infrastructure.

What is needed in the near term?

Under drought-of-record conditions, the state would face an immediate need for 3.6 million acre-feet per year in additional water supplies in 2030. Meeting these needs by 2030 would require implementation of more than 2,300 recommended projects, at a combined capital cost of approximately $64 billion. By 2050, water providers would need to implement more than 2,900 projects at a total cost exceeding $139 billion to meet projected water needs (Table ES-2). The scale and timing of near-term projects in the plan underscore the critical importance of timely financing and implementation, as well as the need to address a growing backlog of projects to mitigate drought risks that could arise in the immediate future.

Table ES-2. Immediate, near-term, and long-term statewide planning outlook

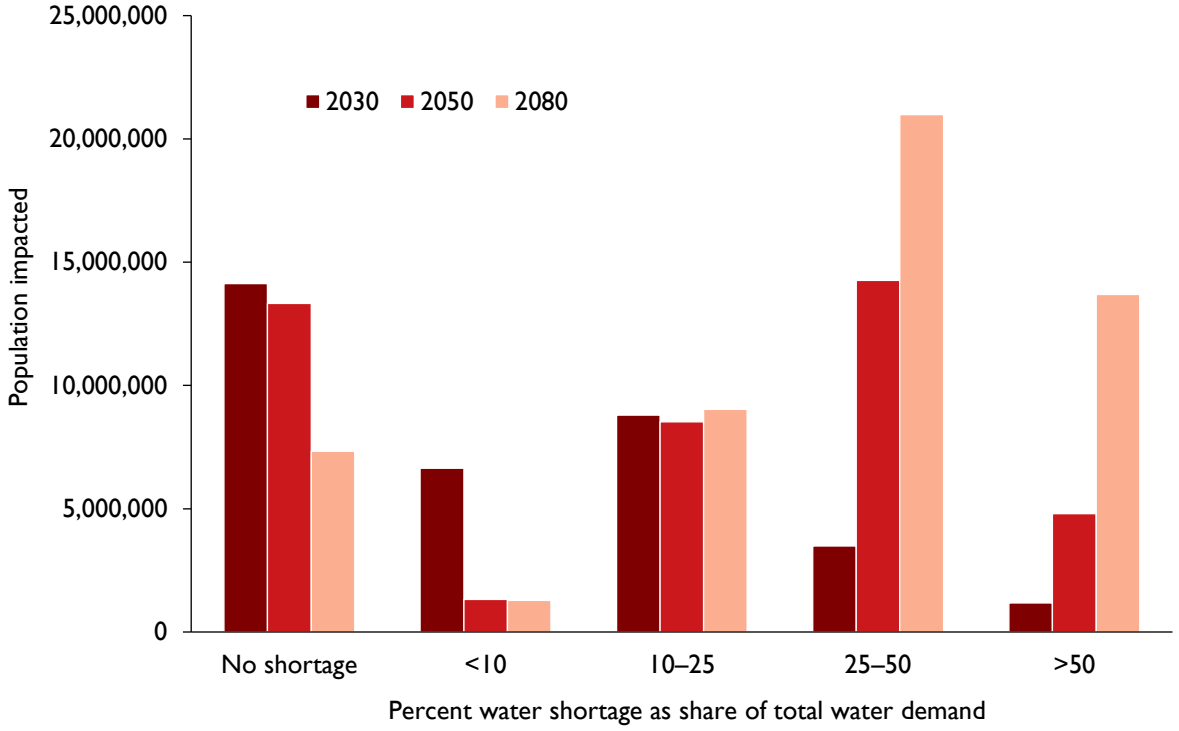
Planning factor	2030	2050	2080
Water demand (acre-feet)	17,363,463	17,776,651	18,384,630
Existing supply (acre-feet)	15,539,340	14,653,265	13,978,122
Water needs (acre-feet)	3,645,447	4,625,477	5,812,309
Water management strategy supply (acre-feet)	2,736,795	5,796,484	7,550,279
Project count (cumulative)	2,385	2,919	3,036
Capital cost (cumulative, billion)	$64	$139	$174

What if we do nothing?

Texas would suffer significant economic losses if the recommended water management strategies are not implemented and another drought of record, or worse, were to occur. Economic modeling indicates that Texas businesses and workers would lose approximately $91 billion in income annually in 2030 and could lose $177 billion annually in 2080 if a one-year repeat of the drought of record were to occur. The number of jobs at risk could increase from 402,000 in 2030 to almost 980,000 in 2080. These estimates are likely conservative and do not account for other impacts, such as long-term economic and development distortions resulting from persistent water shortages, or drought effects on dryland farming and other activities not directly tied to projected water needs in the plan. They also do not attempt to quantify the potential for more severe impacts associated with drought conditions exceeding the drought of record or potential compounding effects of extended multi-year drought events.

If we do nothing, by 2080 approximately four out of five Texans could face at least a 10 percent water shortage in their cities and residences, and about one out of four Texans could have less than half of the water supplies needed to live and work during a drought of record (Figure ES-11).

Figure ES-11. Projected statewide population facing various degrees of severity of municipal water needs in 2030, 2050, and 2080



How are strategies in the state water plan funded?

Strategy sponsors, such as cities or wholesale water providers, must take action to develop water supply projects and conservation measures, including obtaining financial assistance. Sponsors may issue debt independently to fund projects or seek financing through state programs, which may also require significant debt issuance.

In 2013, the Texas Legislature created the State Water Implementation Fund for Texas (SWIFT) and State Water Implementation Revenue Fund for Texas (SWIRFT) to provide affordable, ongoing state financial assistance for projects in the state water plan. Passed by the legislature and approved by Texas voters through a constitutional amendment, the SWIFT[3] program helps communities to develop and optimize water supply projects at cost-effective rates. The program provides low-interest loans, extended repayment terms, deferral of loan repayments, and incremental repurchase terms for projects with state ownership aspects. To be eligible for the SWIFT program, a project and its associated capital costs must be recommended in the state water plan. In addition to SWIFT, the TWDB administers several other state and federal financial assistance programs that may be utilized to fund projects in the state water plan.

[3] The SWIFT program includes two funds, the State Water Implementation Fund for Texas (SWIFT) and the State Water Implementation Revenue Fund for Texas (SWIRFT). Revenue bonds for the program are issued through SWIRFT.

What has the TWDB done to implement water management strategies in the 2022 State Water Plan?

Since adopting the 2022 State Water Plan, the TWDB has delivered to project sponsors more than $6.4 billion toward the implementation of 68 state water plan projects recommended in the 2022 State Water Plan. These projects represent approximately 1.6 million acre-feet of water supplied, conserved, or maintained.[4] Many of these water management strategy projects continue to be recommended strategies in this new plan and are in various stages of implementation across the state.

What were impediments to implementing the previous plan?

Planning groups reported several impediments to implementing recommended water management strategies. The most frequently cited impediment was the absence of an identified project sponsor[5], followed by shifts in anticipated project timelines, economic feasibility, financing challenges, and contract or permitting constraints. Additional impediments included water availability limitations. These reported impediments do not necessarily indicate that a project will not be implemented—rather that implementation may require additional time, coordination, or resources. During each planning cycle, planning groups revise their water management strategies to reflect updates to the anticipated project timelines.

What more can we do?

Planning groups made a variety of regulatory, administrative, and legislative recommendations that they believe are needed to better manage Texas' water resources and to prepare for and respond to droughts. Having considered their recommendations and other potential policy considerations, the TWDB makes the following recommendations for consideration by the Texas Legislature.

Legislative Recommendation 1: Unique stream segment designation

The legislature should designate the five river or stream segments of unique ecological value as recommended by the 2026 regional water plans (Alamito Creek, Black Cypress Bayou, Black Cypress Creek, Pecan Bayou, and Terlingua Creek) for protection under Texas Water Code § 16.051(f).

Legislative Recommendation 2: Unique reservoir site designation

The legislature should designate for protection under Texas Water Code § 16.051(g) four sites of unique value for constructing reservoirs as recommended in the 2026 regional water plans: Coryell County Off-Channel Reservoir, Millers Creek Off-Channel Reservoir (also known as Lake Creek Reservoir), George Parkhouse Reservoir I (South), and George Parkhouse Reservoir II (North).

Legislative Recommendation 3: Remove Interregional Planning Council requirements

The legislature should consider repealing Texas Water Code § 16.052 to eliminate the Interregional Planning Council, whose functions have become largely duplicative of more recent legislative mandates regarding TWDB coordination efforts. Removing this requirement would reduce administrative burden and align the planning process with newer directives focused on multi-regional water supply development and financial assistance programs.

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[4] The above supplies are planned supply volumes. Supplies may change for various reasons once a project is complete.

[5] This primarily includes projects recommended for county-level non-municipal water user groups, which often lack specific identified sponsors and have limited information available to assess implementation.

Legislative Recommendation 4: Improve resources and clarity to assist groundwater conservation districts in establishing desired future conditions policies (three parts)

1) *The legislature should consider providing resources and direction to the TWDB to develop and provide a set of regional predictive groundwater modeling scenarios (such as maintaining average aquifer conditions, high-stress conditions with low recharge and high pumping, and low-stress conditions with high recharge and low pumping) to groundwater management areas for consideration in joint groundwater planning, ahead of each groundwater planning round to support more informed decision-making by groundwater conservation districts that are often lacking the resources to produce these scenarios.*

2) *The legislature should consider requiring groundwater conservation districts to consider predictive modeling scenarios provided by the TWDB in joint planning.*

3) *The legislature should consider removing the "total estimated recoverable storage" from desired future condition consideration requirements and references to "total recoverable storage capacity" in Texas Water Code Chapter 36. Recoverable storage volumes are conceptual and not a broadly practical measure of groundwater recoverability and have, as a result, introduced unreasonable expectations and confusion.*

Legislative Recommendation 5: Require consideration of drought conditions in development of desired future conditions

The legislature should consider requiring all groundwater conservation districts to explicitly evaluate drought conditions for each aquifer in establishing desired future conditions, and document in the desired future condition explanatory report how drought conditions were considered in joint planning.

Legislative Recommendation 6: Establish a single, statewide groundwater well-identification system

The legislature should consider adopting a statewide policy that requires the use of a common well-identification system—for organizing existing data and new well data that is already normally collected—across all groundwater-related databases, and provide resources to the TWDB to create and maintain a centralized and publicly available well inventory database that can be used to link together all Texas' existing groundwater databases through a common well-identification system. This recommendation will facilitate more seamless and efficient data exchanges and improve groundwater management and decision-making, while having no impact on private well-owners.

Legislative Recommendation 7: Socioeconomic analysis tool to support joint groundwater planning

The legislature should consider providing resources to the TWDB to develop a standardized socioeconomic impact analysis tool for use, at the discretion of the groundwater management areas, in joint groundwater planning to support the assessment of socioeconomic impact considerations required for establishing desired future conditions.

Legislative Recommendation 8: Redefine the role of the TWDB in interregional conflict identification and resolution

The legislature should consider defining an interregional conflict in the regional water planning process specifically and solely as an overallocation of planned use of water supply. Under the current planning process, recurring conflicts based on 'potential significant adverse impacts' are problematic and require detailed technical information that is typically only available during the permitting phase—not at the planning stage. Making such determinations within the long-term state-level planning process is premature and risks permanently eliminating viable water supply projects. A clear statutory definition focused exclusively on overallocation will ensure consistency, protect critical water supply options, and maintain the integrity and focus of the planning process.

Legislative Recommendation 9: Conduct alternative versions of socioeconomic analyses of water shortage impacts

The legislature should consider providing resources to the TWDB to develop an alternative socioeconomic impact analysis model and tool that better reflects the long-term implications of not implementing the state water plan, particularly in high-growth areas. The model should be capable of simulating the cumulative, long-term impacts of persistent water shortages, such as building moratoriums and other economic shifts that would result from failure to implement water supply projects associated with population growth. It should incorporate dynamic economic factors that the current simplified static analysis cannot model.

Legislative Recommendation 10: Remove requirement of infeasible strategy assessment amendments

The legislature should consider saving regional water planning groups significant time and resources by removing the requirement in Texas Water Code § 16.053(h)(10) that planning groups amend their previously adopted plans to remove any newly identified infeasible strategies or projects. Any projects identified as infeasible since adoption of the previous plan will still be addressed—by being removed or modified (typically by adjusting timing)—in the next regional plan to ensure feasibility.

I Introduction

Quick facts

Texas' state water plans are based on ensuring water supplies under future conditions equivalent to a recurrence of the worst recorded drought in Texas' history—known as the "drought of record"—a time when, generally, water supplies are lowest and water demands are highest.

The state water plans do not include any recommended strategies, projects, or costs that are associated with replacing[6], rehabilitating, or maintaining water supply infrastructure that already exists. All future supplies recommended in these plans are additional water supply volumes beyond what is currently legally and physically connected to users, including conservation; development of new supplies, such as aquifer storage and recovery, brackish groundwater, seawater desalination, and produced water recycling; and expansion of existing infrastructure beyond the existing current capacity.

Details from the regional and state water plans, including summaries by region, county, and water user group, can be explored through the interactive state water plan webpage (2027.texasstatewaterplan.org).

Historical water use and projected water demand data can be further explored through interactive data dashboards at www.twdb.texas.gov/waterplanning/data.

In response to the drought of the 1950s and in recognition of the need to better plan for the future, the 55th Texas Legislature created the Texas Water Development Board (TWDB) in 1957 to prepare plans and provide funding to address the state's future water needs. In 1997, a brief but intense drought and the growing population adding pressure on water resources led the 75th Texas Legislature to establish a new, bottom-up, stakeholder-driven regional water planning process and formed 16 regional water planning areas (Figure 1-1). In the 30 years since this change, more severe regional droughts, including the 2010–2014 event, have surpassed the 1950s drought within some sub-basins and water sources across the state, establishing new droughts of record and reinforcing the need to plan for recurrence of severe drought.

Comparing conditions and results across successive state water plans is challenging because many key inputs and assumptions change from one planning cycle to the next. Water availability estimates may shift as a result of groundwater management policy decisions, improved data and modeling, and/or actual physical declines in availability. Similarly, projected water demands evolve as planning methodologies are refined, such as the transition to utility-based planning, updates to historical water use baselines, changes in demographic assumptions such as birth rates, and the incorporation of new or improved datasets. Estimates of existing water supply also evolve as the inventory of connected water supplies expands. This includes the addition of supplies generated by the implementation of strategies recommended in prior plans and the reclassification of supply volumes from the future side to the existing side of the planning equation as these strategies come online. Collectively, these and other factors affect the volume of water supply needs identified in each plan and how planning groups recommend addressing those needs.

The first state water plan developed under the regional water planning process provides a useful benchmark for examining how Texas, its water resources, and the planning process itself have evolved over the past 25 years. The regional water planning process has evolved to provide a more granular and utility-focused representation of water users across the state. The 2002 State Water Plan included 2,239 planned-for water user groups, compared to approximately 3,000 in this plan. Part of this increase reflects methodological changes, including the transition from city-based planning to utility-based planning, with municipal water user groups shifting from a city-population threshold to utility-based planning criteria.

[6] With the exception of water loss mitigation projects that include replacement of portions of an existing leaking water transmission or distribution network and result in an immediate, quantifiable increase in water supply.

As noted in the 2002 State Water Plan, Texas' population was projected to reach 39.6 million by 2050, almost doubling across the planning horizon, with most growth projected to occur around major urban centers. The 2002 plan observed that this pattern of growth could create challenges related to resource sharing and increased competition between rural and urban areas. This water plan projects an even higher population of 42.2 million by 2050, further underscoring this continuing growth trend and reaffirming the importance of long-term planning to meet water supply needs for the world's 8th largest economy (Texas Comptroller of Public Accounts, 2024).

The 2002 State Water Plan estimated statewide 2050 water availability at 13.1 million acre-feet of groundwater and 14.4 million acre-feet of surface water. The groundwater availability was assessed by the planning groups under drought conditions. Since that estimation, and in line with a policy recommendation from the 2002 plan, the legislature established groundwater management areas and required the state water plan to be consistent with desired future conditions established through the joint planning process. The 2017 State Water Plan, the first to use modeled available groundwater volumes from the joint planning process, estimated 10.7 million acre-feet of groundwater availability and 12.1 million acre-feet of surface water availability in 2050. In comparison, the 2027 State Water Plan estimates 2050 groundwater availability to be 11.4 million acre-feet and surface water availability to be 10.9 million acre-feet, reflecting the impacts of improved data availability and resulting management decisions.

As described above, no single factor can be isolated to explain these changes. Table 1-1 compares water demands, supplies, and needs for key overlapping decades between the plans and highlights how these evolving inputs are reflected in comparative demand, supply, and need projections. Taken together, these shifts underscore how each planning cycle builds on improved information while responding to new conditions.

Table 1-1. Comparisons of equivalent decades between the 2002 and 2027 State Water Plans (acre-feet per year)

	Demands		Existing supplies		Needs (potential shortages)	
Planning decade	**2002 SWP***	**2027 SWP**	**2002 SWP**	**2027 SWP**	**2002 SWP**	**2027 SWP**
2030	18,732,275	17,363,463	15,220,008	15,539,340	5,780,221	3,645,447
2040	19,369,125	17,768,577	14,693,504	14,991,248	6,744,112	4,410,900
2050	20,022,209	17,776,651	14,469,176	14,653,265	7,512,167	4,625,477

** 2002 State Water Plan demands were notably influenced by irrigation demands (8.8 million acre-feet in 2030 and 8.5 million acre-feet in 2050).*

SWP – state water plan

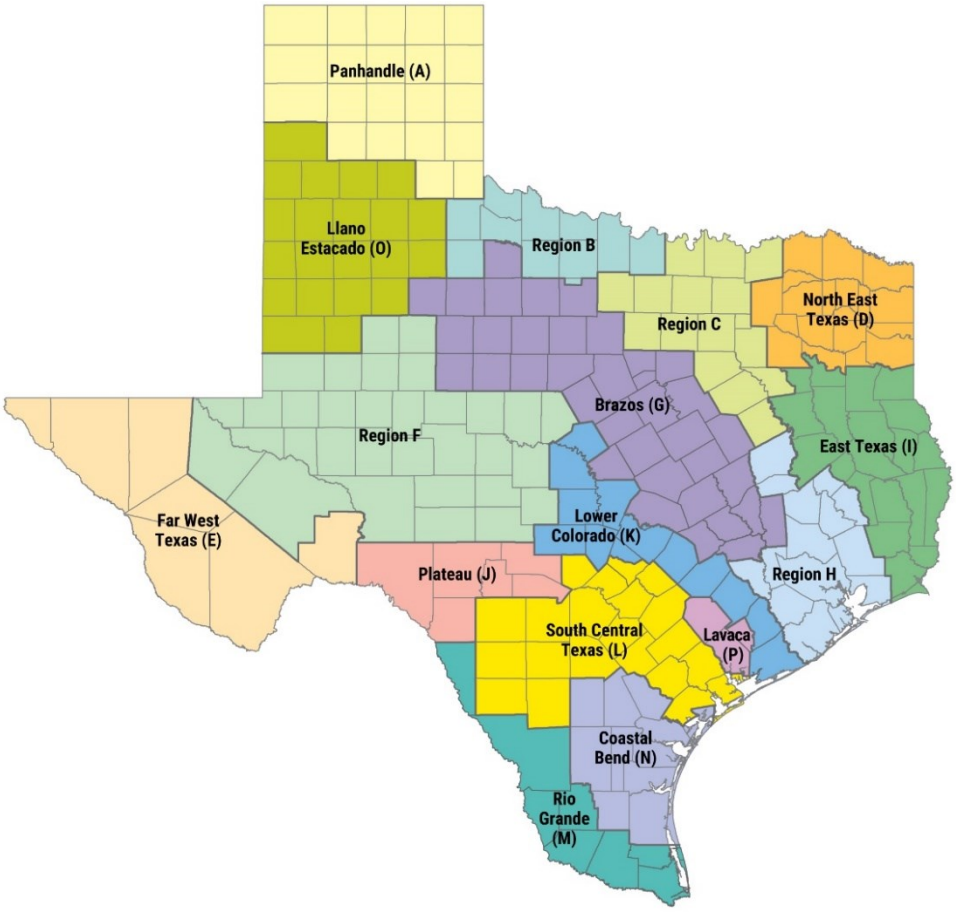
The 2027 State Water Plan is the sixth plan produced under the regional water planning process and the state's 12th water plan overall. It represents the culmination of the sixth cycle of regional water planning and the hard work and dedication of more than 500 volunteer planning group members across Texas' 16 regional water planning groups. Each state water plan compiles information and recommendations from the 16 adopted regional water plans into a single document. Over time, the state plan has become increasingly data-driven, transparent, and user-friendly. This progress is reflected in enhancements to the interactive state water plan website and various online data dashboards, which help policymakers, local officials, and the public better access and understand the water planning information that affects them.

The agency's experience and commitment to continually improving the planning process keep the TWDB and Texas at the forefront of state water planning in the United States. No other fast-growing state has produced a water plan that so clearly demonstrates how its local and regional water suppliers

can provide long-term, affordable water supplies to its residents. Sustained investments by the Texas Legislature have developed surface water and groundwater availability models that improve the credibility of the plans by providing a foundation of science-based constraints and actionable data that shape much of the planning process.

Although the terms "update" or "revision" are sometimes used when referring to regional water plans, each regional and state water plan is, in fact, a new, standalone plan. Each plan is based on updated water demands, revised estimates of potential shortages, and an evolving universe of potentially feasible strategies that might address the potential shortages of all categories of water uses across the state encompassing over 3,000 discrete water user groups. The recurring nature of five-year planning cycles allows the process to respond to legislative policy changes, stakeholder input, implementation challenges, and methodological advancements—while remaining current and relevant.

Figure 1-1. Regional water planning areas



1.1 Regional water planning overview

Senate Bill 1, passed by the Texas Legislature in 1997, outlined an entirely new process in which local and regional stakeholders were tasked with developing consensus-driven regional plans for how to reduce demand and develop supplies beyond those currently existing to meet water needs during times of drought. The TWDB was charged with implementing the program, which meant developing rules and guidelines as well as establishing the planning regions. Senate Bill 1 stipulated that the TWDB could only provide financial assistance for water supply projects, and the Texas Commission on Environmental Quality could only grant new surface water rights if they were consistent with the regional and state

water plans. These incentives were important to encourage water project sponsors to actively participate in the planning process.

The 16 regional water planning areas were designated by considering river basin and aquifer delineations, political subdivision boundaries, socioeconomic characteristics, public comments, and other factors. The TWDB is required to review and update the planning area boundaries at least once every five years. These boundaries were last reviewed in October 2025, and no changes have been made since their initial establishment.

1.1.1 Regional water planning groups

Each of the 16 regional water planning areas has an associated planning group composed of local stakeholders who volunteer their time for this process. Every five years, the planning groups are responsible for developing regional water plans that are funded primarily through legislative appropriations, administered by the TWDB, and guided by statute, rules, contracts, and input from planning group members and the public. In accordance with the Texas Open Meetings Act, all planning groups and their committees conduct their business in meetings that are open to the public and that give the public advance notice of the time, date, location, and subject matter of the meetings.

Each planning group is required to maintain at least one voting representative for each of the 12 interest categories listed in Table 1-2, 11 of which were established in 1997 by Senate Bill 1. In 2011, Senate Bill 660 (82nd Texas Legislature) required planning groups to include additional representatives from each groundwater management area that lies at least partially within the planning area. These representatives are appointed directly by the groundwater management areas and are not selected by the planning groups. The groundwater management area interest category is the only category that may require multiple representatives under statute, resulting in higher minimum membership requirements in some regions.

Table 1-2. Minimum statutory membership requirements* by interest category and region

	Regional water planning areas															
Interest categories	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
Agriculture	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Counties	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Electric-generating utilities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Environment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Groundwater management areas	2	2	3	0	2	3	5	2	2	3	6	5	1	3	2	1
Industry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Municipalities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Public	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
River authorities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Small business	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Water districts	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Water utilities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total minimum membership	**13**	**13**	**14**	**11**	**13**	**14**	**16**	**13**	**13**	**14**	**17**	**16**	**12**	**14**	**13**	**12**

** Assumes the existence of each interest category within a region. Representation is not required for categories that do not exist in a region.*

Currently, every planning group has more than 12 voting members, with the largest having 29 voting members. More than 500 voting members participated in the development of the 2026 regional water

plans (see Acknowledgments). Planning group members serve in a volunteer capacity and are not compensated by the planning groups for their time—although, for many members, participation in the process is effectively part of their regular employment duties. Planning groups also include non-voting members from the TWDB, the Texas Department of Agriculture, the Texas Parks and Wildlife Department, and the Texas State Soil and Water Conservation Board, as well as liaisons from adjacent planning groups, and representatives of any additional interest categories deemed appropriate by the planning group, such as the Texas Commission on Environmental Quality.

The enduring success of Texas' regional water planning process rests with the service of planning group members who dedicate many hours to ensuring the long-term viability of Texas' water supplies. Strong leadership from planning group chairs and other long-time members, as well as recruitment of new members who bring fresh ideas to the table, makes room for dynamic continuity of the planning process.

1.1.2 Program requirements

A regional water plan must meet all statutory and administrative rules and contract requirements. During each five-year planning cycle, each planning group must

- maintain its membership and governing bylaws;
- designate a political subdivision of the state—such as a municipality, river authority, or council of governments—to serve as its administrative sponsor for the purpose of arranging meetings, managing grant-funded contracts, and providing public notices;
- apply to the TWDB for regional water planning grant funding through its administrative sponsor;
- select a technical consultant(s) to serve at the direction of the planning group and to collect information, perform analyses, and prepare the regional water plan document;
- direct the development of its water plan, including making decisions about which water management strategies will be recommended;
- solicit and consider public input, conduct open meetings, and, together with its administrative sponsor, provide required public notices, including for public hearings on the initially prepared (draft) regional water plan;
- submit its initially prepared plan and standardized data to the TWDB for review; and
- adopt a final regional water plan and submit it to the TWDB for approval.

To facilitate the development of the regional water plans, each planning group is supported by an assigned TWDB regional water planner who serves as a project manager and non-voting planning group member. The planner attends all planning group meetings, manages the associated grant contract, and provides technical and administrative assistance throughout the development of the regional water plans—including on-the-fly during their meetings—to help ensure the planning groups make progress and meet their deadlines and all planning requirements. These requirements and administrative support help to ensure a consistent, statewide process for developing the regional water plans.

1.1.3 Development of the regional water plans

Every five years, each of the 16 planning groups is tasked with producing long-range regional water plans that ensure water needs will be met during times of drought for the next 50 years. Although there is plenty of flexibility allowed for each planning group to organize and present their own information, the plans generally follow a common overall format based upon statute, administrative rules, and an established scope of work for each planning cycle.

Regional water planning is based on several fundamental parameters that guide the entire process, the most important of which is anticipation of a repeat of drought of record conditions when, in general, water supplies are lowest and water demands are highest. Planning groups conduct evaluations of future water demands, existing supplies, potential water shortages, and feasible water management strategies

for wholesale water providers and approximately 3,000 water user groups in six categories (municipal, manufacturing, steam-electric power generation, mining, irrigation, and livestock). Planning groups report the associated data by decade over a 50-year planning period (in this cycle from 2030 to 2080) by water user group, county, river basin, and regional water planning area. The regional water plans also include drought response information, policy recommendations, information on project implementation, and a comparison to previous plans.

The 16 regional water plans are the product of hundreds of meetings; the effort and many hours of hard work by the planning groups, consultants, and stakeholders; and the large amount of information that the planning groups develop along the way. Each regional plan presents information in 10 chapters with much of the underlying information entered directly into the TWDB state water planning database.

1.1.4 Development of the state water plan

After planning groups adopt their regional water plans, they submit them to the TWDB for approval. As required by statute, the TWDB develops the state water plan based on those plans with the addition of legislative recommendations and additional insights. The state water plan compiles key information from the regional water plans and serves as a guide to state water policy. It explains planning methodology, aggregates data for the state, identifies statewide trends, and provides recommendations to the Texas Legislature. Prior to adopting the final state water plan, the TWDB releases a draft for public comment, publishes its intent to adopt the state water plan in the Texas Register, and holds, at a minimum, one public hearing. In this case, the state water plan was developed in two phases. The phase one version of the plan was adopted in July 2026 to accommodate State Water Implementation Fund for Texas (SWIFT) funding commitments for projects recommended in the 2026 regional water plans. This substantially enriched document represents the second phase, adopted as the first amendment to the state water plan approved earlier this year.

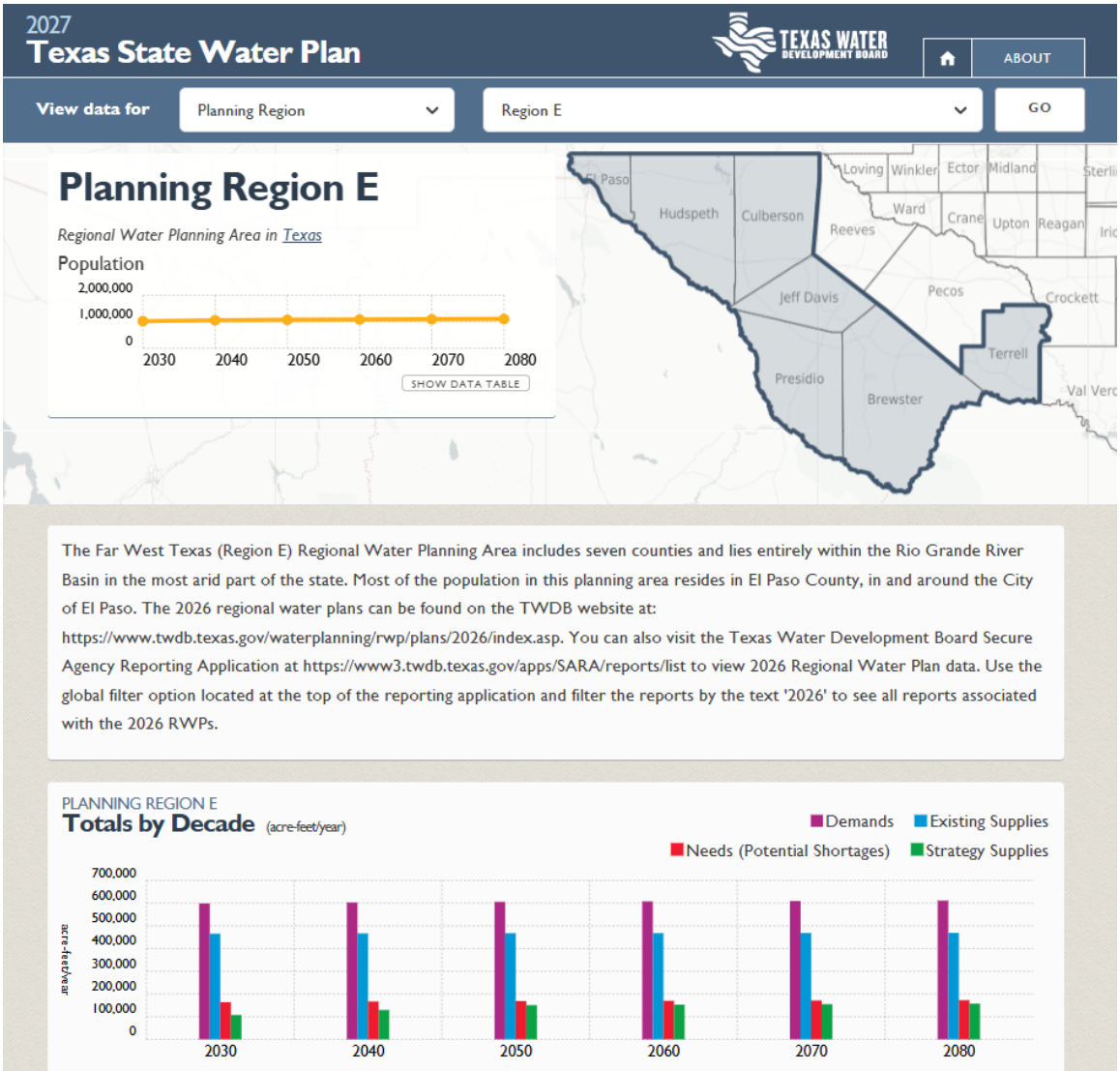
1.2 The interactive state water plan

The 2027 State Water Plan is supported by the interactive state water plan website (2027.texasstatewaterplan.org) that is part of the plan approved and adopted by the TWDB. The interactive plan allows water users to take an up-close look at data thematically and at discrete levels not found in the electronic and bound versions of the plan. Data are presented in geographical and tabular forms with clickable links to help users navigate and download data (Figure 1-2). Users can see the water sources that a particular water user group relies on today for its existing water supplies and find out what recommended strategies and water sources it will depend on in the future.

This approach to the delivery of water planning data to the public provides innumerable data views with a variety of scales, ranging from a snapshot of a single utility to the big picture outlook for the entire state. Users can view the interactive state water plan in numerous ways and from various perspectives:

- At varying geographic scales—utility, county, region, or state
- By specific planning decades—spanning the 50-year planning horizon (2030–2080)
- By water use categories—irrigation, livestock, manufacturing, mining, municipal, and steam-electric power
- By water source—specific aquifers, reservoirs, reuse, and other supplies
- By category of planning information—projected water demands, existing water supplies, water needs, and recommended water management strategies and projects
- By type of water management strategy—to see projects by categories such as aquifer storage and recovery, direct potable reuse, or seawater desalination
- By water user—to see geographically all the water sources a user relies upon

Figure 1-2. View of interactive state water plan site



The TWDB administers the state water planning database that facilitates the interactive state water plan. Planning groups directly populate a unique online database for each planning cycle and rely on it to produce portions of their regional water plans, including calculating water needs for each water user group, and to help ensure that no water sources are overallocated. Some of the planning data, such as water demand projections and modeled available groundwater volumes, are developed and entered directly by the TWDB. The state water planning database helps improve the quality of the plan and greatly accelerates the ability to review and approve the final regional water plans and draft the state water plan.

The interactive website increases transparency, can help promote awareness about the water plan, provides clarity around specific water sources and projects, and makes this critical information—in the form of maps and downloadable data—more accessible to interested stakeholders. During the review period for the draft 2026 regional water plans, a limited-access version allowed the regions to visually present the draft regional plan data during their 20 public hearings. The interactive state water plan is also viewable on most mobile devices, making it a valuable resource in any setting, and users can download data into a spreadsheet for further analysis. Overall, the interactive plan gives Texans the

opportunity to access and understand the enormous amount of information developed as part of the planning process, put that information into context, and use it based on their specific needs.

1.3 New to the 2027 State Water Plan

During the sixth cycle of regional water planning, the legislature, water planning stakeholders, and the TWDB continued to refine the process to produce more realistic, data-driven plans to guide the management of water resources in Texas.

1.3.1 Key legislative changes since the 2022 State Water Plan

Every two years, the Texas Legislature convenes, providing an opportunity to refine or modify the iterative regional water planning process. Several bills enacted during recent legislative sessions resulted in modest changes to the sixth cycle of regional and state water planning, while others carry longer-term implications for state water planning and implementation.

In 2021, the 87th Texas Legislature passed **House Bill 1905**, which repealed requirements for regional water planning groups to prioritize projects in the regional water plans and conduct an infrastructure financing survey. This change allowed the planning groups to spend more of their limited time focused on developing their plans.

In 2023, the 88th Texas Legislature passed **House Bill 1565**, which incorporated statutory recommendations from the Sunset Advisory Commission's review of the TWDB and the State Water Implementation Fund for Texas Advisory Committee (Sunset Advisory Commission, 2023). The bill includes several provisions specific to regional water planning:

- It authorized planning groups to plan for drought conditions worse than the drought of record (summarized in Chapter 11).
- It required regional water planning groups to include information on the implementation of large projects (reservoirs, interstate water transfers, innovative technology projects, desalination plants, and other large projects as determined by the board) in regional water plans (summarized in Appendix E).
- It directed the TWDB to consult with the Office of the State Climatologist at Texas A&M University in the preparation of regional and state water plans to receive information and projections to identify regions of the state that are likely to experience severe drought or excessive rainfall (summarized in Chapter 11).

In 2023, the 88th Texas Legislature also passed **Senate Bill 28**, which created three new funds and accounts for the TWDB to administer: the New Water Supply for Texas Fund, the Texas Water Fund, and the statewide water public awareness account. In addition, **Senate Joint Resolution 75** proposed a constitutional amendment to establish the new Texas Water Fund, and **Senate Bill 30** appropriated $1 billion from general revenue to the Comptroller for deposit to the Texas Water Fund, contingent upon voter approval. In November 2023, Texas voters passed the proposition for Senate Joint Resolution 75, thereby creating the Texas Water Fund to support financing of water supply projects in Texas. Chapter 9 provides more information on these new funds.

In 2025, the 89th Texas Legislature passed **House Bill 2078**, which revises joint groundwater planning requirements in Chapter 36 of the Texas Water Code to increase transparency and accountability for achieving desired future conditions in groundwater management areas; the results of which determine groundwater availability utilized in the regional and state water plans. The bill mandates annual groundwater management areas meetings, strengthens management plan reviews, and requires plain-language explanations of monitoring efforts and desired future conditions progress. It also introduces

interim desired future conditions values for 10-year benchmarks, enhances explanatory report requirements, and formalizes evaluation of district performance during the five-year joint planning cycle.

The legislature also passed **Senate Bill 7**, which revised statutory authorities related to the TWDB by addressing financing eligibility for major water supply infrastructure and requiring the TWDB to "facilitate joint planning and coordination," as well as other responsibilities, on the development of infrastructure to transport water. The bill enables the TWDB to fund and support a broader set of projects through the New Water Supply for Texas Fund, Texas Water Fund, and Texas Water Bank, while also creating a new administrative account within Texas Water Fund to support associated planning and operations. It required the TWDB to conduct an interim study regarding the feasibility and practicality of incorporating planning of wastewater infrastructure into the existing state water planning process, beginning with the five-year state water planning period ending January 5, 2032. It also consolidates existing advisory bodies into the Texas Water Fund Advisory Committee and enhances the TWDB legislative reporting obligations and coordination with the Texas Commission on Environmental Quality.

House Joint Resolution 7 proposed a constitutional amendment dedicating a portion of the revenue generated from state sales and use taxes to the Texas Water Fund. Beginning September 1, 2027, the Texas Comptroller must deposit the first $1 billion of sales tax revenue collected above $46.5 billion in a fiscal year into the fund, with these provisions expiring August 31, 2047. The amendment includes provisions ensuring the protection, allocation, and use of these funds for eligible water infrastructure priorities. In November 2025, Texas voters approved the constitutional amendment, dedicating a portion of state sales and use tax revenue to the fund.

1.3.2 New developments and process improvements

With each cycle of regional water planning, the TWDB strives to make the process more efficient, accessible, coherent, and informative for stakeholders and the public. The sixth regional water planning cycle incorporated new statutory requirements and process improvements that strengthen plan credibility, increase transparency, and improve public access to planning information.

Increased rural outreach

Planning groups were, for the first time, specifically tasked and funded to enhance their rural outreach activities. To support this requirement, the TWDB developed county-level documents summarizing state and regional water plan information, Texas Commission on Environmental Quality 180-day High Priority Water System List occurrences, and water planning and drought resources available from multiple state agencies. These materials were provided to planning groups, the Texas Association of Counties, and the Texas Rural Water Association as resources for their members and stakeholders. Additional details on rural outreach efforts are provided in Chapter 12, a new chapter dedicated to rural entity planning.

Improved information on how regions address planning uncertainty

Regional water plans are developed in the face of a variety of uncertainties and must address water supply needs during a future repeat of the drought of record. During plan development, the generated values of planning factors (supplies, demands, population) all have associated uncertainty. New this cycle, planning groups were required to include a subsection in their plans to summarize how the region incorporated planning for uncertainty into the regional plan. Regions summarized key assumptions, analyses, strategies, and projects included in the regional plan that go beyond meeting identified water needs anticipated under a drought of record, as well as the additional types of measures and responses that certain water providers or users could employ if a drought worse than the drought of record were to occur in the near term. Additional details on planning group results are provided in Chapter 11, a reinstated chapter dedicated to planning uncertainty.

Feasibility review of the 2021 regional water plans

To address requirements established by Senate Bill 1511, 85th Texas Legislature, regional water planning groups reviewed their previously adopted regional water plans to identify water management strategies and projects that had become infeasible and to amend those plans, as necessary. This review was conducted for the first time during this planning cycle. In this context, infeasibility generally refers to whether a strategy or project could still reasonably be implemented by the online decade indicated in the plan, rather than a project's technical feasibility. This review helps ensure that regional water supply plans remain realistic, current, and reflective of actual sponsor commitment.

Additional reporting on implementation status of large projects

To address requirements from House Bill 1565, 88th Texas Legislature, regional water plans now include a sub-section that reports on the implementation status of certain large projects recommended in the plan. These projects include reservoirs, seawater desalination, out-of-state water transfers, and large-scale direct potable reuse, brackish groundwater, and aquifer storage and recovery. The plans document sponsor actions and funds expended to date, along with the status of permitting, land acquisition, design, and construction. A summary of the reporting on implementation is provided in Appendix E.

Consideration of near-term and long-term planning horizons

This state water plan summarizes key planning data across select near-term and long-term planning decades to more clearly indicate when resources, including financial assistance, may be needed (Figure 1-3). The near-term perspective (2030–2050) highlights projected conditions and actions required over the next approximately 20 years, for conditions and actions to occur by year 2050, a time frame in which there is greater certainty regarding future conditions. This includes potential shortages under the recurrence of a drought of record and the projects that are required to meet those needs. The long-term perspective (2060–2080) addresses conditions and needs captured within the last three decades of the planning horizon, when projections are subject to greater uncertainty. Together, these complementary time frames help distinguish immediate implementation priorities from longer-range planning considerations.

Figure 1-3. Near-term and long-term planning horizons

Enhanced data access and visualization

During this planning cycle, the TWDB expanded and improved public access to water planning information through several data visualization tools and a new reporting application, including

- launching the TWDB Database Reports application, which provides public access to regional water plan data reports (www3.twdb.texas.gov/apps/SARA/reports/list);
- launching an online conservation dashboard for planning that allows users to explore historical gallons per capita per day statistics by utility size and region, track trends and targets, review recently implemented conservation best management practices, and view recommended conservation projects from the regional water plans (www.twdb.texas.gov/waterplanning/data/dashboard/conservation);

- launching a water loss data dashboard that displays key performance indicators for water loss, real loss, and apparent loss based on historical water loss audit data from public water systems across the state (www.twdb.texas.gov/conservation/data/water-loss-dashboard);
- enhancing existing dashboards for water demands and socioeconomic impact analyses (www.twdb.texas.gov/waterplanning/data/dashboard and www.twdb.texas.gov/waterplanning/data/analysis); and
- making a preliminary interactive state water plan platform available along with draft regional plan data, supporting planning groups and the public as they reviewed initially prepared (draft) plans, and presented information during public hearings, which improved transparency and public understanding of plan content during the comment period.

1.4 Organization of the plan

The remainder of this document is organized to reflect the major components of the water planning process and the findings of this planning cycle. Chapter 2 of this plan summarizes TWDB recommendations to the Texas Legislature, and Chapter 3 describes Texas droughts and provides drought response information and recommendations. Chapters 4–7 summarize the steps to develop the regional water plans, including the population and water demand projections, existing water supply analysis, needs identification, and recommended water management strategies and projects that are the fundamental building blocks of each state water plan. Chapter 8 highlights conservation planning, programs, and implementation. Chapter 9 presents the costs and financing required to implement strategies and projects recommended in the 2027 State Water Plan. Chapter 10 provides information on the implementation of the 2022 State Water Plan, including projects funded through SWIFT as well as a discussion of impediments to implementing projects. Chapter 11 describes the uncertainties associated with the plan, and Chapter 12 highlights issues affecting rural entities.

Each regional water plan must be consistent with all laws, rules, and regulations applicable to water use in the planning area. Appendix A provides additional information on water quality, drinking water, interstate waters, how surface water and groundwater are managed in Texas, and a brief history of water planning in Texas. Appendix B provides more detailed information on the processes of determining surface water and groundwater availability in the regional water plans. It also presents tabular reports summarizing annual water availability and annual existing supplies for surface water and groundwater. Appendix C summarizes annual water needs by region and water use category and includes details on the severity of shortages for water use groups with needs. Appendix D presents information on regional socioeconomic impacts, and Appendix E provides the implementation status of certain recommended strategies and projects. Appendix F outlines supplemental content available on the 2027 State Water Plan webpage, including the online interactive state water plan, additional reference information, and ancillary analyses.

References

Sunset Advisory Commission, 2023, Staff Report with Final Report: Texas Water Development Board and State Water Implementation Fund for Texas Advisory Committee, www.sunset.texas.gov/public/uploads/2023-08/Texas%20Water%20Development%20Board%20Staff%20Report%20with%20Final%20Results_6-26-23.pdf.

Texas Comptroller of Public Accounts, 2024, Texas GDP on the World Stage (Big Map), comptroller.texas.gov/economy/fiscal-notes/economics/2024/big-map/

2 Recommendations

The state water plan serves as a guide to state water policy, includes legislative recommendations, and may include policy statements on various issues related to water planning and implementation. By statute[7], the Board must consider making recommendations that it believes are needed to facilitate voluntary water transfers and to identify river and stream segments of unique ecological value and sites of unique value for reservoir construction. No recommendations regarding voluntary water transfers are included in this plan.

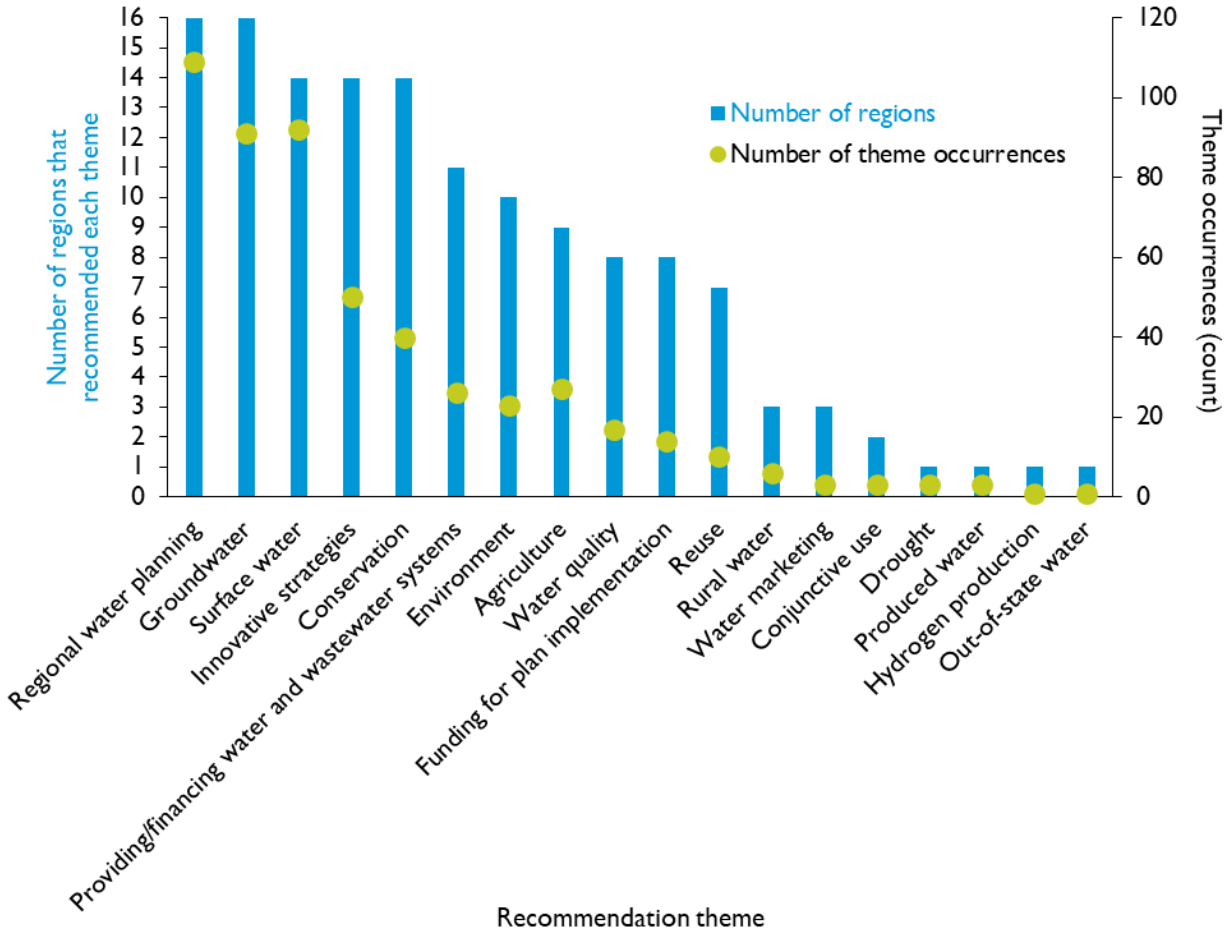
In developing legislative recommendations for this plan, the Texas Water Development Board (TWDB) considered recommendations contained in the 2026 regional water plans. Regional water planning groups made more than 500 regulatory, administrative, and legislative recommendations in the adopted 2026 regional water plans to

- facilitate the orderly development, management, and conservation of water resources;
- facilitate preparation for and response to drought conditions so that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare;
- further economic development; and
- protect the agricultural and natural resources of the state and regional water planning areas.

Figure 2-1 provides a generalized summary of the broad range of planning group recommendation themes. Detailed recommendations can be found in Chapter 8 within each of the regional water plans, which are available on the 2026 regional water plan webpage (www.twdb.texas.gov/waterplanning/rwp/plans/2026).

[7] Texas Water Code § 16.051(e): "…The plan shall include legislative recommendations that the board believes are needed and desirable to facilitate more voluntary water transfers. The plan shall identify river and stream segments of unique ecological value and sites of unique value for the construction of reservoirs that the board recommends for protection under this section."

Figure 2-1. Summary of administrative, legislative, and regulatory recommendations made by the regional water planning groups



Along with general policy and statutory recommendations, planning groups also made recommendations in the 2026 regional water plans for designating river and stream segments of unique ecological value and unique sites for reservoir construction; however, the Texas Legislature is responsible for officially designating these sites.

Planning groups may recommend designating all or parts of river and stream segments of unique ecological value located within their planning areas. These recommendations are based upon several criteria:

- Biological function
- Hydrologic function
- Riparian conservation areas
- High water quality
- Exceptional aquatic life
- High aesthetic value
- Threatened or endangered species/unique communities

The recommendations include physical descriptions of the stream segments, maps, and other supporting documentation. The planning groups coordinate each recommendation with the Texas Parks and

Wildlife Department and include, when available, the Department's evaluation of the river or stream segment in their final plans.

A planning group may also recommend that a site is unique for reservoir construction based upon the following criteria:

- If site-specific reservoir development is recommended as a specific water management strategy or in an alternative long-term scenario in an adopted regional water plan
- If location, hydrology, geology, topography, water availability, water quality, environmental, cultural, and current development characteristics, or other pertinent factors make the site uniquely suited: (a) for reservoir development to provide water supply for the current planning period; or (b) to meet needs beyond the 50-year planning period

2.1 TWDB legislative recommendations

Based on planning groups' recommendations and other policy considerations, the TWDB makes the following recommendations for consideration by the Texas Legislature.

2.1.1 Legislative Recommendation 1: Unique stream segment designation

The legislature should designate the five river or stream segments of unique ecological value as recommended by the 2026 regional water plans (Alamito Creek, Black Cypress Bayou, Black Cypress Creek, Pecan Bayou, and Terlingua Creek) for protection under Texas Water Code § 16.051(f).

Summary of the recommendation

Pursuant to Texas Water Code § 16.051(e) and § 16.053(e)(6), state and regional water plans shall identify river and stream segments of unique ecological value that they recommend for protection. By statute, this designation solely means that a state agency or political subdivision of the state may not finance the construction of a reservoir in a specific river or stream segment that the legislature has designated as having unique ecological value (TWC § 16.051(f)). Such designations are determined by the legislature.

The recommendation is for the following five stream segments:

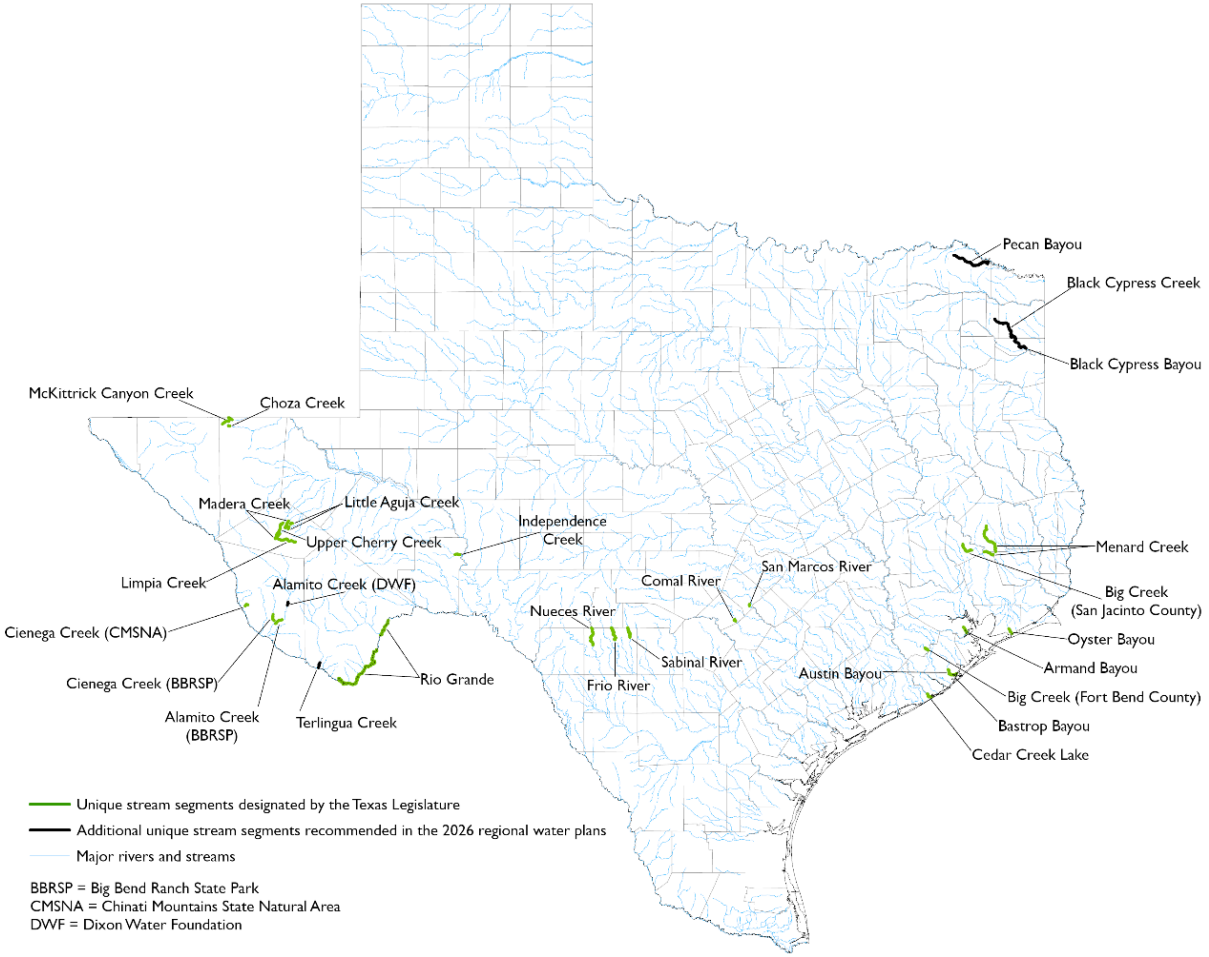
- **Alamito Creek** in Presidio County solely within the boundary of the Alamito Creek Preserve managed by the Dixon Water Foundation—approximately a 3.5-mile stream segment.
- **Black Cypress Bayou** in Marion and Cass counties from the confluence with Big Cypress Bayou in south central Marion County upstream to the confluence of Black Cypress Creek east of Avinger in southern Cass County.
- **Black Cypress Creek** in Cass and Morris counties from the confluence with Black Cypress Bayou east of Avinger in southern Cass County upstream to its headwaters located 4 miles northeast of Daingerfield in the eastern part of Morris County.
- **Pecan Bayou** in Red River County from 2 miles south of Woodland in northwestern Red River County east to the Red River, approximately 1 mile west of the eastern Bowie County line.
- **Terlingua Creek** in Brewster County solely within the boundary of Big Bend National Park—approximately a 5-mile stream segment. The reach of Terlingua Creek recommended as an ecologically unique stream segment is only that portion of the creek located within Big Bend National Park. Terlingua Creek transects Big Bend National Park from the confluence with the Rio Grande to the Big Bend National Park boundary located about 5 miles north of the river.

As put forward in the 2026 North East Texas (Region D) Regional Water Plan, the recommendation for designation of the Black Cypress Bayou, Black Cypress Creek, and Pecan Bayou stream segments is conditioned upon legislation containing the following clarifying provisions:

1) A provision affirming that the only constraint that may result from the ecologically unique stream segment designation is that constraint described in the Texas Water Code § 16.051(f), which prohibits a state agency or political subdivision of the state from financing the construction of a reservoir in a designated stream segment.
2) A provision stating that the constraint described in Texas Water Code § 16.051(f) does not apply to a weir, diversion, flood control, drainage, water supply, or recreation facility currently owned by a political subdivision.
3) A provision stating that this designation will not constrain the permitting, financing, construction, operation, maintenance, or replacement of any water management strategy recommended or designated as an alternative to meet projected needs for additional water supply in the 2026 Regional Water Plan for the North East Texas Water Planning Region.
4) A provision affirming that this designation is not related to the "wild and scenic" federal program or to any similar initiative that could result in "buffer zones," inadvertent takings, or overreaching regulation.
5) A provision stating that all affected landowners shall retain all existing private property rights.
6) A provision recognizing that the unique ecological value of the designated segment is due, in part, to the conscientious, voluntary stewardship of many landowners on the adjoining properties.

Senate Bill 3, passed by the 80th Texas Legislature, designated 19 stream segments recommended in the 2007 State Water Plan, and the 84th Texas Legislature designated an additional five segments from the 2012 State Water Plan with passage of House Bill 1016. Some of these designated stream segments included multiple, separate reaches of the same stream (Figure 2-2).

Figure 2-2. Unique stream segments previously designated by the Texas Legislature and additional recommended segments



2.1.2 Legislative Recommendation 2: Unique reservoir site designation

The legislature should designate for protection under Texas Water Code § 16.051(g) four sites of unique value for constructing reservoirs as recommended in the 2026 regional water plans: Coryell County Off-Channel Reservoir, Millers Creek Off-Channel Reservoir (also known as Lake Creek Reservoir), George Parkhouse Reservoir I (South), and George Parkhouse Reservoir II (North).

Summary of the recommendation

Pursuant to Texas Water Code § 16.051(e) and § 16.053(e)(6), the state and regional water plans shall identify sites of unique value for reservoir construction. This authority also relates to the state's general interest in reservoir development as codified in the Texas Constitution:

> "It is hereby declared to be the policy of the State of Texas to encourage the optimum development of the limited number of feasible sites available for the construction or enlargement of dams and reservoirs for conservation of the public waters of the state, which waters are held in trust for the use and benefit of the public, and to encourage the optimum regional development of systems built for the filtration, treatment, and transmission of water and wastewater." – Texas Constitution, Article 3, § 49-d(a)

Texas Water Code § 16.051(g) gives the legislature authority to designate a site of unique value for constructing a reservoir. By statute, once a reservoir site is designated for protection, a state agency or political subdivision of the state may not obtain a fee title or an easement that would significantly prevent the construction of a reservoir. Without such designation, actions by state or local government entities could compromise the viability of these sites for future reservoir development.

Not all regions of Texas have access to the same types of water resources or have them in similar proportion. For many water users, development of reservoirs is an important means for providing large volumes of renewable, affordable water supply. As evidenced in the 2026 regional water plans and this state water plan, surface water resources, including the development of additional major reservoirs, will continue to play an essential role in Texas' water plans throughout and beyond the current planning horizon.

Approximately 36 percent of all recommended water management strategy supplies in 2080 are associated with surface water, the majority of which is associated with existing and future reservoirs. Meeting a significant share of Texas' future water needs by developing the most promising reservoir sites requires a stable, long-term commitment to the protection of these sites.

Designation of sites of unique value for reservoir construction by the Texas Legislature provides an important measure of protection for these sites for future development. While the legislature's designation of unique sites does prevent some actions that could threaten the development of a reservoir, it does not guarantee protection of the sites, for example, against federal actions.

Prior to the 80th Texas Legislature, three unique reservoir sites had been previously designated: the 76th Texas Legislature designated Allens Creek Reservoir with the passage of Senate Bill 1593; the 77th Texas Legislature designated Post Reservoir in 2001 with House Bill 3096; and the 78th Texas Legislature designated Lake Columbia in 2003 with the passage of Senate Bill 1362 (Figure 2-3).

With the passage of Senate Bill 3 in 2007, the 80th Texas Legislature designated an additional 19 reservoir sites with a provision whereby the designations would expire on September 1, 2015, "unless there is an affirmative vote by a proposed project sponsor to make expenditures necessary in order to construct or file applications for permits required in connection with the construction of the reservoir under federal or state law" (Texas Water Code § 16.051(g-1)). With the passage of House Bill 1042 in 2015, the 84th Texas Legislature re-designated the Lake Ringgold reservoir site as unique.

The Texas Legislature should consider designating the following four additional reservoir sites for protection: Coryell County Off-Channel Reservoir, Millers Creek Off-Channel Reservoir, George Parkhouse Reservoir I (South), and George Parkhouse Reservoir II (North) (Figure 2-4). These reservoir sites were recommended for designation in the 2026 regional water plans and have never been previously designated by the legislature as having unique value for the construction of reservoirs.

Figure 2-3. Unique reservoir sites previously designated by the Texas Legislature

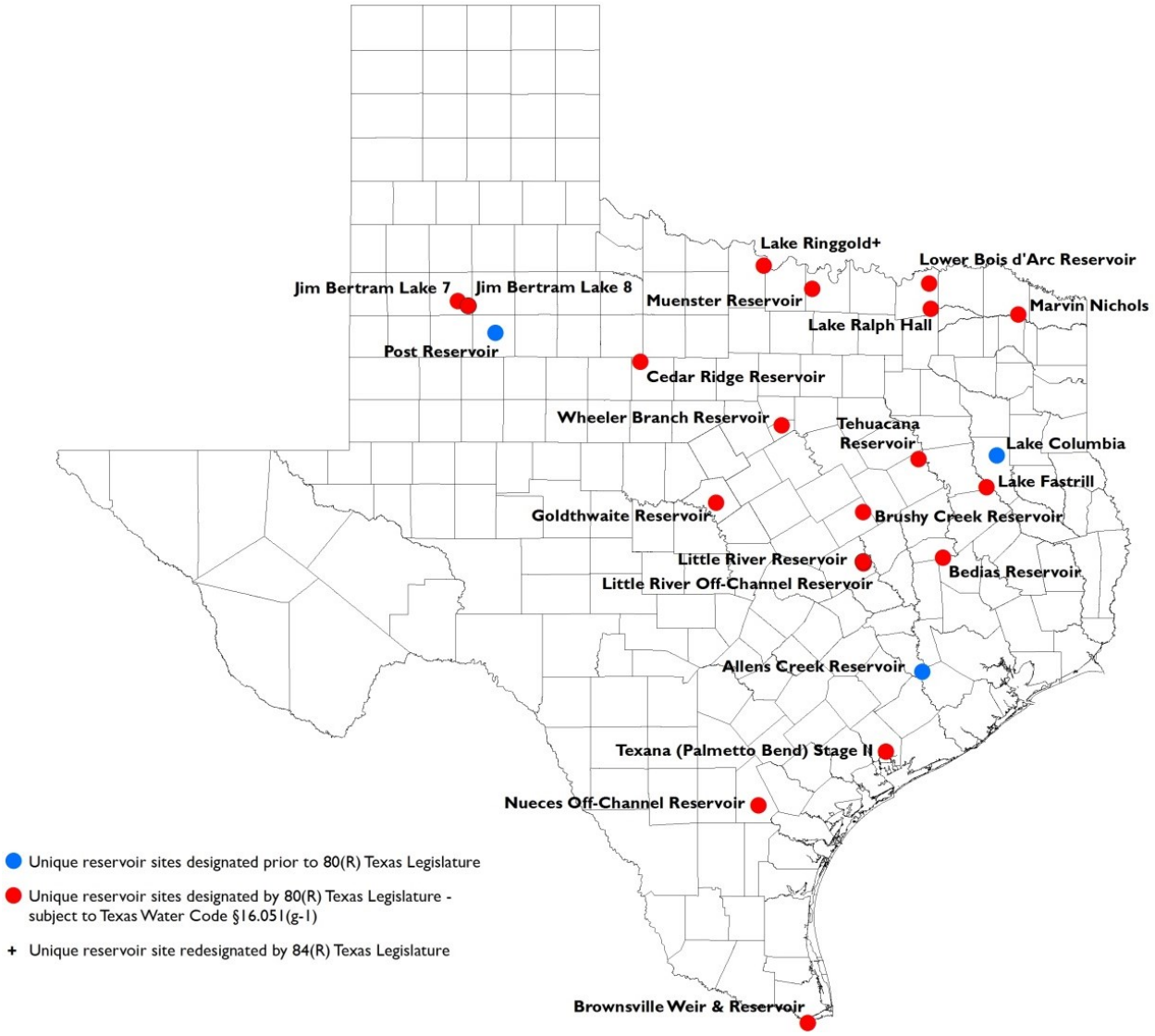
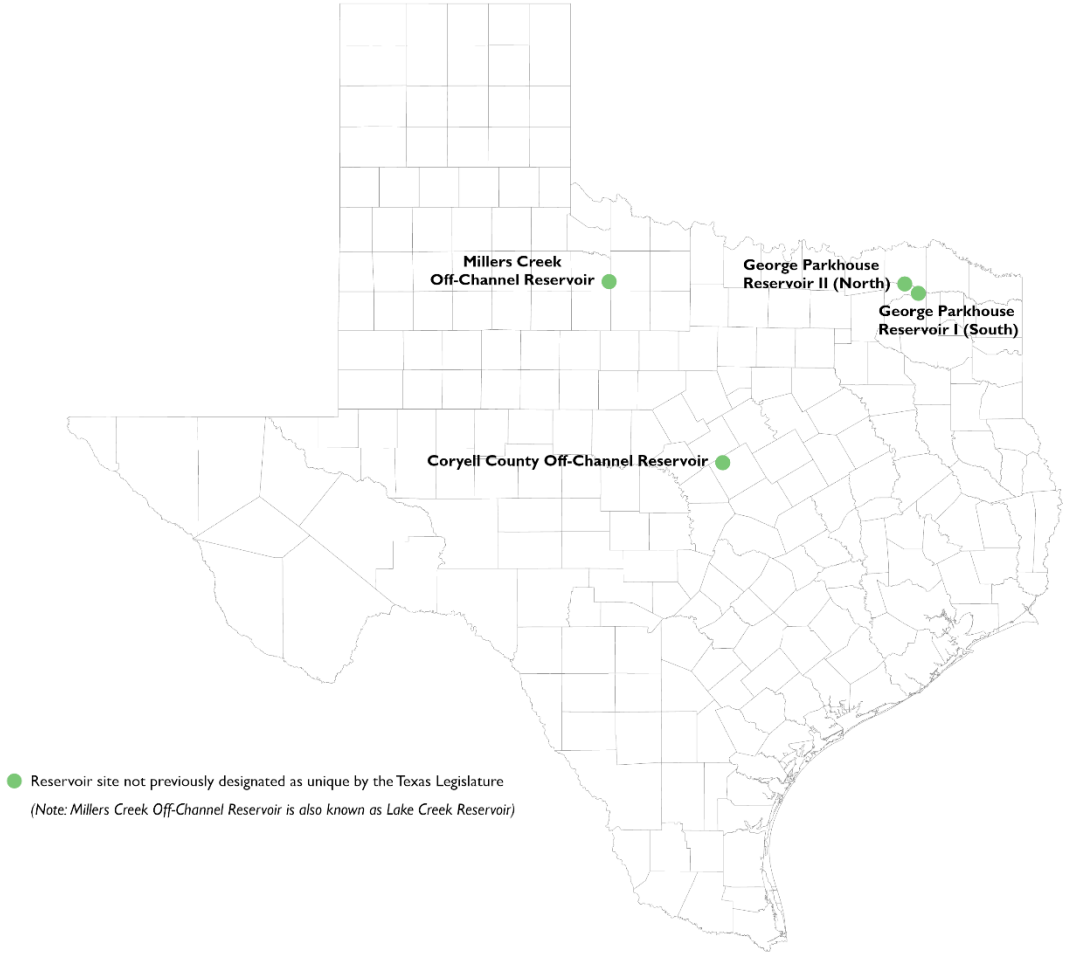


Figure 2-4. Reservoir sites recommended for designation as unique



2.1.3 Legislative Recommendation 3: Remove Interregional Planning Council requirements

The legislature should consider repealing Texas Water Code § 16.052 to eliminate the Interregional Planning Council, whose functions have become largely duplicative of more recent legislative mandates regarding TWDB coordination efforts. Removing this requirement would reduce administrative burden and align the planning process with newer directives focused on multi-regional water supply development and financial assistance programs.

Summary of the recommendation

Since its creation by the 86th Legislature, two councils have been appointed and disbanded upon adoption of the state water plans. Recommendations from the councils to the TWDB, including those regarding interregional coordination, have already been implemented in regional water planning administrative rules (31 TAC §§ 357.12 and 357.50) regarding interregional coordination by planning groups during the development of their regional water plans and documentation of those efforts. Council recommendations to the Legislature remain primarily related to funding/appropriations and it is noted that the Interregional Planning Council does not have any statutory responsibilities associated with declaring, identifying, or resolving interregional conflicts.

The newer legislative mandates from the New Water Supply for Texas Fund and water supply conveyance coordination responsibilities make the Council's role in facilitating dialogue on regional strategies largely duplicative of the latest legislative implementation efforts made by the TWDB. The TWDB will continue to convene, roughly quarterly, regional water planning group chair meetings to discuss regional water planning processes and issues. However, the ongoing benefits of the Interregional Planning Council have diminished significantly, especially when weighed against the effort required to maintain this administrative body.

2.1.4 Legislative Recommendation 4: Improve resources and clarity to assist groundwater conservation districts in establishing desired future conditions policies (three parts)

1) *The Legislature should consider providing resources and direction to the TWDB to develop and provide a set of regional predictive groundwater modeling scenarios (such as maintaining average aquifer conditions, high-stress conditions with low recharge and high pumping, and low-stress conditions with high recharge and low pumping) to groundwater management areas for consideration in joint groundwater planning, ahead of each groundwater planning round to support more informed decision-making by groundwater conservation districts that are often lacking the resources to produce these scenarios.*
2) *The Legislature should consider requiring groundwater conservation districts to consider predictive modeling scenarios provided by the TWDB in joint planning.*
3) *The Legislature should consider removing the "total estimated recoverable storage" from desired future condition consideration requirements and references to "total recoverable storage capacity" in Texas Water Code Chapter 36. Recoverable storage volumes are conceptual and not a broadly practical measure of groundwater recoverability and have, as a result, introduced unreasonable expectations and confusion.*

Summary of the recommendation

Enabling the TWDB to provide a set of additional, standardized modeling analyses as a starting point to inform joint groundwater planning would: establish a consistent, shared baseline of future groundwater scenarios; enable groundwater conservation districts to better focus their limited resources on refining local considerations rather than attempting to build their own scenarios from scratch; and strengthen the linkage between local decision-making and regional groundwater planning by ensuring desired future conditions are informed by a broader understanding of potential hydrologic and demand conditions.

Additionally, for most aquifers across the state, metrics like the total estimated volume of groundwater within an aquifer (total aquifer storage) and the total estimated recoverable storage (TERS) suggest that an aquifer is theoretically capable of producing much higher volumes of water than what is possible to practically recover on a regional water supply basis. This can distort the planning process and stakeholder expectations as groundwater conservation districts make policy decisions (desired future conditions) that result in groundwater availability (modeled available groundwater).

2.1.5 Legislative Recommendation 5: Require consideration of drought conditions in development of desired future conditions

The legislature should consider requiring all groundwater conservation districts to explicitly evaluate drought conditions for each aquifer in establishing desired future conditions, and document in the desired future condition explanatory report how drought conditions were considered in joint planning.

Summary of the recommendation

Considering drought scenarios for all aquifers in joint groundwater planning should better align groundwater management with the state's water planning process and, importantly, more explicitly acknowledge anticipated fluctuations in pumping between wet and dry periods. The outcome being to ensure that groundwater planning adequately considers management of aquifers under drought conditions while better informing the drought-driven regional and state water supply planning processes.

2.1.6 Legislative Recommendation 6: Establish a single, statewide groundwater well-identification system

The legislature should consider adopting a statewide policy that requires the use of a common well-identification system—for organizing existing data and new well data that is already normally collected—across all groundwater-related databases; and provide resources to TWDB to create and maintain a centralized and publicly available well inventory database that can be used to link together all Texas' existing groundwater databases through a common well-identification system. This recommendation will facilitate more seamless and efficient data exchanges and improve groundwater management and decision-making, while having no impact on private well-owners.

Summary of the recommendation

The TWDB is required by Texas Water Code § 16.012 to collect and disseminate groundwater data. This section also requires all state entities (including institutions of higher education) to cooperate with the TWDB in developing a coordinated, efficient, and effective statewide water resource data collection and dissemination network. Texas groundwater data resides in multiple databases, including the TWDB Groundwater Database, the Submitted Drillers Report Database—which is a cooperative database between the Texas Department of Licensing and Regulation and the TWDB—the TWDB Water Use Survey Database, the Texas Commission on Environmental Quality Public Water Supply Database, and numerous other databases maintained by groundwater conservation districts.

This data is not shared or cross-examined for quality control purposes. Collectively, these databases support water resource decision-making across the state. However, the fragmented nature of these data creates challenges for consolidation, sharing, and analyses because of a lack of a complete and interoperable statewide well inventory that could easily link data across all these sources. This critical gap limits the ability to fully leverage the enormous amount of existing data that has been collected for planning and management and new data collection efforts, which can reduce confidence in future water availability estimates and unnecessarily increase the work required to carry out long-term planning efforts.

Creating a simple data-sharing system—based on common well-identification numbers—would allow groundwater conservation district pumping, water-level, and water-quality data to link seamlessly with other water-related database records. This would make information from multiple agencies compatible and comparable, significantly improving the overall quality of groundwater data in Texas.

2.1.7 Legislative Recommendation 7: Socioeconomic analysis tool to support joint groundwater planning

The legislature should consider providing resources to the TWDB to develop a standardized socioeconomic impact analysis tool for use, at the discretion of the groundwater management areas, in joint groundwater planning to support the assessment of socioeconomic impact considerations required for establishing desired future conditions.

Summary of the recommendation

Developing general guidance and a uniform but flexible socioeconomic impact analysis tool would promote statewide consistency and, ideally, improve desired future condition decision-making, including through improved scenario comparisons. Investing in contracting for development of a single, standardized socioeconomic impact evaluation tool would be more efficient than requiring individual groundwater management areas to continue to develop their own methods or rely on unsuitable alternatives. This approach would strengthen the joint groundwater planning process and ensure more consistent and appropriate consideration of socioeconomic factors across Texas.

2.1.8 Legislative Recommendation 8: Redefine the role of the TWDB in interregional conflict identification and resolution

The legislature should consider defining an interregional conflict in the regional water planning process specifically and solely as an overallocation of planned use of water supply. Under the current planning process, recurring conflicts based on 'potential significant adverse impacts' are problematic and require detailed technical information that is typically only available during the permitting phase—not at the planning stage. Making such determinations within the long-term state-level planning process is premature and risks permanently eliminating viable water supply projects. A clear statutory definition focused exclusively on overallocation will ensure consistency, protect critical water supply options, and maintain the integrity and focus of the planning process.

Summary of the recommendation

The TWDB is a non-regulatory agency required to act as a tribunal during the interregional conflict process. The TWDB does not have staff, facilities, or other resources for handling contested matters. As such, interregional conflict identifications and resolutions are a poor fit for the TWDB because it is outside the agency's normal areas of competence and expertise. Limiting the role of the TWDB role to an overallocation-specific analysis is appropriate for the planning-level work conducted by this non-regulatory agency.

2.1.9 Legislative Recommendation 9: Conduct alternative versions of socioeconomic analyses of water shortage impacts

The legislature should consider providing resources to the TWDB to develop an alternative socioeconomic impact analysis model and tool that better reflects the long-term implications of not implementing the state water plan, particularly in high-growth areas. The model should be capable of simulating the cumulative, long-term impacts of persistent water shortages, such as building moratoriums and other economic shifts that would result from failure to implement water supply projects associated with population growth. It should incorporate dynamic economic factors that the current simplified static analysis cannot model.

Summary of the recommendation

Although the current socioeconomic impact assessment made by the TWDB is comprehensive, it does not account for several dynamic factors, including long-term shortages related to growth or potential no growth outcomes, such as building moratoriums and loss of business in rapidly growing areas. Developing enhanced analytical tools would provide a fuller understanding of risks associated with insufficient water supplies under both population growth and drought conditions. Dynamic socioeconomic modeling would allow planners and policymakers to better understand—and communicate to the public—the cascading economic consequences of shortages and to make better informed decisions about investments in water infrastructure.

2.1.10 Legislative Recommendation 10: Remove requirement of infeasible strategy assessment amendments

The legislature should consider saving regional water planning groups significant time and resources by removing the requirement in Texas Water Code §16.053(h)(10) that planning groups amend their previously adopted plans to remove any newly identified infeasible strategies or projects. Any projects identified as infeasible since adoption of the previous plan will still be addressed—by being removed or modified (typically by adjusting timing)—in the next regional plan to ensure feasibility.

Summary of the recommendation

While the original requirement prompted productive discussions about project timing, in practice the resulting amendments have largely focused on shifting project online dates rather than removing projects. At the same time, the formal amendment process places a substantial administrative burden on regional water planning groups and the TWDB and consumes limited planning grant resources, which would be more effectively directed toward developing their next regional plans, in which feasibility updates are already incorporated as part of the five-year adaptive planning cycle.

Removing the statutory requirement to amend regional water plans to remove identified infeasible strategies will reduce significant, unnecessary workload. The planning process will still preserve the requirement that planning groups review their previously adopted regional water plan and identify infeasible strategies or projects in accordance with the definition of infeasible strategies and projects provided for this purpose in Texas Water Code § 16.053(h)(10).

3 Drought and drought response in Texas

Quick facts,

Though the 1950s drought remains the most significant statewide drought observed in Texas' history, more recent droughts of record have occurred at sub-basin scales. Four water planning regions confirmed new sub-basin droughts of record in this plan. Two regions reported they are currently experiencing a new drought of record.

From 2021–2025, the state experienced record-setting heat and persistent drought conditions that triggered several major water supply impacts across the state.

- *In July 2022, extreme drought led to the Lower Colorado River Authority curtailing interruptible water for rice farmers and the Texas Commission on Environmental Quality issuing negative allocations in the Lower Rio Grande Valley (LCRA, 2022; TCEQ 2022).*
- *On July 26, 2022, drought conditions covered 97 percent of the state, the most since 2011 (NDMC, 2026).*
- *Persistent multi-year hydrological drought pushed reservoir storage in the Guadalupe, Nueces, Rio Grande, and San Antonio river basins to record lows by 2024, with the Nueces Basin remaining at record lows into 2026 (TWDB, 2026).*
- *In May 2025, historically low aquifer levels prompted the Edwards Aquifer Authority to implement Stage 5 restrictions in San Antonio for the first time (EAA, 2025).*

The Texas Water Development Board (TWDB) provides a wide range of tools, datasets, and research initiatives to help Texans track and prepare for drought on its drought resources webpage (www.twdb.texas.gov/drought).

Texas has recorded significant droughts dating back to the 1800s (TBWE, 1959), and recurrent drought conditions have shaped the evolution of the state's water laws, financing programs, and the conservation and drought-management practices implemented locally. The state relies on the 1950s drought as the statewide drought of record, but this benchmark is refined using more recent basin-specific droughts of record where local hydrologic conditions have exceeded the severity of the 1950s event. Together, these historic droughts form the fundamental basis for statewide water planning under the principle that preparing for a repeat of intense drought conditions that have already occurred will improve the state's resilience to future events. In practice, regional water planning groups also consider more recent and more intense regional- or basin-specific droughts as updated hydrologic data and water-use information are incorporated into relevant datasets and surface-water availability models.

This chapter describes how drought develops and is measured, reviews historical and emerging droughts of record across the state, and summarizes drought trends. It also outlines drought planning and drought response efforts at local, regional, and state levels and highlights ongoing research and data initiatives that help Texas prepare for, manage, and respond to drought conditions. The information compiled in the regional water plans and presented here serves as the drought response component of the state water plan.

3.1 Understanding drought

To understand how drought affects Texas and shapes statewide planning, it is first important to understand what drought is, how it develops, and how its severity is measured. Droughts are extended periods of abnormally dry weather that cause significant water shortages. Drought develops through the interplay of precipitation, temperature, and evapotranspiration and the subsequent effects on water in soils, rivers, lakes, and aquifers, as well as the feedback on water demand (TWDB, 2022). Unlike other types of weather disasters, drought usually develops over months or even years. Flash droughts can occur when lower-than-normal precipitation combines with unusually high temperatures and strong winds resulting in relatively rapid onset or sharp intensification of drought. Hydrological droughts of

record—the events that most severely affect water supply—result from sustained, multi-year drought conditions rather than brief dry periods, regardless of intensity.

Droughts can have far-reaching impacts, including

- depleted water supplies;
- increased wildfire risk;
- reduced agricultural production;
- heat-related declines in water quality;
- impacts to fish and wildlife;
- diminished ecosystem services, such as filtration by freshwater mussels, increased tree mortality (caused by heat stress, wildfire, or heightened vulnerability to insect infestations [Lawal et al., 2024 and references therein]);
- higher energy use for cooling and water pumping; and
- physical damage to water infrastructure, such as water line breaks, increased treatment costs for alternative water supplies, and higher industrial production costs.

With this foundation, drought can be further categorized into several types, each of which captures different physical conditions and impacts.

3.1.1 Types of drought

There are several common drought types: meteorological, hydrological, agricultural, ecological, and socioeconomic. Each drought type is defined by specific drought impacts. The first four drought types are defined by physical, hydrometeorological, or biological indicators, while the fifth reflects drought impacts on society (TWDB, 2022). The focus of regional water planning is *hydrological drought* as it represents impacts to water supplies.

Meteorological drought begins with a period of abnormally dry weather resulting in less than the long-term average rainfall for that period. It does not necessarily impact water supply.

Hydrological drought is a period of below-average streamflow and water volume in reservoirs and aquifers that results in reduced water supplies and is the focus of regional water planning.

Agricultural drought often follows or coincides with meteorological drought and can appear suddenly and cause rapid impacts to agriculture—especially dryland farming. Precipitation shortages and increased evaporation reduce soil moisture, which decreases crop or range production and increases irrigation demands. This type of drought often leads to drought disaster declarations and, in many cases, is an indicator of an impending hydrological drought.

Ecological drought occurs under similar conditions as agricultural drought, where deficits in water availability cause impacts to biodiversity, natural habitats, and ecosystem functions and the services they provide.

Socioeconomic drought occurs when unmet physical water needs affect the health, safety, and quality of life of the general public or when the drought affects the supply and demand of an economic product.

Identifying and describing drought types is only the first step. Measuring drought severity requires tools and indices that capture how conditions evolve over time and across landscapes.

3.1.2 Measuring drought status and severity

Measuring drought is complex. Not only is it difficult to identify the beginning and end of a drought, but the impacts also vary greatly by location and type. While there is no single measure of drought, there

are some common tools—with varying geographic scales—that can be used to assess the status and severity of drought. Because drought develops differently across time and place, using multiple indices gives Texans a more complete picture of changing conditions.

The U.S. Drought Monitor is a composite index commonly used in Texas to assess drought status. Established in 1999, this weekly map of drought conditions is jointly produced by the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center. The U.S. Drought Monitor uses a composite index incorporating measurements of climatic, hydrologic, and soil conditions, as well as reported impacts and observations from contributors throughout the country. The U.S. Drought Monitor uses a five-category system, from Abnormally Dry (D0) conditions to Exceptional Drought (D4).

A variety of other drought indices, each based on different parameters, are used to assess the severity of drought. The state's Drought Preparedness Council uses several indices to assess the severity of drought in Texas, including the U.S. Drought Monitor, 6-month Standardized Precipitation Index, Palmer Drought Severity Index (PDSI), Evaporative Demand Drought Index, volumetric soil moisture, percent of normal rainfall, Keetch-Byram Drought Index, and the Quick Drought Response Index. The most recent U.S. Drought Monitor and drought indices are available on the Water Data for Texas Interactive Drought Dashboard (waterdatafortexas.org/drought).

TWDB resources for monitoring drought conditions and impacts

The TWDB provides a suite of tools that integrate drought data and help Texans track emerging conditions in real time. The Water Data for Texas Interactive Drought Dashboard is a central resource for understanding drought conditions across the state. It brings together current information on rainfall, temperature, streamflow, and soil moisture, along with high-resolution drought indices such as the Keetch Byram Drought Index, QuickDRI, the Standardized Precipitation Index, and the Palmer Drought Severity Index. The site offers tools to help Texas interpret changing conditions. Together, these resources give users an up-to-date picture of drought conditions across the state. To learn more, visit the Water Data for Texas Interactive Drought Dashboard (waterdatafortexas.org/drought).

Palmer Drought Severity Index (PDSI)

Among the many indices available for Texas, the PDSI is one of the most widely used long-term indicators of how wet or dry conditions are compared to normal. It combines rainfall, temperature, and soil water-holding capacity to indicate whether the land has been gradually drying or becoming wetter over weeks to months. PDSI values typically range from -6 to +6, with negative values indicating dry conditions and positive values indicating wet conditions. The index can be calculated at multiple geographic scales, including state, climate division, and county, and is a useful tool for examining drought duration and intensity.

3.2 Historical and potential new droughts of record

Understanding how drought is measured sets the stage for examining Texas' historical droughts and identifying when new droughts of record emerge. Texas has experienced repeated periods of intense drought that have shaped the state's water resources, economy, and long-term planning. Among these events, the drought of the 1950s remains the most intense *statewide* drought ever recorded, and it continues to serve as an overarching benchmark for water planning today. However, more recent events—particularly the 2010–2014 drought—rival the 1950s drought in intensity, duration, and statewide effect. As drought events recur and new hydrologic data become available, planning groups can reassess and reevaluate droughts of record based on new information.

3.2.1 Historical droughts

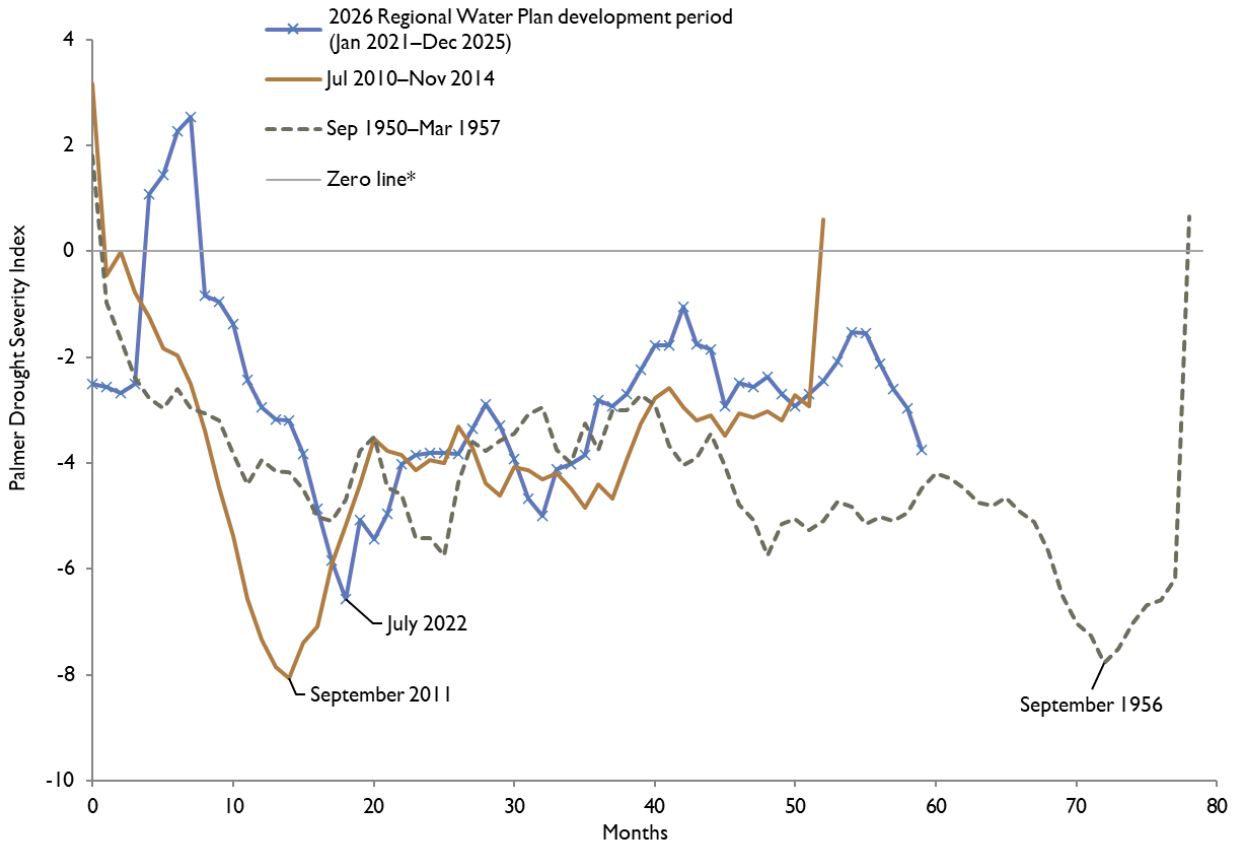
A review of long-term records shows how past droughts have varied in intensity and duration across the state. The drought of the 1950s is the most significant drought recorded in Texas' history (dating back to 1895 records) in terms of geographic extent, duration, and intensity. As measured by PDSI, this drought lasted 77 months, from October 1950 to February 1957 (NOAA, 2026). Based on the same index, the 2010–2014 drought ranks as the second-worst and second-longest statewide drought, lasting 51 months from August 2010 to October 2014.

Occurring within the 2010–2014 drought, 2011 ranks as the worst one-year drought on record. PDSI indicated a record-low measurement in September 2011, following the driest 12-month period of statewide precipitation on record. Conditions in that year were so intense that it continues to be utilized in this state water plan as the best representative "dry year" for most water demand projections discussed in Chapter 4. While historical droughts provide essential context, recent conditions demonstrate how ongoing hot and dry periods continue to challenge water supplies.

3.2.2 Recent drought conditions, 2021–2025

Between November 2014 and August 2021, the PDSI fluctuated between wetter-than-normal periods and drought. Texas entered persistent drought in late 2021, and by August 2022, nearly the entire state was in drought (NDMC, 2026). Statewide monthly average PDSI values have since remained below zero (Figure 3-1). The lowest index value (dry conditions), occurring in July 2022, approaches the severity of 2011 drought conditions and is more severe than some periods within the 1950s drought. While conditions occasionally improved, drought persisted and repeatedly intensified in 2023 and 2025—particularly in Central Texas, the Panhandle, and the Rio Grande Basin.

Figure 3-1. Statewide average Palmer Drought Severity Index (NOAA, 2026)



** An index value of zero indicates normal conditions, while negative numbers indicate drought, and positive numbers indicate above normal moisture.*

Escalating heat and persistent drought in Texas

Record-setting heat is one of the most notable characteristics of drought conditions in Texas from 2021 to 2025. For the state as a whole and for most counties, this period was the hottest five-year duration based on data going back to 1895. The summers of 2023 and 2022 were the second and third hottest ever recorded in Texas, based on statewide average temperatures, positioned just behind the record-breaking summer of 2011.

Record temperatures and persistent drought conditions led to major water supply impacts across Texas. In July 2022, extreme drought led to the Lower Colorado River Authority curtailing interruptible water for rice farmers and the Texas Commission on Environmental Quality issuing negative allocations in the Lower Rio Grande Valley (LCRA, 2022; TCEQ 2022). Persistent multi-year drought pushed reservoir storage in the Guadalupe, Nueces, Rio Grande, and San Antonio river basins to record lows by 2024, with the Nueces Basin remaining at record lows into 2026 (TWDB, 2026). In May 2025, historically low aquifer levels prompted the Edwards Aquifer Authority to implement Stage 5 restrictions in San Antonio for the first time (EAA, 2025).

3.2.3 Confirmed and potential new droughts of record

While the statewide drought of the 1950s is considered the benchmark drought for state water planning, regional water planning groups may also identify additional droughts of record that have affected water supplies within their planning areas, such as droughts at the sub-basin or individual water source level. Planning groups primarily identify additional droughts of record based on evaluations of surface water sources, although a limited number of regions also report droughts of record specific to groundwater sources (Table 3-1). As Table 3-1 suggests, droughts of record across Texas may be increasingly diverse in timing and geography, underscoring that water supply vulnerability is not defined by a single historic event, but by region-specific hydrologic conditions and evolving climate stressors.

For surface water sources, droughts of record are determined through water availability models developed and maintained by the Texas Commission on Environmental Quality. These models are based on historical naturalized flows (i.e., flows without human influence) for time periods that vary by river basin. Most models begin in the 1930s or 1940s and extend through to the mid- to late-1990s (Table 3-2).

Until recently, such notable drought years as 2006, 2009, and 2011 were not included in the naturalized flow record of water availability models. During the 2022 water planning cycle, some regional water planning groups had access to recently updated water availability models for the Colorado and Sulphur river basins while others relied on making updates to the naturalized flows at select control points. In doing this, they were able to use the water availability models to evaluate the impact of the 2010–2014 drought at select locations. As summarized in the 2022 State Water Plan and detailed in the respective 2021 regional water plans, new droughts of record were confirmed for portions of the following river basins and planning regions:

- Canadian River Basin (Region A)
- Colorado River Basin (Regions F and K)
- Nueces River Basin (Regions L and N)
- Red River Basin (Regions A and B)
- Sulphur River Basin (Region C)
- Upper portions of the Brazos River Basin (Region G)

Since then, the Texas Legislature charged the Texas Commission on Environmental Quality with updating and releasing updated water availability models that include updated naturalized flow datasets for the Brazos, Neches, Red, and Rio Grande river basins. Regions utilized these updated water availability models in developing their 2026 regional water plans. Regions C, D, I, and M confirmed new droughts of record for some portions of their planning area as compared to what was considered for the 2021 regional water plans. Regions A and F continue to report that most or all reservoirs in their respective regions are currently experiencing a new drought of record.

Some regions, including Regions M and N, noted that recent drought conditions may represent new droughts of record, though confirmation is not yet possible until the naturalized flow datasets for all water availability models within their region are extended to the current period. Several regional planning groups recommend that the Texas Commission on Environmental Quality provide further updates to the water availability models to capture the recent hydrological record. Figure 3-2 demonstrates the period of record for each water availability model relative to the planning horizon for the 2027 State Water Plan. While the water availability models capture the state's most significant historical drought in terms of geographic extent, duration, and intensity, many models do not capture more recent localized droughts of record, which are important for assessing water availability across the 50-year planning horizon.

For groundwater sources, Regions A and F reported droughts of record based on assessments of annual precipitation and regional PDSI data, with the 2011–2015 drought serving as the drought of record for Region A and the 1950s drought remaining the drought of record for Region F.

Confirming new droughts of record helps to ensure that water supply planning efforts consider the most extreme hydrologic conditions experienced. This updated information helps planners develop strategies to reliably meet water demands based on a repeat of historic worst-case droughts.

Table 3-1. Regional water planning area droughts of record

Region	Description
A	All major reservoirs in the region are currently in a drought of record. For run-of-river supplies, the drought of record is 2011 based on minimum annual streamflow. For groundwater sources, the drought of record is the 2011–2015 drought based on annual precipitation and PDSI.
B	The 1950s drought is the drought of record in the southeastern portion of the region. Elsewhere, the drought of record varies, beginning between 1993 and 2010 and extending through 2015 or 2016, depending on location.
C	The 1950s drought is the drought of record for most of the region. The updated Red River Water Availability Model confirmed 2010–2015 as a new drought of record in parts of the Red River Basin.
D	The 1950s and 2002–2006 are the droughts of record for most of the region. The updated Sulphur River Basin Water Availability Model confirmed new droughts of record for Lake Wright Patman (2005–2006), Lake Chapman (2010–2015), and Lake Sulphur Springs (2003–2007).
E	The 1950s drought is the drought of record for water supplies in the region.
F	Most reservoirs in Region F are currently in a drought of record. The droughts of record for several reservoirs in the region began in the 1990s and early 2000s and lasted until 2000, 2014, or 2016. For run-of-river supplies, the drought of record is 2011–2015, except for the Llano River, which is the 1950s drought based on minimum annual streamflow. For groundwater sources, the drought of record is the 1950s drought based on annual precipitation and PDSI.
G	The 1950s drought is the drought of record for the middle and lower portions of the region. The 2008–2015 drought is the drought of record for the upper portion of the region.
H	The 1950s drought is the drought of record for water supplies in the region.
I	Four droughts of record apply across the region: the 1950s drought in the western and central areas; a mid-1960s drought in eastern and north central areas; a late 1960s to early 1970s drought in north central areas; and an early 2010s drought in the north central portion of the region. The updated Neches Water Availability Model confirmed the early 2010s drought as a new drought of record this cycle.
J	The 1950s drought is the drought of record for water supplies in the region.
K	The 2007–2016 drought is the drought of record for water supplies in the region.
L	The drought of record is the 1950s drought for the Guadalupe-San Antonio River Basin and the 1990s drought for the Nueces River Basin.
M	The updated Rio Grande Water Availability Model confirmed a new drought of record spanning the late 1990s through the early 2000s.
N	The 2007–2013 drought is the drought of record. Based on conditions as of February 2024, ongoing drought conditions indicate the region may be entering a new drought of record.
O	The droughts of record for water supplies in the region are the 1950s drought and the 2010–2015 drought, depending on geographic area, reservoir, or water source.
P	The 1950s drought is the drought of record for water supplies in the region.

** Additional information on droughts of record for each planning area can be found in the 2026 regional water plans, which are available online at www.twdb.texas.gov/waterplanning/rwp/plans/2026.*

Table 3-2. Historical period of record for each river basin water availability model

River basin	Start year	End year
Brazos and San Jacinto Brazos Coastal	1940	2018
Canadian	1948	1998
Colorado River and Brazos-Colorado Coastal	1940	2016
Colorado-Lavaca Coastal	1940	1996
Cypress Creek	1948	1998
Guadalupe and San Antonio	1934	1989
Lavaca	1940	1996
Lavaca-Guadalupe Coastal	1940	1996
Neches	1940	2018
Neches-Trinity Coastal	1940	1996
Nueces	1934	1996
Nueces-Rio Grande Coastal	1948	1998
Red	1948	2018
Rio Grande	1940	2018
Sabine	1940	1998
San Antonio-Nueces Coastal	1948	1998
San Jacinto	1940	1996
Sulphur	1940	2017
Trinity	1940	1996
Trinity-San Jacinto Coastal	1940	1996

Figure 3-2. Period of record for Texas water availability models relative to the 2027 State Water Plan planning horizon

Understanding basin-specific droughts of record

Hydrologic droughts of record can vary by basin because each reservoir or river system responds differently to local inflow patterns, storage characteristics, and drought sequences. In surface water modeling, a reservoir's drought of record is typically determined using a spill-to-spill analysis, which is a measurement of the longest continuous period between reservoir spills (or times that it is full). This period represents the most intense multi-year drought the reservoir has experienced under the historical hydrology used in the Water Availability Model. As hydrology datasets for these models are updated to include more recent periods, planning groups can confirm whether new droughts of record have occurred.

3.3 Drought trends

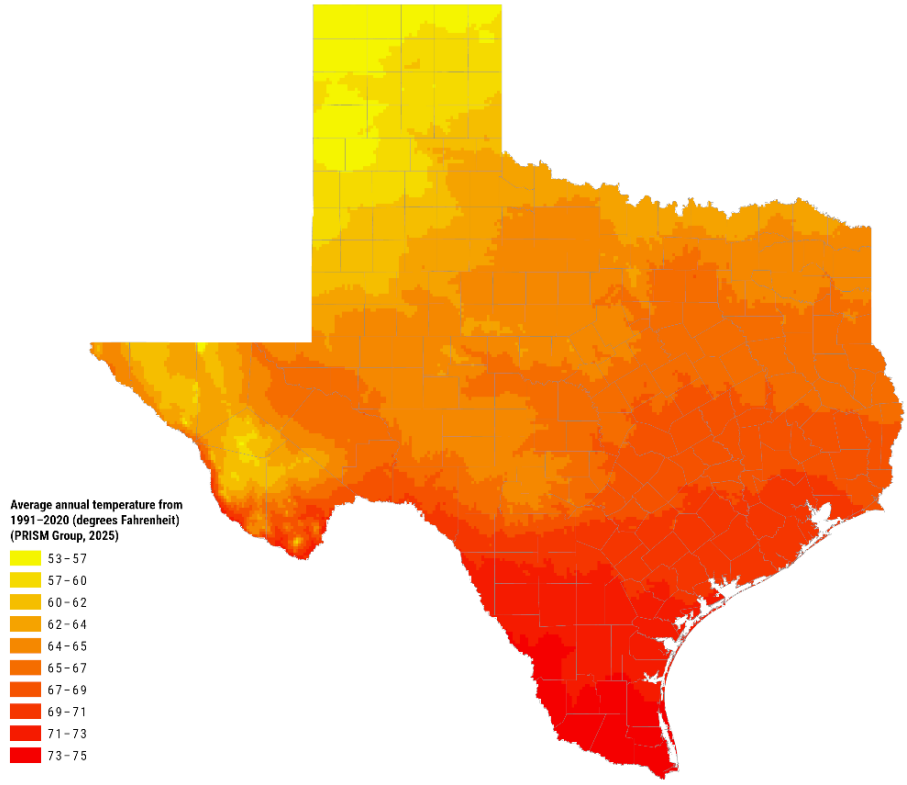
Looking beyond individual drought events, long-term trends in precipitation, temperature, and hydrologic conditions provide insight into how drought risk is changing across Texas. Precipitation, or the lack of precipitation relative to average conditions, is recognized as the dominant factor in creating and sustaining all drought types. Below-average precipitation reduces reservoir inflows, limits aquifer recharge, and can increase competition for limited water supplies. Above-average temperature plays a secondary, but increasingly important role in drought onset and persistence. For hydrological drought, higher-than-normal temperatures increase evapotranspiration from the land and evaporation from water bodies, decrease soil moisture, reduce runoff to streams and rivers, and diminish recharge to aquifers, amplifying the effects of meteorological drought. While precipitation deficits initiate drought, elevated temperatures also increase water demands because rising temperatures amplify drought severity.

This section reviews recent trends in precipitation, temperature, PDSI, and streamflow relative to historical conditions and considers what is needed to better understand and plan for future droughts in Texas. Understanding these trends begins with a look at Texas' climatological conditions.

Temperature, precipitation, and evaporation

Average annual temperature gradually increases from about 53°F in the northern Panhandle of Texas to about 75°F in the Lower Rio Grande Valley, except for isolated mountainous areas of far west Texas, where temperatures are cooler than the surrounding arid valleys and basins (Figure 3-3). In far west Texas, the average annual temperature sharply increases from about 57°F in the Davis and Guadalupe mountains to about 70°F in the Presidio and Big Bend areas.

Figure 3-3. Average annual temperature from 1991–2020 (PRISM Group, 2025)



Average annual precipitation decreases from east to west across the state, ranging from around 60 inches in Beaumont to less than 10 inches in El Paso (Figure 3-4). Correspondingly, average annual gross lake evaporation (water loss caused by evaporation from the lake surface) is less than 50 inches in East Texas and more than 70 inches in far west Texas (Figure 3-5).

Figure 3-4. Average annual precipitation from 1991–2020 (PRISM Group, 2025)

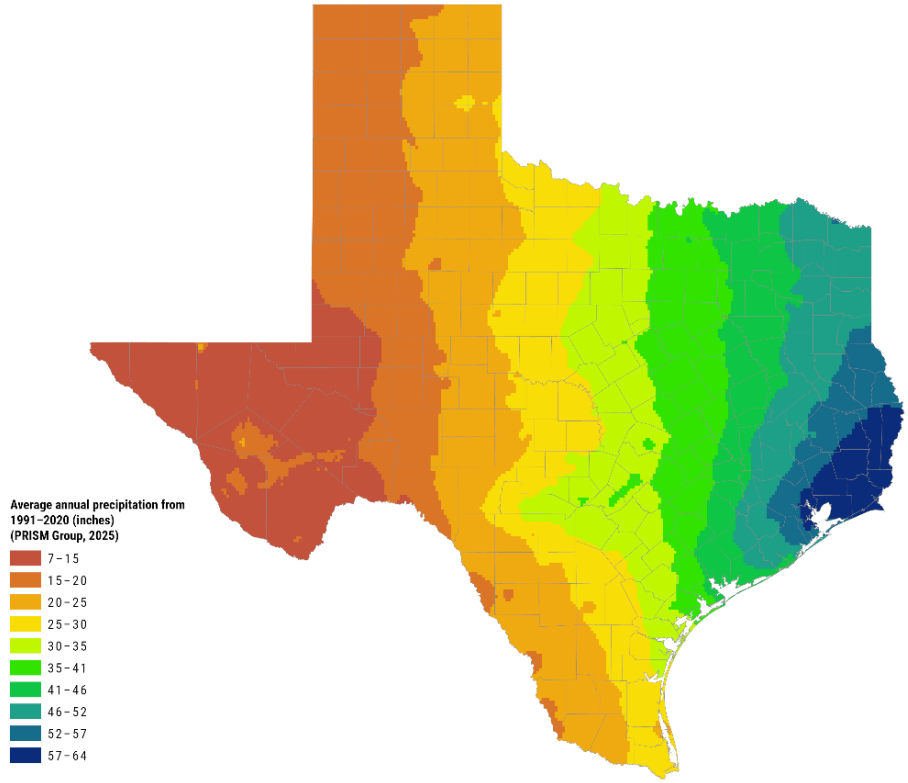
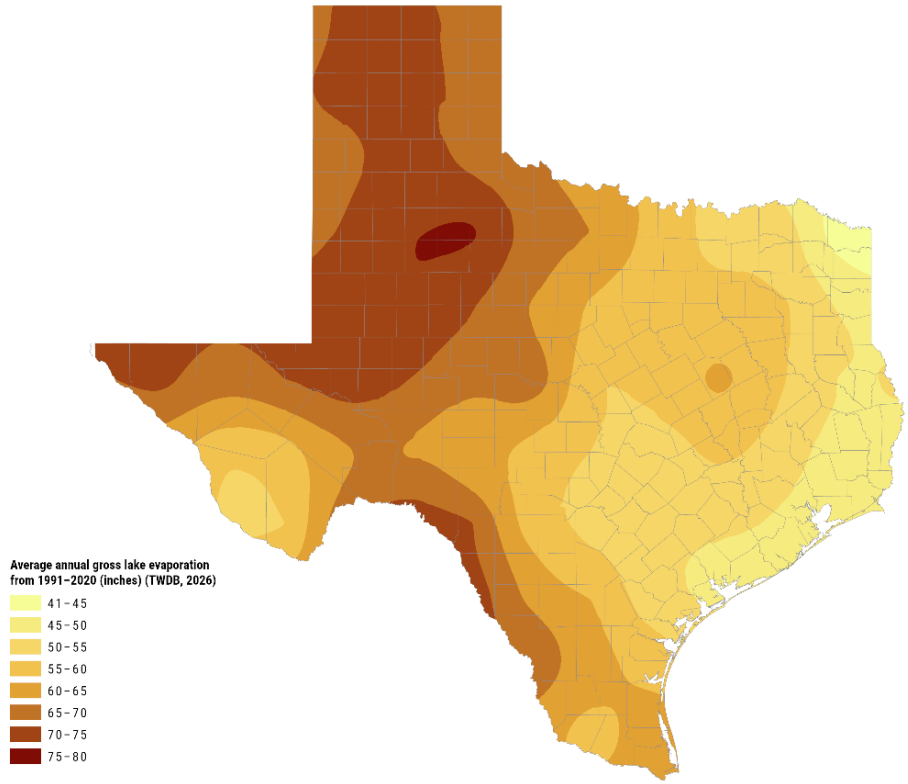


Figure 3-5. Average annual gross lake evaporation from 1991–2020 (TWDB, 2026)



Recent conditions in historical context

In Texas, drought severity and duration are increasingly influenced by hotter temperatures. While average annual precipitation was well below the long-term average during the 1951–1956 drought, as compared to the 2010–2014 or 2021–2025 droughts (Figure 3-6), the average annual temperature was more extreme in those more recent droughts (Figure 3-7). Elevated temperatures contributed to the 2010–2014 drought being more intense (as measured by PDSI) than the historical 1950s drought of record for several parts of the state. Elevated temperatures may also have contributed to the extended length of the 2010–2014 and the 2021–2025 droughts (Figure 3-1).

Average temperatures during 2021–2025 rank as the warmest five-year period dating back to 1895 for 232 of 254 counties (Figure 3-8). The "coolest" county, Dallam County in the northwest corner of the Panhandle, still recorded its eighth hottest five-year span. All other counties experienced either their second, third, or fourth hottest five-year period during 2021–2025.

Figure 3-6. Statewide average annual precipitation (NOAA, 2026)

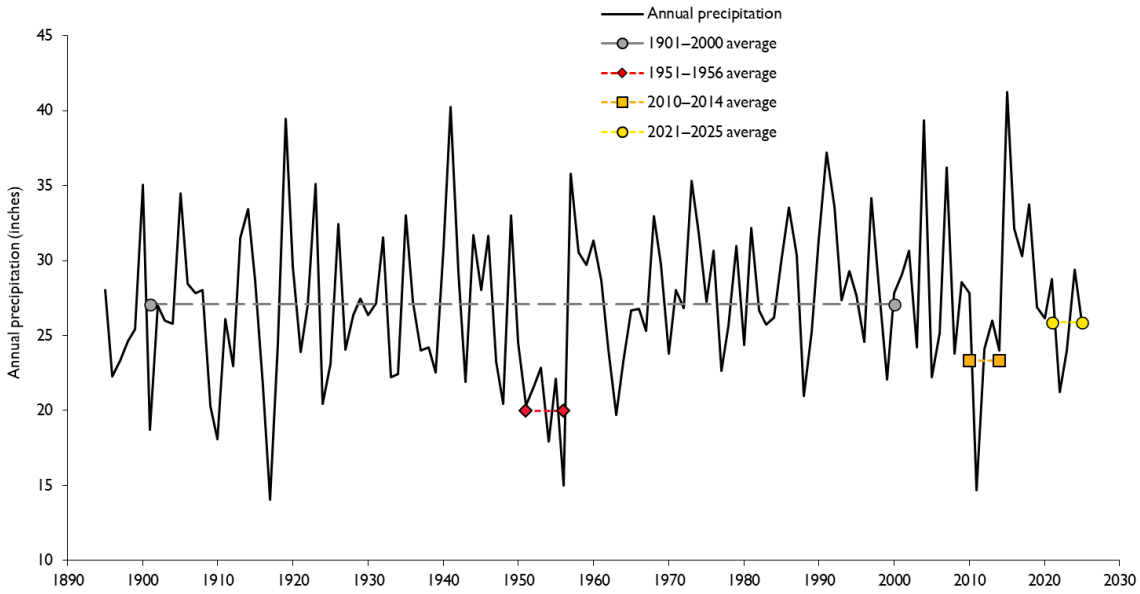


Figure 3-7. Statewide average annual temperature (NOAA, 2026)

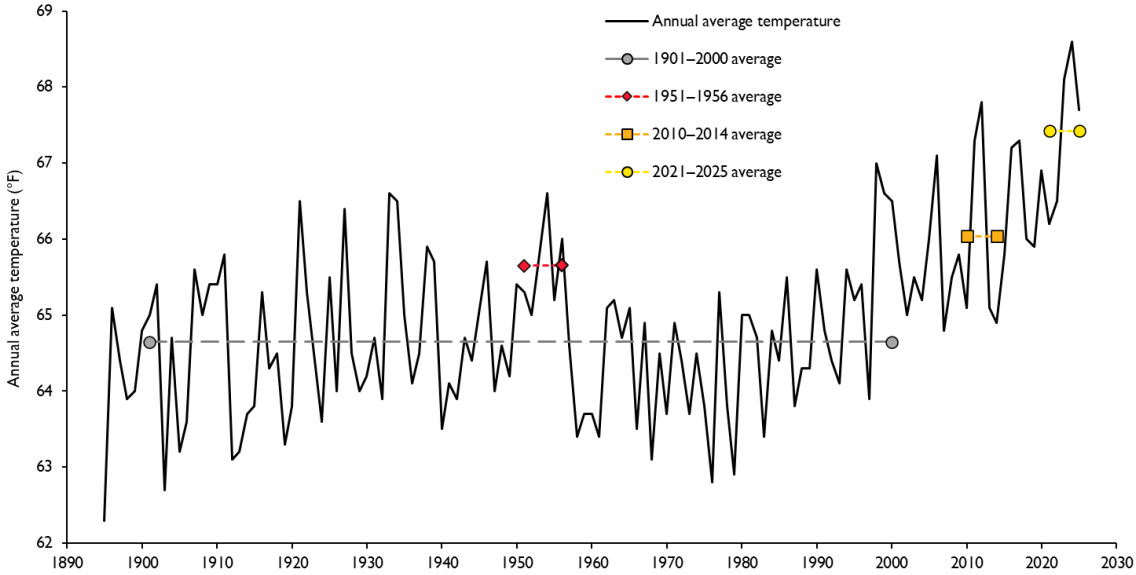
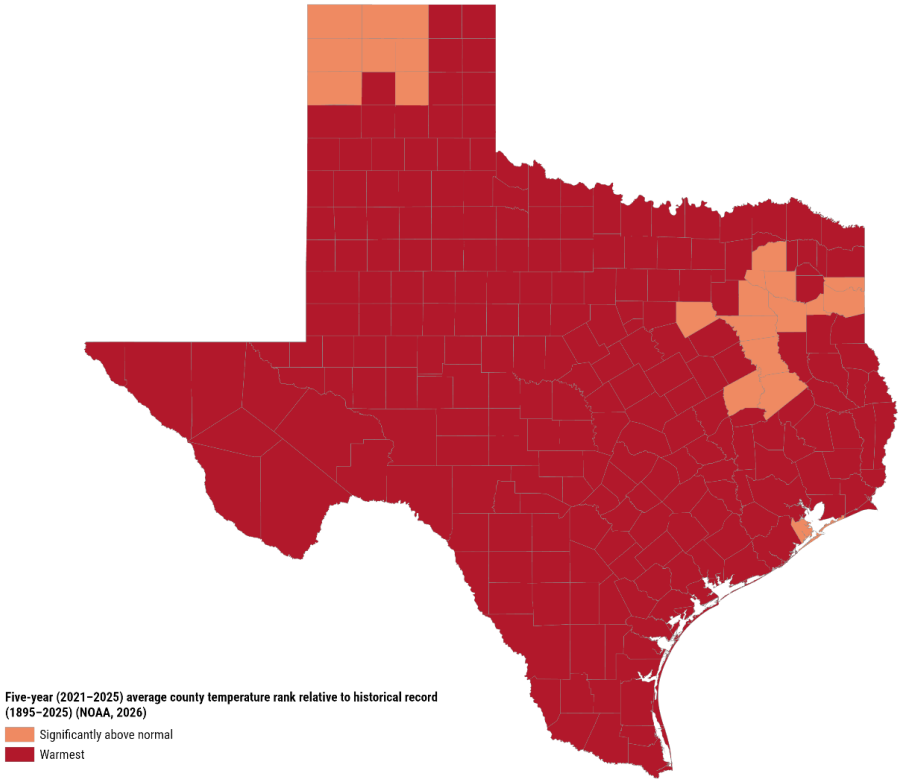
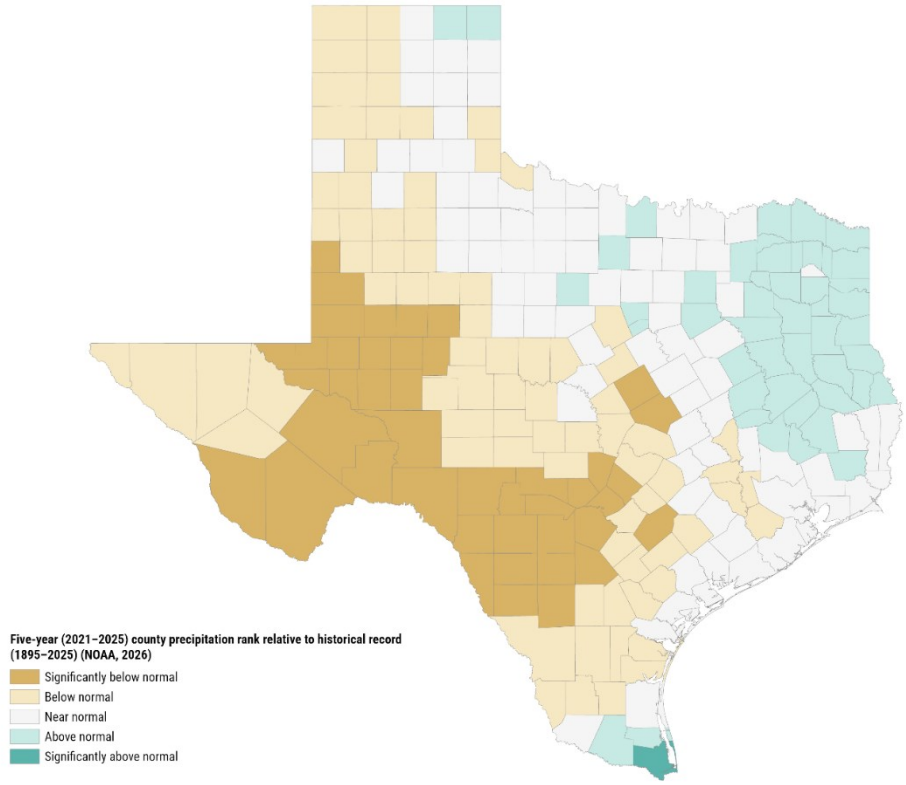


Figure 3-8. Five-year (2021–2025) average county temperature rank relative to historical record (1895–2025) (NOAA, 2026)



Precipitation during 2021–2025 was more variable across the state (Figure 3-9). Ector County in West Texas experienced its second driest five-year period (only 2020–2024 was drier), while Cameron County—the southernmost county in Texas—experienced its eighth wettest (120th driest) five-year period. For all other counties, precipitation rankings fell between the rankings for Ector and Cameron counties. Most of the driest counties were clustered in Central and West Texas.

Figure 3-9. Five-year (2021–2025) county precipitation rank relative to historical record (1895–2025) (NOAA, 2026)



The combined influence of temperature and rainfall is captured by long-term indices, such as PDSI, which can be used to show how drought conditions vary across counties. The variation in temperature and precipitation during 2021–2025 led to varying drought severity across the state, as reflected in county-specific average monthly PDSI (Figure 3-10). Drought conditions developed in counties that were hot and dry, whereas counties that were hot and wet escaped the most extreme drought conditions. Nonetheless, every county in Texas experienced at least five months of long-term drought conditions between January 2021 and December 2025, as noted by a PDSI of -2 or lower. During this time span, 81 counties set one or more new monthly minimum PDSI records (Figure 3-11). Those with multiple monthly minimum PDSI records may have experienced new droughts of record.

Figure 3-10. Five-year (2021–2025) average monthly PDSI by county (NOAA, 2026)

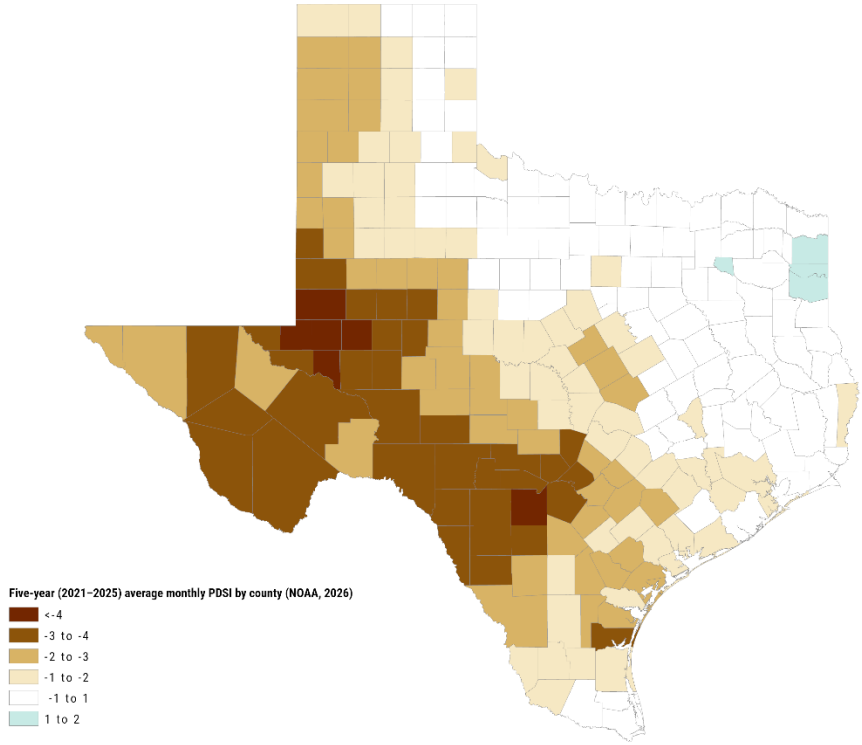
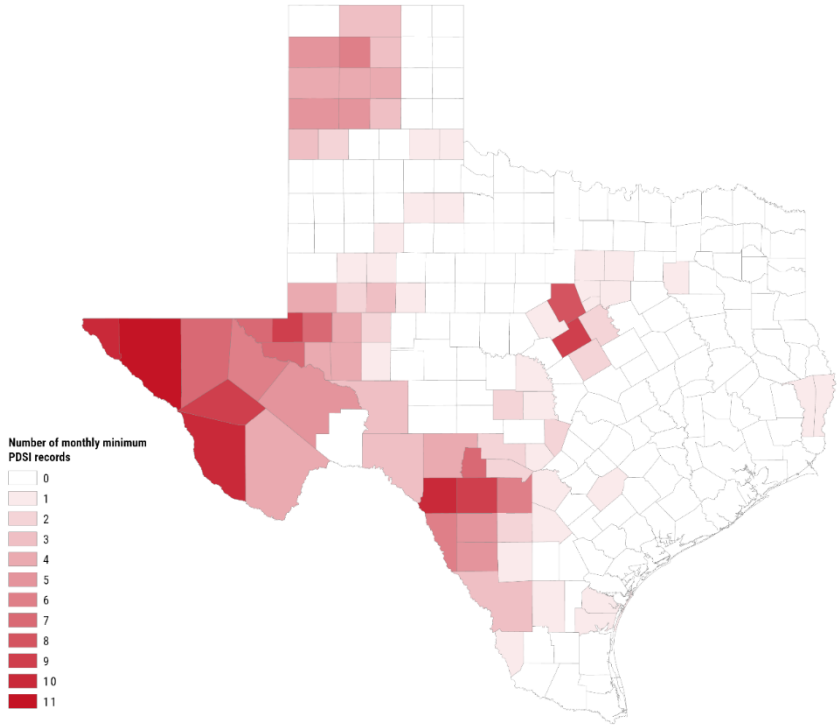
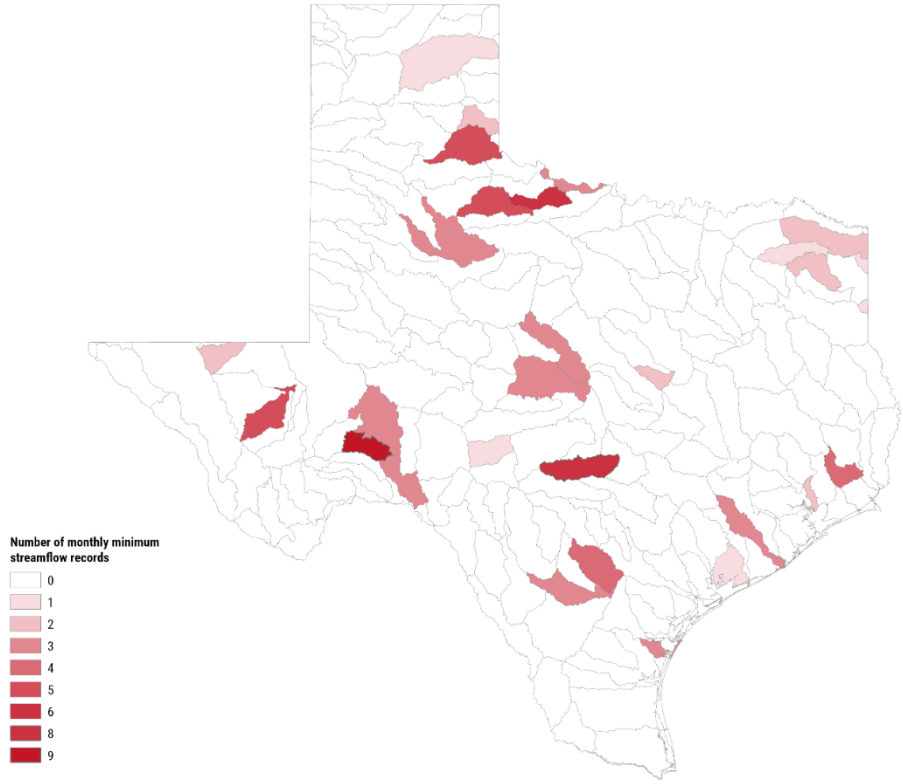


Figure 3-11. New monthly minimum PDSI records set during 2021–2025 compared to the historical record (1895–2025) (NOAA, 2026)



Drought conditions are also reflected in streamflow records, which reveal how drought affects river systems statewide. Streamflow patterns showed similar variability during 2021–2025, as can be seen in monthly streamflow maps for watersheds identified by 8-digit Hydrologic Unit Code (HUC8; USGS, 2026). During this five-year period, 28 of the state's 208 HUC8 watersheds set or tied at least one monthly minimum streamflow record (Figure 3-12). Those with multiple monthly minimum streamflow records may have experienced new droughts of record.

Figure 3-12. New monthly minimum streamflow records per watershed set during 2021–2025 compared to the historical record (1901–2025) (Data from USGS, 2026)



Future drought risk and impacts to water supplies

Warmer temperatures, increased evaporation and evapotranspiration, and increasingly variable precipitation—as experienced in recent years—enhance the risk of extreme drought in Texas (Nielsen-Gammon and others, 2024). Tree ring records extending back to 1500 indicate the occurrence of droughts longer and more severe than the 1950s benchmark drought of record presently used in water planning (Cleaveland and others, 2011). Given this context, climatic conditions certainly will remain a notable factor affecting the availability and reliability of the state's water resources.

In 2023, the Sunset Advisory Commission directed the TWDB to consult with the Office of the State Climatologist to receive information and projections to identify areas of the state that are likely to experience severe drought. This effort to inform regional and state water plans is ongoing and will include gathering stakeholder input on potential products and on how projected impacts may affect water supplies. Stakeholder feedback will also guide how the results of this collaboration are incorporated into future planning processes to ensure a coherent and accepted approach. The TWDB is

actively exploring ways to better prepare the state to respond to the next drought, including identifying the likelihood and associated severity of potential future supply shortages.

Regardless of long-term changes in hydrologic or climatological trends, the natural variation in rainfall under current conditions is enough to create more intense drought events than anticipated. The TWDB seeks to better understand this fact and create tools for assessing the reliability of reservoir yields currently used to plan for existing and future water supplies. Additional information on efforts to evaluate reservoir yield reliability is provided in Chapter 5.

Identifying areas at risk of more severe droughts

Regional water planning groups may assess available water supplies during droughts worse than the drought of record. However, tools available for identifying such droughts are limited—whether presently occurring or likely to occur in the future. Surface water supplies are primarily monitored using water availability models developed by the Texas Commission on Environmental Quality.

With only six of the 20 water availability models extending beyond the year 2000 and only two beginning before 1940, some models miss known periods of minimum precipitation. To consider this factor, the TWDB—with guidance from the State Climatologist—explored the use of historic county-level precipitation records (dating from 1910 to 2022; NOAA, 2024) to identify areas where water planners may benefit from considering droughts more severe than those currently represented in water availability models.

Several time durations were evaluated for minimum precipitation. Shorter durations (i.e., 12 months) may be of interest to dryland agriculture, run-of-river water rights, and other water users that are more quickly and directly impacted by precipitation deficits. Longer durations (i.e., 72 months) may be of interest to large reservoir operations, groundwater recharge, and other water users that are not as immediately susceptible to drought conditions.

Although not every period of minimum precipitation translates directly to low stream flow or reservoir contents and, therefore, to a drought of record as defined by a water availability model, some counties have minimum precipitation periods that fall outside the period-of-record covered by these models. As a result, those counties may have experienced more severe drought conditions than are represented by their current drought-of-record designation.

Against this backdrop, results suggest that every water planning region has at least one county whose short-term period of minimum precipitation (12-month duration) falls outside the period-of-record of an associated water availability model. For longer term droughts (72-month duration), four water planning regions (Regions A, D, I, and L) meet this condition.

From the perspective of the 20 water availability models and their current period-of-record, many models do not capture the short-term, 12-month period of minimum precipitation for most Texas counties represented in a particular model (light blue bars, Figure 3-A). In fact, none of the models capture short-term durations of minimum precipitation for *every* county in a model. Only the Red and Rio Grande models capture minimum precipitation periods for close to 95 percent of counties. For 10 of the models, short-term minimum precipitation is not captured for *any* county in that model, noted by the absence of the light blue bar. Longer term, 72-month drought durations are better represented by

the current period-of-record of the water availability models, with 12 models capturing the minimum precipitation period for all counties represented (dark blue bars, Figure 3-A). The remaining eight models capture minimum precipitation conditions for a majority (65 to 95 percent) of counties represented by that model.

Regional water planning groups may find this information helpful when deciding whether to consider planning for droughts worse than the drought of record. Results may also help identify which parts of the state would benefit most from extending the hydrology data sets in water availability models and have the most potential value for water planning. The TWDB anticipates providing a full report of this analysis in 2026, in preparation for the next five-year planning cycle.

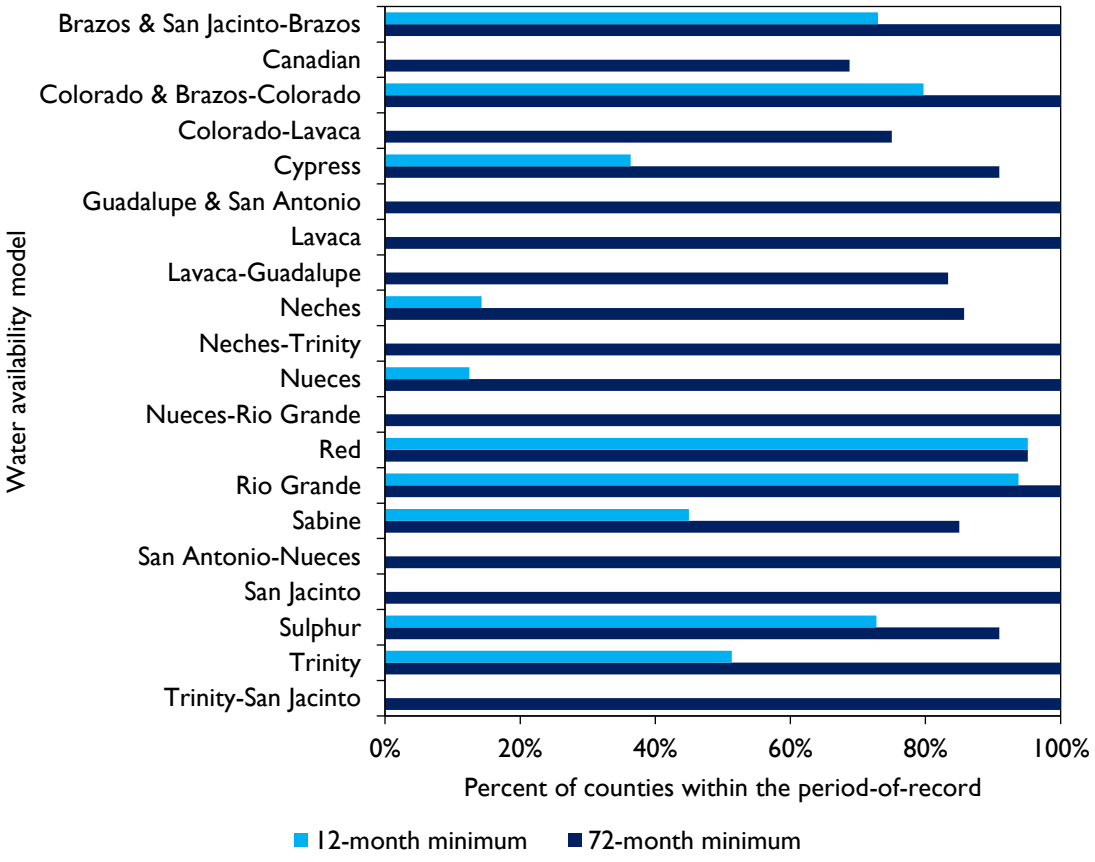


Figure 3-A. Percent of counties with a minimum precipitation period occurring during the period-of-record of a water availability model

3.4 Drought planning and response

These historical and emerging drought patterns underscore the importance of coordinated drought planning and response efforts at the local, regional, and state levels. Planning and preparations occur at

the local level via drought contingency plans, which are required for utilities of a certain size; at the regional level via regional water plans; and at the state level through the state water plan and the state emergency management plan (which includes the state drought preparedness plan).

Regardless of whether drought conditions exist, entities continually implement water conservation plans and water management strategies. When drought conditions exist, entities then implement drought contingency plans and drought management strategies, as necessary. They may also seek emergency funding from the TWDB or the Texas Department of Agriculture. Entities implementing water restrictions as part of their drought contingency plans are required to notify the Texas Commission on Environmental Quality. This information is reported to the Drought Preparedness Council, which coordinates the state's response to drought through the state drought preparedness plan, known as the State of Texas Drought Annex. Disaster proclamations due to drought conditions may also be issued at the state or local level. More information on drought planning, impacts, and resources is available on the TWDB drought resources webpage (www.twdb.texas.gov/drought).

3.4.1 Statewide drought planning and response

Various state agencies support drought planning and response in Texas through their statutorily mandated work and through collaborative efforts as part of councils, task forces, and other collective endeavors. Texas Water Code § 16.055 is the state's foundational plan for mitigating the effects of drought by designating the chief of the Texas Department of Emergency Management as the state drought manager, who is responsible for managing and coordinating the drought response component of the state emergency management plan and serves as chair of the Drought Preparedness Council. The information compiled in the regional water plans—and summarized in this section—serves as the drought response component of the state water plan.

State Drought Preparedness Plan

The state drought preparedness plan, also known as the State of Texas Drought Annex, is prepared by the Drought Preparedness Council and serves as the drought component of the State of Texas Emergency Management Plan. The drought annex pertains to the state's coordination of drought operations expected within the next 6–12 months of publication. It includes a hazard and threat summary analysis and details objectives for the state's drought preparedness, response, and recovery functions. The drought annex defines triggers that activate state response, recovery functions, and responsibilities for state agencies (TDEM, 2025).

Drought Preparedness Council

The Drought Preparedness Council is the overarching body dedicated to monitoring Texas drought conditions and facilitating drought response and recovery efforts among local, state, and federal agencies. The Drought Preparedness Council is composed of representatives from at least 14 state entities as well as governor-appointed members. These entities work closely together at the state level to monitor emerging threats, coordinate resources to respond to local needs, and assist with long-term recovery.

The Council meets regularly to accomplish the following responsibilities:

- Assess and report on drought monitoring and water supply conditions
- Advise the governor on significant drought conditions
- Recommend specific provisions for state response to drought-related disasters be included in the state emergency management plan and the state water plan
- Advise regional water planning groups on drought-related issues in the regional water plans
- Ensure effective coordination among state, local, and federal agencies in drought response planning

- Report biennially to the state legislature on the occurrence of significant drought conditions

The Council coordinates the state's drought preparedness and response through three committees and a specialized task force including the following:

- **Drought Impact Assessment Committee** – coordinates the compilation of information about statewide drought impacts across all sectors as well as appropriate mitigation and response actions.
- **Drought Monitoring and Water Supply Committee** – analyzes current drought and water supply conditions, highlights improvements or degradations, and provides updates to relevant sections of the State of Texas Drought Annex to reflect new drought indices and monitoring tools available for use.
- **Drought Technical Assistance and Planning Committee** – coordinates with regional water planning groups on drought issues and makes recommendations for drought disaster proclamations.
- **Emergency Drinking Water Task Force** – tracks water systems that have been identified as potentially having 180 days or less of potable water, provides support to local water systems, and coordinates assistance and outreach for contingency planning to drought-impacted areas.

As a member of the Drought Preparedness Council, the TWDB chairs the Drought Monitoring and Water Supply Committee and the Drought Technical Assistance and Planning Committee and serves as a member of the Emergency Drinking Water Task Force. In these roles, the TWDB provides a variety of information and resources to assist with drought response and preparedness including the following:

- **Water Data for Texas Interactive Drought Dashboard** (waterdatafortexas.org/drought) – provides weekly U.S. Drought Monitor data, monthly rainfall and temperature data at county and HUC8 watershed levels, monthly streamflow conditions at HUC8 watershed levels, daily streamflow conditions at certain stream gages, daily soil moisture conditions, and several drought indices updated at various timesteps (such as monthly PDSI; 1-,3-,6-,9-, 12-, and 24-month Standardized Precipitation Index; weekly Quick Drought Response Index; weekly and monthly Evaporative Demand Drought Index; and daily Keetch-Byram Drought Index).
- **Reservoir conservation storage dashboard** (waterdatafortexas.org/reservoirs/statewide) – provides instantaneous, daily, and historical conservation storage for 119 monitored major water supply reservoirs in the state and for Elephant Butte Reservoir in New Mexico.
- **Reservoir-specific daily evaporation monitor** (dri-apps.projects.earthengine.app/view/twdb-reservoir-evaporation) – provides daily open-water net evaporation, gross evaporation, and volumetric evaporation for 189 major reservoirs in Texas.
- **Water Weekly** (waterdatafortexas.org/drought/twdb-reports) – summarizes drought conditions across the state.
- **Drought and Water Supply Conditions Report to the Drought Preparedness Council** – bi-weekly, monthly, or quarterly updates (depending on the intensity and extent of drought).
- **Texas Water Conditions Report** (www.twdb.texas.gov/surfacewater/conditions/report) – monthly report documenting drought, rainfall, streamflow, soil moisture, conservation storage in monitored major water supply reservoirs, and groundwater levels in aquifers.
- **Drought stakeholder outreach** – provides technical assistance, educational materials, and literature upon request.

When significant drought conditions exist, the chair of the Drought Preparedness Council makes a recommendation to the governor on which counties should be included in a drought disaster proclamation. The chair considers data from the U.S. Drought Monitor (droughtmonitor.unl.edu/) and information from the TWDB, Texas Commission on Environmental Quality, river authorities,

groundwater conservation districts, and local officials when making a recommendation. Counties that meet any of the following criteria are recommended for inclusion in the drought disaster proclamation:

- Counties where any portion of the county is identified as drought stage D3 (extreme drought) or D4 (exceptional drought) per the U.S. Drought Monitor, and any county that has at least 50 percent of the county identified as drought stage D2 (severe drought) or higher for five weeks.
- Counties that have a public water supplier included on the Texas Commission on Environmental Quality 180-day High Priority Water System List.
- Counties where water rights (excluding temporary water rights for surplus water) are suspended or curtailed.
- Counties that have had water supplies curtailed due to water management decisions and are experiencing economic impacts due to these curtailments.
- Counties that include irrigation district service areas that have less than 30 percent of water remaining in the district's account per the Texas Commission on Environmental Quality Rio Grande Watermaster Report.
- Counties that rely heavily on groundwater and have local aquifers in severe drought conditions.

The chair can exercise professional judgement to make a recommendation regarding a county's drought status that may differ from the recommendation derived from the above criteria. Once a declaration has been issued, the Drought Preparedness Council notifies partner agencies and initiates drought response and recovery actions as outlined in the drought annex.

Each planning cycle, the Drought Preparedness Council also makes recommendations to the regional water planning groups on drought-related issues to consider when developing the regional water plans. For the 2026 regional water plans, the Council encouraged regional water planning groups to:

- consider planning for drought conditions worse than the drought of record, including scenarios that reflect greater rainfall deficits and/or higher surface temperatures;
- incorporate projected future reservoir evaporation rates in their assessments of future surface water availability; and
- identify utilities within their boundaries that reported having less than 180 days of available water supply to the Texas Commission on Environmental Quality during the current or preceding planning cycle. For systems that appeared on the 180-day list, planning groups should perform the evaluation required by 31 Texas Administrative Code § 357.42(g), if it has not already been completed for that system.

Financial assistance for communities facing drought

The state provides financial assistance with special consideration to entities experiencing drought to help affected communities recover as rapidly as possible from disasters and other emergency situations, including unanticipated reduction of adequate water supply due to prolonged drought.

The TWDB offers funding for urgent need projects through the Federal Clean and Drinking Water State Revolving Fund programs. Urgent need projects address unforeseen situations that require immediate attention to protect public health and safety and may be eligible for principal forgiveness. Urgent need situations include prolonged drought-related water supply reductions resulting in a loss of supply within 180 days, catastrophic events resulting in a 20 percent loss in connections or water provided, or other situations as established by the TWDB. The Texas Water Development Fund—a state-funded loan program—is also an option for entities implementing projects in response to drought. Additional information on TWDB financial assistance programs is available online at www.twdb.texas.gov/financial/programs.

In addition to the TWDB, several entities offer financial assistance programs that may be helpful during times of drought:

- The Texas Water Infrastructure Coordinating Committee (twicc.org) is a collaborative endeavor among state and federal government agencies and technical assistance providers that aims to connect water systems with resources for water and wastewater infrastructure projects.
- The U.S. Department of Agriculture offers various disaster assistance programs (www.fsa.usda.gov/programs-and-services/disaster-assistance-program) to help farmers, ranchers, communities, and businesses that have been impacted by natural disasters.
- The Texas Department of Agriculture facilitates the Texas Community Development Block Grant Program for Rural Assistance (texasagriculture.gov/Grants-Services/Rural-Economic-Development/-TxCDBG-Rural-Community-Development-Block-Grant), which includes state urgent need funding for communities meeting eligibility requirements that have been impacted by state-declared disaster events and are not eligible for federal disaster assistance. The agency also operates the Hay Hotline, which helps agricultural producers locate forage and hay supplies for sale.

3.4.2 Regional drought planning and response

At the regional level, water planning groups develop plans tailored to each region's water supplies to ensure water needs will be met during times of drought. Each of the 2026 regional water plans includes a dedicated drought response chapter (Chapter 7) summarizing regional drought response activities, recommendations, and information on

- drought(s) of record in the planning area;
- drought-related uncertainty;
- current drought preparations and drought response triggers and actions;
- unnecessary or counterproductive drought response efforts;
- existing and potential emergency interconnects;
- emergency responses to local drought conditions or loss of municipal supply;
- drought management water management strategies;
- region-specific model drought contingency plans; and
- drought-related considerations and recommendations.

The 2026 regional water plans are available on the 2026 regional water plan webpage (www.twdb.texas.gov/waterplanning/rwp/plans/2026). A summary of the key regional drought planning and response information is included below.

Current regional drought preparations and response

Regional water planning groups review available local drought contingency plans and consolidate information in the regional water plans about how water suppliers in the region identify and respond to drought conditions. The regions also review drought response efforts to identify any unnecessary or counterproductive efforts. This involves a review of available response efforts of neighboring communities for differences that may confuse the public, such as differences in implementation of outdoor watering restrictions.

Five planning groups (Regions B, C, G, I, and M) identified unnecessary or counterproductive drought response efforts that may confuse the public or impede drought response in their regional water plans. A common source of confusion among the public relates to different drought responses and timing within the same region—for example, when neighboring communities share the same source of water but have different drought response triggers and local requirements on drought restrictions. Additionally, variations in drought stage definitions, the variety of drought triggers in use, and the variety

of responses implemented across the region are contributing factors. Not only can these factors create confusion among the public, but they also represent challenges to consider when crafting solutions.

Although local entities are best suited to develop responses tailored to manage local conditions, they must ensure that awareness and coordination occur among water providers and that corresponding communications—especially via mass media—match local drought contingency plans. Targeted public outreach from utilities aimed at educating customers on their source of water supply is an important method in preventing confusion. Regions also recommend that entities utilize information in the regional water plans, including model drought contingency plans, to address inconsistencies in drought response that may confuse the public or impede drought response efforts.

Existing and potential emergency interconnects

Planning groups assessed water infrastructure facilities within their regions to identify existing emergency interconnects between water systems and potential new emergency interconnects. The number of existing emergency connections reported by planning groups has increased since the previous state water plan, and the number of potential new emergency connections has decreased. The 2026 regional water plans identified approximately 1,108 existing emergency connections and 552 potential new emergency connections.

Emergency responses to potential loss of supply for small entities

In accordance with administrative rules, the planning groups evaluated potential emergency responses to local drought conditions or loss of existing supply for two specific groups:

1) Entities with a population of 7,500 or less that rely on a sole source of water supply (for example, a single reservoir or aquifer).
2) All county-other (small, rural water systems) water user groups.

In response to recommendations from the Drought Preparedness Council, some regions also performed this evaluation for entities in the region that reported to the Texas Commission on Environmental Quality as having less than 180 days of available water supply during the current or preceding planning cycle. The evaluation assumed that each entity had only 180 days or less of supply remaining and alternative sources had to be found. This high-level screening served as a guide for identifying potentially vulnerable water user groups and suitable emergency response options.

The most common emergency supply options deemed feasible among the planning groups include

- trucked in water;
- local groundwater wells;
- existing or potential emergency interconnects;
- brackish groundwater development (limited treatment or desalination);
- releases from upstream reservoirs;
- curtailment of water rights; and
- voluntary redistributions from other entities, including irrigation users.

For the temporary emergency response options identified for specific entities, see Chapter 7 of the 2026 regional water plans. A spreadsheet of temporary emergency response options for small systems that rely on a single water source is also available in the supplemental content on the 2027 State Water Plan webpage (Appendix F).

Drought management recommendations by planning groups

Drought management strategies are temporary measures that reduce water use by restricting certain economic or domestic activities, such as car washing and lawn watering. Planning groups, as in past planning cycles, generally deferred to local water providers to implement drought management

strategies as part of local drought contingency plans. However, planning groups H, J, K, L, M, and P recommended the following specific, quantified municipal drought management strategies:

- **Region H** included demand reduction for municipal water user groups required to submit a drought contingency plan to the Texas Commission on Environmental Quality and those municipal users that receive water from a wholesale water provider. Reductions were estimated based on the most recently available drought contingency plan of the water user group or their wholesale water provider and assumed a 50 percent efficacy rate—meaning that only half of the associated drought contingency plan curtailments, for example, would be achieved.
- **Region J** included demand reductions of 20 percent associated with specific wells within the Bandera County-Other water user group.
- **Region K** included demand reductions of 5 percent for all municipal water user groups.
- **Region L** included demand reductions of 10 percent for all municipal water user groups with identified water needs, unless a water user group requested a more utility-specific demand reduction.
- **Region M** included demand reductions of 5 percent for all municipal water user groups with water needs or those that are required to submit a drought contingency plan to the Texas Commission on Environmental Quality.
- **Region P** included varying demand reductions for all municipal water user groups in the region, even though no water needs exist for these entities. Reductions were based on drought contingency plan triggers and responses and the frequency at which a trigger might be reached.

During a drought of record, these collective recommended municipal drought management strategies were assumed to temporarily reduce water use by approximately 75,000 acre-feet per year in 2030 and 133,000 acre-feet per year in 2080.

In some cases, drought management was recommended only as a near-term, stopgap strategy to be displaced in later planning decades by projects that will eventually come online to provide additional water supply and allow entities to avoid the need for drought restrictions. Planning groups generally did not consider it prudent, sustainable, reliable, and/or economically feasible to adopt a regional plan that would intentionally require restrictions on certain economic and domestic activities, especially when there were feasible alternatives that could be implemented to avoid doing so. Most planning groups chose to leave aside the potential volume of water savings from drought management measures as a back-up response or last resort as another hedge against uncertainty, such as a future occurance of a drought worse than the benchmark drought of record.

The effectiveness and sustainability of drought measures vary between utilities and timeframes and were therefore sometimes not considered predictable or reliable enough to quantify for inclusion as a recommended water management strategy. The TWDB has attempted to evaluate reported water use for systems under drought restrictions and noticed that results were highly variable due to the lack of consistent reporting—which made it difficult for the TWDB to determine the duration of the water restriction and net impact to water use. The TWDB will continue its annual collection of drought restriction data and provide it to the planning groups for their consideration in future regional plan development.

To support the development and implementation of meaningful drought contingency plans and drought management strategies, various planning groups developed the following drought-related recommendations:

- Regularly monitor state and local drought conditions through the TWDB, Texas Commission on Environmental Quality, Drought Preparedness Council, or the U.S. Drought Monitor.
- Actively maintain or monitor infrastructure to increase system reliability and minimize catastrophic failures.

- Regularly review and update management strategies and drought contingency plans.
- Develop robust drought contingency plans with clear triggers, enforcement mechanisms, and coordination among wholesale providers, local utilities, and customers to ensure consistent drought response.
- Develop uniformly consistent drought stage definitions among users of the same source of water.
- Designate appropriate resources to allow for consistent application of enforcement procedures as established in drought contingency plans.

Region-specific model drought contingency plans

Planning groups develop and include region-specific model drought contingency plans in the regional water plans. Model plans must be consistent with the minimum requirements in 30 Texas Administrative Code, Chapter 288, Subchapter B, which provides requirements on drought contingency plans for public water suppliers, irrigation use, and wholesale water providers. Regions typically based their region-specific plans upon model plans provided by the Texas Commission on Environmental Quality, modified to specific regional conditions. These plans address such requirements as drought stages, triggers and responses, conservation, and emergency response stages. They are intended to assist water users seeking guidance in developing plans with meaningful, applicable triggers and responses for water sources within the region.

3.4.3 Local drought planning and response

Local utilities are responsible for on-the-ground preparation and drought response within their service areas. Drought contingency plans are implemented at the local level and focus on potential issues related to retail distribution system capacity rather than the entire supply volume to which the entity has access. The plans contain triggers, which are typically based on supply or demand levels to initiate and terminate each stage, and responses associated with the triggers. They also include descriptions of drought indicators and notification and enforcement procedures. Within five days of implementing any mandatory drought contingency measures, wholesale and retail public water suppliers must notify the Texas Commission on Environmental Quality. The Texas Commission on Environmental Quality maintains a list of public water systems limiting water use to avoid shortages (www.tceq.texas.gov/drinkingwater/trot/droughtw.html). The list also identifies systems that have less than a 180-day, 90-day, and 45-day supply.

If a state disaster proclamation is issued due to drought conditions, counties included in the disaster proclamation must provide general notice to the chair of each regional water planning group in which the county is located and to each entity in the county required to develop a water conservation plan or drought contingency plan. After receiving such notice, the entities are required to implement their water conservation and drought contingency plans. Additionally, retail public utilities and entities from which those utilities obtain wholesale water service are required to report to the Texas Commission on Environmental Quality when they are reasonably certain their water supply is limited to less than 180 days.

Drought contingency plans at a glance

Drought contingency plans help water suppliers monitor drought and respond when water supplies become stressed. They include clear triggers for when drought stages begin and end and outline temporary actions—such as outdoor watering limits—to reduce demand and protect system capacity. Plans activate when local triggers are met or when a state drought disaster is declared, ensuring communities take timely steps to maintain reliable water service.

Most water providers are required to have a drought contingency plan, and those who implement mandatory measures must notify the Texas Commission on Environmental Quality within five days. The Texas Commission on Environmental Quality tracks systems limiting water use and those with less than 180 days of supply to help identify emerging risks, coordinate state response, and protect public health and safety. More information on drought contingency plans is available on the TCEQ drought contingency plan webpage (www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/contingency).

3.5 TWDB drought resources and research initiatives

To support planning and improve drought preparedness, the TWDB provides a wide range of tools and datasets to help Texans track drought conditions and prepare for future impacts. These resources offer up-to-date information on rainfall, temperature, soil moisture, reservoir storage, groundwater levels, and drought severity across the state. More information is available on the TWDB drought resources webpage (www.twdb.texas.gov/drought), including the following resources:

- **Water Data for Texas** (waterdatafortexas.org) – information on reservoir storage, lake evaporation and precipitation, and groundwater level measurements.
- **Water Data for Texas Interactive Drought Dashboard** (waterdatafortexas.org/drought) – rainfall, temperature, streamflow, and soil moisture conditions across the state as well as various drought indices and U.S. Drought Monitor status.
- **Water Weekly** (waterdatafortexas.org/drought/twdb-reports) – weekly summary of statewide drought conditions.
- **Texas Water Conditions Report** (www.twdb.texas.gov/surfacewater/conditions/report) – monthly updates on reservoir storage and groundwater levels.

In addition to these resources, the TWDB is investing in scientific studies and decision-support tools to improve long-range forecasting, enhance reservoir operations, and identify areas of the state that may be more likely to experience severe drought. These efforts, as described below, strengthen Texas' ability to anticipate, plan for, and respond to drought.

Ongoing consultation with the Office of the State Climatologist

In response to a 2023 Sunset Commission recommendation, TWDB staff continue to meet regularly with the State Climatologist to share information and explore ways to identify where severe drought impacts are most likely to occur in the state.

Forecast-based efforts for reservoir operations and drought planning

Since 2022, the TWDB has continued to advance scientific progress and stakeholder education related to the concept of using forecast-informed reservoir operations (FIRO) solely for potential enhancement

of water supplies ahead of and during times of drought—not for the purpose of temporarily increasing flood storage, for example, through prereleases from storage.

This work has been supported by partnerships with the University of Texas at Arlington, U.S. Army Corps of Engineers, and Brazos River Authority, as well as federal grant funds from the U.S. Bureau of Reclamation. Through these collaborations, the TWDB participated in, and commissioned studies to support, a FIRO pilot project in the Little River Watershed of the Brazos River Basin (TWDB, 2025). In fiscal year 2025, the TWDB launched a project—funded by the Bureau of Reclamation WaterSMART Drought Response Program—to expand the FIRO pilot project to include key reservoirs in the service area of Dallas Water Utilities in the Upper Trinity and Sabine river basins that provide critical supplies for fast-growing Central and North Texas.

Understanding muti-year wet-dry cycles

The TWDB has contracted with the University of Texas at Austin Bureau of Economic Geology to study what drives shifts between multi-year wet and dry periods in Texas. This first-of-its-kind assessment will support better long-range forecasting and help inform the early implementation of drought contingency triggers at water supply reservoirs.

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4 Future population and water demand

Quick facts

Texas' population is projected to increase by 53 percent during the planning horizon, from 34.2 million in 2030 to 52.3 million in 2080.

While the statewide population is projected to increase, the distribution of this net growth varies across the state and includes declining populations of water user groups in every regional water planning area.

More than 80 percent of the statewide population growth between 2030 and 2080 is expected to occur within Regions C, G, H, and L.

Projecting population growth is merely a stepstone to determining future water demands and supply "needs" (potential shortages), the primary focus of the state's water supply planning process.

Statewide water demand for all water uses is projected to increase by approximately 6 percent, from 17.4 million acre-feet per year in 2030 to 18.4 million acre-feet per year in 2080. This is a smaller magnitude increase as compared to the 2022 State Water Plan, primarily due to the revised water use projection methodology for the manufacturing sector, slower projected population growth over the long-term, and revisions to irrigation water demand projections by the regional water planning groups.

Irrigation is the largest water demand category in each planning decade through 2050. After that point, municipal demand is projected to begin surpassing irrigation demand by 2060.

Population and water demand projections by region and county can be explored on the TWDB Planning Data Dashboard (www.twdb.texas.gov/waterplanning/data/dashboard).

The first major milestone in the five-year regional water planning process is the development of water demand projections. These projections estimate how much water may be needed if there is a recurrence of drought-of-record conditions over the 50-year planning horizon. Developing the most likely set of projections for a long-term plan is challenging and is accomplished through a collaborative process based on best available data. This process is designed to develop consensus between state agencies, regional water planning groups, and local stakeholders.

The Texas Water Development Board (TWDB) developed and distributed draft population and water demand projections using statewide, uniform methodologies for all 16 regional water planning groups. The Texas Commission on Environmental Quality, the Texas Department of Agriculture, the Texas Parks and Wildlife Department, representatives from the planning groups, and members of the public assisted in determining the final projections by providing local data and other information. This process often involves determining the most likely locations where anticipated populations will reside geographically and adjusting anticipated population changes within an entire planning region. Water demand projections were established for municipal water users as well as for five non-municipal water demand categories: irrigation, livestock, manufacturing, mining, and steam-electric power. This chapter delves into each of these categories, summarizes the methodologies used, and analyzes the major trends and current outlook for water demand across the state.

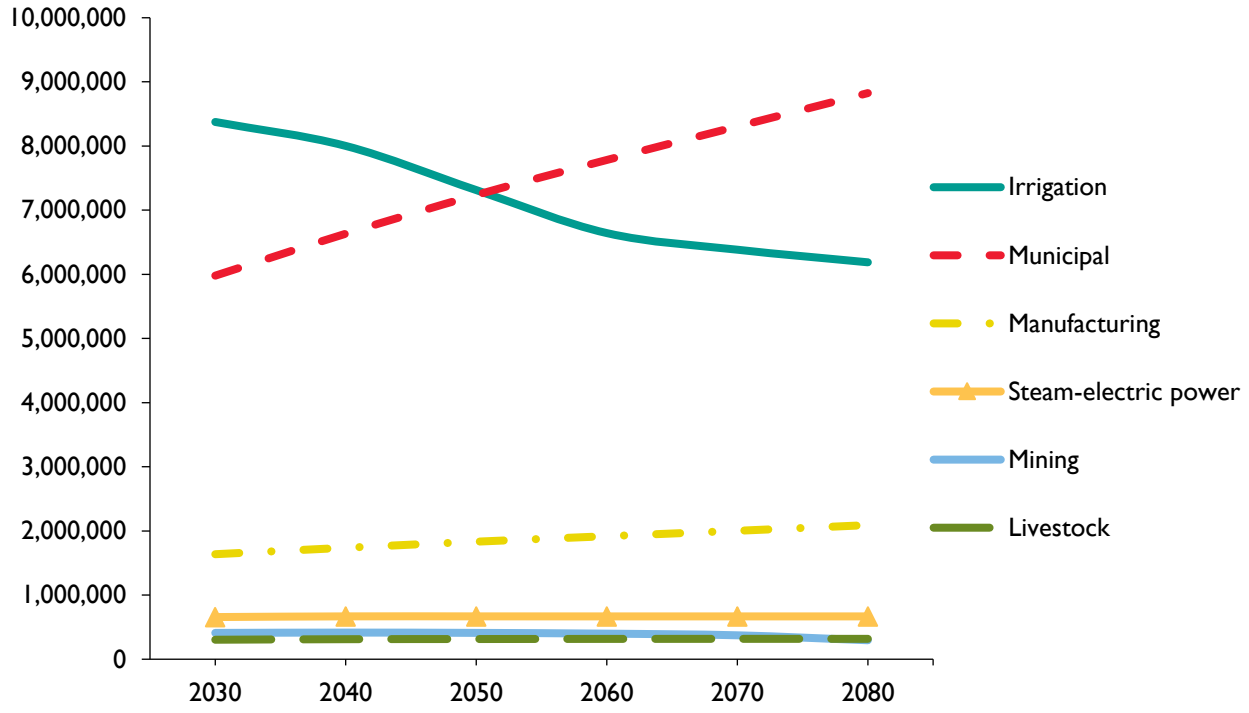
4.1 Water demand projections

The TWDB projects water demand across the 50-year planning horizon for municipal and all non-municipal sectors of the Texas economy to determine how much water the state will need during a single-year recurrence of drought-of-record conditions. Water demand is projected for individual water user groups in six water use categories: municipal, irrigation, livestock, manufacturing, mining, and steam-electric power. Water demand projections exclude demands associated with purely saline water supplies, many of which are associated with industrial uses located along the coast.

Across the planning horizon, the TWDB projects total municipal water demand to increase by 48 percent and non-municipal water demand to decrease by 16 percent (Table 4-1). Much of the non-municipal water demand decrease is due to anticipated declines in water used for irrigated agriculture. Combined, Texas' total water demand is projected to increase by 6 percent over the 50-year planning horizon.

While irrigation is the largest water demand category in each planning decade through 2050, irrigation demand is expected to gradually decrease by 26 percent over the 50-year planning horizon (Figure 4-1, Table 4-1, Table 4-2). Texas' municipal demand is expected to steadily increase in each planning decade due to projected population growth and eventually surpass irrigation demand by 2060. Manufacturing water demand, which is the third largest water use category in Texas, is projected to increase by 28 percent across the planning horizon. Steam-electric power demands are projected to remain almost constant from 2030 to 2080, increasing by approximately two percent across the planning horizon. Water demand for mining—which includes oil and gas operations and accounts for a relatively small amount of water use compared to irrigation and municipal water use—is projected to increase through 2040, then decrease in later planning decades by 28 percent overall. Livestock water demand is projected to increase roughly 5 percent across the planning horizon.

Figure 4-1. Projected annual water demand by water use category (acre-feet)



** Water use categories are presented in the order listed in the legend.*

Table 4-1. Projected annual water demand by water use category (acre-feet)

Category	2030	2040	2050	2060	2070	2080	Percent change from 2030
Irrigation	8,375,529	8,001,557	7,313,180	6,642,983	6,384,027	6,187,571	-26
Livestock	303,833	312,367	314,856	316,567	317,389	317,754	5
Manufacturing	1,637,124	1,737,510	1,832,305	1,917,605	2,002,276	2,090,553	28
Mining	410,204	415,411	410,611	398,520	372,722	295,557	-28
Municipal	5,979,446	6,633,513	7,237,480	7,782,963	8,305,101	8,825,472	48
Steam-electric power	657,327	668,219	668,219	667,723	667,723	667,723	2
Total	**17,363,463**	**17,768,577**	**17,776,651**	**17,726,361**	**18,049,238**	**18,384,630**	**6**

Table 4-2. Projected demands and demands as a percent share of total demand* by water use category in 2030 and 2080 (acre-feet and percent)

Water use category	2030	2080	Percent share of 2030 demand	Percent share of 2080 demand
Irrigation	8,375,529	6,187,571	48	34
Livestock	303,833	317,754	2	2
Manufacturing	1,637,124	2,090,553	9	11
Mining	410,204	295,557	2	2
Municipal	5,979,446	8,825,472	34	48
Steam-electric power	657,327	667,723	4	4
Texas	**17,363,463**	**18,384,630**	**100**	**100**

** Percent share of total demand rounded to the nearest whole percentage.*

4.1.1 Projected water demand by region

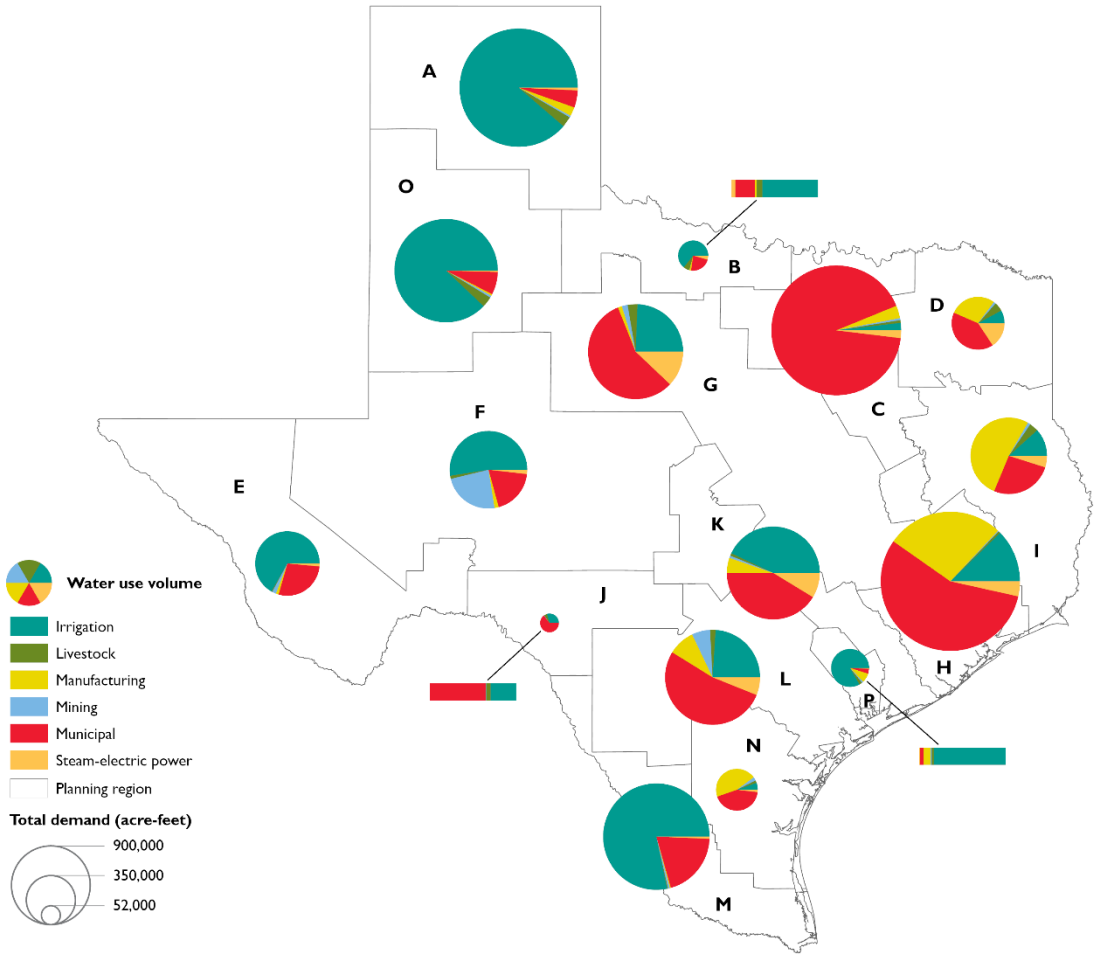
The character and path of total water demand projections vary significantly by regional water planning area (Table 4-3 and Figure 4-2). Water demand in Region C is projected to increase by 55 percent over the planning period, while Region G is projected to have the second largest water demand increase of 40 percent. Both regions' growth in total demand is largely driven by population growth and a corresponding increase in municipal water demands. Significant water demand increases driven by population and manufacturing growth are also projected for Regions H, I, K, and L, where water demand is expected to increase by more than 20 percent between 2030 and 2080.

Regions A and O in the Texas Panhandle are the only planning areas projected to show significant declines in total water demand. Long-term groundwater drawdowns associated with irrigated agriculture are anticipated from 2030 to 2080. Likewise, the Region M total water demand is projected to decline due to anticipated decreases in irrigation demand, declining surface water supplies, and conversion of irrigation water rights to municipal purposes.

Table 4-3. Projected annual water demand by region (acre-feet)

Region	2030	2040	2050	2060	2070	2080	Percent change from 2030
A	2,154,499	2,162,587	2,033,060	1,920,673	1,816,340	1,741,572	-19
B	133,805	133,607	133,210	132,689	132,216	131,784	-2
C	1,948,387	2,214,056	2,449,165	2,663,622	2,860,536	3,028,785	55
D	389,550	399,025	407,468	415,054	422,546	430,678	11
E	598,338	602,792	605,688	607,576	609,495	611,435	2
F	859,746	873,452	876,796	866,685	849,659	837,055	-3
G	1,119,518	1,223,469	1,313,431	1,399,554	1,483,356	1,571,453	40
H	2,558,437	2,689,470	2,816,450	2,909,581	2,993,134	3,076,716	20
I	755,106	803,748	852,417	897,825	942,672	987,594	31
J	50,980	51,355	51,715	52,320	52,936	53,522	5
K	1,138,936	1,197,623	1,255,990	1,317,067	1,378,821	1,447,471	27
L	1,134,971	1,228,646	1,312,186	1,401,489	1,493,287	1,557,437	37
M	1,713,383	1,683,161	1,647,935	1,605,970	1,564,093	1,513,288	-12
N	253,498	254,955	255,332	255,130	255,077	250,809	-1
O	2,345,019	2,039,883	1,554,688	1,069,621	983,165	935,378	-60
P	209,290	210,748	211,120	211,505	211,905	209,653	0
Texas	**17,363,463**	**17,768,577**	**17,776,651**	**17,726,361**	**18,049,238**	**18,384,630**	6

Figure 4-2. Projected annual water demand by region and category in 2050*



** Relative size of pie charts is based on volume of water demand.*

4.1.2 Water demand methodology

The TWDB utilizes historical water use survey data, annual water use estimates, and other data sources to project water demand for individual water user groups in each of the six water use categories over the planning horizon. This section defines water user groups, provides an overview of the data that serves as the basis of water demand projections, and describes how water demand projections are developed for the regional and state water plans. Detailed projection methodologies for each water use category are included in Sections 4.1.3 through 4.1.8.

Water user groups

Water user groups are the entities for which water demand projections are developed by the TWDB and that form the underlying, highest resolution basis for the state water plan. Water user groups fall within the six water use categories (municipal, irrigation, livestock, manufacturing, mining, and steam-electric power).

Municipal water user groups are utility-based entities that specifically 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 water utilities providing more than 100 acre-feet or more of municipal water per year;
- collections of utilities with a common water supplier or water supplies (Collective Reporting Units or 'CRU'); and,
- the remaining public water systems and self-supplied domestic water use are aggregated at the county level as "County-Other".

The municipal water user groups in this state water plan include those from the 2022 State Water Plan with active, community public water systems and additional new municipal water user groups that met the above criteria. The regional water planning groups reviewed and revised the list of municipal water user groups before population and water demand projections were developed.

While specific, privately owned individual water systems may use volumes that exceed 100 acre-feet per year, the utility must average more than 100 acre-feet per year across all the water systems it owns in the state to be considered as an individual municipal water user group. Additionally, the system's water use data must be reported to the TWDB during the annual Water Use Survey to be included in the water user group list or the data must be provided by the planning groups during the revision process. Otherwise, the individual water systems are grouped into County-Other water user groups for planning purposes.

Non-municipal (irrigation, livestock, manufacturing, mining, and steam-electric power generation) water user groups are determined based on total water use for the specific water use category. All water use for a category, such as manufacturing, is aggregated at the county-level and planned for as one category-specific water user group. Not all counties will have a water user group for each non-municipal water use category. For example, there are no steam-electric power generation facilities in any county in Region J, and so there are no steam-electric power water user groups in Region J.

Annual water use estimates

Water demand projections in the regional and state water plans are anchored in historically reported and estimated annual water use. Each year the TWDB collects water use data from municipal entities and industrial facilities within the state via the Water Use Survey (Figure 4-3). For quality assurance, survey data is compared to historical survey data and verified against water rights data from the Texas Commission on Environmental Quality, pumping data from groundwater conservation districts, and public water system boundaries in the Texas Water Service Boundary Viewer. The TWDB then utilizes survey data and secondary information sources to develop annual statewide water use estimates for all water use categories. These historical annual estimates inform the baseline used to develop water demand projections for the regional and state water plans. Figure 4-4 provides a breakdown of statewide water use in 2023 based on the TWDB Water Use Survey and annual estimates.

Annual estimates of non-surveyed water use categories (irrigation, livestock, oil and gas, mining, and domestic/rural purposes) attempt to account for water use that is detectable but unreported. For example, agricultural water use and water used for oil and gas are not surveyed. Instead, they are estimated by the TWDB using third party sources, like the United States Department of Agriculture and FracFocus, to ensure these types of water uses are captured in TWDB annual water use estimates. Similarly, municipal water use includes domestic rural use not served by a public water system and not reported through the Water Use Survey. The TWDB estimates this non-surveyed domestic water use with an average statewide per capita water use for rural water systems. This average is applied to the

estimated population that relies on private sources and is not served by any public water system. In this way, the TWDB annual water use estimates capture both surveyed and non-surveyed uses.

Although it is difficult to know exactly how much water is used throughout the state, by leveraging multiple sources of data and cross-checking water use where possible, the TWDB annual estimates are the best data available for water use in Texas. Annual water use estimates are a key component of water demand projections, socioeconomic impact analyses, and water supply projections in the state water plan. They are also used in groundwater availability models, groundwater conservation district management plans, water conservation tracking, and research, media, and legislative requests. Water Use Survey data also feeds into utility Water Loss Audits and Water Conservation Plans.

Figure 4-3. Data sources and use of TWDB annual water use survey and annual water use estimates

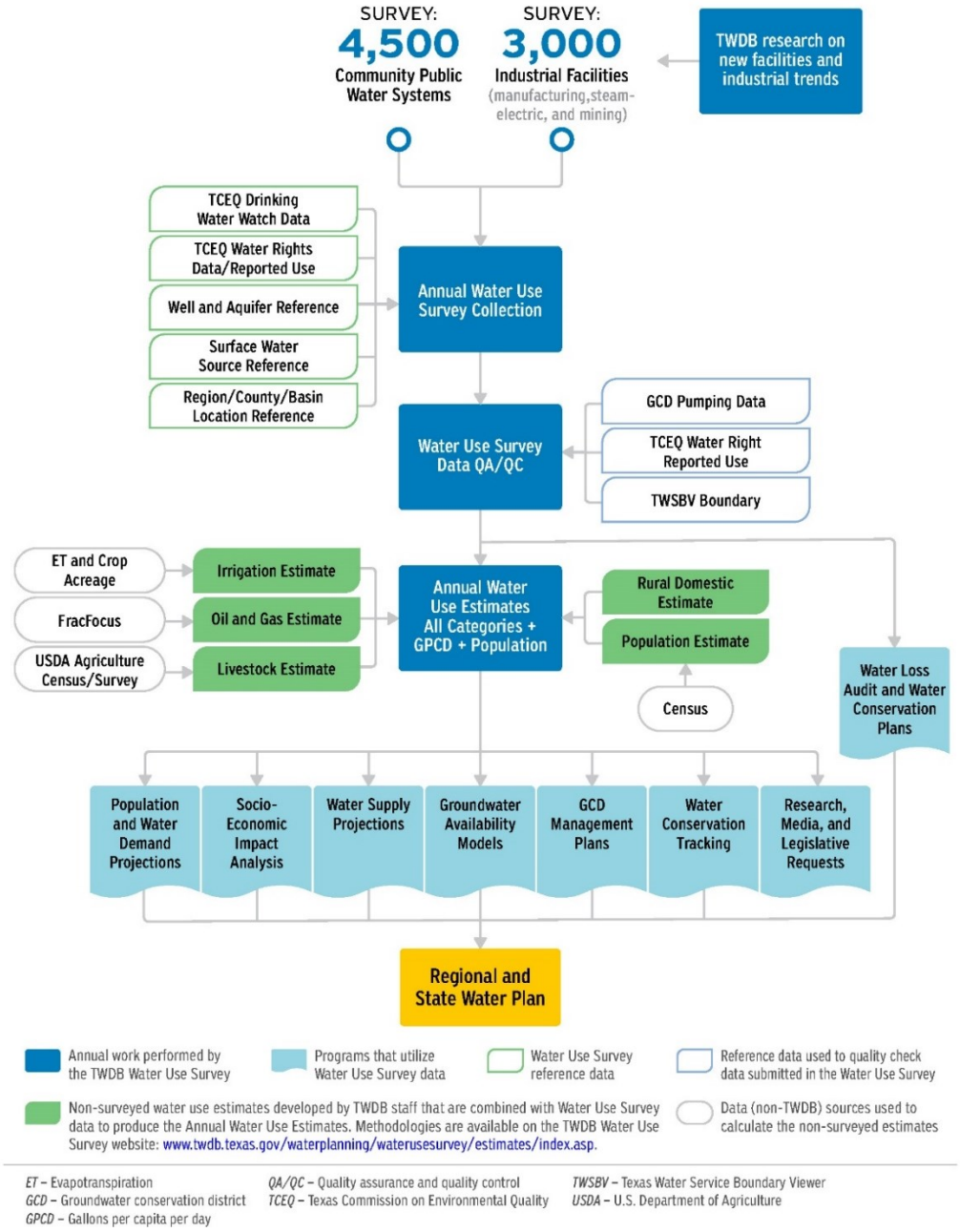
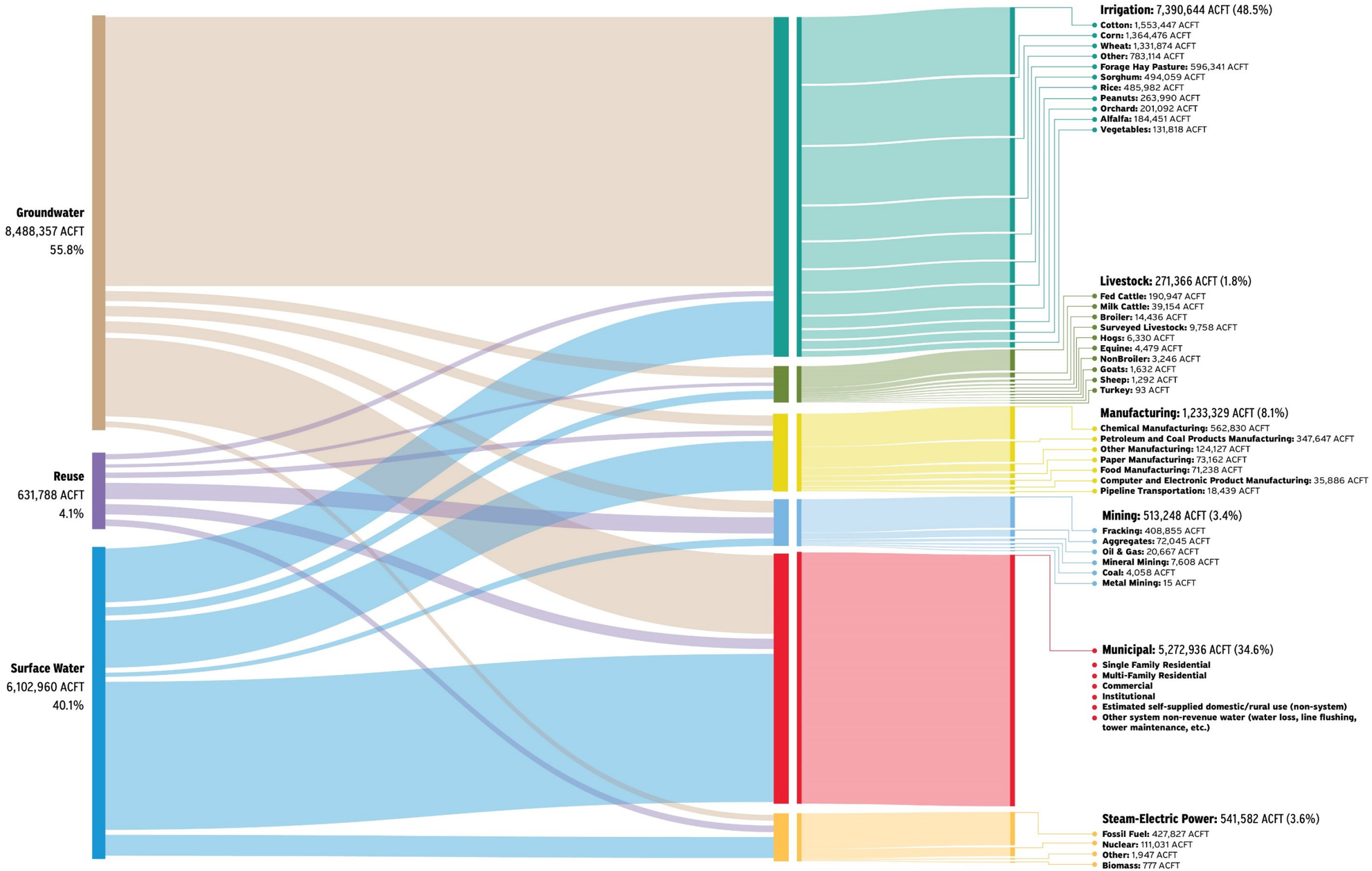


Figure 4-4. Statewide total water use, 2023



Note: Statewide water use totals are estimated using information reported through the TWDB Water Use Survey and annual estimates. Municipal water use is not separated into detailed subcategories because available reporting does not always distinguish these categories consistently. Data for recent years may change as updated or improved information becomes available.

More resources

Learn more about the annual Water Use Survey at www.twdb.texas.gov/waterplanning/waterusesurvey/index.

Explore historical water use data via the Historical Water Use Summary and Data Dashboard at www.twdb.texas.gov/waterplanning/waterusesurvey/dashboard/index.

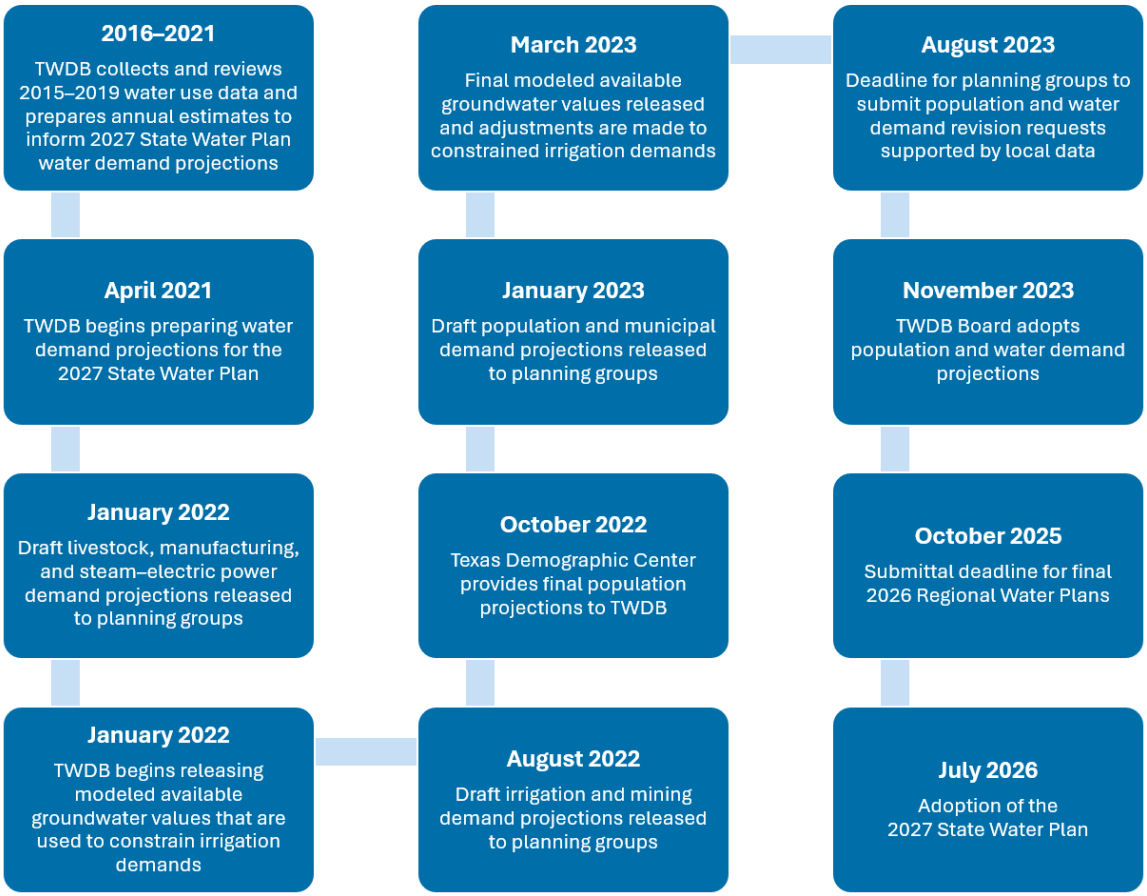
Water demand methodology

The TWDB—in consultation with the Texas Commission on Environmental Quality, the Texas Department of Agriculture, and the Texas Parks and Wildlife Department—developed water demand projections for the municipal, manufacturing, steam-electric, mining, livestock, and irrigation water use categories using statewide, uniform methodologies for all 16 regional water planning groups. The draft projections were provided to the planning groups for review. Each planning group then submitted a revision request, as applicable, to the TWDB for consideration. Figure 4-5 presents the timeline for the development of projections for this plan.

The TWDB relies on the planning groups and their revision requests to further refine water demand projections by providing additional local, region, county, and water user group-specific information. For example, a planning group may have additional information that strongly supports shifting a portion of the projected future population from one county or water provider to another adjacent county or water provider. The TWDB supports the planning groups in their reviews of the draft projections by providing in-person presentations, relevant datasets, and data tools (like the online projection dashboards). The TWDB also works with the planning groups to resolve questions and data errors—such as incorrect reporting to the Water Use Survey—and provides supporting data and preliminary feedback prior to the official planning group revision submittals.

As a result of their review, the planning groups requested changes for more than 2,900 of the water user groups listed in the plan. The requests were extensive and involved a wide variety of unique situations and accompanying justifications and data. Over 92 percent of the revisions requested were accepted as submitted and an additional 6 percent were further revised before they were recommended by the four agencies and adopted by the TWDB. Only one percent of the planning group revision requests were not recommended and adopted by the TWDB.

Figure 4-5. Projections development timeline



Note: In general, water demand projections are developed using the most recent five years of water use as the baseline. For this plan, the baseline period of annual water use for projections was 2015–2019. From 2016 to 2021, the TWDB collected baseline water use data and prepared annual water use estimates and modeled available groundwater data that would inform water demand projections. Draft projections were released to planning groups in several stages during 2022 and early 2023. Planning groups reviewed the draft projections and submitted revision requests based on local data to the TWDB by August 2023. Final population and water demand projections were adopted by the TWDB Board in November 2023. Since then, the TWDB has continued its annual work to collect and review water use data and prepare annual estimates for use in future water plans. The most recent water use data, transposed onto projections, are available on the TWDB Planning Data Dashboard (www.twdb.texas.gov/waterplanning/data/dashboard).

4.1.3 Municipal water demand

Municipal water demand includes water used by a variety of consumers in Texas communities that range from single and multifamily residences to non-residential establishments. Non-residential establishments include commercial, institutional, and light industrial users, as well as some smaller data centers, that are served by municipal providers. Residential, nonresidential, and even many commercial consumers use water for similar purposes, such as drinking, cooking, sanitation, cooling, and landscaping. Water-intensive industrial customers—such as large manufacturing plants, steam-electric power generation facilities, and mining operations—are not included in municipal water demand, despite their presence within municipalities. Instead, they are included in their associated nonmunicipal demand categories (Sections 4.1.6 through 4.1.8). Municipal water demand projections are calculated by developing population projections for each water user group and multiplying them by a projected gallons per capita per day that is based on historical dry-year water use and projected water efficiency savings (Figure 4-6).

Across the planning horizon, statewide total municipal water demand is projected to increase by 48 percent from almost 6.0 million acre-feet in 2030 to 8.8 million acre-feet in 2080 (Table 4-1). Regions C, G, H, K, and L account for more than 80 percent of statewide municipal demand in 2080 (Figure 4-7).

Figure 4-6. Municipal water demand calculation

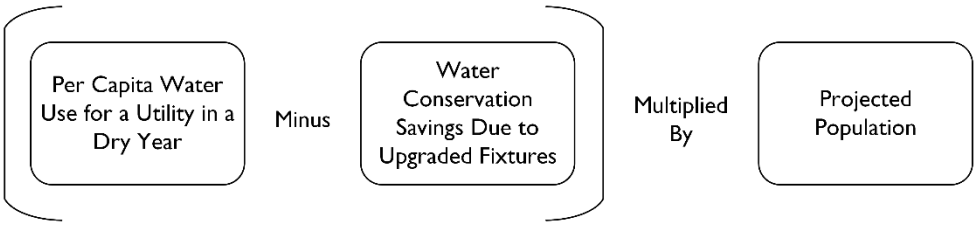
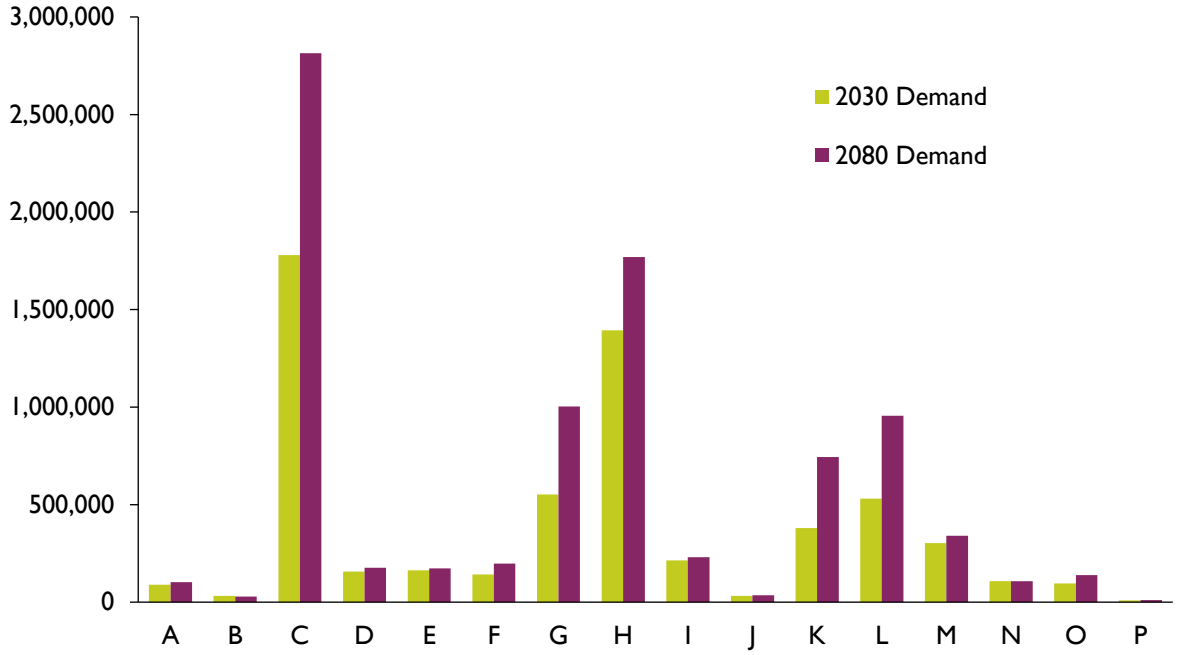


Figure 4-7. Projected annual municipal demand by region in 2030 and 2080 (acre-feet)



Per capita water use

To project total annual municipal water demand, the TWDB multiplies the projected populations for each municipal water user group by the associated projected per capita water use (also referred to as gallons per capita daily or GPCD) during a historical dry year. The GPCD for water user groups is based on representative dry-year conditions. For the majority of municipalities, that year is 2011, when there was a historic drought for much of Texas—but some water user groups relied on other years that represented more recent dry-year conditions, such as 2018. Per capita water use is the product of a wide variety of factors that vary across municipal communities. These factors include individual preferences, culture and habits, the weather, local conservation ordinances, the relative share of commercial water use in the community (including from tourists and commuters), domestic water use, and the adoption of more water-efficient appliances. Counterintuitively, dry-year water use usually reflects the highest per capita water use.

While population projections account for the permanent residential population, the GPCD includes all types of municipal water use. Per capita water use is comprised of residential use by permanent and

transient populations including estimated use for people on their own wells; commercial and institutional water use, which may include hotels, hospitals, schools, and/or restaurants; and light industrial water use within water utilities. The TWDB acknowledges the difficulty in accurately estimating water use for nonsystem populations or those on private water wells. Consequently, the TWDB has initiated a study to improve data collection and estimation around this type of water use, with results expected in 2026 for use in the 2032 State Water Plan.

Water efficiency savings

Municipal water demand projections account for anticipated future water savings attributable to state and federal laws governing water efficiency standards for fixtures and appliances, including toilets, shower heads, and clothes washers. This planning cycle, water efficiency savings also included projected savings from commercial fixture plumbing code laws that were not accounted for in previous planning cycles. Statewide water efficiency savings are projected to be approximately 171,000 acre-feet per year in 2030, increasing to 351,000 acre-feet per year in 2080. Water savings due to existing legal requirements are embedded in the municipal water demand projections because they can be expected to occur passively and therefore require no additional proactive action on the part of cities and water utilities.

Planning groups estimated and incorporated additional future water savings from municipal conservation programs—beyond those occurring due to plumbing codes—as recommended water management strategies in the regional plans to be implemented by water providers (see Chapter 7). These strategy volumes represent voluntary water conservation savings that would not otherwise occur if not for additional proactive actions and investments by water providers and customers.

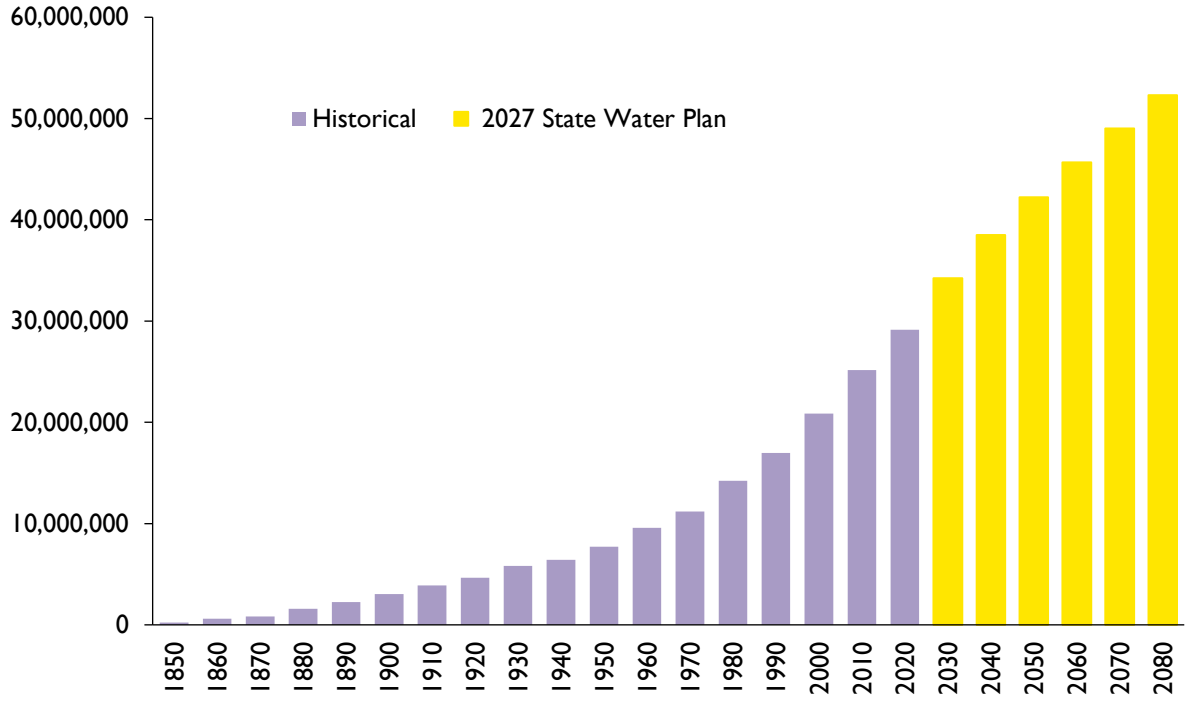
Population projections

An important step in projecting municipal water demand is projecting the future population. To project into the future, we must review historical data and trends to know the current population. Texas has the second largest population in the United States and has gained more residents than any other state since 2000 (U.S. Census Bureau, 2023). The state's growth, which has outpaced the national average in each decade since the 1850s (Murdock and Cline, 2018), has been incorporated into the past regional and state water plans developed by the planning groups and the TWDB. While the total population of Texas has grown significantly, the rate of growth has slowed over time and is projected to continue slowing in line with historical trends. However, a slowing rate of growth does not mean significant growth will not occur. Texas' population is projected to increase by more than 50 percent during the planning horizon, from 34.2 million in 2030 to more than 52.3 million in 2080 (Figure 4-8).

There are many factors that contribute to slower overall growth rates, including aging population and lower fertility rates. These nationwide trends are not unique to Texas. The baby boomer generation, born between 1946–1964, was the largest generation in American history[8]. By 2030, all baby boomers will be at least 65 years of age or older (U.S. Census Bureau, 2019), and this contributes to a demographic shift over the 50-year planning horizon. Furthermore, the United States is experiencing record-low fertility rates. While Texas fertility rates are slightly higher than the national average, they are still below the 2.1 replacement rate, which is generally two children per two adults (Texas Demographic Center, 2022). These factors directly drive down projected growth rates and reduce projected total population compared to previous projections that shaped earlier Texas state water plans.

[8] Baby boomers peaked in 1999 at 78.8 million people, according to the Pew Research Center (2020).

Figure 4-8. Historical and projected population growth in Texas (1850–2080)

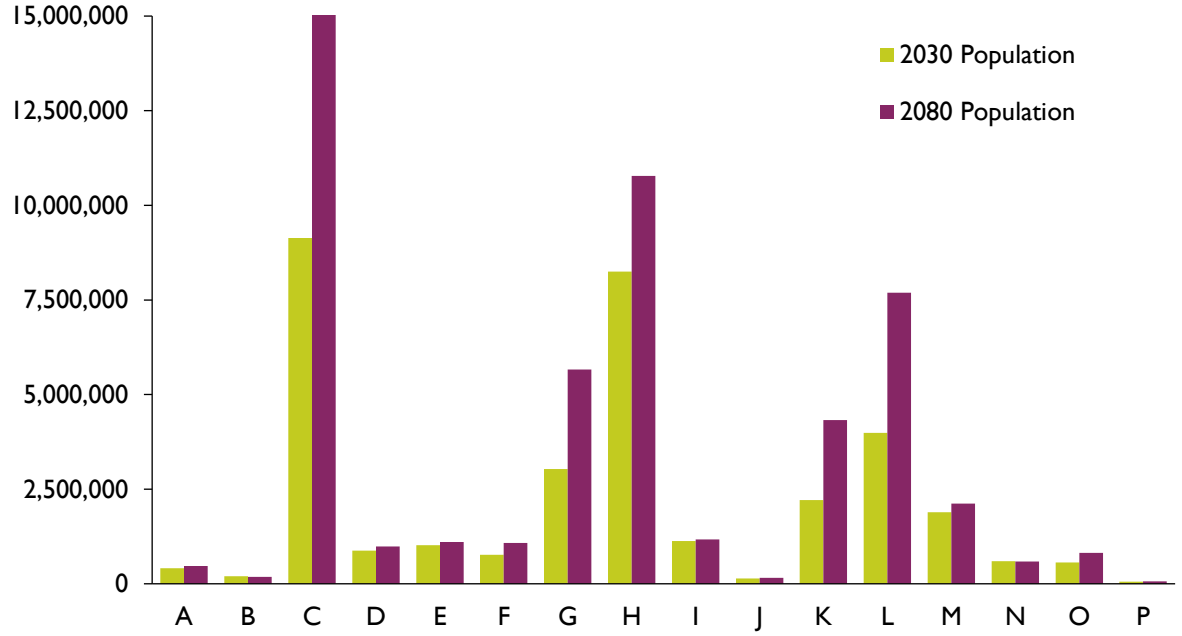


The population projections developed for this plan are grounded in data from the recent 2020 U.S. Census and projections from the Texas Demographic Center. While Texas is projected to continue to grow, not all regions or counties will experience this growth equally (Table 4-4). Recent historical population growth has been concentrated around the state's urban and suburban areas, and this trend is projected to continue. Growth is projected to be concentrated around the state's major metropolitan areas, especially Austin, Dallas-Fort Worth, Houston, and San Antonio. Regions C and H (which include the Dallas-Fort Worth metropolitan area and Houston, respectively) are expected to capture more than 50 percent of the state's growth over the next 50 years (Figure 4-9). Significant growth is not projected to occur in many rural areas of the state, reflecting the increasingly urban character of Texas and the nation. In West Texas, most population growth is projected to occur within regional urban hubs, such as Amarillo, El Paso, Lubbock, Midland, and Odessa.

Table 4-4. Projected population by region (2030–2080)

Region	2030	2040	2050	2060	2070	2080	Percent change from 2030
A	407,985	426,366	439,607	449,783	460,031	470,326	15
B	199,116	198,526	195,661	192,041	188,649	185,480	-7
C	9,133,116	10,504,043	11,804,305	13,000,417	14,163,968	15,126,596	66
D	873,433	904,455	928,548	947,851	964,080	983,981	13
E	1,022,933	1,055,055	1,072,097	1,082,561	1,093,197	1,104,003	8
F	762,985	834,344	901,689	955,743	1,013,398	1,074,918	41
G	3,032,159	3,649,340	4,183,073	4,682,109	5,160,738	5,660,538	87
H	8,245,006	8,927,345	9,536,233	9,995,159	10,398,715	10,778,027	31
I	1,126,375	1,153,046	1,170,483	1,169,886	1,169,921	1,170,658	4
J	140,468	143,115	145,118	148,281	151,470	154,530	10
K	2,208,542	2,631,327	3,023,187	3,427,947	3,856,350	4,328,648	96
L	3,987,279	4,793,957	5,469,629	6,176,459	6,897,460	7,689,377	93
M	1,893,334	1,991,852	2,049,126	2,071,536	2,094,192	2,117,096	12
N	593,187	601,949	602,191	598,824	595,485	592,173	0
O	564,047	607,386	648,854	700,823	757,033	817,498	45
P	53,799	56,340	58,525	60,742	63,033	65,399	22
Texas	**34,243,764**	**38,478,446**	**42,228,326**	**45,660,162**	**49,027,720**	**52,319,248**	**53**

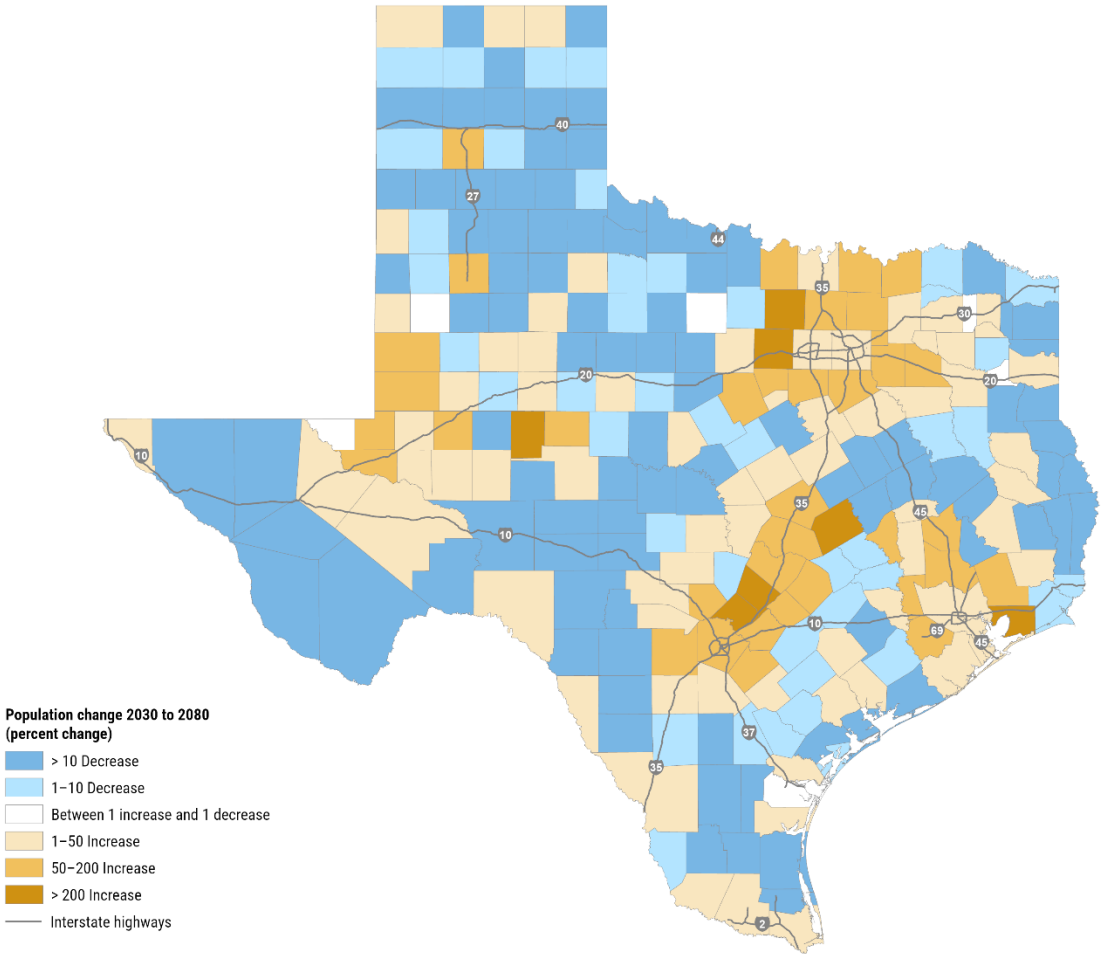
Figure 4-9. Projected population by region in 2030 and 2080



At a county level, 19 Texas counties are expected to at least double in population between 2030 and 2080 (Figure 4-10). These highest-growth counties are predominantly suburban areas surrounding the state's major metropolitan areas. During the same planning horizon, 137 counties around the state are projected to experience declines in population.

In addition to its highly variable climate, Texas' sustained population growth is a fundamental reason why the state has been at the forefront of long-range water supply planning since the 1960s. Past state water plans have charted the additional growth anticipated over the planning horizon, which will put increasing pressure on existing water supplies, regardless of advances in municipal conservation in recent years. This plan projects population growth from 2030 to 2080 for more than 1,200 municipal water user groups across Texas' 254 counties. The next section provides detailed information on the methodology for determining population projections for this planning cycle.

Figure 4-10. Projected population change by county (2030–2080)



Population projections methodology

Population projections are developed in two steps. Population is first projected at the county level by the state demographer at the Texas Demographic Center for permanent residential population, using a standard demographic methodology known as a cohort-component method (Texas State Demographer, 2022). This procedure uses separate cohorts (combinations of age, gender, and racial-ethnic groups) and components of cohort change (birth rates, survival rates, and migration rates) to estimate future populations by county. This method provided the TWDB with initial, 30-year projections by county,

which the TWDB then extrapolated into the final two planning decades to complete the state water plan's 50-year planning horizon. For the 2026 regional water plans, the population projections developed by the state demographer rely on demographic data from the Texas Department of State Health Services and the U.S. Census Bureau, including the most recent 2020 Census. Once county-level projections are developed, the TWDB distributes them to individual municipal water user groups, including utility service areas and rural areas located within each county.

The TWDB population projections for the regional and state water plans have always initially relied on county-level population projections from the Texas Demographic Center. In the past, the TWDB altered the resulting regional plan population projections in certain counties—by holding them flat into future planning decades—to avoid projecting overall declining municipal demands. For the 2026 regional water plans, the draft county population projections followed the trends projected by the Texas Demographic Center, including declines. This change in methodology was implemented to better estimate future municipal water demands and needs (potential shortages), improve the credibility of the water plan, better inform evaluations of potential funding applications, and better understand financial risks associated with water supply projects funded through TWDB state financial assistance programs.

Of the three components of cohort change, the migration rate (which indicates how many people move in and out of counties) is the factor with the highest level of uncertainty and is the most difficult to project over the long term. While birth and survival rates tend to closely follow historical trends and are based on demographics (age, sex, and race/ethnicity), migration rates by county are influenced by the local economy, job opportunities, land and home prices, transportation options, and many other local variables.

For county-level projections, the Texas Demographic Center developed two migration scenarios:

- One-half of the observed migration rates from 2010 to 2020 (0.5 scenario), and
- Full 2010 to 2020 migration rates (1.0 scenario).

The TWDB initially drafted municipal water user group projections with the full migration scenario and provided both county-level projection scenarios to the planning groups. Due to numerous requests from the planning groups, the TWDB also drafted a complete set of water user group population projections using the one-half migration scenario for all regional water planning areas. Regional water planning groups selected what they considered the most appropriate migration scenario for each county or provided supporting data for alternative county-level scenarios.

The Texas Demographic Center full migration scenario—including the TWDB extrapolation of the remaining two planning decades—projected Texas' population to grow from almost 33 million in 2030 to 53 million in 2080, or 62 percent growth. Under the one-half migration scenario, Texas' population is projected to grow from 31.6 million in 2030 to just over 39 million in 2080, or 25 percent growth. The regional water planning groups reviewed each county-level scenario developed by the Texas Demographic Center and the water user group projections drafted by the TWDB. All planning regions selected a mix of migration scenarios for their county-level population projections and, if applicable, provided supporting justification based on local data for further changes. They then selected either the county-level projection scenario that fit best or proposed revisions to the county totals.

Requested revisions to the population projections included

- demographic adjustments due to the federally acknowledged 2020 Census undercount,
- updates to population due to new home subdivision growth,
- subdivision buildout (often limiting growth),
- population growth due to recent additions of industries and jobs, and/or
- aligning with utility/wholesale water provider/groundwater district comprehensive plans.

Due to the 2020 decennial Census undercount of the Texas population, acknowledged by the U.S. Census Bureau to be approximately 1.92 percent (U.S. Census Bureau, 2022), several regions requested to increase their total population. For example, Regions E and M opted to utilize a demographic undercount approach to increase the regions' population by 5 percent for the Latino population and 3.3 percent for the Black population, as nationally undercounted and acknowledged by the Pew Research Center (Pew Research Center, 2022).

As with any projections of the future, there is uncertainty in this plan's population and water demand projections. The TWDB sought out and depended upon local data from the planning groups to refine the initial draft projections in terms of population growth but also where those future residents will most likely be located. The TWDB works with the planning groups through a rigorous data review process to develop deterministic population projections based on the best available data. Therefore, the TWDB population projections in the regional and state water plans vary from the Texas Demographic Center's county-level projections. Furthermore, accuracy increases with a higher level of geography; in other words, state-level projections tend to be more accurate than some of the water user group-level projections. This plan projects the statewide population will grow from 34.2 million in 2030 to more than 52.3 million in 2080, or more than 50 percent growth across the planning horizon.

4.1.4 Irrigation water demand

Irrigation water demand includes water used for irrigated field crops, vineyards, orchards, and self-supplied golf courses. The baseline methodology for irrigation water demand projections was to average the most recent five years (2015-2019) of water use estimates and hold that value constant between 2030 and 2080. However, in certain counties, the total groundwater availability over the planning period was projected to be less than the groundwater portion of the baseline water demand projections. Where this occurred, the draft demand projections decline in later decades roughly commensurate with the groundwater availability—but at a delayed rate to recognize the fact that water demands will likely remain higher than water availability, even as they both decline.

This projection methodology was developed as part of an effort by the TWDB to update nonmunicipal projection methodologies and included a study (CDM Smith, 2016) funded by the TWDB. The goal of the study was to find the best projection method for this sector that the TWDB can update regularly and that transparently and more directly considers, incorporates, and reflects irrigators' approaches to foreseeable declines in water availability than previous methods. This is the second state water plan that utilizes this methodology. Planning groups reviewed the draft irrigation water demand projections and requested revisions based on local data as appropriate. For example, Region O has the largest irrigation water use in the state and requested significant changes to the TWDB irrigation water demand projections to better reflect anticipated near-term and long-term changes in water use within the region.

Overall irrigation demand is projected to decline because of more efficient irrigation systems, declining groundwater and surface water supplies, the economic difficulty of pumping groundwater from increasingly greater depths, and the transfer of water rights from agricultural to municipal uses in the Lower Rio Grande. In total, irrigation is projected to account for 48 percent of Texas' water demand in 2030 and decline to 34 percent by 2080. Regions A, M, and O are projected to account for more than 55 percent of statewide irrigation water demand in 2080 (Figure 4-11).

At a regional level, irrigation water demands are projected to decline in Regions A, K, M, and O over the planning period. It is estimated that Region O will have a nearly 67 percent decline in irrigation water demand over the planning horizon (Figure 4-12).

Figure 4-11. Projected annual irrigation water demand by region in 2030 and 2080 (acre-feet)

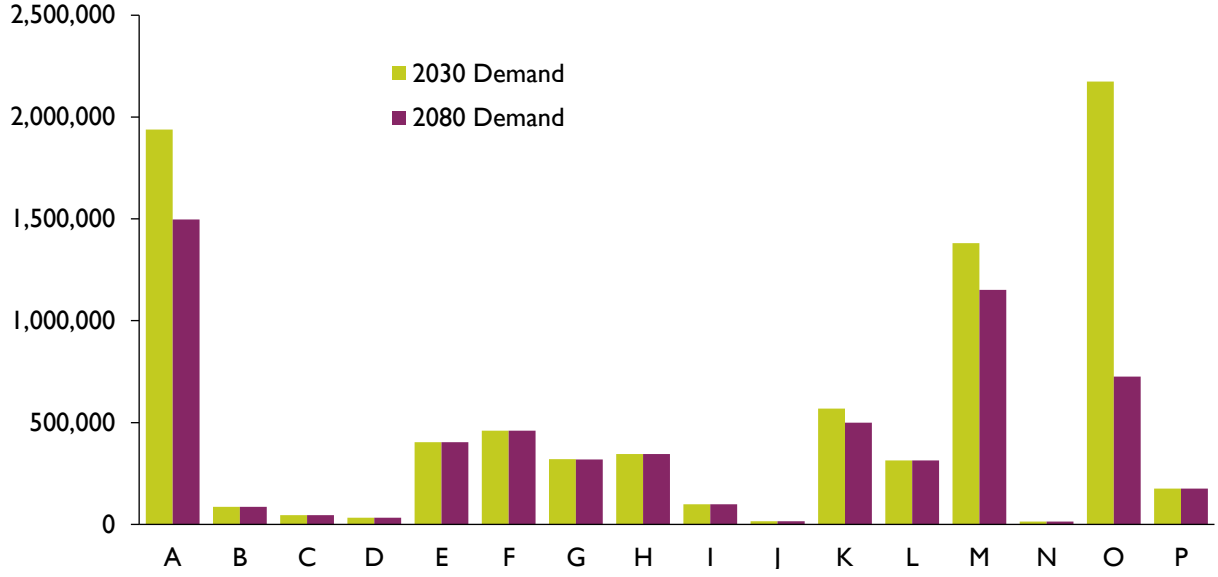
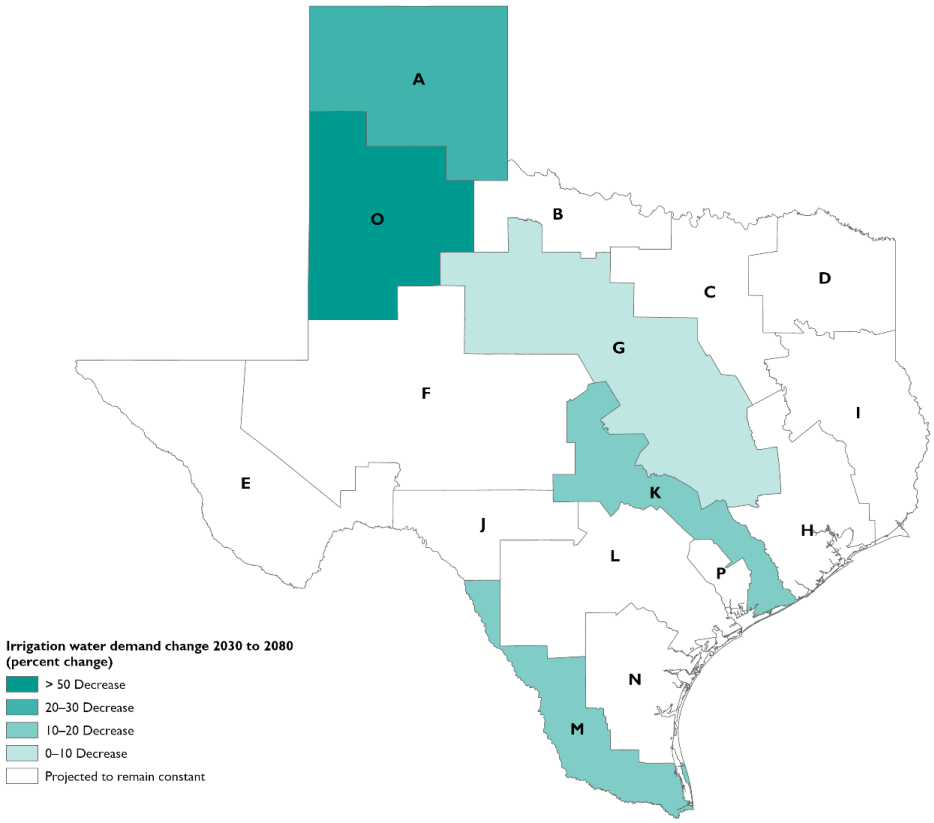


Figure 4-12. Projected irrigation water demand change by region (2030–2080)



How future groundwater availability can shape projected irrigation water demands in Region O

Region O irrigation

The Region O Llano Estacado planning area is the region with the largest irrigation water use in Texas. The water that agricultural producers in Region O use to grow cotton, corn, wheat, and other crops accounts for about 30 percent of all water used for irrigation in Texas. Within the region, farmers rely almost entirely on groundwater to supplement precipitation for crop production, and 98 percent of the groundwater used to irrigate crops comes from the Ogallala Aquifer. This outsized reliance on a singular source means that the agriculture sector in Region O is greatly influenced by management of the Ogallala Aquifer.

Managed depletion of the Ogallala Aquifer

Dating back to 1998 groundwater management plans, local groundwater conservation districts in the Panhandle made explicit policy decisions to manage depletion of the Ogallala Aquifer. This represented an acknowledgement that little aquifer recharge occurs due to ongoing, high-volume pumping. In practice, this means that the groundwater conservation districts fully expect annual groundwater availability volumes to decline with each future planning decade. As of today, the Panhandle groundwater conservation districts are over 20 years into applying their managed depletion groundwater policy, which, in this case, plans for between 40–80 percent of the total Ogallala Aquifer storage to remain after a 50-year period.

Impacts on irrigation water demand

This planning cycle, the Llano Estacado Regional Water Planning Group indicated that they did not believe the most recent TWDB irrigation water demand projection methodology reflected the historical or anticipated rate of decline for irrigation water use occurring within the region. As part of the draft irrigation demand review and revision process, the planning group worked closely with the TWDB to apply their own methodology for projecting irrigation demands to better reflect anticipated near-term and long-term changes in water use. These trends are driven by the declining availability of water from the Ogallala Aquifer as well as economic drivers of irrigated versus dryland agricultural production, increasing irrigation efficiency, decreasing irrigated acreage, and projected production changes.

The resulting projection methodology reduced near-term (2030) irrigation demands by 10 percent of historical use and showed more aggressive declines in demands through 2060—at which point the projected irrigation demand is based on projected groundwater availability and non-irrigation groundwater demands. This new method fundamentally captures how Region O expects its irrigation demands to trace a similar path to declining Ogallala Aquifer storage.

As a result, Region O and statewide irrigation water demands in the 2027 State Water Plan are significantly lower than the 2022 State Water Plan. As shown in Figure 4-A, there is a 65 percent decline in Region O irrigation water demands between the two plans (over 1.4 million acre-feet) by 2070. The 2027 State Water Plan better reflects the anticipated impact of declining groundwater availability on future irrigation water demand in Region O.

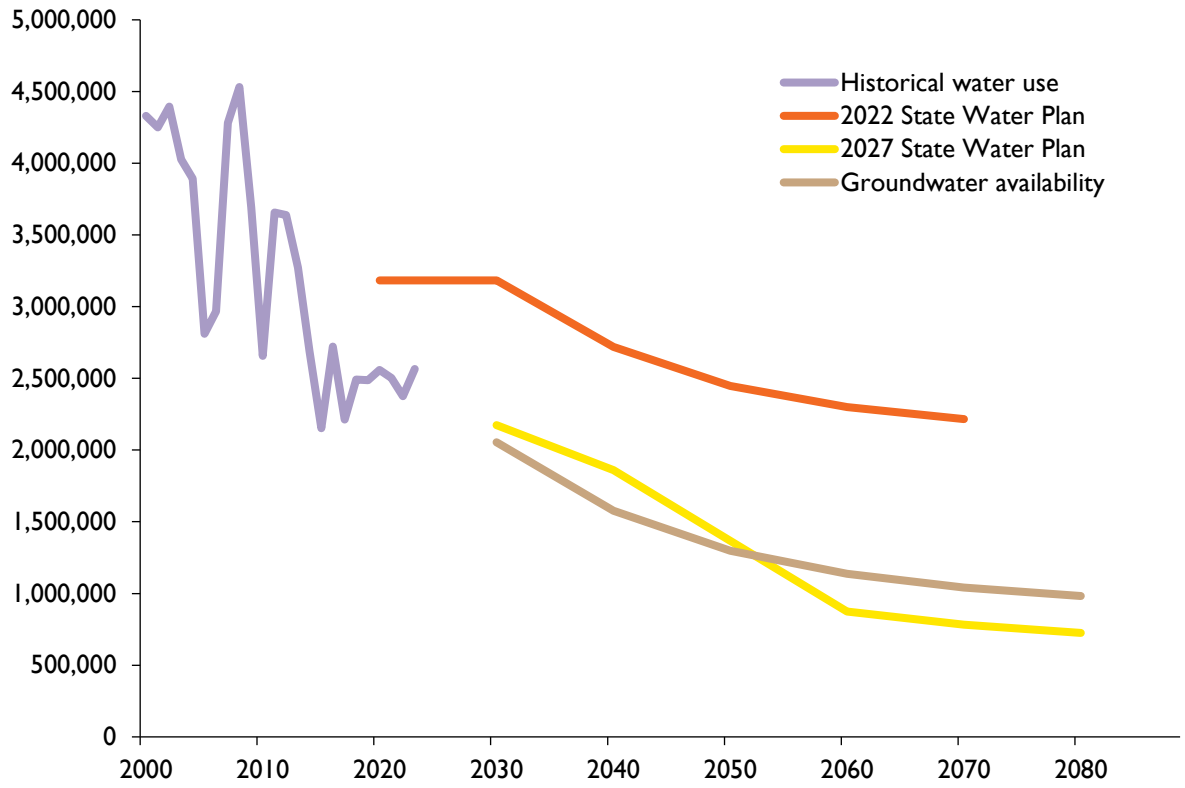


Figure 4-A. Comparison of projected Region O irrigation demand between the 2022 and 2027 state water plans to historical water use and projected groundwater availability (acre-feet)

4.1.5 Livestock water demand

Livestock water demand includes water used in the production of various types of livestock, including cattle (beef and dairy), poultry, hogs, horses, sheep, and goats. The 2030 water demand projections for each county were based on the average of the most recent five years (2015-2019) of water use estimates, though some regions requested to incorporate the dry years from 2010-2014 into the baseline.

Water use estimates were calculated by applying a water use coefficient for each livestock category to county-level inventory estimates from the United States Department of Agriculture National Agricultural Statistics Service. The rate of change for projections in each planning area was carried forward from the 2022 State Water Plan and applied to the new baseline estimate. Livestock water demand occurs throughout Texas but is highest in Regions A, G, I, and O, due to the concentration of confined animal feeding operations in these areas. All planning groups reviewed the draft projections and requested revisions based on local data as appropriate. Regions A and O created a joint subcommittee to review the draft projections in their regions and submitted revision requests based on projected

inventory and local water demand that affect both regions. As a whole, livestock accounts for roughly 2 percent of Texas' total water demand across the planning horizon.

4.1.6 Manufacturing water demand

Manufacturing water demand consists of the water necessary for large production facilities, including those that process chemicals, oil and gas, food, paper, and other materials. The manufacturing water demand projections for each county were anchored on baseline estimates of the highest region-county manufacturing water use in the most recent five years of Water Use Survey data (2015–2019), plus estimated unaccounted-for water use. Volumes of fresh water (surface water and groundwater), reuse (such as treated effluent), and brackish groundwater used by manufacturing facilities were included in the historical estimates and the water demand projections. Saline surface water was not included. The full intake was included in the baseline (minus sales), not consumptive use.

Because the TWDB annual Water Use Survey focuses on the major water users within the manufacturing category, it may not capture all entities with significant water use. Therefore, the baseline water demand was adjusted to add potential non-surveyed water use, i.e., unaccounted-for water use, which was determined using the U.S. Census Bureau County Business Pattern dataset that provides the number of firms within various number of employee categories for manufacturing sectors statewide. The unaccounted-for water use was then distributed to each county and added to the historical baseline water use for the county.

Once the baseline volume was established, the draft projections were developed using a statewide production growth proxy representing consistent incremental change to ensure the accommodation of potential near-term economic and manufacturing sector production growth. Since the first projected decade (2030) is more than 10 years from the baseline water use data, the statewide annual historical water use rate of change from 2010–2019 was applied to adjust the baseline value to the initial year of projections value (2030). For each planning decade after 2030, a statewide manufacturing growth proxy, based on the historical number of establishments in the manufacturing sector from 2010–2019 in the County Business Patterns dataset, was applied annually to project increases in manufacturing water demands.

This methodology for projecting manufacturing water demand differs from the methodology used in the 2022 State Water Plan. The 2022 State Water Plan methodology had 2020–2030 projections follow the rate of change from the Texas Workforce Commission's employment projection—and hold constant the projections through 2070. Historically, the TWDB has seen the manufacturing sector continue to increase water use efficiency while increasing its economic output. The projection methodology was updated this planning cycle based on feedback from the regional water planning groups and the fact that the Texas Workforce Commission's employment projections in the manufacturing sector are much lower than previously projected, but the historical number of manufacturing establishments on the ground has been increasing in Texas. The new projection methodology better reflects the growth in the number of firms in the manufacturing sector and has resulted in an increase in projected statewide manufacturing water demand compared to the previous state water plan (Figure 4-13).

For data centers, AI facilities, and cryptocurrency facilities specifically, the TWDB approach to estimating and forecasting digital infrastructure facility water use starts with the TWDB collecting water use data for all sectors (e.g., municipal, manufacturing) in Texas through its long-standing Water Use Survey. These annual surveys already capture reported direct water use by digital infrastructure facilities either within the municipal category (as commercial use in public water systems) or as self-supplied facilities within the manufacturing sector.

Water in these facilities is used directly onsite, including for cooling, and they indirectly rely on water use tied to electricity generation. The water use rate varies widely depending on technology, operations,

and energy sources. Indirect water use is associated with electricity consumption, which is generally captured within the power generation water use category. For the development of the 2026 Regional Water Plans and 2027 State Water Plan, there was limited data available regarding this category of water use with which to inform our future water demand projections, however none of the 16 planning groups requested any digital infrastructure facility-related adjustments to their water demand projections this planning cycle.

The TWDB is enhancing its data collection and analysis efforts to improve our projections of digital infrastructure facility water demands for future state water planning cycles. As this sector grows, this water use category will report and fall more comprehensively within our manufacturing water use projections largely because of direct use reporting. Long term forecasting for these types of facilities remains difficult due to rapidly evolving technologies, diverse energy sources, increasing onsite generation, and the proprietary nature of facility siting. Additionally, The TWDB has no regulatory authority regarding any water use.

It is important to acknowledge that Texas' industry has historically been successful at implementing water conservation and consistently demonstrated its ability to produce greater gross domestic product while using less water. The sector's water use is generally anticipated to increase due to businesses moving to Texas and the emergence of additional industry in the state—although it was projected conservatively in this plan to help ensure that Texas can accommodate the associated economic growth.

The regional water planning groups provided input based on local data and submitted requests to revise the draft manufacturing water demand projections, as applicable. Revisions included adding water demand for existing manufacturing firms, adding demand for manufacturing firms with water contracts opening in the near future, and using region- or county-level rates of change that varied significantly from the state-level.

Overall, manufacturing accounts for approximately 9 percent of Texas' water demand in 2030 and 11 percent in 2080. The majority of Texas manufacturing occurs along the Gulf Coast, with Regions H and I accounting for more than 65 percent of all manufacturing demand over the planning horizon (Figure 4-14).

Figure 4-13. Comparison of manufacturing water demand projections between the 2022 and 2027 state water plans (acre-feet)

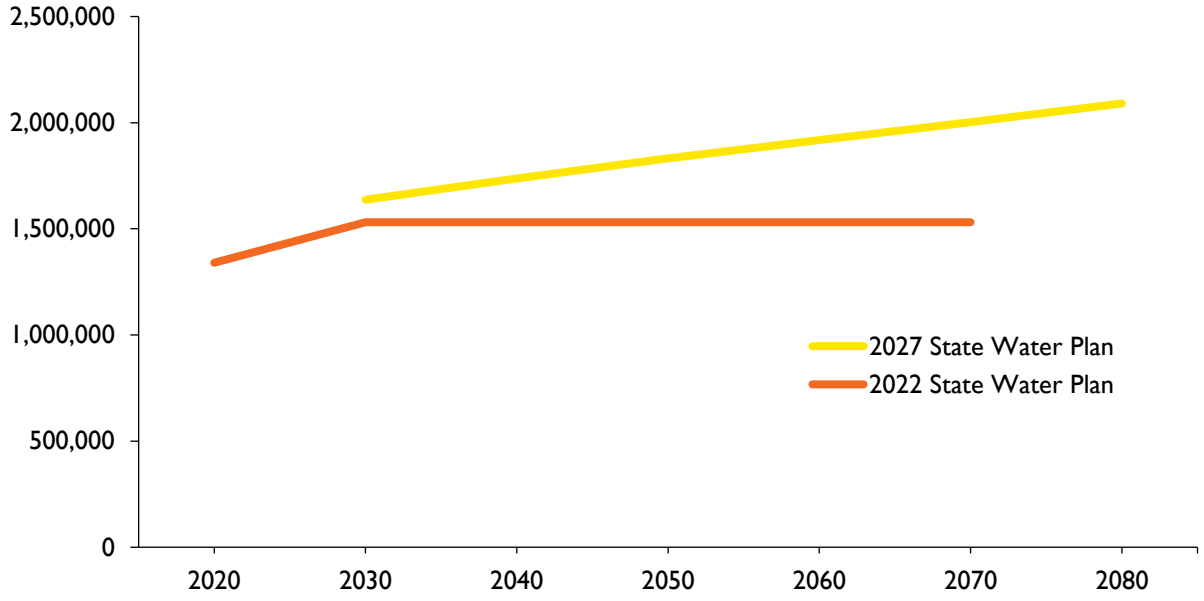
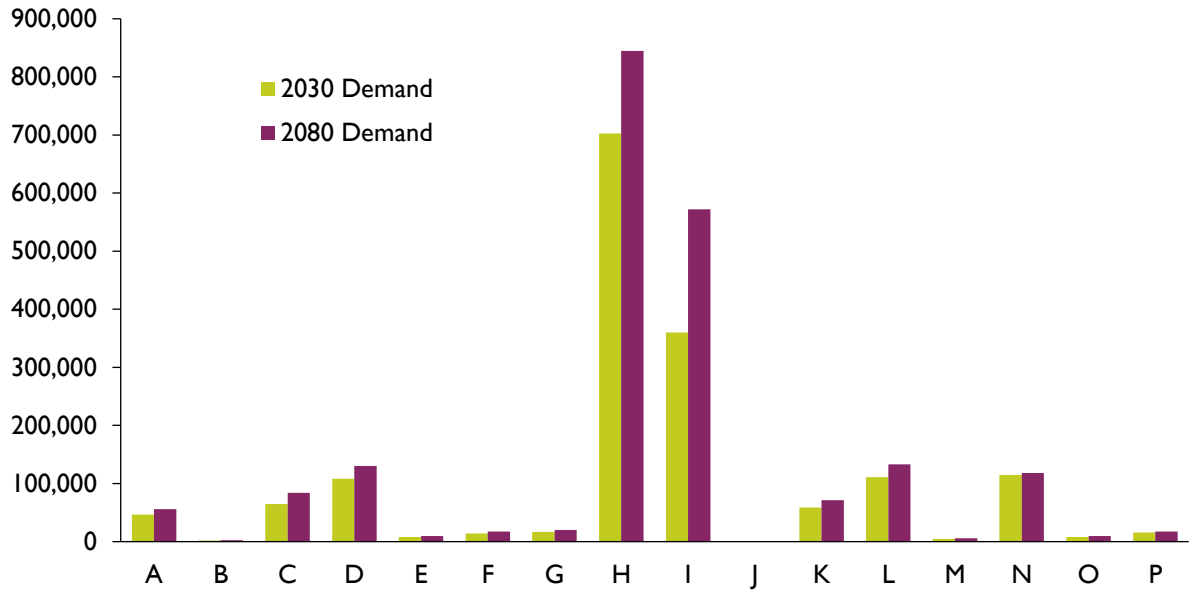


Figure 4-14. Projected annual manufacturing water demand by region in 2030 and 2080 (acre-feet)



4.1.7 Mining water demand

Mining water demand consists of water used in exploring, developing, and extracting oil, gas, coal, aggregates, and other minerals. Mining water demand projections were based upon the 2022 TWDB mining water use study conducted in partnership with the United States Geological Survey and the University of Texas at Austin's Bureau of Economic Geology (BEG, 2022). The study provided a comprehensive and quantitative assessment of mining water use for oil and gas, aggregates, and coal and lignite, and served as an update to the 2011 mining water use study conducted by the Bureau of Economic Geology (BEG, 2011).

Each mining type utilized a different projection methodology. Oil and gas projections were developed using projected total recoverable resources, historical well inventory, volume of water per well, and average number of wells drilled each year, which was then distributed over the planning horizon. Oil and gas total recoverable resources are projected to decline after 2060; therefore, water demand is also projected to decline. Aggregate production is a function of statewide population; thus, water demand is projected to increase over the planning horizon for aggregate production. Coal and lignite mining is tied to the life of the power plant that purchases from the mine. There are only six coal mines in Texas, all of which are expected to close during the 50-year planning horizon. Therefore, coal mining water demand is anticipated to decline.

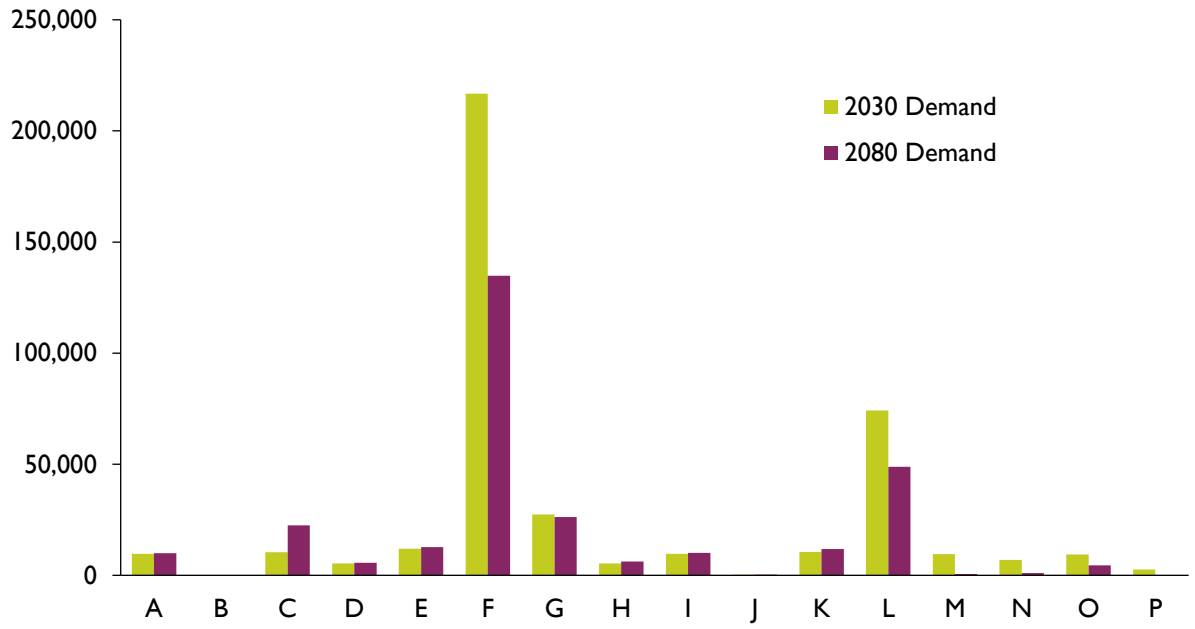
The results of the 2022 mining water use study served as the draft projections. Regional water planning groups then reviewed and requested revisions to the projections based on local knowledge of oil and gas water use trends and/or new aggregate mining operations. Overall, mining water demand projections are expected to slightly increase from 2030–2040 and then steadily decline by almost 28 percent over the planning horizon—largely due to the projected decrease associated with fracking operations. Across the planning horizon, mining accounts for roughly 2 percent of total water demand statewide.

Mining water demands are highest in Region F due to hydraulic fracturing in the Permian Basin. A portion of oil and gas water demand within the region involves the Midland Basin, with development rates assuming 2,400 new wells per year, accompanied by exhaustion of total recoverable resources

within that basin by the year 2064. Planning group members proposed a change in the uniform rate of drilling utilized in the draft projections for the Midland Basin portion of demand. They submitted a schedule maintaining the original drilling rate in the first two decades, followed by a gradual decrease in the rate of development beginning in 2050. The revision maintained the original projected number of wells available for development and extends the drilling period through the year 2080.

Region L has the next highest mining water demands, due to oil and gas drilling in the Eagle Ford Shale. The planning group did not request any revisions to the draft projections. Water demand for aggregate production operations is projected to increase in Regions C, G, and K. Regions F and L account for more than 70 percent of the statewide mining water demand in 2030 and 60 percent in 2080 (Figure 4-15).

Figure 4-15. Projected annual mining water demand by region in 2030 and 2080 (acre-feet)



4.1.8 Steam-electric power water demand

Steam-electric power water demand consists of water used for the purpose of generating utility-scale power. A generation facility typically diverts surface water, uses it for cooling purposes, and then returns a large portion to a body of water. Renewable energy facilities, landfill gas, and battery power plants were not included in the water demand projections because they do not use significant volumes of water in producing energy.

Water demand projections for 2030 were based on the highest county-aggregated historical steam-electric power water use in the most recent five years of survey data (2015–2019). Volumes of fresh water (surface water and groundwater), reuse (such as treated effluent), and brackish groundwater were included in the historical estimates and demand projections. Furthermore, the demand projections were based on consumptive use, not the entire withdrawal. The anticipated water use for future power generation facilities listed in state and federal reports was added to the demand projections from the anticipated operation date through 2080.

Based on data reported to the U.S. Energy Information Administration (EIA, 2023), approximately 60 percent of all capacity of proposed electricity generators in Texas will come from renewable sources. These sources are mainly wind and solar, which use far less water than conventional fossil fuel sources

to generate power. Subsequent demand projections, after proposed fossil fuel facilities were included, were held constant throughout the planning period to reflect increasing trends in using renewable energy and more water-efficient technology.

This projection methodology was based on a study (CDM Smith, 2016) funded by the TWDB. The study's goal was to find the best projection method for this sector that the TWDB can update regularly and that better reflects overall historical patterns of water demand in this sector. This is the second state water plan to utilize this methodology, and the TWDB is reviewing this methodology for the development of the 2032 State Water Plan. The TWDB is enhancing its data collection and analysis efforts to improve our projections of digital infrastructure facility water demands for future state water planning cycles. As this sector grows, this water use category will report and fall more comprehensively within our manufacturing water use projections largely because of direct use reporting. Long term forecasting for these types of facilities remains difficult due to rapidly evolving technologies, diverse energy sources, increasing onsite generation, and the proprietary nature of facility siting.

Steam-electric power currently accounts for roughly 4 percent of Texas' total water demand across the planning horizon. Regions D, G, H, K, and L account for more than 75 percent of statewide steam-electric power water demand.

4.2 Comparison to the 2022 State Water Plan

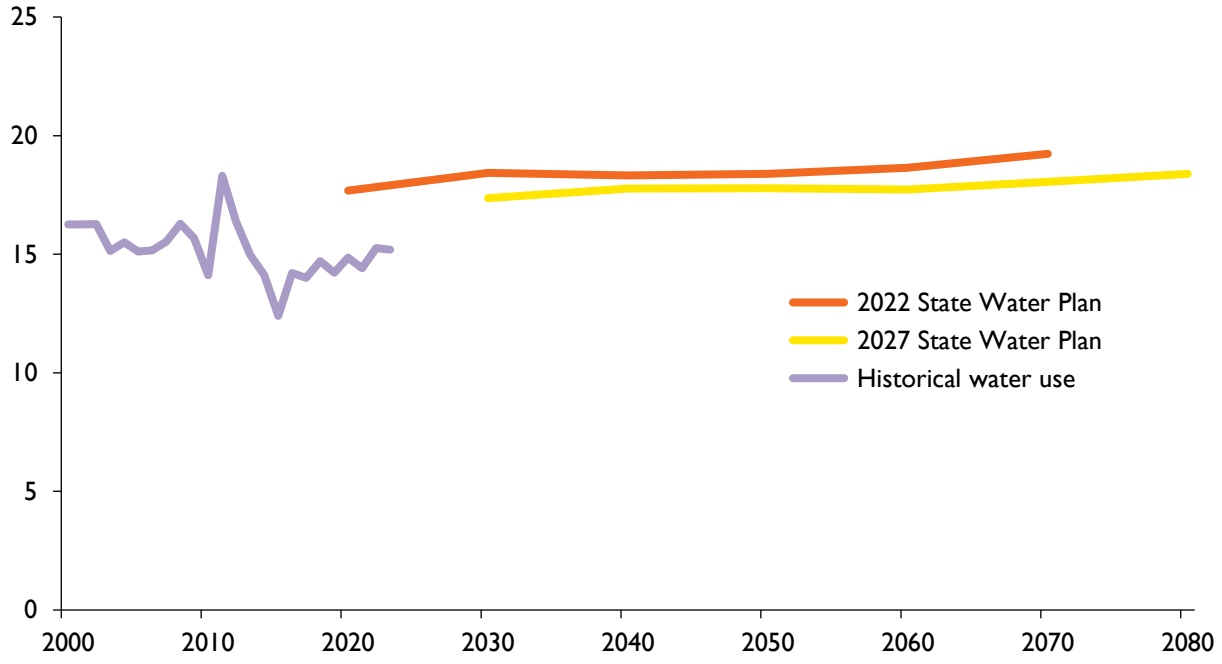
This water plan projects that the total annual statewide water demand in 2030 will be approximately 1.1 million acre-feet per year lower (a 6 percent decrease) and 1.2 million acre-feet per year lower by 2070 (a 6 percent decrease) as compared to the 2022 State Water Plan (Figure 4-16). Differences between the plans include decreases in projected irrigation, steam-electric power, and long-term municipal water demand and increases in projected manufacturing, mining, and near-term municipal water demand. Changes are primarily due to updated projection methodologies and input and revisions from the planning groups, particularly for irrigation demands.

Notable changes to the projected population and water demand from the 2022 State Water Plan are summarized below:

- This plan projects the state's population to be 1 percent higher in 2030 than the previous plan. By 2070, however, the population is projected to be nearly 5 percent lower than in the 2022 State Water Plan. There are several reasons for these changes. The 2022 State Water Plan did not include new population projections, as the projections were carried over from the 2017 State Water Plan and were based on 2010 Census data and migration rates from 2000-2010. The 2022 State Water Plan also held population flat in areas of anticipated population decline. The population projections in this plan utilized 2020 Census data and considered changes in population and migration rates from 2010-2020. Additionally, for the first time, the TWDB followed Texas Demographic Center trends, which resulted in declining population projections in many counties.
- Mirroring the population projections, total municipal water demand is approximately 3 percent higher in 2030 and 2 percent lower in 2070 than the 2022 State Water Plan. Although long-term municipal demands have decreased since the last plan, municipal demands are still projected to increase by 48 percent over the planning horizon. The most significant changes in municipal demands occurred in Regions G and L, where municipal demands are projected to be about 208,000 acre-feet (29 percent) and 156,000 acre-feet (22 percent) higher, respectively, in 2070. In addition, projected 2070 municipal demands for Regions A and M declined since the previous plan by approximately 35,000 acre-feet (26 percent) and 284,000 acre-feet (46 percent), respectively.

- Statewide annual irrigation water demand in 2030 is projected to be 1 million acre-feet less than in the previous plan. The difference in irrigation demand increases to 1.2 million acre-feet in 2070. This is primarily due to revised demands by Region O to better reflect the anticipated rate of decline for irrigation water use in the region.
- Comparisons with the 2022 plan show that manufacturing demands are approximately 7 percent higher in 2030 and 31 percent higher in 2070 in this plan. This can be attributed to the revised projection methodology that incorporates a rate of change for the historical number of manufacturing establishments in the 2040 to 2080 projections in order to better reflect the growth in the number of firms in the manufacturing sector. In comparison, the 2022 plan held manufacturing demands constant from 2030 to 2070.
- Mining water demand is consistent with the previous plan in 2030 but is approximately 14 percent higher in 2040 and 33 percent higher in 2070. Projections in the previous plan are based on a TWDB mining water use study conducted in 2011. Projections in this plan are based on the 2022 TWDB mining water use study, which accounts for significant increases in hydraulic fracturing water use since 2010.
- Water demand for steam-electric power is approximately 30 percent lower across the planning horizon compared to the last plan due primarily to more retired facilities and fewer proposed facilities in the U.S. Energy Information Administration database. The associated projection methodology and future demand projections will be updated by early 2027 in preparation for the next planning cycle.
- Statewide livestock water demand decreased slightly but is overall similar to the last plan. The slight decrease is due to a change in the methodology for estimating chicken inventory.

Figure 4-16. Comparison of water demand projections between 2022 and 2027 state water plans (millions of acre-feet)



More resources

Visit the TWDB's state water plan comparison tool (www.twdb.texas.gov/waterplanning/data/dashboard/index) to further explore historical water use estimates and TWDB water demand projections.

4.3 Research studies to improve projection methodologies

A benefit of the five-year regional water planning cycle is the opportunity to review and improve water demand projection methodologies every cycle. The TWDB frequently reviews current methods, seeks new data and input from stakeholders, and considers how to best improve the demand projections in the plans. After the completion of the demand projections for this plan, the TWDB contracted the University of Texas Bureau of Economic Geology for three studies:

- Assessment of the Population and Municipal Water Demand Projections in the Texas Regional and State Water Plans
- Estimating Non-Surveyed Groundwater Use for Texas Regional and State Water Planning
- Updating Key Metrics Regarding Outdoor Water Use in Texas Community Water Systems

These three contracts will result in improved and/or new methodologies to be incorporated into the next planning cycle and are expected to be completed by fall 2026.

Assessment of the population and municipal water demand projections in the Texas regional and state water plans

The purpose of this study is to assess the accuracy of TWDB projections in previous plans, determine the margin of error, consider the related uncertainties associated with projecting population and water demands, and recommend modifications, as appropriate, to improve the quality of the projections and efficiency of the process required to draft and finalize the projections. The aim is to make this foundational planning process more accurate, predictable, flexible, and simple for the agency, regional water planning groups, and other stakeholders. Furthermore, the University of Texas Bureau of Economic Geology will develop a framework for the TWDB and the regional water planning groups that will have built-in allowances for revisions based on the assessed margin of error and reasonable degree of uncertainty.

Estimating non-surveyed groundwater use for Texas regional and state water planning

This study seeks to evaluate improved methods for estimating non-surveyed municipal groundwater use per capita values that better capture the water demand of these uses. The study will develop a method to estimate a single non-surveyed groundwater use in gallons per capita per day at the county level and undertake a case study to test the methodology. The TWDB will review the outcome and apply the methodology to improve the annual non-surveyed groundwater use estimates, which are incorporated into the water demand projections.

Updating key metrics regarding outdoor water use in Texas community water systems

This study will update and improve upon a technical note published in 2012 (Technical Note 12-01) that studied outdoor residential water use patterns in Texas by incorporating water use data from the 2011-2015 drought, assess correlations between climate drivers and outdoor water use, and determine regional and statewide average outdoor water use metrics. Such metrics are incorporated in the state water plan's municipal water demand projections and the socioeconomic impact analysis.

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5 Water availability and existing supplies

Quick facts

In this plan, total surface water availability declines by 4 percent over the planning horizon. Total surface water availability is approximately 12 percent lower in 2030 and 13 percent lower in 2070 than in the 2022 State Water Plan, primarily due to the removal of brackish run-of-river sources in the Neches and Sabine river basins that are no longer considered potential water supply sources in Region I.

Total groundwater availability is largely consistent with the 2022 State Water Plan, with total groundwater availability expected to decline by 16 percent over the planning horizon. The Ogallala/Edwards-Trinity (High Plains) and Ogallala/Rita Blanca aquifers[9] are projected to lose more than 50 percent of their 2030 availability by 2080.

Total groundwater availability includes nearly 1.6 million acre-feet of brackish groundwater, or about 13 percent of total availability, in 2030.

The existing water supplies—water supplies that can be readily delivered in a drought from sources including surface water, groundwater, reuse, and aquifer storage and recovery—are expected to decline approximately 10 percent between 2030 and 2080.

There are 184 major water supply reservoirs that provide nearly three-fourths of existing water supply.

In 2030, more than one-quarter of irrigation and livestock water supplies are from the Ogallala/Edwards-Trinity (High Plains) Aquifer, while one-fifth of all non-agricultural-related water supply in Texas is from the Trinity River Basin.

The state water plan is required to prepare for and respond to drought conditions. Essential to this process is estimating how much water Texans will have to meet their water demands during drought conditions, without over-allocating any water sources. To accomplish that, the planning groups must determine how much total water is available from each source and how much of that water is already in use and connected as existing supply.

5.1 Evaluating water resources for planning

During development of the regional plans, each water planning group must identify all water sources within or resourcing from their planning area as well as their associated annual availability volumes. Water availability refers to the maximum volume of raw water that, with the right infrastructure in place, could be obtained annually from each source (such as a reservoir or aquifer) during a repeat of the drought of record. Availability volumes are not affected by whether the supply is connected or already legally authorized for use. Availability is analyzed from the perspective of the water source and answers the following question:

> *How much water could be taken from this source and delivered to water users during a repeat of the drought of record, as either existing water supply or as part of a future water management strategy?*

Determining water availability is the first step in assessing potential water supply volumes (Figure 5-1).

Next, each planning group must quantify the volume of the available water for each source that is already connected to water user groups. This subset is defined as the existing supply. Existing water supplies are determined by legal access to the water—such as water rights permits, property rights, or pumping permits—as well as existing infrastructure like water wells, pipelines, and treatment plant

[9] Ogallala/Edwards-Trinity (High Plains) and Ogallala/Rita Blanca are aquifer combinations that reflect specific groundwater management policy decisions based on aquifer properties.

capacity to treat and deliver the water to the "doorstep" of a water user group. Existing supply is analyzed from the perspective of the water users and answers the following question:

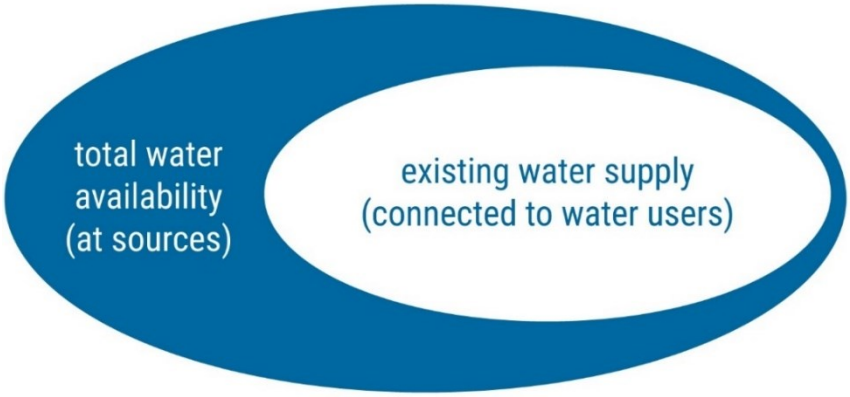
> *How much existing water supply can each water user group rely on if a repeat of the drought of record occurs?*

For example, the firm yield of a surface water reservoir might be 100,000 acre-feet per year. Of that available 100,000 acre-feet per year, if the current pipeline to that source only conveys 60,000 acre-feet per year to users, then 60,000 acre-feet of the 100,000 is considered existing supply. There remains an additional 40,000 acre-feet per year of available water that can serve as the basis for a future water management strategy.

As another example, if a county has a modeled available groundwater volume of 50,000 acre-feet per year and current permits and pumping facilities are only able to pump 20,000 acre-feet per year as existing supplies, then there remains 30,000 acre-feet per year in available groundwater to support future water management strategies.

Because existing supplies are a subset of the availability of water sources, existing supplies cannot exceed availability without the risk of running short of water in a drought of record. Over-allocation, which is not allowed, occurs if the sum of all reported existing supply volumes exceeds the source availability upon which they are based. To ensure that planning groups do not associate more water supply from a water source than the source can provide in a drought of record, the Texas Water Development Board (TWDB) performs a detailed, statewide accounting of all assigned existing water supply volumes and notifies planning groups of over-allocations. Planning groups must then adjust their plans accordingly.

Figure 5-1. Existing supply as a subset of water availability



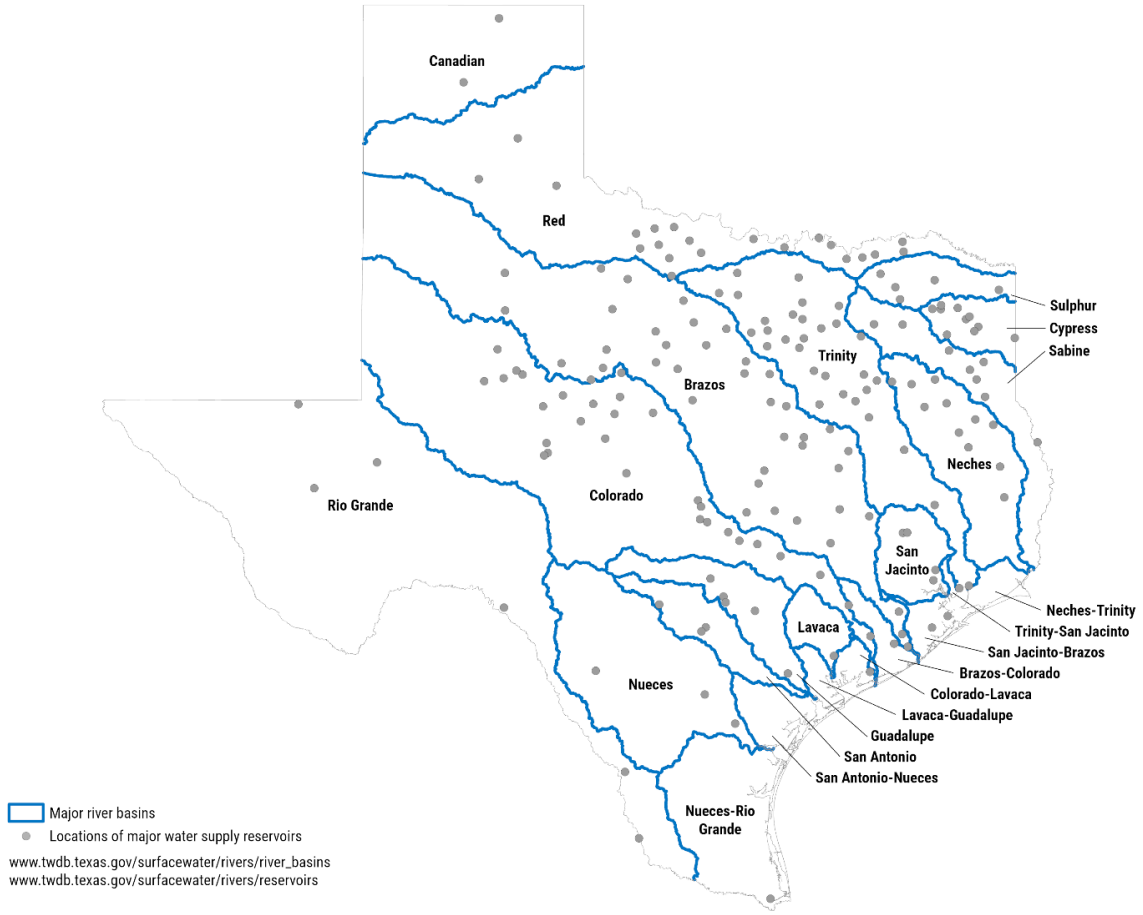
5.2 Surface water availability within river basins

Surface water supplies in Texas come from 15 major river basins and 8 coastal basins via 184 major (*i.e.*, with a capacity > 5,000 acre-feet) water supply reservoirs[10], numerous smaller reservoirs, and river diversions, known as run-of-river supplies (Figure 5-2).

[10] There are 184 major water supply reservoirs identified as supply sources for the 2027 State Water Plan. The 2022 State Water Plan listed 187 major water supply reservoirs. Two of the three reservoirs not carried forward in the 2027 plan are impoundments for water quality (i.e., Sulphur Springs Draw and Wallisville Saltwater Barrier) and do not serve as surface water supply sources. The third reservoir, Cox Lake, is now categorized as a minor reservoir because its capacity is less than 5,000 acre-feet.

Surface water availability in Texas is evaluated using river-basin-specific water availability models, which may be adjusted for planning to account for factors such as reservoir sedimentation, operating conditions, and planning uncertainties. The amount of surface water available for planning is also constrained by such requirements as environmental flow needs and permitting considerations that affect future water management strategies.

Figure 5-2. Major river and coastal basins and major surface water supply reservoir locations



5.2.1 Surface water availability modeling and planning considerations

Surface water availability is determined using the most recent water availability models (WAMs) from the Texas Commission on Environmental Quality that were developed for administering water rights and for assessing water rights reliability. These models utilize historical evaporation and naturalized streamflow data (estimates of what streamflow would have been without the influence of human activity at that historical time) to approximate the monthly and annual water volumes that could be diverted each year through drought-of-record conditions. The state's WAM models include a built-in accounting of historic evaporation losses from surface water reservoirs.

It is important to recognize that while the WAMs represent a significant technical and financial investment for the state, they were not designed for long-range water supply planning purposes. The WAMs were built specifically for Texas' water rights permitting and administration. The WAMs illustrate streamflow and net reservoir evaporation conditions under static, historic hydrology. The WAMs, by design, cannot simulate changes to water availability or impacts on water supply arising from

changes to watershed characteristics like groundwater recharge, soil moisture, and land use/land cover (that can drive changes to runoff and reservoir inflows), nor can they provide quantitative insight into the future reliability of water supply volumes based on the historic hydrology.

For planning purposes, the default model is WAM Run 3, which conservatively assumes that all existing water rights are fully used with no return flows to the river, unless specifically required by a permit. Planning groups adjust WAM Run 3 to account for the effects of anticipated reservoir sedimentation on major water supply reservoir yields. When evaluating existing water supplies for planning purposes, planning groups are allowed and encouraged to modify the default model to reflect appropriate conditions not already included in WAM Run 3. Modifying the models is intended to better approximate real-world river basin operations and, for example, to avoid overstating shortages associated with existing water rights, over each future planning decade.

Modifications to the water availability models, approved by the TWDB executive administrator, are expected to better reflect real-world conditions that would be expected. They may include correcting known model errors, subordination agreements or current river system operations, or revising reservoir inflows to incorporate recent drought conditions—including return flows. To address planning uncertainties and consider droughts worse than the drought of record, regions may also request hydrologic variances to apply more conservative assumptions. Assumptions such as using a reservoir safe yield instead of firm yield or using alternative yields that incorporate expected changes to future reservoir inflow and evaporation. Safe yield represents a reduced annual water volume that continues to be available from a reservoir for periods longer than a drought of record.

Fourteen of the sixteen regional water planning groups requested and received approval from the TWDB executive administrator to modify their surface water availability analysis for the purpose of evaluating existing water supplies. Select modifications utilized in the development of surface water availability estimates are summarized in Appendix B.

Local planning for droughts worse than the drought of record

As discussed in Chapter 3, predicting the likelihood or conditions of new hydrological droughts that are more severe than the drought of record remains challenging, especially at the scale of local water supply sources.

Some major water providers in the state are utilizing downscaled climate model data in their own long-range planning efforts to evaluate conditions exceeding the drought of record. In Region C, the North Texas Municipal Water District has used downscaled climate data (temperature, precipitation, and evaporation) along with statistical hydrologic modeling to assess potential impacts of future climate conditions on many of its surface water supplies. This analysis considered how changes to climate conditions could affect reservoir inflows, evaporative losses, and reliable supply availability, and the findings informed the district's Long-Range Water Supply Plan.

For its 2026 regional water plan, Region C requested and received approval to incorporate results from the North Texas Municipal Water District Long-Range Water Supply Plan into the allocation and distribution of surface water supplies from several reservoirs used by the district. This approach allows Region C to account for the potential impacts of a drought more severe than the drought of record. It also illustrates how local water planning efforts can directly inform and strengthen the state's water planning process.

Surface water availability for future water management strategies (Chapter 7) was evaluated using an unmodified WAM Run 3 unless an alternative model produced more conservative (*i.e.*, lower) yields or the water management strategy itself was based on departing from the default model parameters. For example, if a senior water right is to be "subordinated" to a junior water right to increase the reliability of the junior water right, the alternative model would be used.

5.2.2 Total surface water availability

Overall surface water availability in Texas—represented as the sum of all reservoir firm yields, approved safe or alternative yields, and run-of-river water right availabilities as determined by the planning groups—is anticipated to decline by approximately 4 percent from 2030 to 2080 (Figure 5-3). The decline is primarily due to sedimentation, which reduces reservoir storage. Changes in temperature impacting evaporative losses from reservoirs, changes in reservoir inflows because of watershed changes, and changes in groundwater levels impacting stream-aquifer interactions are factors that could impact availability but are not included in the methodology for assessing future surface water availability. More than half of the annual statewide surface water availability of 11.0 million acre-feet in 2030 occurs within the Trinity, Neches, and Sabine river basins (Figure 5-4, Appendix B).

Understanding groundwater and surface water interactions

Groundwater and surface water interaction refers to the natural movement of water between underground aquifers and above-ground rivers and streams. In simple terms, groundwater can flow into rivers, and rivers can lose water into the ground that percolates down into aquifers. In practice, however, understanding and measuring these interactions is complex. It is especially difficult to observe and quantify diffuse groundwater flow that enters or leaves streams and rivers, and seasonal changes can alter the direction between rivers and aquifers and the amount of flow.

The most recent statewide assessment of these interactions, conducted by the TWDB in 2016, estimated that 9.3 million acre-feet of groundwater flows discharge into Texas surface waters each year, accounting for roughly 30 percent of the state's average surface water flow. While this accounting is informative, determining these estimates is complex and the results represent averages that may vary significantly seasonally, year to year, or in different areas of the state. More targeted studies are needed to refine estimates and better characterize these interactions and their implications for future surface water availability, particularly in river alluviums and aquifer recharge zones. The extent of these effects is not yet fully understood, but they could be significant. Without improved data, modeling, and studies, water planners and decisionmakers cannot accurately assess how changes in groundwater or surface water supplies influence one another. This knowledge gap—including the potential impact that future groundwater declines may have on future surface water availability—introduces uncertainty into water availability estimates and complicates efforts to assess the future reliability of surface water and groundwater resources.

Figure 5-3. Texas' total annual surface water availability and total existing surface water supply (acre-feet)

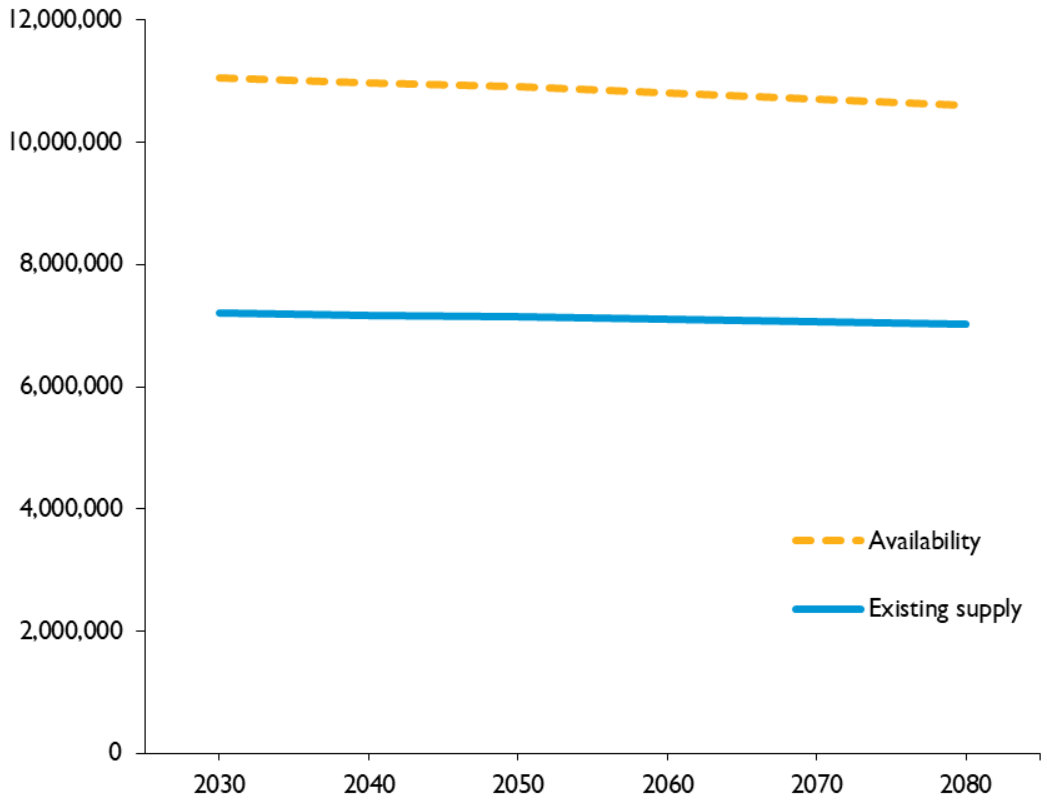
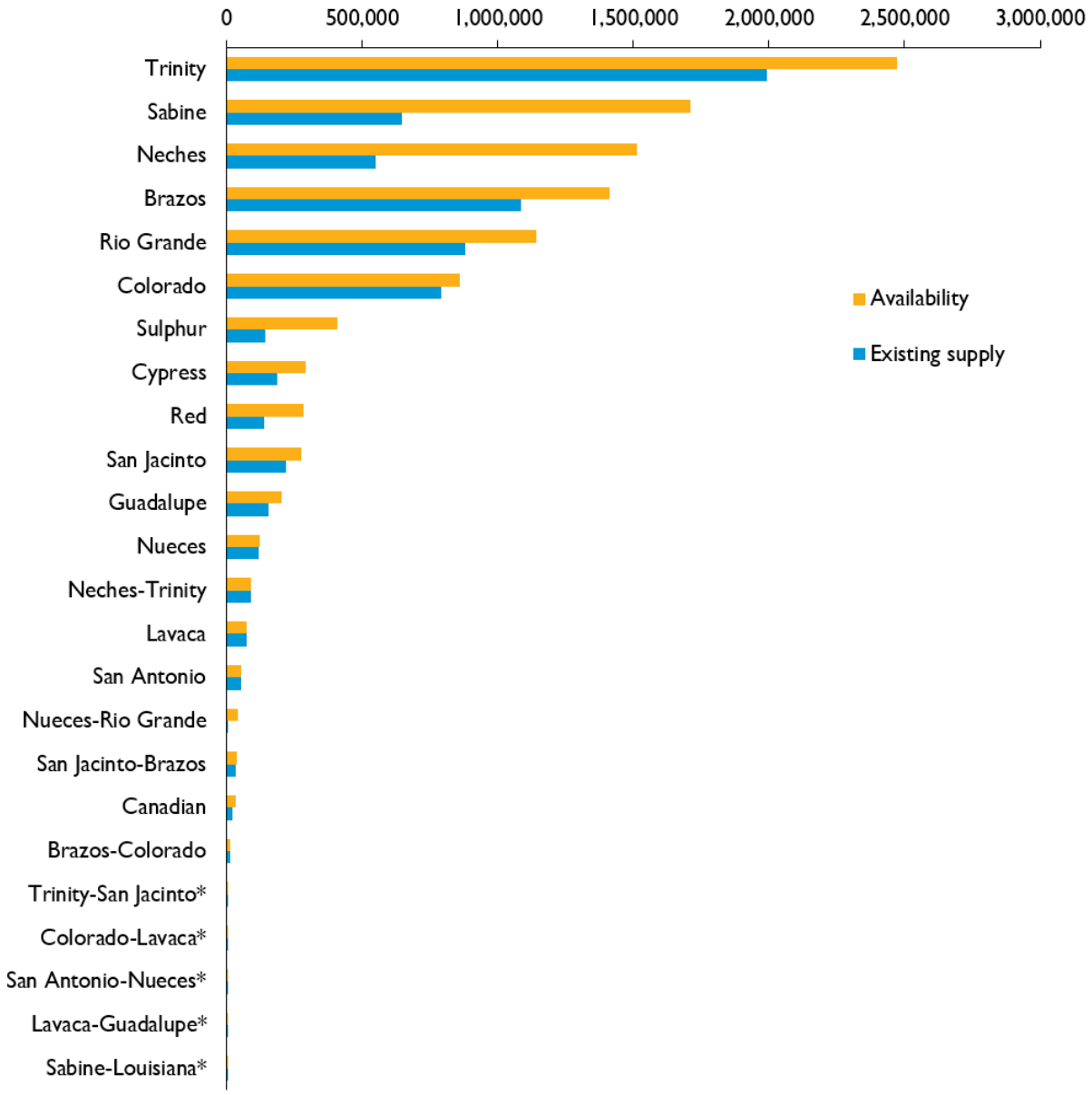


Figure 5-4. Annual surface water availability and existing surface water supplies by river and coastal basin in 2030 (acre-feet)



** The following basins have less than 10,000 acre-feet of availability and existing supply in 2030 and are at a scale not clearly visible in the figure: Trinity-San Jacinto, Colorado-Lavaca, San Antonio-Nueces, Lavaca-Guadalupe, and Sabine-Louisiana.*

5.2.3 Environmental flow considerations for future surface water availability

Surface water availability may be increased by implementing certain types of water management strategies. By capturing and storing streamflow, for example, the construction of a new reservoir can increase the reliable volume of water available for permitting and annual diversion. However, the quantity of surface water available for future water management strategies will be limited by any amounts required for environmental flows, such as environmental flow standards placed on permits and reflected in water availability modeling.

In cases where no environmental flow standards were adopted by the Texas Commission on Environmental Quality, planning groups were required to model diversions based on the Consensus Criteria for Environmental Flow Needs developed through a stakeholder process by the TWDB, the Texas Parks and Wildlife Department, and the Texas Commission on Environmental Quality. Alternatively, planning groups may utilize more detailed site-specific studies when available. The ultimate supply volumes associated with many recommended water management strategies remain subject to permitting requirements administered by the Texas Commission on Environmental Quality, regardless of the approach taken to estimate project yields or to consider environmental flow needs during the planning process.

5.3 Groundwater availability of aquifers

Groundwater supply in Texas comes from 9 major and 22 minor aquifers, as well as other water-bearing geologic formations around the state. Major aquifers produce large amounts of water over large areas (Figure 5-5), whereas minor aquifers produce minor amounts of water over large areas or major amounts of water over small areas (Figure 5-6). For most aquifers in the state, total aquifer storage is much higher than the amount that is possible to practically recover on a regional supply basis. As such, groundwater availability is estimated through a combination of policy decisions—made by groundwater conservation districts during joint groundwater planning—and modeling of aquifer characteristics, such as the ability of an aquifer to transmit water to wells. The TWDB uses groundwater availability models along with the desired future conditions established by groundwater management areas to calculate modeled available groundwater estimates, which form the basis for most groundwater availability in this plan.

Figure 5-5. Major aquifers of Texas

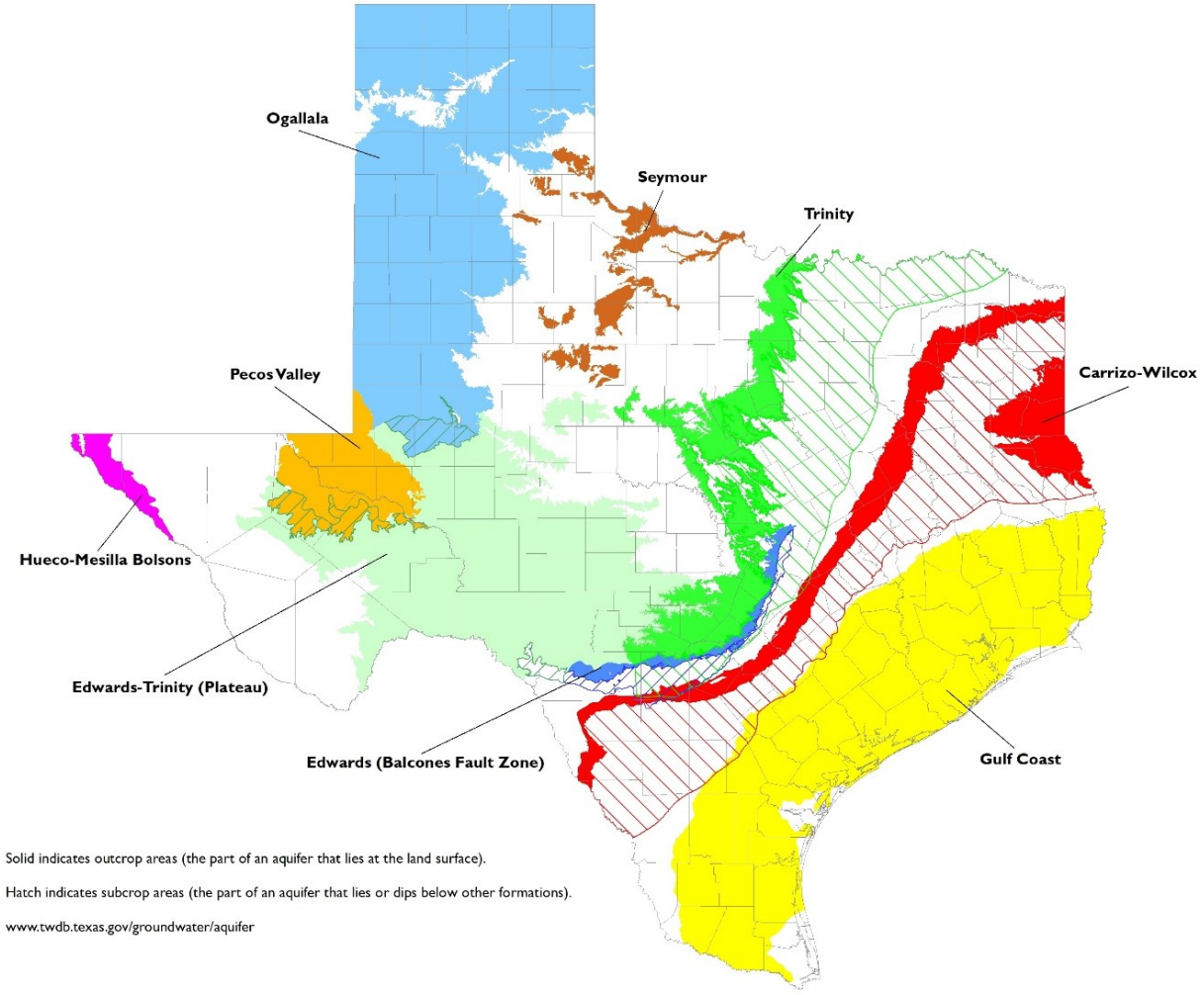
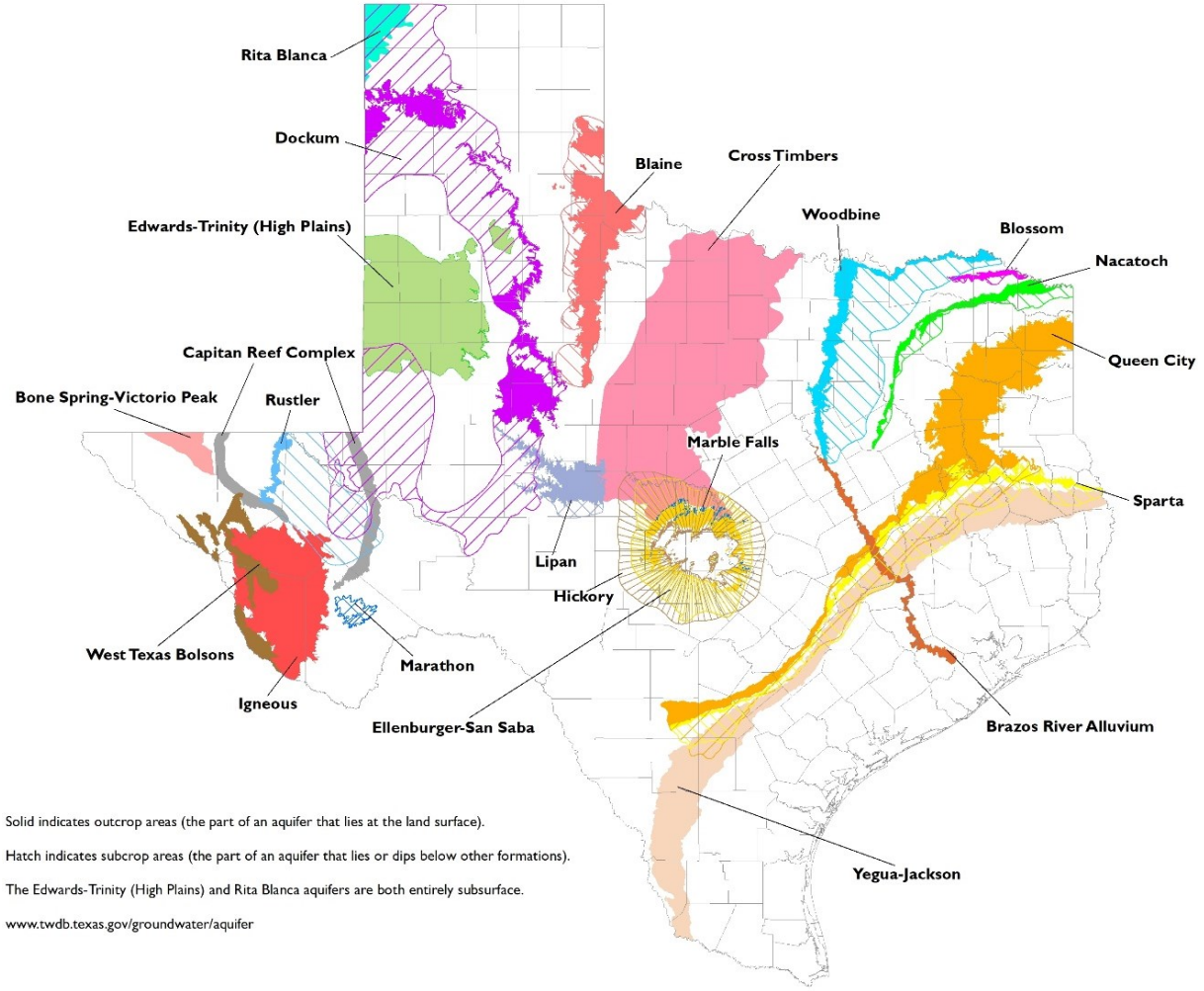


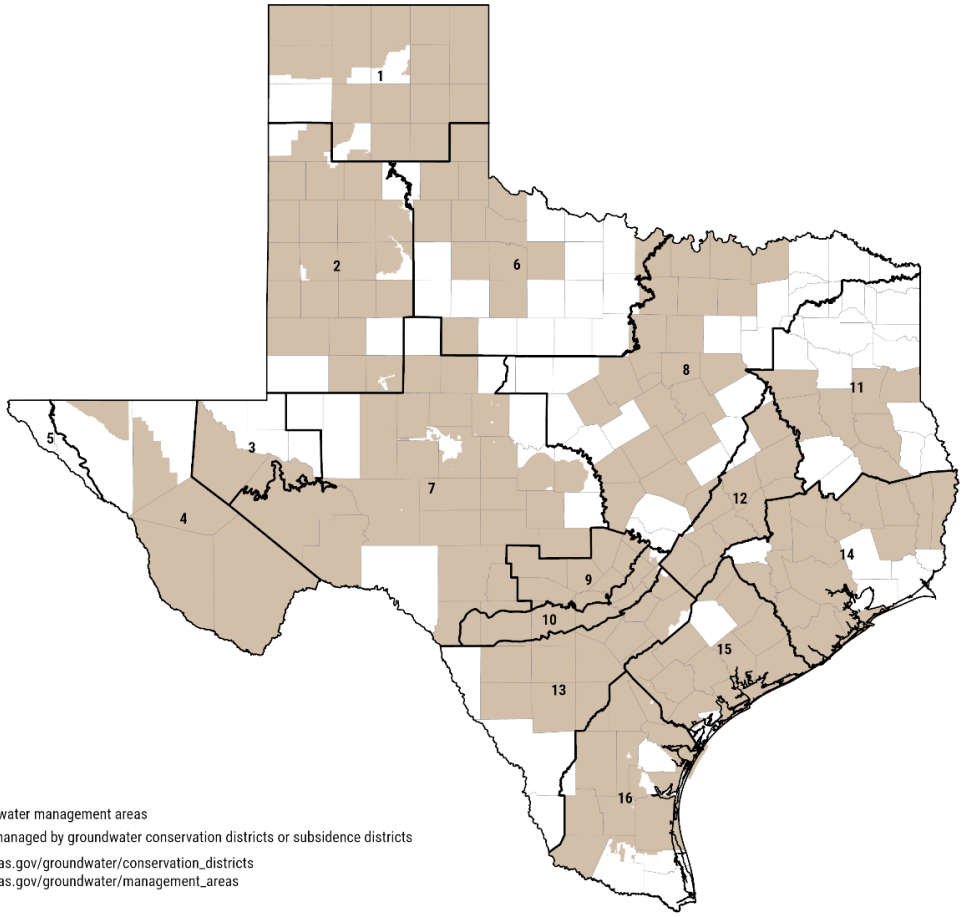
Figure 5-6. Minor aquifers of Texas



5.3.1 Modeled available groundwater to achieve desired future conditions

In Texas, groundwater is governed by the rule of capture, which may be modified where groundwater conservation districts and subsidence districts exist (Figure 5-7). Districts regulate spacing of wells and may issue permits with groundwater production limits within their jurisdictions. Groundwater conservation districts within the state's groundwater management areas work together to determine groundwater management policies, including the desired future conditions of relevant aquifers within that area. Texas Water Code § 16.053(e) requires that groundwater availability in the state water plan is consistent with desired future conditions established for relevant aquifers.

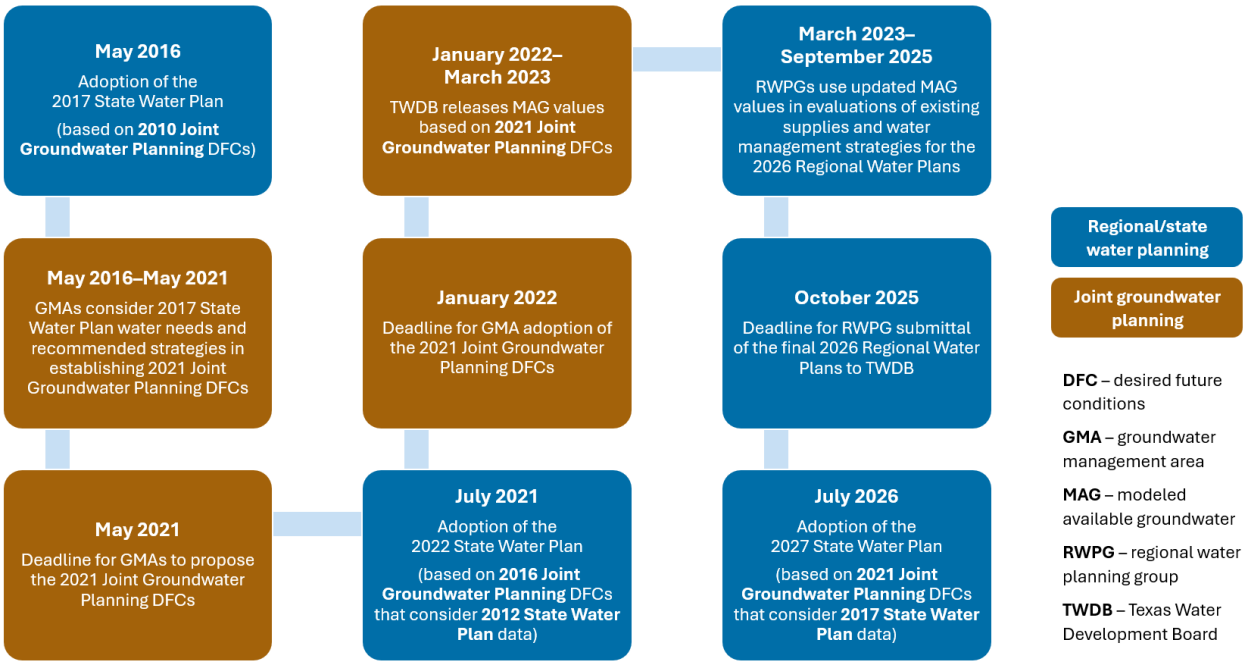
Figure 5-7. Locations of groundwater conservation districts or subsidence districts and 16 groundwater management areas



Desired future conditions are the desired, quantified conditions of groundwater resources (such as water levels, water quality, spring flows, storage volumes, or subsidence) for each approximately 50-year planning period that align with state and regional water plans. The desired future conditions are defined by groundwater conservation districts within a groundwater management area as part of the joint planning process. Desired future conditions are required for major or minor aquifers—which are referred to as relevant aquifers. However, a groundwater management area may declare a major or minor aquifer as non-relevant for regional joint planning purposes if the aquifer does not warrant a desired future condition due to such factors as limited extent, depth, poor quality, lack of use, or lack of projected demand. These factors are evidence that adjacent or hydraulically connected aquifers will not be affected. In these situations, the non-relevant aquifer would not have a desired future condition or modeled available groundwater value.

Groundwater availability in this plan is based on the desired future conditions developed in the 2021 round of joint planning and adopted by groundwater management areas by January 5, 2022. As shown in Figure 5-8, development of the 2021 desired future conditions began in 2016 and considered water needs and recommended strategies from the 2017 State Water Plan.

Figure 5-8. Planning process timelines that inform state water plan groundwater availability

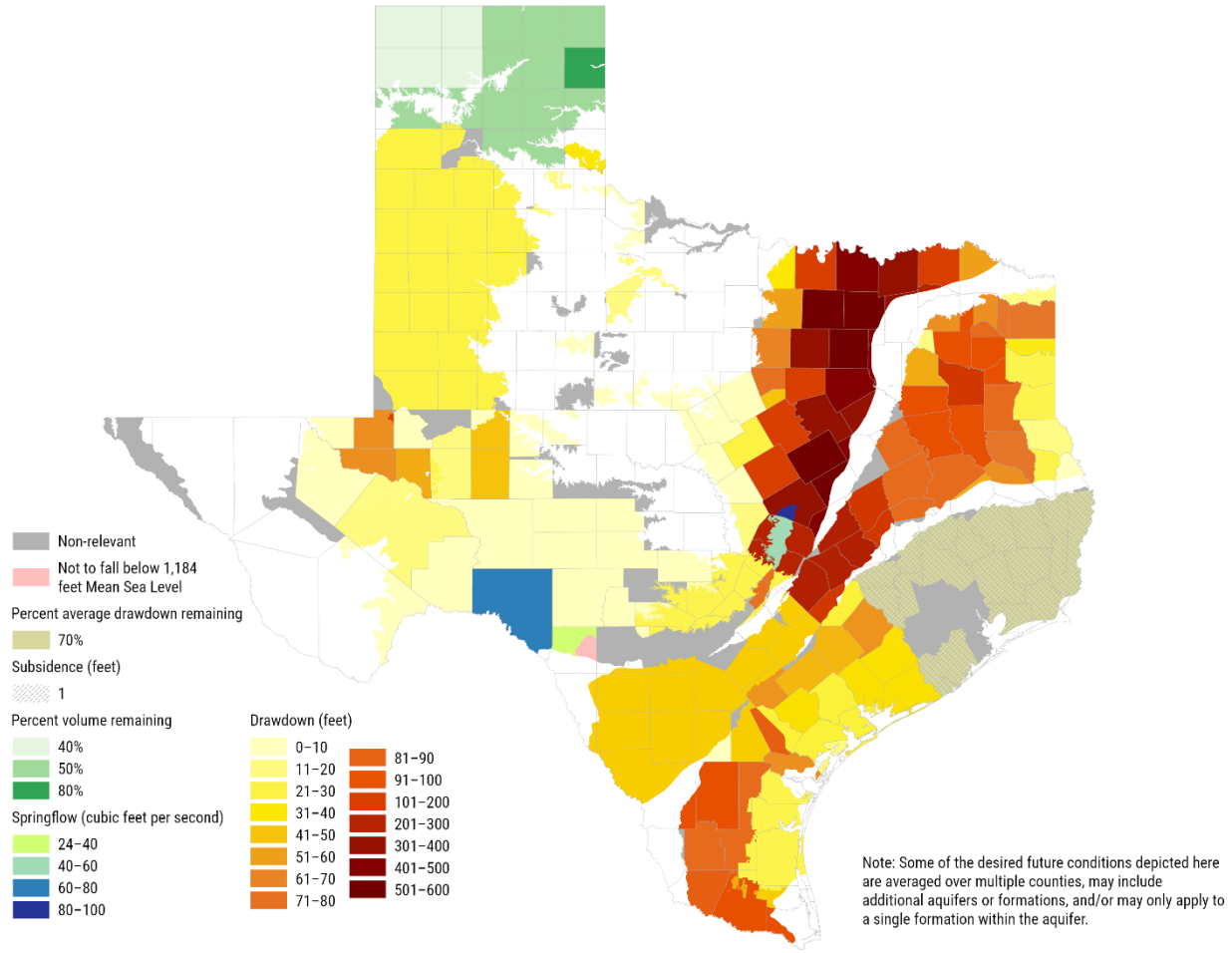


Note: This timeline represents a snapshot of the coordinated and iterative planning process between regional water planning and joint groundwater planning, focusing primarily on activities that informed the 2027 State Water Plan.

Due to differences in the timing of the regional water planning and joint groundwater planning processes, there is an approximately five-year gap between the most recent desired future conditions and modeled available groundwater values and the regional and state water plans. Additionally, there is an approximately 10-year gap between the state water plan data considered during development of desired future conditions and the subsequent state water plan based on those desired future conditions.

The types of desired future conditions established for major aquifers in the 2021 round of joint planning varied across the state and included drawdown, percent volume remaining, spring flow, percent average drawdown remaining, subsidence, and elevation in a particular well (Figure 5-9). Detailed information on desired future conditions is available on the 2021 Joint Groundwater Planning webpage (www.twdb.texas.gov/groundwater/dfc/2021jointplanning).

Figure 5-9. Desired future conditions adopted in 2021 for major aquifers by county (based on key drawdown, spring flow, or volumetric parameters)



Note: Gray areas indicate where the aquifer was deemed non-relevant for joint planning purposes by groundwater management areas.

Once desired future conditions are adopted by districts within the groundwater management areas, the TWDB uses groundwater availability models, or other approaches if a model is not applicable, to estimate modeled available groundwater values. Modeled available groundwater is the volume of groundwater production on an average annual basis that will achieve a desired future condition. For regional planning, modeled available groundwater values are the basis of groundwater availability for relevant aquifers.

It is important to note that modeled available groundwater values are independent of existing pumping permits and may, depending on the aquifer characteristics and how the desired future conditions are defined, include a variety of water quality types, including some brackish groundwater. In addition, unlike the regional and state water planning process, the joint groundwater planning process does not require explicit consideration of drought of record conditions when developing policy goals expressed as desired future conditions. Districts in a groundwater management area may—but are not required to—consider the drought of record in developing desired future conditions. By extension, the modeled available groundwater values derived from desired future conditions statements across the state may or may not incorporate the drought of record. Two groundwater management areas (8 and 10) explicitly address drought in their 2021 desired future conditions statements and modeling assumptions.

A disconnect between modeled available groundwater and groundwater district permits

Groundwater conservation districts are required to manage long-term groundwater production to achieve desired future conditions by issuing permits with groundwater production limits that align total exempt and permitted pumping with those goals. Although modeled available groundwater provides an important benchmark and is required for consideration by districts in permitting, it is only an estimate and it does not serve as a cap on what a district can permit. Modeled available groundwater estimates can be improved by updating groundwater availability models with additional groundwater data, like aquifer properties, water levels, and accurate groundwater production data. In addition to modeled available groundwater estimates, districts must consider a broader set of factors and information when issuing permits to ensure they remain on track to achieve a desired future condition, including

1) production from uses exempt from permitting,
2) cumulative permitted volumes,
3) actual production estimates,
4) annual precipitation and production patterns, and
5) whether proposed use will unreasonably affect existing groundwater and surface water resources.

Districts may issue permits above or below the modeled available groundwater if the long-term path toward the desired future condition is maintained.

5.3.2 Modeled available groundwater peak factor

As previously noted, modeled available groundwater volumes account for most of the groundwater availability considered in this plan. In response to concerns that most of these volumes were developed using groundwater availability models calibrated for long-term average conditions rather than drought-of-record conditions, and because drought is not an explicit consideration when developing desired future conditions, the TWDB allows for the use of a modeled available groundwater peak factor.

A peak factor allows regional water planning groups to develop plans, where appropriate, that reflect more realistic groundwater availability in drought conditions. The modeled available groundwater peak factor accommodates planning for short-term pumping above the modeled available groundwater value if it can be shown that the desired future conditions would still be met. It can accommodate anticipated fluctuations in pumping between wet and dry periods or account for other shifts in the timing of pumping while remaining consistent with desired future conditions. This approach, used only for regional water planning purposes—not permitting, reflects additional potential groundwater that could be available for pumping over limited periods of time during drought. The peak factor is not intended as a limit to permits or as guaranteed approval or pre-approval of any future permit application.

Subject to many variables, the modeled available groundwater peak factor might be considered in instances, for example, where

- actual pumping in wetter years is expected to fall below the modeled available groundwater, thereby allowing intermittent pumping of volumes greater than the modeled available groundwater during drought; or
- groundwater pumping in early decades is expected to consistently remain well below the modeled available groundwater, thereby accommodating pumping volumes somewhat higher than the modeled available groundwater in later decades—all while still achieving the desired future condition.

The use of modeled available groundwater peak factors requires review and approval by relevant groundwater conservation districts, groundwater management areas, regional water planning groups, and the TWDB executive administrator. The peak factor is optional for planning groups. Region H was the only planning group to utilize the approach in this cycle of planning.

5.3.3 Availability for aquifers that do not have desired future conditions

Most aquifers have desired future conditions and will therefore have an associated annual modeled available groundwater volume. In limited locations, however, there are some aquifers that may not have a desired future condition and/or a resulting modeled available groundwater volume. For example, certain aquifers or portions of aquifers are deemed non-relevant for joint planning purposes by groundwater management areas based on evidence that adjacent or hydraulically-connected relevant aquifers will not be affected. This means they fall outside of requirements related to developing and achieving desired future conditions.

For aquifers and portions of aquifers that do not have modeled available groundwater values, planning groups determine the groundwater availability in consultation with the TWDB. Planning group estimated groundwater availabilities are determined using availability values presented in TWDB groundwater availability models, local groundwater conservation district management plans, or other means. Planning groups are strongly encouraged to consider the physical compatibility with or possible impacts to adjacent or nearby desired future conditions of the regional aquifers in the development of groundwater availability. The TWDB provided non-relevant groundwater availability values, derived from modeled available groundwater model runs and compatible with desired future conditions, for planning groups to consider.

Statute provides a specific circumstance under which a regional water planning group may use an alternative approach to defining groundwater availability. Texas Water Code § 16.053(e)(2-a) allows a regional water planning group to determine all groundwater availability within its region when no groundwater conservation districts are located within the regional water planning area. This provision only applies to the North East Texas Regional Planning Group, Region D. Groundwater availability values estimated by Region D were reviewed and approved by the TWDB to ensure physical compatibility with desired future conditions in groundwater conservation districts within co-located groundwater management areas.

5.3.4 Brackish groundwater

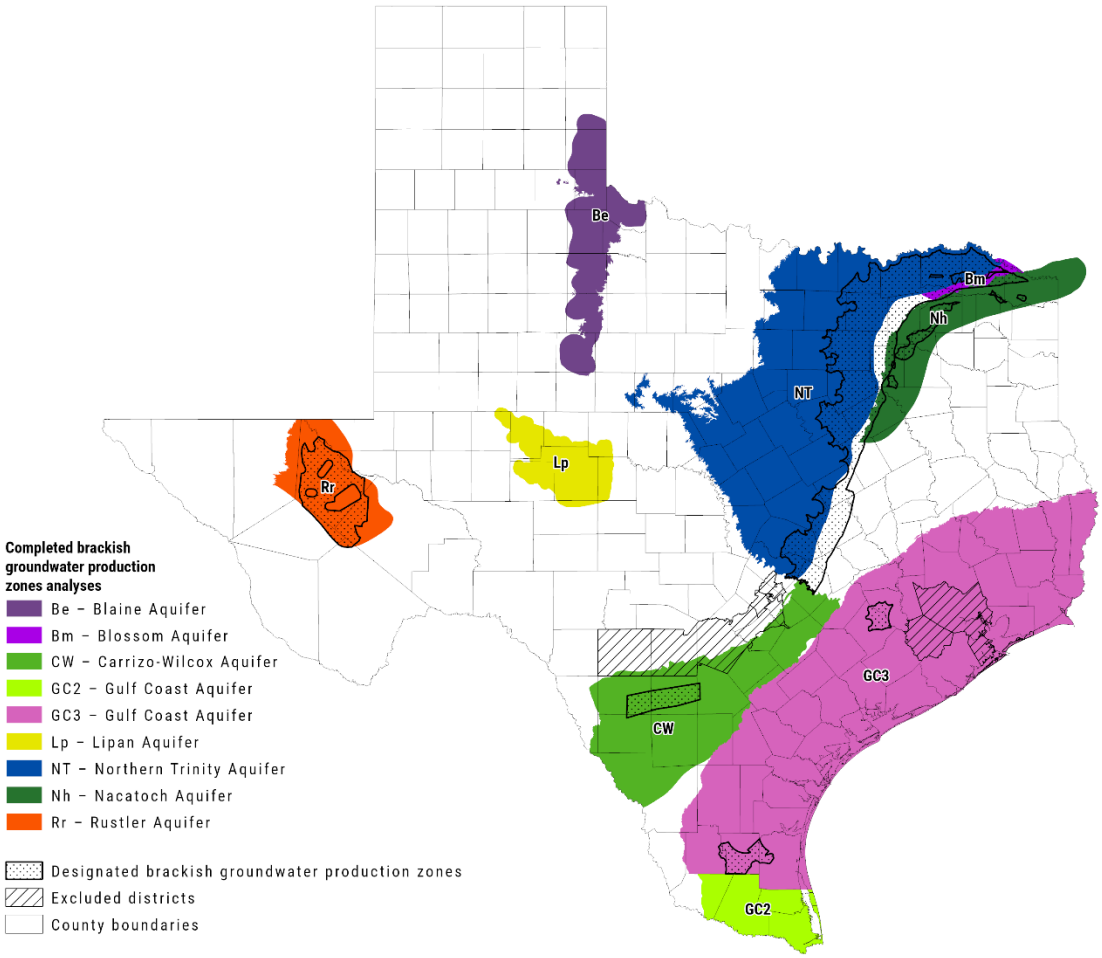
The major and minor aquifer boundaries are delineated based on water quality ranging from 1,000 to 5,000 milligrams per liter of total dissolved solids, meaning the major and minor aquifers may contain both fresh and some brackish groundwater. The current models used to determine modeled available groundwater volumes are designed to simulate groundwater behavior in aquifers, but they are not based on water quality and generally do not distinguish between fresh and brackish groundwater. Due to this limitation, regional water planning groups assign salinity types—fresh, brackish, and/or saline—to groundwater sources based on available information. For simplicity, this plan refers to all sources that are not entirely fresh as brackish groundwater. Brackish groundwater availability within the modeled

available groundwater volume is estimated to be nearly 1.6 million acre-feet per year in 2030—or about 13 percent of total groundwater availability—and increase to over 1.7 million acre-feet per year by 2080.

The TWDB Brackish Resources Aquifer Characterization System (BRACS) program studies the state's aquifers to better understand where significant brackish groundwater resources exist. The program has completed 17 studies and has four more underway. As of publication of the 2027 State Water Plan, the TWDB has designated 31 local and regional brackish groundwater production zones within the Carrizo-Wilcox, Gulf Coast, Rustler, Blossom, Nacatoch, and Northern Trinity aquifers (Figure 5-10). BRACS studies currently estimate that these zones contain approximately 123,000 acre-feet per year of brackish groundwater availability. As required by statute, this brackish groundwater production zone availability is separate from modeled available groundwater.

Information on brackish groundwater production zones was provided to the planning groups, but none utilized these sources in this planning cycle. As the BRACS program continues its work, additional brackish groundwater sources may be included in future plans.

Figure 5-10. Designated brackish groundwater production zones



5.3.5 Total groundwater availability

Total statewide annual groundwater availability is estimated to be 12.5 million acre-feet in 2030 (Figure 5-11). Just over half of that comes from the Ogallala/Edwards-Trinity (High Plains), Ogallala, and Gulf Coast aquifers (Figures 5-12 and 5-13, Appendix B). On a statewide basis, total groundwater availability is projected to decrease by approximately 16 percent to 10.5 million acre-feet in 2080. This is primarily due to reductions in groundwater availability in the Ogallala/Edwards-Trinity (High Plains), Ogallala/Rita Blanca, Ogallala, and Dockum aquifers. By 2080, these aquifers are projected to have significantly reduced availability, with availability declining more than 50 percent compared to the initial 2030 availability in the Ogallala/Edwards-Trinity (High Plains) and Ogallala/Rita Blanca aquifers (Figure 5-14). Declines in groundwater availability are largely anticipated to occur in the Panhandle and Llano Estacado planning areas where these aquifers are located (Figure 5-15).

Although groundwater availability decreases overall statewide, some areas may show increases in availability over the planning period (Figure 5-15). In these cases, groundwater conservation districts may expect more pumping in the future and are planning for it based on demand associated with projected population growth, water management strategies in the state water plan, or other projects expected to come online in later planning decades.

Figure 5-11. Texas' annual groundwater availability and existing groundwater supplies (acre-feet)

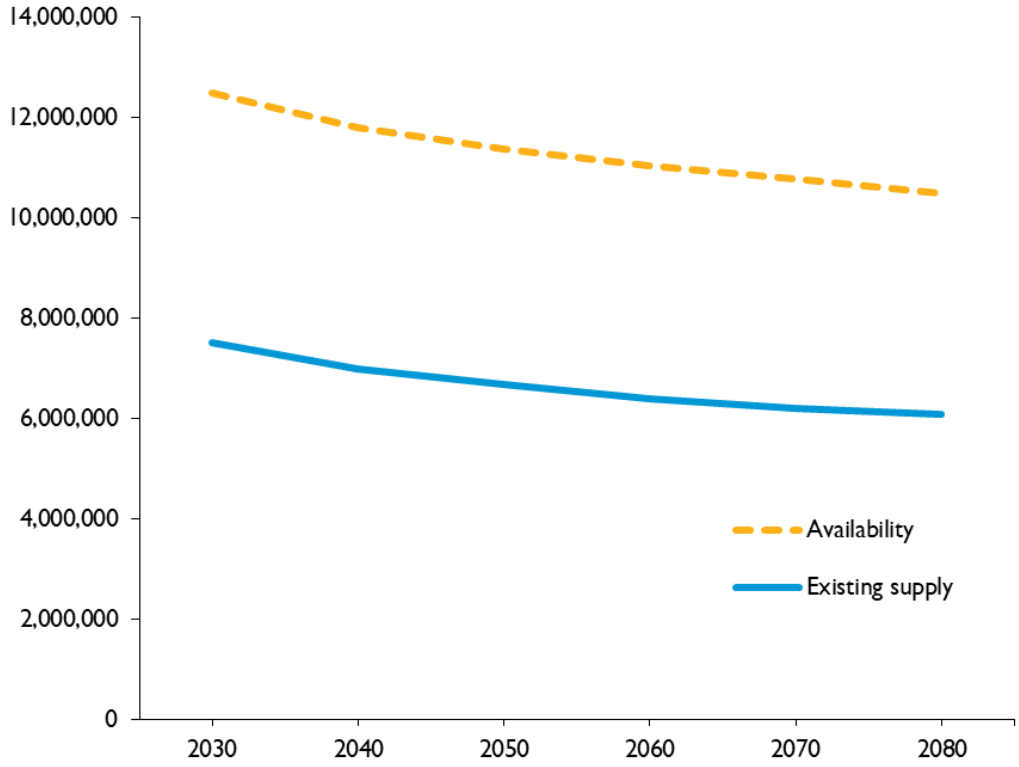
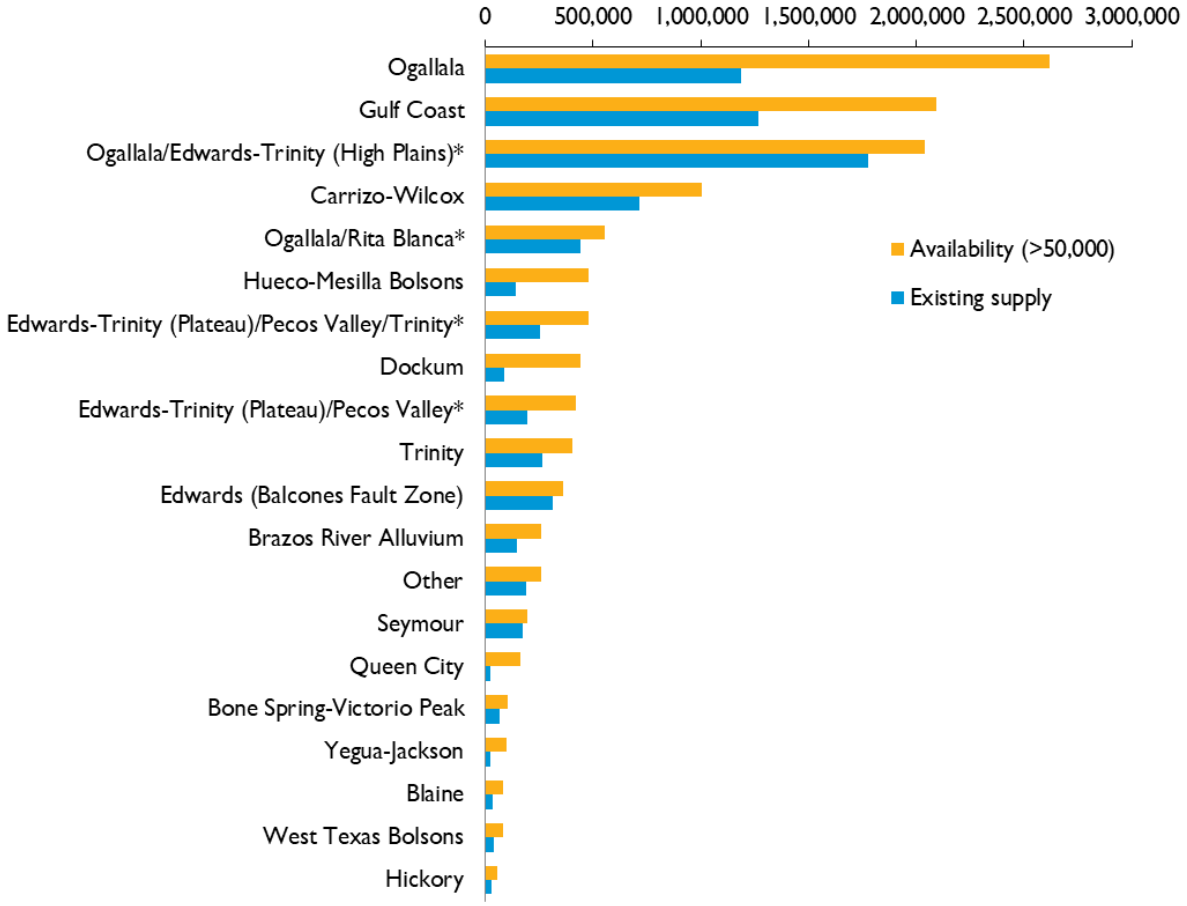


Figure 5-12. Annual groundwater availability greater than 50,000 acre-feet and existing groundwater supplies by aquifer in 2030 (acre-feet)



** The Ogallala/Edwards-Trinity (High Plains); Ogallala/Rita Blanca; Edwards-Trinity (Plateau)/Pecos Valley/Trinity; and the Edwards-Trinity (Plateau)/Pecos Valley are aquifer combinations that 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.*

Figure 5-13. Annual groundwater availability less than 50,000 acre-feet and existing groundwater supplies by aquifer in 2030 (acre-feet)

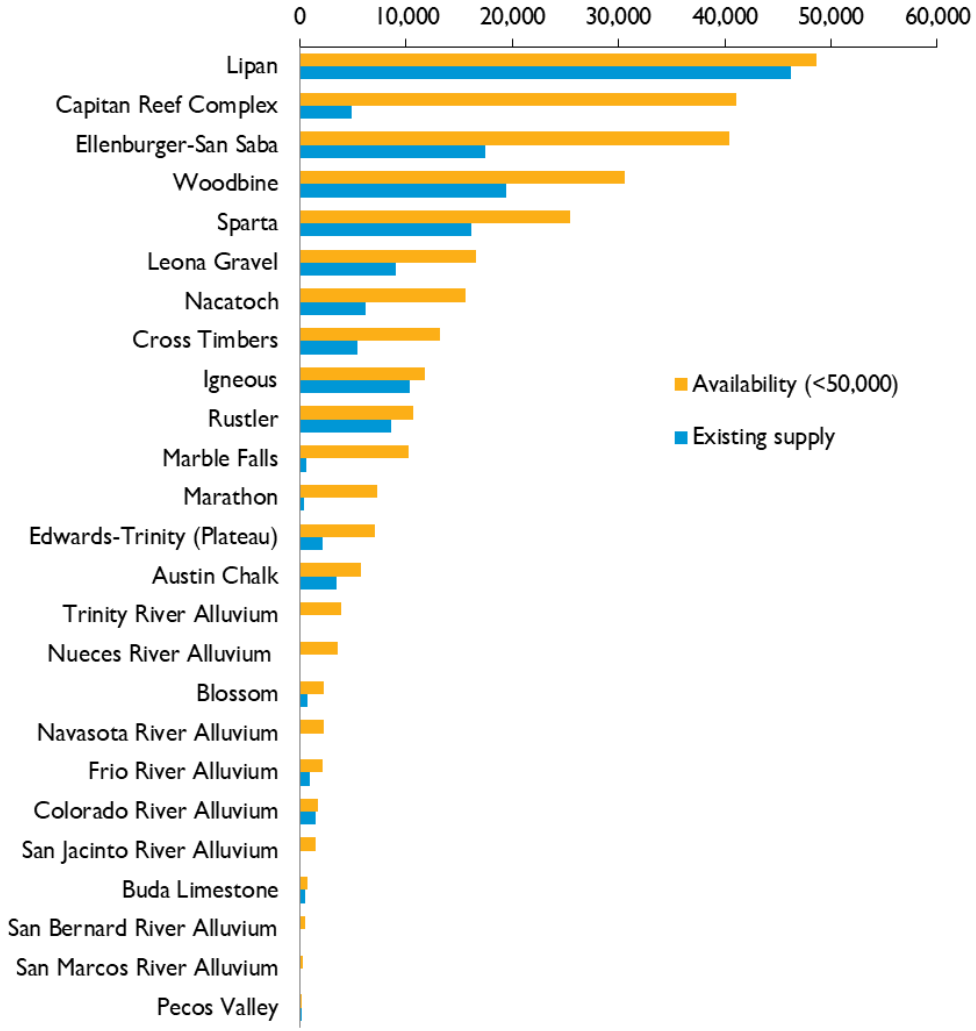
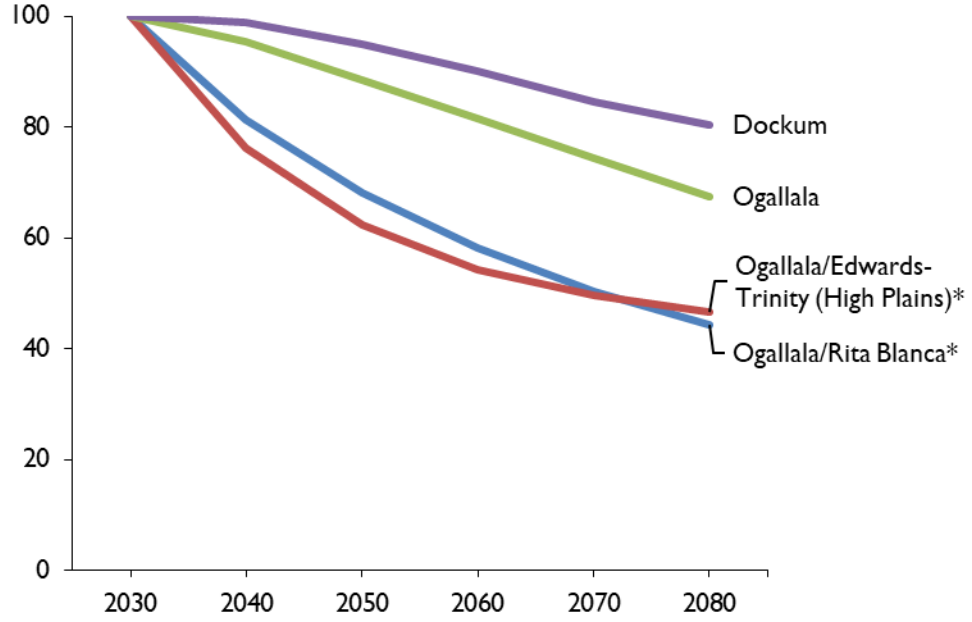


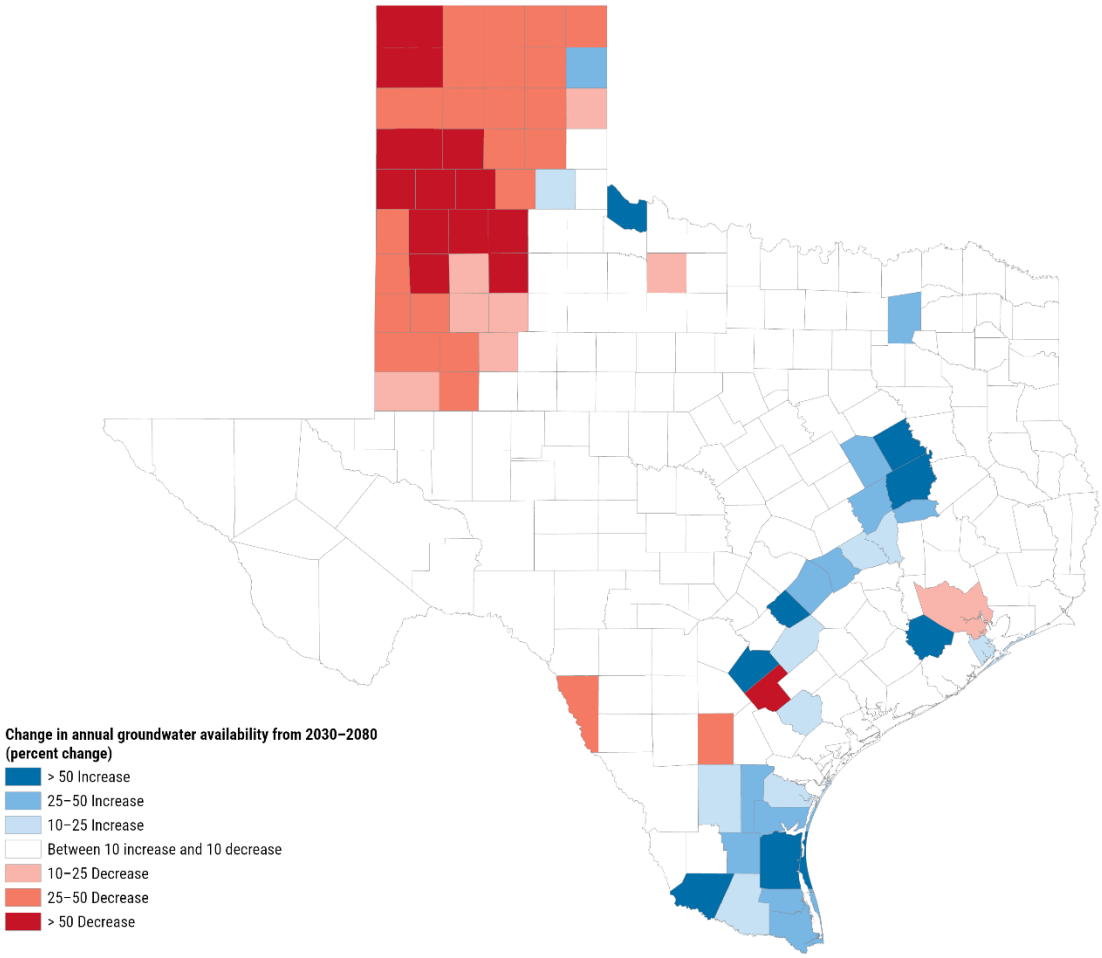
Figure 5-14. Percent declines from initial annual groundwater availability volume between 2030 and 2080



Note: All other major and minor aquifers have no declines or declines less than two percent.

** The Ogallala/Edwards-Trinity (High Plains) and Ogallala/Rita Blanca are aquifer combinations that reflect specific groundwater management policy decisions based on aquifer properties. In these cases, the groundwater availability values have likewise been developed to honor these aquifer combinations.*

Figure 5-15. Change in annual groundwater availability from 2030–2080 (percent change)



Note: Includes aggregated data for all aquifers within the county

5.3.6 Future groundwater availability for planning

For planning purposes, future groundwater availability for a given area may decrease or increase over the planning period. In aggregate, groundwater availability decreases overall statewide, though some areas may show increases in availability if groundwater conservation districts expect more pumping in the future and adopt desired future conditions that allow for higher levels of future groundwater use based on demand associated with projected population growth, water management strategies in the state water plan, or other projects expected to come online in later planning decades.

Changes in groundwater availability between state water plans are largely attributable to either changes in groundwater management policies (desired future conditions) by groundwater conservation districts within groundwater management areas or due to updates or revisions to groundwater availability models. Desired future conditions can be revised every five years through the state's regional joint groundwater planning process. Groundwater availability models are continually updated with newly developed local studies or new data and can result in different availability estimates without modifying the desired future conditions. More details on differences across the groundwater joint planning process cycles are included in Appendix B.

Groundwater policy in Texas

Texas groundwater policy has long been shaped by efforts to balance private property rights with the need to sustain groundwater resources for long-term use. The legal foundation[11] of groundwater management in Texas is the "rule of capture," which was established by common law and affirmed a landowner's right to pump groundwater from beneath their land without liability for impacts to neighboring wells—with exceptions allowed only for malicious use, waste, or subsidence. Over time, legislative actions, judicial decisions, and advances in hydrogeologic science have shifted this perspective. While the rule of capture remains a defining element of Texas groundwater law, it now operates within a framework of local regulation and groundwater management area policies that inform regional water planning.

Historical foundations

The first significant legislative step toward organized groundwater management was the Groundwater Conservation District Act of 1949, which promoted the "orderly development, conservation, and use of groundwater." The Act was the first step towards decentralized groundwater management and introduced groundwater conservation districts as the only entity empowered to regulate groundwater and with the only means of modifying the rule of capture. The Act also firmly established groundwater as a private property right legally distinguished from surface water, and that groundwater and surface water are managed differently.

Groundwater sustainability concerns emerged in statewide water planning when the 1968 State Water Plan proposed importing water from the Mississippi River, driven in part by fears that continued reliance on groundwater could lead to long-term aquifer depletion. Similar large-scale water transfer concepts have continued to appear in policy discussions since that time.

The 1997 State Water Plan, the last plan prepared before the regional water planning process began, identified a key governance gap: Texas law did not (and still does not) recognize the physical connection between surface water and groundwater. The plan observed that Texas relied on "conflicting management schemes" for resources that are hydrologically connected, and recommended reassessing groundwater law doctrines to improve water management. That same year, Senate Bill 1 fundamentally reshaped water planning by establishing a regional water planning process and requiring groundwater conservation districts to prepare management plans. Most groundwater conservation districts operating today were created after this legislation, reflecting a more broad and systematic approach to groundwater regulation.

The 2002 State Water Plan policy recommendations emphasized sustainable groundwater management, assessed locally or regionally, and balanced across competing interests. That plan raised issues that continue to surface in legislative conversations, including groundwater export projects, permitting processes, and aquifer depletion risks.

Significant changes to groundwater planning followed in 2005, with legislative direction introducing a joint groundwater planning process within a regional framework of groundwater management areas. The concept established consensus goals called "desired future conditions" and corresponding estimates of groundwater availability called "managed available groundwater." Desired future conditions adopted by districts within groundwater management areas represented policy-based management goals for future aquifer conditions, and managed available groundwater translated those goals into estimated volumes used for planning and permitting. Prior to the formal incorporation of groundwater availability derived from desired future conditions, regional water planning groups relied on a combination of variable planning policies and district-level estimates to determine groundwater supplies available for planning, as

[11] 1904 Texas Supreme Court decision *Houston & Texas Central Railroad Company v. East.*

noted in the 2007 and 2012 state water plans. Later statutory changes revised the term to "modeled available groundwater" and removed the requirement that these volumes serve as a firm permitting cap. As a result, this shifted the management focus to achievement of the desired future conditions and allowed some groundwater conservation districts to permit volumes that exceed planning estimates. This raised questions about how local regulatory decisions, policy goals, and long-term planning interact within the current framework.

Judicial decisions and legislative amendments in the 2010s further clarified groundwater policy. Courts affirmed that landowners have an ownership interest in groundwater in place while also recognizing the authority of groundwater conservation districts to regulate production (*Edwards Aquifer Authority v. Day*). These developments reinforced the dual emphasis on private property rights and local management that characterizes Texas groundwater management today. They also highlighted the need to balance private property rights with the state's interest in groundwater conservation and planning, and brought increased attention to how regulatory decisions, permitting practices, and planning assumptions interact with constitutional protections.

Current landscape and ongoing challenges

Today, groundwater accounts for about 56 percent of the state's annual water use and is projected to continue playing a central role in meeting the future water demands, even as groundwater availability is expected to decline by approximately 16 percent over the next 50 years (Figure 5-A).

Groundwater conservation districts remain the preferred method of groundwater management and the primary regulatory entities, though 77 Texas counties have no groundwater conservation district and 35 counties are only partially within a district. Rule of capture prevails in those areas not located in a groundwater conservation district. In both planning and management, districts rely on technical data, monitoring networks, and groundwater availability models developed and supported by the TWDB.

The TWDB provides statewide leadership by coordinating regional water planning that relies on modeled available groundwater, developing and maintaining groundwater availability models, collecting and disseminating groundwater data, and offering technical and financial assistance. This statewide role supports consistent planning assumptions, improves data accessibility and interoperability, and enables groundwater conservation districts and regional planning groups to address complex technical analyses more efficiently at a statewide scale.

Advances in hydrogeology, data collection, and modeling have improved understanding of aquifer systems and the effects of pumping over time. However, groundwater systems remain complex and variable, and uncertainties persist regarding recharge, pumping volumes, groundwater-surface water interactions, and long-term aquifer responses to sustained pumping and drought. Uncertainties shaping groundwater policy discussions include

- gaps in data availability and timing;
- insufficient data governance;
- limited infrastructure to collect and disseminate data; and
- minimal incorporation of groundwater-surface water interactions and drought conditions into planning assumptions.

These uncertainties continue to shape groundwater policy discussions. The evolution of Texas groundwater policy reflects an ongoing effort to adapt a long-standing legal framework to improve scientific understanding, changing water demands, evolving uncertainty, and the goal of long-term water security for the state.

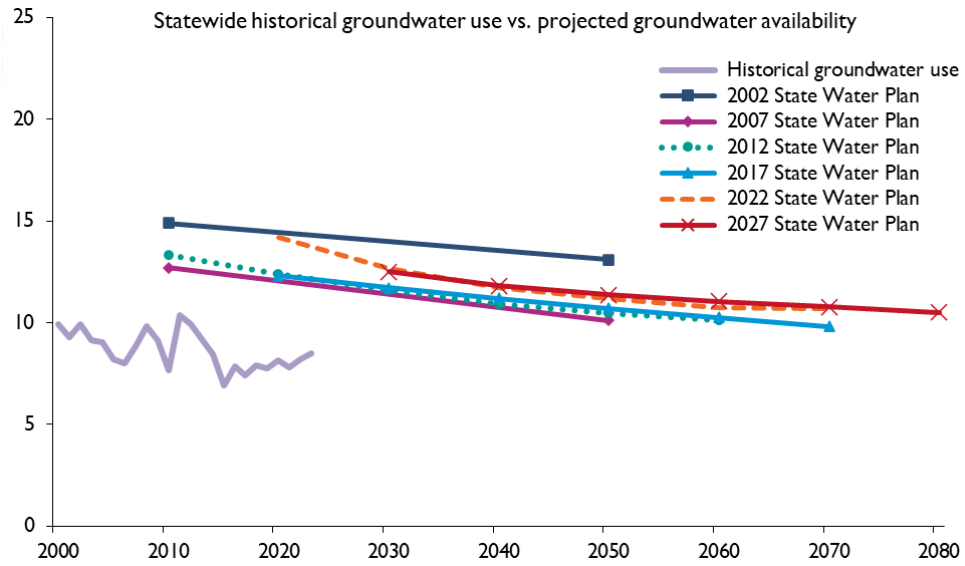


Figure 5-A. Comparison of projected statewide annual groundwater availability reported in state water plans to estimated historical groundwater water use (million acre-feet)

5.4 Availability of other sources

The majority of Texas' water supply comes from river basins and aquifers, but seawater, reclaimed water for reuse, and groundwater stored in aquifer storage and recovery projects represent other widely available sources of water.

Seawater availability is vast and generally limited only by the ability to legally access it along the coast.

Reuse availability changes over time and is limited by the amount of wastewater generated by water users at any given time, unless a water use permit or agreement states otherwise. Reuse availability is estimated at nearly 1.0 million acre-feet per year in 2030, increasing slightly to 1.1 million acre-feet per year in 2080. These volumes include direct and indirect potable and non-potable reuse, as well as onsite water recycling.

Aquifer storage and recovery availability represents the amount of water that could be used annually from storage in active aquifer storage and recovery projects, which is growing. In this plan, groundwater stored in these projects is now accounted for separately from conventional groundwater for planning purposes. Unlike past plans—where these volumes were limited and included within groundwater availability—aquifer storage and recovery source availability is estimated to be 201,000 acre-feet per year across the planning period. Availability is limited to the percent recovery of each project, which varies by site and depends on the physical characteristics of the aquifer and groundwater geochemistry.

Produced water availability is not consistently assessed across the state due to regulatory, technical, and data limitations. However, limited volumes of oil and gas produced water are included in this plan as

existing and future supplies for mining operations and are classified as reuse under the water recycling subtype.

5.5 Existing supplies

The share of available water sources that can be legally produced and delivered to water user groups based on existing infrastructure (i.e., the existing supply) during a repeat of the drought of record is influenced by many factors. For example, a reservoir may have a large volume of available water, but existing water supplies that can be delivered to users may be limited by pipeline infrastructure capacity, treatment plant capacity, or legal restrictions on diversions. Based on the volume of available water at each source, planning groups evaluated the share of supplies that can be relied upon to meet water demands in the event of drought. The planning group analyses considered the legal and physical limitations of the supplies for each water user group.

5.5.1 Total existing supplies

Statewide, surface water makes up almost two-thirds of the nearly 9.2 million acre-feet per year total existing water supply for municipal, manufacturing, steam-electric, and mining users (Figure 5-16). However, irrigation and livestock users rely on groundwater for 77 percent of their approximately 6.4 million acre-feet per year total existing water supply (Figure 5-17).

Texas' total existing water supply in 2030 is approximately 15.5 million acre-feet, consisting roughly of half surface water and half groundwater, with reuse contributing 5 percent (Table 5-1, Figure 5-18). Existing aquifer storage and recovery supplies account for less than 1 percent of the total 2030 existing supply. By 2080, existing water supply is projected to decline 10 percent, to almost 14.0 million acre-feet per year (Table 5-1, Figure 5-18). Changes in supply to water user groups vary by location.

Figure 5-16. Shares of total, statewide existing municipal, steam electric, manufacturing, and mining supply by water source in 2030 (percent)

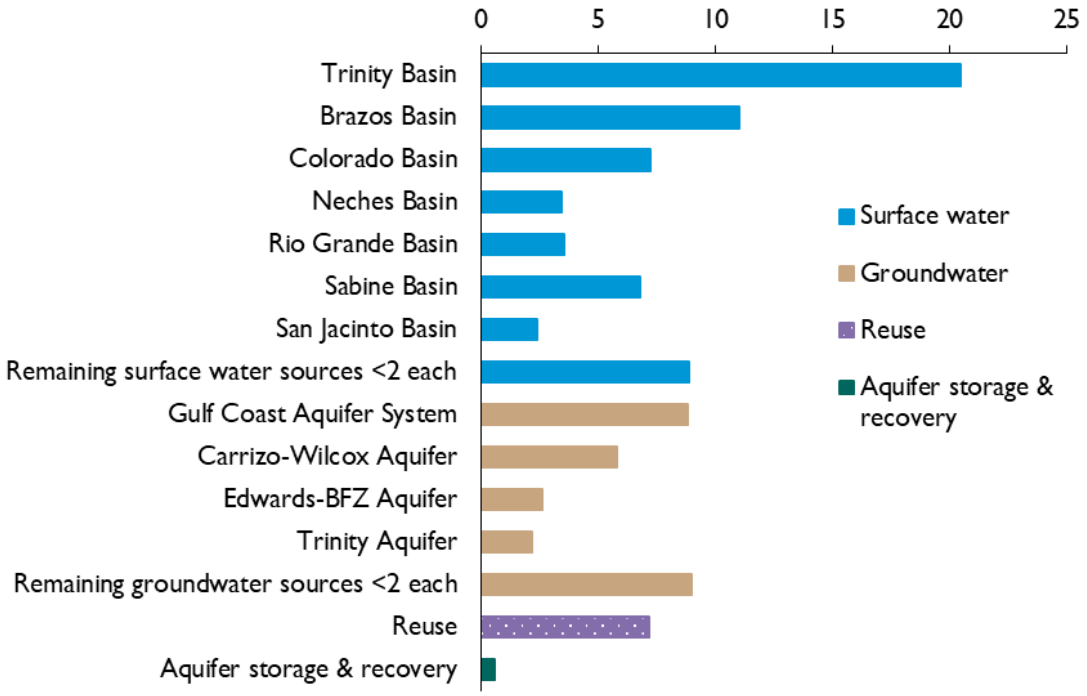


Figure 5-17. Shares of total, statewide existing irrigation and livestock supply by water source in 2030 (percent)

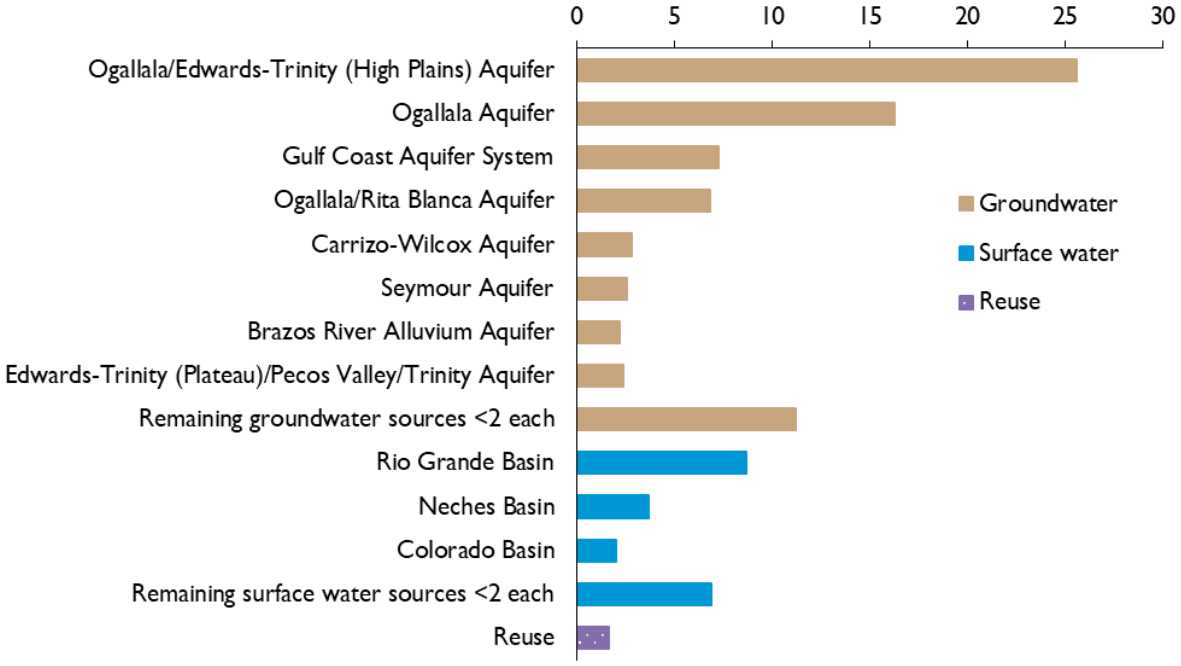
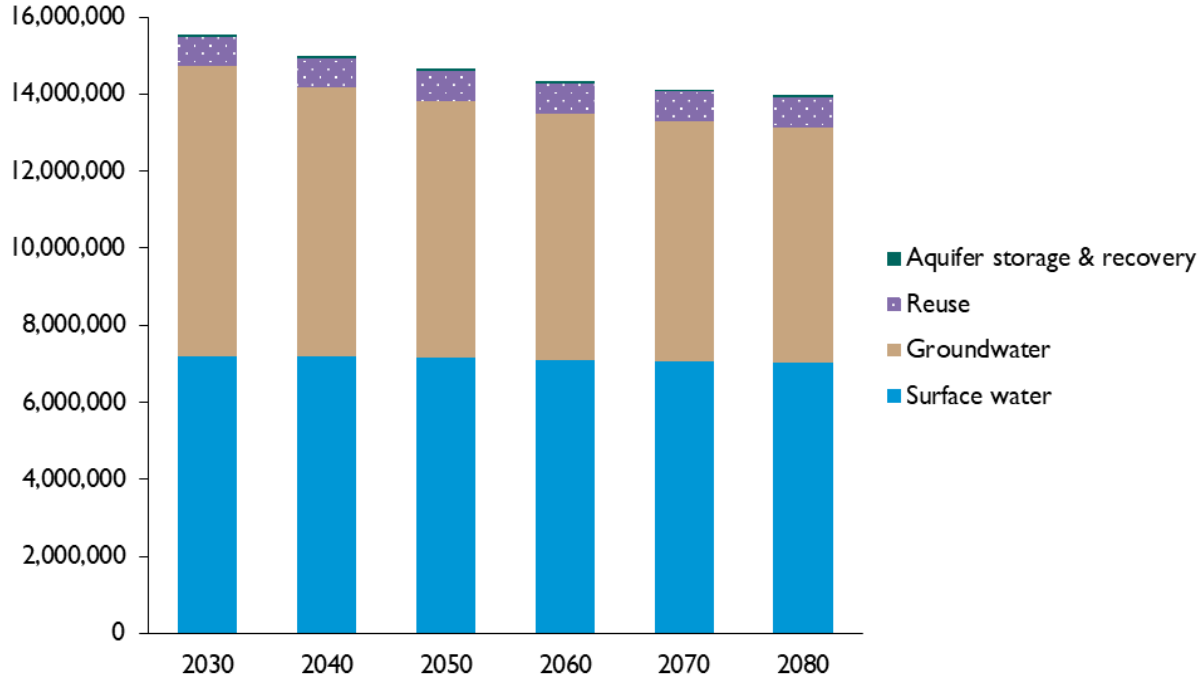


Table 5-1. Texas' annual existing water supply (acre-feet)

Source	2030	2040	2050	2060	2070	2080	Percent change from 2030
Surface water	7,202,299	7,178,185	7,141,704	7,100,599	7,067,475	7,034,277	-2
Groundwater	7,524,781	6,993,988	6,678,387	6,387,397	6,213,830	6,096,221	-19
Reuse	760,997	767,812	781,911	794,089	791,789	796,361	5
Aquifer storage & recovery	51,263	51,263	51,263	51,263	51,263	51,263	0
Texas [a]	**15,539,340**	**14,991,248**	**14,653,265**	**14,333,348**	**14,124,357**	**13,978,122**	**-10**

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

Figure 5-18. Texas' projected annual existing water supply (acre-feet)*



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

5.5.2 Surface water supply

Total annual existing surface water supply is anticipated to remain generally stable, declining approximately 2 percent from 2030 through 2080 (Figure 5-3). Nearly three-fourths of all existing surface water supply comes from reservoirs or reservoir systems. Reservoirs are projected to provide existing water supply to almost 28 million people in 2030, increasing to 43 million in 2080. The decline in existing surface water supply over the planning horizon is primarily due to sedimentation decreasing the storage capacity of many reservoirs. Factors not projected in the surface water modeling results, including changes to inflow or evaporative loss, contribute uncertainty to the noted decline.

5.5.3 Groundwater supply

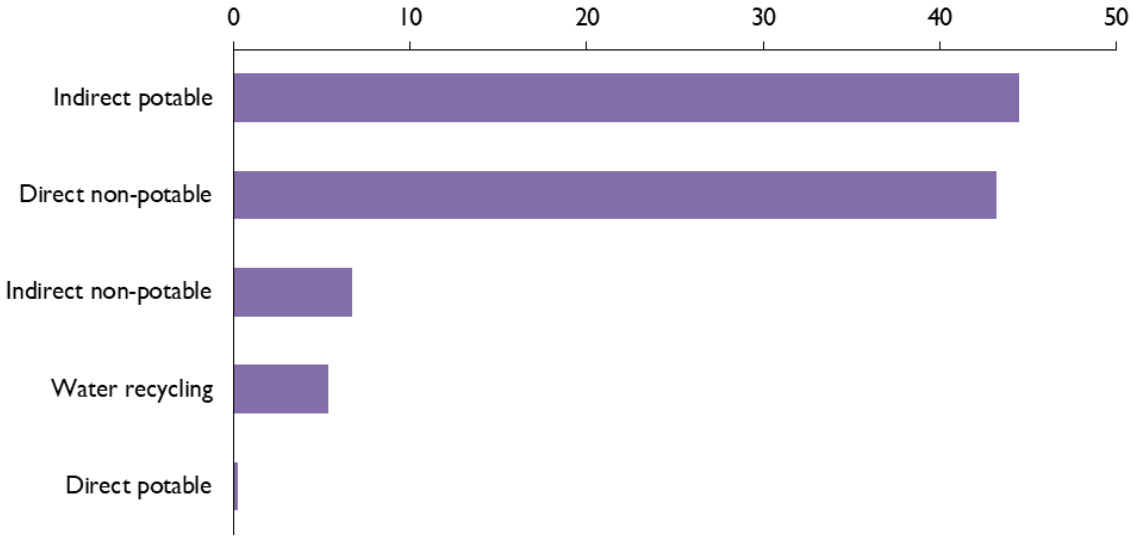
Total annual existing groundwater supply is anticipated to decline about 19 percent from 2030 to 2080. The decline is due primarily to reduced availability from the Ogallala Aquifer based on groundwater conservation district policy decisions to manage depletion of the aquifer (Figure 5-14). Of these groundwater supplies, the total annual existing supply (connected to users) from brackish sources remains relatively stable, ranging from 813,000 acre-feet in 2030 to 818,000 acre-feet in 2080.[12]

5.5.4 Reuse supply

Total annual reuse supply makes up 5 percent of total supplies in 2030, with over one-third of this supply occurring in Region C (Table 5-2). By 2080, reuse supplies are estimated to increase statewide by 5 percent (Table 5-1). The increase is generally due to an expected increase in municipal return flows over time as the population and subsequent wastewater generated by the population increases. Water conservation, which can reduce return flows, contributes some uncertainty to these increases.

Indirect potable reuse and direct non-potable reuse are estimated to make up the dominant share of annual existing reuse supply in 2030, with each accounting for more than 40 percent of existing reuse supply (Figure 5-19). Indirect non-potable reuse involves discharging treated wastewater into a lake, river, or aquifer and retrieving it for use again, which accounts for almost 7 percent of existing reuse supply in 2030. Water recycling involves water supply that is used, recycled onsite, and then reused—which includes well field recycling of oil and gas produced water—accounts for 5 percent of existing reuse supply in 2030. Direct potable reuse involves sending highly treated wastewater directly into a drinking water system and accounts for less than 1 percent of existing reuse supply in 2030.

Figure 5-19. Share of projected annual existing reuse supply by reuse type in 2030 (percent)



[12] The brackish groundwater existing supply volume is a subset of the total groundwater existing supply that is not entirely fresh. This does not include brackish groundwater production zones volumes as noted in Section 5.3.4.

Table 5-2. Projected annual existing reuse supply (all types) by region and reuse type (acre-feet)

Region	Reuse type	2030	2040	2050	2060	2070	2080
A	Direct non-potable reuse	20,647	20,651	20,650	20,646	20,642	20,639
A	Water recycling	500	500	500	500	500	500
B	Direct non-potable reuse	459	459	459	459	459	459
B	Indirect potable reuse	8,731	8,968	8,967	8,968	8,968	8,968
C	Direct non-potable reuse	24,476	23,916	23,942	23,967	23,993	24,018
C	Indirect non-potable reuse	486	486	486	486	486	486
C	Indirect potable reuse	264,113	280,003	291,399	297,689	304,557	311,452
D	Direct non-potable reuse	72,993	67,677	68,933	77,807	71,581	71,581
D	Indirect potable reuse	1,500	1,400	1,402	1,383	1,343	1,414
E	Direct non-potable reuse	6,193	6,193	6,193	6,193	6,193	6,193
E	Indirect non-potable reuse	334	334	334	334	334	334
E	Indirect potable reuse	29,289	30,569	31,372	31,881	32,398	32,922
F	Direct non-potable reuse	25,411	25,411	25,411	25,411	25,411	25,411
F	Direct potable reuse	1,846	1,847	1,848	1,848	1,849	1,848
F	Indirect potable reuse	8,300	-	-	-	-	-
F	Water recycling	33,925	33,925	32,259	28,921	24,399	20,465
G	Direct non-potable reuse	34,000	34,000	34,000	34,000	34,000	34,000
G	Direct potable reuse	9	8	7	7	6	6
G	Indirect potable reuse	7,905	7,983	8,130	8,200	8,242	8,233
H	Direct non-potable reuse	25,580	25,580	25,580	25,580	25,580	25,580
H	Indirect potable reuse	18,810	20,135	22,150	24,140	25,184	26,219
I	Direct non-potable reuse	115	115	115	115	115	115
I	Water recycling	1,153	1,153	1,153	1,153	1,153	1,153
J	Direct non-potable reuse	2,735	2,735	2,735	2,735	2,735	2,735
K	Direct non-potable reuse	9,217	9,219	9,219	9,219	9,219	9,217
K	Indirect non-potable reuse	98	98	98	98	98	98
L	Direct non-potable reuse	49,646	58,370	58,370	58,370	58,344	58,372
L	Indirect non-potable reuse	50,000	50,000	50,000	50,000	50,000	50,000
L	Water recycling	2,420	2,420	2,420	2,420	2,420	2,420
M	Direct non-potable reuse	9,221	9,492	9,614	9,634	9,655	9,677
N	Direct non-potable reuse	2,895	2,895	2,895	2,895	2,895	2,895
N	Water recycling	2,528	2,528	2,528	2,528	2,528	2,449
O	Direct non-potable reuse	45,462	38,742	38,742	36,502	36,502	36,502
Texas	**Total direct non-potable reuse**	**329,050**	**325,455**	**326,858**	**333,533**	**327,324**	**327,394**
Texas	**Total direct potable reuse**	**1,855**	**1,855**	**1,855**	**1,855**	**1,855**	**1,854**
Texas	**Total indirect non-potable reuse**	**50,918**	**50,918**	**50,918**	**50,918**	**50,918**	**50,918**
Texas	**Total indirect potable reuse**	**338,648**	**349,058**	**363,420**	**372,261**	**380,692**	**389,208**
Texas	**Total water recycling**	**40,526**	**40,526**	**38,860**	**35,522**	**31,000**	**26,987**
Texas	**Grand total reuse**	**760,997**	**767,812**	**781,911**	**794,089**	**791,789**	**796,361**

5.5.5 Aquifer storage and recovery supply

Aquifer storage and recovery sources represent water stored in active aquifer storage and recovery projects. Existing supply from aquifer storage and recovery sources accounts for less than 1 percent of statewide total existing supply. Across the planning horizon, aquifer storage and recovery sources are estimated to have approximately 200,000 acre-feet of annual availability and provide a combined 51,000 acre-feet of existing supply to water user groups located in Regions J, K, and L.

5.6 Source availability for future development

The share of available water that remains to be developed for water supply varies by water source and location. In the Trinity River Basin, approximately 80 percent of the available water is committed as existing surface water supplies, but less than 40 percent of the Sabine, Neches, and several other basins' availability are similarly connected as existing supply (Figure 5-4). In the Ogallala/Edwards-Trinity (High Plains), Edwards (Balcones Fault Zone), Seymour, and several other aquifers, more than 85 percent of the available water is connected as existing supply, whereas less than 20 percent of the Dockum, Queen City, and several other aquifers are connected as existing supply (Figure 5-12, Figure 5-13).

Any remaining available water beyond what is already connected as existing supply could, in concept, be the water source to support a recommended water management strategy, subject to many feasibility factors, including its proximity to identified water needs and associated costs. However, there are factors unrelated to water source availability that can also reduce the existing supply of specific water users, including declines in groundwater levels relative to a well pump intake, reduced reservoir surface levels relative to an intake elevation, encroaching salt water or other groundwater quality degradation, and expiring water supply contracts.

5.7 Comparison to the 2022 State Water Plan

Many factors have affected estimates of water availability volumes of the 2,310 individually quantified water source units and the estimates of existing water supply volumes of the approximately 3,000 water user groups since adopting the 2022 State Water Plan. These factors include policy decisions, modeling assumptions, accumulated historical streamflow data, local decisions, additional information regarding physical and legal constraints to supplies, and implementation of water supply projects during the intervening years. When comparing the planning decades of 2030 through 2070 statewide, relative changes range greatly by water source location and user. A comparison is not provided for existing aquifer storage and recovery sources because this is the first plan to separately report on this source type rather than include it within the overall groundwater volumes.

Surface water

Statewide, surface water availability has decreased by 12 to 13 percent across all decades as compared to the last plan, although this varies significantly by location (Figure 5-20). The overall decline in availability between plans is largely due to the removal of brackish run-of-river sources in the Neches and Sabine river basins to more accurately align with updated surface water availability model results and projected demands for the brackish sources.

Existing supplies from surface water remained largely consistent between the plans.

Groundwater

While the aggregated total groundwater availability volume is relatively close to the availability in the 2022 State Water Plan, there was variation by county and aquifer within the total, including relatively greater decreases in eastern and southern counties (Figure 5-21). Changes are primarily due to policy decisions made as part of the groundwater management area joint planning process, although updated

groundwater availability models may also contribute to differences. There was little change in the aggregate 2030 groundwater availability volume between plans, even though groundwater availability in 2030 decreased by more than 10 percent for 51 of Texas' 254 counties and increased by more than 10 percent in 38 counties (Table 5-3). The remaining 165 counties showed no significant change in 2030 groundwater availability.

Statewide, based on the net result of changes to all users' individual supplies, existing groundwater supply decreased slightly in 2030 and increased slightly in all remaining decades as compared to the 2022 State Water Plan.

Reuse

Existing reuse supply increased in all decades compared to the 2022 State Water Plan. The largest relative change was an approximate 19 percent increase in 2030, largely attributed to the implementation of direct and indirect non-potable reuse projects, primarily in Region L, and well field recycling of oil and gas produced water in Region F.

Figure 5-20. Net changes, by basin, from the 2022 State Water Plan in annual surface water availability in 2030

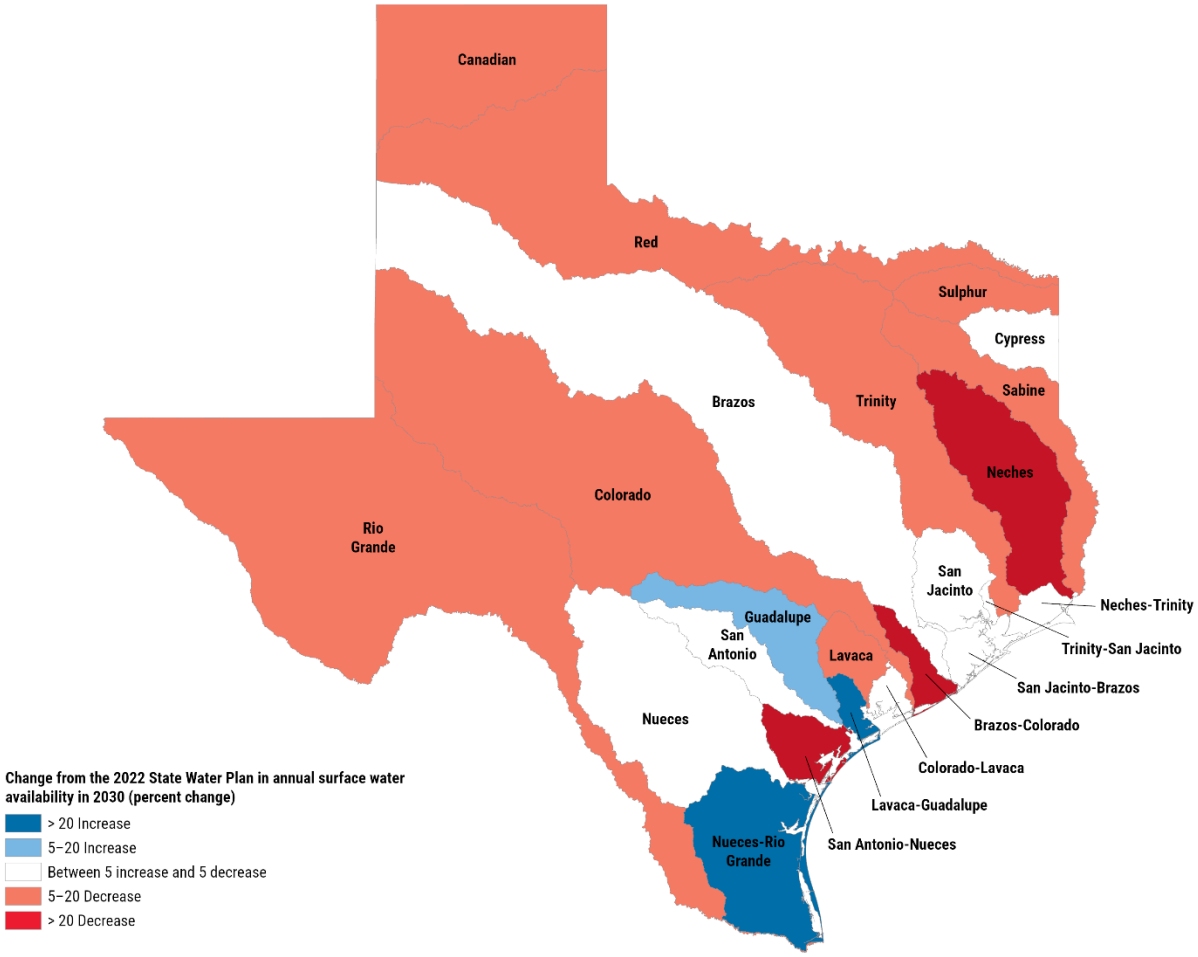
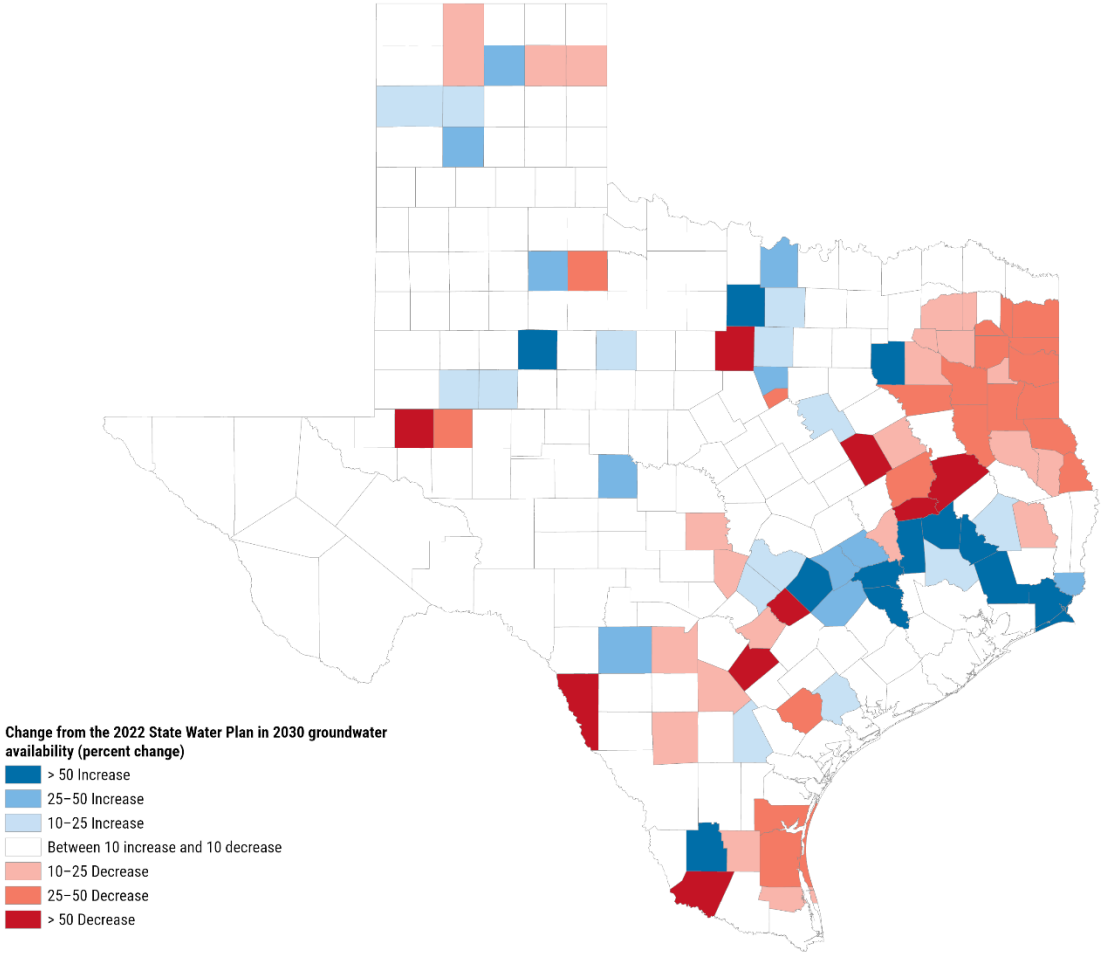


Figure 5-21. Net changes, by county, from the 2022 State Water Plan in annual groundwater availability in 2030



** In the 2022 State Water Plan, modeled available groundwater peak factors were used to determine groundwater availability for certain aquifers in the following counties: Austin, Brazoria, Brazos, Madison, Montgomery, Walker, and Waller. In the 2027 State Water Plan, only one modeled available groundwater peak factor was used to determine groundwater availability in Brazoria County. Availability changes in these counties reflect changes in the groundwater availability reported for regional water planning purposes and may not necessarily reflect changes in resource availability since the 2022 State Water Plan.*

Table 5-3. Number of counties where there is a net decrease, no significant net change, or net increase in groundwater availability between the 2022 and 2027 State Water Plans (expressed as a percent)

Decade	Decrease of more than 10 percent	Decrease of less than 10 percent or increase of less than 10 percent	Increase of more than 10 percent
2030	51	165	38
2040	45	171	38
2050	44	167	43
2060	44	165	45
2070	48	160	46

5.8 TWDB initiatives to improve water availability estimates

Understanding how evaporation, runoff, and rainfall may change in the coming decades is important for assessing future water availability in Texas. To support more accurate planning, the TWDB is advancing several research initiatives that refine evaporation datasets, incorporate projected temperature trends into water availability modeling, and develop methods for estimating future runoff and reservoir evaporation. These efforts are intended to provide planning groups with improved tools and data for evaluating and planning for future drought conditions and droughts potentially worse than the drought of record.

Enhanced evaporation datasets for water planning

As part of its responsibilities under Texas Water Code § 16.012, the TWDB collects, compiles, and disseminates reservoir evaporation data. Since 2019, the TWDB has led a collaborative effort to enhance the accuracy and the spatial and temporal resolution of reservoir evaporation data for Texas, which is a key input to the Water Availability Models used by the Texas Commission on Environmental Quality for water rights permitting and by regional water planning groups for water planning.

Since 2021, the TWDB has maintained a limited open water reservoir evaporation monitoring network and has deployed buoys with meteorological and water temperature sensors at Lake Buchanan, Choke Canyon Reservoir, Lake Meredith, and Red Bluff Reservoir. These instruments collect data needed to estimate reservoir evaporation using the aerodynamic mass transfer method. In addition, evaporation data are collected at Twin Buttes Reservoir using a Collison Floating Evaporation Pan system.

From 2021 to 2023, the TWDB and its partners developed a reservoir-specific daily evaporation dataset for 189 major reservoirs in Texas (Zhao et al., 2024). Released in May 2023, the TWDB reservoir evaporation dataset is available online at dri-apps.projects.earthengine.app/view/twdb-reservoir-evaporation, along with a companion 4 km × 4 km raster evaporation dataset for multiple pond depths that is available online at dri-apps.projects.earthengine.app/view/twdb-raster-lake-evaporation. Both rely on a physically based model that accounts for hydrometeorological conditions and reservoir characteristics.

Although the new daily evaporation datasets represent a major improvement, validation using Texas in-situ data has been limited. Stakeholders have requested additional verification, so the TWDB has contracted with the U.S. Geological Survey to develop best practices for validating the reservoir-specific daily evaporation dataset. The study will compare the new estimates with legacy quadrangle values, measurements from TWDB in-situ open water reservoir evaporation monitoring stations, and water-budget-based evaporation estimates.

The TWDB has also contracted to extend the reservoir-specific daily evaporation dataset back to 1934 to match the simulation period of the Texas Commission on Environmental Quality Water Availability Models (1934 through 2018 or beyond). This extended dataset will allow the TWDB to assess how water availability changes when the improved reservoir evaporation data are used in the Water Availability Models.

In 2026, a new buoy station will be deployed at Sam Rayburn Reservoir, and a Collison Pan Station will be deployed at Lake Buchanan. In addition, the TWDB is overseeing the development of reservoir-specific daily evaporation forecasts for 189 major reservoirs with a 1- to 28-day lead time to assist reservoir operators in estimating projected reservoir drawdown due to evaporation.

Integrating future temperature trends into water availability modeling

In 2023, the Sunset Advisory Commission made a management recommendation directing the TWDB to consult with the State Climatologist to obtain climate projections for the purpose of assessing regions of the state likely to experience severe drought. In response, the TWDB is developing a method to

incorporate projected temperature increases provided by the State Climatologist into projected reservoir evaporation estimates. The TWDB will, after public input, provide modified net-evaporation datasets that planning groups and others may use in basin-specific Water Availability Models to assess the potential future impact that changing evaporation rates may have on future available surface water. The approach is limited in scope; extending observed historical trends in reservoir-specific evaporation rates into the future while assuming no change to other relevant variables, such as future runoff.

Developing methods to estimate future runoff and reservoir evaporation

The TWDB has contracted to develop a method for estimating future monthly runoff and potential future net reservoir evaporation for a selected river basin for the period of 2020–2080 using temperature change scenarios from the State Climatologist. The project will develop datasets of future projected runoff and projected net reservoir evaporation that may be used to assess future drought conditions and help identify regions that may face droughts more severe than the drought of record. The methodology is anticipated to allow the TWDB to produce similar datasets for evaluating changes to runoff in different regions of the state.

Datasets and studies to assess the impact of reservoir sedimentation on future available surface water

The TWDB has developed projected reservoir elevation-area-capacity rating curves for major water supply reservoirs in Texas using a methodology that accounts for the distribution of sediment volume by lake elevation (Zhu et al., 2025). Simplified projected rating curves (i.e., rating curves for 12 elevation points at equal elevation interval, suited for input to the Water Availability Models) are available for 80 major water supply reservoirs for the 2030–2080 water planning decades at: www.twdb.texas.gov/surfacewater/data/projectedratingcurves/index. Using the projected rating curves, the TWDB is undertaking a study to evaluate how the variable distribution of sediment volume by lake elevation impacts future reservoir capacity and future reservoir firm yield.

Datasets and studies to identify and quantify groundwater-surface water interactions

The TWDB has recently contracted for two groundwater-surface water interaction studies: one completed along the Brazos River (Zamora et al., 2025) and another ongoing along the Devils River. A key finding of Zamora et al. (2025) is the complexity of the interface between the aquifer and the surface water system. It is clear that to better understand and quantify this flow, more gain-loss studies are needed across Texas. Datasets of these gain-loss studies should be created to capture these interactions at a variety of river flow stages, which will better reflect interannual variability in groundwater-surface water interaction flow.

Increase coverage of groundwater data

The TWDB maintains a statewide database of groundwater data that includes information on water levels, chemistry, and aquifer property tests. These data are key inputs to the groundwater availability models used in water planning. Robust groundwater data enables the TWDB to better estimate aquifer properties such as transmissivity, conductivity, specific capacity, and storativity, which are often heterogeneous and require representative spatial distribution to properly model aquifer systems. The TWDB is continually collecting groundwater data to reduce spatial and temporal data gaps and encourages groundwater stewards across the state to submit available groundwater data to improve groundwater availability modeling that supports regional planning efforts.

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6 Water supply needs

Quick facts

Absent the development of new water supplies or implementation of water management strategies, such as conservation, Texas water users could face water shortages of approximately 3.6 million acre-feet per year by 2030, growing to 5.8 million acre-feet per year by 2080, if drought conditions comparable to the drought of record recur. For scale, Toledo Bend Reservoir, the largest reservoir in Texas, has a maximum storage capacity of about 4.5 million acre-feet, meaning projected annual shortages could exceed the full capacity of the state's largest reservoir.

Without additional supplies being developed through the recommended strategies and projects, approximately one out of four Texans in 2080 would have less than half the municipal water supplies they will require if drought conditions comparable to the drought of record recur.

Overall, population growth is why Texas' municipal water users could potentially face rapidly growing needs, with potential drought condition shortages increasing from about 714,000 acre-feet in 2030 to roughly 3.3 million acre-feet in 2080, unless recommended strategies and projects are implemented.

If Texas does not implement the water supply strategies and projects in the state water plan, a severe drought could cause an estimated $91 billion in economic damages in 2030, and those potential damages are projected to increase to $177 billion per year by 2080.

When existing water supplies—water that already will be legally and physically available during a drought of record without further action—are less than the projected water demands required to support economic and domestic activities, potential water shortages exist. These potential water shortages are referred to as water supply needs. For clarification, this chapter focuses on the aggregated identified water needs and assumes that no water management strategies are implemented in the future.

Water shortages pose enormous risks to the Texas economy and public health and safety. Economically, a perceived lack of water in a region can deter decisionmakers from investing in new business or expanding their existing enterprises in Texas. More fundamentally, public health and safety depend on adequate water supplies for drinking water, sanitation, and hygiene.

To determine if existing water supply is adequate to support the demands of Texas' rapidly growing population, expanding economy, and vital natural resources, the regional water planning groups compared projected water demand to existing water supplies—under drought conditions—for each water user group and reported the results by region, county, and river basin. This analysis included more than 17,500 individual comparisons over the 50-year planning horizon and identified potential water supply shortages and surpluses under a repeat of the drought of record. The planning groups also reported economic and social impacts that could occur if no water management strategies are implemented to address these identified water needs.

When considering potential water shortages, the significance of an identified water need is best judged as a share of the total water demand of the entity with the potential shortage. For example, a 10,000 acre-foot water need may represent only 5 percent of one entity's total demand and pose relatively little supply risk, whereas a seemingly small 10 acre-foot shortage could represent 50 percent of another entity's demand and create a severe supply challenge. Total impacts of shortages also vary depending upon the water use sector of interest and the relative value of water in producing output in that sector. The economic impacts of water shortages vary widely by use sector. In general, water applied in manufacturing is associated with higher economic output per acre-foot than irrigation use, though outcomes depend on industry characteristics, crop type, regional context, and market forces.

6.1 Identification of water needs

For the purposes of this state planning perspective, the Texas Water Development Board (TWDB) uses the data provided by the planning groups in the state water planning database to calculate water needs for every water user group in each water use category and for individual decades over the next 50 years. In some cases, aggregating existing water supplies across a group of water users within a geographic area can mask underlying shortages. While supplies may appear sufficient to meet total regional needs, when viewed comprehensively, they are often not distributed in a way that satisfies demand on a user-by-user basis. As a result, geographic areas that appear adequately supplied overall may have individual entities experiencing shortages, even as others within the same area hold surplus supplies. In such situations, there may be an opportunity to meet water needs of certain water users within that geographic area by implementing a water management strategy that would transfer surplus water supply from one water provider to another with a deficit. Depending on the infrastructure that already exists within that geography and between water users, delivery and treatment of those shifted water supplies may or may not require new or expanded water infrastructure.

In 2030, Texas faces a potential water shortage of more than 3.6 million acre-feet during a drought of record. These needs increase to about 4.6 million acre-feet by 2050 and exceed 5.8 million acre-feet by 2080 (Table 6-1). Water needs vary considerably by water use category (Figure 6-1). Although all 16 regions face water needs in all planning decades, the magnitude of those needs varies significantly among regional water planning areas (Table 6-2). Region C faces the largest overall increase in water needs from 2030 to 2080, with water needs increasing to almost 1.4 million acre-feet in 2080 (primarily associated with municipal users), while Region P anticipates only a very slight increase, less than 1,000 acre-feet, in its water needs over the same period. These differences are primarily driven by variations in population growth.

How water needs are calculated

Statewide water needs are not calculated by simply adding up the total statewide water supply and then comparing it to the total statewide water demand. This approach would obscure regional and localized shortages because water supplies are not equally accessible to all users or transferable across locations.

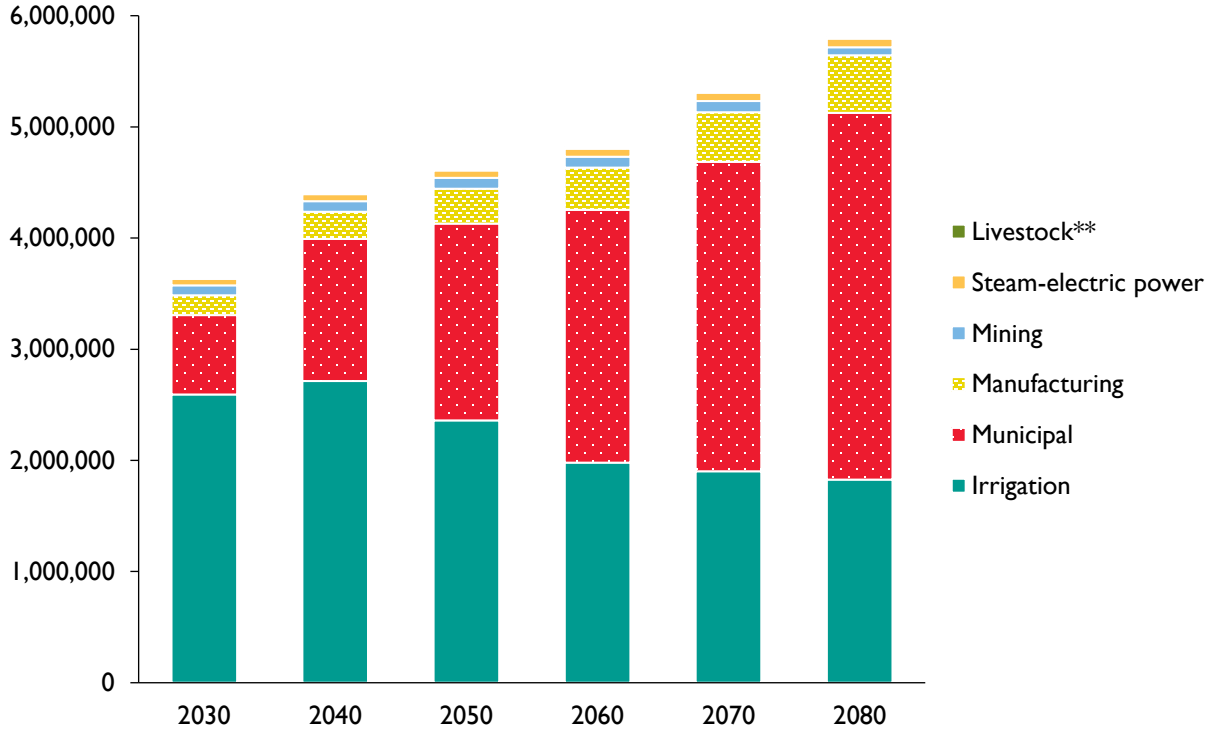
Instead, water needs are first calculated at the individual **water user group** level within each **water use category**. For each user group, projected water demand is compared against the specific existing water supplies that are physically and legally connected and are therefore available to meet that demand. Any shortfall between demand and available supply constitutes a water need for that user group under drought conditions. These individual user-level needs are then aggregated to produce the statewide totals for each water use category. This bottom-up approach ensures that shortages experienced in one location are not masked by surplus supplies elsewhere.

In the state water plan, *water user group* needs do not necessarily equate, one-to-one, to water demands associated with *water providers*. For example, while a municipal water provider may supply water to residential and commercial customers accounted for in the plan under a municipal water user group, that same water provider may also deliver additional substantial volumes of water to industrial customers accounted for as county-manufacturing water user groups. Each of those water user groups would have a separate needs calculation.

Table 6-1. Projected annual water needs by water use category (acre-feet)

Category	2030	2040	2050	2060	2070	2080	Percent change from 2030
Irrigation	2,592,164	2,714,671	2,361,117	1,981,182	1,901,134	1,826,275	-30
Livestock	13,818	16,284	16,549	16,943	17,714	18,091	31
Manufacturing	178,797	245,523	314,524	380,356	446,796	516,497	189
Mining	89,250	93,025	96,472	98,379	99,297	71,890	-19
Municipal	713,928	1,277,021	1,768,727	2,272,459	2,784,391	3,300,634	362
Steam-electric power	57,490	64,376	68,088	71,658	75,402	78,922	37
Texas	**3,645,447**	**4,410,900**	**4,625,477**	**4,820,977**	**5,324,734**	**5,812,309**	**59**

Figure 6-1. Projected annual water needs by water use category (acre-feet)*



** Water use categories are presented in the order listed in the legend.*
*** Livestock water needs account for less than 1 percent of needs in each decade and are at a scale not visible in the figure.*

Table 6-2. Projected annual water needs by region (acre-feet)

Region	2030	2040	2050	2060	2070	2080
A	443,043	580,263	559,928	542,358	523,513	513,956
B	5,348	7,134	9,027	11,534	14,127	17,213
C	236,300	498,885	747,252	977,256	1,183,397	1,359,023
D	53,515	58,502	62,722	65,971	70,600	75,685
E	163,720	166,678	168,570	169,835	171,165	172,494
F	47,083	64,900	76,340	82,783	88,675	99,822
G	198,087	272,316	356,013	432,135	523,303	615,384
H	393,159	563,715	641,628	701,830	757,068	815,133
I	20,321	54,130	92,166	129,981	168,509	206,643
J	11,714	12,049	12,331	12,781	13,235	13,670
K	319,277	326,443	336,821	374,231	432,303	498,146
L	185,132	220,771	269,912	350,184	437,491	513,712
M	946,972	909,595	874,515	833,054	792,440	748,312
N	41,084	43,988	45,947	47,430	49,080	55,578
O	567,682	617,887	358,640	75,928	86,120	93,806
P	13,010	13,644	13,665	13,686	13,708	13,732
Texas	**3,645,447**	**4,410,900**	**4,625,477**	**4,820,977**	**5,324,734**	**5,812,309**

6.2 Municipal needs

Municipal water users account for the greatest overall share of the statewide increase in potential shortages compared to other uses—growing from 20 percent of all state water needs in 2030 to 57 percent in 2080 (Table 6-1). Except for Region P, each region faces at least some potential municipal water shortages over the next 50 years if recommended strategies are not implemented. Under drought conditions, statewide projected municipal water needs are expected to surpass irrigation needs by 2060, and the municipal category continues to represent the largest unmet demand in Texas through 2080.

Across the planning horizon, Region C exhibits the largest annual municipal needs, increasing from approximately 221,000 acre-feet in 2030 to more than 1.3 million acre-feet in 2080 (Appendix C). Statewide, the concentrations of potential future municipal shortages are largely associated with areas where the greatest future population growth is projected to occur.

If no recommended strategies were implemented by 2080 and drought conditions comparable to the drought of record were to recur,

- municipal needs volumes within 10 individual counties located across 5 regions could each exceed 100,000 acre-feet (Figure 6-2), and
- municipal water users within 30 counties could, in aggregate by county, face shortages equal to at least half of their combined projected demands during a drought of record (Figure 6-3).

Even in the absence of drought conditions, failure to implement the strategies identified in the plan would eventually leave many high-growth areas across Texas facing severe and persistent water supply constraints as population and economic development continue to expand.

Figure 6-2. Projected municipal water needs volumes, aggregated by county, in 2030 and 2080

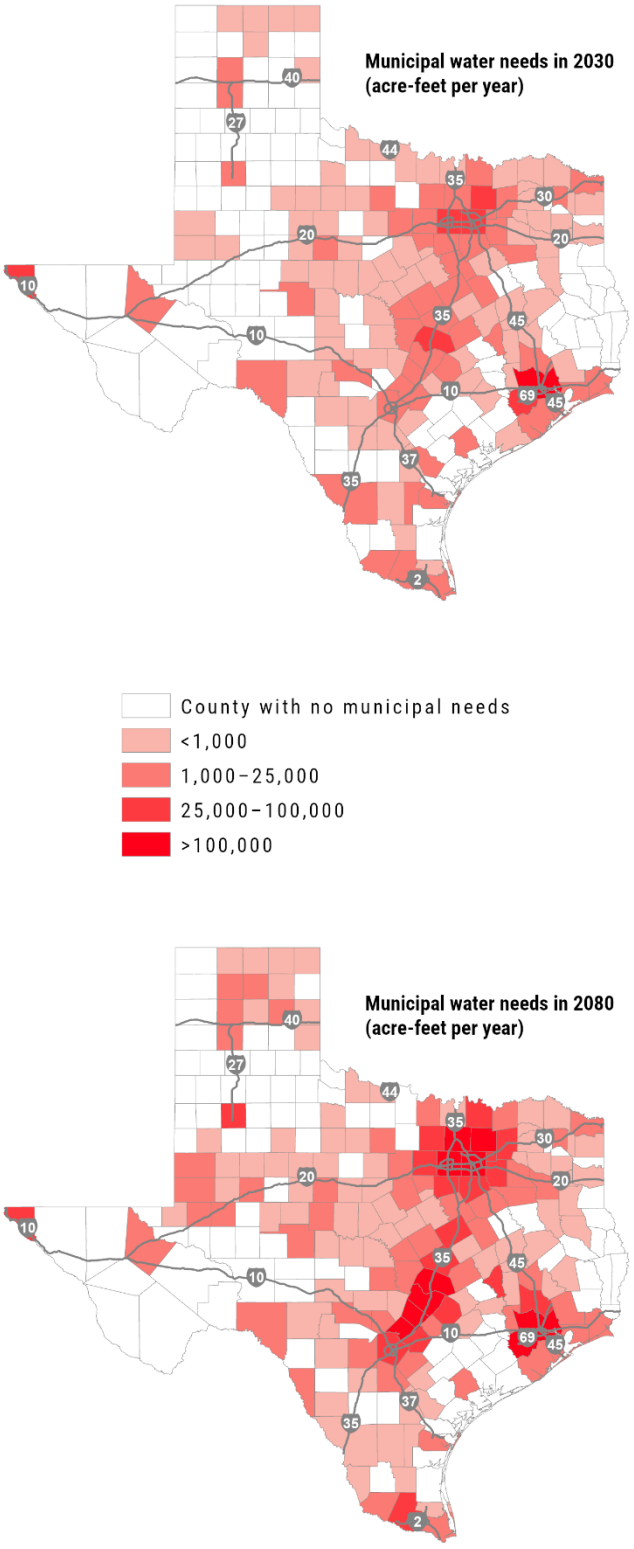
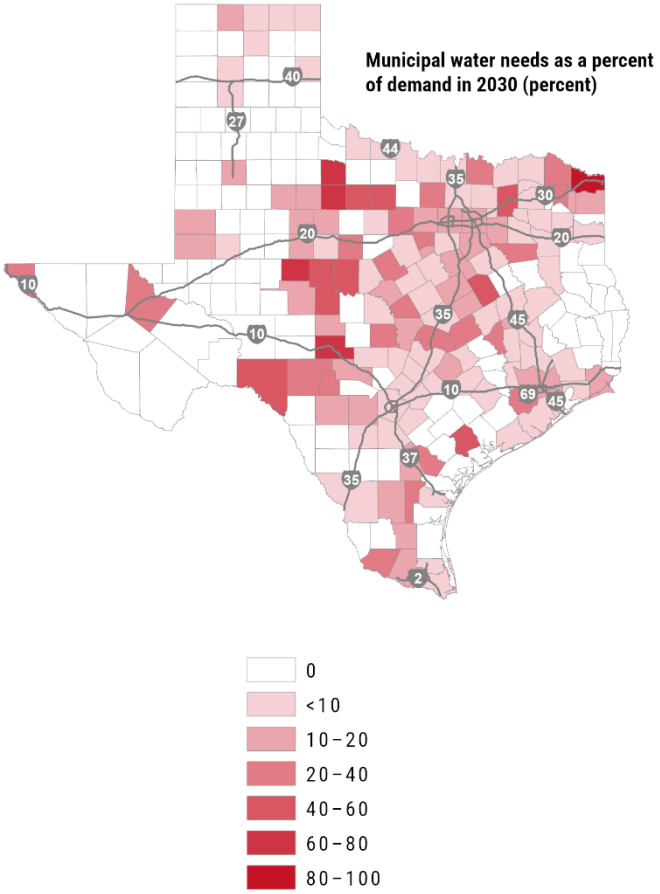
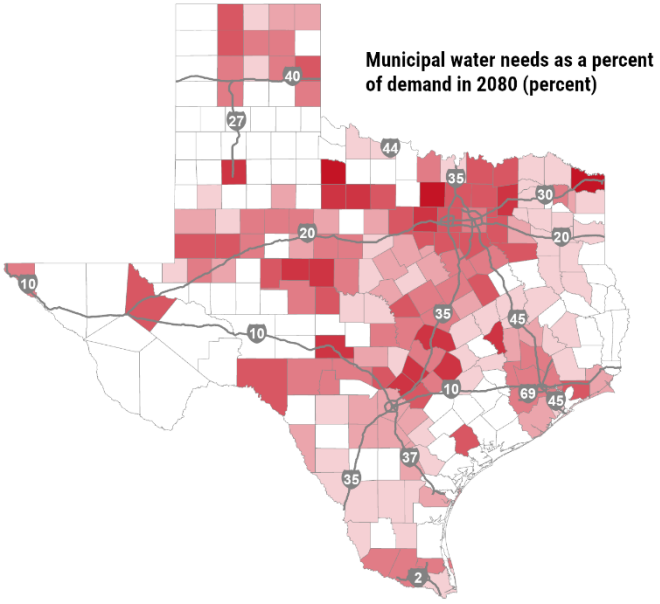


Figure 6-3. Aggregated municipal water needs projections as a percent share of aggregated municipal water demands, by county, in 2030 and 2080





Municipal water user groups across Texas face a wide range of projected shortage severity over the next 50 years. Appendix C shows aggregated categorical water needs by region and, separately, provides a summary of the relative shortages as a percentage of total demand by decade for every water user with a projected need and indicates whether those shortages would be met through implementation of the plan (Figure 6-4). In these graphics, red denotes a severe relative shortage under drought conditions, while green indicates little-to-no relative need. Accompanying text provides additional details on the magnitude of need and whether recommended strategies would address identified shortages.

A comparable spreadsheet that includes data for all water user groups is available in the supplemental content on the 2027 State Water Plan webpage (Appendix F).

Figure 6-4. Excerpt of Appendix C, Table C-2, showing projected needs of select water user groups in Williamson County, expressed as a share of total demand (percent)

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Austin	K	Hays; Travis; Williamson	Municipal	-	-	-	7	16	25
Bartlett	G	Bell; Williamson	Municipal	1	-	-	-	-	-
Brushy Creek MUD	G; K	Williamson	Municipal	20	21	21	22	22	23
Cedar Park	G; K	Travis; Williamson	Municipal	12	13	13	13	13	13
County-Other, Williamson	G; K	Williamson	Municipal	62	74	78	80	80	79
Fern Bluff MUD	G; K	Williamson	Municipal	0	4	8	9	9	9
Florence	G	Williamson	Municipal	54	57	60	63	66	69
Georgetown	G; K	Bell; Burnet; Williamson	Municipal	27	58	70	75	80	83
Granger	G	Williamson	Municipal	-	-	-	-	2	9
Hutto	G	Williamson	Municipal	52	66	76	82	87	91
Irrigation, Williamson	G	Williamson	Irrigation	56	57	57	57	57	57
Jarrell-Schwertner	G	Bell; Williamson	Municipal	38	43	46	49	51	54
Jonah Water SUD	G	Williamson	Municipal	35	55	67	75	80	84
Leander	G; K	Travis; Williamson	Municipal	41	53	56	56	56	56
Liberty Hill	G	Williamson	Municipal	-	-	-	18	35	47
Mining, Williamson	G; K	Williamson	Mining	51	59	65	70	74	77
North Austin MUD 1	K	Travis; Williamson	Municipal	-	100	100	100	100	100
Paloma Lake MUD 1	G	Williamson	Municipal	24	25	26	26	26	26
Paloma Lake MUD 2	G	Williamson	Municipal	26	28	28	28	28	28
Round Rock	G; K	Travis; Williamson	Municipal	-	8	23	27	30	32
Sonterra MUD	G	Williamson	Municipal	41	63	74	81	85	88
Taylor	G	Williamson	Municipal	59	72	79	84	87	89
Wells Branch MUD	K	Travis; Williamson	Municipal	-	100	100	100	100	100
Williamson County MUD 11	G	Williamson	Municipal	12	38	54	65	72	77
Williamson County WSID 3	G; K	Travis; Williamson	Municipal	12	31	45	55	63	69

The greater an entity's share of total demand that cannot be met under drought conditions, the greater the potential risk to economic activity as well as to public health and safety. A community's ability to manage extended future water shortages through temporary measures alone, such as drought restrictions to reduce water demand, depends largely on the severity of the actual supply shortfall, the

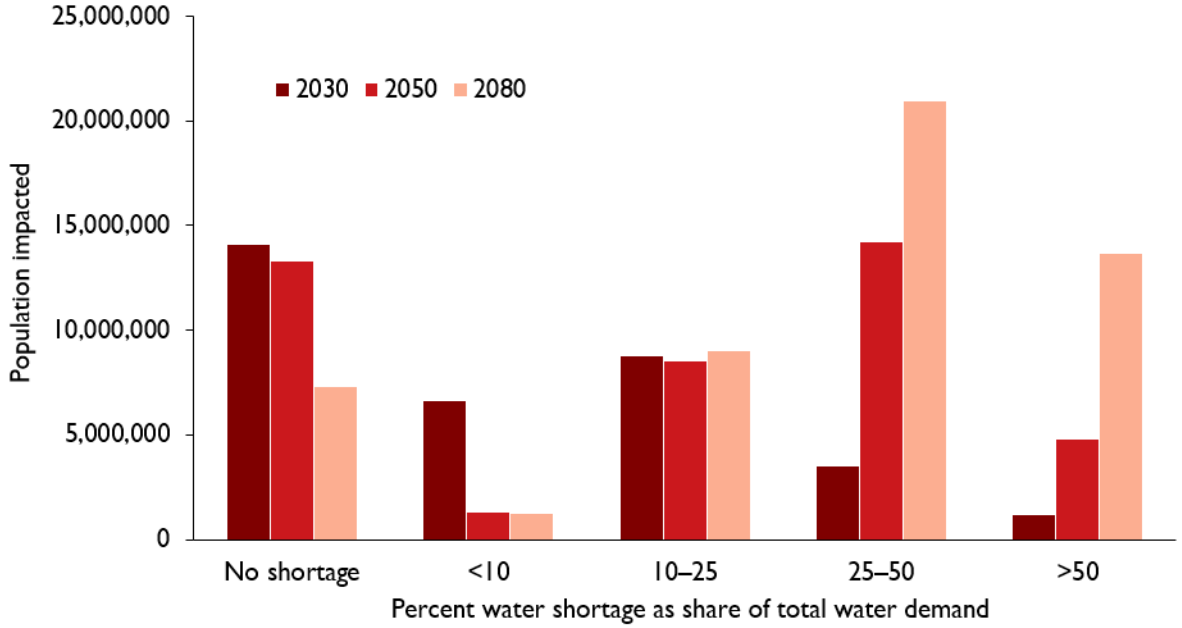
extent of demand hardening already achieved through conservation, the availability of emergency interconnections to alternative sources of water, and the pace of ongoing water demand growth.

In general, communities facing modest relative shortages with limited recent growth and less-advanced conservation practices may retain greater flexibility to respond to drought through short-term management actions. In contrast, areas facing deep water shortages that have already implemented significant conservation and are also experiencing rapid growth typically have far less operational flexibility under drought conditions. In these cases, highly efficient baseline water use—which leaves little discretionary water use left to cut—combined with expanding water demand leaves limited remaining capacity to absorb drought impacts without incurring economic disruption or heightened risks to health and safety. These risks highlight the need for local entities to implement their recommended water plan projects *before the onset of drought.*

Figure 6-5 shows how many people are projected to face municipal water shortages of varying severity over the planning horizon. If no recommended municipal water management strategies were implemented by the onset of another drought of record,

- approximately 84 percent (43.7 million) of all Texans in 2080 could face at least a 10 percent water shortage in their cities and residences; and
- approximately 26 percent (13.7 million) of all Texans in 2080 could have less than half of the municipal water supplies they require.

Figure 6-5. Projected statewide population facing various degrees of severity of municipal water needs in 2030, 2050, and 2080



6.3 Non-municipal needs

Across the planning horizon from 2030 to 2080, irrigation accounts for the highest volume of non-municipal water needs statewide, while livestock accounts for the lowest (Table 6-1). A breakdown of annual water needs by region and water use category is included in Appendix C. Figure 6-6 shows the distribution of non-municipal needs by county in 2080.

Irrigation water needs are projected to peak in 2030 at approximately 2.7 million acre-feet per year and then gradually decline to just over 1.8 million acre-feet in 2080. Region M has the greatest volume of irrigation water needs across the planning period. Region O irrigation water needs are projected to decrease significantly beginning in 2060, consistent with declining irrigation demands in the region.

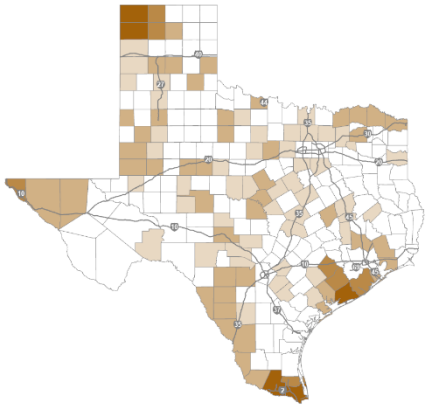
Manufacturing water needs are greatest in Regions H and I. Total statewide manufacturing water needs nearly triple over the planning period, increasing from 179,000 acre-feet per year in 2030 to 516,000 acre-feet in 2080.

Steam-electric power water needs are greatest in Region G and reach a statewide maximum of 79,000 acre-feet per year in 2080.

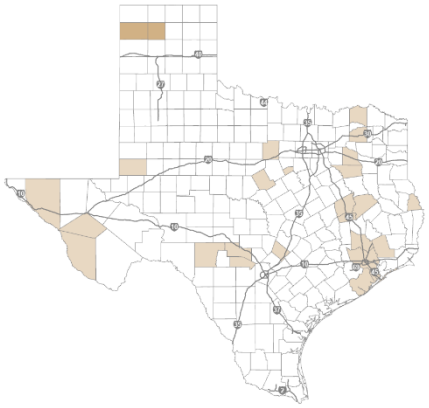
Mining water needs are greatest in Regions F and L. Mining needs increase through 2070, peaking at 99,000 acre-feet, then decreasing to 72,000 acre-feet in 2080.

Livestock water needs are greatest in Region A. The statewide total increases from 2030 to 2080 but does not exceed approximately 18,000 acre-feet per year.

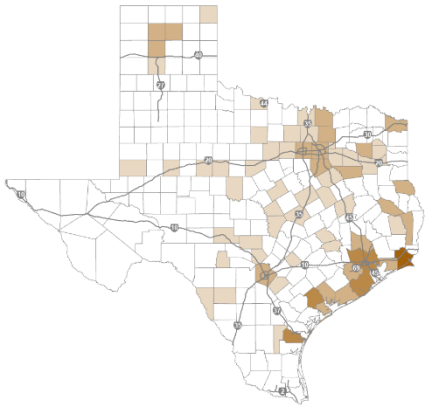
Figure 6-6. Projected non-municipal water needs volumes, aggregated by county in 2080



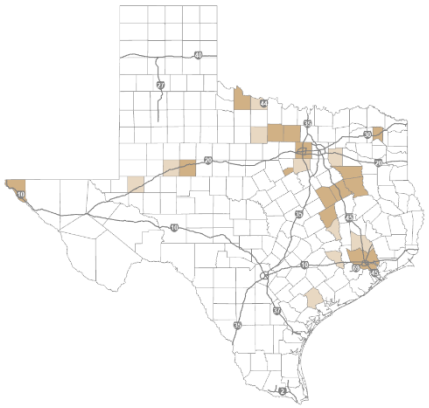
Irrigation water needs in 2080 (acre-feet per year)



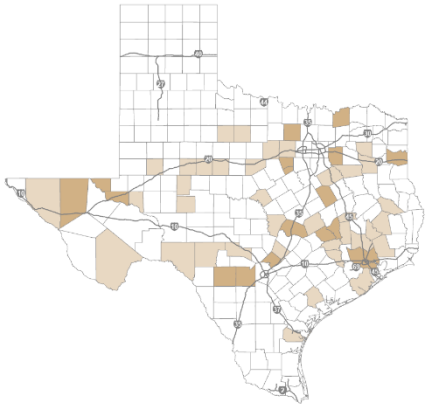
Livestock water needs in 2080 (acre-feet per year)



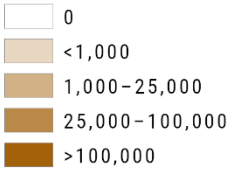
Manufacturing water needs in 2080 (acre-feet per year)



Steam-electric power water needs in 2080 (acre-feet per year)



Mining water needs in 2080 (acre-feet per year)



6.4 Major water provider needs

Major water providers are water user groups or wholesale water providers identified by regional water planning groups to be of particular significance to a region's water supply. A single entity, such as Dallas Water Utilities, may be considered a water user group, wholesale water provider, and a major water provider. Major water providers include public or private entities—such as river authorities, water districts, municipal utility districts, or water supply corporations—that deliver and sell large volumes of untreated and treated water for municipal, manufacturing, irrigation, and steam-electric use on a wholesale or retail basis.

The identified water needs of major water providers are based on aggregating the water needs of their customer water user groups and are used as the basis for developing major provider water management strategies. To avoid double counting water user needs in the plans, the aggregated needs considered by major water providers are not added again to the total water needs presented in the regional or state water plans. Instead, water needs are calculated and presented only at the individual water user group level, and those user-level shortages are used to determine collective regional and statewide totals.

In 2030, 125 of the 231 major water providers identified by the planning groups are projected to face potential annual shortages totaling nearly 1.7 million acre-feet statewide, increasing to 164 major water providers facing 4.7 million acre-feet of shortages by 2080. Appendix C, Table C-3, presents the 2030 and 2080 water needs reported for each major water provider in the regional water plans.

6.5 Impacts of not meeting identified water needs

Insufficient water supplies could negatively affect existing businesses and industry, future economic development efforts, and potentially put public health and safety at risk in Texas. Planning groups are required to include the economic and social impacts of not mitigating future water needs in their water plans. At the request of the planning groups, the TWDB assisted with meeting this requirement by applying a consistent methodology, statewide, to assess the socioeconomic impacts of not meeting water needs and provided that information to each region.

The economic impact portion of the analysis estimates potential impacts of not meeting identified water needs, including the potential economic losses to regions from reduced economic output for agricultural, industrial, and commercial water uses. In simple terms, the analysis primarily estimates how water shortages could reduce jobs and income. The TWDB performed the analysis using a static economic impact modeling software package, Impact for Planning Analysis (IMPLAN), as well as other economic analysis techniques. This analysis represents a snapshot estimate of statewide socioeconomic impacts in the event of a single year repeat of the drought of record, with the fundamental assumption that no water management strategies are implemented to reduce the identified water needs.

The social impact portion of the analysis focuses on potential demographic effects, including changes in population and school enrollment, by incorporating results from potential job losses if water needs are not met. The analysis estimates how changes in a region's economy could affect patterns of migration from a region. This relied partially on a simplified ratio of job and net population losses calculated for the state based on a recent study of how job layoffs impact the labor market population (Foote and others, 2015).

As expected, statewide economic and social impacts associated with potential water shortages rise because of the significant increases in projected water needs, from 3.6 to 5.8 million acre-feet over the 50-year planning horizon (Table 6-1). The estimated statewide impacts of not meeting the identified water needs in Texas could result in an estimated annual combined lost income of $91 billion in 2030, increasing to $177 billion by 2080 in today's dollars (Table 6-3). The number of jobs at risk could increase from 402,000 in 2030 to almost 980,000 in 2080. To put these impact estimates into

perspective, the projected annual lost income estimates for 2030 are equivalent to approximately 4 percent of Texas' 2023 annual gross domestic product, which was approximately $2.6 trillion (BEA, 2024).

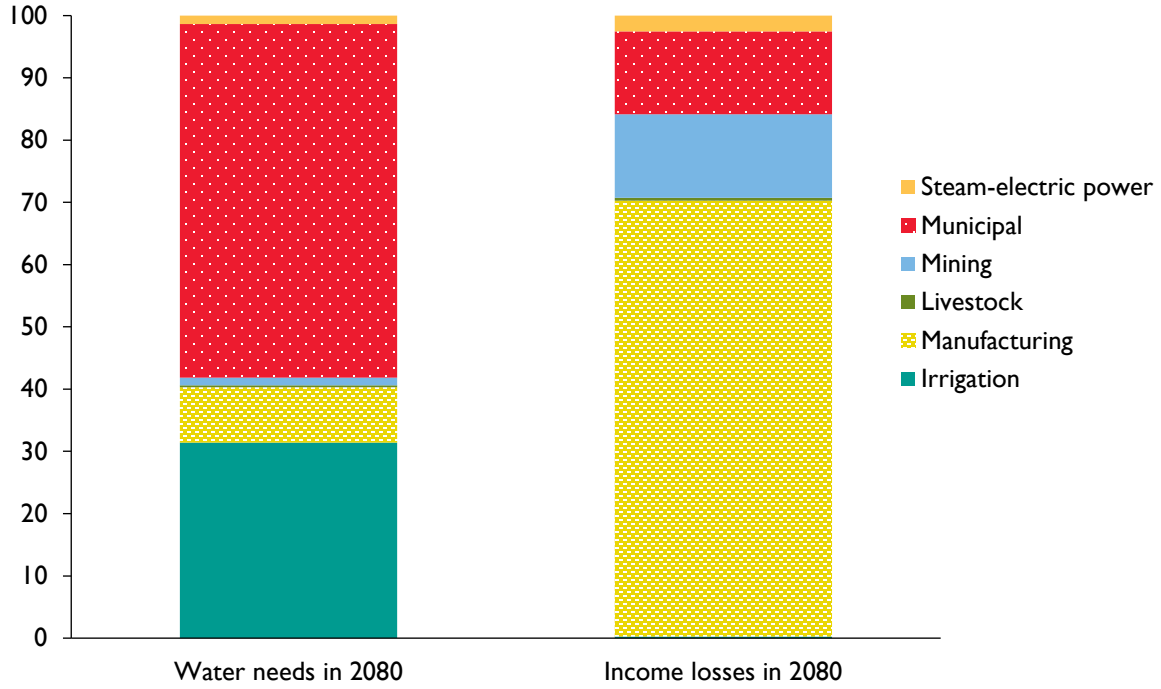
Projected impacts vary, along with the magnitude of needs over time, as well as the variations in estimated lost income per acre-foot of water needs associated with the different economic sectors as shown in Figure 6-7.

Table 6-3. Projected statewide annual socioeconomic impacts from not meeting water needs[13]

Impact measure	2030	2040	2050	2060	2070	2080
Estimated income loss (billions of dollars)*	$91	$111	$131	$154	$177	$177
At risk job loss	402,146	524,720	646,610	782,805	918,771	979,644
At risk population out-migration	57,587	75,140	92,595	112,098	131,568	140,285

** Year 2023 dollars, rounded.*

Figure 6-7. Estimated relative percent share, by sector statewide, of water needs and potential income losses in 2080



** Water use sectors are presented in the order listed in the legend.*

[13] These statewide impacts vary from the impact results presented in the regional water plans (Appendix D) and online dashboard primarily because they are based on different underlying water needs and manufacturing data. The regional water plans and online dashboard reflect an analysis conducted in March 2025 and water needs included in the draft regional water plans. Some water needs estimates were updated in the final regional water plans. Additionally, the baseline data to calculate the value of manufacturing water use was revised. The TWDB statewide impact estimates in this chapter are based on those data updates, compiled in October 2025.

In attempting to estimate a wide range of socioeconomic impacts over a large geographic area across 50 years, the impact model requires making many assumptions and recognizing the model's uncertainty and limitations. Those assumptions include a lack of reliable water use data for significant portions of the economy, coupled with limited knowledge concerning how each given economic sector or facility might respond in the event of an actual long-term drought.

Because of data and methodological limitations, the model cannot capture all economic impacts. As a result, the actual economic impacts are likely significantly larger than those that resulted from this analysis.

Analysis of this type is better at predicting relative percent differences caused by a shock to a complex system (such as a water shortage imposed upon a regional economy) than the precise size of an impact. It is the general and relative magnitudes of impacts, as well as the changes of these impacts over time, that should be the focus rather than the absolute numbers. Key assumptions and limitations of the analysis include the following:

- Changes in the future structure of the Texas economy are not considered.
- All estimated socioeconomic impacts are snapshots of a one-year repeat of the drought of record. These independent and distinct "what if" scenarios for each planning region for each particular year with water shortages are assumed to be temporary events, thereby underestimating the total impacts of a longer-term, multi-year drought event.
- The analysis focuses only on the water-intensive economic sectors for which the TWDB has adequate water use estimates. Other water use sectors contribute to the value of production in the state economy, but the TWDB does not have sufficient data to include them. For example, data limitations for many of the commercial sectors incorporated within municipal use precluded an estimate of the adverse impacts of water shortages in those sectors.
- Lost income within forwardly linked sectors of the economy, such as the reduced retail beef sales accompanying fewer marketable cattle following a drought, is not considered. Traditional input-output analysis using IMPLAN or similar models cannot determine the adverse impacts on downstream sectors within the economy.
- The significant economic spillover impacts (indirect and induced) on adjoining regions are not considered.
- The analysis does not attempt to estimate the possible impacts of lost growth opportunities over time due to chronic water shortages due to a failure to implement the plan in a environment of high population growth. Possible building moratoriums and similar longer-term impacts were not examined.
- The analysis does not attempt to estimate or include many other significant impacts—unrelated to the bounds of regional and state water planning—that a drought of record would have, such as dryland farming, because these activities are not directly associated with water needs identified in the regional plans.

Additional details on the methodologies and the impact estimate results for each planning group and county, along with the final regional impact reports, are available on the TWDB socioeconomic impact analysis webpage (www.twdb.texas.gov/waterplanning/data/analysis).

Potential enhancement of socioeconomic impact analysis through dynamic modeling

Although the TWDB current socioeconomic impact assessment is comprehensive in both geographic and sectoral scope, it does not capture several dynamic factors, including long-term shortages related to growth or potential no-growth outcomes such as building moratoria, business relocation, or loss from rapidly growing areas.

Therefore, this plan recommends in Chapter 2 that the legislature consider funding development of a dynamic socioeconomic impact model capable of capturing the long-term, cumulative economic consequences of persistent water shortages—such as building moratoriums and other growth-related impacts—that the current static, one-year analysis cannot reflect. Enhanced analytical tools would provide a fuller understanding of risks associated with insufficient water supplies under population growth and drought conditions. A dynamic modeling approach would also help planners and policymakers better understand the cascading economic consequences of shortages, leading to more informed decisions about investments in water infrastructure and improved communication with the public.

6.6 Comparison to the 2022 State Water Plan

This water plan estimates annual statewide water needs of 3.6 million acre-feet in 2030 and 5.3 million acre-feet in 2070. These amounts are less than the 2022 State Water Plan estimates of 4.8 million acre-feet and 6.9 million acre-feet for the same decades. The overall net change in needs is driven primarily by updated demand projections, particularly lower irrigation demands in Region O.

When needs are aggregated at the statewide level, however, the results can obscure important geographic and categorical mismatches between water demands and available supplies that can be significant at the local level. Because many factors influence water need calculations, drawing broad conclusions about why there are changes from one plan to the next can be quite challenging. Notable changes to the projected water needs from the 2022 State Water Plan are summarized below.

- Statewide, annual municipal water needs in 2030 are projected to be about 146,000 acre-feet less than the previous plan, primarily due to lower water demand projections due largely to lower birth rates. However, municipal needs in Region G are significantly higher for each decade of the 50-year planning period, and Regions E and I also show significantly higher municipal needs in 2030 and 2040. In general, these changes are due to a varying mix of increased demands driven by population growth and a reduction in the volume of existing water supplies available during drought.
- Comparisons with the 2022 plan show a substantial decrease in irrigation needs across every decade of the planning horizon. These reductions account for most of the overall net change in statewide needs between the plans, with irrigation needs nearly 727,000 acre-feet lower in 2030 and more than 1.1 million acre-feet lower in 2070. This change is driven primarily by updated demand projections, particularly lower irrigation demands in Region O.
- Water needs for steam-electric power decreased by more than half in every decade of the planning horizon, primarily due to lower demands compared to the previous plan as a result of plant retirements and less water use at existing plants.

- The projected socioeconomic impacts of not meeting water needs are higher than the previous plan. This is due to many factors, including inflation, updated relevant water use volumes and economic output values, refinements to socioeconomic impact assessment methodology, and underlying changes in the economy.
- A variety of conservation and other projects have been implemented since 2022, which results in increasing the existing volume of water on the existing supply side of the planning equation, thereby reducing the resulting water need calculation.

References

BEA (Bureau of Economic Analysis), 2024, Gross domestic product by state, apps.bea.gov/histdata/HistFileDetails.html?HistCateID=1&FileGroupID=289, accessed March 2026.

Foote, A., Grosz, M., and Stevens, A., 2015, Locate your nearest exit—Mass layoffs and local labor market response, University of California, Davis, 44 p. www.nber.org/papers/w21618.

7 Water management strategies and projects

Quick facts

*More than 5,800 recommended water management strategies would provide approximately 5.8 million acre-feet per year in additional water supplies to water user groups by **2050**.*

*The cost of implementing the more than 2,900 recommended water management strategy projects by **2050** is $139 billion in 2023 dollars, without accounting for future inflation.*

*Approximately 6,700 recommended water management strategies would provide about 7.6 million acre-feet per year in additional water supplies to water user groups in **2080**.*

*The cost of implementing the more than 3,000 recommended water management strategy projects by **2080** is $174 billion in 2023 dollars, without accounting for future inflation.*

Conservation strategies represent approximately 30 percent, or 2.2 million acre-feet per year, of all recommended water management strategy volumes in 2080 and were recommended for more than half of the water user groups in the plan.

Planning groups recommended 20 new major reservoirs that, if implemented, would provide 676,000 acre-feet per year in additional supplies by 2080.

Of the recommended new water supplies in 2080, approximately 36 percent are based on surface water, 13 percent on reuse, 13 percent on groundwater, 4 percent on seawater, and 3 percent on aquifer storage and recovery, with an additional 32 percent derived from demand reduction.

This plan includes 45 recommended strategies, implemented through 52 projects, that benefit multiple planning regions. These regionalized strategies account for 17 percent of the total recommended strategy supply volume in 2080 and serve about 365 unique water user groups across 10 of the 16 planning regions.

There are significant agricultural irrigation water needs that would remain unmet under drought even if the plan is fully implemented, largely due to managed depletion of aquifers and a lack of economically feasible alternatives.

A water management *strategy* is a plan to address a water need (potential shortage) of a water user group. After identifying water surpluses and potential water needs for water user groups in their regions, regional water planning groups identify, evaluate, and recommend water management strategies to address potential shortages that would protect public health, safety, and welfare during a repeat of the drought of record over the next 50 years.

Water management strategies are actions that, if implemented, will ultimately result in *additional water volumes* arriving at the "front door" of retail water systems. These strategies do not include maintenance projects intended solely to maintain existing supply, such as repairing, replacing, or rehabilitating facilities to restore lost capacity due to lack of upkeep. However, they can include projects that increase available supply through conservation. The water supply volumes (in acre-feet per year) are allocated to specific water user groups, often through an intermediate regional or wholesale water provider. In the same manner that projected water demands, existing water supplies, and water needs in this plan are associated with water user groups, recommended water management strategy water volumes are also generally associated directly with specific water user groups.

Strategies may or may not require new water infrastructure, which are referred to as "water management strategy *projects*." Construction of most new water infrastructure projects requires long-term financing of the capital costs. The Texas Water Development Board (TWDB) may provide financial assistance to support the implementation of water supply projects if the needs addressed by the project are consistent with the regional water plans and the state water plan. This same provision applies to the granting of water right permits by the Texas Commission on Environmental Quality, although the governing bodies of these agencies may grant waivers to the consistency requirement. The TWDB

financial program that specifically targets implementation of state water plan projects, the State Water Implementation Fund for Texas (SWIFT) program, further requires that projects and their capital costs be recommended as water management strategy projects in the most recently adopted state water plan to be eligible for that financial assistance.

State water plan focus: Development of additional water supplies

Texas' planning process is based on a fundamental expectation that water providers will properly maintain the capacity and function of their existing infrastructure to ensure the design capacity continues to provide those water supplies. The purpose of the state water plan—and the associated SWIFT funding—isn't to replace aged or neglected infrastructure, but rather to *increase the volumes of additional water supply delivered to water user groups under intense drought conditions* beyond the existing capacity of current water supply infrastructure. Hence, the capital costs included in this state plan do not include replacement, rehabilitation, maintenance, or other related costs.

7.1 Selecting water management strategies

Each planning group identifies and evaluates feasible water management strategies for consideration to include as a recommended final set of strategies. Evaluations of feasible water management strategies are based on drought-of-record conditions and must honor all existing water rights, which are the same benchmark conditions used in evaluations of projected water demands and existing water supply. In selecting strategies, planning groups are required to consider certain factors, including

- quantity of supply provided by a strategy;
- reliability of the supply under drought-of-record conditions;
- cost of the supply (including borrowing and mitigation costs); and
- impacts of the strategy on water quality and on water, agricultural, and natural resources.

Planning groups are also required to consider conservation and drought management strategies for all water user groups that have identified water needs. Each strategy must have an identified sponsor that represents the entity responsible for developing the associated supply. For planning purposes, sponsors can include county-level water user groups, such as county-other and non-municipal water user groups. Following evaluation, each planning group recommends a set of water management strategies and associated projects and documents its selection process in its regional water plan.

The types of strategies recommended by planning groups depend upon the size and nature of identified water needs, geographic location, available water resources, associated strategy impacts, and costs of implementation. Some water management strategies do not require infrastructure projects with capital costs to implement while others may require significant capital investments, including various combinations of pipelines, wells, pump stations, river diversion facilities, or new water treatment plants. For example, certain types of conservation may be supported by annual program budgets—without borrowing—and many water purchase strategies will rely on existing infrastructure capacity to convey increased water deliveries. Other strategies, such as new reservoirs and seawater desalination plants, require significant upfront investment in infrastructure to implement. However, the significance of any infrastructure investment is relative and varies by community and entity. For example, installing a single new groundwater well may constitute a major investment for a small community.

The complexity of recommended strategies and the projects supporting them varies greatly. Some strategies, such as new groundwater wells, may be implemented by and serve a single water provider from a single water source. Other large regional projects ultimately serve numerous retail water providers. For example, conveyances from reservoirs may involve multiple wholesale water providers and require a variety of major infrastructure components, including intakes, major pipelines, and pump stations.

Approximately 6,700 water management strategies were recommended by the 16 regional planning groups. If all were implemented, they would provide—including conservation savings—almost 2.7 million acre-feet per year in 2030 to water user groups and nearly 7.6 million acre-feet per year in 2080 (Tables 7-1 and 7-2). The total capital cost of the approximately 3,000 recommended water management strategy projects associated with these nearly 6,700 strategies is approximately $174 billion (Tables 7-3 and 7-4). The number of recommended projects and total capital costs vary by region and online decade (Figures 7-1 and 7-2). Approximately 79 percent of all projects are recommended for implementation by 2030, the majority of which are related to conservation (Figures 7-3 and 7-4).

Table 7-1. Annual volume of recommended water management strategies by region (acre-feet)

Region	2030	2040	2050	2060	2070	2080
A	116,168	265,027	335,527	404,255	451,904	496,863
B	15,691	44,639	49,606	51,492	53,323	53,233
C	269,870	551,007	835,459	1,000,063	1,257,391	1,424,211
D	93,446	124,505	135,574	147,960	161,660	166,302
E	107,696	129,428	150,676	152,895	155,063	157,393
F	62,158	139,629	166,350	171,701	175,588	180,937
G	216,798	353,550	425,350	481,714	558,520	595,821
H	823,041	1,296,008	1,659,865	1,724,980	1,771,802	1,823,053
I	45,455	157,058	219,000	267,658	305,804	344,084
J	20,898	30,073	30,099	30,405	30,413	30,417
K	110,052	257,839	331,413	387,457	444,562	497,913
L	274,397	476,498	580,216	669,087	750,172	810,933
M	170,540	259,256	311,944	349,475	383,595	414,018
N	256,493	390,415	394,958	399,001	402,826	405,933
O	133,387	178,152	148,531	116,004	118,995	126,802
P	20,705	21,679	21,916	22,078	22,219	22,366
Texas	**2,736,795**	**4,674,763**	**5,796,484**	**6,376,225**	**7,043,837**	**7,550,279**

More information on recommended strategies and projects

Detailed lists of the recommended water management strategies and projects may be found on the 2027 State Water Plan webpage at www.twdb.texas.gov/waterplanning/swp/2027 and the interactive state water plan website at 2027.texasstatewaterplan.org.

Table 7-2. Count of water management strategies by region and decade*

Region	2030**	2040	2050	2060	2070	2080	Total
A	108	45	9	2	7	0	171
B	39	18	4	0	0	0	61
C	1,152	673	213	70	395	179	2,682
D	127	6	1	1	2	3	140
E	48	7	2	0	0	0	57
F	187	37	6	3	0	14	247
G	387	31	26	19	5	3	471
H	716	154	15	6	4	1	896
I	331	25	8	3	61	2	430
J	49	9	0	0	0	0	58
K	378	36	27	3	3	4	451
L	422	77	8	8	1	1	517
M	236	64	2	1	0	0	303
N	75	21	0	1	0	0	97
O	63	8	0	1	2	1	75
P	25	5	0	1	0	0	31
Texas	**4,343**	**1,216**	**321**	**119**	**480**	**208**	**6,687**

** Count of unique combinations of recommended water management strategies and benefiting whole water user group by sponsor region. Strategies sponsored by one region may also serve others.*

*** Many conservation strategies are reported as coming online in early decades although they may be implemented incrementally over an extended time, which inflates near-term counts.*

Table 7-3. Cumulative capital costs*, by online decade, of all recommended water management strategy projects by region (million dollars)

Region	2030	2040	2050	2060	2070	2080	Number of projects**
A	$1,271	$1,773	$1,855	$1,867	$2,396	$2,396	67
B	$208	$771	$841	$841	$841	$841	19
C	$9,767	$24,514	$33,371	$35,949	$54,582	$61,187	458
D	$1,538	$1,574	$1,694	$1,725	$1,745	$1,747	112
E	$1,641	$1,891	$2,913	$2,913	$2,913	$2,913	45
F	$758	$2,699	$2,824	$2,848	$2,859	$2,860	119
G	$7,567	$9,081	$9,595	$9,791	$9,866	$9,875	190
H	$14,690	$27,537	$30,591	$30,931	$31,040	$31,100	890
I	$1,609	$3,421	$4,134	$4,160	$4,885	$4,885	232
J	$285	$541	$541	$541	$541	$541	42
K	$3,167	$6,805	$12,233	$15,793	$16,037	$16,042	164
L	$8,019	$17,348	$18,952	$19,348	$19,348	$19,348	364
M	$3,788	$4,807	$5,018	$5,036	$5,058	$5,058	230
N	$8,666	$12,689	$12,689	$12,689	$12,689	$12,689	70
O	$341	$993	$993	$994	$1,241	$1,436	17
P	$229	$831	$831	$831	$831	$831	17
Texas	**$63,544**	**$117,275**	**$139,075**	**$146,257**	**$166,872**	**$173,749**	**3,036**

* *Capital costs represent approximations based on anticipated online dates. Projects with capital costs that would occur over multiple decades are reported as a single, total capital cost in the project's online decade and may therefore differ from those presented in the regional water plans. Many conservation projects are reported as coming online in early decades although they may be implemented incrementally over an extended time, which may inflate the reported costs for early decades relative to more traditional infrastructure projects, which are typically fewer in number and reported with more conventional capital timing.*

** *Some projects are associated with multiple sponsors.*

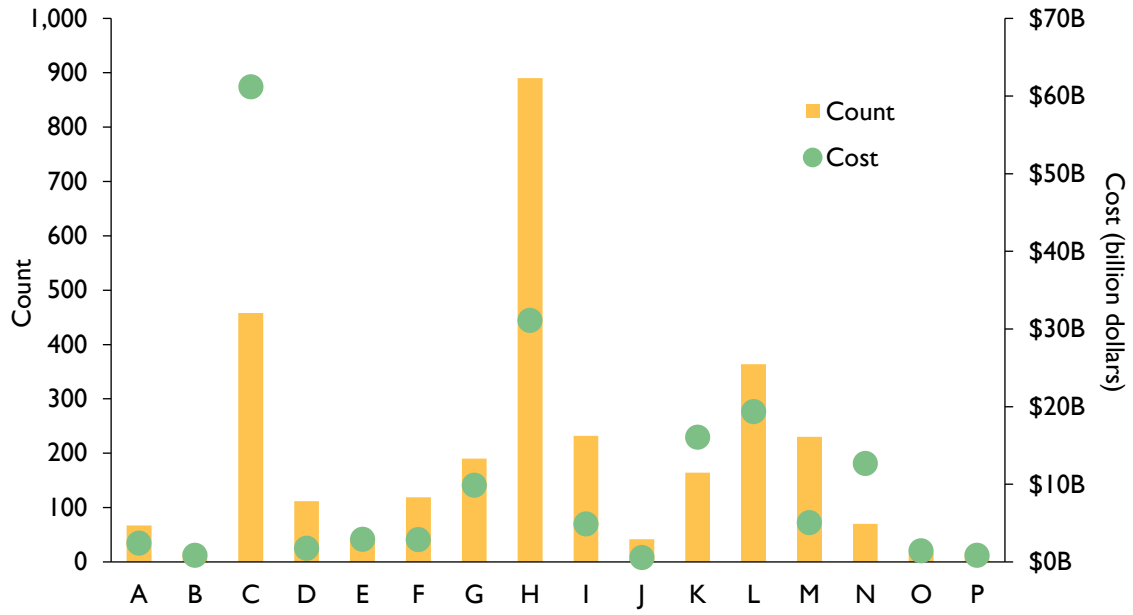
Table 7-4. Count* of water management strategy projects by region and online decade

Region	2030**	2040	2050	2060	2070	2080	Total
A	49	11	2	2	3	0	67
B	14	2	3	0	0	0	19
C	373	36	24	9	9	7	458
D	97	5	4	2	1	3	112
E	37	7	1	0	0	0	45
F	74	19	13	1	11	1	119
G	147	18	8	11	4	2	190
H	682	136	39	18	11	4	890
I	208	13	6	3	2	0	232
J	29	13	0	0	0	0	42
K	142	14	5	1	1	1	164
L	305	48	7	4	0	0	364
M	155	67	6	1	1	0	230
N	54	16	0	0	0	0	70
O	5	8	0	1	2	1	17
P	14	3	0	0	0	0	17
Texas	**2,385**	**416**	**118**	**53**	**45**	**19**	**3,036**

** Count of recommended projects by project sponsor region. Some projects are associated with multiple sponsors. Conservation strategies may include costs aggregated over multiple decades but reported in early planning periods. This can overstate near-term capital needs and project counts relative to more traditional infrastructure projects, which are typically fewer in number and reported with more conventional capital timing.*

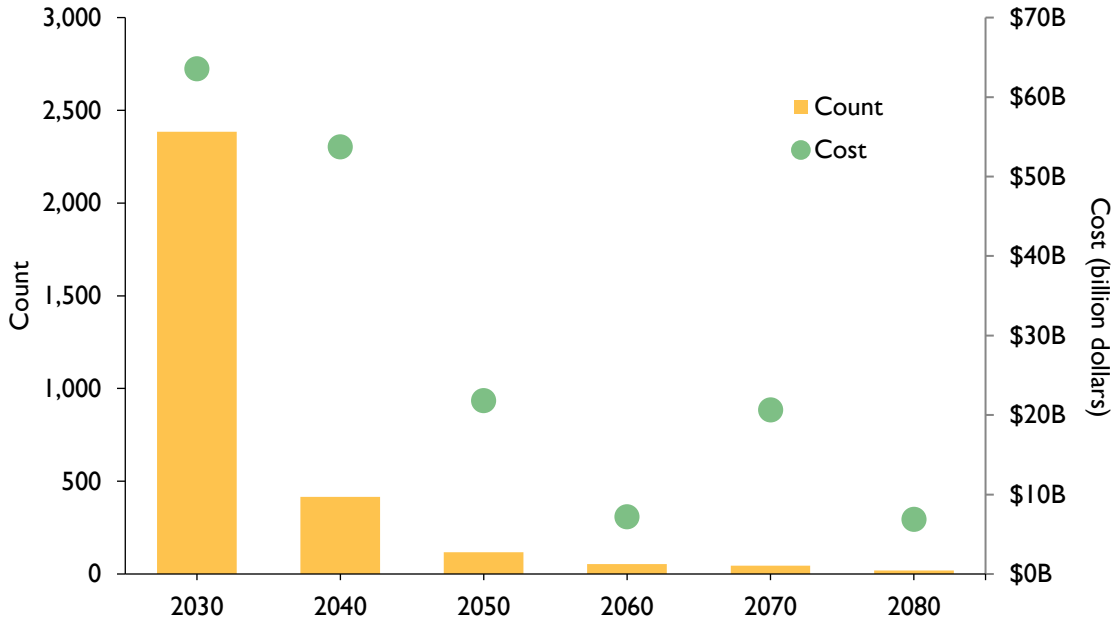
*** Many conservation strategies are reported as coming online in early decades although they may be implemented incrementally over an extended time, which inflates near-term counts.*

Figure 7-1. Count* and total capital cost of all recommended water management strategy projects by region



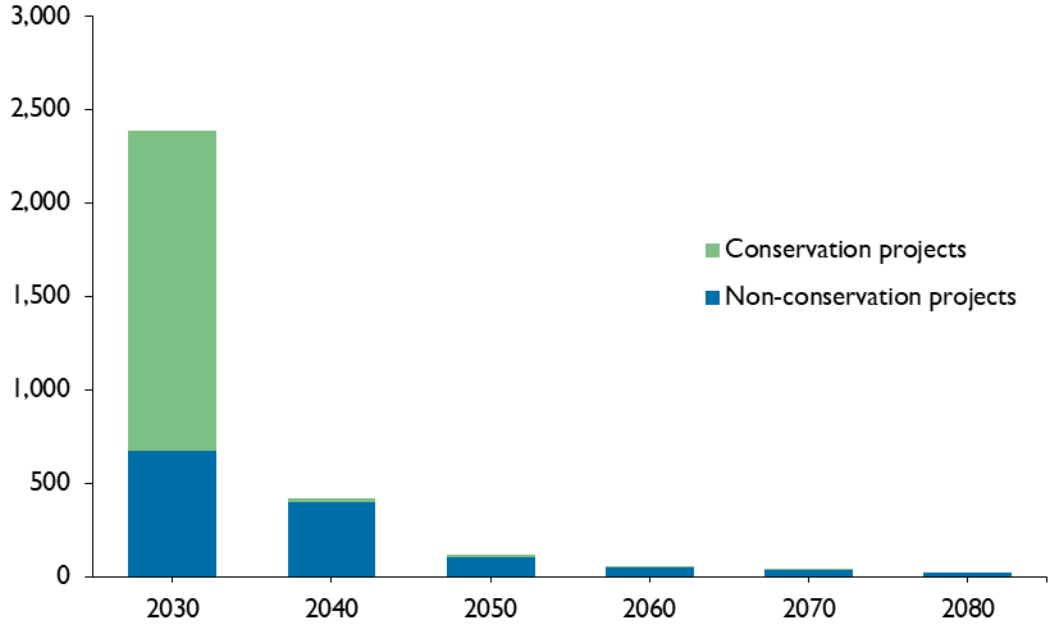
** Some projects are associated with multiple sponsors.*

Figure 7-2. Count* and total capital cost of all recommended water management strategy projects by decade



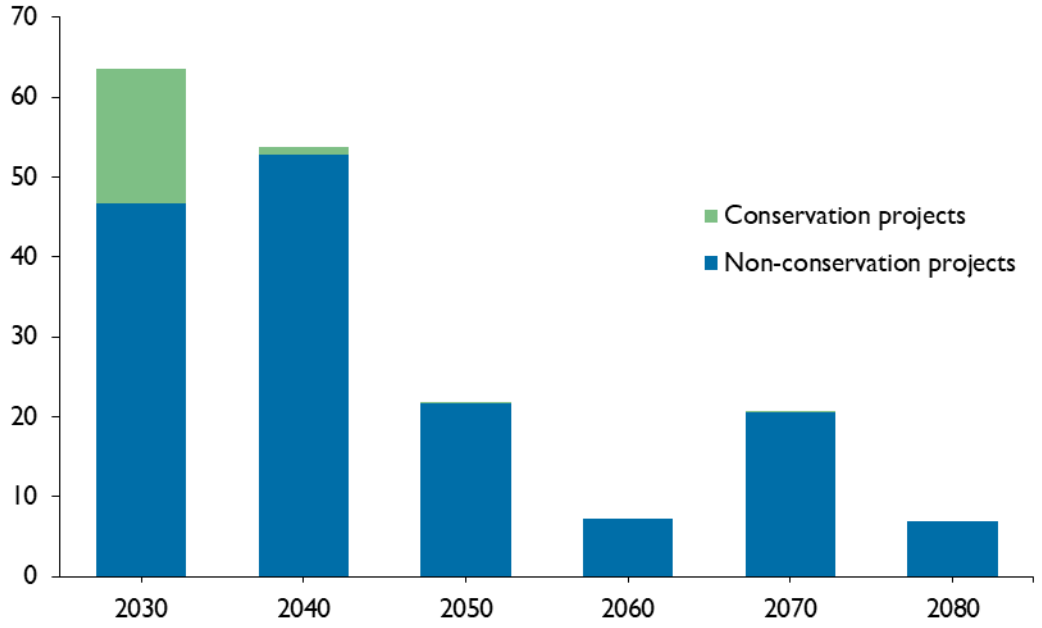
** Some projects are associated with multiple sponsors. Many conservation strategies and projects are reported as coming online in early decades but are often implemented incrementally over extended periods; this can inflate near-term counts and may overstate early-decade costs relative to traditional infrastructure projects, which are fewer in number and typically reported with more conventional capital timing.*

Figure 7-3. Count* of recommended projects by conservation and non-conservation project type and decade



** Some projects are associated with multiple sponsors. Conservation strategies may include activities aggregated over multiple decades but reported in early planning periods. This can overstate near-term project counts relative to more traditional infrastructure projects, which are typically fewer in number and reported with more conventional capital timing.*

Figure 7-4. Total capital cost* by conservation and non-conservation project type and decade (billion dollars)



** Some projects are associated with multiple sponsors. Conservation strategies may include costs aggregated over multiple decades but reported in early planning periods. This can overstate near-term capital needs and project counts relative to more traditional infrastructure projects, which are typically fewer in number and reported with more conventional capital timing.*

7.2 Water resources for recommended strategies

Recommended water management strategies may be considered from different perspectives, including

- by the water resources on which they rely; or
- by the combination of specific water source(s), projects, and/or technology required for implementation.

Recommended water management strategies rely on future demand reduction and a variety of Texas' water resources (Figures 7-5 and 7-6). If implemented, all recommended water management strategies would provide approximately 7.6 million acre-feet per year in additional water supplies to water user groups in 2080.

Surface water would be the most significant water resource upon which strategies are based, providing nearly 2.7 million acre-feet per year to water user groups, which is approximately 36 percent of the total recommended strategy supplies in 2080.

Demand reduction, mostly in the form of conservation savings but also including drought management, would address almost 2.4 million acre-feet per year in water user group water demands, which is approximately 32 percent of the recommended strategy volume in 2080.

Reuse would provide just over 1.0 million acre-feet per year to water user groups, which is approximately 13 percent of the total recommended strategy supplies in 2080.

Fresh groundwater resources would provide nearly 583,000 acre-feet per year to water user groups, which is approximately 8 percent of the total recommended strategy supplies in 2080.

Brackish and saline groundwater resources would provide nearly 386,000 acre-feet per year to water user groups, which is approximately 5 percent of the total recommended strategy supplies in 2080.

Seawater would provide nearly 278,000 acre-feet per year to water user groups, which is approximately 4 percent of the total recommended strategy supplies in 2080.

Aquifer storage and recovery, which can use a variety of water source types that are then stored underground, would provide approximately 238,000 acre-feet per year to water user groups, or approximately 3 percent of the total recommended strategy supplies in 2080.

Figure 7-5. Share of recommended water management strategy volume by water resource in 2080 (percent)

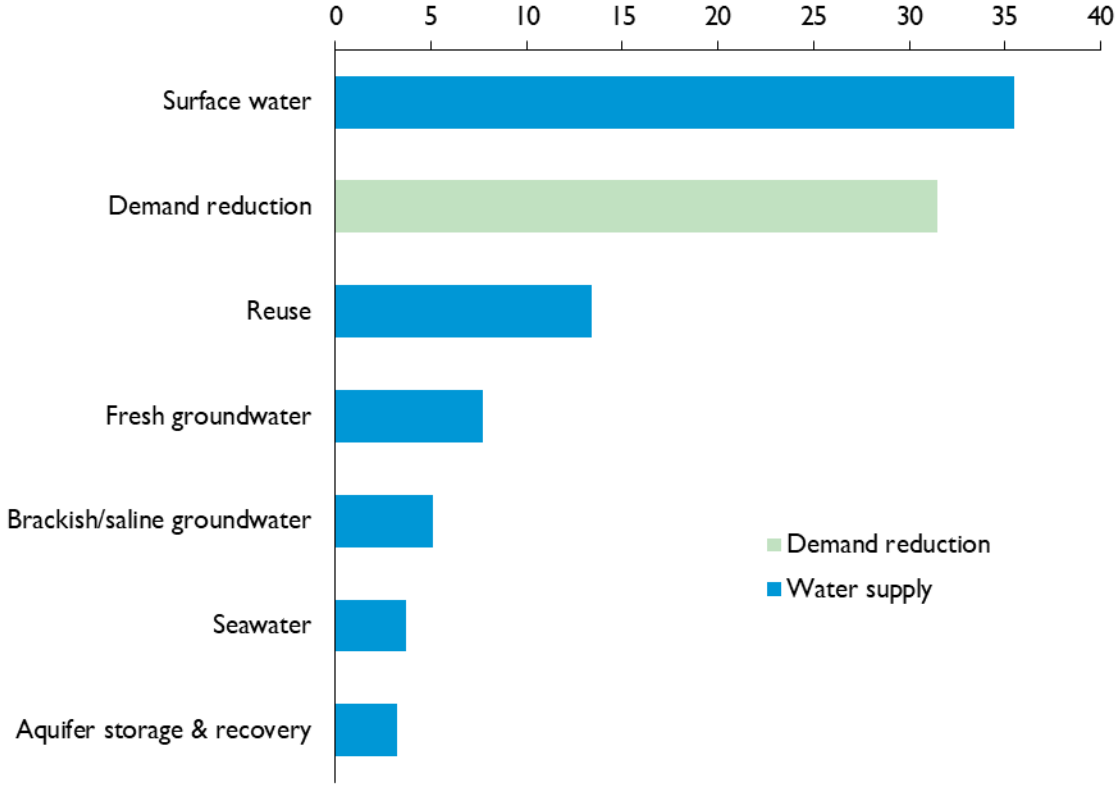
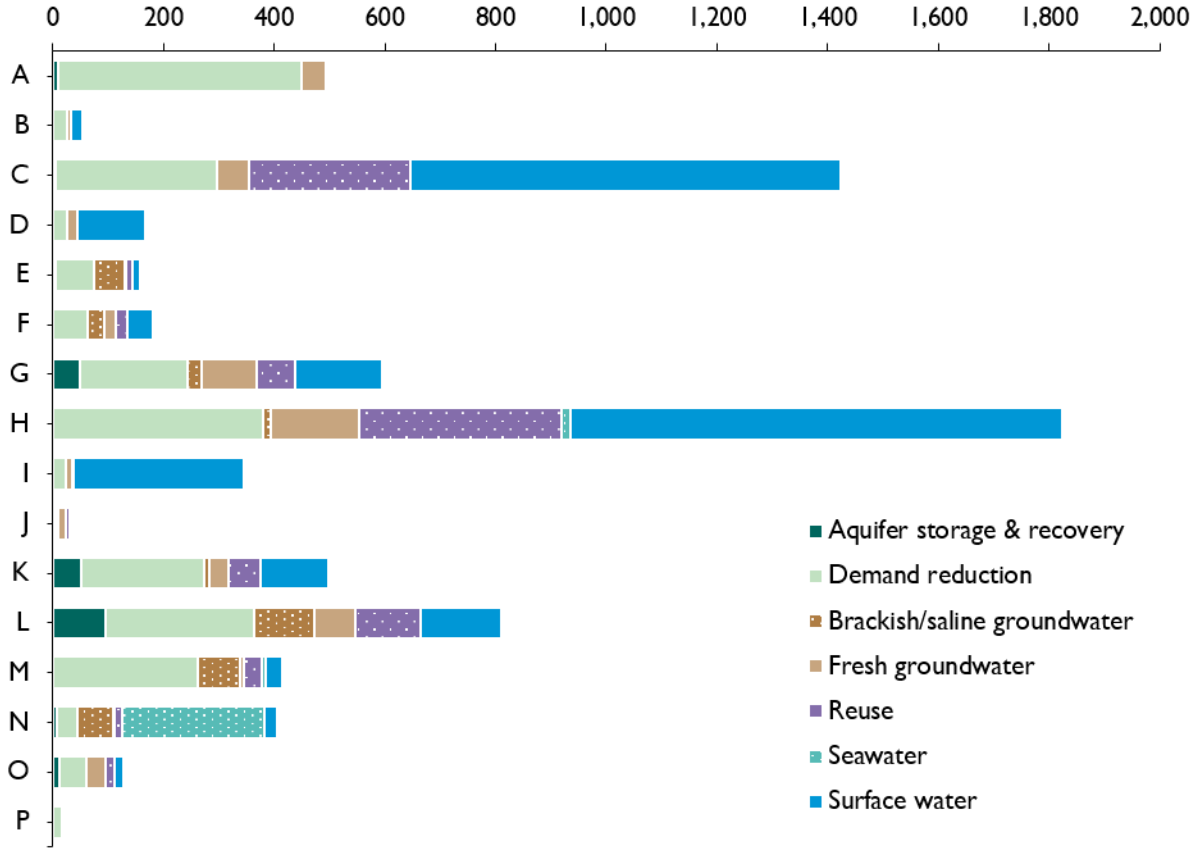


Figure 7-6. Annual volume of recommended water management strategies by region and water resource in 2080 (thousands of acre-feet)



** Strategy types are presented left to right in the order listed in the legend.*

7.3 Strategy types

Planning groups recommended a wide variety of water management strategies to serve water user groups, each of which relies on a specific combination of water source(s), infrastructure, and technology (Figure 7-7, Table 7-5).

Figure 7-7. Share of total recommended water management strategies volume by strategy type in 2080 (percent)

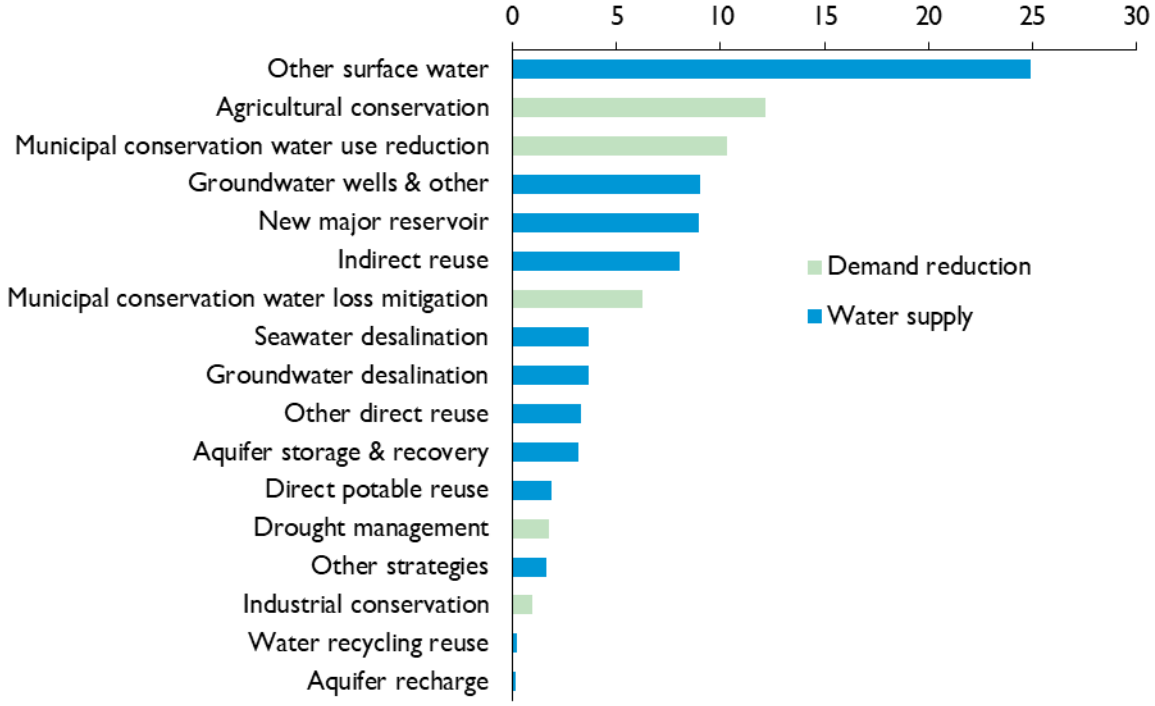


Table 7-5. Annual volume of recommended water management strategies by online decade and strategy type (acre-feet)

Water management strategy type	2030	2040	2050	2060	2070	2080
Agricultural conservation	468,170	682,236	753,637	802,287	861,442	916,494
Aquifer recharge	0	9,783	9,887	9,762	9,799	9,799
Aquifer storage & recovery	53,715	206,335	213,404	217,176	216,942	238,233
Direct potable reuse	35,752	84,801	105,664	117,062	138,252	139,852
Drought management	75,014	86,433	96,204	105,629	115,321	132,924
Groundwater desalination	124,804	195,045	227,416	254,090	278,873	276,887
Groundwater wells & other	346,678	459,893	559,996	624,262	658,256	679,765
Indirect reuse	205,455	475,990	567,702	649,233	582,664	606,456
Industrial conservation	11,774	23,559	38,529	50,227	62,358	73,583
Municipal conservation water loss mitigation	137,688	261,872	333,235	381,289	421,027	472,614
Municipal conservation water use reduction	176,626	318,956	441,975	552,357	661,940	779,871
New major reservoir	101,535	287,582	369,256	408,077	612,550	676,053
Other direct reuse	83,262	138,143	185,245	211,140	240,537	249,853
Other strategies	95,177	112,215	116,107	119,143	122,111	125,158
Other surface water	659,486	1,046,226	1,492,053	1,587,750	1,773,482	1,880,944
Seawater desalination	151,218	275,165	275,699	276,278	276,893	277,542
Water recycling reuse	10,441	10,529	10,475	10,463	11,390	14,251
Texas	**2,736,795**	**4,674,763**	**5,796,484**	**6,376,225**	**7,043,837**	**7,550,279**

7.3.1 Conservation

Conservation includes a variety of activities that either reduce everyday water consumption or increase water use efficiency, allowing more to be done with the same amount of water. Conservation occurs throughout both wet and dry weather and maintains all normal economic and domestic activities. Conservation strategies are divided into several types, including

- municipal, which for the first time in a state water plan, is divided into two distinct types: water use reduction and water loss mitigation;
- agricultural, which includes strategies predominantly for irrigation and some livestock water users; and
- industrial, which includes conservation strategies for steam-electric power, manufacturing, and mining water users.

Water use reduction strategies focus on lowering water consumption and may include conservation analysis and planning, education and outreach, conservation-oriented pricing, landscape irrigation conservation and incentives, outdoor watering schedules, and prohibitions on wasting water.

Water loss mitigation strategies specifically target reducing utility water loss. These strategies may include leak detection and repair programs, advanced metering infrastructure, utility water loss audits, and measures to reduce transmission system losses.

Planning groups reviewed available water loss data and were encouraged to consider strategies to specifically address water loss. Municipal water loss mitigation strategies were recommended by 15 regions. Water loss mitigation strategies are projected to provide about 138,000 acre-feet per year of supply in 2030, increasing to nearly 473,000 acre-feet per year in 2080.

Overall, conservation strategies are recommended in all 16 regional water plans and are associated with more than 1,800 water user groups (Table 7-6). In total, about 794,000 acre-feet per year in conservation strategy volume is recommended in 2030, and 2.2 million acre-feet per year is recommended in 2080. Conservation strategies represent 30 percent of all recommended strategy volumes in 2080. Additional information on conservation strategies, planning, and programs is provided in Chapter 8.

Table 7-6. Number of water user groups relying on different types of water management strategies by region*

Water management strategy type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Texas
Agricultural conservation	21	10	14	0	4	30	18	8	1	3	7	15	8	0	18	3	**160**
Aquifer recharge	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**3**
Aquifer storage & recovery	6	0	95	0	1	0	16	0	0	3	5	33	0	2	2	0	**163**
Direct potable reuse	0	0	5	0	1	2	2	0	0	1	4	6	8	3	2	0	**34**
Drought management	0	0	0	0	0	0	2	49	0	1	119	74	42	0	0	9	**296**
Groundwater desalination	1	0	1	0	2	4	2	7	0	1	3	9	20	8	0	0	**58**
Groundwater wells & other	26	5	165	39	19	28	101	140	19	18	37	52	11	14	15	2	**691**
Indirect reuse	0	5	224	9	0	7	11	9	4	0	1	0	1	0	0	0	**271**
Industrial conservation	0	1	15	6	0	0	25	11	0	0	1	0	14	14	0	3	**90**
Municipal conservation water loss mitigation	8	1	279	59	13	11	50	377	193	9	116	139	58	31	0	8	**1,352**
Municipal conservation water use reduction	42	12	281	15	4	68	158	1	120	4	115	140	39	0	40	7	**1,046**
New major reservoir	0	18	221	7	0	0	32	18	22	0	32	21	0	0	1	1	**373**
Other direct reuse	0	0	9	0	1	1	18	21	0	2	6	12	3	1	2	0	**76**
Other strategies	6	0	10	0	1	12	0	0	0	7	2	34	7	0	8	0	**87**
Other surface water	0	0	252	38	2	43	78	113	19	1	17	4	62	2	1	1	**633**
Seawater desalination	0	0	0	0	0	0	0	13	0	0	0	0	1	3	0	0	**17**
Water recycling reuse	0	8	5	0	1	24	0	0	0	0	0	0	0	0	0	0	**38**

** Water user groups associated with more than one planning region may be counted more than once with different region and strategy type combinations.*

7.3.2 Drought management

Drought management reduces water use during times of drought by *temporarily* restricting certain economic and domestic activities such as car washing and landscape irrigation. These measures vary and are generally implemented by local water providers. Planning groups recommended drought management strategies for certain water user groups and, in limited instances, to address shortages that could not be met in the near-term but that would be met in future decades from other water supply strategies. It is important to recognize that in the absence of sufficient water, restricting water use through drought management is likely the primary, and often the only means by which water providers will be able to successfully navigate through a severe drought. About 75,000 acre-feet per year in drought management strategies is recommended in 2030, and 133,000 acre-feet per year is recommended in 2080.

7.3.3 Reuse

Reuse takes many forms and is broadly categorized as either direct or indirect. Either type of reuse may be used for potable or non-potable purposes. This plan adds a new subcategory of reuse for onsite recycling and reuse of water.

Direct potable reuse involves further treating treated wastewater effluent at an advanced water treatment plant and then either introducing it ahead of the water treatment plant or directly into the potable water distribution system. About 36,000 acre-feet per year in direct potable reuse strategies is recommended in 2030, and 140,000 acre-feet per year is recommended in 2080.

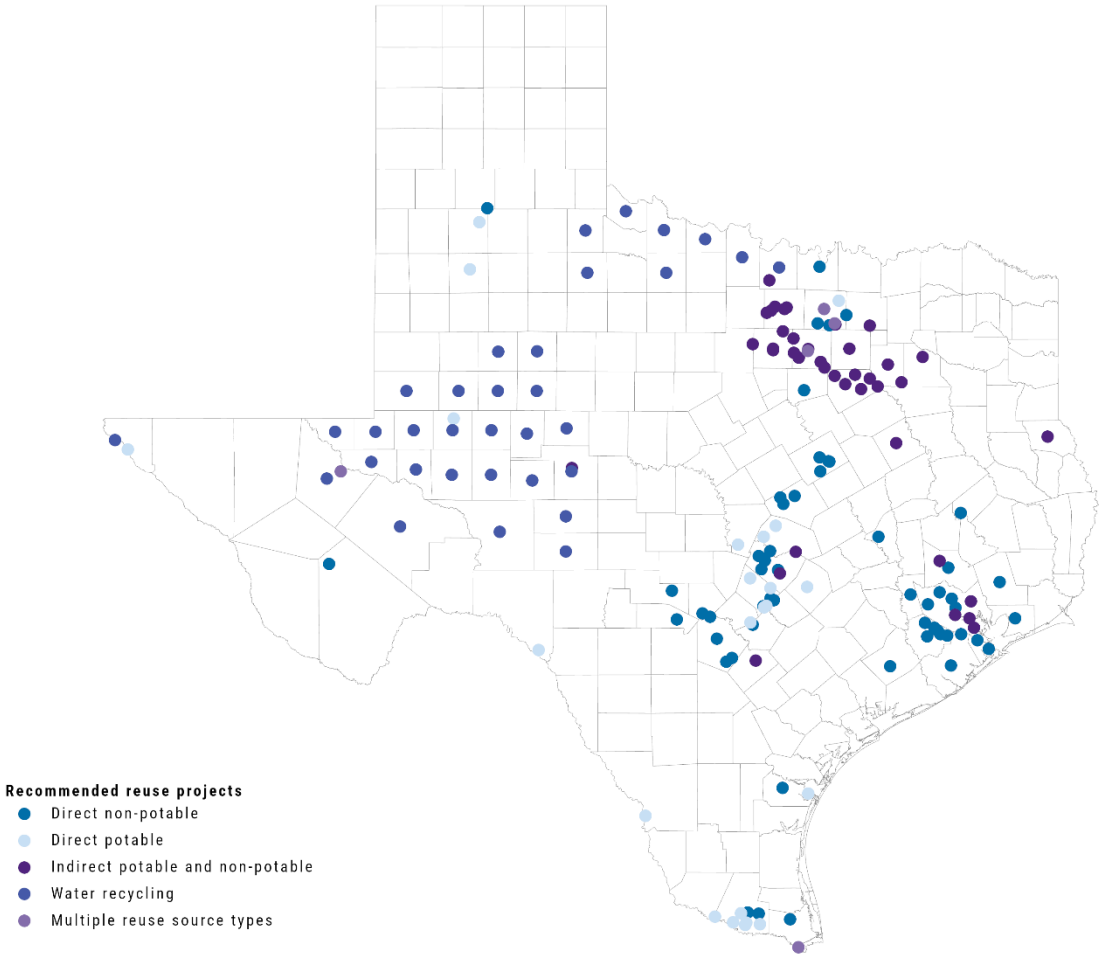
Other direct reuse strategies, which in this plan consist entirely of direct non-potable reuse, generally convey treated wastewater effluent directly from a treatment plant to non-potable uses such as landscape irrigation or industrial processes. About 83,000 acre-feet per year in other direct reuse (direct non-potable reuse) strategies are recommended in 2030, and 250,000 acre-feet per year is recommended in 2080.

Indirect reuse generally involves discharging treated wastewater into a natural water body and later diverting that water for subsequent potable or non-potable use. About 205,000 acre-feet per year in indirect reuse strategies is recommended in 2030, and 606,000 acre-feet per year is recommended in 2080—all of which appears to be intended for potable use.

Water recycling reuse represents water supply that is used, recycled onsite, and reused. This includes onsite graywater, blackwater, or industrial onsite recycling systems, as well as recycling and reuse of oil and gas produced water. Water recycling reuse strategies account for about 10,000 acre-feet per year in recommended strategies in 2030 and 14,000 acre-feet per year in 2080. Most of these strategies are associated with onsite water recycling of oil and gas produced water—approximately 9,000 acre-feet per year in 2030 and 13,000 acre-feet per year in 2080.

Across the state, over 200 recommended projects are needed by 2080 to develop the supply associated with these reuse strategies (Figure 7-8).

Figure 7-8. Recommended reuse projects*



** Includes projects directly related to development of new, or increase of existing, reuse sources that include a water treatment plant or new water supply reservoir in reported project components. Note that the locations presented are generalized and may not represent actual locations of facilities. The reference to "multiple reuse source types" indicates that a project utilizes more than one reuse source type or that the location includes multiple projects that use a variety of reuse source types.*

7.3.4 Aquifer recharge

Aquifer recharge strategies involve adding water to an aquifer via injection well, infiltration basin, or other means of infiltration to replenish the water in an aquifer. These strategies generally focus on increasing groundwater availability and long-term aquifer recovery. No aquifer recharge strategies are recommended until 2040 when approximately 10,000 acre-feet per year of supply is recommended through 2080.

7.3.5 Aquifer storage and recovery

Aquifer storage and recovery is the practice of injecting water into a geologic formation for later recovery and beneficial use. This strategy is feasible only in certain geologic formations and in areas where only the project sponsor may retrieve the stored water. While aquifer storage and recovery projects avoid evaporation associated with surface storage, they still experience operational losses, as

discussed later. In 2030, about 54,000 acre-feet per year in aquifer storage and recovery strategies is recommended, while 238,000 acre-feet per year is recommended in 2080.

Aquifer storage and recovery strategies can be associated with a variety of water source types. Such strategies are categorized under their own water source type (Figure 7-5) or may be associated with one or a combination of water source types. Approximately 57 percent of 2080 aquifer storage and recovery strategy supplies are associated with stored surface water sources, 7 percent are associated with stored groundwater sources, and 3 percent are associated with stored reuse sources. The remaining 33 percent are associated with combinations of stored surface water, groundwater, and reuse sources.

As planning groups consider and evaluate water management strategies, they are required by statute to provide an assessment of the potential for aquifer storage and recovery projects to meet identified significant water needs. Due to the varied nature of the regions, each planning group defines its own threshold for what constitutes a significant water need. Most regions define a quantitative threshold ranging from water needs greater than 800 acre-feet (Region J) to greater than 25,000 acre-feet (Regions C and H) in any decade. Thresholds were generally determined by evaluating needs across a planning region or comparing needs to demands.

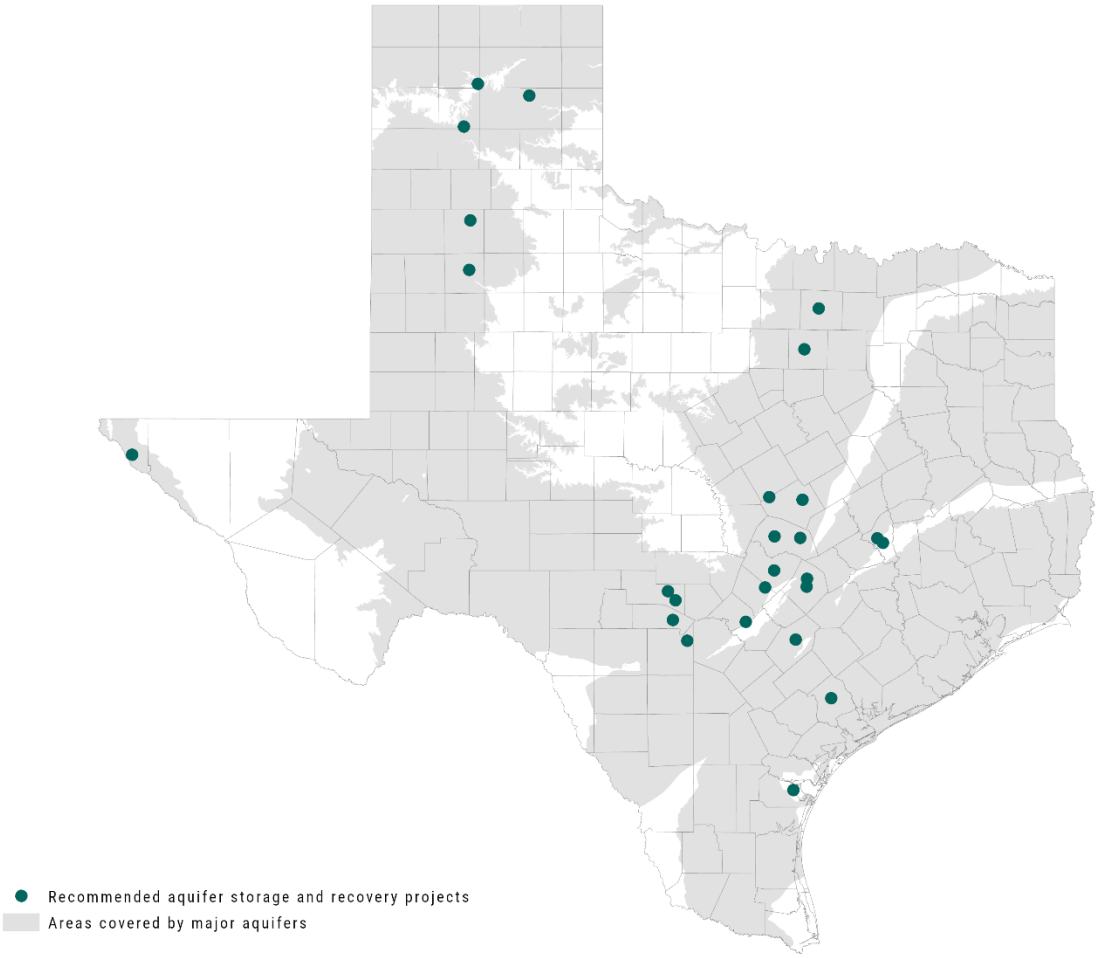
In some regions, quantitative thresholds were limited to municipal water users. Region O utilized categorical thresholds to define significant water need as any non-irrigation water need. Assessments of the potential for aquifer storage and recovery projects to meet significant water needs also varied by region, but generally took into consideration available water sources, suitable geology, and project sponsor interest.

Nine regions recommended aquifer storage and recovery strategies. Associated with these strategies are 27 recommended projects that would establish aquifer storage and recovery systems or pilot projects (Figure 7-9). Regions not recommending aquifer storage and recovery strategies (Regions B, D, F, H, I, M, and P) cited such reasons as the lack of suitable geology in proximity to needs, cost constraints, or a lack of interested project sponsors.

As previously mentioned, aquifer storage and recovery projects may involve commitment of a certain volume of water that is not recoverable, including an initial volume of unrecoverable water dedicated to developing the storage zone and ongoing operations. Unrecoverable water volumes depend on a variety of parameters that are site specific and difficult to quantify. The initial unrecoverable water is used to create a buffer zone between the stored water and native groundwater and to condition the aquifer for storage. Ongoing operational reductions may be due to continued migration of the stored water and mixing of stored water with the buffer.

The unrecoverable volumes in a typical aquifer storage and recovery system can range from 10 to 20 percent of the stored water (i.e., 80–90 percent recovery of the stored water). Systems that store the water within a brackish geological formation or carbonates can see unrecoverable volumes of 30 percent or more. Aquifer storage and recovery in a fresh aquifer that is well-developed can conceivably achieve close to 100 percent recovery. This is because the system is recharging water into compatible, freshwater aquifers, and it may be permitted to produce groundwater in addition to the aquifer storage and recovery. Existing aquifer storage and recovery systems in freshwater formations that report recovery near 100 percent include those operated by the City of Kerrville and San Antonio Water System.

Figure 7-9. Recommended aquifer storage and recovery projects*



** Includes projects directly related to development of new, or increase of existing, aquifer storage and recovery sources that include a well in reported project components. Note that the locations presented are generalized and may not represent actual locations of facilities.*

Statewide survey of aquifer storage and recovery, recharge suitability

In 2020, the TWDB completed a statewide survey to assess the relative suitability of Texas aquifers for aquifer storage and recovery and aquifer recharge projects. The study evaluated hydrogeological conditions, availability of sources for recharge, and proximity to current and future water supply needs. The survey provides screening-level information that highlights areas in Texas that could be a good fit for applying these technologies.

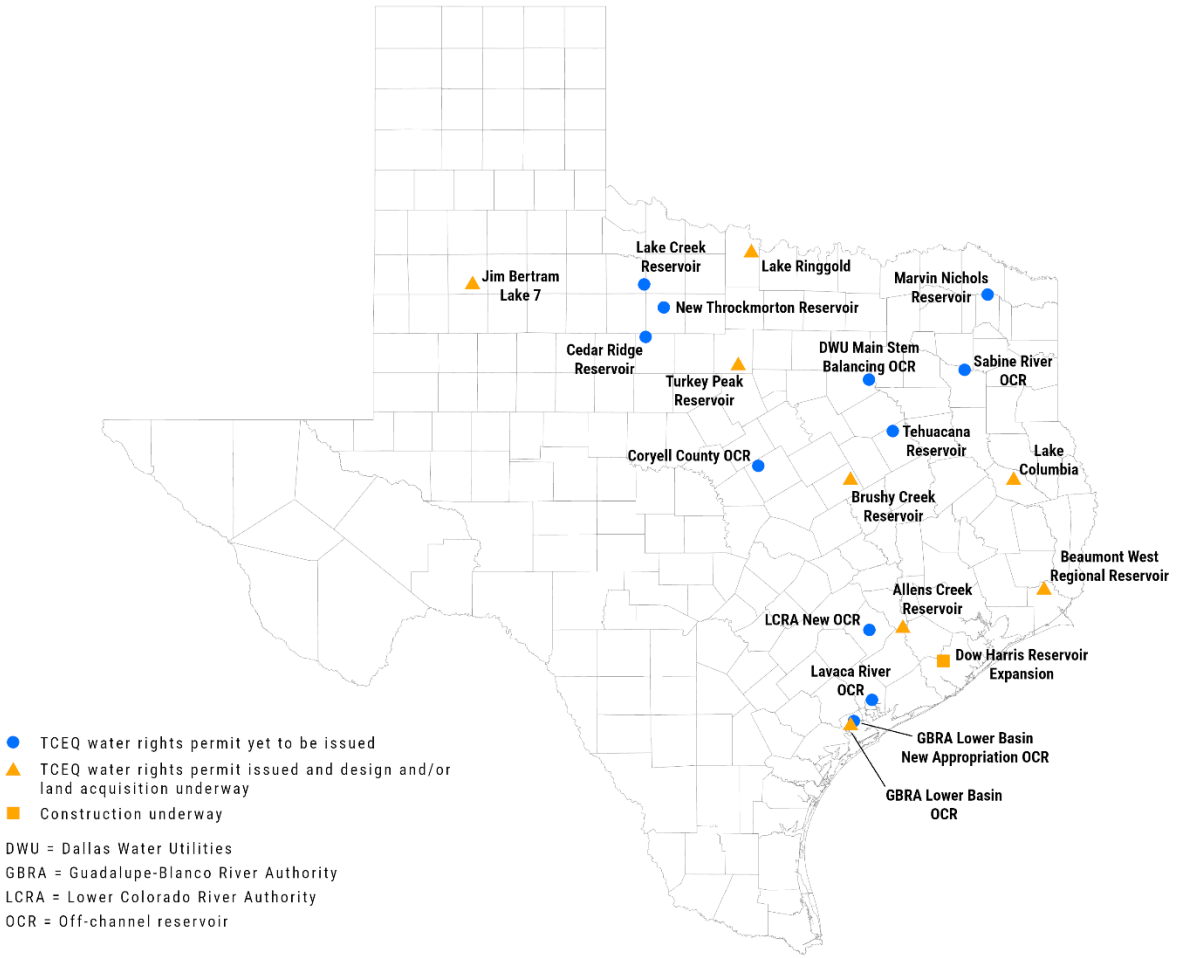
Additional information is available through the Aquifer Suitability web tool (twdb.maps.arcgis.com/apps/webappviewer/index.html?id=0a33ad03f2de45ce959c84759031564c) and Interactive Story Map (storymaps.arcgis.com/collections/083460614add4eeb8e034a3918087a1f).

7.3.6 New major reservoirs

A major reservoir has a storage capacity of 5,000 acre-feet or more. Regional planning groups recommended 20 new major reservoirs during this planning cycle (Figure 7-10). About 102,000 acre-feet per year from new major reservoir strategies is recommended in 2030—including some that will store water generated from indirect reuse—and 676,000 acre-feet per year is recommended in 2080. Several of these reservoir sites are off-channel, meaning they would not be built on the main stem of a river, although they might rely on the main stem flows.

In the near-term, three of the recommended new major reservoirs in this plan are anticipated to be online and providing water supply by 2030 (Table 7-7). An additional nine new major reservoirs are planned to be online by 2040. Planning groups were required to document the implementation status and anticipated timeline for recommended new major reservoir strategies. Reported implementation status is summarized in Appendix E.

Figure 7-10. Recommended new major reservoirs*



** Includes projects directly related to development of new major reservoirs. Note that the locations presented are generalized and may not represent actual locations of facilities.*

Table 7-7. Recommended new major reservoir summary

Reservoir	Source region	Basin	Online decade	Sponsor	Conservation storage capacity (acre-feet)	Firm yield 2080 (acre-feet)	Capital cost (million $)
Allens Creek Reservoir	H	Brazos	2040	Brazos River Authority	145,533	99,650	$494
Beaumont West Regional Reservoir	I	Neches	2030	Lower Neches Valley Authority	16,000	16,000	$253
Brushy Creek Reservoir	G	Brazos	2040	Marlin	6,560	2,000	$60
Cedar Ridge Reservoir	G	Brazos	2040	Abilene	227,127	25,760	$540
Coryell County OCR	G	Brazos	2050	Multi County WSC	15,380	3,190	$121
Dow Harris Reservoir Expansion	H	Brazos	2030	Brazosport Water Authority; Dow Inc	56,760	80,000	$565
DWU Main Stem Balancing OCR	C	Trinity	2050	Dallas	300,000	114,342	$1,767
GBRA Lower Basin New Appropriation OCR	L	Guadalupe	2040	Guadalupe-Blanco River Authority	50,000	26,500	$250
GBRA Lower Basin OCR	L	Guadalupe	2040	Guadalupe-Blanco River Authority	60,000	118,800	$2,463
Jim Bertram Lake 7	O	Brazos	2040	Lubbock	20,000	8,300	$483
Lake Columbia	I	Neches	2040	Angelina and Neches River Authority	195,500	75,400	$486
Lake Creek Reservoir	G	Brazos	2050	North Central Texas Municipal Water Authority	58,560	6,090	$236
Lake Ringgold	B	Red	2040	Wichita Falls	275,000	19,550	$560
Lavaca River OCR	P	Lavaca	2040	Lavaca Navidad River Authority	50,000	30,600	$393
LCRA New OCR	K	Colorado	2050	Lower Colorado River Authority	80,000	81,696	$4,073
Marvin Nichols Reservoir	D	Sulphur	2070	Upper Trinity Regional WD; North Texas MWD; Tarrant Regional WD	1,532,000	400,200	$7,365
New Throckmorton Reservoir	G	Brazos	2050	Throckmorton	15,900	1,280	$89
Sabine River OCR	D	Sabine	2080	Dallas	67,200	73,986	$903
Tehuacana Reservoir	C	Trinity	2050	Tarrant Regional WD	337,947	22,330	$575
Turkey Peak Reservoir	G	Brazos	2030	Palo Pinto County MWD 1	22,577	7,750	$201

DWU – Dallas Water Utilties
GBRA – Guadalupe-Blanco River Authority
LCRA – Lower Colorado River Authority
MWD – municipal water district
OCR – off-channel reservoir
WD – water district
WSC – water supply corporation

7.3.7 Other surface water

Other surface water includes strategies that rely on surface water but are not associated with new major reservoirs, surface water desalination, or aquifer storage and recovery. This strategy type includes the subordination of surface water rights as well as a wide variety of other strategies that convey, treat, reassign, or otherwise make additional surface water supplies accessible to users—with or without additional infrastructure.

Approximately 659,000 acre-feet per year of supply from other surface water strategies is recommended for 2030, increasing to nearly 1.9 million acre-feet per year by 2080. Over the planning period, other surface water strategies make up the largest recommended strategy type by volume.

Other surface water strategies can be grouped into three general types: expanded use of existing supplies requiring only conventional treatment and conveyance, surface water yield enhancement, and new minor reservoirs.

Expanded use of existing supply requiring only conventional treatment and conveyance accounts for the largest share of other surface water strategies, totaling approximately 1.6 million acre-feet in 2080. These strategies focus on improving access to previously developed and permitted surface water supplies by removing infrastructure bottlenecks. They may also involve transactions—such as sales, contracts, or purchases between wholesale and/or retail water providers—that facilitate the delivery of previously developed supplies. Examples include constructing pipelines to convey supplies over long distances, expanding water treatment plant capacity to better align with existing pipeline capacity, and lowering reservoir intake elevations to allow continued withdrawals when lake levels are low. Figure 7-11 and Table 7-8 present select recommended major conveyance and transfer projects, including those associated with other surface water strategies.

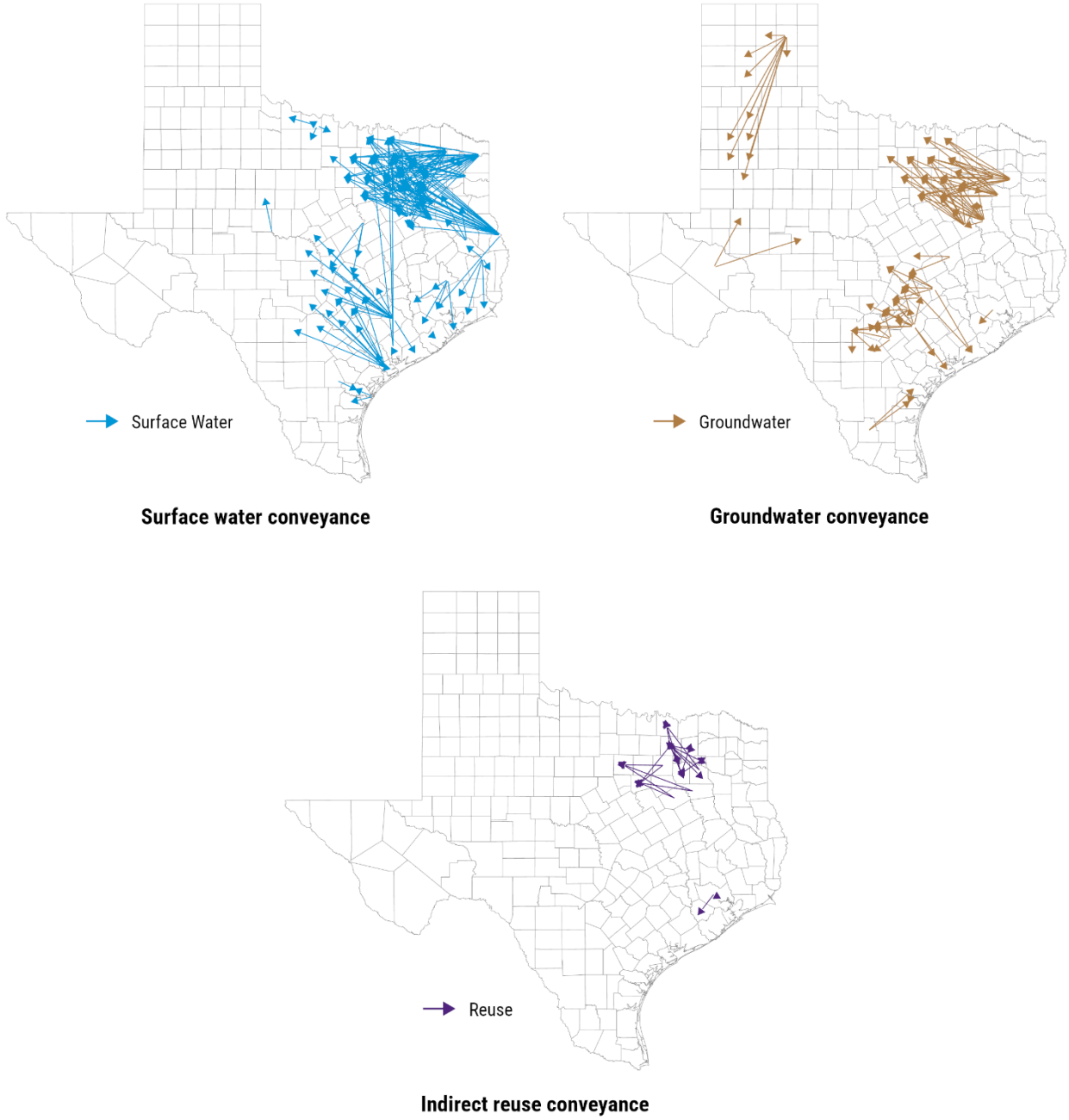
Surface water yield enhancement accounts for about 290,000 acre-feet of supply in 2080. These strategies increase the firm availability of previously developed supplies by improving how water is stored, allocated, or managed. Unlike expanded use strategies, which focus on access and delivery, yield enhancement strategies focus on increasing the firm yield of a source. Examples include dredging, reallocating water within reservoir pools to augment conservation storage, and other approaches that increase firm availability through permitting adjustments or operational changes. Delivery and treatment of these additional water supplies may or may not require new or expanded water infrastructure.

Minor reservoirs account for roughly one percent of other surface water supplies in 2080 and include strategies to construct new reservoirs with less than 5,000 acre-feet of storage.

Acquisition of water rights that originate outside of Texas

Regions continue to evaluate opportunities to acquire water supplies from states outside Texas; however, no out-of-state water supply strategies are recommended in this plan. The Region C plan includes five alternative projects evaluated to acquire water rights to develop surface water supplies originating in Oklahoma and Arkansas, but these projects are not recommended for implementation at this time. Availability of out-of-state water remains limited, as Oklahoma currently limits water exports from the state, and although potential sources in Arkansas and Louisiana have been considered in planning studies, no projects involving those sources are currently recommended.

Figure 7-11. Select* recommended conveyance and transfers associated with projects conveying at least 10,000 acre-feet per year in 2080 a distance greater than 10 miles, by source type



** Includes recommended projects with transmission line components estimated to exceed 10 miles in length and with project-related supplies of more than 10,000 acre-feet in 2080 assigned to water user groups. Excludes direct reuse projects. Lines on the map extend from each project's source location(s) to the centroid of the county or counties benefiting from the project. Additional project information included in Table 7-8.*

Table 7-8. Select examples of recommended conveyance and transfer projects*

Sponsor region	Project name	Related source types	Counties receiving project supply
A	Develop Roberts County Well Field (Ogallala Aquifer) – Amarillo	Groundwater	Potter; Randall
A	Expansion of Roberts County Well Field (Ogallala Aquifer) – CRMWA2	Groundwater	Dawson; Gray; Hale; Hockley; Hutchinson; Lubbock; Lynn; Potter; Randall; Terry
B	Lake Ringgold	Surface water	Archer; Clay; Wichita; Wilbarger
C	County-Other, Parker – RWD (New Regional Water District for Trinity Basin)	Groundwater; Reuse; Surface water	Parker
C	County-Other, Wise – New regional Water Supplier (TRWD)	Groundwater; Reuse; Surface water	Wise
C	DWU – Connect Lake Palestine (Dallas Portion of IPL and IPL to Bachman)	Surface water	Collin; Cooke; Dallas; Denton; Ellis; Grayson; Johnson; Kaufman; Rockwall; Tarrant; Wise
C	DWU – Main Stem Balancing Reservoir	Reuse; Surface water	Collin; Cooke; Dallas; Denton; Ellis; Grayson; Johnson; Kaufman; Rockwall; Tarrant; Wise
C	DWU – Sabine Conjunctive Use Part 1 – Carrizo Wilcox Groundwater	Groundwater	Collin; Cooke; Dallas; Denton; Ellis; Grayson; Johnson; Kaufman; Rockwall; Tarrant; Wise
C	GTUA – Parallel Collin-Grayson Municipal Alliance Pipeline	Reuse; Surface water	Collin; Grayson
C	GTUA – Regional Water System Phase 2	Surface water	Collin; Denton; Grayson
C	Marvin Nichols (328) – TRWD, NTMWD, UTRWD	Surface water	Collin; Cooke; Dallas; Denton; Ellis; Freestone; Grayson; Henderson; Hunt; Johnson; Kaufman; Navarro; Parker; Rains; Rockwall; Tarrant; Van Zandt; Wise
C	NTMWD – Additional Lake Texoma Blend Phase 1	Surface water	Collin; Dallas; Denton; Grayson; Hunt; Kaufman; Rains; Rockwall; Van Zandt
C	NTMWD – Expanded Wetland Reuse	Reuse	Collin; Dallas; Denton; Grayson; Hunt; Kaufman; Rains; Rockwall; Van Zandt
C	NTMWD – Lake of the Pines	Surface water	Collin; Dallas; Denton; Grayson; Hunt; Kaufman; Rains; Rockwall
C	Toledo Bend Reservoir for TRWD, NTMWD and UTRWD	Surface water	Collin; Cooke; Dallas; Denton; Ellis; Freestone; Grayson; Henderson; Hunt; Johnson; Kaufman; Navarro; Parker; Rains; Rockwall; Tarrant; Van Zandt; Wise
C	TRWD – Additional Transmission Pipeline	Groundwater; Reuse; Surface water	Dallas; Denton; Ellis; Freestone; Henderson; Jack; Johnson; Kaufman; Navarro; Parker; Tarrant; Van Zandt; Wise
C	TRWD – Carrizo-Wilcox Groundwater	Groundwater	Dallas; Denton; Ellis; Freestone; Henderson; Jack; Johnson; Kaufman; Navarro; Parker; Tarrant; Van Zandt; Wise
C	TRWD – Complete IPL	Reuse	Dallas; Denton; Ellis; Freestone; Henderson; Jack; Johnson; Kaufman; Navarro; Parker; Tarrant; Van Zandt; Wise
C	TRWD – Marty Leonard (Cedar Creek) Wetlands Reuse	Reuse	Dallas; Denton; Ellis; Freestone; Henderson; Jack; Johnson; Kaufman; Navarro; Parker; Tarrant; Van Zandt; Wise
C	Wright Patman Reallocation NTMWD and TRWD	Surface water	Collin; Dallas; Denton; Ellis; Freestone; Grayson; Henderson; Hunt; Johnson; Kaufman; Navarro; Parker; Rains; Rockwall; Tarrant; Van Zandt; Wise
D	New WTP Greenville	Surface water	Hunt
D	Upper Cypress Basin Supply	Surface water	Morris; Titus

Sponsor region	Project name	Related source types	Counties receiving project supply
F	West Texas Water Partnership	Groundwater; Surface water	Midland; Taylor; Tom Green
G	Delivery of Lake Whitney Reallocation Supplies to Williamson County	Surface water	Bell; Burnet; Williamson
G	Regional Groundwater Supply System	Groundwater	Bell; Williamson
H	BWA Transmission and Storage Expansion	Groundwater; Surface water	Brazoria
H	City of Houston GRP Transmission – 2025 Phase	Groundwater; Reuse; Surface water	Fort Bend; Harris; Montgomery
H	City of Houston Reuse Infrastructure	Reuse	Fort Bend; Harris; Waller
H	CWA Pipeline Transmission Expansion	Groundwater; Reuse; Surface water	Fort Bend; Harris; Montgomery
H	East Texas Transfer	Surface water	Harris
H	LNVA Neches-Trinity Basin Interconnect	Surface water	Chambers; Liberty
H	NFBWA Phase 2 Distribution Segments	Groundwater; Reuse; Surface water	Fort Bend; Harris; Waller
H	NHCRWA Transmission Lines	Groundwater; Reuse; Surface water	Harris; Montgomery
H	Southeast Transmission Line Improvements	Surface water	Galveston; Harris
H	WHCRWA/NFBWA Transmission Line	Groundwater; Reuse; Surface water	Fort Bend; Harris; Waller
I	Angelina Neches River Authority – Treatment Plant and Distribution System	Surface water	Cherokee; Rusk; Smith
I	Lufkin – Conveyance from Sam Rayburn to Kurth Lake – Phase 1	Surface water	Angelina
I	Manufacturing, Jasper County – Purchase from LNVA (Sam Rayburn)	Surface water	Jasper
I	Manufacturing, Jefferson County – Purchase from LNVA (Sam Rayburn)	Surface water	Jefferson
I	Upper Neches River MWA – Neches Run of River with Lake Palestine	Surface water	Collin; Cooke; Dallas; Denton; Ellis; Grayson; Johnson; Kaufman; Rockwall; Tarrant; Wise
K	Austin – Aquifer Storage and Recovery	Groundwater	Travis
K	LCRA – Lower Basin Off-Channel Reservoir	Surface water	Bastrop; Blanco; Burnet; Caldwell; Hays; Lampasas; Lee; Llano; Matagorda; Mills; San Saba; Travis; Williamson
K	LCRA – Purchase Wholesale Groundwater	Groundwater	Burnet; Hays; Matagorda; Travis; Williamson
L	ARWA Expanded Carrizo-Wilcox Project (Phase 2)	Groundwater	Bexar; Caldwell; Comal; Guadalupe; Hays
L	GBRA WaterSECURE – Shared Facilities	Groundwater; Surface water	Bastrop; Bexar; Caldwell; Calhoun; Comal; Gonzales; Guadalupe; Hays; Kendall; Medina; Travis; Victoria
L	Medina County Regional ASR	Groundwater	Atascosa; Bexar; Frio; Medina
L	SAWS – Regional Wilcox Project	Groundwater	Atascosa; Bexar; Comal; Medina
N	EV Ranch Brackish Groundwater Desalination	Groundwater	Nueces; San Patricio

Sponsor region	Project name	Related source types	Counties receiving project supply
N	Evangeline/Laguna Treated Groundwater Project	Groundwater	Nueces; San Patricio
N	Port of Corpus Christi Authority Seawater Desalination – Harbor Island	Surface water	Nueces; San Patricio
N	SPMWD Project No. 2	Surface water	San Patricio
P	Lake Texana Yield Enhancement Project – Phase 2	Surface water	Jackson

** Includes recommended projects with transmission line components estimated to exceed 10 miles in length and with project-related supplies of more than 10,000 acre-feet in 2080 assigned to water user groups. Excludes direct reuse projects.*

7.3.8 Groundwater wells and other

All 16 planning groups recommended the development of at least some additional groundwater. This includes single wells or multiple wells, which may be part of the development of new well fields or expansion of existing well fields. New wells are often the only economically feasible strategy to meet the water needs of rural municipal water users.

Other groundwater strategies do not involve installing new wells but instead conveying, reassigning, or otherwise making accessible previously developed groundwater supplies to users with or without additional conveyance and/or treatment infrastructure. These strategies may include, for example, maximizing the use of existing facilities by increasing production from existing groundwater wells and conveying groundwater supplies from one provider to another through a purchase.

About 347,000 acre-feet per year of supply from groundwater development strategies (not associated with groundwater desalination or aquifer storage and recovery strategies) is recommended in 2030 and 680,000 acre-feet per year is recommended in 2080.

7.3.9 Desalination of groundwater and seawater

Desalination is the process of removing dissolved solids from seawater or groundwater, often by forcing the source water through membranes under high pressure. The specific process used to desalinate water varies depending upon the total dissolved solids, temperature, and other physical characteristics of the source water—but disposal of concentrate that has a higher total dissolved content than the source water is always required. Disposal may take the form of an injection well, evaporation pond, discharge to surface water, or an ocean outfall diffuser.

For planning purposes, freshwater is defined as having a total dissolved solids concentration of less than 1,000 milligrams per liter (mg/L). Brackish water typically has total dissolved solids concentrations between 1,000 and 10,000 mg/L, saline water ranges from 10,001 to 34,999 mg/L, and seawater has total dissolved solids concentrations of 35,000 mg/L or greater.

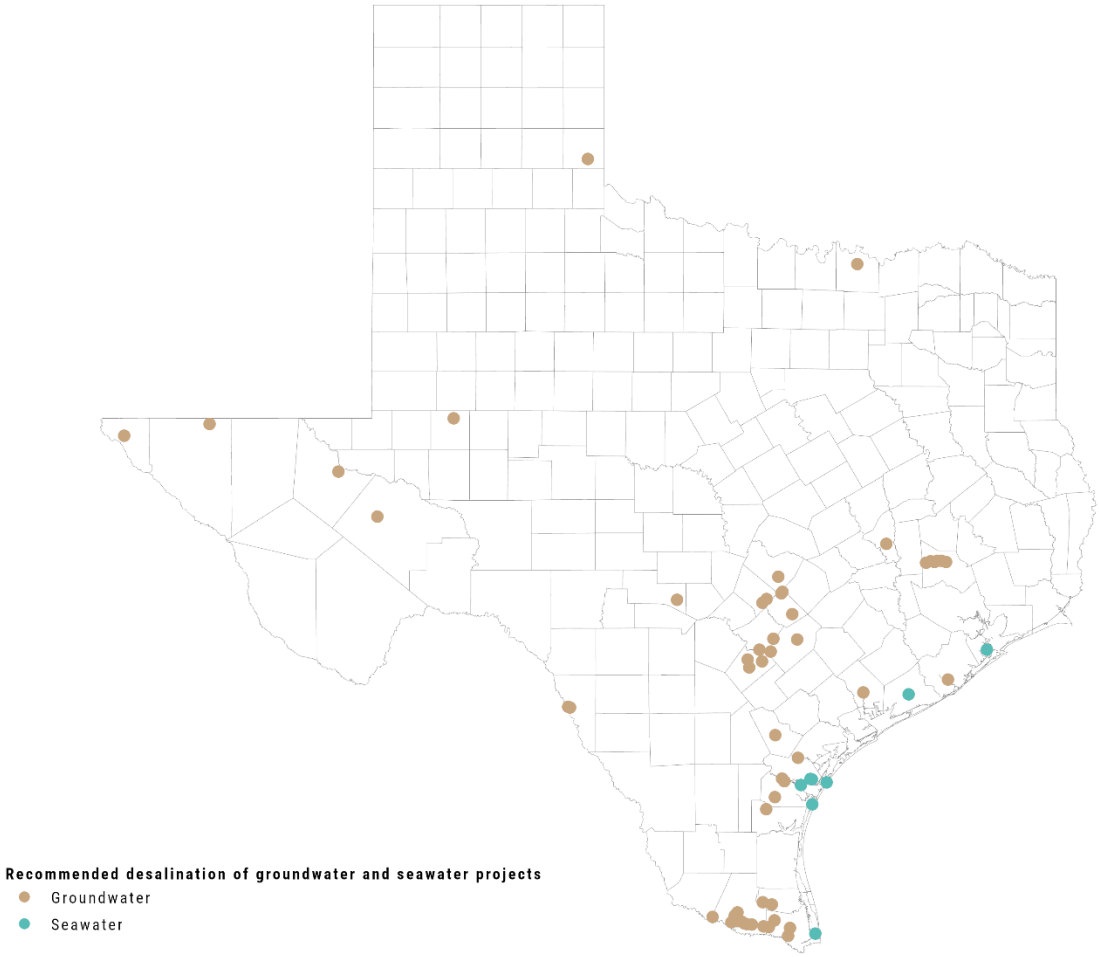
About 125,000 acre-feet per year of supply from groundwater desalination strategies is recommended in 2030 and 277,000 acre-feet per year is recommended in 2080. There are 63 recommended projects directly associated with increasing water supply through groundwater desalination (Figure 7-12).

For seawater desalination strategies, 151,000 acre-feet per year is recommended by 2030, and 278,000 acre-feet per year of supply is recommended to be online by 2080. There are eight recommended projects directly associated with increasing water supply through seawater desalination (Figure 7-12).

Groundwater desalination strategies were recommended by 11 planning groups and three recommended seawater desalination strategies. Planning groups cited the cost of desalination treatment and infrastructure, a lack of interested project sponsors, and the existing availability of non-brackish

water sources as reasons for not recommending groundwater desalination strategies. Finding qualified operators in rural areas to run these sophisticated systems is an implementation issue that has been raised as well. The primary reason for not recommending seawater desalination strategies was based on cost, particularly as related to the distance that supplies would often have to be conveyed from source to users.

Figure 7-12. Recommended groundwater and seawater desalination projects*



** Includes projects directly related to development of new, or increase of existing, water supply from desalinated groundwater and seawater sources that include a water treatment plant in reported project components. Note that the locations presented are generalized and may not represent actual locations of facilities.*

7.3.10 Other strategies

Four remaining strategy types complete the portfolio of recommended water management strategies. Each individually provides approximately 1 percent or less of the total recommended strategy supplies in 2080. For weather modification and brush control, it is difficult to quantify the reliable supplies they could provide under extended drought-of-record conditions when less cloud cover, precipitation, runoff, and infiltration of precipitation into the soil exists. For this reason, they are not often recommended as strategies to meet needs.

Surface water desalination is the process of removing dissolved solids from brackish surface water, often by forcing the source water through membranes under low pressure. About 25,000 acre-feet per year of supply from surface water desalination strategies is recommended in 2080.

Weather modification, sometimes referred to as cloud seeding, is the application of technology to enhance precipitation from clouds. About 84,000 acre-feet per year of supply from weather modification strategies is recommended in 2080 to address needs for select irrigation water users that also have recommended irrigation conservation strategies.

Brush control is a land stewardship technique that involves removal of species, such as salt cedar, that may reduce runoff to streams and rivers and recharge to aquifers. About 5,000 acre-feet per year of supply is recommended from brush control strategies in 2080 to address needs for select non-municipal water users that also have other recommended strategies.

Rainwater harvesting involves capturing, diverting, and storing rainwater for domestic use, including household and irrigation needs, aquifer recharge, and stormwater abatement. Rainwater harvesting can reduce municipal outdoor irrigation demand on potable systems. Building-scale level of rainwater harvesting, as was generally considered by planning groups and which meets planning rules, requires active management by each system owner to economically develop it to a scale that is large and productive enough to ensure a meaningful supply *sustainable throughout a drought of record*. About 12,000 acre-feet per year of supply from rainwater harvesting strategies is recommended in 2080 to address needs for select water users that have multiple additional recommended strategies.

Firm yield of rainwater harvesting in Texas

A recent study by the Meadows Center for Water and the Environment demonstrates that rainwater harvesting systems can be designed to provide a fully reliable, drought of record (firm-yield) supply even in the most arid regions of Texas. As part of the study, researchers developed a free spreadsheet-based tool (RAINFAL) that allows users to test different rainwater harvesting system designs. The RAINFAL tool and its user guide are available online at: www.meadowscenter.txst.edu/research/water-conservation/rainwater-firm-yield.html.

7.3.11 Conjunctive use

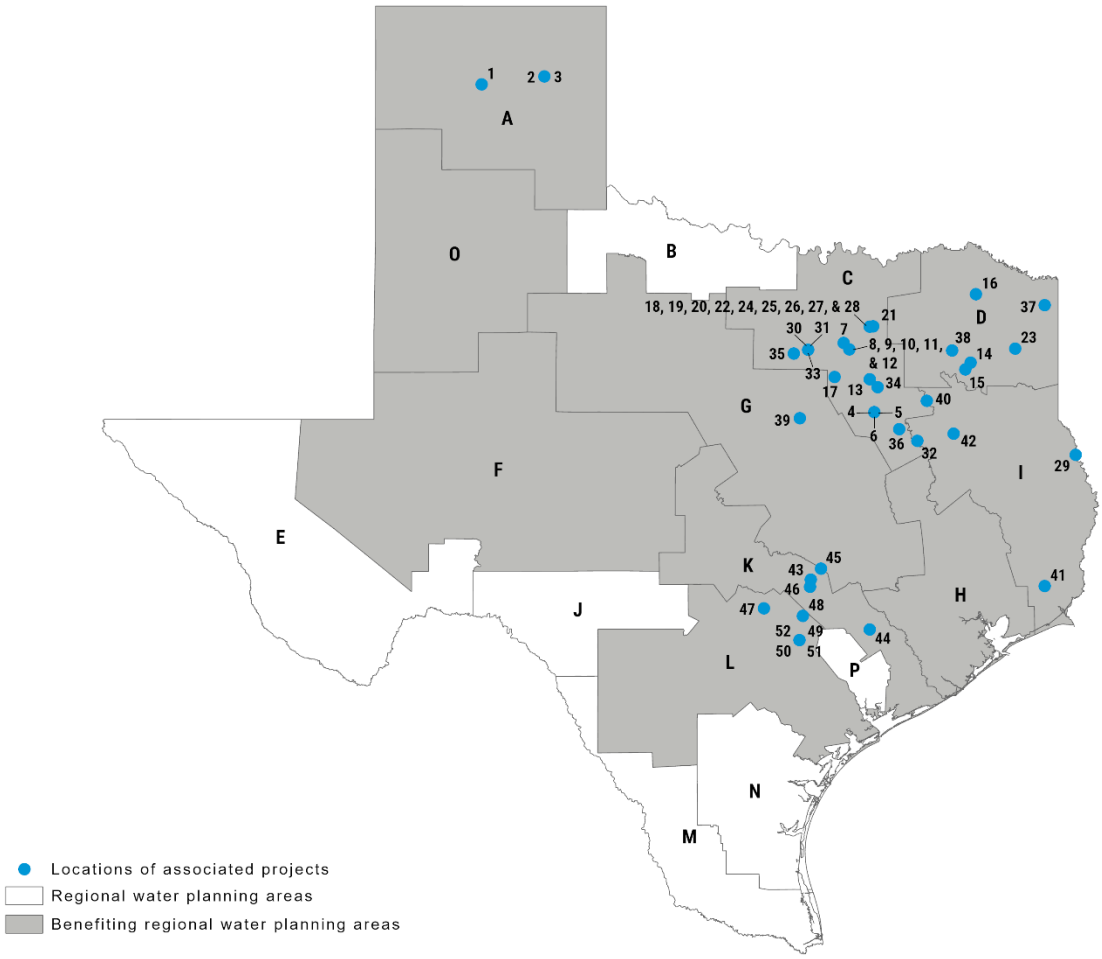
Conjunctive use involves varying the use/mix of multiple water sources (surface water, groundwater, reuse, etc.) to make efficient use of an entity's overall water supply operations based on factors like demand, available infrastructure, and seasonal conditions. For example, a utility with groundwater and surface water supply may rely primarily on surface water during periods of average to above-average rainfall to reduce stress on groundwater resources, then shift to groundwater during drier periods.

Although conjunctive use is no longer a standalone strategy type in the state water plan, planning groups identified which recommended strategies incorporate conjunctive use. In total, five recommended strategies are classified as conjunctive use, providing approximately 5,000 acre-feet per year of statewide strategy supplies in 2030 and increasing to about 51,000 acre-feet per year by 2080.

7.4 Strategies benefiting multiple regions

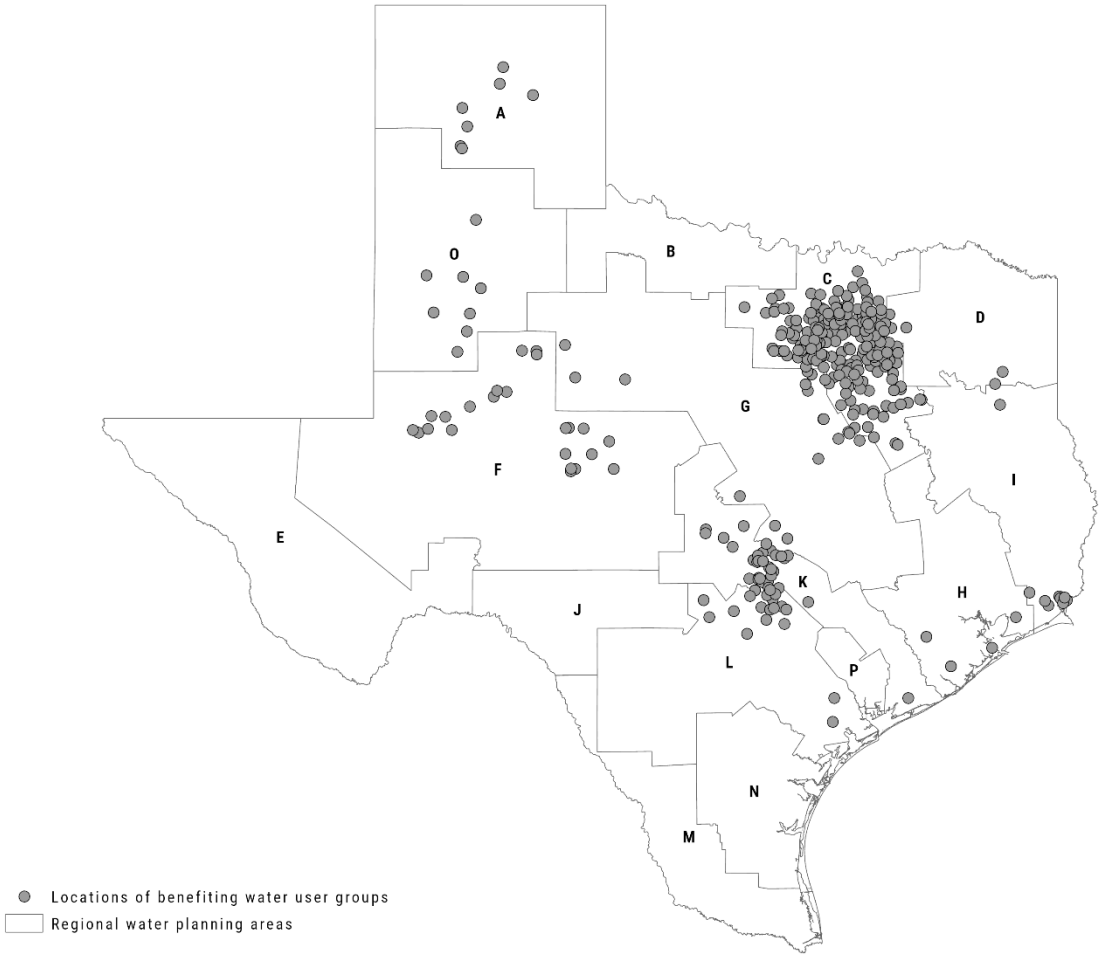
Several wholesale and major water providers included in this plan serve customers across multiple planning regions. Regional water planning groups also coordinate throughout each cycle to identify and consider potential regionalized projects. In this plan, 45 recommended strategies representing a wide range of strategy types benefit water user groups in more than one primary region. There are 52 recommended projects to implement these strategies (Figure 7-13, Table 7-9). These regionalized strategies represent 17 percent of the total recommended water supply volume in 2080 and serve approximately 365 unique water user groups located in 10 of the 16 planning regions (Figure 7-14).

Figure 7-13. Recommended projects associated with strategies that benefit multiple regions*



** Includes projects associated with water management strategies serving more than one water user group that are primarily located in different regions or that serve a water user group associated with three or more geographically split regions. Conservation strategies and projects are excluded since they are typically implemented locally.*

Figure 7-14. Water user groups associated with strategies that benefit multiple regions*



** Includes locations of all water user groups that will receive supply from water management strategies serving more than one water user group, which are primarily located in different regions or that serve a water user group associated with three or more geographically split regions. Conservation strategies and projects are excluded since they are typically implemented locally.*

Local strategy with multi-regional benefits

The Brazos River Authority Lake Whitney storage reallocation strategy would convert a portion of existing hydropower and inactive storage at Lake Whitney to water conservation storage, increasing available water supplies without requiring construction of a new reservoir. By leveraging existing infrastructure, the strategy is planned to provide approximately 93,000 acre-feet per year beginning in 2030 to water user groups in eight counties across Regions G, H, and K. This strategy is one of the 45 recommended in this plan that would provide water supplies to water user groups in multiple regions if implemented.

Table 7-9. Recommended projects benefiting multiple regions (shown in Figure 7-13)

Map Id	Project	Sponsor	Sponsor region	Benefiting regions	Online decade	Capital cost
1	Desalination of Lake Meredith Water - CRMWA	Canadian River Municipal Water Authority	A	A; O	2040	$196,190,000
2	Expansion of Roberts County Well Field (Ogallala Aquifer) - CRMWA2	Canadian River Municipal Water Authority	A	A; O	2030	$767,771,000
3	Replace Capacity of Roberts County Well Field (Ogallala Aquifer) - CRMWA	Canadian River Municipal Water Authority	A	A; O	2040	$35,598,000
4	Corsicana - 8 MGD WTP Expansion, Halbert-Richland Chambers-1	Corsicana	C	C; G	2050	$34,694,000
5	Corsicana - 8 MGD WTP Expansion, Halbert-Richland Chambers-2	Corsicana	C	C; G	2080	$34,694,000
6	Corsicana - New 8 MGD WTP, Halbert-Richland Chambers	Corsicana	C	C; G	2030	$93,240,000
7	DWU - Connect Lake Palestine (Dallas Portion of IPL and IPL to Bachman)	Dallas	C	C; G	2040	$700,902,000
8	DWU - Infrastructure to Treat and Deliver to Customers 2030	Dallas	C	C; G	2030	$985,373,000
9	DWU - Infrastructure to Treat and Deliver to Customers 2040	Dallas	C	C; G	2040	$1,687,443,000
10	DWU - Infrastructure to Treat and Deliver to Customers 2050	Dallas	C	C; G	2050	$1,873,926,000
11	DWU - Infrastructure to Treat and Deliver to Customers 2070	Dallas	C	C; G	2070	$297,422,000
12	DWU - Infrastructure to Treat and Deliver to Customers 2080	Dallas	C	C; G	2080	$386,643,000
13	DWU - Main Stem Balancing Reservoir	Dallas	C	C; G	2050	$1,767,099,000
14	DWU - Sabine Conjunctive Use Part 1 - Carrizo Wilcox Groundwater	Dallas	C	C; G	2060	$694,882,000
15	DWU - Sabine Conjunctive Use Part 2 - Sabine River Off Channel Reservoir	Dallas	C	C; G	2080	$903,296,000
16	Marvin Nichols (328) - TRWD, NTMWD, UTRWD	Upper Trinity Regional WD; North Texas MWD; Tarrant Regional WD	C	C; D; G	2070	$7,364,973,000
17	Midlothian - Expand Tayman WTP to 20 MGD (8 MGD Expansion)	Midlothian	C	C; G	2030	$64,554,000
18	NTMWD - Additional Lake Texoma Blend Phase 1	North Texas MWD	C	C; D	2030	$465,653,000
19	NTMWD - Additional Lake Texoma Blend Phase 2	North Texas MWD	C	C; D	2050	$997,393,000
20	NTMWD - Additional Lavon Watershed Reuse	North Texas MWD	C	C; D	2040	$517,000
21	NTMWD - Additional Measure to Access Full Lake Lavon Yield	North Texas MWD	C	C; D	2040	$209,348,000

Map Id	Project	Sponsor	Sponsor region	Benefiting regions	Online decade	Capital cost
22	NTMWD - Expanded Wetland Reuse	North Texas MWD	C	C; D	2030	$686,489,000
23	NTMWD - Lake of the Pines	North Texas MWD	C	C; D	2040	$1,345,792,000
24	NTMWD - Sabine Creek WWTP Reuse	North Texas MWD	C	C; D	2040	$517,000
25	NTMWD Treatment & Treated Water Distribution Improvements 2030	North Texas MWD	C	C; D	2030	$970,322,000
26	NTMWD Treatment & Treated Water Distribution Improvements 2040	North Texas MWD	C	C; D	2040	$2,628,183,000
27	NTMWD Treatment & Treated Water Distribution Improvements 2050	North Texas MWD	C	C; D	2050	$227,085,000
28	NTMWD Treatment & Treated Water Distribution Improvements 2060	North Texas MWD	C	C; D; G	2060	$859,180,000
29	Toledo Bend Reservoir for TRWD, NTMWD and UTRWD	Upper Trinity Regional WD; North Texas MWD; Tarrant Regional WD	C	C; D; G	2070	$9,831,285,000
30	TRWD - Additional Transmission Pipeline	Tarrant Regional WD	C	C; D; G	2050	$1,322,706,000
31	TRWD - ASR Pilot	Tarrant Regional WD	C	C; G	2030	$14,932,000
32	TRWD - Carrizo-Wilcox Groundwater	Tarrant Regional WD	C	C; D; G	2050	$356,209,000
33	TRWD - Complete IPL	Tarrant Regional WD	C	C; D; G	2040	$1,327,000,000
34	TRWD - Marty Leonard (Cedar Creek) Wetlands Reuse	Tarrant Regional WD	C	C; D; G	2030	$673,381,000
35	TRWD - Reuse from Mary's Creek WRF	Tarrant Regional WD	C	C; D; G	2030	$68,938,000
36	TRWD - Tehuacana Reservoir	Tarrant Regional WD	C	C; D; G	2050	$575,134,000
37	Wright Patman Reallocation NTMWD and TRWD	North Texas MWD; Tarrant Regional WD	C	C; D; G	2080	$4,760,029,000
38	Sabine River Authority Wood County Well Field and Pipeline	Sabine River Authority	D	D; I	2030	$94,255,000
39	Lake Whitney Reallocation	Brazos River Authority	G	G; H; K	2030	$44,678,000
40	Athens MWA - WTP Booster Pump Station Expansion	Athens Municipal Water Authority	I	C; I	2050	$3,121,000
41	LNVA - West Beaumont Reservoir	Lower Neches Valley Authority	I	H; I	2030	$252,586,000
42	Upper Neches River MWA - Neches Run of River with Lake Palestine	Upper Neches River Municipal Water Authority	I	C; G; I	2070	$719,027,000
43	Aqua WSC - ASR Wellfield	Aqua WSC	K	G; K; L	2030	$18,829,000
44	LCRA - Lower Basin Off-Channel Reservoir	Lower Colorado River Authority	K	G; K; L	2050	$4,072,661,000

Map Id	Project	Sponsor	Sponsor region	Benefiting regions	Online decade	Capital cost
45	LCRA - Purchase Wholesale Groundwater	Lower Colorado River Authority	K	G; K	2040	$634,998,000
46	New Surface Water Infrastructure - Aqua WSC	Aqua WSC	K	G; K; L	2050	$164,803,000
47	ARWA DPR Project (Phase 3)	Alliance Regional Water Authority	L	K; L	2060	$119,879,000
48	ARWA Expanded Carrizo-Wilcox Project (Phase 2)	Alliance Regional Water Authority	L	K; L	2040	$263,794,000
49	GBRA WaterSECURE - ASR	Guadalupe-Blanco River Authority	L	K; L	2040	$191,788,000
50	GBRA WaterSECURE - Brackish Groundwater	Guadalupe-Blanco River Authority	L	K; L	2040	$263,504,000
51	GBRA WaterSECURE - OCR	Guadalupe-Blanco River Authority	L	K; L	2040	$2,462,738,000
52	GBRA WaterSECURE - Shared Facilities	Guadalupe-Blanco River Authority	L	K; L	2040	$3,267,839,000

ASR – aquifer storage and recovery
CRMWA – Canadian River Municipal Water Authority
DPR – direct potable reuse
DWU – Dallas Water Utilities
GBRA – Guadalupe-Blanco River Authority
IPL – Integrated Pipeline
LCRA – Lower Colorado River Authority
LNVA – Lower Neches Valley Authority
MGD – million gallons per day
MWA – municipal water authority
MWD – municipal water district
NTMWD – North Texas Municipal Water District
OCR – off-channel reservoir
TRWD – Tarrant Regional Water District
UTRWD – Upper Trinity Regional Water District
WD – water district
WRF – water reclamation facility
WSC – water supply corporation
WTP – water treatment plant

7.5 Assignment of strategy and project supply volumes

The volume of water associated with all recommended water management strategy projects may, in some cases, be greater than an identified need or what was assigned to specific water user groups. Differences in water volumes may occur between the yield developed by certain projects at the source and the volume that would be conveyed to wholesalers or water user groups, the volume assigned to wholesale water providers and retail water providers, and/or the identified water user needs and strategy volume assigned to a specific water user. Depending on the project and provider, these differences in water volumes generally represent

- anticipated water losses in conveyance and/or treatment;
- a management supply or safety factor to address such uncertainties as whether recommended projects will be implemented, unanticipated water supply reductions, or greater-than-anticipated water demand for wholesale and retail water system operations;
- a planning buffer against a future drought worse than the drought of record;
- water supply available to a wholesale provider that could eventually be distributed to meet the needs of its customer water user groups; and/or
- a portion of the capacity of larger, optimally sized regional projects, such as major reservoirs, that come online later in the planning decades and that may not be fully connected to or utilized by water user groups, for example, until after 2080.

In some cases, additional water may be developed at the source only, while in other instances the water may be delivered to a wholesale provider but may not have been assigned to any specific water user

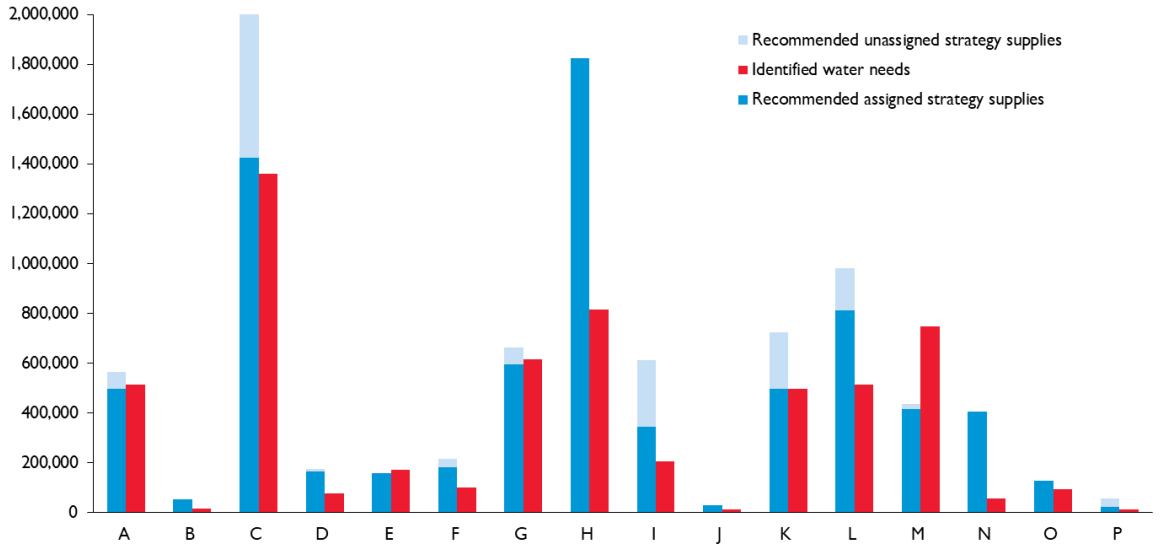
group in a particular decade. Future delivery of unassigned water volumes could require additional water infrastructure that may not be included in this plan.

The full capacities of all recommended projects and strategies that are included in the approved regional water plans—including any of their associated capacities or volumes of water that may not be assigned to specific water user groups—are also considered to be part of the state water plan. There are 21 recommended projects that are associated with only unassigned strategy supplies, meaning the supplies from these projects have not yet been allocated to a specific water user group. A significant portion of the unassigned supplies are indicative of the fact that some projects, especially those not anticipated to come online until later decades, are meant to provide water for future populations and other needs beyond the 2080 planning horizon.

Approximately 436,000 acre-feet per year of unassigned supply are associated with recommended strategies in 2030 and 1.7 million acre-feet per year is associated with recommended strategies in 2080. Unassigned strategy supplies account for 14 percent of the total supply share in 2030 and 19 percent in 2080. Figure 7-15 presents recommended assigned and unassigned strategy supplies in 2080 by region.

Even though a region's total recommended strategy supplies may exceed its total identified needs, some water user groups may still have unmet needs for reasons of geography. This occurs because needs and unmet needs are evaluated at the individual water user group level, then aggregated at the regional and state level to prevent shortages from being obscured by combining the various surpluses and deficits of different water users. Additional information on needs met by the plan and unmet needs is provided in Section 7.8.

Figure 7-15. Recommended assigned and unassigned strategy supplies and needs by region in 2080 (acre-feet)



7.6 Costs of recommended strategies

Planning groups estimated the costs of their recommended water management strategy projects using common cost elements and methodologies. This is the third cycle of regional plans in which planning groups utilized a cost estimation tool (Version 3.01) that was developed under a TWDB-funded research study, which has improved consistency and comparability across projects. The tool is updated each cycle to reflect current cost conditions, and planning groups may incorporate more detailed, project-specific estimates where available, adjusted to a common dollar year. In the Uniform Costing Model, contingency costs are embedded within broader cost factors. For planning level cost estimates, a

percentage of the construction cost is used to calculate costs for engineering, financial, and legal services, and contingencies. The contingency portion helps account for unforeseen circumstances and for variances in design and construction.

In accordance with planning rules and guidance, state water plans are intended to include only those recommended projects and costs necessary to conserve, develop, deliver, or treat additional water supply volumes. The plans specifically exclude cost for maintaining or replacing existing infrastructure as well as retail distribution projects—such as expanding internal distribution infrastructure to serve a new subdivision other than those directly associated with conservation strategies.

The total capital cost required to implement all recommended water management strategy projects is about $174 billion in 2023 dollars, without accounting for future inflation. This includes approximately 3,000 projects that would be built and completed at various times over the next five planning decades.

The estimated unit cost of water (dollars per acre-foot of water delivered to water user groups in each year) varies greatly depending on the strategy type, location, water source, and infrastructure required to convey and treat the water. Statewide, based on a weighted average cost,[14] the least expensive recommended water management strategy type in the year 2080 is aquifer recharge, followed by industrial conservation. The most expensive is groundwater desalination, followed by seawater desalination (Table 7-10). There can be a substantial range in unit cost even within a single type of strategy depending on the source water quality, project size, geographic distances, and whether the unit cost includes debt service in the later decades; this cost difference occurs between regions as well. For example, if a seawater desalination strategy requires pumping the treated water 100 miles inland, the costs of that strategy will likely be substantially greater than a seawater desalination plant built to serve an entity located on the coast.

Similarly, unit costs of water management strategies can vary over time. Unit costs generally decline over time as debt service included in early-decade costs is paid off. To illustrate this range, statewide unit costs were estimated by strategy type for two points in time: the decade which the strategy comes online and 2080, the last decade of the planning horizon (Table 7-11). Because approximately 90 percent of strategies are planned to be online before 2060 and debt service is generally estimated to span 20 years (or 40 years for reservoirs), the weight-averaged unit costs in 2080 serve as a reasonable proxy for unit costs with little or no remaining debt service.

Statewide weight-averaged unit costs appear generally higher than the 2022 State Water Plan for every strategy type except direct potable reuse and industrial conservation. Additional details on plan costs are provided in Chapter 9.

The growing cost of the state water plan

The total capital cost of projects in this plan reaches $174 billion in 2023 dollars, meaning the total nominal cost to implement the state water plan has more than doubled since the 2022 State Water Plan. A significant increase was expected for a variety of reasons, including: overall inflation and escalation of construction costs exacerbated by lingering post COVID-19 pandemic supply chain pressures over the past five years; a growing backlog of near-term recommended—but not yet implemented—water supply projects that remain in the plan; and the extension of the planning horizon an additional 10 years to 2080.

[14] The weighted average is the average of values scaled by the relative volume of each strategy.

Table 7-10. Weight-averaged unit costs (dollars per acre-foot) of strategy water supplies by region and strategy type in 2080*

Water management strategy type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Texas
Agricultural conservation	$87	$47	$305	na	$45	$0	$1,562	$155	$300	$0	$135	$347	$561	na	$619	$174	$215
Aquifer recharge	na	$4	na	na	na	na	$34	na	na	na	na	Na	na	na	na	na	$20
Aquifer storage & recovery	$2,884	na	$1,985	na	$511	na	$861	na	na	$181	$434	$669	na	$1,224	$1,598	na	$842
Municipal conservation water loss mitigation	$963	$2,405	$392	$387	$15,335	$2,112	$379	$745	$363	$13,348	$497	$7,139	$1,479	$581	na	$1,715	$1,010
Municipal conservation water use reduction	$619	$400	$88	$679	$132	$616	$682	$250	$210	$529	$1,014	$305	$308	na	$471	$296	$452
Direct potable reuse	na	na	$2,300	na	$167	$1,327	$467	na	na	$27	$2,120	$478	$1,984	$952	$1,002	na	$1,011
Drought management**	na	na	na	na	na	na	$0	$53	na	$0	$163	$358	$398	na	na	$621	$287
Groundwater desalination	$1,345	na	$2,027	na	$2,186	$929	$1,523	$1,087	na	$302	$2,261	$4,614	$2,177	$2,293	na	na	$2,739
Groundwater wells & other	$699	$363	$999	$1,069	$1,095	$194	$534	$959	$877	$691	$1,248	$4,120	$111	$226	$511	$1,446	$1,290
Indirect reuse	na	$751	$2,847	$3,167	na	$1,871	$1,448	$595	$254	na	$324	na	$2,298	na	na	na	$1,558
Industrial conservation	na	$510	$326	$105	na	na	$163	$247	na	na	$105	na	$25	$20	na	$20	$191
New major reservoir	na	$275	$3,049	$1,325	na	na	$959	$102	$1,340	na	$705	$1,440	na	na	$772	$155	$1,641
Other direct reuse	na	na	$671	na	$1,400	$325	$471	$555	na	$98	$338	$2,854	$344	$557	$474	na	$1,373
Other strategies	$1,857	na	$1,879	na	$243	$427	na	na	na	$101	$8,817	$7	$14	na	$1,945	na	$1,165
Other surface water	na	na	$2,287	$569	$322	$630	$822	$287	$672	$157	$1,854	$1,546	$846	$605	$3,849	$0	$969
Seawater desalination	na	na	na	na	na	na	na	$2,086	na	na	na	na	$2,226	$1,673	na	na	$1,706
Water recycling reuse	na	$3,111	$200	na	$1,365	$0	na	na	na	na	na	na	na	na	na	na	$287

** Unit costs include a mixture of projects, some of which will be beyond their debt service period by 2080.*

*** Unit costs for drought management strategies represent possible costs to municipal water users from foregone consumer surplus of imposed reduced water use rather than capital expended to produce water supply.*

na – not applicable or not available.

Table 7-11. Statewide weight-averaged unit costs (dollars per acre-foot)* of strategy water supplies by strategy type in online decade and 2080

Water management strategy type	Initial online unit cost	2080 decade unit cost**
Agricultural conservation	$337	$215
Aquifer recharge	$39	$20
Aquifer storage & recovery	$2,164	$842
Municipal conservation water loss mitigation	$3,263	$1,010
Municipal conservation water use reduction	$672	$452
Direct potable reuse	$2,525	$1,011
Drought management***	$232	$287
Groundwater desalination	$4,643	$2,739
Groundwater wells & other	$2,235	$1,290
Indirect reuse	$2,014	$1,558
Industrial conservation	$529	$191
New major reservoir	$2,488	$1,641
Other direct reuse	$1,693	$1,373
Other strategies	$479	$1,165
Other surface water	$1,505	$969
Seawater desalination	$3,634	$1,706
Water recycling reuse	$918	$287

* *Unit costs include a mixture of water user group-level infrastructure projects and project components. Unit costs can be higher in earlier decades due to debt service and, as a result, may decline over time.*

** *Costs shown for 2080 may reflect lower unit costs due absence of debt service for some projects.*

*** *Unit costs for drought management strategies represent possible costs to municipal water users from foregone consumer surplus of imposed reduced water use rather than capital expended to produce water supply.*

7.7 Impacts of recommended strategies

The process of developing regional water plans requires that planning groups describe the major impacts on key water quality parameters and how the plans are consistent with the long-term protection of water, agricultural, and natural resources.

7.7.1 Potential impacts on water quality

To assess how water management strategies could potentially affect water quality, planning groups identified key water quality parameters within their regions. These parameters were generally based on surface and groundwater quality standards, the list of impaired waters developed by the Texas Commission on Environmental Quality, and input from local and regional water management entities and the public.

Planning groups presented high-level assessments of how implementing strategies could potentially affect the water quality of surface water and groundwater sources. Regions used different approaches, including categorical assessments (such as low, moderate, high) or numerical impact classifications (such as 1, 2, 3, 4, 5).

To evaluate the potential impacts of the recommended water management strategies on surface water quality, the planning groups commonly used the Texas Surface Water Quality Standards, which include the following:

- **Total dissolved solids (salinity)**: For most purposes, total dissolved solids is a direct measure of salinity. Salinity concentration determines whether water is acceptable for drinking water, livestock, or irrigation.
- **Nutrients**: Nutrients are chemical constituents, most commonly as a form of nitrogen or phosphorus, that can occur in high concentrations and contribute to the overgrowth of aquatic vegetation and impact water uses.
- **Dissolved oxygen**: Dissolved oxygen concentrations must be sufficient to support existing, designated, presumed, and attainable aquatic life uses in classified water body segments.
- **Bacteria**: Some bacteria, although not generally harmful themselves, indicate potential contamination by feces of warm-blooded animals.
- **Toxicity**: Toxicity is the occurrence of adverse effects to living organisms due to exposure to a wide range of toxic materials.

The water quality indicators that planning groups commonly used to evaluate groundwater quality impacts of the recommended water management strategies include the following:

- **Total dissolved solids (salinity)**: As noted above, total dissolved solids is a measure of the salinity of water and represents the amount of minerals dissolved in water.
- **Nitrates**: Although nitrates are naturally occurring nutrients, elevated levels generally result from human activities, such as overuse of fertilizer and improper disposal of human and animal waste.
- **Arsenic**: Although arsenic can occur both naturally and through human contamination, most arsenic in Texas groundwater is naturally occurring.
- **Radionuclides**: A radionuclide is an atom with an unstable nucleus that emits radiation; this occurs naturally in several Texas aquifers.

Water management strategies for water supply are subject to the Texas Commission on Environmental Quality's Public Drinking Water and Water Quality standards, permitting, monitoring, assessment, treatment, sampling, and other requirements or methods used by that agency to address water quality problems related to water supply.

7.7.2 Protecting the state's water, agricultural, and natural resources

In developing the regional plans, planning groups honored all existing water rights and contracts and considered conservation strategies based on identified best management practices for all water user groups with a water supply need or that relied on an inter-basin transfer. Planning groups also accounted for environmental flow standards adopted by the Texas Commission on Environmental Quality, Consensus Criteria for Environmental Flow Needs, or when available, site-specific studies. Regional plans do not include any recommended strategies incompatible with the desired future conditions of aquifers or that divert greater-than-permitted surface water volumes.

Planning groups quantified and considered the impacts of water management strategies on agricultural resources. In developing the plans, planning groups were also required to consider and, when feasible, recommend water management strategies to meet the water supply needs of irrigated agriculture and livestock production. Recommended strategies involving conversion or transfer of water associated with existing water right permits—either being used for agricultural purposes or from rural areas—were based on future assumed voluntary transactions between willing buyers and sellers.

In considering the protection of natural resources, planning groups included estimated costs of anticipated mitigation requirements for project construction and quantified the potential impacts of water management strategies related to environmental factors. These factors were quantified and summarized primarily based on existing data and the potential to avoid or mitigate impacts. Some categorized assessments as "high," "moderate," or "low" based on underlying quantified impacts or ranges of impacts. For example, a "low" impact rating indicated that impacts could generally be avoided or mitigated relatively easily. In contrast, an impact rated as "high" generally indicated that impacts would be significant with the potential for substantial mitigation requirements.

In their environmental reviews, planning groups also considered a variety of factors, including the volume of discharge a strategy would produce, the number of acres of habitat potentially affected, changes to streamflow, and changes to bay and estuary inflow patterns. The groups also relied on identifying the number of endangered or threatened species or cultural sites occurring within the vicinity of the recommended projects.

The emphasis of these evaluations varied by region based on the type of project under consideration and the relevant resources affected. Evaluations included project-by-project evaluations as well as cumulative, region-wide impact analyses. In general, most planning groups relied on existing information and data generated as part of the technical evaluations of strategies—such as flow frequency data, land cover, and habitat maps—to evaluate the impacts of water management strategies on agricultural and natural resources.

7.8 Needs met by recommended strategies and unmet needs

Planning groups were required to consider all identified water needs (potential shortages) and to identify possible strategies to meet them, when feasible. Three planning groups (Regions B, N, and P) were able to recommend water management strategies that, if implemented, can meet the needs of all their water user groups. The remaining 13 planning groups were unable to identify sufficient feasible strategies that could meet both Texas' planning requirements and all the needs in their regions (Figure 7-16).

An unmet water need is the portion of an identified water need that would not be met after implementing all recommended water management strategies. This generally occurs when a planning group cannot identify an economically feasible water management strategy to address the potential shortage. At least some unmet water supply needs occur for all categories of water user groups, with irrigation water user groups accounting for most unmet water needs (Figure 7-17, Tables 7-12 and 7-13).

Statewide, approximately 19 percent of the total projected irrigation drought demand in 2080 would be unmet by the plan. The significant unmet irrigation water needs are largely due to reduced groundwater availability over the planning period associated with the managed depletion of aquifers, along with a lack of economically feasible alternatives to meet agricultural needs under drought. Note that much of the unmet irrigation needs associated with managed aquifer depletion are anticipated to occur in most years—not just severe drought years—since aquifer depletion reduces the capacity to irrigate in all years.

Statewide unmet municipal needs increase over the planning horizon from about 35,000 acre-feet per year in 2030 to 197,000 acre-feet per year in 2080. Seven planning groups (Regions A, C, D, F, G, K, and L) were unable to identify potentially feasible strategies to fully meet all identified municipal water needs for a total of 220 water user groups. Municipal unmet needs account for approximately 3 percent or less of municipal demands for these regions in most decades. The exception is Region G, where unmet needs account for 4 to 13 percent of the region's municipal demands over the planning period.

At the county level, unmet municipal needs become more severe in some counties between 2030 and 2080, and the overall number of counties with unmet municipal needs largely remains unchanged

between the two decades (Figure 7-18). In the near term, Dallas, Williamson, and Brazos counties are projected to have the largest unmet municipal needs if no additional strategies are implemented and a drought of record occurs. These three counties together account for nearly 70 percent of statewide unmet municipal needs in 2030. By 2080, more than half of all statewide municipal unmet needs occur in Williamson County.

Regions noted that some unmet municipal needs arise because supply is constrained within the limits imposed by modeled available groundwater values associated with desired future conditions. Also, in practice, these unmet municipal needs may be less, depending upon future regulatory decisions of groundwater conservation districts and their management of groundwater permits. Regions with unmet municipal needs provided the following explanations as to how affected water user groups will ensure protection of public health, safety, and welfare in the event of a repeat of the drought of record:

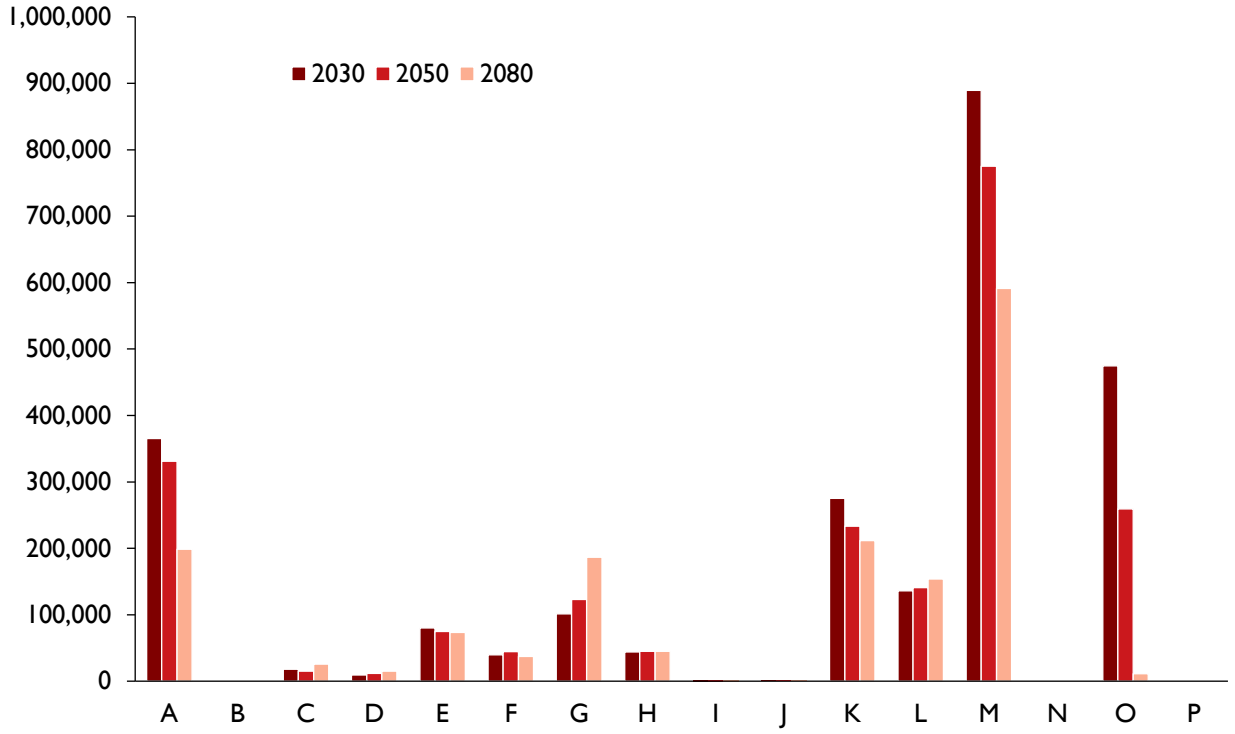
- Developing additional groundwater supplies, as legally allowable, to meet needs.
- Coordinating with groundwater conservation districts to temporarily develop groundwater supplies above the modeled available groundwater volume.
- Implementing drought management measures as outlined in individual drought contingency plans to prolong supply and reduce impacts to communities by limiting water use to only essential water uses.
- Implementing emergency reponse options such as emergency interconnection or purchasing hauled water.

An unmet need shown in a regional plan does not prevent an associated entity from developing additional water supplies to address it. In some instances, portions of an underlying, projected increase in demand that is the cause of an unmet need in the plan may simply not occur where anticipated, instead arising in a less water-scarce geographic location. An example would be when power generators change locations of future power production facilities from where they are currently anticipated to be built.

Unmet needs assume full implementation of strategies in this plan

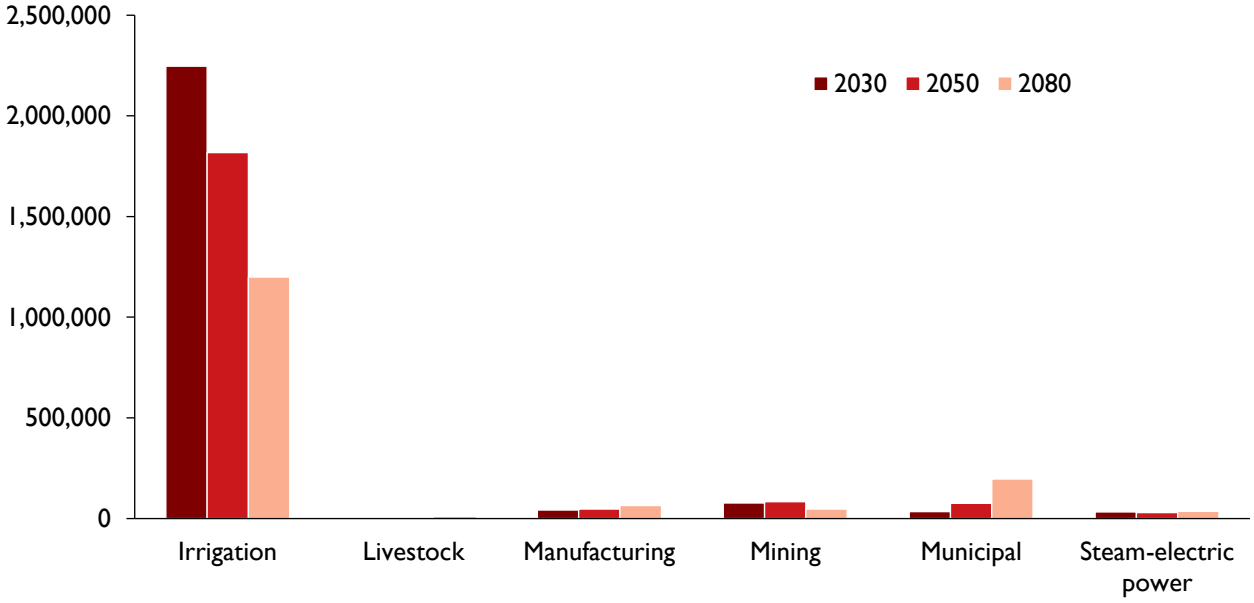
The projected 1.6 million acre-feet per year of unmet needs in 2080 represent a subset of the 5.8 million acre-feet per year water needs identified in Chapter 6. Water needs represent the anticipated shortages that Texas will face *if none of the water management strategies in this plan are implemented*. Whereas unmet needs are the anticipated shortages that water user groups would still face in a drought of record *assuming full implementation of all recommended water management strategies in this plan*. Significant unmet municipal needs highlight areas where additional effort, attention, and resources will likely be required to find solutions.

Figure 7-16. Annual unmet water supply needs by region in 2030, 2050, and 2080 (acre-feet)



** Regions B, N, and P are projected to have no unmet water supply needs if all recommended strategies are implemented. Projected unmet needs in Regions I and J remain at or below about 2,000 acre-feet per year across the planning horizon.*

Figure 7-17. Annual unmet water supply needs by water use category in 2030, 2050, and 2080 (acre-feet)



** Livestock unmet needs are projected to be less than 10,000 acre-feet per year across the planning horizon and are at a scale not visible in the figure.*

Table 7-12. Statewide projected annual unmet water needs (acre-feet)

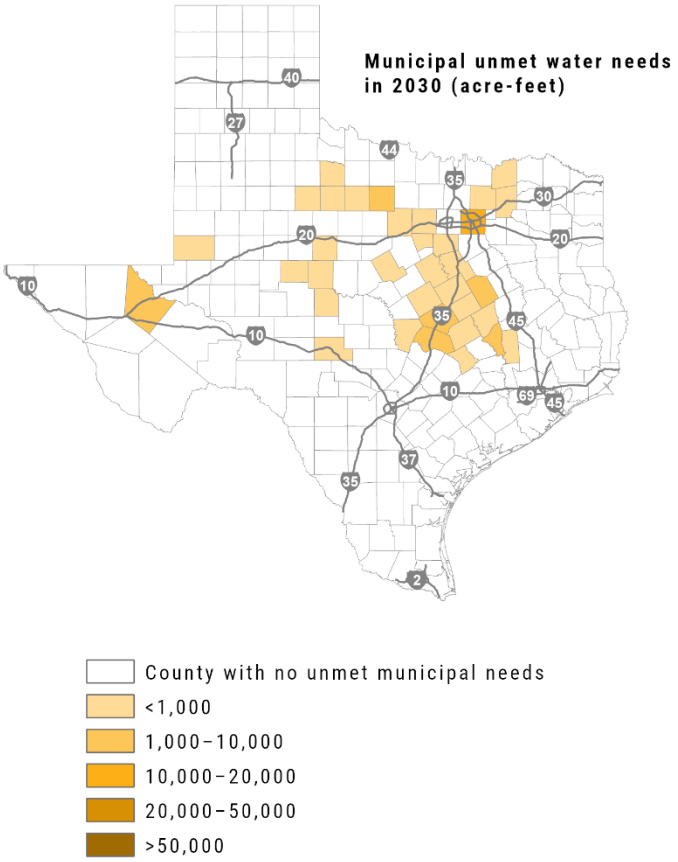
Water use category	2030	2040	2050	2060	2070	2080
Irrigation	2,246,993	2,208,123	1,817,168	1,435,313	1,314,403	1,200,128
Livestock	3,086	3,313	3,887	5,826	7,620	9,329
Manufacturing	41,793	43,626	47,840	53,622	58,872	64,153
Mining	77,050	81,481	82,925	82,776	79,789	47,296
Municipal	35,004	41,826	75,359	153,733	141,331	197,103
Steam-electric power	32,491	35,875	29,682	31,987	33,136	35,249
Total	**2,436,417**	**2,414,244**	**2,056,861**	**1,763,257**	**1,635,151**	**1,553,258**

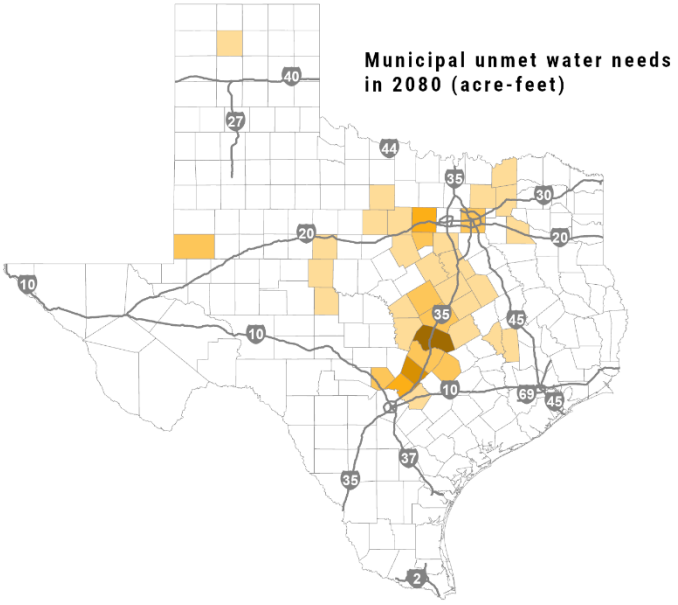
Table 7-13. Projected annual unmet water needs by region and water use category (acre-feet)

Region	Water use category	2030	2040	2050	2060	2070	2080
A	Irrigation	365,396	401,480	330,483	271,094	227,267	189,549
A	Livestock	0	0	538	2,449	4,222	5,923
A	Manufacturing	0	0	168	893	1,852	3,004
A	Municipal	0	0	0	105	211	322
C	Irrigation	5,120	5,034	4,958	4,918	4,882	4,865
C	Manufacturing	1,699	1,620	1,782	2,265	2,116	2,291
C	Municipal	10,981	11,099	6,757	48,674	13,003	16,459
C	Steam-electric power	0	1,384	1,617	2,695	2,027	2,232
D	Irrigation	7,830	7,830	7,829	7,829	7,829	7,829
D	Livestock	83	83	83	83	83	83
D	Mining	1,215	1,199	1,185	1,177	1,168	1,168
D	Municipal	62	116	181	354	344	452
D	Steam-electric power	0	1,198	2,458	3,143	4,433	5,693
E	Irrigation	74,662	70,209	69,456	68,989	68,562	68,110
E	Mining	5,372	5,375	5,379	5,381	5,382	5,382
F	Irrigation	8,546	12,772	13,381	14,717	14,801	14,674
F	Manufacturing	70	140	184	218	249	279
F	Mining	24,673	26,006	24,153	20,492	15,069	11,114
F	Municipal	2,646	1,664	2,782	4,054	5,381	6,790
F	Steam-electric power	3,940	3,989	3,969	4,035	4,099	4,165
G	Irrigation	45,563	35,948	31,439	28,708	30,891	31,139
G	Livestock	900	908	915	922	929	936
G	Manufacturing	257	268	275	694	828	319
G	Mining	7,725	7,460	7,378	7,512	6,653	6,770
G	Municipal	21,151	28,635	63,890	87,884	95,170	127,199

Region	Water use category	2030	2040	2050	2060	2070	2080
G	Steam-electric power	25,824	26,577	18,911	19,387	19,850	20,432
H	Irrigation	41,407	41,721	41,813	41,891	41,919	41,937
H	Livestock	2,075	2,294	2,323	2,344	2,358	2,359
H	Mining	710	710	710	710	710	710
I	Steam-electric power	2,061	2,061	2,061	2,061	2,061	2,061
J	Irrigation	891	891	891	891	891	891
J	Livestock	28	28	28	28	28	28
J	Manufacturing	2	2	2	2	2	2
J	Mining	75	75	75	75	75	75
K	Irrigation	274,305	243,887	229,983	216,454	203,558	191,388
K	Mining	795	1,074	1,393	1,781	2,165	2,521
K	Municipal	164	312	1,749	6,623	11,992	17,846
L	Irrigation	62,403	60,336	55,331	52,286	49,754	47,206
L	Manufacturing	39,765	41,596	45,429	49,550	53,825	58,258
L	Mining	33,371	36,467	39,536	42,530	45,382	19,556
L	Municipal	0	0	0	6,039	15,230	28,035
L	Steam-electric power	666	666	666	666	666	666
M	Irrigation	886,185	832,772	772,109	710,988	650,653	591,422
M	Mining	3,114	3,115	3,116	3,118	3,185	0
O	Irrigation	474,685	495,243	259,495	16,548	13,396	11,118
Texas	**All**	**2,436,417**	**2,414,244**	**2,056,861**	**1,763,257**	**1,635,151**	**1,553,258**

Figure 7-18. Projected municipal unmet water needs aggregated by county in 2030 and 2080





7.9 Comparison to the 2022 State Water Plan

The volumes and relative mix of recommended water management strategies shift between each state water plan for a variety of reasons. For example, some strategies recommended in the previous plan will have been implemented by the adoption of the next water plan, at which time those "new" supplies are then accounted for as existing water supplies (Chapter 5 of this plan), thereby reducing the resulting water needs volume.

Counts of recommended strategies in this plan vary from the 2022 State Water Plan largely due to the addition of new strategy types (aquifer recharge, municipal conservation water loss mitigation, municipal conservation water use reduction, water recycling reuse). There are approximately 6,700 recommended strategies described in this plan that represent the total number of recommended strategies assigned to water user groups, accounting for individual and grouped strategies. This represents a net increase of approximately 900 recommended strategies compared to the 2022 plan.

Both plans include a varying mixture of water supply volumes not directly associated with water user groups. However, the associated volumes and project sponsors differ, making comparisons between plans difficult. The recommended water management supplies presented here are those supply volumes that planning groups associated with specific water user groups. Notable changes from the 2022 State Water Plan include the following:

- Anticipated total strategy supplies directly associated with water user groups in the 2070 decade decreased from 7.8 million acre-feet in the 2022 State Water Plan to 7.0 million acre-feet in this plan, primarily due to a lower volume of needs to address in 2070. Implementation of major water supply projects since the last plan—including Bois D'Arc Lake and Lake Ralph Hall—also contributes to the decrease, since strategy supplies transition to existing supply once a strategy and associated projects are implemented.
- The types and magnitudes of recommended water projects remains similar to prior plans. This continued, relative stability of the regional plans indicates that the most feasible water supply options across the planning regions continue to be grounded in a sound planning process.
- The total capital costs of all recommended strategies increased significantly from $81 billion in the previous plan to $174 billion. The increase in costs between planning cycles is due to a combination of factors, including the addition of new projects, refinement of project scopes, general inflation and increased construction costs, and unimplemented near-term projects that remain in the plan. It also reflects a major change resulting from the Region C and Region D mediated agreement that elevated the Toledo Bend Reservoir project from an alternative to a recommended strategy, which added $9.8 billion to the total plan cost.
- Capital-intensive conservation strategies increased significantly to $17.7 billion—$10.4 billion more than in the previous plan—largely due to the addition of the new water loss mitigation conservation strategy type and increased efforts by planning groups to identify and recommend strategies to address water loss.
- Major surface water reservoirs continue to play a significant role despite the considerable time and resources required to implement them. This is unsurprising as reservoirs are well-established as one of the most efficient means of developing large volumes of the state's water, including to capture and store flood flows. More broadly, development of surface water continues to account for a dominant share (36 percent) of all future water supply strategies, exceeding development of all other water supply sources combined.
- The volume of recommended municipal conservation savings in 2070 increased from 977,000 acre-feet per year recommended in the 2022 plan to 1.1 million acre-feet per year.
- The volume of recommended direct potable reuse strategies in 2070 doubled from approximately 62,000 acre-feet per year in the 2022 plan to 138,000 acre-feet per year.

- The volume of recommended desalination strategies in 2070 increased by 41 percent from 412,000 acre-feet per year in the 2022 plan to almost 580,000 acre-feet per year.
- Total annual statewide unmet needs are approximately 15 percent lower in 2030 and 34 percent lower in 2070 than the 2022 plan. The net change is due almost entirely to reduced irrigation unmet needs, driven by the revised methodology for projecting irrigation demands in Region O in this plan. There were some notable increases in 2070 unmet needs between the plans, including increased municipal unmet needs in Region G and irrigation unmet needs in Regions A and K.
- There were notable increases in 2030 unmet municipal needs for Regions C and G. Region C municipal unmet needs increased by almost 11,000 acre-feet due to rapid growth, lack of available supplies, and the timing required to implement strategies. Region G unmet municipal needs increased by over 18,000 acre-feet following changes to the region's strategy recommendation process to incorporate criteria from its infeasibility review. In addition, Region G unmet municipal needs in 2080 increased significantly, by more than 95,000 acre-feet compared to the previous plan.

8 Conservation

Quick facts

This is the first state water plan in which planning groups were required to distinguish between two types of municipal conservation strategies—water use reduction and water loss mitigation.

Conservation is recommended in all 16 regional water plans and accounts for a substantial share of total recommended water management strategy supplies, particularly in the near-term planning decades.

Fourteen planning regions recommend water use reduction strategies that are projected to save 780,000 acre-feet in 2080 at no capital cost.

Fifteen regions recommend water loss mitigation strategies that are expected to save nearly 473,000 acre-feet per year by 2080, with Region H alone accounting for about half of statewide savings.

Total capital costs for water loss mitigation projects are estimated at $16.6 billion.

Statewide average municipal per capita use has generally declined over the past several decades, reflecting the cumulative effects of conservation implementation funded through multiple state financing programs.

Conservation plays a critical role in meeting Texas' future water needs and remains one of the most cost effective and broadly applicable strategies available to water providers. Across the state, utilities dedicate resources to improving both indoor and outdoor water use efficiency and in reducing utility water loss. The increased attention is evident by enhanced conservation planning in the regional water plans and new initiatives within Texas Water Development Board (TWDB) conservation programs.

Planning groups recommended a variety of water conservation measures and best practices to reduce water consumption, limit losses and waste, and enhance the long-term reliability of existing water supplies[15] without constraining economic or community activities. In this planning cycle, conservation is presented with added clarity. For the first time, municipal conservation strategies are specifically separated into two distinct types—water use reduction and water loss mitigation—marking a shift toward more standardized and measurable conservation planning and implementation tracking.

Measured statewide, municipal per capita water use has generally declined over several decades, as shown later in this chapter (Figure 8-8), which indicates potential implementation of conservation programs as well as the impacts of state and federal plumbing efficiency standards. Although measuring conservation implementation remains challenging, efforts have been made to improve tracking through expanded use and visualization of data reported in water conservation plan annual reports and water loss audits.

This chapter provides information on TWDB conservation programs and compiles conservation information from Chapter 5 of the regional water plans, including recommended conservation strategies, municipal gallons per capita per day (GPCD) goals, and conservation-related policy recommendations. It also provides an overview of conservation implementation progress across the state.

[15] Texas Water Code § 11.002 defines conservation as the development of water resources and those practices, techniques, and technologies that will reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses. For regional planning purposes, activities labeled as water conservation measures do not include reservoirs, aquifer storage and recovery, or other types of projects that develop new water supplies. Additionally, water reuse is considered a unique strategy type separate from conservation, as are drought management strategies.

8.1 Agency program and legislated conservation initiatives

The TWDB administers programs that support water conservation across Texas by providing utilities and planning groups with data, tools, and educational and financial resources to plan for and implement conservation. The agency's water loss initiatives have expanded in recent years to include water loss audit validation, enhanced technical assistance, and improved reporting to increase the accuracy and availability of water loss data. The TWDB also provides planning groups with a variety of conservation-related information collected through water conservation plans, annual implementation reports, and water loss audits to support development of the regional water plans. These data are publicly available on the TWDB historical data webpage at www.twdb.texas.gov/conservation/municipal/waterloss/historical-annual-report.

8.1.1 Water conservation plans and annual reports

Water conservation plans describe how utilities monitor and manage water use and establish quantified five- and ten-year GPCD targets for total use, residential use, and water loss, along with implementation schedules, progress-tracking methods, and rate structures that discourage excessive use. Plans also include such long-term measures as public education, universal metering, water accounting, reuse and recycling savings, and leak detection and repair.

Water conservation plans are updated every five years, and approximately 800 entities were required to submit them to the TWDB and the Texas Commission on Environmental Quality and to provide copies to their regional water planning group in 2024. In addition, about 1,000 entities submit annual reports to the TWDB that describe conservation implementation progress, including water use, GPCD, implemented best management practices, leaks repaired, and water loss.

Data from water conservation plan annual reports—including GPCD trends and targets and recently implemented best management practices—are visualized through the TWDB conservation information dashboard for water supply planning, available at www.twdb.texas.gov/waterplanning/data/dashboard/conservation.

8.1.2 Water loss audits, validation, and technical assistance

Water loss audits and related validation and assistance programs provide the foundational data needed to understand system losses and support effective planning. The following subsections summarize water loss audit requirements, validation efforts, technical assistance initiatives, and recent legislative directives that guide this work.

Water loss audits

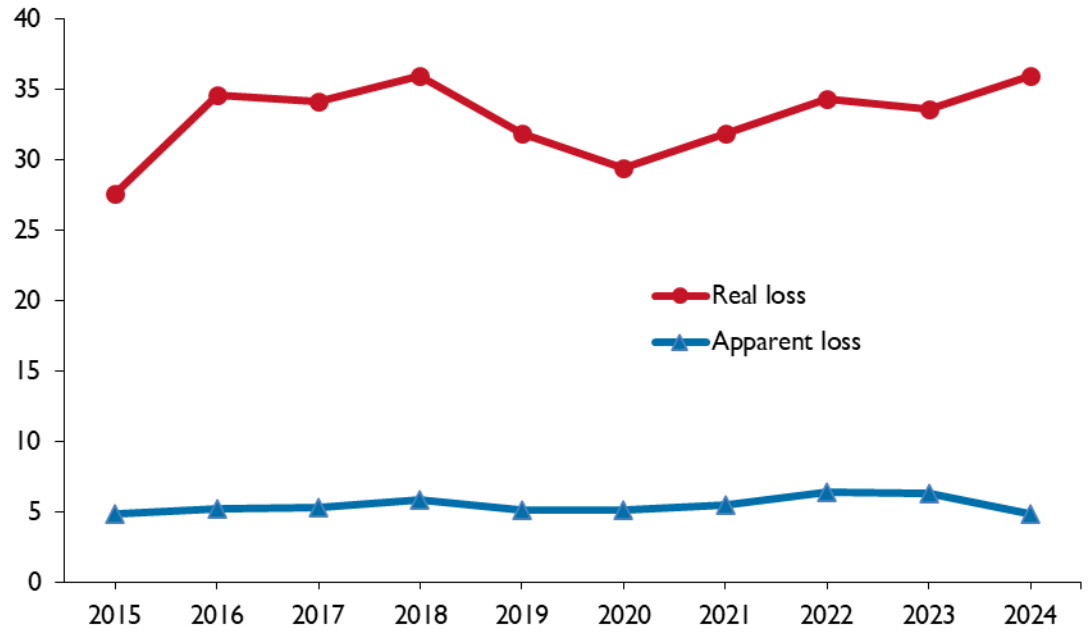
To plan effectively for the future, water utilities must first understand how much water they are using within and losing from their systems. Utilities conduct and submit water loss audits to the TWDB—about 800 utilities annually and 4,000 every five years—to determine how much water is being lost from their systems and how and where mitigation efforts are needed. Water loss audits also help assess the effectiveness of utility policies and procedures related to data collection and reporting. This is important because if a utility's water loss mitigation plan is developed using incorrect data, it may be less effective. Accurate and reliable data helps utilities and the state make informed decisions when it comes to directing resources to meet Texas' water needs.

Based on data from 2024 water loss audits, total annual statewide water loss is approximately 519,000 acre-feet. Of this total, about 64,000 acre-feet are classified as *apparent water loss*—water that is consumed but not properly measured or billed—and approximately 454,000 acre-feet are *real water loss*, representing water physically lost from water systems. Most apparent loss (52,000 acre-feet) is attributable to water volumes unaccounted for due to inaccurate customer meters. Most real loss

(393,000 acre-feet) is categorized as unreported losses, which includes losses that are not detected due to the small size of the leak, the leak location, or other factors. The six municipally-owned utilities with more than 150,000 service connections that are affected by House Bill 29, discussed later in this chapter, account for approximately 215,000 acre-feet, or 41 percent, of the total statewide water loss.

Water loss is often measured by how many gallons of water are lost per service connection each day (gallons per *connection* per day). Based on data from 2024 water loss audits, the statewide median apparent water loss amounts to nearly 5 gallons per connection per day, while real water loss is approximately 36 gallons per connection per day (Figure 8-1).

Figure 8-1. Statewide historical, median real and apparent water loss by audit year (gallons per connection per day)



Water loss performance indicator key terms

Gallons per connection per day (GCD) is a normalized unit of measurement used to report water loss relative to the number of service connections.

Apparent Loss GCD is a performance indicator used to track a water utility's efforts to reduce apparent water loss. It is calculated by dividing the total volume of apparent loss by the number of service connections and by 365 days.

Real Loss GCD is a performance indicator used to track a water utility's efforts to reduce real water loss. It is calculated by dividing the total volume of real loss by the number of service connections and by 365 days.

Water loss validation

Once water loss audits are submitted, validation helps ensure the data reported by utilities are reliable and consistent. The validation process involves reviewing audit inputs to improve accuracy, identify errors or misapplied methodologies, and document associated uncertainty. As of January 1, 2025, utilities with an active financial obligation to the TWDB or those applying for financial assistance are required to validate their annual water loss audits. The TWDB provides validation services at no cost, although utilities may use third-party validators if the validation is consistent with TWDB guidelines.

In 2025, the TWDB completed 226 of the 499 required validations. The remaining audits were not completed for various reasons: 125 utilities were non-responsive, 78 failed to submit an audit, and 70 were not contacted due to limited staff resources. Of the 226 completed validations, 53 were required based on the utility having a new loan and 173 were required for utilities having an existing loan through the TWDB.

Texas Water Loss Audit Validation Study

In 2021, the TWDB completed a water loss audit validation study involving 10 volunteer utilities of varying sizes from across the state. The study confirmed the value of validating reported water loss data and helped inform several key TWDB actions. As a result, the TWDB

- launched a pilot program for water loss validation,
- incorporated the pilot program into the State Revolving Fund Intended Use Plans, and
- adopted new rules requiring water loss validation for utilities that submit annual water loss audits due to a financial obligation to the TWDB or when applying for financial assistance.

For more on the Texas Water Loss Audit Validation Study, visit: www.twdb.texas.gov/publications/reports/contracted_reports/doc/2100012468.pdf.

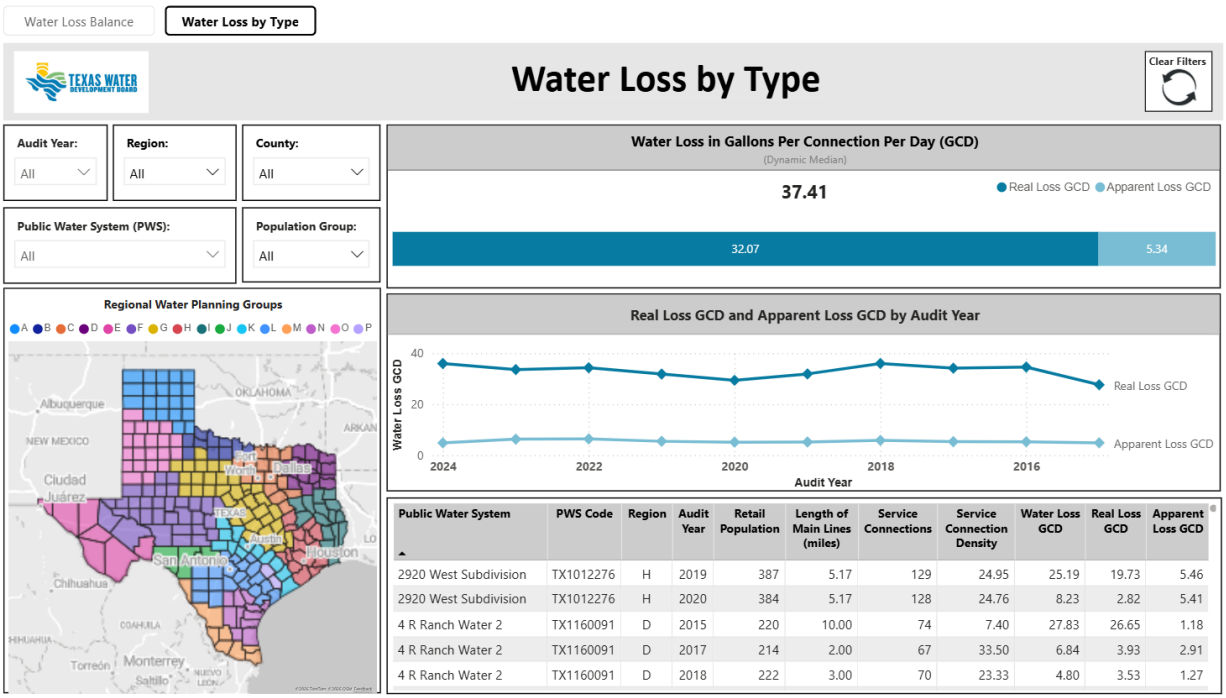
Enhanced technical assistance

In 2023, Senate Bill 28 (88th Legislature) directed the TWDB to establish a water loss technical assistance program to help retail public utilities conduct water loss audits and pursue financial assistance to mitigate losses. Technical assistance is prioritized based on submitted audits, population served, and system integrity.

In 2025, the TWDB reviewed 2024 water loss audits to identify data issues and conducted targeted outreach, prioritizing smaller and rural systems. This initial review found that approximately 30 percent of submitted audits contained at least one significant data issue, ranging from impossible values and abnormal loss indicators to less severe anomalies.

To further improve access to information, the TWDB maintains an interactive water loss dashboard—updated quarterly—that presents key performance indicators, mitigation measures, audit validations, and financial assistance information to help utilities and stakeholders evaluate system performance and identify opportunities to reduce water loss (Figure 8-2). The water loss dashboard is available at www.twdb.texas.gov/conservation/data/water-loss-dashboard.

Figure 8-2. TWDB Water Loss Dashboard



Public Water System	PWS Code	Region	Audit Year	Retail Population	Length of Main Lines (miles)	Service Connections	Service Connection Density	Water Loss GCD	Real Loss GCD	Apparent Loss GCD
2920 West Subdivision	TX1012276	H	2019	387	5.17	129	24.95	25.19	19.73	5.46
2920 West Subdivision	TX1012276	H	2020	384	5.17	128	24.76	8.23	2.82	5.41
4 R Ranch Water 2	TX1160091	D	2015	220	10.00	74	7.40	27.83	26.65	1.18
4 R Ranch Water 2	TX1160091	D	2017	214	2.00	67	33.50	6.84	3.93	2.91
4 R Ranch Water 2	TX1160091	D	2018	222	3.00	70	23.33	4.80	3.53	1.27

New requirements for Texas' largest municipally owned utilities

House Bill 29, passed by the 89th Texas Legislature in 2025, established new water loss audit validation and mitigation planning requirements for municipally-owned utilities with more than 150,000 service connections. Based on 2024 audit submissions, six utilities meet this threshold: Austin, El Paso Water, Fort Worth, Houston, Dallas Water Utilities, and the San Antonio Water System.

Affected utilities must obtain third-party validation of their water loss audits within 180 days of filing and submit a water loss mitigation plan to the TWDB within one year. Mitigation plans must

- include multi-year goals, implementation measures, and estimated water savings and costs;
- be incorporated into the utility's water conservation plan; and
- be updated following detailed audit validations, which are required by December 31, 2030, and every 10 years thereafter.

These validation results will be made available through the TWDB water loss dashboard.

8.1.3 Agricultural water conservation grants program

The TWDB also supports agricultural conservation through grants and low-interest loans. The Agricultural Water Conservation Grants Program offers grants to state agencies, political subdivisions, and universities to demonstrate agricultural water conservation best management practices and to support the implementation of agricultural conservation strategies in alignment with the state water plan. Past grants have supported education and technical assistance, demonstration projects, technology transfer, equipment cost share, and research. The TWDB also offers low-interest, fixed-rate loans to political subdivisions that can then pass funds to individual producers for irrigation equipment upgrades and improved irrigation efficiency. In 2025, the 89th Texas Legislature passed Senate Bill 7 that made changes to the Texas Water Fund statute, expanding the accounts to which funds may be transferred, including the Agricultural Water Conservation Fund.

From 2014 through 2025, the Agricultural Water Conservation Fund provided financial assistance to 112 projects, including grant awards totaling $29.2 million and loan commitments totaling nearly $11.1 million. Collectively, these funded projects are estimated to have generated water savings exceeding 700,000 acre-feet. In 2025, the program received a record 37 grant applications requesting $9.7 million—9 of which were awarded funding totaling $1.5 million.

8.2 Conservation's role in the state water planning process

Conservation is an integral part of the state water planning process, beginning with how passive savings are incorporated into municipal demand projections. Every five years, the TWDB develops water demand projections for each of the regional planning groups to review and use in their regional plans (Chapter 4). The municipal water demands utilize GPCD that is based on historical dry-year water use and anticipated water savings (passive conservation savings) from federal and state water-efficiency standards for plumbing fixtures and appliances.

These anticipated water savings are referred to as passive water savings because they do not require any additional action on the part of water utilities to realize the savings. Importantly, the per capita per day water use in these municipal projections already reflects previous and often significant conservation savings already achieved. That includes, for example, benefits from conservation best management practices that water providers may have been following for years. Past conservation achievements necessarily limit the future capacity for achieving additional conservation, especially in areas with limited growth.[16]

Under efficiency standards in place at the time of this plan's development, the additional, combined savings of water-efficient showerheads, clothes washers, residential toilets, and commercial toilets and urinals are anticipated to reduce the future municipal water demands of the state by approximately 3 percent in 2030 and 4 percent in 2080 (Chapter 4). Passive saving volumes and recommended municipal conservation strategies will together amount to about 486,000 acre-feet of water in 2030 and approximately 1.6 million acre-feet in 2080 (Table 8-1).

In the context of all recommended conservation supplies, passive savings exceed the volumes recommended for industrial conservation and represent nearly one-third of recommended agricultural conservation strategy supplies (Figure 8-3). Although these savings are already incorporated into the water demand projections—thereby lowering them—that are the basis for the regional and state plans, passive savings play an important role in reducing long-term water demand.

Compared to the previous state water plan, methodology updates have resulted in lower anticipated passive savings in later decades. The revised method stops counting savings after the final year in which fixture replacements can produce measurable benefits, an improvement over the prior approach that overstated long-term savings. Additional changes include the following:

- Removing faucet and dishwasher savings because efficiency gains are expected to be fully realized by 2030.
- Calculating savings using the difference between pre- and post-replacement water use, divided by the decade's ending population—replacing the marginal-savings method that tended to overstate impacts for growing water user groups.
- Shortening the assumed useful life of toilets from 50 to 25 years, reducing projected long-term savings.

[16] This tendency for past conservation to increase the difficulty and cost of additional future conservation is called "demand hardening."

Once water supply needs (potential shortages) are identified, each planning group is required to first consider water conservation strategies to address those needs. As planning groups identify and evaluate water management strategies, they must also consider existing utility water conservation plans and data from water loss audits submitted by water providers in the region. If a planning group determines that recommending a conservation strategy for an identified water need is not feasible, it must document the reason in its plan.

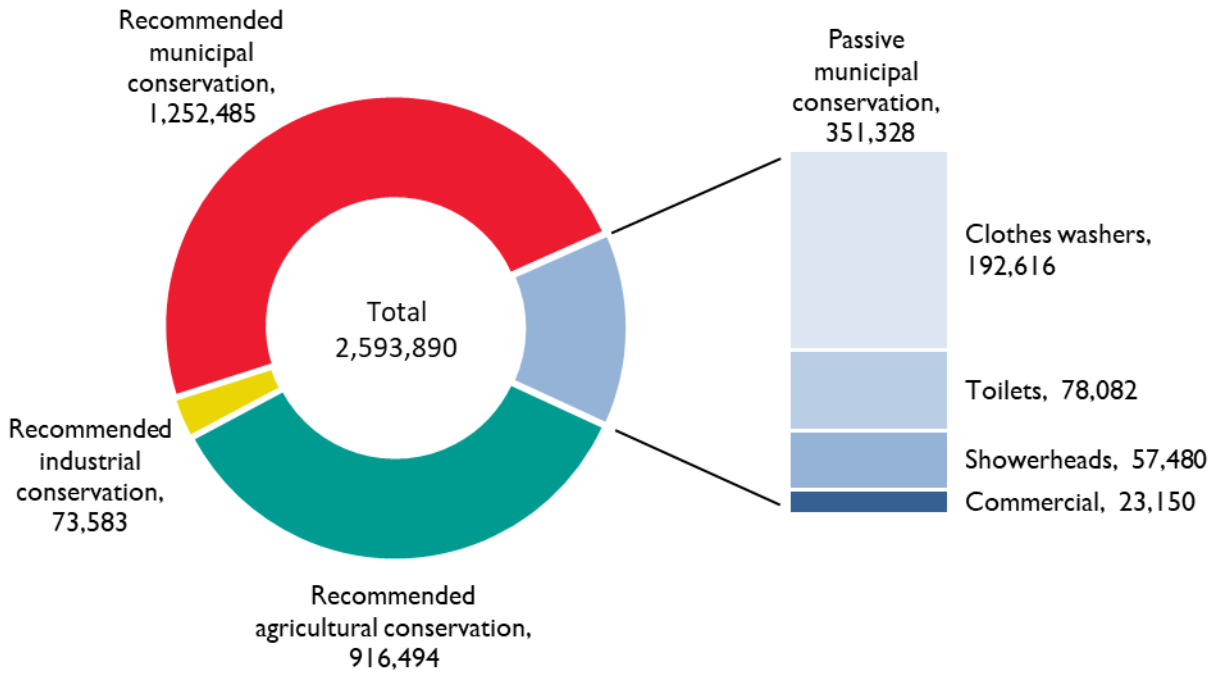
Each plan must also include region-specific model water conservation plans as a resource for entities to reference when developing their own water conservation plans. In doing so, planning groups have generally chosen to reference Texas Commission on Environmental Quality requirements for compulsory conservation plans from certain entities every five years. These include such factors as a utility profile that describes the entity, water system, and water use data; quantified 5-year and 10-year water savings goals; and documentation of coordination with the regional water planning group.

For water users dependent upon water management strategies involving interbasin transfers, planning groups are required to include the highest practicable level of water conservation for those entities. To help each planning group evaluate whether they are meeting those associated conservation expectations, the TWDB uses the state water planning database to provide summaries of each region's conservation strategy savings associated with water users who may depend on future interbasin transfers.

Table 8-1. Anticipated (passive and strategy) municipal conservation water volumes in 2030 and 2080 (acre-feet)

		2030	2080
Demands	**Passive water savings by fixtures/appliances**		
	Clothes washers	105,582	192,616
	Toilets	25,889	78,082
	Showerheads	31,778	57,480
	Commercial	7,946	23,150
	Subtotal	**171,195**	**351,328**
Strategies	**Subtotal recommended municipal conservation strategy supplies**	**314,314**	**1,252,485**
	Total	**485,509**	**1,603,813**

Figure 8-3. Breakdown of anticipated (passive and strategy) conservation water volumes in 2080 (acre-feet)



8.3 Establishing regional conservation goals

Regional water planning groups are required to recommend municipal GPCD goals for each planning decade under drought conditions. These dry-year goals align with the benchmarks used in the regional and state water plans and may differ from utility conservation plan goals, which are often based on multi-year averages and total GPCD. To support goal development, the TWDB provided planning groups with historical water use estimates and information from water conservation annual reports.

Most planning groups developed GPCD goals by adjusting baseline dry-year planning GPCD to account for anticipated passive savings and recommended conservation strategies, though approaches varied by region. In response to updated guidance, some regions applied annual percentage reductions consistent with Water Conservation Advisory Council recommendations, while others continued using a 140 GPCD target[17] or relied on estimated savings from selected best management practices. Specific municipal GPCD goals are documented in the regional water plans.

In the 2026 regional water plans, four regions (Regions G, N, O, and P) continued to base their conservation strategies—and thereby their municipal GPCD goals—on reducing water use until 140 GPCD is reached. Three regions (Regions K, L, and M) applied an annual percentage reduction in GPCD like the method recommended by the Water Conservation Advisory Council. The remaining regions largely based their municipal conservation strategies on anticipated savings from selected best management practices.

[17] This specific target was a recommendation by the 2004 Water Conservation Implementation Task Force (WCITF, 2004).

Gallons per capita per day

Gallons per capita per day, or GPCD, is a common metric used by municipalities, water utilities, and regional planners to assess water use, evaluate system needs, and track conservation implementation. GPCD can be calculated in several ways depending on the water use and population inputs applied. Two GPCD metrics commonly used in TWDB programs are described below.

Regional water planning GPCD is the value used in the regional water planning process. Planning GPCD is calculated for municipal water user groups by dividing the *total net use* (total intake minus total sales) by the *permanent population of the municipal water use group,* divided by 365. Retail volumes sold to large industrial facilities are not included in planning GPCD.

Total GPCD is a value reported in conservation plans and annual reports. Total GPCD is calculated for public water systems as the *total system input volume* (water produced plus wholesale water imported minus wholesale water exported and adjusted by meter accuracy estimates) divided by the *total permanent population of the system,* divided by 365. Retail, not wholesale, volumes sold to large industrial facilities are included in total GPCD.

Residential GPCD is a value reported in conservation annual reports through the water use survey. Residential GPCD is calculated as the *total volume of water metered* to residential and multi-family connections, divided by the *total residential population served,* divided by 365. The residential population includes only residents living in single-family and multi-family housing within the service area.

8.4 Conservation water management strategies and projects

The recommended conservation water management strategies vary across the 16 regions but were generally based on an analysis of best management practices for various types of water users. These practices reduce everyday water consumption, improve water use efficiency, or reduce water loss—allowing more to be done with the same amount of water and resulting in additional available water supplies. Conservation requires continuous effort, occurs throughout wet and dry weather cycles, and maintains all normal economic and domestic activities. Best management practices are defined as conservation measures that are useful, proven, cost-effective, and generally accepted among conservation experts. These practices are further described in the water conservation best management practices guides developed by the state's Water Conservation Advisory Council and are available at www.twdb.texas.gov/conservation/BMPs.

Conservation is a recommended strategy in all 16 regional water plans. Together, the plans recommended about 794,000 acre-feet per year in conservation strategy supplies in 2030 and 2.2 million acre-feet per year in 2080 (Table 8-2). Conservation strategies fall into three categories: municipal, irrigation, and industrial. By 2080, municipal conservation accounts for the largest share of total conservation savings (Figure 8-4). The following sections provide additional detail on recommended strategies within each category.

Figure 8-4. Share of statewide recommended conservation water management strategies by type in 2030 and 2080 (percent)

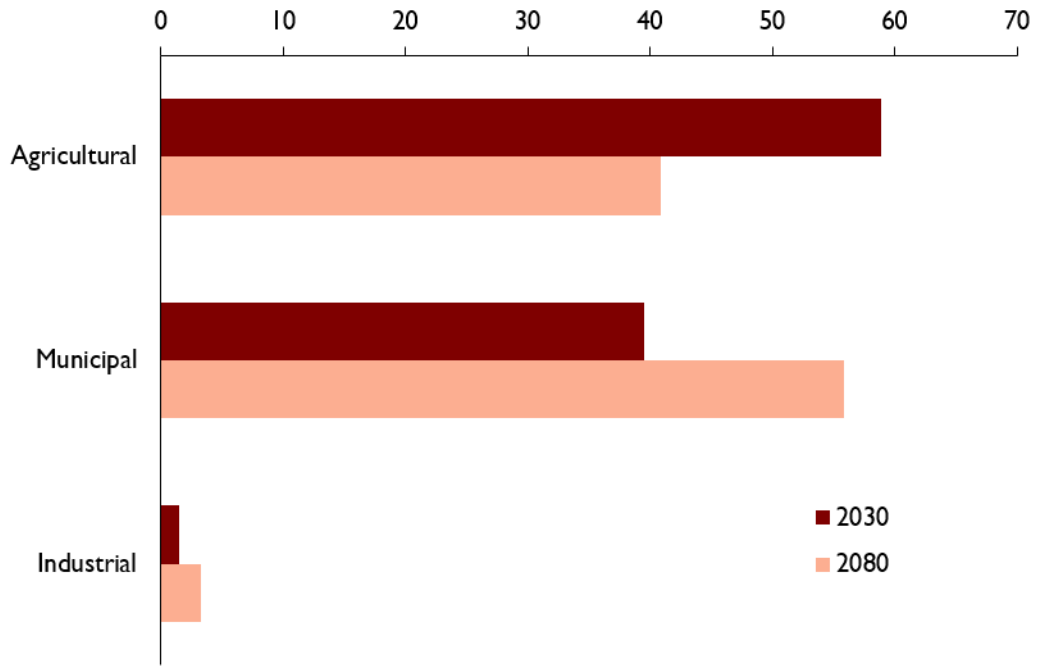


Table 8-2. Annual volume of all recommended conservation strategies by use category in 2030 and 2080 (acre-feet)

Category	Decade	A	B	C	D	E	F	G	H	I
Irrigation	2030	91,683	13,024	45	0	42,581	22,196	7,034	103,799	0
Irrigation	2080	433,268	19,257	2,550	0	42,581	58,605	16,347	103,799	5
Manufacturing	2030	0	0	0	417	0	0	312	3,320	0
Manufacturing	2080	0	0	2,522	686	0	0	878	43,892	0
Mining	2030	0	0	0	0	0	0	617	0	0
Mining	2080	0	0	0	0	0	0	1,344	0	0
Municipal water loss mitigation	2030	3,719	169	19,790	7,061	2,688	308	6,561	51,192	4,908
Municipal water loss mitigation	2080	4,448	169	105,361	8,208	2,688	358	9,298	230,124	17,983
Municipal water use reduction	2030	1,356	489	64,734	1,806	9,971	2,508	25,970	2	2,698
Municipal water use reduction	2080	1,615	3,238	180,459	17,362	25,382	3,963	167,410	2	5,954
Steam-electric power	2030	0	0	0	0	0	0	0	0	0
Steam-electric power	2080	0	3,000	0	0	0	0	0	0	0
Total	2030	96,758	13,682	84,569	9,284	55,240	25,012	40,494	158,313	7,606
Total	2080	439,331	25,664	290,892	26,256	70,651	62,926	195,277	377,817	23,942

Table 8-2. Annual volume of all recommended conservation strategies by use category in 2030 and 2080 (acre-feet) – continued

Category	Decade	J	K	L	M	N	O	P	Texas
Irrigation	2030	139	15,942	4,494	45,608	0	107,380	14,245	**468,170**
Irrigation	2080	139	32,068	17,720	127,008	0	48,902	14,245	**916,494**
Manufacturing	2030	0	0	0	468	2,878	0	1,578	**8,973**
Manufacturing	2080	0	1	0	577	17,689	0	1,715	**67,960**
Mining	2030	0	0	0	948	173	0	0	**1,738**
Mining	2080	0	0	0	63	153	0	0	**1,560**
Municipal water loss mitigation	2030	702	4,232	14,549	15,372	6,212	0	225	**137,688**
Municipal water loss mitigation	2080	702	23,725	17,034	34,519	17,588	0	409	**472,614**
Municipal water use reduction	2030	8	29,125	23,198	12,654	0	2,100	7	**176,626**
Municipal water use reduction	2080	8	122,060	160,957	90,248	0	662	551	**779,871**
Steam-electric power	2030	0	0	0	1,063	0	0	0	**1,063**
Steam-electric power	2080	0	0	0	1,063	0	0	0	**4,063**
Total	2030	849	49,299	42,241	76,113	9,263	109,480	16,055	**794,258**
Total	2080	849	177,854	195,711	253,478	35,430	49,564	16,920	**2,242,562**

8.4.1 Municipal conservation

In a report to the Texas Legislature, the TWDB determined that some utilities do not describe their conservation activities in terms of formalized best management practices and many utilities list potential best management practices they may consider, but not ultimately pursue, when implementing their water conservation plan (TWDB, 2019). Therefore, many of the municipal conservation water management strategies in the state water plan essentially consist of a menu of potential best practices that may be implemented to achieve a specific, estimated amount of water savings. The same report to the legislature also determined that all utilities reviewed included, at a minimum, the following three best management practices:

- Metering of all new connections and retrofit of existing connections
- System water audit and water loss control
- Public information

The recommended municipal conservation strategies in this state water plan include all of these and other common best practices, as well as infrastructure-based projects that will address water loss and metering. Municipal conservation was a recommended strategy in every regional water plan and is associated with approximately 1,600 municipal water user groups statewide.

Regional water planning groups recommended about 314,000 acre-feet per year in municipal conservation strategies for 2030 and about 1.3 million acre-feet per year by 2080 (Table 8-2). These savings are in addition to the estimated volume of additional future passive conservation savings expected to occur—171,000 acre-feet per year in 2030 and 351,000 acre-feet per year in 2080—because of existing plumbing codes and water-efficiency standards discussed earlier in this section. Recommended municipal conservation strategies address approximately 26 percent of identified

municipal needs in 2030 and about 31 percent of identified needs in 2080. This plan further divides municipal conservation into two distinct types: water use reduction and water loss mitigation.

Water use reduction

Water use reduction strategies focus on lowering water consumption and include a variety of activities, such as

- incentivized installation of water-efficient plumbing fixtures (for example, through rebates; included by 7 regions);
- stronger water conservation pricing structures that discourage waste (included by 13 regions);
- education and outreach programs (included by 15 regions); and
- year-round landscape irrigation restrictions that continue to allow for maintenance of healthy landscapes (included by 13 regions). Best practices for outdoor landscape watering were included in the municipal conservation strategies in 14 of the 16 regional water plans.

Fourteen regions (all except Regions H and N) recommended municipal water use reduction strategies that are projected to save about 177,000 acre-feet in 2030. By 2080, savings are expected to increase significantly to 780,000 acre-feet per year. Regions C, G, K, and L recommend the largest volumes of water use reduction strategies in both 2030 and 2080, accounting for 81 percent of statewide municipal water use reduction savings in both decades (Figure 8-5). No capital cost projects are required to implement the recommended water use reduction strategies.

Statewide and across the planning horizon, water use reduction makes up the larger share of municipal conservation. In 2080, 11 regions recommended more water use reduction than water loss mitigation, indicating that most regions anticipate greater savings from reducing water use than addressing loss (Figure 8-6). The mix of municipal conservation strategies varies by region based on local conditions and needs.

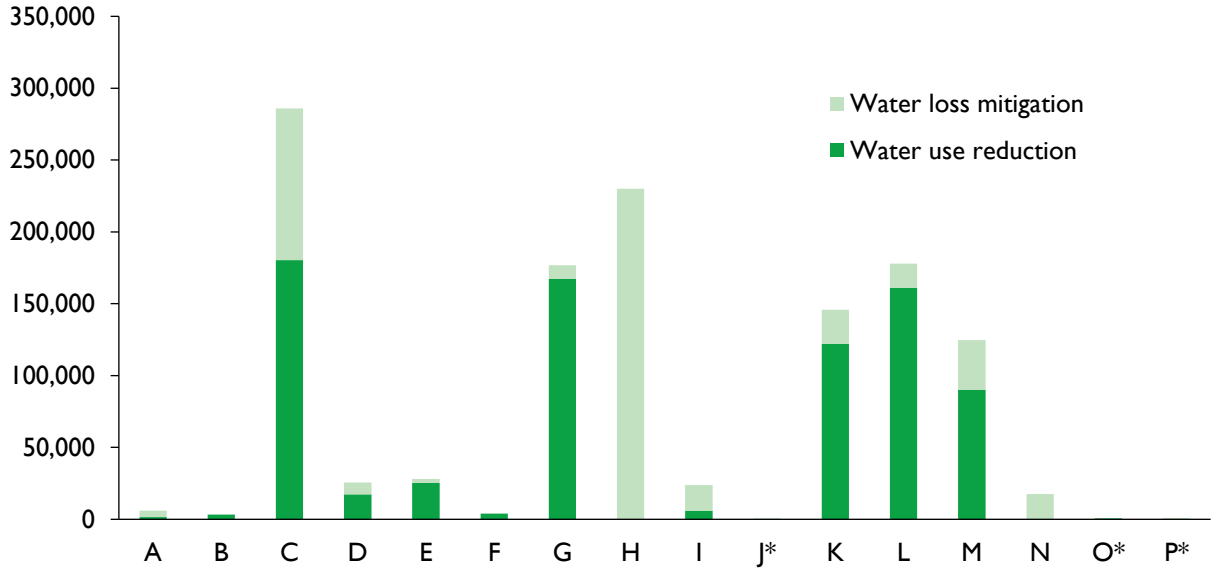
Water loss mitigation

Planning groups are required to review recent water loss audit data when developing their plans and consider strategies to specifically address water loss. Water loss mitigation strategies include activities to detect, measure, and reduce water loss, such as leak detection programs, advanced metering infrastructure, water loss audits, and transmission system water loss mitigation. Addressing water loss is important because new water supplies cannot be fully utilized if significant volumes are lost through inefficient or deteriorating infrastructure.

Fifteen regions (all except Region O) recommended municipal water loss mitigation strategies. These strategies are projected to provide about 138,000 acre-feet per year of water savings in 2030, increasing to nearly 473,000 acre-feet per year in 2080. Regions H, C, and M recommended the largest volumes of water loss mitigation in both 2030 and 2080, together accounting for about 63 percent of statewide municipal water loss mitigation savings in 2030 and 78 percent in 2080. Region H alone accounts for half of the state's anticipated water loss mitigation savings in 2080.

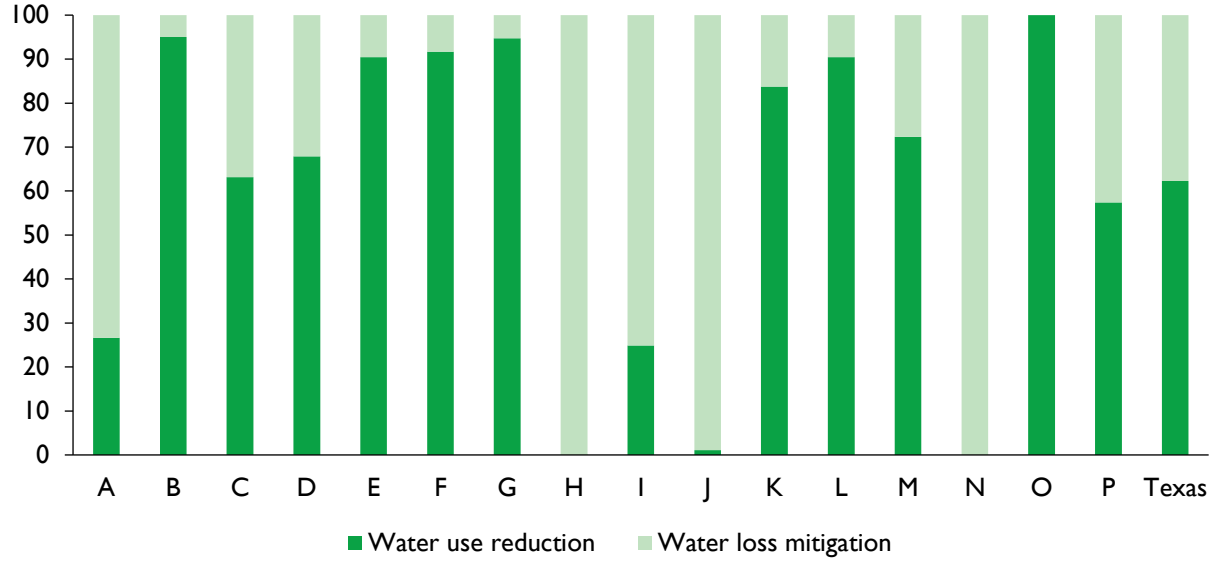
The estimated total capital cost to implement all the recommended municipal water loss mitigation projects is $16.6 billion, including $15.7 billion for projects planned to be online by 2030.

Figure 8-5. Annual volume of recommended municipal conservation strategies by region and type in 2080 (acre-feet)



** Municipal conservation strategy volumes are less than 1,000 acre-feet and are at a scale that may not be visible in the figure.*

Figure 8-6. Share of recommended municipal water conservation by water use reduction and water loss mitigation in 2080 (percent)



Updating key metrics on outdoor water use in Texas

In 2026, the TWDB completed a study to develop updated outdoor water use data, methodologies, and performance metrics. The study reassessed prior methods, analyzed more recent public water system and climate data, and evaluated the influence of climate drivers on outdoor water use. The results of this effort determined outdoor water use to be 27 percent of the statewide average of single-family water use. The study results are being used to inform the projections included in the 2031 regional water plans and the 2032 State Water Plan.

For more on the outdoor water use study, visit: www.twdb.texas.gov/waterplanning/data/resources/index.

8.4.2 Agricultural conservation

Irrigation for agricultural production is the largest water demand sector in the state for most of the planning horizon and is projected to account for 41 percent of annual statewide water use in 2050 and 34 percent in 2080. Identified water supply needs for this sector account for 51 percent of total statewide needs in 2050 and 31 percent in 2080.

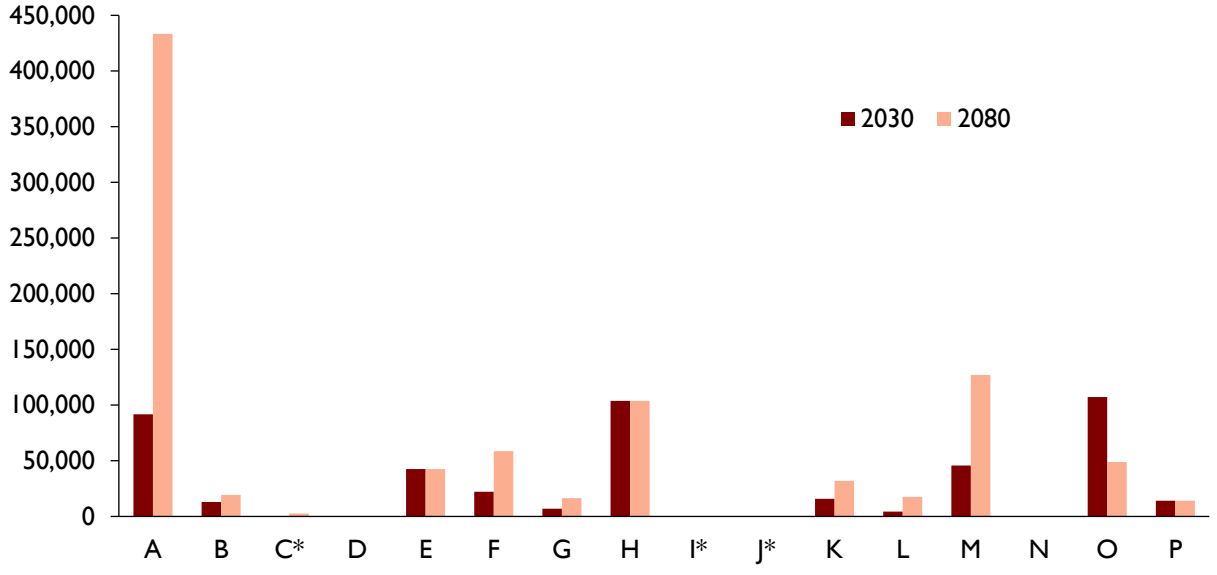
Agricultural conservation strategies include changes to irrigation methods, equipment, and crops. For example, conversion to Low Energy Precision Application systems and irrigation scheduling—as well as other activities associated with irrigation best management practices—can help producers reduce their water use. Strategies to improve irrigation canal delivery systems to reduce water loss are also included in agricultural conservation.

There are about 468,000 acre-feet per year in irrigation conservation strategies recommended in 2030 and 916,000 acre-feet per year recommended in 2080 (Table 8-2). Regions O, H, A, and M recommend the largest volumes of agricultural conservation in 2030. By 2080, recommended agricultural conservation supplies decrease in Region O in line with the region's declining irrigation demands. Agricultural conservation supplies in most other regions increase by 2080 (Figure 8-7). Region A has the largest increase in 2080, with recommended supplies reaching almost five times those recommended in 2030.

Implementing all recommended agricultural conservation strategies will cost approximately $2 billion, which is slightly more than 1 percent of the total capital costs of all recommended water management strategy projects in the plan. Conservation is the primary strategy recommended to address identified irrigation needs in most regions, and it has an estimated statewide average implementation cost of about $215 per acre-foot in 2080. Agricultural conservation is the largest statewide relative share of recommended conservation from 2030 to 2040, but the volume of municipal conservation surpasses irrigation from 2050 to 2080 as municipal needs increase and irrigation demands decrease over the planning horizon.

Compared to the 2022 State Water Plan, recommended agricultural conservation supplies are lower in all decades. This decrease is largely driven by reduced agricultural conservation recommended in Regions A and O, reflecting the underlying declining irrigation demand in Region O and updated evaluations that account for current agricultural industry projections in Region A.

Figure 8-7. Annual volume of recommended agricultural conservation strategies by region in 2030 and 2080 (acre-feet)



** Agricultural conservation strategy volumes are less than 1,000 acre-feet in at least one decade and are at a scale that may not be visible in the figure. No agricultural conservation strategies are recommended for Regions D and N.*

8.4.3 Industrial conservation

Conservation is also a recommended strategy for steam-electric, manufacturing, and mining water users. Recommended conservation measures for these users, to be implemented mostly by private enterprises, are generally based on best management practices appropriate for each facility—which may include evaluating more efficient cooling and processing water practices, water audits, or submetering. Although presented individually in this subchapter, these sectors of use are collectively presented as *industrial conservation* elsewhere in this state water plan. In total, planning groups recommend about 12,000 acre-feet per year of industrial conservation savings in 2030, increasing to about 74,000 acre-feet per year in 2080 (Table 8-2).

Two regions (Regions B and M) recommend conservation strategies for steam-electric water users. Approximately 1,000 acre-feet per year in steam-electric conservation strategies is recommended in 2030 and 4,000 acre-feet per year is recommended in 2080.

Seven regions (Regions C, D, G, H, M, N, and P) recommend conservation strategies for manufacturing water users. A small amount of manufacturing conservation is also recommended for one split water user group located in Region K. Regions H and N recommend the most manufacturing conservation strategy supplies, together accounting for about 69 percent of statewide manufacturing conservation strategy supplies in 2030 and 91 percent in 2080. Total supplies from recommended manufacturing conservation strategies increase significantly over the planning horizon—from about 9,000 acre-feet per year in 2030 to 68,000 acre-feet per year in 2080.

Three regions (Regions G, M, and N) recommend conservation strategies for mining water users. The amount of water saved from these strategies varies slightly but remains relatively stable over the planning period. Recommended mining conservation strategies account for approximately 2,000 acre-feet per year in 2030 and 2080. These volumes are lower than the previous state water plan because

some activities that were previously counted as mining conservation are now categorized under the new water recycling reuse strategy type.

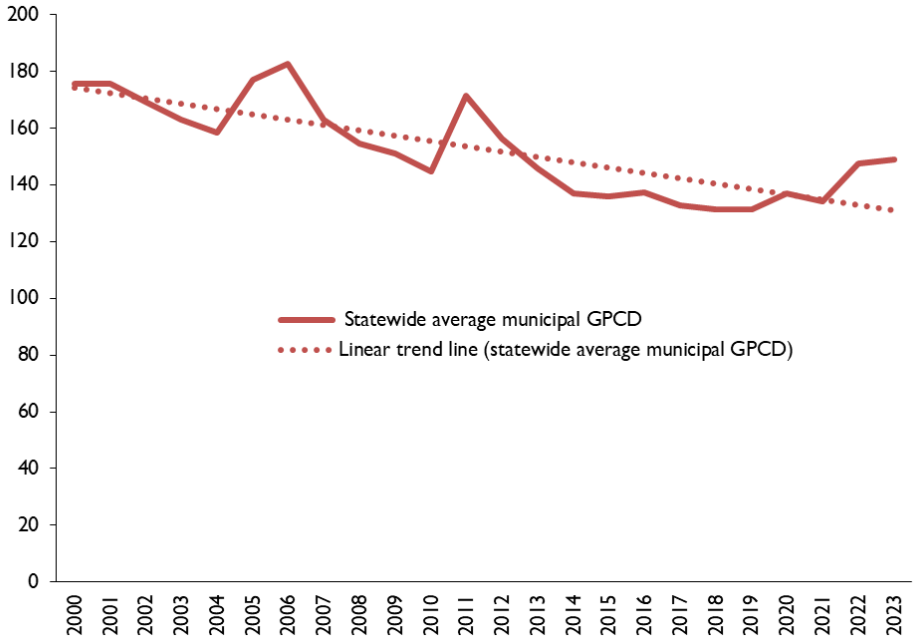
8.5 Conservation implementation

Assessing conservation implementation is essential for understanding statewide patterns in water use, the effectiveness of recommended strategies, and long-term progress toward conservation goals. However, measuring and tracking conservation implementation can be challenging due to limitations in utilities' data across water use sectors and the large number of factors that can impact water use, such as weather (BBC, 2012; WCAC, 2020; TWDB, 2021). This section examines implementation through trends in water use, reported conservation activities, and demand for financial assistance.

8.5.1 Trends in statewide average municipal water use

Historical implementation of statewide municipal conservation can be observed in the generally declining trend of the statewide average municipal GPCD as reported through the TWDB annual water use survey (Figure 8-8).[18] The 2006 and 2011 peaks in reported use correspond to drought conditions experienced across the state. Increases in 2022 and 2023 appear to reflect a combination of statewide drought conditions and improved survey quality-assurance and quality-control processes that identified water use not captured in prior surveys, thereby increasing GPCD.

Figure 8-8. Historical statewide average municipal GPCD (2000–2023)



GPCD – gallons per capita per day

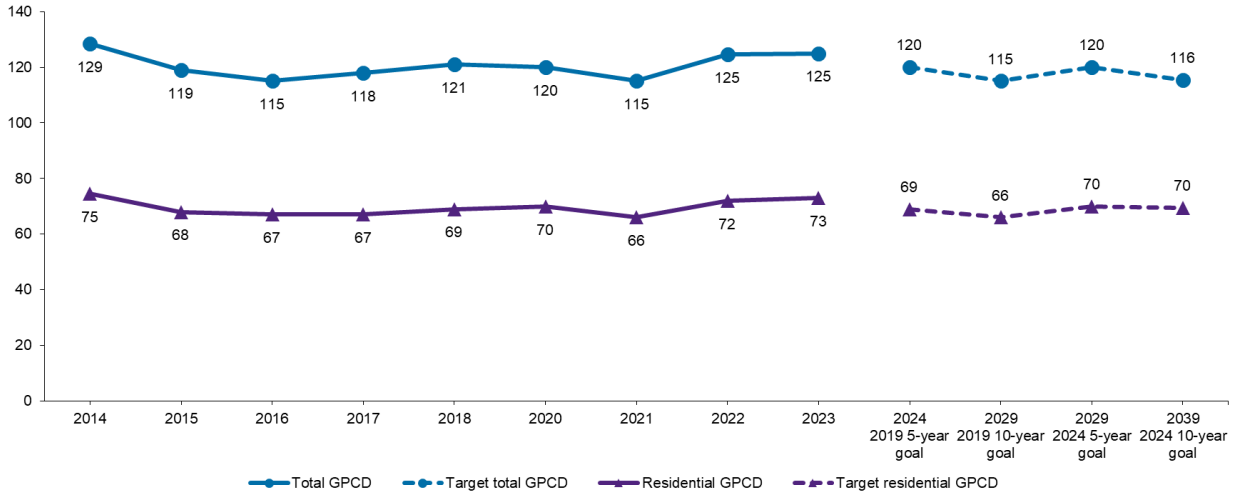
8.5.2 Reported conservation activities

Ultimately, each utility is best suited to track its own progress on implementing its programs. However, data that is reported to the TWDB in annual conservation reports provide insight into the

[18] www.twdb.texas.gov/waterplanning/waterusesurvey/estimates

implementation of these conservation programs across the state. Data collected through annual conservation reports indicate an overall reduction in water use (Figure 8-9). Recent median total and residential gallons per capita per day (GPCD) water use remain slightly higher compared to the most recent 5- and 10-year goals.

Figure 8-9. Statewide historical, median GPCD and 5- and 10-year goals for total and residential water use



Utilities report steady implementation of conservation activities—with hundreds of thousands of meters replaced each year, increasing adoption of automated meter reading, tens of thousands of leaks repaired annually, and growing participation in education programs and implementation of best management practices (Table 8-3). Metering and retrofitting connections was the most common implemented best management practice reported from 2020 to 2022. While it remained widely implemented in subsequent years, conservation coordinators and public information programs were the most frequently reported practices in 2023 and 2024, respectively (Figure 8-10).

Table 8-3. Recently reported* conservation activities

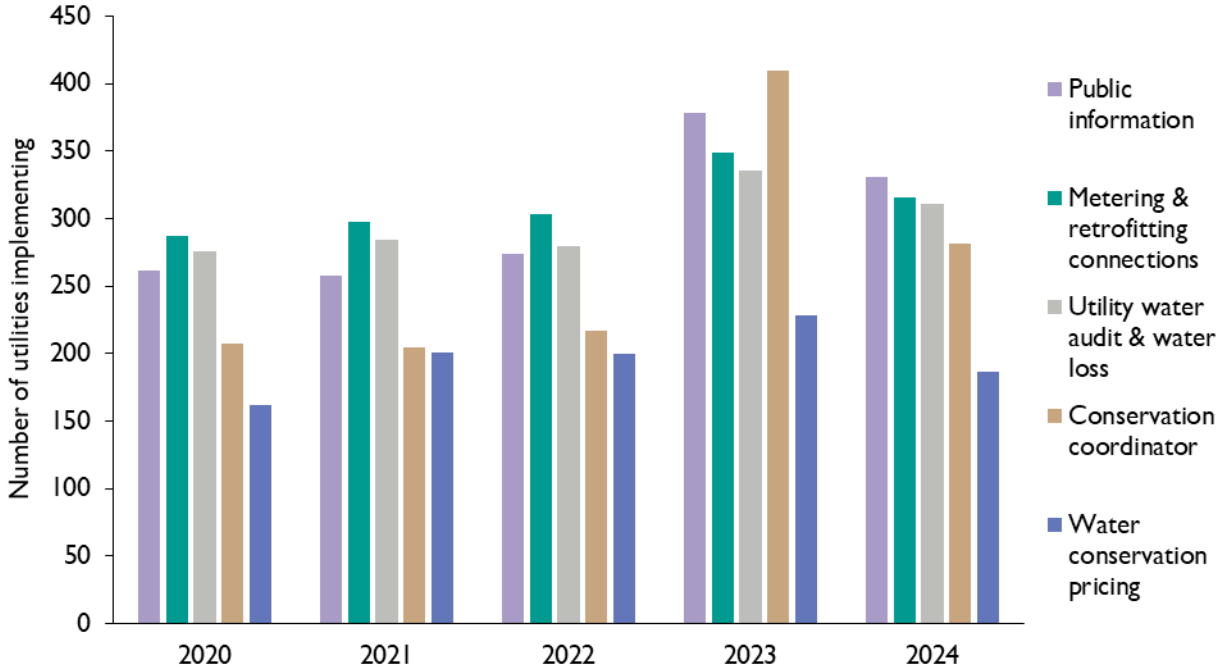
Activities	2020	2021	2022	2023	2024
Meters replaced**	298,092	392,234	309,171	339,975	543,655
Utilities with automated meter readings	220	259	248	291	342
Leaks repaired	64,850	90,948	74,428	108,220	103,232
Utilities implementing education program	280	314	304	355	310
Drought plans activated	36	40	103	147	136
Utilities implementing best management practices	294	326	285	365	438
Retail population served***	18,242,567	19,797,966	16,461,718	20,350,055	19,796,446

* *Data based on water loss audits and water conservation annual reports submitted to the TWDB that have been reviewed for quality assurance and control. Audits and reports with obvious data issues have been removed.*

** *1.5 inch and smaller service lines*

*** *Reported population in 2022 was lower due to several larger utilities having data issues or not submitting their annual report.*

Figure 8-10. Most frequently implemented best management practices as reported* in conservation annual reports by reporting year



** Data based on water conservation annual reports submitted to the TWDB that have been reviewed for quality assurance and control. Reports with obvious data issues have been removed.*

8.5.3 Regional water planning implementation survey

Each regional water plan is required to report on the implementation status of all strategies that they recommended in their previous plan. Gathering the required information is generally accomplished through surveys of entities in the regional water planning area. The surveys differentiated conservation *strategies* from conservation *projects*—*strategies* do not require infrastructure or capital costs, whereas *projects* do.

Based on survey respondents and as reported by the regional water planning groups, implementation data indicates that of the conservation *strategies* with reported information (65 percent of all recommended conservation *strategies* in the 2022 State Water Plan), 1 percent of respondents reported full implementation and 96 percent reported progress towards implementation. Of the conservation *projects* with reported information (60 percent of all recommended conservation *projects* in the 2022 State Water Plan), 1 percent of respondents reported full implementation and 84 percent reported progress towards implementation. This partly reflects the long (50-year) timeframe over which all these recommended strategies are to be implemented.

8.5.4 TWDB financial assistance

TWDB financial programs play an important role in supporting conservation implementation across Texas and complementing the conservation strategies recommended in the state water plan. These programs fund certain conservation projects, including projects not specifically recommended in the state water plan. Since the passage of House Bill 3605 in 2013, all retail water utilities applying for TWDB financial assistance for a water supply project must be below water loss thresholds established

by the agency, encouraging conservation when rehabilitating system infrastructure and developing new water supplies.

If an applicant's water loss meets or exceeds TWDB thresholds, the associated project must include water loss mitigation activities. Applicants may satisfy this requirement by incorporating water loss mitigation components into the project they are seeking to fund. If a utility is already implementing mitigation efforts, it may request a waiver from the TWDB. The waiver must identify the utility's current and planned mitigation activities and the related funding sources.

Between 2004 and 2025, the TWDB funded a total of 231 water loss projects, most commonly involving distribution main line replacement and automated meter reading (Figure 8-11). In total, the TWDB has committed more than $1.9 billion in funding to water loss projects.

Strong interest in conservation funding is evident across several TWDB programs. In response to the State Fiscal Year 2025 Clean Water and Drinking Water State Revolving Fund solicitations, the TWDB received 68 project information forms totaling more than $607 million for water conservation and water loss projects. In February 2025, the TWDB committed more than $35 million in 100 percent grant funding for 10 water loss projects. This interest is also reflected in the Agricultural Water Conservation Grants and Loan Program, which received a record number of grant applications totaling $9.7 million in Fiscal Year 2025.

Current funding through the Texas Water Fund expands statewide support for conservation. Of the initial $1 billion appropriation to the Texas Water Fund, the TWDB has allocated $265 million specifically to water conservation and water loss mitigation projects through the Rural Water Assistance Fund and the Water Loan Assistance Fund.

Figure 8-11. TWDB funded water loss project count by type (2004–2025)

8.6 Conservation policy recommendations from the regional water planning groups

Each regional water plan contains policy recommendations developed by the planning groups for consideration by the legislature and various state agencies, including the TWDB. Fourteen planning groups included at least one conservation-related policy recommendation. Recommendations are largely related to project funding, program support, and data collection. Three planning groups recommended continued support of the state's Water Conservation Advisory Council and its recommendations. Several planning groups recommended funding additional data collection to support the understanding of conservation implementation in various sectors of water use and to better inform the development of future conservation measures and recommended strategies. Most of the planning groups recommended that the legislature continue funding conservation initiatives and project development through the TWDB and other state agencies, including infrastructure projects, educational programs, and demonstration projects.

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9 Costs and financing

Quick facts

The plan includes a total of $174 billion in capital costs (2023 dollars) that would be required to implement the state water plan over the next 50 years, including $139 billion *for projects that must be online by 2050.*

As of July 2026, the State Water Implementation Fund for Texas (SWIFT) program, created specifically to fund state water plan projects, has committed nearly $16.9 billion since its inaugural cycle in 2015.

Significant investment is required for Texas to secure reliable water supplies over the next 50 years. Regional water planning groups estimated the costs to implement such strategies as conservation, groundwater development, desalination, and new reservoirs that would meet future demand during a repeat of the drought of record. Many of these recommended strategies require capital projects that will require financing for planning, permitting, design, and construction.

The Texas Water Development Board (TWDB) provides a variety of low-interest financial assistance programs, grants, and other financial tools that make it easier and more affordable for cities, utilities, and rural communities to plan, design, and construct the water projects they need. Together, these programs provide billions of dollars to develop water infrastructure to meet Texas' water needs today and in the future. As of July 2026, the TWDB has committed more than $44.3 billion for water infrastructure projects in Texas via the agency's financial assistance programs.

During this planning cycle, regional water planning groups were no longer required to estimate and report on the financing that may be needed to implement recommended strategies and projects due to a statutory change. In the previous five planning cycles, basic infrastructure financing surveys were conducted to develop these estimates, and the results consistently showed entities reporting that roughly half of project costs would require state financial assistance.

9.1 Costs of implementing the state water plan

The estimated total capital cost of the water management strategy projects recommended by the 16 regional water planning groups is $174 billion in 2023 dollars; actual costs will vary over time due to inflation, market conditions, and project-specific factors. This is an increase of almost $93 billion, more than doubling the $81 billion total capital costs of the previous plan. This increase is the result of a variety of factors, including

1) overall inflation and escalation of construction costs exacerbated by lingering post-COVID supply chain pressures over the past five years
2) a growing backlog of near-term projects that remain in the plan even as the planning horizon continues to advance; and
3) the extension of the planning horizon by an additional 10 years to 2080.

Estimating total capital costs and unit costs of water

Projects in this plan include conservation and development of new supplies from fresh and brackish groundwater, seawater desalination, aquifer storage and recovery, reservoirs, produced water recycling, and other strategies that would meet water needs in times of drought over the next 50 years. Many of these projects vary in stages of implementation and are anticipated to be completed at various points in time throughout the next 50 years (Figure 9-1). All strategies and projects have an identified online decade by which they are projected to be online and providing water supply.

The planning groups estimated both the total capital costs of projects as well as the annual unit costs of water—including operation and maintenance and debt repayment—for each water user group. For state water planning purposes, direct and indirect capital costs include, but are not limited to

- engineering services, including for planning, design, and construction;
- feasibility studies, including those for permitting and mitigation;
- construction;
- professional services related to legal assistance and financing costs;
- land and easement acquisition; and
- purchases of water rights.

Unit costs of water supply (dollars per acre-foot supplied in each year) are calculated based on total annual costs divided by the associated water volume and include annual debt service associated with the capital costs as well as operation and maintenance costs. Operation and maintenance costs, including power costs, are based on the quantity of water supplied and include all related expenses.

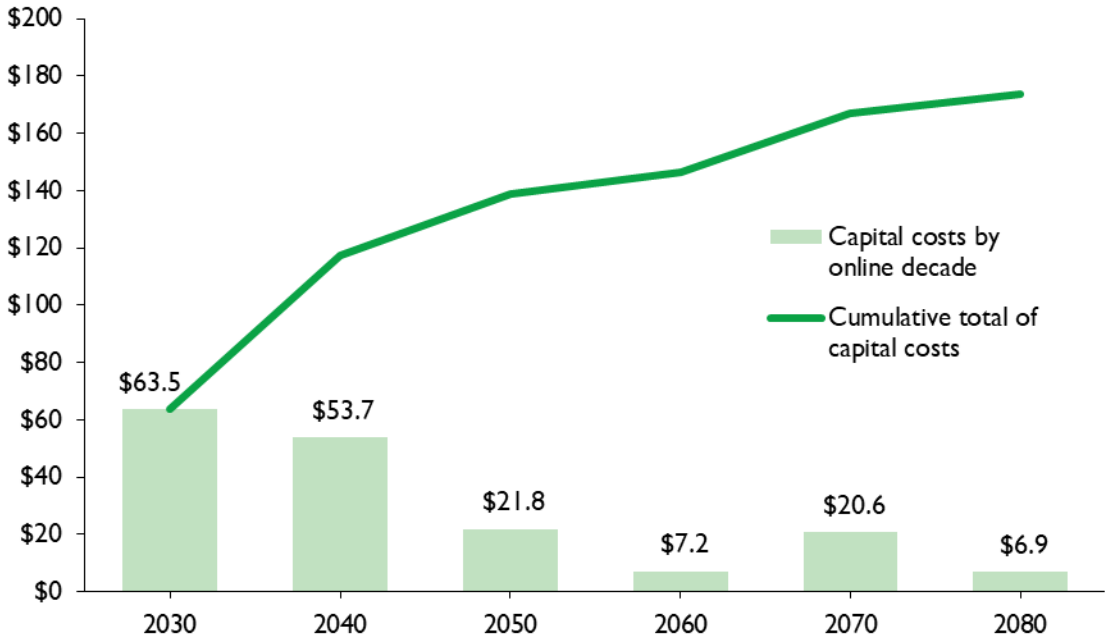
Cost estimates presented in the state water plan are planning level estimates developed using a standardized methodology, including the Texas Water Development Board's Uniform Costing Model, to ensure consistent treatment of key cost components across regions and project types. These estimates are intended to provide a comparable, statewide basis for evaluating strategies and are not equivalent to project-specific engineering estimates.

Actual project costs may vary—potentially significantly—based on factors such as project design, site-specific conditions (e.g., geotechnical, environmental, and right of way constraints), permitting requirements, market conditions (including labor and materials), procurement approach, and timing of implementation. Accordingly, these estimates should be interpreted as order of magnitude planning values rather than precise cost forecasts.

What is not included in costs

The estimated costs in this plan exclude expenses for maintaining or expanding retail water system distribution facilities or for replacing or rehabilitating aging infrastructure—with the specific exception of conservation strategies that reduce water loss through replacement of internal distribution system lines. Texas' planning process is based on a fundamental expectation that water providers will properly maintain their existing infrastructure so that it continues to operate at designed capacity. The purpose of the state water plan—and the associated SWIFT funding—is to increase water supply available under severe drought conditions, not to replace aged or neglected infrastructure. The TWDB offers other financial assistance program options for rehabilitation and replacement of infrastructure, summarized later in this chapter.

Figure 9-1. Decadal* and cumulative capital cost of all recommended water management strategy projects (in billions)

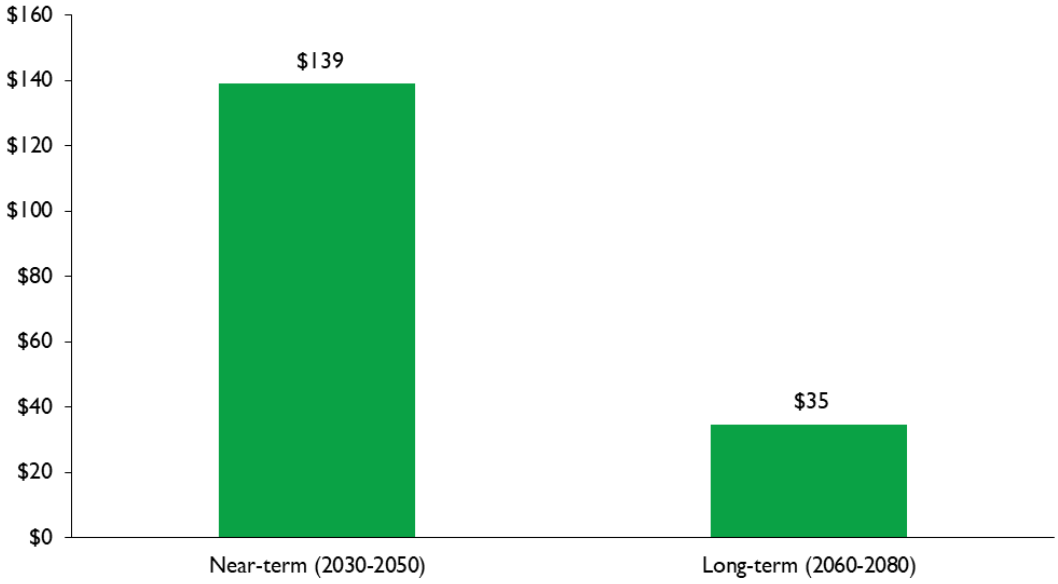


** Decadal costs represent expenditures needed to bring water management strategy supplies planned for a given decade online by the beginning of that decade. For example, costs for 2030 reflect necessary expenditures from 2020 to 2029 for projects online by 2030.*

Near-term and longer-term capital costs

Roughly 80 percent of the plan's $174 billion in capital costs—about $139 billion—is associated with projects that are anticipated to be online by 2050 to address rapidly growing water demands and maintain reliability during drought (Figure 9-2). This near-term concentration underscores the importance of timely financing and streamlined project delivery. Based on an average of previous infrastructure financing survey results, it is estimated that approximately half of these costs may rely on state financial assistance.

Figure 9-2. Near-term and long-term capital cost* of all recommended water management strategy projects (in billions)

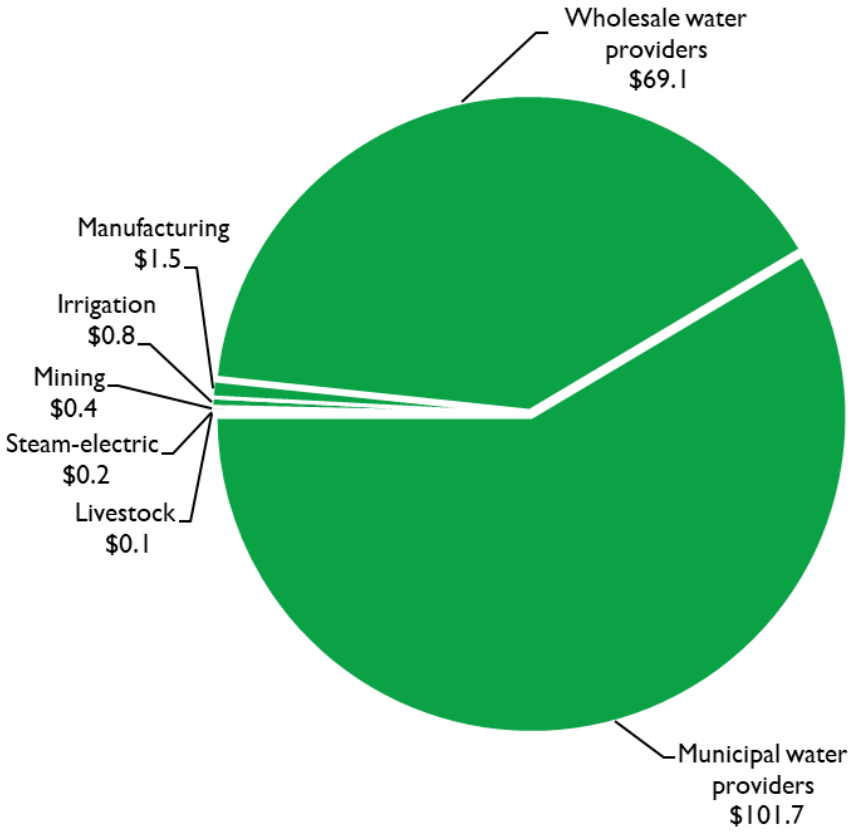


* *Conservation strategies may include costs aggregated over multiple decades but reported in early planning periods. This can overstate near-term capital needs and project counts relative to more traditional infrastructure projects, which are typically fewer in number and reported with more conventional capital timing.*

Distribution of capital costs

Approximately 98 percent ($171 billion) of the $174 billion in anticipated capital costs is associated with recommended water management strategy projects sponsored by municipal water user groups and wholesale water providers (Figure 9-3). Region C ($61.2 billion), Region H ($31.1 billion), and Region L ($19.3 billion) have the highest estimated capital costs required to implement the recommended strategy projects in their 2026 regional water plans (Figure 7-1, Table 7-3). Together, these three regions account for nearly two-thirds of the total capital costs in the 2027 State Water Plan. These regions also represent almost two-thirds of the state's projected population (Table 4-4) and municipal water needs in 2080 (Appendix C).

Figure 9-3. Total capital costs of all recommended water management strategy projects by wholesale water providers and water user group sponsor type (in billions)



Large capital-cost projects in the 2027 State Water Plan

The number of recommended projects with capital costs exceeding $1 billion has increased to 36, which is four times the number included in the 2022 State Water Plan, and includes 14 newly recommended projects exceeding one billion dollars in cost. One such project is the Region C Toledo Bend Reservoir conveyance project, which was considered an alternative project in previous plans and is now recommended because of a mediated resolution to an interregional conflict. This single project adds approximately $9.8 billion to the total plan cost.

As described in the Region C plan, the project would develop supplies from the existing Toledo Bend Reservoir in the Sabine River Basin in Region I for delivery to Region C, beginning with a phased supply of up to 250,000 acre-feet per year in 2070. Development would require agreement among multiple suppliers, an inter-basin transfer permit, and construction of long-distance transmission infrastructure, which all contribute to its high capital cost and operational complexity. As currently planned, the Region C Toledo Bend Reservoir conveyance project could benefit more than 180 water user groups across Regions C, D, and G. Region H also has a separate recommended strategy utilizing water from Toledo Bend to benefit Houston for a cost of $663 million.

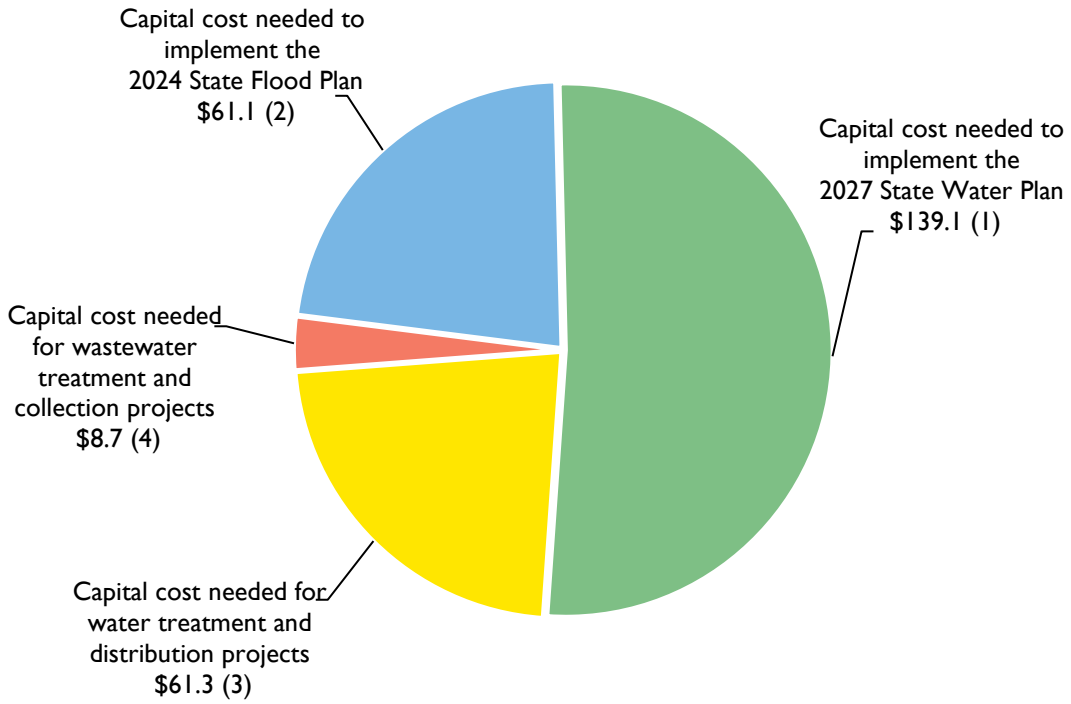
9.2 How state water plan costs fit within Texas' broader water infrastructure landscape

The amount of money required to implement the 2027 State Water Plan is substantial, but it represents only one component of Texas' overall water infrastructure development picture. Many strategies recommended in regional and state water plans focus on "bringing water into the pipe" and delivering it to the front door of community water distribution infrastructure, factories, farms, and other water users. These strategies focus on developing and delivering the additional water supply required to meet demands in drought conditions—they exclude the cost of replacement or maintenance of existing water supply infrastructure and the cost of other water-related infrastructure. Infrastructure excluded from the state water plan by design, comprises

- retail water supply conveyance or distribution infrastructure within community service areas, such as distribution water mains, pump stations, and storage facilities within a utility's distribution system;
- wastewater treatment plants or collection infrastructure, such as sewer mains and pipes that convey wastewater from homes and businesses to treatment facilities or discharge outfalls; and
- flood mitigation infrastructure.

To give context to the investment required to implement the 2027 State Water Plan, it is necessary to consider the broader set of water infrastructure costs facing the state. Current TWDB estimates indicate that Texas will need to invest more than $270 billion by 2050 to meet needs for water supply, water and wastewater infrastructure, and flood control. Water management strategies and projects recommended in the 2027 State Water Plan account for approximately 52 percent of this total need by 2050 (Figure 9-4).

Figure 9-4. Approximate magnitude of capital costs to address water supply, water treatment and retail distribution, wastewater treatment and collection, and flood mitigation by 2050 (in billions)



This total investment includes the estimated costs to

1) implement the 2027 State Water Plan through 2050;
2) implement the 2024 State Flood Plan, which recommends flood risk reduction studies, projects, and strategies with an estimated statewide implementation cost of approximately $61.1 billion[19];
3) address drinking water infrastructure needs identified in the most recent U.S. Environmental Protection Agency Drinking Water Infrastructure Needs Survey, which determined that drinking water systems in Texas will require more than $61.3 billion over the next *20 years* for pipe replacement, treatment plant upgrades, storage facilities, and other critical assets (EPA 2023)[20]; and
4) address wastewater infrastructure needs identified in the most recent U.S. Environmental Protection Agency Clean Watershed Needs Survey, which determined that wastewater systems in Texas will require nearly $8.7 billion over the next *20 years* to support collection systems, lift stations, treatment plants, and other critical infrastructure (EPA 2022).

Together, these estimates illustrate that the state water plan is one component of a much larger portfolio of water-related infrastructure investments that will be required in Texas. The following section describes the primary state and federal financing tools available to support implementation of state water plan projects and other water-related infrastructure needs.

9.3 Financing the state water plan and other water-related projects

Given the substantial costs of developing new water supplies, many water providers rely on state and federal financial assistance to implement projects. In Texas, political subdivisions have traditionally funded most water-related infrastructure projects through municipal debt issued on the open bond market or, less commonly, through cash or private equity sources such as banks. Recognizing the need for more affordable financial assistance, the Texas Legislature entrusted the TWDB with a set of financing tools to help public utilities achieve their water infrastructure goals.

The federal government has also historically played a major role in developing water projects, and earlier state water plans relied heavily on the federal government for financial assistance. Federal agencies such as the U.S. Natural Resources Conservation Service (formerly the Soil Conservation Service), the U.S. Bureau of Reclamation, and the U.S. Army Corps of Engineers constructed many surface water reservoirs—primarily for flood control—that now provide a large portion of the state's current water supply.

However, the pace of federal spending on reservoir construction has declined considerably since the 1950s and 1960s, when most of the major reservoirs in the state were constructed. Federal policy reflects a declining federal role in the long-term management of water supplies and assigns the financial burden of developing water supplies to local users (USACE, 1999). State programs help fill that gap by lowering borrowing costs and offering grants and flexible terms.

9.3.1 TWDB financial assistance

The TWDB offers cost-effective financial assistance programs to help communities address immediate needs to meet regulatory requirements and long-term water supply solutions (Figure 9-5). The TWDB

[19] The 2024 State Flood Plan estimated statewide costs for flood control total more than $54.5 billion. Subsequent amendments adopted by the regional flood planning groups added additional flood risk reduction solutions, which increased the total statewide estimated implementation cost to approximately $61.1 billion.

[20] This includes some limited overlap with the state water plan capital costs, for example, related to water treatment capacity.

administers multiple financial programs for political subdivisions, including programs that use issuance of general obligation as well as revenue bonds.

General obligation bonds, secured by the full faith and credit of the State of Texas, may be issued for water supply, wastewater conveyance and treatment, flood control, and water quality enhancement projects, including control/removal of emerging contaminants. Revenue bonds, which are secured by repayments from program participants, may be issued to finance wastewater treatment projects that could produce recycled water supplies through the State Water Pollution Control (Clean Water) Revolving Fund, drinking water treatment through the State Safe Drinking Water Revolving Fund, and state water plan implementation through the State Water Implementation Revenue Fund for Texas (SWIRFT). With strong credit ratings, the TWDB may offer lower interest rates than many water providers would be able to obtain through traditional financing means.

Authority for the TWDB to issue general obligation bonds was first approved by the Texas Legislature and voters in 1957 through a constitutional amendment. It authorized the agency to issue $200 million in general obligation bonds for financial programs for constructing dams, reservoirs, and other water storage projects. Since then, additional constitutional amendments have expanded both the agency's issuance authority (to $6 billion in evergreen authority) and the purposes for which the funds may be used.

Explore available funding options

Visit the TWDB financial assistance programs webpage (www.twdb.texas.gov/financial/programs) for financial assistance program details, application tools, and contacts.

Email Financial_Assistance@twdb.texas.gov or call 512-463-7847 for assistance.

Figure 9-5. TWDB financial assistance programs

Texas Water Development Board financial assistance programs

The Texas Water Development Board offers a variety of cost-effective financial assistance programs that provide for the planning, acquisition, design, and construction of water and flood-related infrastructure, other water quality improvements, and agricultural water conservation initiatives.

	Federal funding	State funding	Water supply	Wastewater	Flood	Conservation	Grant/Principal Forgiveness	Loan/Bond	Reuse	
www.twdb.texas.gov/financial/programs/awcg		✓				✓	✓	✓		**Agricultural Water Conservation Grant and Loan Program** Projects that implement strategies and practices to improve agricultural irrigation, water use efficiency, and conservation
www.twdb.texas.gov/financial/programs/cwsrf	✓	✓		✓		✓	✓	✓	✓	**Clean Water State Revolving Fund** Wastewater, stormwater, reuse, and other pollution control projects
www.twdb.texas.gov/financial/programs/dwsrf	✓	✓	✓			✓	✓	✓	✓	**Drinking Water State Revolving Fund** Infrastructure projects that facilitate compliance with drinking water standards
www.twdb.texas.gov/financial/programs/EDAP		✓	✓	✓			✓	✓		**Economically Distressed Areas Program** Water supply and wastewater projects in economically distressed areas where service is unavailable or does not meet state standards
www.twdb.texas.gov/financial/programs/fif	✓	✓	✓		✓		✓	✓		**Flood Infrastructure Fund** Flood management evaluations, flood mitigation projects, and flood management strategies recommended in the state flood plan—some of which may have a water supply component
www.twdb.texas.gov/financial/programs/rwaf		✓	✓	✓		✓	✓	✓		**Rural Water Assistance Fund** Water supply and wastewater projects for rural political subdivisions and nonprofit water supply corporations
www.twdb.texas.gov/financial/programs/spp		✓	✓	✓	✓			✓		**State Participation Program** Water supply, wastewater, and flood control projects that account for excess capacity in consideration of future needs
www.twdb.texas.gov/publications/shells/doc/SWIFT.pdf		✓	✓			✓		✓	✓	**State Water Implementation Fund for Texas** Recommended water management strategy projects with an associated capital cost in the state water plan
www.twdb.texas.gov/financial/programs/twdf		✓	✓	✓	✓	✓		✓	✓	**Texas Water Development Fund** Infrastructure projects for water supply, conservation, water quality enhancement, flood control, and wastewater

9.3.2 State Water Implementation Fund for Texas

With overwhelming approval of both the legislature and the voters of Texas, the SWIFT program was capitalized by a constitutionally protected one-time, up-front transfer of $2 billion from the State's Rainy Day Fund in 2013. State Water Implementation Revenue Fund for Texas (SWIRFT) bonds are issued to fund water supply projects and financially incentivize the development of projects identified in the State Water Plan. Together, these two funds comprise the SWIFT program The program helps communities develop cost-effective water supplies by providing low-interest obligations, extended repayment terms, deferral of repayments, and incremental repurchase terms through the Board Participation program that includes financing terms like the State Participation program.

At the state level, TWDB administrative rules include a prioritization system for projects applying for SWIFT funding each annual cycle. This system includes factors required by the SWIFT legislation and the associated weighting of criteria, such as how many people will be served by the project and whether the project will serve a diverse urban and rural population. Other criteria include the local financial contribution, emergency needs for water, and the project's impact on conservation. Typically, the TWDB solicits SWIFT abridged applications once a year, and the projects in each abridged application solicitation are prioritized using this system.

As of July 2026, the SWIFT program has committed nearly $16.9 billion to state water plan projects. The latest SWIFT biennial reporting, which includes progress toward program funding goals, is available at www.twdb.texas.gov/financial/programs/SWIFT/implementation.

9.3.3 Texas Water Fund

Senate Bill 28 and Senate Joint Resolution 75, passed in 2023 by the 88th Texas Legislature, provided for creation of the Texas Water Fund, which is a special fund in the state treasury outside the general revenue fund that is administered by the TWDB. Later that year, Texas voters approved Proposition 6, creating the Texas Water Fund to assist in financing water projects in Texas. The Texas Water Fund is not a TWDB financial assistance program and cannot offer financial assistance directly. Rather, it enables the TWDB to direct additional funding into existing financial assistance programs and the newly created New Water Supply for Texas Fund (Figure 9-6).

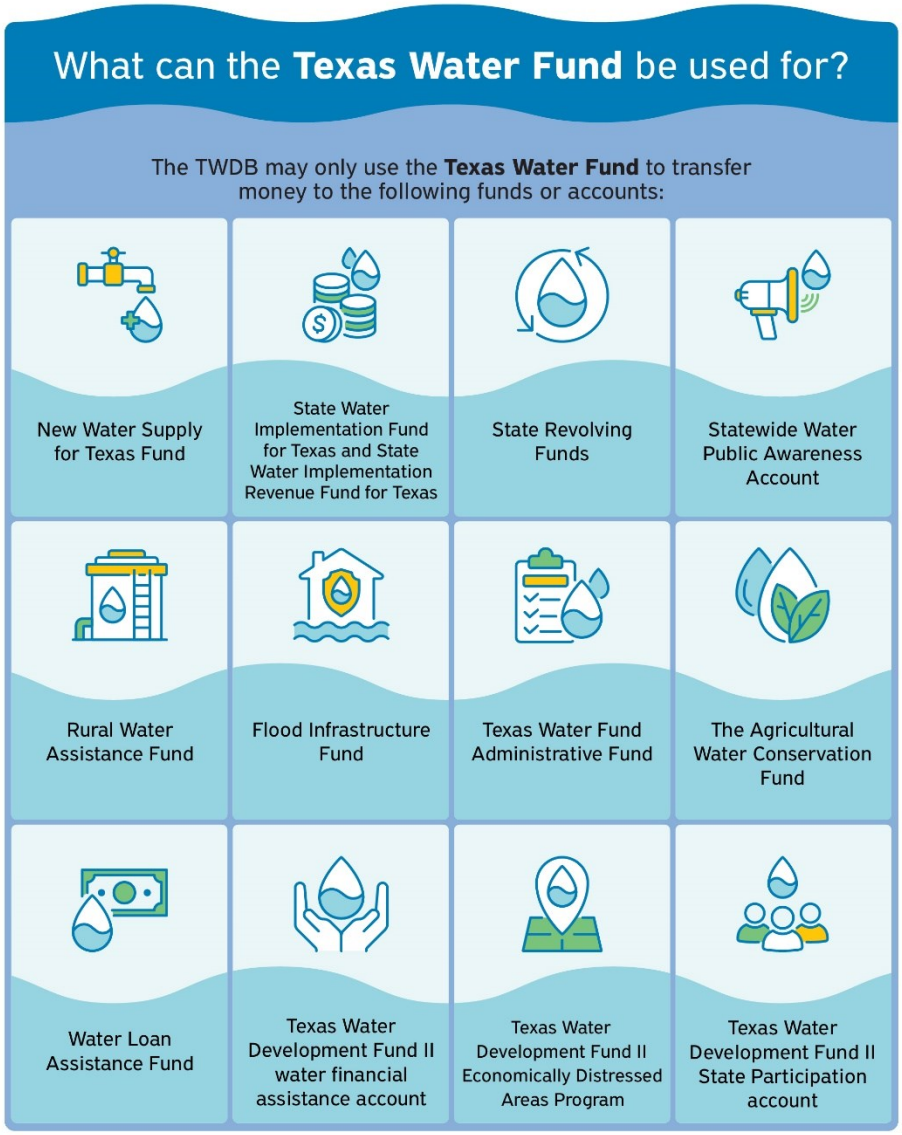
The 88th Texas Legislature authorized a one-time, $1 billion supplemental appropriation of general revenue to the Texas Water Fund, as approved by voters in 2023. At least 25 percent of this initial funding ($250 million) was directed to the New Water Supply for Texas Fund. The TWDB must also ensure that a portion of the money transferred from the Texas Water Fund supports high-priority water projects, including rural infrastructure, permitted projects, conservation, water loss mitigation, and public awareness efforts. To meet these statutory directives and in response to solicited stakeholder feedback, the TWDB Executive Administrator developed an initial Texas Water Fund implementation plan in 2024 (www.twdb.texas.gov/financial/programs/TWF/doc/2024-07-23-Brd02.pdf).

In 2025, lawmakers passed Senate Bill 7, which made changes to the Texas Water Fund statute to allow the fund to support more water-related programs administered by the TWDB. Later that year, Texas voters approved Proposition 4, dedicating a portion of state sales and use tax revenue to the fund. The provision goes into effect during State Fiscal Year 2028, allowing up to $1 billion per year for deposit into the fund if sales tax collections exceed $46.5 billion in the fiscal year. Any resulting support for the Texas Water Fund, and therefore project participants in the TWDB financial assistance programs, will depend upon the amount of sales tax collected as well as the timing of when those collections are distributed to the fund.

The TWDB is currently authorized to use the Texas Water Fund to transfer money to the following funds or accounts administered by the TWDB:

- the New Water Supply for Texas Fund;
- the SWIFT and SWIRFT;
- the Texas Water Fund administrative fund;
- the Flood Infrastructure Fund;
- the Water Assistance Fund and Water Loan Assistance Fund;
- the Clean Water and Drinking Water State Revolving Funds;
- the Rural Water Assistance Fund;
- the Agricultural Water Conservation fund;
- the statewide water public awareness account, a newly created account that will direct funds toward a statewide public awareness program;
- the Texas Water Development Fund II water financial assistance account;
- the Texas Water Development Fund II Economically Distressed Areas Program; and
- the Texas Water Development Fund II State Participation account.

Figure 9-6. Texas Water Fund



9.3.4 New Water Supply for Texas Fund

The New Water Supply for Texas Fund is a special fund in the state treasury, outside the general revenue fund, administered by the TWDB. The fund was established by the 88th Texas Legislature in 2023 through Senate Bill 28 and Senate Joint Resolution 75 to finance the development and acquisition of new water supply for all Texans.

Of the money deposited to the credit of the Texas Water Fund from the constitutionally dedicated revenue stream before September 1, 2047, the TWDB is required to allocate no less than 50 percent for transfer to the New Water Supply for Texas Fund and/or the SWIFT. The fund may be used to provide financial assistance to political subdivisions of the state to develop water supply projects that create new water supplies, including

- desalination projects;
- produced water treatment projects that would provide water for purposes other than oil and gas exploration;
- aquifer storage and recovery projects;
- water and wastewater reuse projects;
- acquisition of water rights originating outside of Texas;
- reservoir projects that have acquired land and completed state and federal permitting; and
- infrastructure to transport water or integrate water into a water supply system, excluding groundwater unless part of the project types above.

The TWDB is directed to finance projects through this fund that will lead to the development of at least 7 million acre-feet of new water supplies by the end of 2033.

9.3.5 Other TWDB state-funded programs

In addition to SWIFT and the programs supported by the Texas Water Fund, the TWDB offers other financial assistance programs to fund projects in the state water plan as well as projects not included in, but consistent with, the state water plan. These programs encourage municipalities to break ground on projects to ensure an adequate water supply for future generations.

The **Texas Water Development Fund** was created in 1957 with the passage of the agency's first constitutional amendment and is the oldest of the TWDB programs. The program is a streamlined state program that provides financing for various types of infrastructure projects. This program enables the TWDB to fund projects with multiple purposes, like water and wastewater or flood control, in one commitment.

The **State Participation Program** allows for the "right sizing" of projects in consideration of future water needs. The program encourages the optimum development of regional projects by funding excess capacity for future use. The TWDB assumes a temporary ownership interest, and the local sponsor repurchases TWDB interest as growth is realized and additional customers connect to the system. Projects can include reservoirs, well fields, water rights, wastewater, and flood control. The 86th Texas Legislature passed House Bill 1052 in 2019, which expanded the program's scope to encourage interregional water supply projects and the development of desalination and aquifer storage and recovery facilities.

The **Rural Water Assistance Fund** provides small, rural water utilities with low-cost, long-term financing and grants for water and wastewater projects. The program is designed to offer tax-exempt equivalent financing to water supply corporations or projects ineligible for tax-exempt financing. Eligible applicants are nonprofit water supply corporations, districts, municipalities serving a population of

10,000 or less, and counties in which no urban area has a population exceeding 50,000, as further defined in 31 Texas Administrative Code § 365.2(6)).

The **Water Loan Assistance Fund** provides financial assistance in the form of grants or loans for water conservation, desalination, brush control, weather modification, regionalization and projects providing regional water quality enhancement services and grants to drainage districts for water supply projects including those that contain a flood control component.

The **Agricultural Water Conservation Program** provides financial assistance in the form of loans and grants for agricultural water conservation projects in Texas. The program supports the implementation of strategies and practices that improve agricultural irrigation water use efficiency. Some of the projects funded by the program include irrigation equipment upgrades, metering devices, and construction projects that improve infrastructure, equipment, and efficiency of irrigation.

The **Economically Distressed Areas Program** provides financial assistance in the form of grants and loans for water and wastewater projects in economically distressed areas where service is unavailable or inadequate to meet state standards. Funded projects must be within counties that are enforcing adopted Model Subdivision Rules. Constitutional bonding authority is the primary mechanism for this funding. In November 2019, Texas voters approved a proposition authorizing the TWDB to issue additional general obligation bonds in an amount not to exceed $200 million for Economically Distressed Areas Program projects. Individual bond issuances depend on biennial legislative appropriations. Appropriations were received to support the issuance of approximately $100 million in financial assistance for the 2024–2025 biennium.

The **Flood Infrastructure Fund** became available in 2020 to provide grants and low-cost loans for flood control, flood mitigation, and drainage projects, some of which may have a water supply component. Only flood management evaluations, flood mitigation projects, and flood management strategies recommended in the state flood plan approved by the TWDB are eligible for this financial assistance.

9.3.6 TWDB federally funded programs

Alongside state funded programs, the TWDB administers two major federal revolving funds that offer low-cost financing for drinking water, wastewater, and stormwater projects.

The **Clean Water State Revolving Fund (CWSRF)** was authorized by the Clean Water Act to provide low-cost financial assistance for planning, acquisition, design, and construction of wastewater, reuse, and stormwater infrastructure. The program allows for project submissions to be made year-round. This funding addresses water quality needs by building on state partnerships with the U.S. Environmental Protection Agency. Currently, all 50 states and Puerto Rico operate CWSRF programs. The program is funded by annual capitalization grants from the U.S. Congress through the Environmental Protection Agency, a required 20 percent state funding match, program equity, and revenue bonds.

The **Drinking Water State Revolving Fund (DWSRF)** was authorized by the Safe Drinking Water Act to assist communities by providing low-cost financing for a wide range of water projects that facilitate compliance with drinking water standards. Below market interest rate assistance is offered for planning, acquisition, design, and construction of water infrastructure projects, such as water treatment facilities, system upgrades, source water protection, and flood resiliency projects. Like the CWSRF, the program allows project submissions to be made year-round. The program is funded by annual capitalization grants made by the U.S. Congress through the U.S. Environmental Protection Agency, a required 20 percent state funding match, program equity and revenue bonds.

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10 Implementation of the 2022 State Water Plan

Quick facts

Regional water planning groups reported that 780, or 47 percent, of the water management strategies in the 2022 State Water Plan that did not require a capital project were either partially or fully implemented. In addition, 935 projects—38 percent of projects recommended in the plan—were either partially or fully implemented.

Of the total estimated $81 billion in project costs in the 2022 State Water Plan, the Texas Water Development Board (TWDB) has delivered to project sponsors more than $6.4 billion toward the implementation of 68 recommended state water plan projects. These projects represent approximately 1.6 million acre-feet of water supplied, conserved, or maintained. [21]

Based on the relative severity of potential shortages, a greater share of Texans appear better positioned to withstand drought-of-record conditions in the near-term decades compared to the 2022 State Water Plan. However, a substantial share of the state's population could still experience severe shortages exceeding 25 percent or more of demand, demonstrating that drought vulnerability remains a significant concern especially if recommended water management strategies are not implemented.

Regional water planning groups help to assess the state's progress in meeting future water needs by evaluating which previously recommended water management strategies and projects in their region were implemented during the five-year planning cycle, identifying impediments to implementation, and reviewing the feasibility of the previous plan. To provide additional insight on implementation, the state water plan also includes information on state water plan projects funded since the adoption of the previous plan, an assessment of whether projects prioritized by the TWDB for State Water Implementation Fund for Texas (SWIFT) funding were implemented in their decade of need, and any impediments that delayed implementation.

10.1 Implementation of the 2022 State Water Plan

Water management *strategies* in the state water plan may or may not require new infrastructure—referred to as water management strategy *projects*—to be developed. Not every strategy requires a project, but every project is tied to an associated strategy.

Planning groups reported on the implementation of water management strategies and projects from the 2022 State Water Plan in their 2026 regional water plans. To do this, the planning groups surveyed the project sponsors and reported on the extent to which water infrastructure projects had progressed toward planning, design, or construction phases. They also gathered information on strategies that do not require new infrastructure development. Examples include demand reduction strategies (conservation and drought management) and other supply development strategies, such as utilization of unallocated supplies, contract purchases, and voluntary redistributions or transfers that use existing infrastructure.

Because water management strategies, particularly those involving infrastructure projects, can require several years to fully implement, both strategy and project progress were categorized in two ways:

1. Implemented – when a strategy is in place and fully capable of meeting water needs as planned.
2. Progress toward implementation – includes any type of implementation step to start project construction (including such pre-implementation activities as negotiating contracts, applying for and

[21] The above supplies are planned supply volumes. Supplies may change for various reasons once a project is complete.

securing financing or state and federal permits, or conducting preliminary feasibility and engineering studies) or achieve a portion of the total anticipated conservation savings from a strategy.

Aggregated implementation of projects in the previous plan

Statewide implementation progress of the 2022 State Water Plan is presented below as relative counts based on the number of survey responses for two distinct categories: recommended projects (approximately 1,300 survey responses) and strategies not associated with a project (approximately 830 survey responses). Figures 10-1 and 10-2 present these results in the context of the total number of recommended projects (approximately 2,400) and strategies not associated with a project (approximately 1,700), highlighting the limited number of survey responses implementation findings are based on. The overall survey response rate was about 48 percent.

The planning groups reported implementation survey information for approximately 1,300 specific projects, accounting for 54 percent of the recommended projects in the 2022 State Water Plan. Of the projects that were reported on, about 5 percent were reported as fully implemented, 66 percent had some degree of implementation progress, 22 percent had no implementation, and 7 percent were reported as no longer being pursued. Projects reported as fully or partially implemented account for almost $27.8 billion, or 34 percent, of the 2022 State Water Plan total capital costs.

Planning groups also reported, separate from the recommended projects, the implementation survey information for 828 strategies not associated with a project. Of these, about 3 percent were reported as fully implemented, 91 percent had some form of implementation progress, 5 percent had no implementation, and 1 percent were reported as no longer being pursued. Strategies reported as fully implemented account for just over 1 percent of the total number of recommended water management strategies without an associated project in the 2022 State Water Plan. Strategies reported as only partially implemented account for about 45 percent of the total number of strategies without associated projects in the 2022 State Water Plan.

Overall, the survey results point to a growing backlog of projects that need to be implemented ahead of the onset of the next drought. The lack of implementation of strategies by sponsors leaves the associated communities vulnerable to drought.

Water supplies associated with fully implemented strategies shift from future supply to the "existing supply" side of the planning equation in this current water plan.

Figure 10-1. Reported implementation of all recommended water management strategy projects from the 2022 State Water Plan by share of total number of projects (percent)

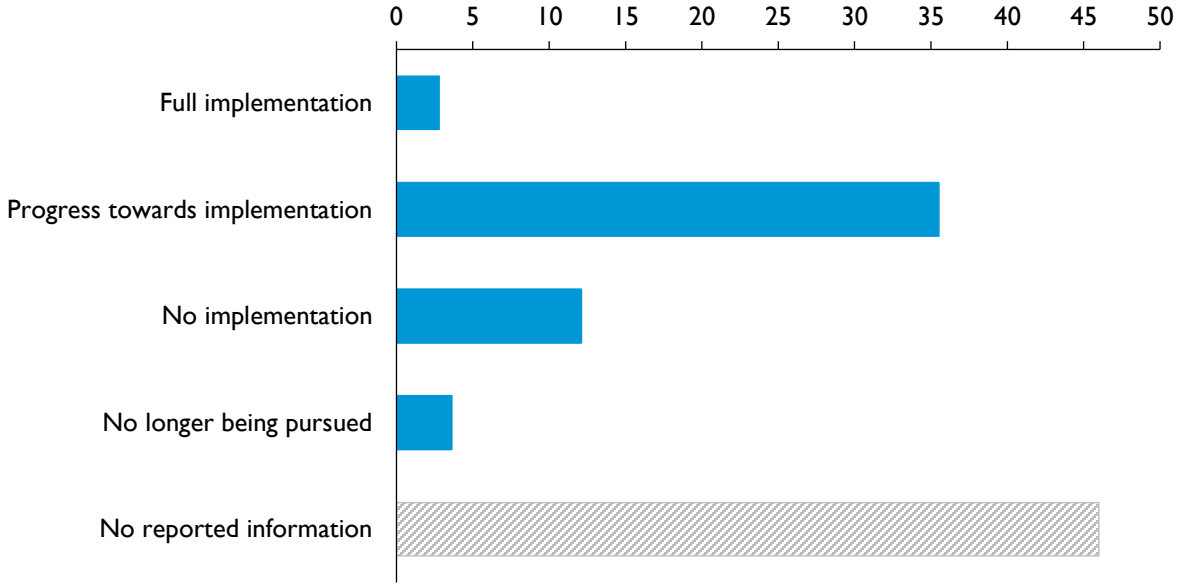
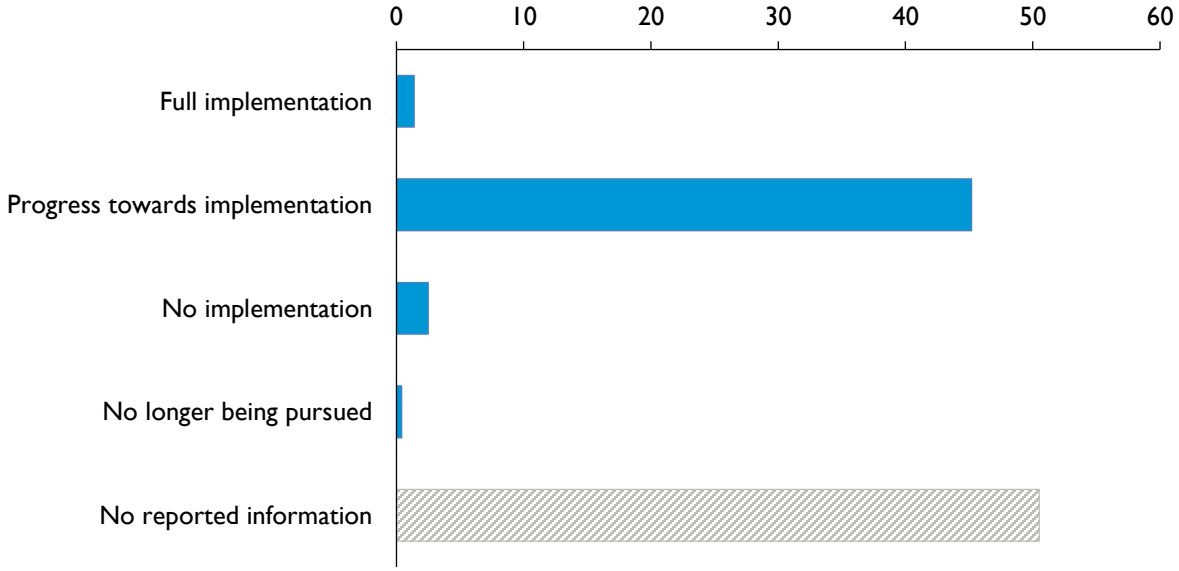


Figure 10-2. Reported implementation of recommended water management strategies not associated with a project from the 2022 State Water Plan by share of total number of strategies not associated with a project (percent)



Implementation of specific projects in near decades

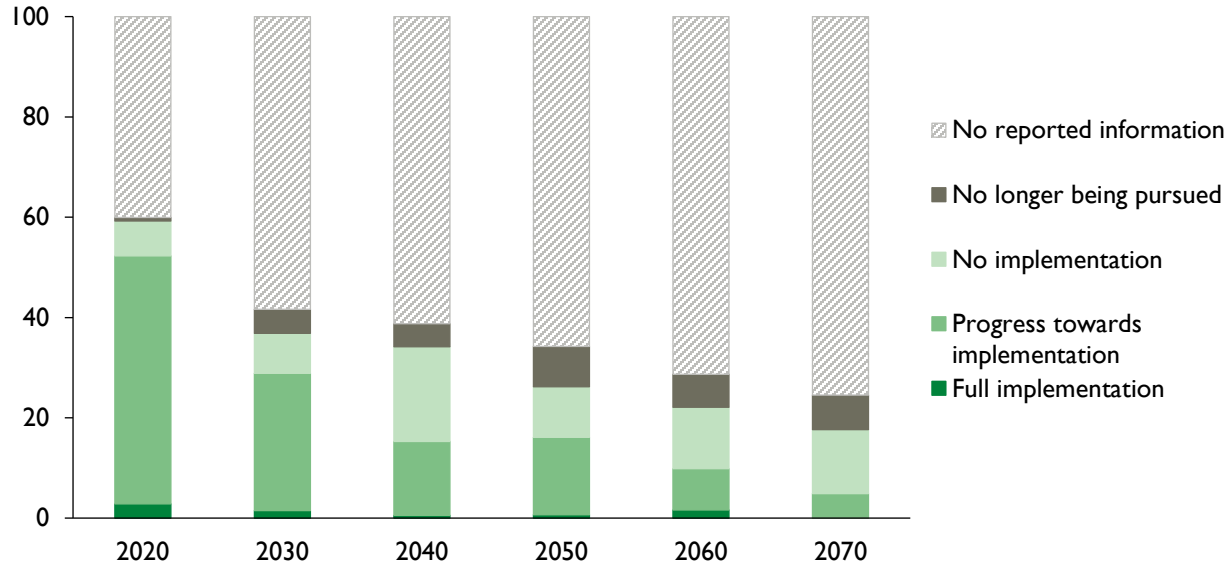
The TWDB is limited in its ability to provide one-to-one assessments of the extent to which projects in the previous plan were not implemented in the decade in which they are needed, especially for decades beyond the first in the planning cycle. During each planning cycle, the planning groups update their water management strategies, including the names, configuration, beneficiaries, capacity, and when the projects

are anticipated to be needed and fully operational. Due to these changes, including schedule updates, the regional and state water plans will rarely reflect a project not being implemented in time for the recommended decade. When looking at the implementation of the 2022 State Water Plan, this only measurably applies to projects due to be online in 2020 that are not currently online.

Even with these reporting limitations, the available survey responses provide insight into near-term implementation progress. Planning groups reported the implementation status of 1,600 of the approximately 2,700 water management strategies and projects in the 2022 State Water Plan that were due to be online in 2020 (Figure 10-3). Of these, approximately 5 percent were reported as fully implemented, 83 percent as partially implemented, 12 percent as not implemented, and 1 percent as no longer being pursued. Projects reported as fully or partially implemented account for approximately $9.9 billion, or 58 percent, of total 2020 capital costs in the previous plan.

Looking beyond the 2020 decade, the survey also captured progress on projects planned for 2030. Planning groups reported the implementation status of 359 of the 863 water management strategies and projects in the 2022 State Water Plan that were due to be online in 2030. Of these, 4 percent were reported as fully implemented, 66 percent as partially implemented, 19 percent as not implemented, and 11 percent as no longer being pursued. Projects reported as fully or partially implemented account for approximately $12.8 billion, or 46 percent, of total 2030 capital costs.

Figure 10-3. Reported implementation survey results by online decade (percent)*



** Presents combined implementation survey results for projects and strategies without a project that have a defined online decade. Survey responses are presented in the order listed in the legend.*

Progress in achieving economies of scale

As part of their task to review and report on implementation of the previous regional water plan, planning groups also assessed regional efforts to encourage cooperation between water user groups to develop strategies that achieve economies of scale and benefit the entire region. Planning groups identified 226 strategies in the previous regional water plans that serve multiple water user groups and reported that at least 10 of these strategies have been fully implemented. Regions G and H identified an additional 50 strategies that serve multiple water user groups that have been fully or partially implemented, but their reporting did not distinguish which of these were fully implemented.

Statewide changes in projected drought vulnerability

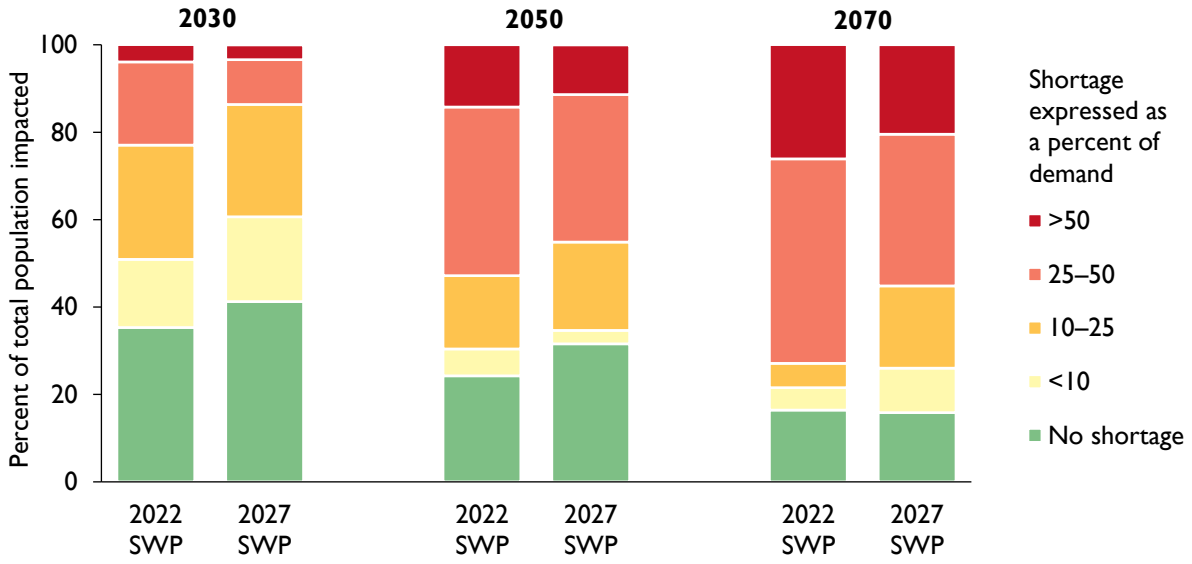
The state water plan consists of thousands of individual assessments of water user group demands, existing supplies, and potential shortages under drought-of-record conditions. These assessments vary considerably across the state based on local conditions and are updated with each planning cycle. Because the state water plan is revised every five years and underlying demand, supply, and shortage projections are continually refined, it is not straightforward to develop a single metric that meaningfully represents statewide "implementation progress" over time.

Beyond tracking the implementation status of individual water management strategies, a more practical way to evaluate statewide progress is to examine relative changes in projected drought vulnerability between state water plans. By comparing projected shortages under drought-of-record conditions across plans for the same planning decade, it is possible to assess whether water user groups, in general, are projected to be more or less vulnerable to a recurrence of drought-of-record conditions. This approach shifts the focus away from calculating a statewide "percent complete" for a plan that has since been superseded and toward a more relevant question: In the latest state water plan, do Texans appear better or worse positioned to withstand a repeat of drought-of-record conditions?

One way to evaluate changes in statewide drought vulnerability is to compare the number of Texans projected to experience varying levels of shortages under drought-of-record conditions, expressed as a percentage of water demand (Figure 10-4). Compared to the 2022 State Water Plan, the 2027 State Water Plan indicates that fewer Texans are projected to experience shortages across nearly all levels of severity if a drought-of-record were to recur in 2030 assuming no strategies were implemented.

This comparison suggests that Texans are projected to be better positioned in 2030—and, to a lesser extent, in 2050—to withstand drought-of-record conditions than was projected in the 2022 State Water Plan. While this improvement reflects the combined effect of many factors, it nevertheless represents a meaningful reduction in projected drought vulnerability. However, the results also indicate that a substantial share of the state's population could still experience severe shortages exceeding 25 percent of demand, demonstrating that drought vulnerability remains a significant concern *especially* if recommended water management strategies are not implemented.

Figure 10-4. Comparison of the percentage of statewide population projected to face various degrees of severity of municipal water needs in 2030, 2050, and 2070



SWP – state water plan

Projects carried forward across state water plans

To better understand ongoing implementation challenges and to attempt to characterize at least a subset of the growing backlog of near-term recommended—but not yet fully implemented—water supply projects, the TWDB analyzed projects recommended for the first planning decade in water plans that have then been carried forward across multiple state water plans.

The analysis identified several projects that were recommended for implementation by 2020 in the 2017 State Water Plan that are also recommended in the 2027 State Water Plan, but with an online decade of 2030. A significant share of these projects are conservation measures that, while often evaluated for costing and comparison within the first planning decade, will likely be implemented over the full 50-year planning horizon—thereby creating a misleading artifact in the analysis.

Aside from conservation projects, there were 166 projects that were shifted forward by 10 years between plans. These projects represented approximately $3.1 billion (5 percent of total capital costs) in the 2017 plan, and now account for nearly $6.7 billion (4 percent of total capital costs) in the 2027 plan. Collectively, these projects comprise about 5 percent of all projects recommended in the 2027 State Water Plan. The result is a continued accumulation of recommended but not yet implemented projects that must be implemented in the immediate future to ensure drought preparedness. Figure 10-A shows the count of carried-forward projects by associated strategy type, other than conservation projects. Most of the carried-forward projects are associated with groundwater development and water recycling and reuse.

Implementation survey results indicate that 37 percent of these projects were reported as having some progress toward implementation, while approximately 28 percent had no implementation activity. Projects reported as having no implementation are primarily associated with water reuse recycling strategies for mining water users. Projects recommended for county-level water user groups often lack specific identified sponsors and have limited information available to assess implementation. In addition, several projects across other strategy types—including those associated with multiple strategy types, groundwater, other direct reuse, and other surface water—also reported no implementation activity.

The most frequently cited impediments to implementation are

- a lack of an identified project sponsor (30 projects),
- shifts in project timelines (14 projects), and
- contracting or permitting constraints (5 projects).

Overall, the persistence of these projects across planning cycles, along with their increasing capital costs, highlights ongoing implementation and financing challenges and underscores the need for early project development, sustained funding, and targeted efforts to address barriers that delay implementation.

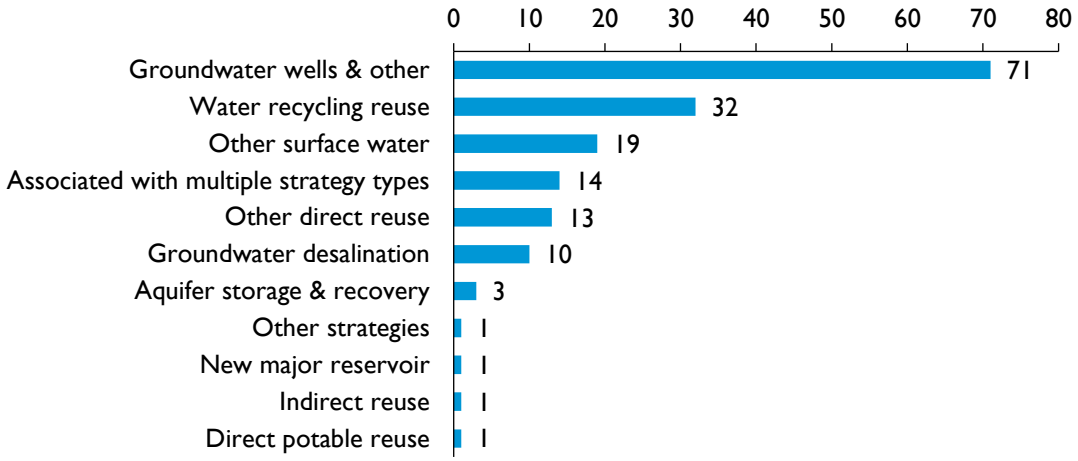


Figure 10-A. Count of non-conservation projects by associated water management strategy type with an online decade of 2020 in the 2017 State Water Plan that have been carried forward and are recommended in the 2027 State Water Plan with a 2030 online decade

10.2 Funding of the 2022 State Water Plan

Since adopting the 2022 State Water Plan, the TWDB has delivered to project sponsors more than $6.4 billion toward the implementation of 68 state water plan projects recommended in the 2022 State Water Plan (Table 10-1). These projects represent approximately 1.6 million acre-feet of water supplied, conserved, or maintained.[22] The TWDB has funded recommended water management strategies through several funding programs including the State Water Implementation Fund for Texas, Texas Water Development Fund, Rural Water Assistance Fund, Water Loan Assistance Fund, and the Clean and Drinking Water State Revolving Funds.

A wide variety of water management strategies have received commitments for TWDB funding since the adoption of the 2022 State Water Plan, including reservoirs, seawater desalination, transmission line expansions, new water meters, acquisition of water rights, new groundwater wells, and aquifer storage and recovery projects. Funding commitments, which may be larger than the estimated costs of those projects in the state water plan, were associated with several different project sponsors throughout Texas, including cities and regional water providers (Figure 10-5).

[22] The above supplies are planned supply volumes. Supplies may change for various reasons once a project is complete.

Table 10-1. 2022 State Water Plan projects funded by the TWDB, by project sponsor as of July 2026

Map reference	Sponsor region[a]	Project[b]	Project sponsor entity	Financial assistance features			Closed funding amount	Associated annual water supply (acre-feet per year)[c]
				SWIFT funding	Board participation	Other state and federal funding		
1	A	Develop Additional Water Supplies from the Ogallala Aquifer	Greenbelt MIWA			x	$18,110,000	2,000
2	B	Odell-Winston Wellfield Pipeline	Vernon	x			$12,000,000	120
3	C	20 MGD WTP Expansion – Ray Roberts Phase 1	Denton	x			$21,370,000	22,418
4	C	2025 DWSRF Honey Grove Water System Improvements	Honey Grove			x	$4,196,000	1,613
5	C	Bois d'Arc Lake & Leonard Water Treatment Plant	North Texas MWD	x			$771,450,000	120,665
6	C	City of Bonham Water System Improvements	Bonham			x	$24,274,100	1,492
7	C	City of Denison Water Distribution Improvements Project for Disadvantaged Areas	Denison			x	$16,950,000	18
8	C	City of Springtown – Water System Improvements	Springtown			x	$1,390,000	81
9	C	Conservation, Water Loss Control	White Settlement	x			$675,000	30
10	C	Eagle Mountain Water Treatment Plant – 35 MGD Expansion	Fort Worth	x			$305,000,000	39,497
11	C	GTUA – Collin-Grayson Municipal Alliance (CGMA) Bloomdale Pump Station Expansion	Greater Texoma UA	x			$7,525,000	4,491
12	C	GTUA/City of Bells Water & Wastewater Improvements	Greater Texoma UA			x	$7,200,000	7,259
13	C	GTUA/City of Dorchester Water System Improvements	Greater Texoma UA			x	$4,625,000	200
14	C	GTUA/City of Gainesville Water Transmission Main Replacement Project	Greater Texoma UA	x			$2,705,000	18
15	C	GTUA/White Shed WSC Water Well & System Improvements	Greater Texoma UA			x	$3,520,000	605
16	C	Harpool RWTP Expansion Phase 2	Upper Trinity Regional WD	x	x		$80,000,000	33,600
17	C	Infrastructure to Treat and Deliver to Customers: Design of Lake June Pump Station Replacement	Dallas	x			$7,500,000	14,600
18	C	Infrastructure to Treat and Deliver to Customers: Water Main Replacement Program	Dallas	x			$170,000,000	2,090
19	C	Integrated Pipeline (IPL) Connect Lake Palestine	Tarrant Regional WD	x			$255,000,000	114,377
20	C	Lake Ralph Hall Reservoir	Upper Trinity Regional WD	x	x		$614,345,000	60,399

Map reference	Sponsor region[a]	Project[b]	Project sponsor entity	Financial assistance features			Closed funding amount	Associated annual water supply (acre-feet per year)[c]
				SWIFT funding	Board participation	Other state and federal funding		
21	C	Mabank Wastewater and Water Infrastructure	Mabank			x	$28,790,000	0
22		North System Raw Water Pipelines	North Texas MWD	x			$641,695,000	80,304
23		RTWS Northeast Transmission Pipelines & Loop	Upper Trinity Regional WD	x	x		$58,460,000	33,479
24		South Transmission System Pipeline	Greater Texoma UA			x	$43,200,000	12,797
25		Southwest Pipeline Phase 1	Dallas	x			$73,300,000	19,900
26		Springtown Raw Water Station; Surface WTP Improvements	Springtown	x			$1,390,000	81
27		Taylor Regional Water Treatment Plant Expansion	Upper Trinity Regional WD	x	x		$115,620,000	16,800
28	D	New 15 MGD WTP	Greenville	x			$90,500,000	8,077
29		Riverbend Regional Water System	Riverbend Water Resources District			x	$258,700,000	80,209
30	F	Hickory Aquifer Wellfield Phase II	San Angelo			x	$69,490,000	3,000
31	G	Brushy Creek Regional Utility Authority Water Treatment and Distribution Project	Brushy Creek Regional UA	x			$311,495,000	42,410
32		Carrizo Aquifer Development	Bistone Municipal WSD	x			$5,000,000	371
33		Granbury Emerging Contaminants Reduction Improvements	Granbury			x	$57,800,000	5,601
34		Turkey Peak Reservoir	Palo Pinto Co MWD # 1	x			$72,000,000	6,000
35	H	Allens Creek Reservoir	Brazos River Authority	x			$50,000,000	0
36		BAWA East SWTP Expansion	Baytown Area WA	x			$69,000,000	6,720
37		Brazosport WSC Reservoir Project	Brazosport WSC	x			$573,470,000	84,000
38		Central Harris County Regional Water Authority Transmission and Distribution Expansion	Central Harris Co Regional WA	x			$13,000,000	5,470
39		City of Groveton Water Improvements	Groveton			x	$4,261,250	323
40		City of Houston East Water Purification Plant Enhancement	Houston	x			$350,000,000	403,251
41		CWA TRANSMISSION EXPANSION (WMS-4009)	Coastal Water Authority	x			$75,000,000	134,506
42		NHCRWA Internal 2020 Distribution	North Harris Co Regional WA	x			$362,960,000	143,360
43		Oakwilde & Woodland Oaks WWTPs	Sunbelt FWSD			x	$10,440,000	806
44		The City of Cut and Shoot Water Well #6 and EST	Cut and Shoot			x	$5,875,000	483

Map reference	Sponsor region[a]	Project[b]	Project sponsor entity	Financial assistance features			Closed funding amount	Associated annual water supply (acre-feet per year)[c]
				SWIFT funding	Board participation	Other state and federal funding		
45	J	City of Bandera Water Supply Improvements	Bandera			x	$2,755,800	39
46		Drill a new well and connect to distribution system	Del Rio	x			$4,865,000	3,226
47		Water Treatment Plant Expansion	Del Rio	x			$3,455,000	4,705
48	K	Conservation Strategy – Smart Meters (Advanced Meter Infrastructure)	Austin	x			$70,000,000	6,105
49		Direct Reuse Strategy	Austin	x			$10,000,000	70
50		Marble Falls – Purple Pipe System Extension	Marble Falls			x	$4,300,859	13
51		Municipal Conservation	Austin	x			$3,000,000	700
52	L	Carrizo Groundwater Supply Project	Guadalupe Blanco RA	x	x		$240,040,000	24,000
53		Hays-Caldwell Water Treatment Plant Improvement Project	Canyon Regional WA			x	$5,000,000	1,560
54		I-35 Business Waterline Extension and Citywide Waterline Replacement	Pearsall			x	$7,400,000	397
55		Phase 1B, 1C, and 1D	Alliance Regional Water Authority	x			$181,500,000	16,320
56		SAWS ASR Treatment Plant Expansion	San Antonio Water System	x			$27,635,000	21,000
57		Trinity Aquifer Groundwater Wells	New Braunfels			x	$40,000,000	4,480
58	M	City of McAllen Acquisition of Water Rights (Conversion of Water Rights)	McAllen	x			$3,215,000	1,333
59		City of McAllen Brackish Groundwater Treatment Plant	McAllen	x			$30,000,000	6,720
60		ERHWSC North Cameron Reverse Osmosis Plant Expansion	East Rio Hondo WSC			x	$43,110,000	2,800
61		McAllen Citywide AMI/AMR Infrastructure Upgrade Project	McAllen	x			$18,000,000	964
62		Rio Hondo Proposed Reverse Osmosis Treatment Plant & Water Well Improvements	Rio Hondo			x	$4,140,000	1,120
63		Seawater Desalination Plant	Laguna Madre WD	x			$74,655,000	5,600
64		Sharyland Water Supply Corporation Test Wells	Sharyland WSC			x	$1,050,000	0
65	N	Replace Small Diameter Distribution Lines & Install Automated Meter Reading System	Nueces Co WCID # 3			x	$9,304,876	4
66		Seawater Desalination	Corpus Christi	x			$10,000,000	33,604
67		Supplemental Water Resources	Alice			x	$12,499,000	3,336

Map reference	Sponsor region[a]	Project[b]	Project sponsor entity	Financial assistance features			Closed funding amount	Associated annual water supply (acre-feet per year)[c]
				SWIFT funding	Board participation	Other state and federal funding		
68	O	Seminole 2024 Water System Improvements	Seminole			x	$6,090,000	1,120

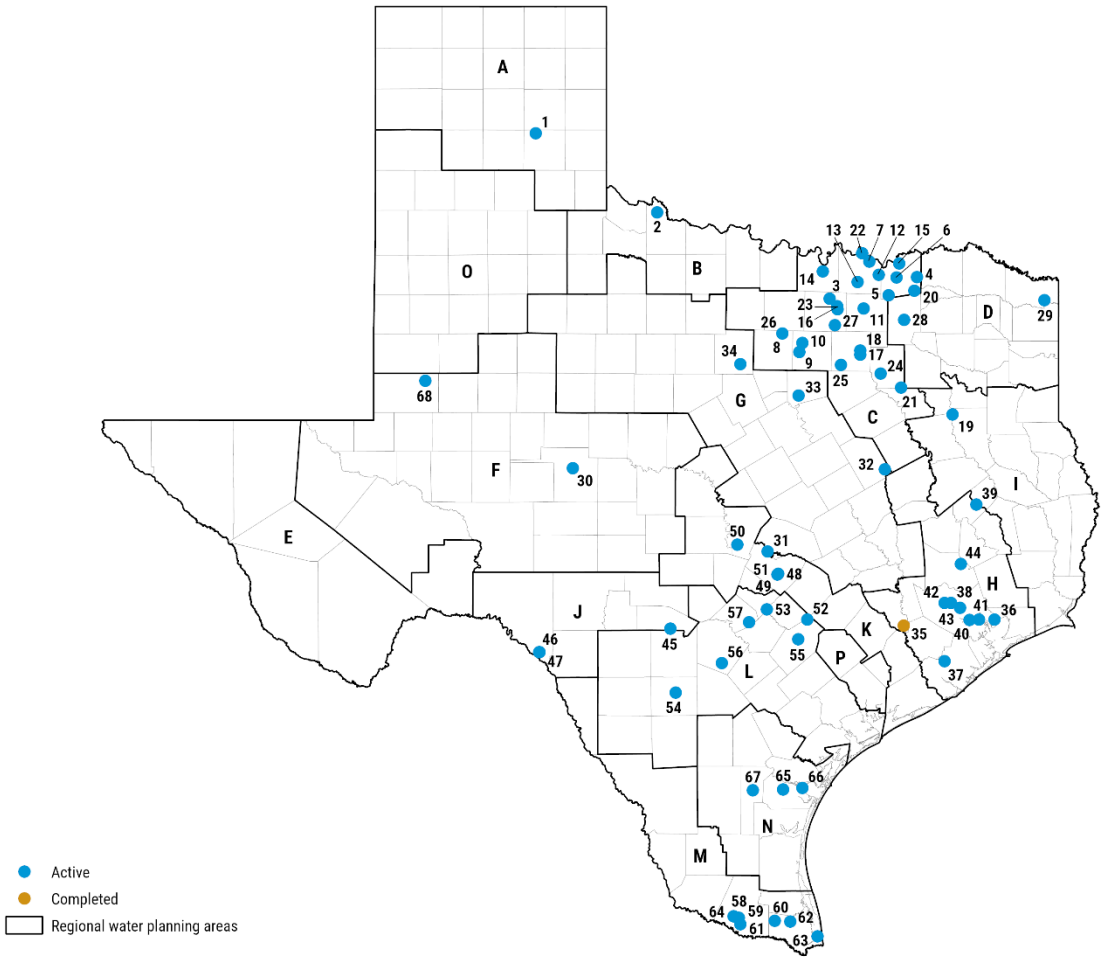
[a] Sponsor region may differ from the project location region.

[b] Project name and components may vary from the 2022 State Water Plan.

[c] Associated annual supply volumes based on best available information. Water volumes may also be associated with other projects and may differ from the final amounts at project completion. Projects with zero acre-feet of associated supply do not include a construction phase required to bring supplies online.

FWSD – fresh water supply district
MIWA – municipal and industrial water authority
MWD – municipal water district
RA – river authority
SWIFT – State Water Implementation Fund for Texas
UA – utility authority
WA – water authority
WCID – water control and improvement district
WD – water district
WSC – water supply corporation
WSD – water supply district

Figure 10-5. Locations of 2022 State Water Plan projects funded by the TWDB, by project sponsor*



* *Numbers correspond to the map reference key in Table 10-1.*

10.3 Impediments to implementation of the 2022 State Water Plan

Because the project evaluations in each five-year planning cycle are expected to consider updated conditions and reflect changed circumstances since the previous plan, they are inherently adaptive in reflecting the associated project implementation timelines. In addition to being survey based, which results in limited responses, tracking implementation of all projects across multiple planning cycles is difficult, especially for phased projects. However, certain larger and consistently defined projects—such as the construction of new reservoirs that have longer development timelines and more reliable survey responses—are easier to consistently track across water plans and are, therefore, more easily assessed over time.

To better understand why some water management strategy projects are not implemented in the decade in which they are needed, the planning groups are required to collect information on impediments to implementation through surveys sent to project sponsors. To improve consistency in reporting, this cycle's survey included five standardized response options based on impediments frequently identified in past surveys, along with an option to write in custom responses for other

impediments. The top reported impediments to project implementation, and the approximate number of associated survey responses, included the following:

- **Project sponsor not identified** (151 survey responses): No entity has formally taken responsibility for advancing the project. This primarily includes projects recommended for county-level non-municipal water user groups, which often lack specific identified sponsors and have limited information available to assess implementation.
- **Shift in timeline** (121 survey responses): The project schedule changed. This could be due to a variety of issues, including delays in financing, planning, permitting, or construction as well as staffing changes or shifts in local priorities.
- **Economic feasibility and financing** (96 survey responses): Costs, funding gaps, or financial uncertainties are preventing progress.
- **Contract and permit constraints** (51 survey responses): Required agreements or permits are delayed or difficult to obtain.
- **Water supply constraints** (46 survey responses): Limitations on available water or water rights are blocking or slowing implementation.

Other noted impediments, each reported roughly 10 times or fewer, included the lack of drought conditions as a decision driver, site selection difficulties, and challenges acquiring property and easements.

Because even technically and economically feasible projects, especially large ones, require significant time and effort to implement, these impediments do not necessarily mean that a project will not be implemented. Instead, they indicate that implementation may take longer than previously anticipated and could delay the project online date. Right-of-way acquisition is a good example of a process that can create significant delays, even for relatively straightforward projects that simply require conveyance pipelines.

Since the establishment of regional water planning in 1997, several legislative initiatives have sought to improve implementation and overcome impediments through various statewide planning initiatives. These included requiring project prioritization by planning groups to inform state financial assistance for project implementation, charging an interregional planning council to facilitate dialogue regarding regional water management strategies, and most recently establishing conveyance coordination requirements for TWDB project development planning (SB 7, 89(R)).

While this legislation largely focuses on large-scale planning and implementation frameworks, the development of individual projects continues to face long-standing impediments that remain unresolved. Although financial limitations will always constrain implementation to some degree, significant challenges persist within state and federal permitting processes. Certain federal permitting requirements—such as those related to demonstrating project "purpose and need"—do not recognize state water plan projections or the results of Texas' water supply planning process as an adequate analytical basis. This disconnect impedes permitting decisions and may effectively preclude consideration of planned "excess" capacity, even when such capacity aligns with long-term statewide water supply objectives.

Implementation and impediments of highly prioritized SWIFT projects

Of the 2022 State Water Plan projects prioritized for funding through the SWIFT program since 2021, approximately 32 percent of projects had an online decade of 2020 in the 2022 State Water Plan and applied for funding after their decade of need. Of these prioritized projects with a 2020 online decade, only 67 percent completed the full SWIFT application process and received funding. For various reasons, several entities submitted abridged applications for prioritization and then decided not to submit a full application, and others submitted a full application but then withdrew before receiving a funding commitment.

Impediments reported for projects that received high SWIFT priority were similar to those seen across all projects and included financing challenges, water supply or water rights constraints, and delays in acquiring easements and completing construction. The remaining 68 percent of the projects prioritized for funding through the SWIFT program since 2021 applied for funding prior to their decades of need as identified in the 2022 State Water Plan, with most (47 percent) having an online decade of 2030.

10.4 Feasibility review of the 2022 State Water Plan

Separate from implementation tracking, each planning group must evaluate whether any strategies or projects in their previous plan have become infeasible. Every five years, planning groups are required to review the previous regional water plans to identify water management strategies and projects that have become infeasible and amend those plans if any infeasible strategies or projects were identified. This is the first cycle that planning groups have conducted this review.

In accordance with statute, a water management strategy or project is considered infeasible if its proposed sponsor has not taken an affirmative vote or other action to commit funds needed to file required federal or state permit applications or construct the project in time to meet its planned online decade in the regional or state water plan. Infeasibility in this context focuses on whether a strategy or project can still be implemented on schedule rather than on its technical feasibility.

Planning groups focused their feasibility reviews on projects requiring permits for construction, those scheduled for the 2020 or 2030 decades, and large and/or complex projects like new reservoirs, desalination, direct potable reuse, brackish groundwater, aquifer storage and recovery, and out-of-state transfers. If a project was determined to be infeasible, planning groups were required to amend their regional water plan to adjust its online date, replace it with a feasible alternative, or remove it and leave associated needs unmet. A total of 13 strategies and projects were found to be infeasible by Regions B, F, G, and M. These regions amended their 2021 plans to either remove the identified infeasible strategies and projects or revise their online decade to ensure that they are feasible. The remaining 12 regions did not identify any infeasible strategies or projects.

TWDB authority regarding project inclusion in water plans

A common question is whether the TWDB has the authority to remove projects from regional water plans that may be perceived as redundant or unnecessary. The TWDB does not have statutory authority to add or remove projects from the regional or state water plans if the associated water planning statute, rules, and technical guidance requirements have been met. Nor does the TWDB have clear statutory authority to require regions to amend their plans outside of specific instances, which include resolving interregional conflicts; addressing conflicts between a regional water plan and a groundwater conservation district's management plan; facilitating planning for water supplies for a clean coal project; or responding to a statutorily established petition process. Therefore, recommended strategies and projects in this and all state water plans since 2002 are solely the culmination of regional water planning group work and decisions.

11 Planning under uncertainty

Quick Facts

Texas' regional and state water planning framework is based on a deterministic rather than a probabilistic approach, relying on a single default drought-of-record scenario rather than a probability distribution of potential outcomes. While this simplifies planning, it doesn't quantify the associated risks.

Although Texas' water plans seek to prepare for a repeat of the most severe droughts on record, droughts worse than those historical benchmarks continue to emerge and have occurred in 8 out of 15 river basins since 2000.

Planning groups address a portion of these uncertainties by using conservative assumptions and other risk-mitigation methods to build buffers against droughts worse than the drought of record and other unexpected conditions.

Population projections underpin municipal water demand estimates but become increasingly uncertain further into the planning horizon due to assumptions about birth rates, mortality rates, migration, and development patterns that may change abruptly.

Non-municipal water demand—especially for industry and irrigation—is sensitive to economic cycles and private business decisions, making projections particularly difficult.

Firm yield volume is a commonly used measure of annual surface water availability, yet it is associated with only one point on a broader reliability–yield spectrum. As a result, firm yield estimates carry unquantified risks of not being met.

Planning uncertainty compounds across each step of the process (population-demand-supply-shortages), with each dimension contributing a degree of uncertainty and potentially amplifying the overall uncertainty.

Climate variability introduces additional and complex uncertainty—particularly through rising temperatures, increased evaporation, and more variable rainfall—that may intensify the impacts of future droughts; however, its relative contribution to the overall uncertainty of water availability is not known. The Texas Water Development Board (TWDB) consults with the Office of the State Climatologist and performs and supports studies that will help to better quantify and address planning uncertainties to further reduce risks of shortages.

These many sources of uncertainty in regional water planning highlight the importance of continuing regular five-year plan updates.

11.1 Background

The State of Texas established a regional and state water planning process that is designed to respond over time to new challenges, evolving realities, and inherent uncertainties. In a way, regional water planning is a risk assessment of whether we will have enough water in the future and, if not, what will be done to remedy shortages. By revisiting the regional water plans every five years, planning groups can address new information (such as shifts in population, water demand projections, and changes to water supplies), technological advancements (such as desalination), and new policy directives. The purpose of this chapter is to describe sources of uncertainty and risks within the context of Texas' state water planning process and how the planning groups and TWDB work to address those uncertainties and to mitigate risks associated with water supply.

Texas' water planning framework

Texas' bottom-up water planning framework is intentionally practical and relatively straightforward. Regional water planning groups develop their plans using a consistent statewide methodology in which a

single set of projected water demands—considered to be a realistic likely case[23]—is compared to a single set of projected supplies (based on benchmark drought conditions where possible) to identify potential future shortages and recommend strategies to address them. The default benchmark is the drought of record, which is the most severe historical hydrologic sequence within the available period of record for a region or basin. This benchmark represents the minimum threshold, though many regions plan beyond this minimum condition, as will be explained later in this chapter.

This **deterministic approach**—that plans around a single future rather than evaluating a range of future scenarios—has proven effective for developing statewide water plans in Texas. It controls and streamlines the planning workload, provides a common analytical anchor for the plans and recommended strategies, and enables planning groups and the TWDB to meet statutory deadlines for developing regional plans and synthesizing them into a coherent state water plan every five years.

This approach includes flexibility for local utilities and regional water suppliers, such as river authorities, to apply more advanced risk analysis methods for their water supply systems when appropriate. Regional water planning groups may choose to use tools like scenario analysis, stress testing, probabilistic yield ranges, and portfolio optimization when local conditions, potential consequences, and/or available resources justify further evaluation. Use of these tools should align with the availability of sufficient planning resources and the need for deeper analysis.

The planning process also enables planning groups to incorporate a "cushion" into regional water plans to address uncertainties that cannot be fully quantified. This helps mitigate risk and supports more refined assessments of water supply reliability where needed. Importantly, including safety factors does not imply that providers intend to overbuild or implement projects prematurely. On the contrary, water providers typically strive to defer major infrastructure investments as long as possible, often relying first on demand management strategies, such as conservation programs, to optimize existing resources before committing to costly new projects.

Texas' regional water planning process does not require performing complex statistical analyses or comparison of numerous multi-scenario ensembles to address ranges of uncertain future conditions. This is intentional for several reasons: limited resources and time available to the 16 regions to develop their plans; the need to develop numerous "mini-plans" for more than 3,000 individual water user groups; and, the reality that sophisticated analyses, such as accounting for variations in local risk tolerance, would not be the best use of limited planning resources. Many water providers remain unprepared for a repeat of *severe drought conditions that we know have already occurred in the historical record,* let alone droughts potentially worse than the drought of record.

The primary risk of water planning—water shortages

For water planning, the primary risk is the adverse impact of insufficient water supplies to meet the needs of the population and economy. The consequences of such shortages could be dire—including

[23] Water demand projections form the foundation of water planning. These projections—largely based on what could be considered a middle-of-the-road population forecast—serve as a "best estimate" grounded in expert judgment and the best available data. Systematically evaluating a range of plausible possible futures, including high/worst-case, most-likely, and low/best-case scenarios would require significantly more time and resources.

An alternative approach would be to design a plan that supports a specific future target population regardless of when that population is reached, rather than projecting precise population counts for specific future dates. Pairing combinations of potential ranges of demands and supplies—for example, to produce best- and worst-case shortages—is one way to attempt addressing this uncertainty. However, this approach can quickly generate a large number of scenarios that the regional water planning process does not currently have capacity to evaluate. For example, considering only three versions each for water demands and water supplies alone—a low, middle, and high for each—would generate nine paired scenarios that would have to be considered.

residential shortages, crop failures, major disruptions to industrial operations, business closures, or worse. Longer-term impacts could include stunted economic growth and loss of population, even if such shortages are marginally averted. This risk is intrinsically linked to the uncertainties in the water planning process.

At a basic level, Texas addresses these risks by using robust methods to project future population and water demands, evaluate water supplies, and recommend strategies to manage shortages. Plans are updated every five years *as new plans*, incorporating additional data and information that improves the accuracy and reliability of water demand projections and supply estimates that each plan is based on. The process is grounded in assessing conditions expected under the most severe drought conditions previously encountered, when the risk of not meeting demand is greatest. Despite these efforts, significant unquantified residual risk remains due to unavoidable uncertainties discussed in this chapter.

Relevant uncertainties outside of the water planning process

Community values, trust, and willingness-to-pay can indirectly influence implementation of a water plan. Public support for conservation, reuse, rate adjustments, land acquisition, or implementation of major infrastructure (new reservoirs, pipelines, well fields) can shift with recent drought experience, affordability concerns, and perceptions of equity. Political will at city councils, boards, and the legislature can affect permitting, financing, and strategy prioritization. As these sentiments evolve, they have the potential to accelerate or stall projects, alter water provision outcomes, and reshape water plans. More broadly, societal and institutional culture—including attitudes toward risk, long-term planning, environmental stewardship, and growth—evolves in ways that are difficult to predict and can materially influence future water supply decisions and planning outcomes.

11.2 Understanding uncertainty and risk

Risk is borne of uncertainty—without uncertainty, there is no risk. In planning and providing water supply for society, we must acknowledge both unavoidable uncertainties and the potential risks faced. And, even if risks could be fully quantified, our resources and ability to completely mitigate those risks remain limited. As a result, every water plan—no matter how robust—retains some level of residual risk of water shortage, which must be recognized and managed. Likewise, pursuing a highly risk-averse approach to minimize the likelihood of any future water shortage introduces new risks, including the risk of investing in water supply capacity that might never be needed but would nevertheless have to be paid for and maintained.

Broadly speaking, **uncertainty** describes situations where the outcomes and their probabilities are not fully known or cannot be reliably estimated. In contrast, **risk** in the water planning context refers to possible adverse outcomes with known probabilities or those which are reasonably estimated. In essence, risk is the quantification of expected impacts from quantifiable uncertainty (i.e., risk = $\sum$ [probabilities x impacts]). Meanwhile, uncertainty represents incomplete knowledge, some of which may be inherently unpredictable or unknowable.[24]

[24] The Rumsfeld Matrix (introduced by former Secretary of Defense Donald Rumsfeld) offers another instructive framework for characterizing our knowledge and thinking about uncertainty and risks. There are four distinct types of knowledge in the matrix, the first two of which allow, conceivably, for quantifying uncertainty and risk:

- Known Knowns: Facts or variables we can confidently understand (especially true for near-term planning).
- Known Unknowns: Gaps in our knowledge that we are aware of.
- Unknown Knowns: Things we don't realize that we could know if we just looked a little harder (tacit knowledge).
- Unknown Unknowns: This might be described as encompassing any unpredictable surprises. In concept, this falls into an 'unimaginable category' which suggests that our lack of insight into some futures would tell us to at least keep an open mind, stay alert, and be ready to adjust to anything that might arise.

It is useful to approach uncertainty and risk in a variety of ways. People assess risk every day—through career choices, investment, and health decisions, or even while driving. For example, carrying an umbrella requires effort, but not carrying one runs the risk of getting soaked, and that risk changes from day to day and is often not known precisely. Similarly, deciding to remodel a kitchen involves risk and uncertainty. The risk includes going over budget or encountering expensive structural issues. The uncertainty lies in such factors as whether material prices will rise, how long contractors will take, and if unexpected problems like plumbing or electrical issues will surface.

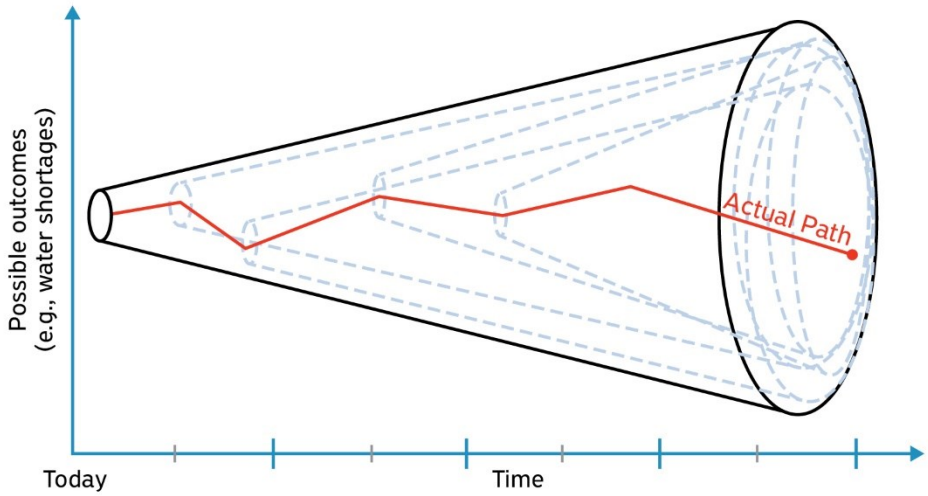
Deciding to invest substantial public resources in a major water supply project involves weighing key uncertainties: Will the projected population growth that will benefit and help pay for the project occur as projected? How might future climate conditions and management decisions affect the future water availability of this project? Can the future project be implemented within political and financial constraints by the time that it is needed?

Some uncertainties are measurable and lend themselves to risk quantification, while others are inherently unpredictable or unknowable and cannot be quantified. Although the current regional planning process does not attempt to quantify the uncertainties and risks, the planning process tempers these by revisiting the plans—from water demand projections through recommended strategies—every five years to incorporate observed trends, new information, and new decennial census counts to gradually improve their accuracy over time.

Uncertainty grows along the planning horizon. The farther into the future a plan extends, the wider the range of possible outcomes and the greater the uncertainty. Figure 11-1 illustrates this concept as a "cone of uncertainty," where the universe of potential futures expands over time.

The regional water planning process does not attempt to model this full range of future possibilities. Instead, it focuses on a single deterministic path based on a single highly plausible scenario that can accommodate conservative adjustments to reduce risk of future shortages. For example, Texas allows planning groups to assume a drought worse than the drought of record to provide a margin of safety with supplies, although the relative size of such a margin is not necessarily known.

Figure 11-1. Universe of possible future outcomes



Risks associated with flood planning and water supply planning

It is instructive to compare, for illustrative purposes, water supply planning within the risk framework used for flood planning (see Table 11-1). In both cases, the concept of **hazard** refers to the physical

condition that could lead to harm—such as high-water flows during a flood or insufficient water availability during drought.

These hazards create **risk** when combined with **exposure** (populations and businesses that rely on water supply or are in flood-prone areas) and **vulnerability** (the degree to which these users lack alternative water supplies or safe evacuation routes to avoid inundation).

The resulting **impacts**, such as public health issues and economic losses, occur if the hazard materializes and risk is not adequately managed. In short: hazard is the event, risk is the likelihood and consequence, and impacts are the outcomes.

Table 11-1. Comparison of flood planning and water supply planning risk framework

Dimension	Flood Planning	Water Supply Planning
Core definition (risk framework)	**Risk = Hazard × Exposure × Vulnerability**. Hazard is the flood event (rising water, inundation); exposure is who/what lies in flood-prone areas; vulnerability is sensitivity due to building type, lack of protection, or socioeconomic factors.	**Risk = Hazard × Exposure × Vulnerability**. Hazard is insufficient water availability (e.g., drought, aquifer depletion); exposure is the populations and economic sectors dependent on the supply; vulnerability reflects lack of backup sources, inflexible infrastructure, limited storage, or socioeconomic constraints.
Hazard (physical event/condition)	**Flooding** (riverine, coastal, pluvial, dam failure).	**Water shortage** (drought-induced supply failure; operational issues including impaired surface supply or transmission pump station failure).
Exposure (who/what is in harm's way)	People, homes, businesses, critical facilities, and infrastructure corridors in floodplains or inundation zones.	People, businesses, agriculture, industry, and public water suppliers reliant on specific water sources or systems.
Vulnerability determinants (sensitivity & adaptive capacity)	Building elevation, construction quality, presence/absence of levees, ability to evacuate, income/insurance coverage, criticality of facilities.	Redundancy of water sources, interconnections, storage capacity, demand management flexibility, infrastructure and source reliability, and institutional capacity.
Impacts (if risk materializes)	Injury and loss of life, property damage, service interruptions, and economic disruption.	Public health risks, water service curtailments/boil notices, economic losses, and business closures.
Primary mitigation strategies	Structural: levees, floodwalls, detention basins, and channel improvements. Non-structural: floodplain management, buyouts, elevation, early warning systems, and evacuation plans.	Supply-side: increase water supply, system interconnections, water resource management, and water source diversification. Demand-side: conservation, tiered pricing to reduce peak risk.
Residual risk management	Insurance, risk transfer, post-event aid, and resilient design standards.	Emergency water supply contracts, mutual aid, potable water delivery, temporary water treatment, targeted assistance, and implementing drought contingency plans.

11.3 Sources of uncertainty in the water planning process

Uncertainty is present at every stage of developing a long-term water plan and even within the data underlying the scientific and technical analyses that support the planning process. However, three main drivers—future water demand, future water supply, and additional future supply from recommended strategies—introduce the most significant uncertainty (Singh and others, 2010).

This section discusses these and other sources of uncertainty to provide a broad perspective on the wide range of factors that contribute to overall risk in water planning.

It is important to distinguish between uncertainties in long-term planning versus those affecting day-to-day provision of retail water supply through operations of regional and retail water systems. The planning process focuses on annual volumes of water supply and demand; it does not touch on operational issues such as system pressure, equipment failures, or short-term outages. Operational uncertainties, while critical for utilities to plan for, fall outside the scope of regional water planning and most of this discussion.

11.3.1 Future population growth and migration patterns

Population growth and migration strongly influence municipal water demand and the geographic distribution of water needs. However, projecting future population is inherently uncertain because demographic and economic dynamics evolve over time and vary across regions. Population growth and distribution depend on economic and social factors including individual preferences. The farther projections extend into the future, the greater this uncertainty becomes, as assumptions about birth rates, mortality rates, and migration patterns that seem reasonable today may shift over time.

Changes in population projections between planning cycles illustrate how uncertainty affects water planning. These differences, often revealed through updated U.S. Census counts, underscore the need to regularly revisit and update regional and state water plans. They also highlight the importance of planning conservatively, including preparing for scenarios where water demand exceeds current estimates. For example, in this planning cycle, the population projections were lower than the previous water plan in part due to declining birth rates, which reflect a broader national trend.

In addition to fundamental demographic behaviors and typical migration patterns, sudden shifts can occur that are not possible to predict. For instance, an influx of people moved to the Houston area from New Orleans following Hurricane Katrina. Similarly, this plan anticipates a geographic shift of future population farther inland, away from the coast within the Houston region, driven in part by flood risk, including lessons learned from Hurricane Harvey. These examples illustrate the challenge of projecting future population for any specific area and the need for flexibility in water planning.

11.3.2 Future water demand behavior

Residential municipal per capita water demand tends to be somewhat stable and predictable for planning purposes, especially in the near term, thanks to extensive data collected through TWDB annual water use surveys. However, projecting total municipal demand is more challenging because it depends not only on residential per capita use, but also on associated population shifts and changes to the commercial activities, which are inherently uncertain.

Uncertainty grows as the specific geographic area of interest considered shrinks. For example, total population projections for the entire state of Texas will have a smaller relative error than the population projections for certain small suburban communities in fast-growing areas. It is difficult to project with high precision exactly where individuals will choose to live and where development will occur.

Uncertainty is even greater for water demands related to industry and irrigation, which are closely tied to economic conditions. When the economy is strong, industrial and agricultural water use may rise; during downturns, demand may decline. These fluctuations, and a general lack of insight into future private business decisions, make long-term projections for non-municipal sectors particularly difficult.

Municipal demand

Municipal demand, which includes commercial use, depends on appliance standards, building codes, fixture efficiency, price signals, landscaping norms, irrigation technology, and local ordinances—all of which can change over time. The geographic location of municipal demands shifts along with population movement and growth, which is not always foreseeable, especially at the geographic resolution of individual water providers.

Industrial (manufacturing, mining, power generation) demand

Industrial water demand is shaped by macroeconomic conditions, energy prices, technology adoption, and regulatory frameworks. Projecting future manufacturing water use is particularly challenging because the locations of future large facilities cannot be known in advance. Recent trends add complexity: water use in manufacturing has declined significantly even as manufacturing gross domestic product continues to grow. This may seem counterintuitive, but, aside from shifts in the mix of industry, it reflects the increasing adoption of water recycling and efficiency measures, driven primarily by cost savings to businesses.

Predicting long-term trends in this sector is difficult because technological changes are inherently unpredictable. For example, the sudden emergence of hydraulic fracturing dramatically increased certain local water demands for oil and gas production, requiring the TWDB to revise mining water demand projections to anticipate how the use of the technology might evolve. The emergence of hydraulic fracturing activity around 2010 provides an instructive historical example of the difficulty in predicting water demands that emerge because of new technologies. Similarly, water demand forecasting for digital infrastructure facilities remains difficult due to rapidly evolving technologies, diverse energy sources, and the proprietary nature of facility siting.

Irrigation demand

Irrigation demand is highly sensitive to such factors as crop mix, planted acreage, irrigation methods, commodity prices, federal price supports, energy costs, and weather variability. In some cases, projecting irrigation water use is particularly challenging because availability of water can drive demand as much as demand drives supply. For example, stakeholders relying on the Ogallala Aquifer generally anticipate significantly adjusting their water use over time depending on how much supply they believe will remain available under the local groundwater conservation district's managed depletion practices and the amount of water needed to sustain farming at current rates. This dynamic interplay between supply and demand makes long-term irrigation projections inherently uncertain.

11.3.3 Future water supply

Water supply projections are inherently uncertain due to the complexity of hydrology and the influence of multiple interrelated factors. Surface water availability depends on precipitation, temperature, evaporation, land cover, and interactions with groundwater—all of which may shift over time due to climate variability, declining baseflows, and watershed changes. Groundwater availability is shaped by aquifer properties, recharge rates, past pumping, modeling predictions, and policy decisions within groundwater management areas, adding further unpredictability.

Future droughts

Drought is one of the most significant sources of uncertainty in water planning because its timing, location, and severity are inherently unpredictable. Past patterns may not predict future conditions, making it difficult to anticipate how future droughts will affect existing and future water supplies. Drought impacts surface water supplies most acutely, although some aquifers (especially those with significant groundwater-surface water interactions) are also highly responsive and vulnerable to droughts. More generally, providers may be forced to rely on groundwater if surface water supplies wane.

Drought impacts progress through three phases:

- Meteorological – prolonged periods of low precipitation
- Soil moisture/vegetative – affecting crops and ecosystems
- Hydrologic – reducing streamflows, reservoir levels, and aquifer storage

These phases often culminate abruptly, sometimes ending with floods or hurricanes. State water planning focuses primarily on the hydrologic phase because it directly impacts water supply reliability. However, the complex dynamics of drought patterns make forecasting water availability extremely challenging.

The drought of the 1950s remains the most significant single *statewide* drought in recorded Texas history. It affected nearly every region, lasted multiple years, and produced hydrologic conditions that still serve as the benchmark for firm-yield calculations and long-horizon planning in certain locations. At regional or local geographic scales, each river basin or sub-basin may have its own drought of record period—outside of the 1950s—which forms the basis for calculating associated surface water supplies.

While the 1950s drought was severe and statewide, the period of record available for analysis is relatively short, beginning only in the late 1800s. Paleoclimate evidence, including tree ring records extending back to 1500, indicates the occurrence of droughts longer and more severe than the benchmark drought of record presently used in planning (Cleaveland and others, 2011). This underscores a critical risk: even if one assumes climate stationarity—that future conditions mirror past conditions—droughts worse than the presumed drought of record remain possible. Planning based solely on historical hydrologic patterns and extremes therefore underestimates potential future drought severity.

Current water planning considers the firm yield of surface water reservoirs derived from historical hydrology, but this volume carries implicit risk because any single annual water supply yield estimate has a probability of not occurring. Assuming that firm yield volumes are 100 percent reliable would be a mistake, since they represent only one outcome within a broader range of possible yields, each with its own probability of not occurring.

The uncertainty that drought introduces to water supply has been repeatedly demonstrated by the identification of new droughts of record since 2000. Each associated extension of the hydrologic record—to incorporate the new drought of record period—has permanently lowered firm yield estimates for associated reservoirs across all or portions of several Texas river basins, including:

- Brazos River Basin
- Canadian River Basin
- Colorado River Basin
- Neches River Basin
- Nueces River Basin
- Red River Basin
- Rio Grande Basin
- Sulphur River Basin

11.3.4 Future water shortages

Uncertainty can be cumulative. Each planning factor (demand, current water supply, and future water supply) carries its own uncertainty, and when these interact, the overall uncertainty is compounded. For example, population projections influence water demand estimates, which will in turn affect the calculation of projected water shortages as a key input to that calculation. As assumptions shift over time, these cascading uncertainties underscore the importance of adaptive planning and periodic updates to maintain reliability, particularly for near-term planning horizons.

Predicting future water needs—and potential shortages—under future drought conditions is especially challenging because uncertainties affecting water demand and water supply may amplify or, in some cases, cancel each other out. For instance, higher-than-projected per capita water use combined with lower-than-anticipated water supply could result in greater shortages than would be anticipated by a water plan using middle-of-the road estimates for both.

11.3.5 Future implementation of strategies and projects

Uncertainty surrounding the implementation of future water supply projects presents significant risk. Factors such as permitting timelines, financing conditions, construction constraints, and political feasibility introduce uncertainty about whether—and when—a recommended project will come online to address projected shortages. This raises a critical question: which water management strategies are truly viable? There is always a risk that a recommended strategy may not be implemented for a variety of reasons.

Implementation is never guaranteed. Project sponsors bear ultimate responsibility for developing water management strategies, and many significant projects require regulatory approvals like surface water rights or groundwater permits. Large projects, such as major reservoirs, often involve extensive, time-intensive studies and environmental reviews, including permitting by the U.S. Army Corps of Engineers and compliance with the National Environmental Policy Act, which requires extensive information collection, analysis, and public input.

A proposed reservoir may fail to secure a permit, or a policy change could reduce groundwater availability, thus presenting additional challenges to secure a permit for a planned well field. These uncertainties underscore the importance of contingency planning and strategy diversification to ensure reliability under changing conditions.

11.3.6 Additional sources of uncertainty

Additional sources of uncertainty exist—some difficult to quantify and others so inherently unpredictable that they are effectively unquantifiable. These factors can interact in complex ways, compounding overall uncertainty. For example, artificial intelligence perfectly illustrates how emerging trends can simultaneously increase water use (through data centers and energy demands) while enabling new potential technologies that may ultimately reduce water consumption associated with artificial intelligence and other uses. Such dynamics underscore the complexity of anticipating future conditions.

All these uncertainties remain relevant to water planning and water supply and, to the extent feasible, should be considered when developing water plans.

Data and modeling uncertainty

Thanks to the foresight of the Texas Legislature, Texas is well ahead of most states in collecting data and developing models for its water resources. Nevertheless, it is important to recognize that all water planning activities rely on imperfect data and models, each with inherent limitations. Survey response and measurement errors, sparse monitoring networks, limited periods of record, and gaps in historical

observations introduce noise and bias. Model uncertainty arises from structural assumptions, parameter estimation, and scenario selection. These limitations and errors accumulate throughout the information that supports the planning process, compounding uncertainty and influencing the reliability of estimates and projections.

Sustainability of water resources

Long-term sustainability of existing groundwater supplies depends on keeping withdrawals within reasonable bounds to ensure continued and economically viable use of the resource. Groundwater depletion can reduce aquifer levels and pressure, impair well yields, reduce baseflow in rivers, increase pumping costs, and in some systems, contribute to land subsidence or water-quality degradation. Where use is unregulated or loosely enforced, localized overuse of groundwater may propagate widespread and long-term impacts. On the surface water side, reservoir sedimentation incrementally reduces storage capacity and firm yield over time, complicating the reliability of supply during droughts and raising lifecycle costs for potential dredging, mitigation, or new storage.

Groundwater-surface water interactions

Texas water policy and planning frameworks have historically treated groundwater and surface water as separate resources, though changes in one system—such as groundwater pumping that reduces spring flow and/or baseflow in rivers or surface water that replenishes groundwater supplies—often directly affect the other. Current regulatory structures, water availability modeling, and planning processes do not fully account for these interactions, which creates significant uncertainty.

Future policy and management decisions

Decisions by state and local governments and regulatory entities can significantly influence socioeconomic growth patterns, water demands, water supplies, and water supply infrastructure development. Policies may range from those directly affecting water availability to peripheral issues that may impact infrastructure development costs. State subsidies, political priorities, statutory changes, litigation precedents, and/or regulatory or other restrictions imposed by government all have the potential to create uncertainty and drive unpredictable changes in water supply development and management.

The availability of groundwater and the costs of obtaining groundwater, for example, are closely tied to decisions made by groundwater conservation districts within groundwater management areas. Because groundwater conservation district boards are largely elected, their governance and long-term decisions cannot be predicted with certainty. This introduces significant uncertainty regarding the amount and sustainability of available groundwater for future use and is arguably a relatively greater source of uncertainty for groundwater supply availability than other factors like climate.

For instance, the decision to manage the continued depletion of the Ogallala Aquifer, while eventually diminishing it to a fraction of its original water volume, has at least been a relatively consistent policy with predictable outcomes. In contrast, the management of other aquifers may be less stable and predictable over time, with fluctuations in allowable pumping volumes as a result. As joint planning in groundwater management evolves, much remains uncertain, making this a critical feature impacting water supply planning in Texas.

Future technological advancements

Technology has the potential to reshape water planning in multiple ways, including by amplifying demand, reducing consumption through efficiency gains, or expanding supply options. The timing, cost, and adoption of these innovations remain highly uncertain. Efficiency improvements like smart metering, leak detection, advanced irrigation systems, and water-efficient appliances can lower per-capita use, while more advanced supply technologies like direct potable reuse, brackish groundwater desalination, and aquifer storage and recovery can enhance system resilience.

At the same time, such emerging technology sectors as data centers, advanced manufacturing, and artificial-intelligence-enabled industries may introduce concentrated, high-reliability water and energy demands in specific regions, challenging existing water projections. Planners should be mindful of both the potential benefits and risks that anticipated innovations generate at a different pace and/or in unexpected forms.

Future economic conditions

Economic trajectories—including those related to the energy sector regarding oil and gas extraction and energy generation—shape water demands and can play a key role in the feasibility of future water supply strategies. Rapid economic growth can accelerate municipal and industrial demand and attract additional population from other states, while recession can impact project repayments and may delay additional projects, reduce available capital, or alter consumption patterns associated with population migrations. Future federal policies could also exert an outsized influence on Texas' economic conditions, adding another layer of uncertainty to long-term water planning.

Infrastructure failure (including cybersecurity/terrorism threats)

Failures of critical infrastructure—including the electric grid—can significantly disrupt water supply. Modern water systems depend on a variety of technologies, including digital control (SCADA/ICS), networked sensors, and cloud-connected operations, making them vulnerable to cyber intrusions and ransomware. Such physical security risks as sabotage, tampering, or contamination attempts also persist. Even short-lived incidents can erode public confidence, disrupt service, and trigger costly emergency responses. Interdependencies with the power grid and telecommunications add further complexity to day-to-day operational considerations, requiring contingency planning, redundant operations, and continuous risk management at the local level to maintain reliability.

Emerging and unpredictable sources of uncertainty

Rare or compound events such as novel hazards, natural disasters, cascading infrastructure, or other failures, sudden legal or geopolitical shifts, emergent contaminants, or unprecedented climate extremes exist beyond quantification. While such events cannot be forecasted with precision, more sophisticated scenario exploration, stress testing, and flexible water supply portfolios can help reveal vulnerabilities and response options for water providers. Maintaining optionality and continuing to develop regional water plans every five years is essential to manage the irreducible uncertainty that accompanies truly unforeseen circumstances.

Winter Storm Uri in February 2021, which occurred amid the COVID-19 pandemic, illustrates how short-term events can trigger operational impacts far beyond planners' expectations. While the cold was forecasted, cascading failures across energy and water systems were not. Record-breaking cold temperatures led to widespread power outages, frozen infrastructure, and simultaneous failures in interconnected systems, amplifying disruption and complicating recovery. Events like Uri underscore the risk of unprecedented, compounding disruptions.

11.4 Addressing uncertainty

Although many uncertainties discussed in this chapter are not quantified in the regional planning process and some are unknowable, the fundamental risk of running out of water is addressed by planning for conditions expected during a repeat of the drought of record. This approach assumes high water demands, low supplies, and recommends strategies to address identified shortages. In short, regional water plans are built around the most severe drought on record when the risk and magnitude of shortages have been greatest. Because plans are updated every five years, the process can quickly incorporate new data and developments, improving accuracy and reliability—especially for near-term planning horizons. Beyond this foundation, planning groups and the TWDB employ additional measures

and are exploring other paths to address more of the uncertainty and better mitigate the risk of future water shortages.

11.4.1 How regional water plans address uncertainty

Beyond planning for a drought of record, regional water plans also incorporate local knowledge and elements from other plans, some informed by advanced risk assessments. Some larger water providers across the state conduct scenario planning for their long-range strategies, but smaller entities typically lack the resources or technical capacity to perform similar analyses. As a result, the results of prior scenario evaluations by major providers influence regional plans, though indirectly.

In addition, planning groups use a variety of approaches within the existing regional planning framework to manage uncertainty and reduce the risk of future water shortages. These enhancements to the plans differ by region and are shaped by available resources, technical capacity, local conditions, and less formally, by risk aversion.

Conservative assumptions

Some planning groups address drought-related uncertainty by applying conservative methods when estimating water supplies. For example, using one-year safe yield estimates for surface water reservoirs effectively reduces assumed supply volumes, providing an additional buffer (equivalent to setting aside one year of additional supply) and increasing the likelihood that water providers can withstand a new drought of record. This approach reduces the expected annual supply volume from existing sources, which not only extends the life of the supply but also, by reducing the estimated supply, increases projected shortages that must then be addressed. Effectively, this method would accommodate a drought lasting one year longer than the drought of record, providing a margin for conditions worse than any previously experienced.

In other cases, planning groups may incorporate a "management supply factor" into planning; including a percentage of water supply above the amount that would be required to meet the baseline deterministic drought-of-record calculations for a given decade. In growing regions, for example, this means planning to bring projects online earlier than baseline projections might suggest, creating an ongoing safety buffer against higher-than-expected demands, more severe droughts, and/or a situation in which a recommended project is abandoned.

Both approaches provide a cushion against potential shortfalls under extreme conditions, even though they are not tied to quantified probabilities.

Some planning groups (Regions C, K, and L) incorporated estimates from water providers based on downscaled climate models to assess potential impacts of future climate conditions on its surface water supplies. This approach can account for the potential impacts of a drought that is more severe than the drought of record if droughts are projected to worsen.

Diversified portfolios and alternatives to improve resiliency

To address uncertainties like project delays, downsizing, or when permitted water volumes are lower than anticipated, planning groups may recommend a mix of water management strategies that, if implemented, would provide more supply than baseline projections of shortage indicate. This approach ensures that if a project is significantly delayed, reduced in size, or even removed, overall water supply security is not substantially compromised.

Another way some entities mitigate risk is by diversifying water sources or regionalization of systems, similar to investing in a mutual fund rather than a single stock. Relying on a portfolio of water resources with different risk profiles helps hedge against collective supply risk, avoiding the vulnerability of an "all-in-one-basket" approach.

Some groups also include fully evaluated alternative water management strategies as backups. These options can be substituted into a regional plan if a recommended strategy becomes infeasible due to regulatory changes, technological shifts, or cost considerations, preserving some flexibility in the planning process.

Emergency interconnects

Planning groups assess existing and potential emergency interconnects between water systems to improve drought resilience.

Holding drought management strategies in reserve

Most planning groups avoid relying on drought restrictions in their regional plans as a demand reduction strategy to address potential shortages, viewing them as impractical and economically disruptive when feasible water supply alternatives exist. Instead, they typically reserve the potential volume of water savings from drought management measures as a contingency—a safety factor or last resort response to address uncertainty, such as a drought more severe than the benchmark drought of record (BBC Research & Consulting, 2009).

Adaptive planning

Recognizing that uncertainty expands along the 50-year planning horizon, the process incorporates flexibility by updating regional plans every five years. This recurring, adaptive cycle allows integration of new data, regulatory changes, and technological advances, ensuring plans remain relevant and credible, especially for the near-term decades. In addition, the regional plans can be amended at any time to address changed circumstances.

Aligning implementation with actual demand growth

Regardless of when future population growth and associated municipal water demands and industrial demands arrive, or how large they become in the short term, regional water plans are designed for a long planning horizon. This high level of planning allows for the pace of implementation—including strategies and projects—to shift along the way by accelerating or decelerating efforts to align with real-world conditions. A temporary surge in demand or a slowdown in growth does not render the plan obsolete; it simply shifts the planning window in which projects are implemented.

A good example is the rapid emergence of new water demands that do not automatically require revisiting the regional water plans and identifying or implementing additional projects. In many cases, it may simply mean that additional water demands are "arriving" somewhat earlier than expected, which may require earlier implementation of planned future projects at some point in the future.

11.4.2 TWDB efforts to address uncertainties

Effective long-range water planning requires recognizing and managing the many uncertainties that influence future water supply, demand, and reliability. To strengthen the technical foundation of the regional and state water plans, the TWDB is pursuing several initiatives aimed at better understanding climatic, demographic, and hydrologic variability and reducing the associated risks. These efforts include ongoing consultation with the Office of the State Climatologist (OSC), contracted research to quantify population projection uncertainty, development of methods to evaluate supply reliability, and continued investment in datasets and tools that support drought preparedness and adaptive decision-making.

Seeking additional support

Regional water planning groups and their technical consultants have expressed a need for additional guidance and resources from TWDB to strengthen their ability to quantify and address uncertainty. This feedback has focused in particular on improving methods to evaluate the likelihood of droughts more

severe than the drought of record and to assess the potential impacts of future climate conditions on water supplies. TWDB's ongoing efforts, including coordination with the OSC, represent steps toward addressing these concerns.

Ongoing consultation with the Office of the State Climatologist

The TWDB has coordinated with the OSC for many years on a variety of water resource-related matters, including

- development of the drought dashboard for the Water Data for Texas data portal;
- assessment of the feasibility of establishing an evapotranspiration network for Texas;
- development of the TexMesonet Advisory Committee's recommendation report on key priorities to advance TexMesonet;
- development of methodologies for incorporating the impacts of projected temperature on future reservoir evaporation, runoff, and water availability;
- development of gridded future projected rainfall and rainfall return intervals; and
- development of a county-level assessment of historical drought events.

In 2023, the Sunset Committee (see Sunset Staff Report for the 88th Legislature with Final Results[25]) directed the TWDB to *"consult with the Office of the State Climatologist at Texas A&M University in the preparation of regional and state water plans to receive information and projections to identify regions of the state that are likely to experience severe drought or excessive rainfall."*

The TWDB began consulting with the OSC on this Sunset Directive in 2023 and continues working to identify the most promising areas to pursue for technical support—such as datasets, methodologies, and other tools or products—to better support the regional and state water supply and flood planning processes.

As part of this effort, the TWDB provided input to the OSC, which is developing an advisory report intended to be responsive to the Sunset Committee charge and offer related guidance to the state water planning process. The advisory report is anticipated to provide temperature projections appropriate for long-term planning purposes and assist in identifying areas likely to experience severe drought or excessive rainfall. The advisory report is a key step in which the OSC considers, for planning purposes, which large-scale future climate conditions would be appropriate to consider for assessing the likelihood of future severe droughts, potentially worse than the drought of record in the historical period.

Also, as a direct result of this consultation, the TWDB has drafted two technical notes:

- An analysis of historical, county-level precipitation data to identify areas of Texas most at risk of droughts worse than their current drought of record
- A methodology for developing future evaporation rates based on projected temperature increases from the OSC advisory report

In consultation with the OSC, the TWDB continues to assess the most relevant and impactful areas of research to support water supply planning and anticipates seeking stakeholder input to help prioritize its limited internal technical resources. As part of efforts to assess the potential impacts of future climate conditions on Texas' water supply, with a focus on areas where confidence in estimating future changes is higher, consultations with the OSC have led to an initial focus on the following:

- Surface water evaporation (draft methodology developed)
- Runoff

[22] www.sunset.texas.gov/public/uploads/2023-08/Texas%20Water%20Development%20Board%20Staff%20Report%20with%20Final%20Results_6-26-23.pdf

- Soil moisture with regard to aquifer recharge and municipal outdoor water demand

The TWDB continues to consult with the OSC through ongoing meetings to share information and explore methods for identifying areas of the state most vulnerable to severe drought or excessive rainfall, both now and in the future. This effort is expected to include stakeholder engagement to help identify and shape potential tools and products and to assess implications for water supply and flood risk. Any resulting data, methodologies, or guidance will be provided to regional planning groups for consideration in developing their plans.

Quantifying uncertainty of population projections

After six cycles of developing regional water plan projections, the TWDB has engaged the Bureau of Economic Geology to conduct a comprehensive retrospective assessment of population projections used in prior state and regional water planning cycles. This study evaluates the accuracy of previous plan projections against U.S. Census counts and state demographer estimates, quantifies the associated uncertainty, and compares methodologies across other states and agencies. The goal is to determine statistical margins of error, translate these into practical uncertainty ranges, and recommend improvements to TWDB population projection methods. These recommendations will include options for simplifying the projections process and enhancing flexibility for planning groups to make reasonable adjustments. The project is scheduled for completion in 2026.

Assessing supply reliability

The TWDB is exploring methods to quantify the drought risk associated with existing water supplies and to potentially give planning groups greater ability to consider supply-reliability level (e.g., 95 percent reliability) rather than treating specific annual yield estimates as implicitly representing a 100-percent-reliable supply. Even in the absence of long-term hydrologic or climatic shifts, natural variability in rainfall can produce droughts more severe than those historically observed, which in turn may reduce future reservoir yields.

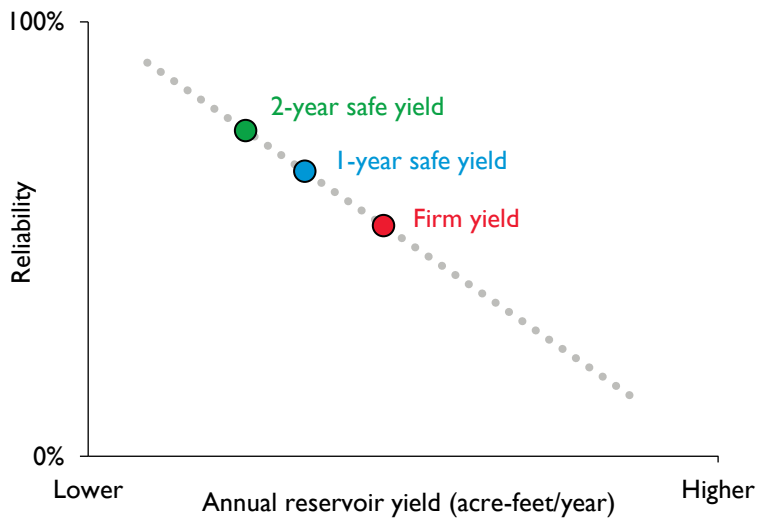
Without a yield-reliability curve for a given source, planning groups lack the context needed to make informed choices about levels of risk and to what degree they can reduce that risk. For example, limiting annual yield to a one- or two-year firm-yield volume may qualitatively increase reliability, but without having the full yield-reliability curve, the magnitude of the risk reduction (and residual risk) remains unknown (Figure 11-2).

In practice, a firm yield represents only one point on a broader yield-reliability spectrum (Figure 11-3), with each potential yield corresponding to a different probability of being met.

Developing supply-reliability curves through statistical analyses—including analyses for proposed projects—combined with planning group discussions about the appetite or aversion for risk in different water-user sectors (e.g., municipal users typically seeking higher reliability than others) could improve decision-making and better mitigate risks associated with ensuring adequate water supply. This approach would help to reduce the guesswork that currently leads to building *ad-hoc* cushions into plans, such as one-year safe yields. Explicitly selecting target reliability levels would also create transparency for the inherent and unavoidable uncertainty within the planning process.

Figure 11-2. Qualitative decision-making without quantified reliability

Figure 11-3. Decision-making based on illustrative reliability curve



Other agency activities to address uncertainty and mitigate risk

In addition, the TWDB continues to develop datasets, analytical tools, and information to monitor and prepare for future drought conditions and impacts to water resources (see Chapter 3, Section 3.5 and Chapter 5, Section 5.8 for detailed descriptions). These include

- improving the accuracy, spatial, and temporal resolution of reservoir evaporation data;
- improving the accuracy and availability of statewide soil moisture and evapotranspiration data;
- undertaking research to address critical knowledge gaps pertaining to future available surface water (*e.g.,* studies to develop future projected runoff, inflow and reservoir evaporation for select river basins);
- undertaking monitoring and research projects to improve understanding of surface water-groundwater interaction in the state (*e.g.,* aerial electromagnetic survey of the Brazos River alluvium);
- identifying opportunities for optimizing source water availability (*e.g.,* exploring applications of forecast-informed reservoir operations to increase water supply); and
- undertaking research and pilot projects to establish the feasibility of innovative water sources and technologies (*e.g.,* aquifer storage and recovery, brackish aquifer characterization, and seawater desalination) in the state.

These efforts collectively strengthen the scientific foundation for water planning by systematically improving data quality, analytical capability, and process understanding, enabling the TWDB to better characterize risk, transparently communicate uncertainty, and iteratively narrow that uncertainty over time as new information becomes available. In total, these support more resilient, adaptive, and defensible water management decisions under future drought and climate variability.

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12 Rural entity planning

Quick facts

This is the first state water plan in which planning groups were required to specifically conduct additional outreach to rural entities and report the results of those efforts in their plans.

In 2030, Texas' rural population is projected to be about 25 percent of the state's total population, with population in 142 of 254 counties considered entirely rural.

Groundwater is the dominant water source for many rural water users.

Resources for rural entities, include county-level information sheets that summarize water plan data and drought and planning resources, are available on the Texas Water Development Board (TWDB) website at www.twdb.texas.gov/waterplanning/rwp/outreach.

Rural, often smaller water systems have notable challenges due to limited resources for long-range water supply planning, as well as infrastructure maintenance and development. Rural municipal and domestic water users are generally captured in the regional and state water plans as county-level aggregated data referred to as "County-Other." Although these public water systems or utilities do not meet the volumetric threshold to be designated as standalone water user groups in the plan, the aggregation of data is informed by individual system water use data and ensures that rural and small-scale water needs are accounted for in the planning process. Beginning with the 2022 State Water Plan, the TWDB reduced the volumetric threshold required to designate individual water user groups, resulting in the inclusion of more than 250 additional, smaller discrete water users.

This new chapter of the state water plan gathers and presents a variety of information on rural and small municipal water users, as well as agency initiatives designed to support these systems. The intent is to focus on near-term planning information for these entities to inform future TWDB data analysis and financial assistance outreach around smaller and rural systems aimed at assessing and addressing potential water supply risks. Meanwhile, more information on small systems and alternative supplies can be found in Chapter 7 of the regional water plans. A spreadsheet of temporary emergency response options for small systems that rely on a single water source is available in the supplemental content on the 2027 State Water Plan webpage (Appendix F).

12.1 Introduction to rural water supply planning

Background

In general, smaller water systems face staffing challenges and resource constraints that limit their ability to conduct long-range water supply planning and to maintain and develop infrastructure. Although planning groups do not have a specific "rural" interest category, issues affecting smaller systems are generally represented by members of the public, counties, municipalities, groundwater conservation districts, and river authorities due to their knowledge of and experience working with these entities. In addition, required pre-planning meetings at the beginning of each planning cycle and public comment opportunities at all planning group meetings provide mechanisms for rural issues to be considered and addressed.

For this plan, planning groups implemented structured outreach to rural entities to improve water supply planning data and ensure inclusion of smaller systems. Outreach efforts were largely consistent statewide and centered on survey distribution, follow-up communication, and risk-based prioritization of outreach to systems with reported shortages or identified supply needs in recent plans. Additional efforts targeted County-Other systems, often through phone calls, emails, certified mail, and workshops.

Defining rural

There are multiple ways that rural and small entities are defined and addressed through TWDB programs. For planning purposes, discretely planned-for entities that are municipal water user groups are defined in administrative rules as retail public utilities that provide more than 100 acre-feet per year for municipal use, privately owned utilities, state or federal facility systems, and County-Other groups that aggregate all remaining municipal and domestic water users. These County-Other aggregates generally serve as the planning proxy for rural water users but do not have a geographic parameter in their definition (i.e., they can be in primarily urban counties).

For financial assistance purposes, Texas Water Code § 15.001 defines rural political subdivisions to include nonprofit water supply corporations or districts, no part of the service area of which is within an urban area with a population of more than 50,000; municipal water systems serving a population of 10,000 or less, no part of the services area is within an urban area with a population of more than 50,000, or that is located in a county in which no urban area has a population of more than 50,000; counties with no urban area of over 50,000; or an entity that demonstrates that the entity is rural or the area to be served by the project is wholly rural.[26]

Federal funding assistance through state revolving fund programs is determined by "system population served" in the following categories:

- Less than 1,000 people
- 1,000 to 10,000
- 10,000 to 150,000
- More than 150,000 people

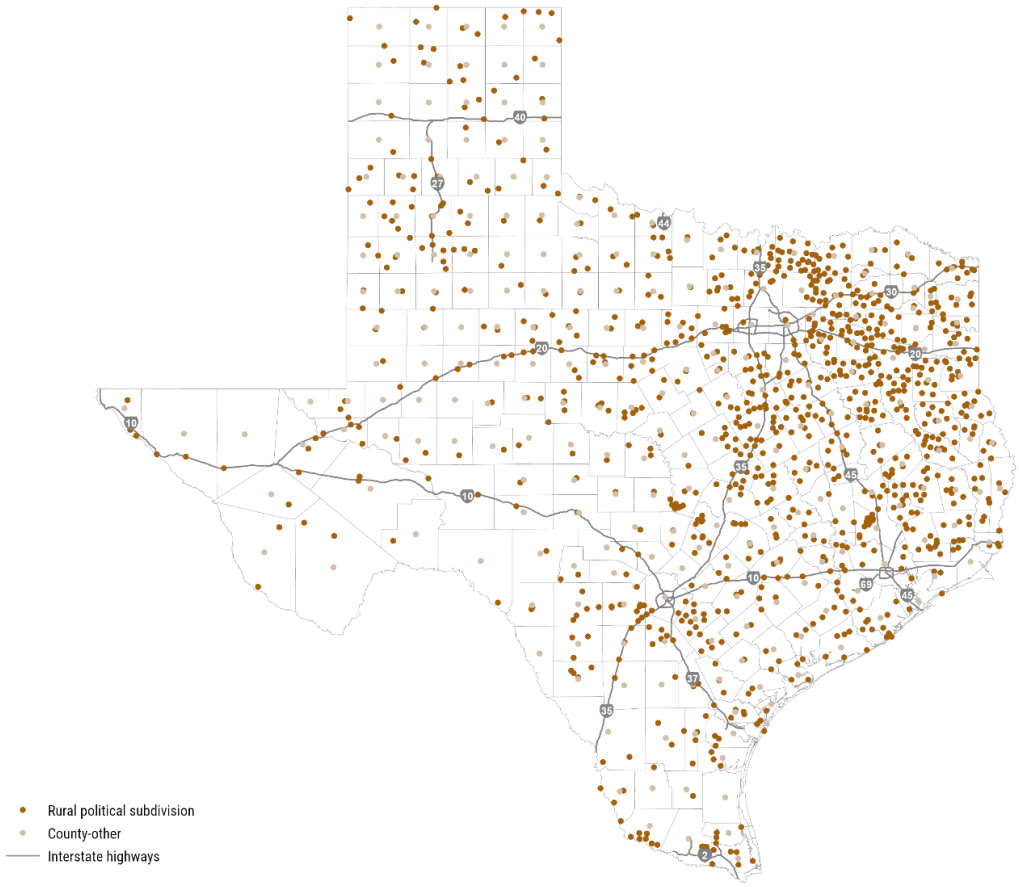
Additionally, very small to medium water utility size thresholds can often serve as proxies for more rural areas. For water loss audit purposes, utility sizes are established in Texas Water Code § 16.0121 (and associated with Environmental Protection Agency categorizations) as the following:

- Very large systems serving 100,000 or more people
- Large systems serving 50,000 to 99,999 or more than 10,000 to 49,999
- Medium systems serving 3,301 to 10,000
- Small systems serving 501 to 3,300
- Very small systems serving 25 to 500 people

For the remainder of this chapter, unless otherwise noted, a **rural water user group** refers to a planning-defined water user group that meets the definition of a rural political subdivision in Texas Water Code § 15.001 and/or is part of the County-Other water user group in the state water plan (Figure 12-1).

[26] A more detailed definition is available in 31 Texas Administrative Code § 365.2(6).

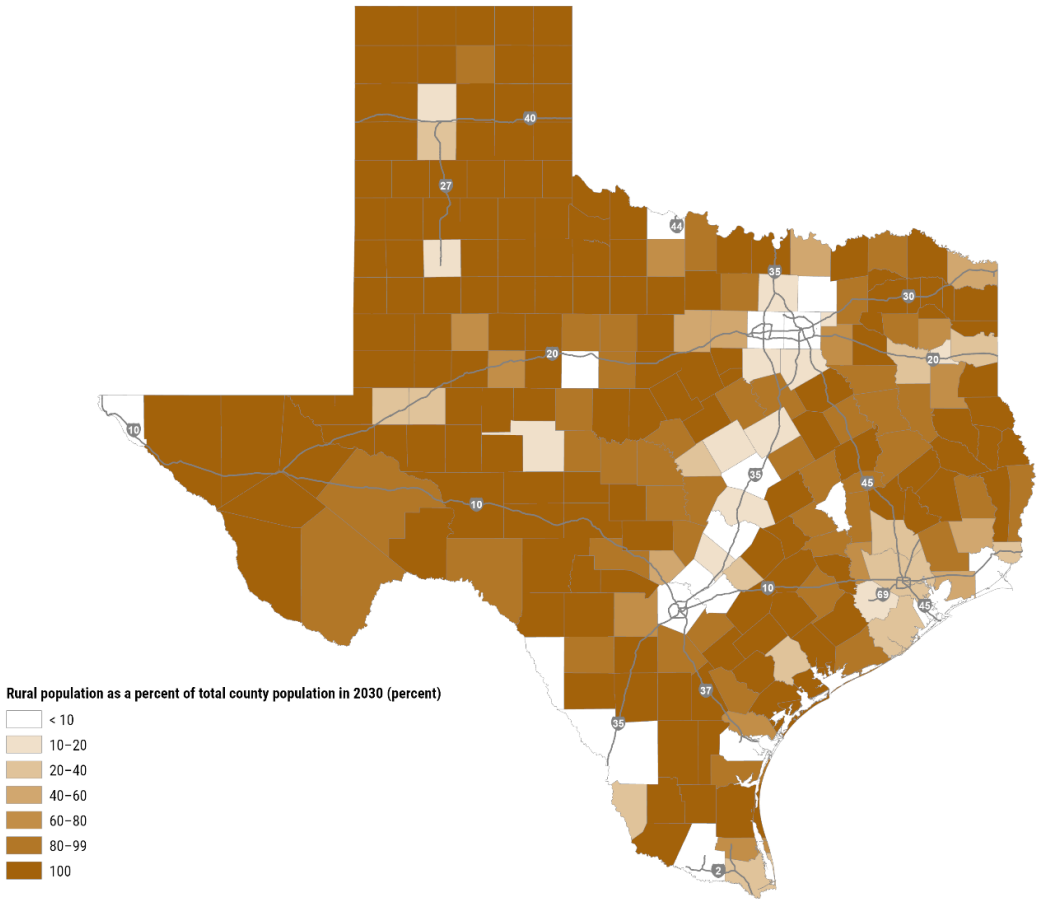
Figure 12-1. Rural water user groups



12.2 Rural population trends

As discussed in detail in Chapter 4, recent historical population growth in Texas has been concentrated in urban and suburban areas, a trend that is projected to continue. By 2030, the state's rural population is projected to account for approximately 25 percent of the total population, with the population of 142 of Texas' 254 counties considered entirely rural (Figure 12-2). Many rural areas of the state are not projected to experience significant growth, reflecting the increasingly urban character of Texas and the nation. At the county level, 139 counties are projected to experience population declines in rural areas between 2030 and 2050.

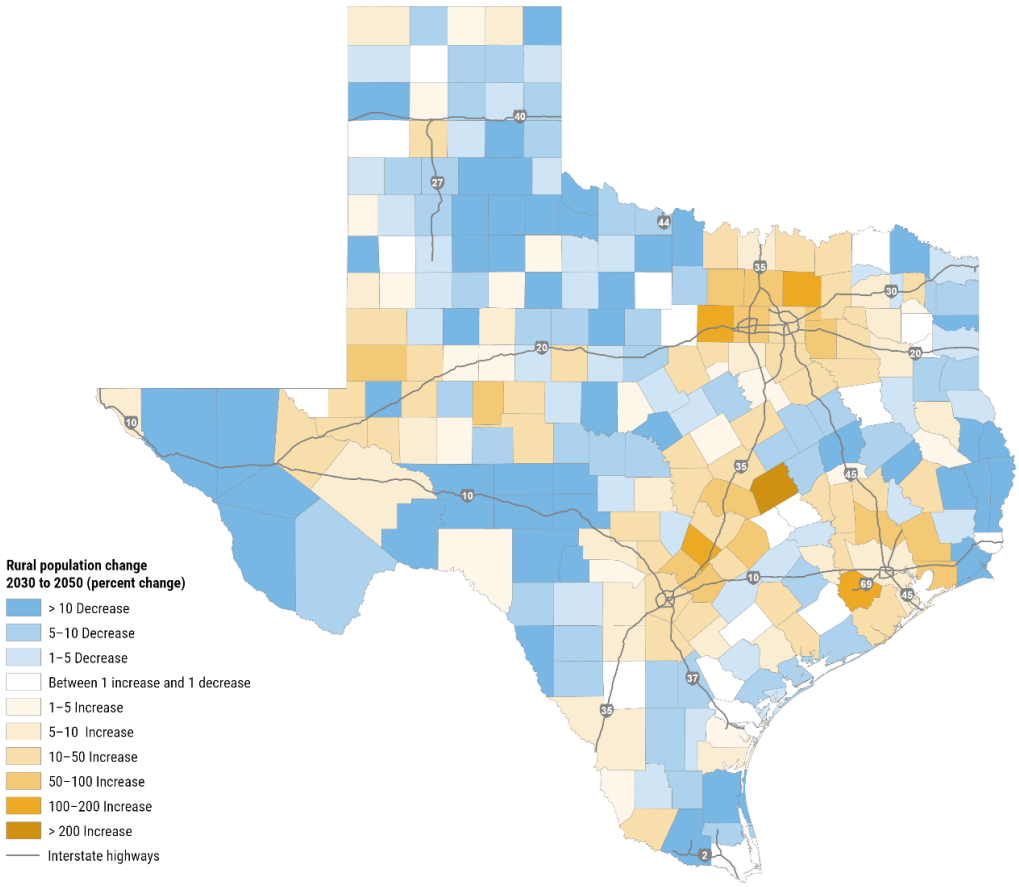
Figure 12-2. Rural population as percent of total population by county in 2030



Near-term projections through 2050 show mixed population trends among rural water user groups. Rural populations are projected to increase in 113 counties, with growth of 5 percent or more in 87 of those counties. Conversely, rural populations are projected to decline in 139 counties, with decreases exceeding 5 percent in 92 of those counties (Figure 12-3).

The 2002 State Water Plan similarly observed that many rural communities and small cities were growing more slowly than areas near major metropolitan centers. Additionally, nonmetropolitan areas reportedly contained approximately 15 percent of the state's population while covering about 80 percent of Texas' land area. The 2002 plan anticipated that these demographic differences could contribute to long-term challenges related to resource sharing and competition between rural and urban areas, particularly as urban demand increased. Current projections indicate that rural water user groups will continue to represent a significant share of the state's population, underscoring their continued importance in statewide water planning despite ongoing demographic pressures.

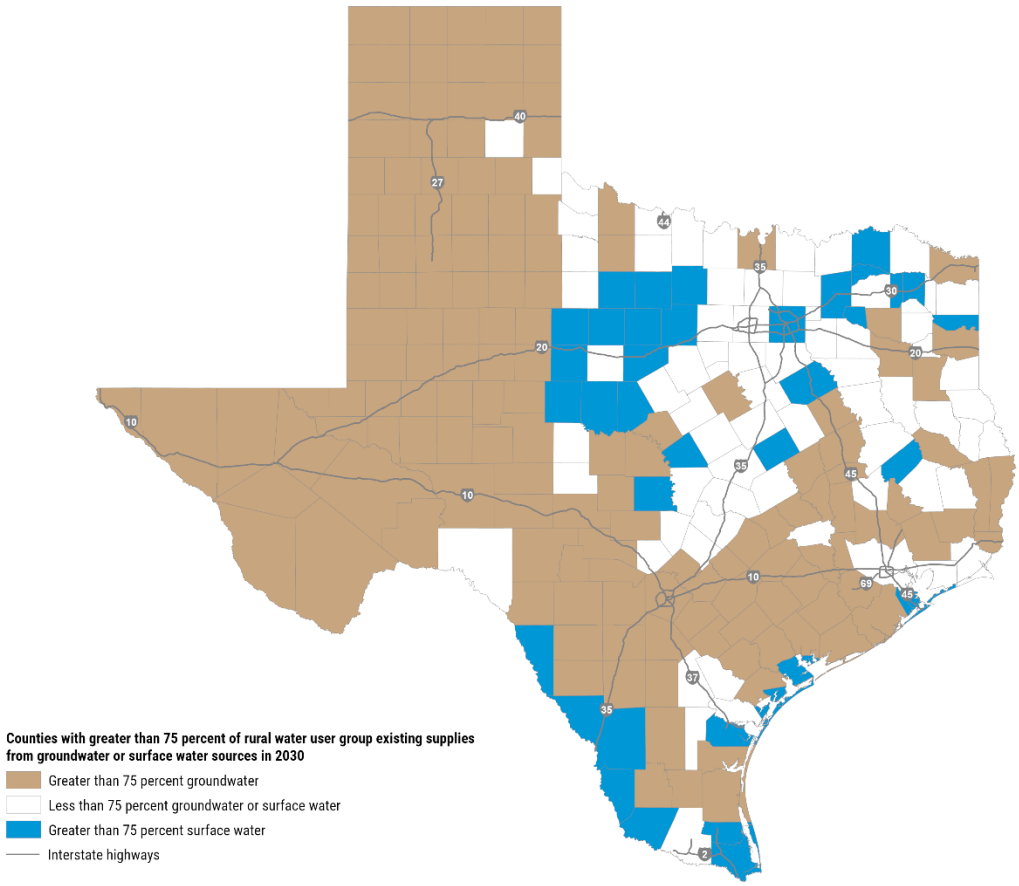
Figure 12-3. Projected rural water user group population change by county (2030–2050)



12.3 Rural existing water supplies

Groundwater accounts for 75 percent or more of the total existing supply for rural water user groups in 148 counties during the 2030 planning decade (Figure 12-4), with some rural water user groups relying exclusively on groundwater for their existing source of supply. In contrast, rural water user groups in 35 counties use 75 percent or more surface water for their existing supply in the 2030 decade, while the rural water user groups in the remaining 71 counties use a mix of groundwater, surface water, and reuse supplies. Given the significant dependence of rural water user groups on groundwater sources, the lack of groundwater data in many areas of the state presents a growing challenge for evaluating long-term supply reliability and understanding potential risks to rural water supplies.

Figure 12-4. Counties with rural water user group existing supplies being 75 percent or more from groundwater or surface water sources in 2030



12.4 Rural water supply needs and unmet needs

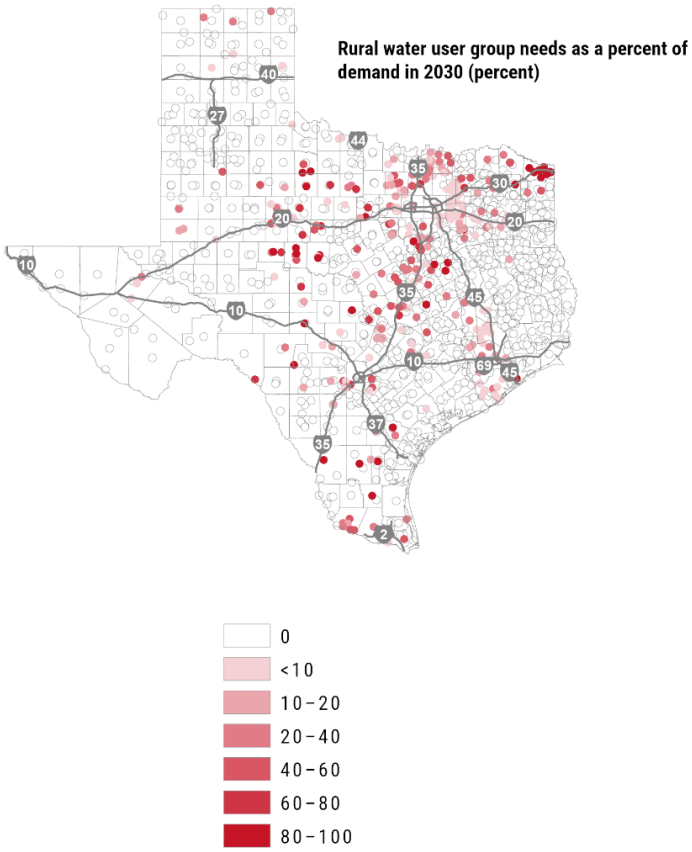
12.4.1 Projected water needs

Water supply needs are projected for 23 percent of rural water user groups in 2030. Among those 295 rural water user groups with identified needs, 193 face shortages greater than 10 percent of their projected water demands (Figure 12-5). Water supply needs expressed as a percent of the water user group's total demand provides an indicator of the severity of need. The larger the percent of an entity's total demand indicates a more severe potential shortage. To discuss the relative risk of water shortages due to drought among these water systems, we introduce the following terms:

- **Significant exposure**: rural water user groups relying on a single water source and having identified needs that account for more than 10 percent of their demands in 2030
- **Extreme exposure**: rural water user groups relying on a single water source and having identified needs equal to 100 percent of their demands in 2030, 2050, and 2080 (Figure 12-6), indicating that they would not have any water supply in a repeat of a drought of record

By 2080, this number increases to 362 rural water user groups with needs greater than 10 percent of demand. Near-term analysis through 2050 indicates that the volume of rural water user group supply needs increases more than 25 percent between the 2030 and 2050 planning decades in 79 counties.

Figure 12-5. Projected rural water user group needs as a percent of demand in 2030 and 2050 (percent)



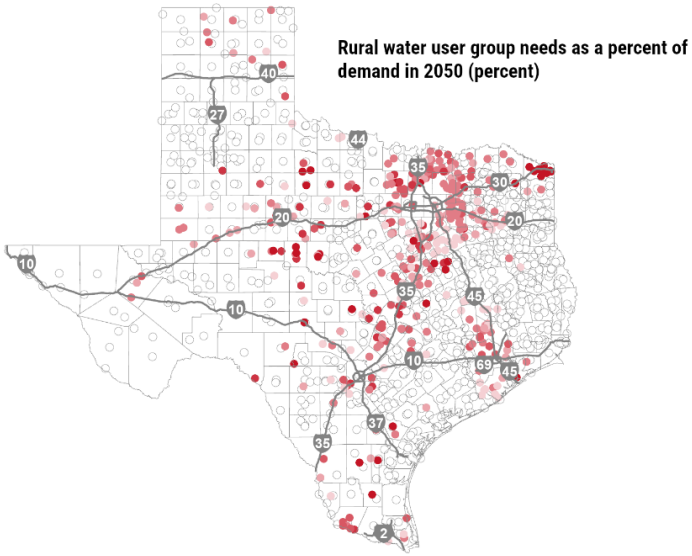
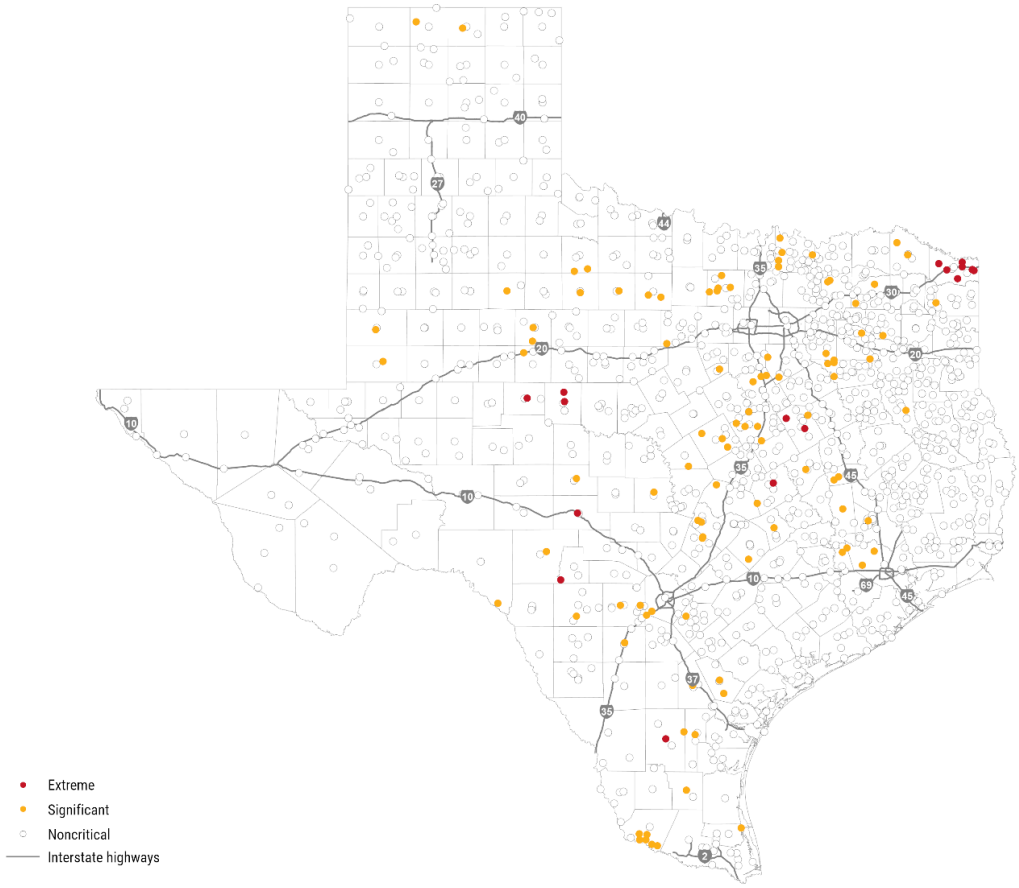


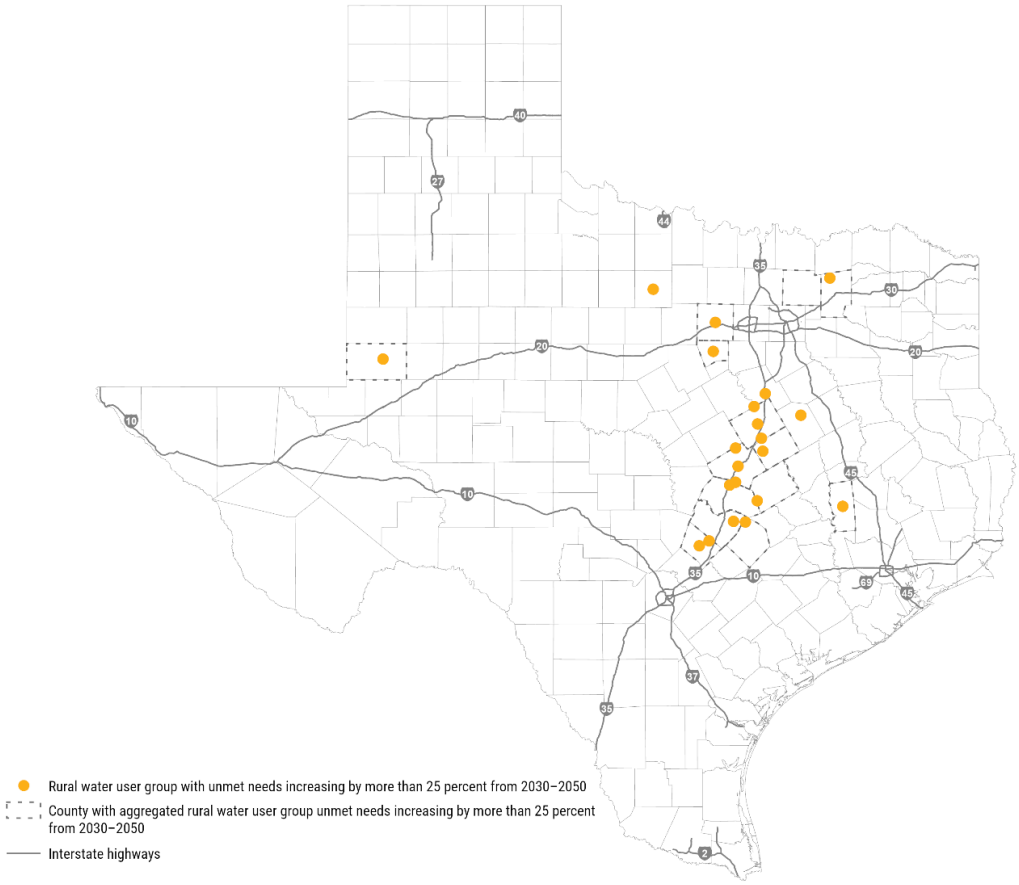
Figure 12-6. Rural water user groups with identified significant and extreme exposure to drought in 2030



12.4.2 Projected unmet needs

After recommended water management strategies have been implemented, 44 rural water user groups across 37 counties have not fully met their projected needs by 2030. By 2050, 36 rural water user groups have unmet needs across 31 counties. And 14 counties have rural water user groups with unmet needs that increase by more than 25 percent between 2030 and 2050 (Figure 12-7).

Figure 12-7. Rural water user groups with unmet needs increasing by more than 25 percent from 2030–2050



12.5 Rural water management strategies and projects

Most recommended water management strategies for rural water user groups focus on conventional groundwater development, indirect reuse, conservation, and other surface water supplies throughout the planning period. Combined, these categories account for 87 percent of rural water user group recommended strategy supply in 2030 and 79 percent in 2050 (Figure 12-8). Recommended strategy volumes associated with the "other surface water" category[27] alone make up approximately 38 percent of the total rural water user group recommended strategy supply in 2030 and 27 percent in 2050. New major reservoir strategies are projected to have the largest growth in water supply for rural water user groups, increasing by more than 3,400 percent from 2030 to 2080.

Of the more than 1,300 water management strategy projects sponsored by rural water user groups in this plan, more than two-thirds (67 percent) are municipal conservation efforts, including water loss mitigation. An additional 16 percent of recommended projects sponsored by rural water user groups involve development of fresh groundwater supplies. Although water supply system improvement and expansion projects to increase the water supply volume in drought only make up 3 percent of the total

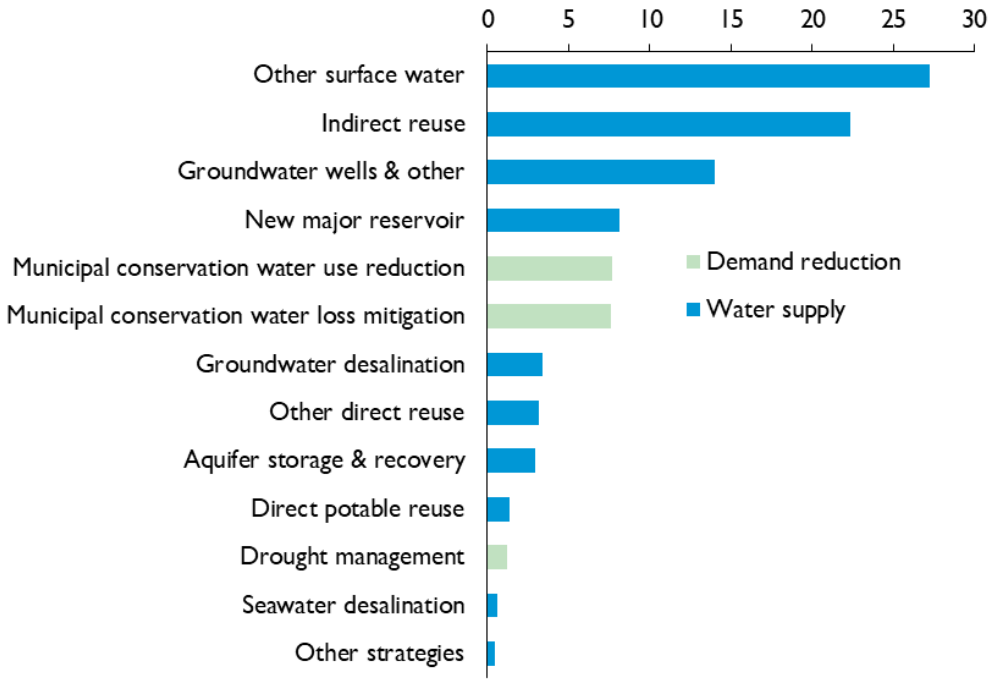
[27] Additional information provided in Section 7.3.7.

number of projects sponsored by rural water user groups, they account for 40 percent of the total capital cost.

Desalination of groundwater is recommended by some rural water user groups across nine planning areas. However, this approach to addressing water supply needs makes up just 2 percent of their sponsored projects, which is not surprising considering the relatively high cost of implementation and the advanced expertise required to operate desalination systems. Some organizations that work closely with rural entities have identified brackish groundwater regionalization as a potential solution for rural water users, but the relatively high cost of these projects may limit broader adoption.

Rural water user groups may benefit from regional projects led by rural and non-rural entities. This plan identifies 180 recommended water management strategy projects that serve multiple municipal water user groups, including at least one rural group.

Figure 12-8. Share of total water management strategy volume recommended for rural entities by strategy type in 2050 (percent)



12.6 Implementation and impediments

This plan includes 693 projects to benefit rural water user groups that were also recommended in the 2022 State Water Plan. Based on data collected through project implementation surveys, approximately 48 percent of these projects are either close to completion or have made progress toward being fully implemented. Reported challenges include changes in project schedules, contract or permit requirements, difficulties selecting project sites, financial or economic barriers, and cases where expected growth in water demand did not happen. Together, these factors highlight both the progress made toward implementation and the challenges that can affect project advancement for rural water systems. While many rural-related projects advance beyond planning stages, a substantial share remain subject to delays or constraints, affecting the timing and reliability of expected supply contributions over the planning horizon.

Other anecdotal challenges for smaller systems in rural areas where growth is encroaching include existing system infrastructure not being sized to serve the growth or limited available remaining local water resources to develop. The increased expense to develop distant supplies coupled with financial assistance limitations around growth-dependent debt service for certain types of entities, such as water supply corporations, could pose challenges towards project implementation.

12.7 Rural system planning constraints

Based upon the results of the targeted rural outreach conducted by the planning groups, a significant portion of rural systems are represented in the plans as discrete water user groups. Long-term planning for small and rural water systems is often constrained by limited data availability—including incomplete information on existing system infrastructure, such as a lack of mapped existing water lines. The targeted rural outreach conducted by planning groups found that many rural entities, especially smaller or independent systems, did not respond despite repeated outreach. This limited participation results in incomplete data for critical planning inputs like supply reliability and drought preparedness, particularly for self-supplied systems.

Positive outcomes reported by planning groups were that the targeted outreach helped build relationships, increased awareness of planning processes, and connected rural systems to resources and funding opportunities. Responsive rural entities helped improve the planning data accuracy and better identify and quantify local needs and supply risks.

Some rural water systems located near fast-growing areas may face additional planning and supply challenges. In these areas, development pressures can outpace water supply readiness—particularly where systems rely on limited or single water sources or where identified needs may have persisted across multiple planning cycles—indicating potential challenges for project implementation to address those identified needs.

During the development of population and demand projections for this plan, 2,775 public water systems, or about 61 percent of systems associated with discrete water user groups, did not submit or reference local long-range plans during the process to review draft projected water demands. While most rural water user groups participate in TWDB water use surveys, some groundwater use—such as exempt domestic wells, very small non-community systems, and certain commercial or institutional users—are not captured. Historically, these uses have been estimated with statewide average per capita values, which may not fully reflect localized groundwater impacts. The TWDB is evaluating potential, feasible improvements to estimating these uses for future planning cycles.

Regionalization is often explored as a potential solution for rural water supply challenges, but its feasibility varies widely. Past regional studies in this planning process have shown that low population densities, distances between potential participants, high infrastructure costs relative to the potential water rate base, and limited existing connections between systems can make system consolidation impractical or cost-prohibitive in many rural areas. Where growth is limited, smaller transmission systems may meet immediate needs but restrict long-term flexibility. As a result, regional water planning groups were required to consider *feasible* alternatives that generally focus on supporting locally driven projects and voluntary partnerships rather than broadly treating regionalization as a universal solution.

12.8 Agency programs and related rural initiatives

Since 2013, 49 percent of TWDB project funding—totaling $3.4 billion through all programs—has been for projects in rural communities as defined by Texas Water Code § 15.001(14). Despite a limited number of rural entities having applied directly for funding through the State Water Implementation Fund for Texas (SWIFT) program, many have benefited from SWIFT projects with regional sponsors

that provide water supplies to many large and small communities over extended geographic areas, such as the development of Bois d'Arc Lake.

The TWDB estimates that more than $1.6 billion in Economically Distressed Areas Program (EDAP)-type financial assistance is needed for water and wastewater projects that could serve around 370,000 Texans. This estimate is based on entities that have expressed interest in EDAP or submitted project information forms for the state revolving fund programs and qualify as disadvantaged. General revenue appropriated by the 88th Texas Legislature supported the issuance of general obligation bonds that provided financial assistance for up to $100 million in EDAP projects in the 2024–2025 biennium.

During this planning cycle for the 2027 State Water Plan, the TWDB expanded outreach, planning, and technical assistance efforts targeted to rural water systems. These efforts respond, in part, to recommendations from the Sunset Advisory Commission's 2022–2023 review of the agency, which directed the TWDB to better analyze and report assistance provided to rural communities and to develop a more coordinated outreach approach, including contracting with qualified external partners to support rural entities seeking financial assistance. To implement these directives, the TWDB financial assistance outreach team collaborates with rural advocacy and support organizations and conducts direct outreach through conferences, referrals, and funding workshops held in rural communities. This planning cycle is also the first in which regional water planning groups were specifically funded to enhance rural outreach, supported by county-level information sheets (www.twdb.texas.gov/water planning/rwp/outreach) summarizing water plan data and drought and planning resources.

Despite these efforts, financial and technical capacity constraints continue to limit the ability of some rural and economically disadvantaged communities to address water and wastewater infrastructure needs. While state revolving fund programs and EDAP have provided substantial assistance over several decades, many small systems lack the financial capacity to repay loans and therefore require additional support. Senate Bills 28 and 30 (88th Legislative Session) created the Texas Water Fund to help address these gaps. A portion of Texas Water Fund resources are directed to water infrastructure projects for rural political subdivisions and to establish a water loss technical assistance program that prioritizes smaller utilities. Implementation of this legislation allocated $195,000,000 to the Rural Water Assistance Fund to offer grant and/or loan funding to entities that meet the rural definition in Texas Water Code § 15.001(14) for water conservation and water loss projects. Implementation of this legislation, including prioritization of small systems, is discussed further in Chapter 8, Conservation.

This dedicated support for rural projects is complemented by technical assistance initiatives, such as the Asset Management Program for Small Systems and the Water Utilities Technical Assistance Program, which reflects the legislature's addition of technical assistance requirements to the statutory language in the Rural Water Assistance Fund. Collectively, these programs are intended to improve rural systems' ability to plan for, finance, and implement needed water infrastructure improvements. The Water Utilities Technical Assistance Program provides water and wastewater utilities in Texas with financial, managerial, and technical capabilities necessary to apply for financial assistance from the TWDB. Technical assistance is delivered, through contracts between the provider and the TWDB, by experts in the field that have been pre-qualified by the TWDB. Initial funding of $2,000,000 for this program was provided through the state revolving fund origination fees. Accumulated total fees reserved for this purpose now total $6,000,000. The 88th legislature also appropriated $1.5 million annually in general revenue to contract with an entity to provide technical assistance to rural communities (Rider 27). This amount was continued by the 89th legislature under Rider 25 to provide technical assistance to entities under this program.

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TWDB, 2002, Water for Texas – 2002, 156 p., www.twdb.texas.gov/waterplanning/swp/2002

Sunset Advisory Commission, 2023, Staff report with final results, Texas Water Development Board, 67 p., www.sunset.texas.gov/public/uploads/2023-08/Texas%20Water%20Development%20Board%20Staff%20Report%20with%20Final%20Results_6-26-23.pdf

Region F Water Planning Group, 2009, Study of the economics of rural water distribution and integrated water supply study, 141p., www.twdb.texas.gov/publications/reports/contracted_reports/doc/0704830691_RegionF/EconomicsofRuralWaterDistribution.pdf

Glossary

The following definitions are provided for planning purposes and reflect how terms are used in the development of the state water plan.

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 groundwater
Groundwater containing total dissolved solids between 1,000 and 35,000 milligrams per liter.

Brackish surface water
Surface water containing total salts between 500 and 30,000 milligrams per liter.

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

Conjunctive use
For state water planning purposes, the combined use of surface water, groundwater, and/or reuse sources that optimizes the beneficial characteristics of each source to make efficient use of an entity's total water supply operations based on demand, infrastructure, or seasonal conditions. It is not the maximized use of diversified sources, such as continuous, maximum pumping of a well during drought.

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.

Demand
Volume of water required to carry out the anticipated domestic, public, and/or economic activities of a water user group during drought conditions.

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.

Direct reuse
Wastewater reused directly after treatment or stored for later reuse without discharge to a watercourse and is classified as potable or non-potable based on its end use.

Drought
Generally applied to periods of less-than-average precipitation over a certain period. 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 rivers, reservoirs, and aquifers).

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 bound by barrier islands, where freshwater and seawater mix to create economically and ecologically important habitats and species and 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 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.

Indirect reuse
Reuse that generally involves discharging wastewater into a natural water body and diverting that water for subsequent potable or non-potable use.

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
Adequate water flow and water quality to maintain an ecologically sound environment in streams and rivers.

Interactive state water plan
A TWDB website that lets water users statewide take an up-close look at data in the 2027 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. 2027.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.

Long-term
The latter portion of the planning period, which includes the 2060, 2070, and 2080 planning decades.

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 a 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.

Near-term
The earlier portion of the planning period, which includes the 2030, 2040, and 2050 planning decades.

Needs
Projected water demands in excess of existing water supplies for a water user group or a wholesale water provider. Needs represent the anticipated shortages that will occur in a drought of record if no water management strategies are implemented.

Non-relevant aquifer
Aquifers or portions of aquifers with aquifer characteristics, groundwater demands, and current groundwater uses that do not warrant adoption of a desired future condition by a groundwater management area. Non-relevant aquifers do not have an associated modeled available groundwater volume.

Onsite water recycling reuse
Water supply that is used, recycled onsite, and reused. This includes onsite graywater, blackwater, or industrial onsite recycling systems as well as recycling and reuse of oil and gas produced water.

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

Regional water planning group
A designated planning group 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.

Rural water user group
For purposes of data presentation and discussion in this state water plan data, a water user group as defined in 31 Texas Administrative Code § 357.10(43) that also meets the rural political subdivision definition of Texas Water Code § 15.001(14) or is a County-Other water user group as defined in 31 Texas Administrative Code § 357.10(7).

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
Water demand that will 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 loss mitigation
Conservation strategies that specifically target reducing utility water loss. These strategies may include leak detection and repair programs, advanced metering infrastructure, utility water loss audits, and measures to reduce transmission system losses.

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, maximizing an existing supply, and/or reducing demands.

Water management strategy project
Infrastructure that has a non-zero capital cost and is necessary to implement a water management strategy. A water management strategy project may be associated with multiple water management strategies.

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

Water use reduction
Conservation strategies that focus on lowering water consumption and may include conservation analysis and planning, education and outreach, conservation-oriented pricing, landscape irrigation conservation and incentives, outdoor watering schedules, and prohibitions on wasting water.

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—or that the regional water planning group expects or recommends to deliver or sell—water wholesale (treated or raw) 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

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.

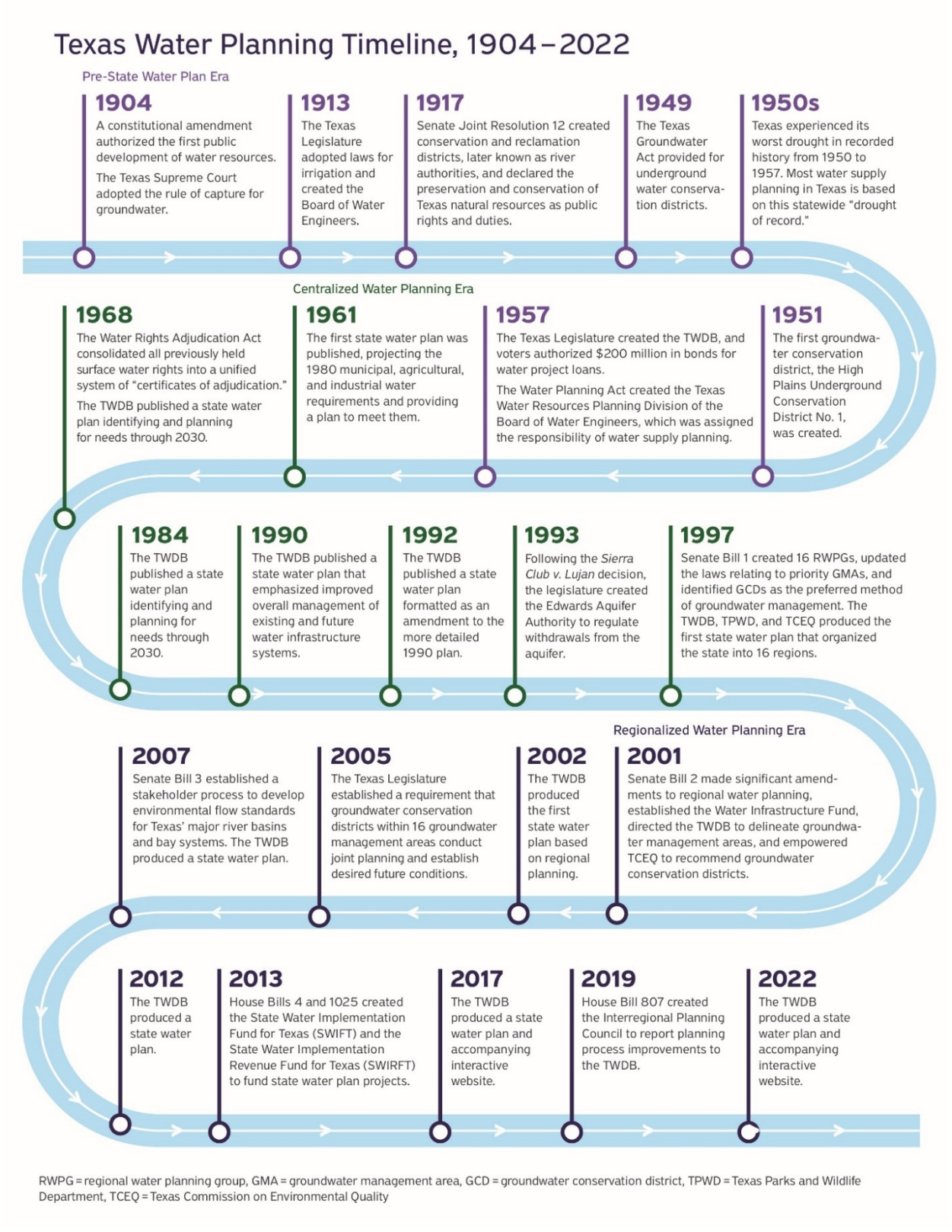
The creation of the Texas Board of Water Engineers, a predecessor agency to both the Texas Water Development Board (TWDB) and the Texas Commission on Environmental Quality, played a significant role in the early history of water management in the state. The major duties of the Board of Water Engineers 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, 244 of Texas' 254 counties were classified as disaster areas. The drought ended in 1957 with widespread, heavy 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 on 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 followed by floods that caused an additional $120 million in damages (TBWE, 1958).

Figure A-1. Texas water planning timeline



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 (UT Institute of Public Affairs, 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 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 failures, 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, and 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 local and regional stakeholders would develop consensus-driven regional plans every five years 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 2027 State Water Plan is the sixth plan completed under the Senate Bill 1 planning process and comprises the 16 regional water plans delivered to the TWDB on January 5, 2026.

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 participating 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 Board members appointed by the governor. It supports the development of the 16 regional water plans and is responsible for developing a state water plan every five years. It similarly supports the development of regional flood plans and incorporates them into the state flood plan. The TWDB provides financial assistance through various state and federal programs to local governments for projects that support water supply, wastewater treatment, flood mitigation, and agricultural water conservation.

The TWDB collects data annually through the Water Use Survey, Water Loss Audit, and Water Conservation Plan Annual Reports. It provides scientific information on state water resources by collecting data, developing models, and conducting studies of surface water and groundwater availability and quality. The TWDB also participates in research and demonstration projects needed to advance innovative water technologies, all of which support the state water planning process. The agency 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 Geographic Information Office (TxGIO)**, which provides high-quality historic and present-day geospatial data products. The Deputy Executive Administrator of TxGIO 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 (TPWD)**. Today, the agency is led by nine commissioners appointed by the governor and 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.

The Texas Parks and Wildlife Department reviews and makes recommendations to minimize or avoid impacts on fish and wildlife resources resulting from water projects. Additionally, the 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 also 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. The Commission 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.

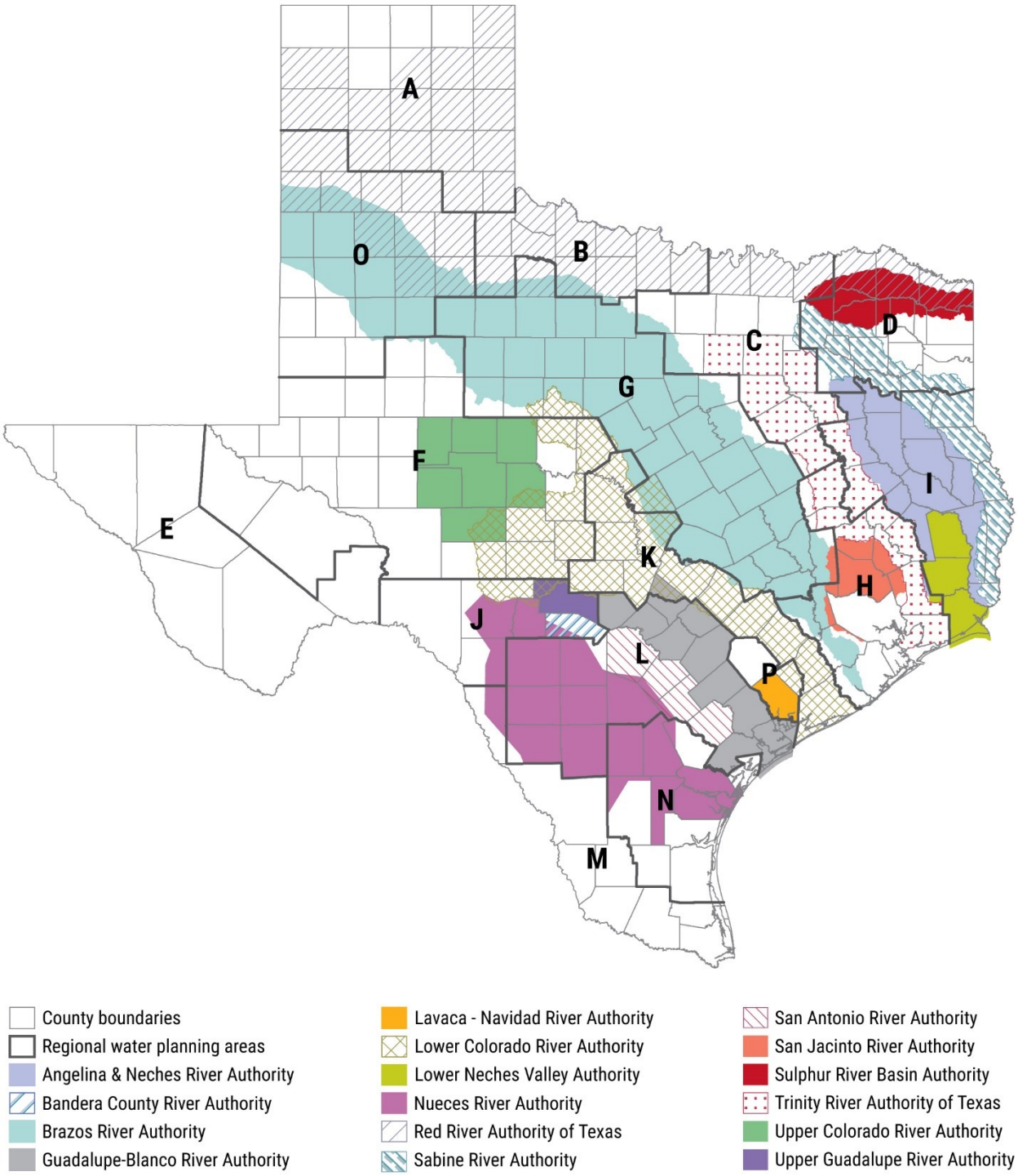
The **Texas Department of Agriculture**, established by the Texas Legislature in 1907, is led by the Texas Commissioner of Agriculture, an elected official of the state. It supports protection of agricultural crops and livestock from harmful pests and diseases; facilitates trade and market development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

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 to manage 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.

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

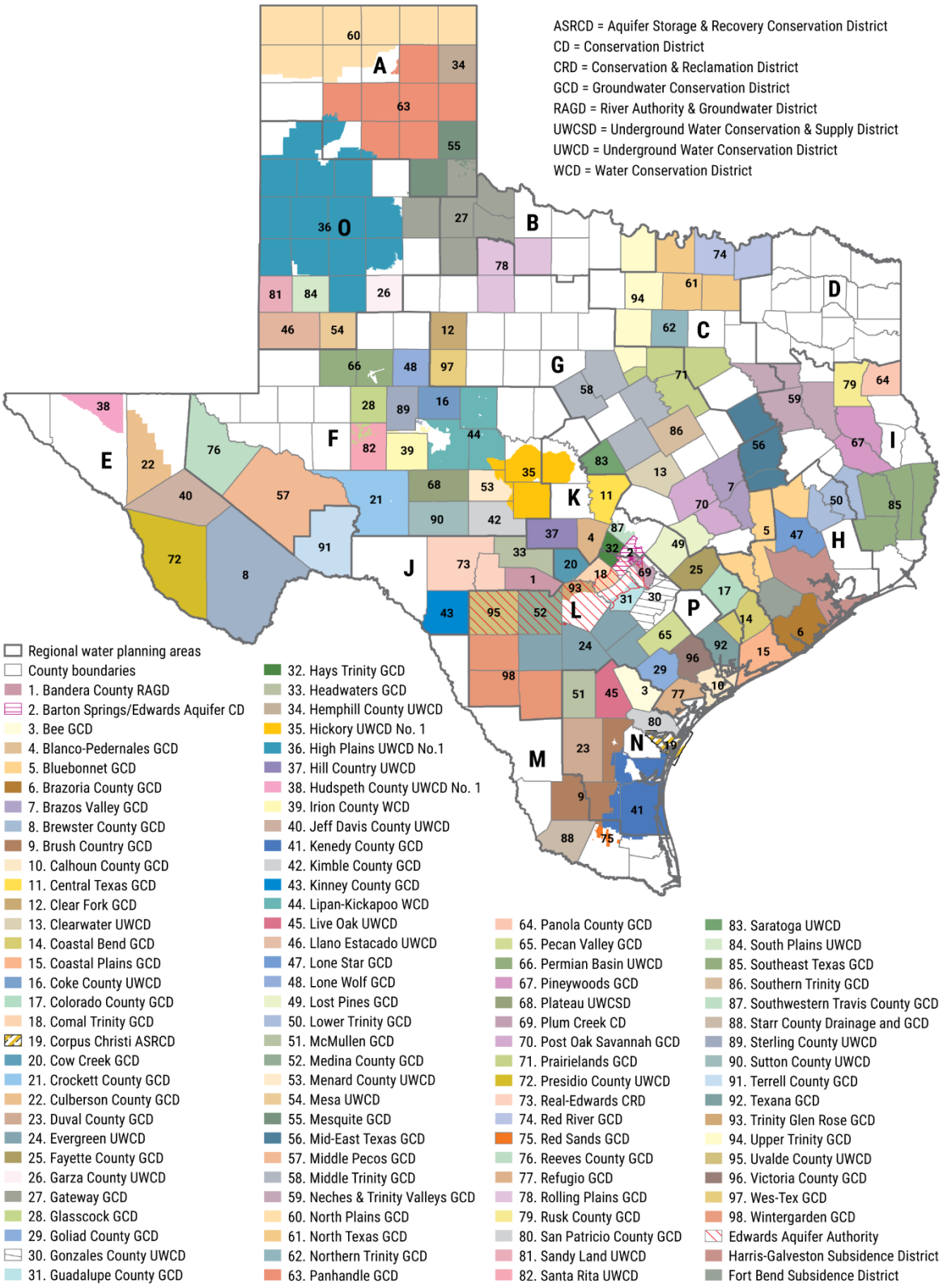


The formation of **groundwater conservation districts** was first authorized by the legislature in 1949 to manage and protect groundwater at the local level. Groundwater conservation districts are governed by a local board of directors, which develops a management plan for the district with technical 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 is typically 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 2026, there are 98 confirmed groundwater conservation districts (excluding the two subsidence districts and the Edwards Aquifer Authority) located partially or fully within 173 of 254 Texas counties (Figure A-3). A map of these districts is also available on the TWDB groundwater conservation districts webpage (www.twdb.texas.gov/groundwater/conservation_districts/).

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.

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



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 to repay a portion of the costs. The **Soil Conservation Service**, the **U.S. Bureau of Reclamation**, and the **U.S. Army Corps of Engineers** are federal agencies that constructed many 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 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.

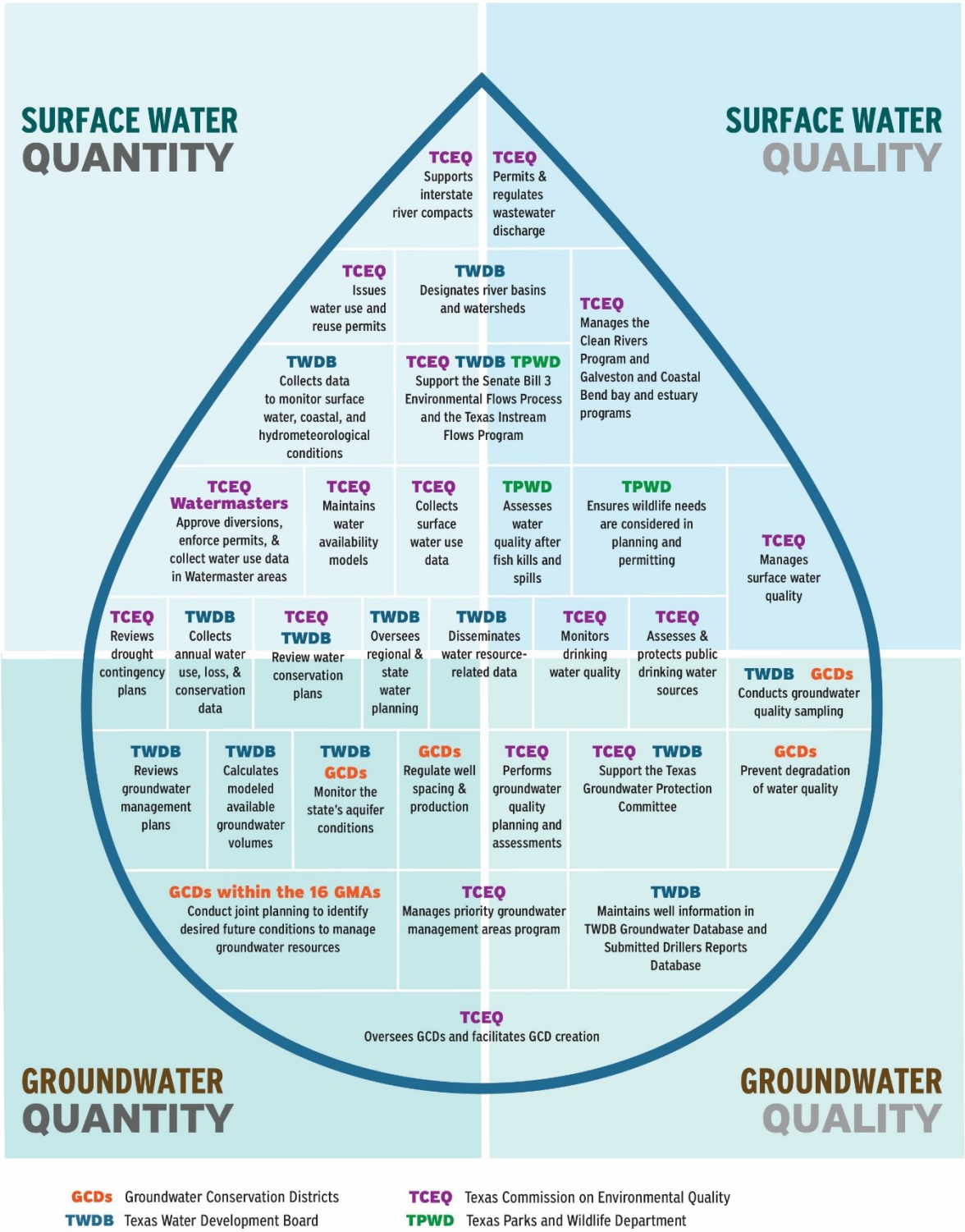
The **Natural Resources Conservation Service**, part of the U.S. Department of Agriculture and successor to the Soil Conservation Service, implements soil conservation programs and works at the local level through conservation planning and assistance programs. The **U.S. Environmental Protection Agency** 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, and they determine 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, groundwater, and reuse resources, as well as water quality, drinking water, and interstate waters—all important considerations when planning for drought.

Figure A-4 offers a visual overview of how water resources are managed in Texas, illustrating which state agencies oversee surface water and which oversee groundwater, including aspects of water quality and water quantity. It highlights the distinct regulatory systems for each resource and indicates how agencies such as the TWDB, the Texas Commission on Environmental Quality, the Texas Parks and Wildlife Department, and others share roles in planning, permitting, science, and oversight related to both surface water and groundwater.

Figure A-4. Overview of agency responsibilities for managing Texas water resources



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, 2019). 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 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.

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. In 1967, because 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 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, 2019). 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 together 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. The 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 now 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:

5) Action of the Texas Legislature
6) Petition by property owners
7) Initiation by the Texas Commission on Environmental Quality
8) 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 for 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.

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.

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 water supply 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 the management plans. The

agency also evaluates designated priority groundwater management areas, which are areas 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.

Reuse

Reclaimed water is domestic or municipal wastewater that has been treated to a quality suitable for beneficial use. There are two types of reclaimed water: Type I reclaimed water is defined as use of reclaimed water where contact between humans and the reclaimed water is likely, and Type II reclaimed water is where contact between humans and the water is unlikely. The use of reclaimed water for beneficial purposes is regulated by the Texas Commission on Environmental Quality (www.tceq.texas.gov/assistance/water/reclaimed_water.html).

Water reuse falls into two main categories: indirect reuse and direct reuse. Indirect reuse involves the discharge of reclaimed water back to an environmental buffer, such as a lake, river, or aquifer, and retrieving it to be utilized again. Water reuse projects that involve discharge to a watercourse must comply with federal and state requirements pursuant to the Clean Water Act. They also require a bed and banks permit from the Texas Commission on Environmental Quality, which authorizes the permit holder to convey and subsequently divert water. Direct reuse involves piping reclaimed water directly from a wastewater treatment facility to a distribution system for beneficial use.

Both categories can be used for potable or non-potable purposes. Potable reuse projects require advanced treatment and must meet all applicable drinking water standards adopted under the Safe Drinking Water Act. To ensure safe drinking water, the Texas Commission on Environmental Quality reviews and approves potable reuse projects on a case-by-case basis prior to implementation. For non-potable uses, Texas Commission on Environmental Quality requirements depend on the type of reclaimed water and its intended use. In general, entities must obtain authorization from the Texas Commission on Environmental Quality to use reclaimed water for non-potable uses. The Texas Commission on Environmental Quality enforces water quality and monitoring requirements for all active reuse projects.

Onsite reuse is another form of reuse used for non-potable applications. It involves the beneficial use of water generated at a specific site, including graywater and alternative water sources such as rainwater, air-conditioning condensate, foundation drain water, stormwater, swimming pool backwash, and reverse osmosis reject water. Onsite reuse systems are typically implemented at the building or facility scale and are designed so that water is generated and reused within the same site. In Texas, onsite reuse is regulated by the Texas Commission on Environmental Quality with specific provisions that vary based on the type of water source and system design.

Seawater

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 the diversion of marine seawater and discharge of the desalination waste that apply 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, and the map of zones is available at the

General Land Office Coastal Resource Management Viewer (www.glo.texas.gov/maps/coastal-resource-management-viewer).

Surface water quality

The Texas Commission on Environmental Quality is charged with managing the quality of the 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 surface water quality within each river basin.

Every two years, Texas submits the Texas Integrated Report for Surface Water Quality (www.tceq.texas.gov/waterquality/assessment) to the U.S. Environmental Protection Agency. The report 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 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 for a more conservative yield—such as a one- to two-year safe yield—because some reservoirs in more arid regions of the state have extended periods between refilling.

Seven planning regions (Regions A, B, C, F, G, N, and O) requested and were authorized to use safe yield for at least some portion of the surface water availability analyses in their plan development. Authorization was granted by the executive administrator based upon the specifics of the request and planning group assurances that the resulting estimates of alternative water availability would be reasonable for drought planning purposes and would reflect realistic conditions expected in the event of near-term, actual drought conditions. These authorizations are summarized in Table B-1.

Additionally, planning groups reported the standard firm yield value in their plan. For presentation purposes, only approved safe yield hydrologic variance assumptions for reservoir sources are summarized. Certain run-of-river sources also had 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 period of record beyond the current water availability model hydrologic period of record (Regions A and N);
- modifications to water availability models to more accurately reflect operational, contract, or subordination agreements (*e.g.*, associated with existing water rights); correct known errors in the models; or remove canceled water rights (Regions B, C, D, E, F, G, H, I, K, L, M, and O);
- accounting for return flows in water availability modeling (Regions D, G, H, J, K, L, M, and O);
- use of alternative models more conservative than WAM Run 3 (Regions A, I, L, and N); and
- use of alternative yields, other than safe yield, more conservative than WAM Run 3 (Regions C and E).

Table B-1. Summary of safe yield hydrologic variances used in the 2027 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	2030 Firm yield (ac-ft/yr)	2030 Safe yield (ac-ft/yr)	Percent difference between firm and safe yield availability 2030	2080 Firm yield (ac-ft/yr)	2080 Safe yield (ac-ft/yr)	Percent difference between firm and safe yield availability 2080
Brazos	Baird Lake/Reservoir	G	None	1 year	30	20	-33	30	20	-33
Brazos	Cisco Lake/Reservoir	G	None	1 year	1,227	997	-19	1,227	926	-25
Brazos	Daniel Lake/Reservoir	G	None	1 year	50	21	-58	0	0	0
Brazos	Fort Phantom Hill Lake/Reservoir	G	G	2 year	7,833	5,339	-32	7,833	5,310	-32
Brazos	Graham/Eddleman Lake/Reservoir	B; C; G	None	1 year	1,800	789	-56	1,420	366	-74
Brazos	Hubbard Creek Lake/Reservoir	G	G	2 year	26,380	16,879	-36	24,810	15,196	-39
Brazos	McCarty Lake/Reservoir	G	None	1 year	110	80	-27	110	80	-27
Brazos	Millers Creek Lake/Reservoir	B; G	None	1 year	400	227	-43	180	93	-48
Brazos	Palo Pinto Lake/Reservoir	C; G	G	0.5 year	8,880	6,236	-30	7,710	5,318	-31
Brazos	Stamford Lake/Reservoir	G	None	1 year	3,900	2,060	-47	3,440	1,569	-54
Brazos	Woodson Lake/Reservoir	G	None	1 year	0	0	0	0	0	0
Canadian	Meredith Lake/Reservoir	A; O	A; O	1 year	28,221	24,600	-13	28,326	24,600	-13
Colorado	Brownwood Lake/Reservoir	F; G	F	1 year	19,000	15,550	-18	18,300	14,900	-19
Colorado	OH Ivie Lake/Reservoir Non-System Portion	F; G	F; G	1 year	17,272	15,263	-12	15,139	12,855	-15
Nueces	Corpus Christi-Choke Canyon Lake/Reservoir System	N	N	75,000 acre-feet reserve	126,766	110,766	-13	114,766	97,766	-15
Red	Greenbelt Lake/Reservoir	A; B	None	1 year	3,964	3,140	-21	3,276	2,175	-34

River basin	Reservoir source	Region(s) utilizing reservoir as current source	Region(s) utilizing reservoir as future source	Safe yield additional period assumption	2030 Firm yield (ac-ft/yr)	2030 Safe yield (ac-ft/yr)	Percent difference between firm and safe yield availability 2030	2080 Firm yield (ac-ft/yr)	2080 Safe yield (ac-ft/yr)	Percent difference between firm and safe yield availability 2080
Red	Kemp-Diversion Lake/Reservoir System	B	None	20 percent reservoir capacity	46,500	32,900	-29	31,400	20,800	-34
Red	Little Wichita River Lake/Reservoir System	B	None	20 percent reservoir capacity	31,770	16,300	-49	28,960	11,200	-61
Red	Olney-Cooper Lake/Reservoir System	B; G	None	1 year	247	145	-41	153	85	-44
Red	Santa Rosa Lake/Reservoir	B	None	1 year	3,075	920	-70	3,075	920	-70
Rio Grande	Red Bluff Lake/Reservoir	F	None	1 year	20,350	16,180	-21	20,170	16,040	-21
Trinity	Amon G. Carter Lake/Reservoir	B	None	1 year	1,689	1,080	-36	1,185	770	-35
Trinity	Ray Hubbard Lake/Reservoir	C; G	None	9 months	55,730	46,239	-17	51,160	42,461	-17
Trinity	Ray Roberts-Lewisville-Grapevine Lake/Reservoir System	C; G	C	9 months	207,399	174,899	-16	201,269	169,539	-16
Trinity	TRWD Lake/Reservoir System	C; D; G	C; G	1 year	564,732	454,182	-20	547,532	433,272	-21
Trinity	White Rock Lake/Reservoir	C	None	9 months	3,400	2,540	-25	2,400	1,650	-31

ac-ft/yr – acre-feet per year

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

Surface water basin	2030	2040	2050	2060	2070	2080	Percent change from 2030
Brazos	1,409,981	1,389,460	1,368,940	1,348,418	1,327,898	1,307,377	-7
Brazos-Colorado	12,968	12,968	12,968	12,968	12,968	12,968	0
Canadian	35,439	35,439	35,439	35,439	35,439	35,439	0
Colorado	861,271	858,661	856,050	853,274	850,498	847,721	-2
Colorado-Lavaca	4,803	4,803	4,803	4,803	4,803	4,803	0
Cypress	291,718	288,445	285,172	281,897	278,624	275,351	-6
Guadalupe	201,553	201,407	201,263	201,119	200,740	200,335	-1
Lavaca	75,506	75,506	75,506	75,506	75,506	75,506	0
Lavaca-Guadalupe	373	373	373	373	373	373	0
Neches	1,511,800	1,509,032	1,506,222	1,502,872	1,499,713	1,496,710	-1
Neches-Trinity	89,651	89,651	89,651	89,651	89,651	89,651	0
Nueces	120,687	118,770	116,877	114,988	113,102	108,223	-10
Nueces-Rio Grande	40,929	40,929	40,929	40,929	40,929	40,929	0
Red	284,681	280,721	276,734	272,502	268,271	264,039	-7
Rio Grande	1,141,655	1,141,119	1,140,583	1,139,348	1,137,550	1,135,414	-1
Sabine	1,712,186	1,706,720	1,701,454	1,695,777	1,690,301	1,684,823	-2
Sabine-Louisiana	224	194	170	145	125	107	-52
San Antonio	52,878	52,878	52,878	52,878	52,878	52,878	0
San Antonio-Nueces	484	484	484	484	484	484	0
San Jacinto	275,525	273,025	270,575	268,175	265,825	263,425	-4
San Jacinto-Brazos	37,091	37,091	37,091	37,091	37,091	37,091	0
Sulphur	408,327	397,370	386,543	375,694	364,846	353,997	-13
Trinity	2,472,140	2,464,212	2,456,076	2,408,298	2,358,574	2,310,682	-7
Trinity-San Jacinto	5,539	5,539	5,539	5,539	5,539	5,539	0
Texas	**11,047,409**	**10,984,797**	**10,922,320**	**10,818,168**	**10,711,728**	**10,603,865**	**-4**

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

Surface water basin	2030	2040	2050	2060	2070	2080	Percent change from 2030
Brazos	1,085,705	1,081,433	1,069,551	1,058,409	1,044,724	1,032,149	-5
Brazos-Colorado	12,247	12,247	12,247	12,247	12,247	12,247	0
Canadian	22,839	21,339	19,839	18,339	16,839	15,339	-33
Colorado	789,408	790,484	794,490	794,127	793,279	792,421	0
Colorado-Lavaca	312	312	312	312	312	312	0
Cypress	187,195	185,649	184,252	182,948	181,482	179,647	-4
Guadalupe	152,720	148,159	148,140	144,121	143,866	143,582	-6
Lavaca	74,590	74,590	74,590	74,590	74,590	74,590	0
Lavaca-Guadalupe	373	373	373	373	373	373	0
Neches	549,546	559,246	564,969	567,688	570,661	574,151	5
Neches-Trinity	89,065	89,065	89,065	89,065	89,065	89,065	0
Nueces	118,972	116,977	114,976	112,976	111,016	106,016	-11
Nueces-Rio Grande	3,581	3,581	3,581	3,581	3,581	3,581	0
Red	138,991	136,464	134,519	131,613	128,525	125,367	-10
Rio Grande	880,186	880,439	878,474	877,967	877,344	876,222	-1
Sabine	645,821	646,719	647,485	650,240	654,330	658,587	2
Sabine-Louisiana	224	194	170	145	125	107	-52
San Antonio	52,877	52,877	52,877	52,877	52,877	52,877	0
San Antonio-Nueces	409	409	409	409	409	409	0
San Jacinto	220,500	218,650	216,850	215,050	213,300	211,550	-4
San Jacinto-Brazos	34,253	34,253	34,253	34,253	34,253	34,253	0
Sulphur	143,285	141,583	140,156	141,214	142,323	143,108	0
Trinity	1,993,661	1,977,603	1,954,587	1,932,516	1,916,415	1,902,785	-5
Trinity-San Jacinto	5,539	5,539	5,539	5,539	5,539	5,539	0
Texas[a]	**7,202,299**	**7,178,185**	**7,141,704**	**7,100,599**	**7,067,475**	**7,034,277**	**-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 volumes in this plan. Desired future conditions for this plan were adopted by districts within the groundwater management areas by January 5, 2022. Summaries of adopted desired future conditions, desired future conditions explanatory reports, and modeled available groundwater summaries, reports, and model files are available for each groundwater management area on the 2021 Joint Groundwater Planning webpage (www.twdb.texas.gov/groundwater/dfc/2021jointplanning).

The modeled available groundwater peak factor option discussed in Chapter 5 was utilized for this state water plan by Region H.

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

Aquifer	2030	2040	2050	2060	2070	2080	Percent change from 2030
Austin Chalk	5,704	5,704	5,704	5,704	5,704	5,704	0
Blaine	82,174	82,174	82,174	82,174	82,174	82,174	0
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	260,006	259,145	258,624	258,410	258,243	258,243	-1
Buda Limestone	758	758	758	758	758	758	0
Capitan Reef Complex	41,123	41,123	41,123	41,123	41,123	41,123	0
Carrizo-Wilcox	1,006,179	1,066,274	1,142,713	1,207,247	1,258,020	1,249,594	24
Colorado River Alluvium	1,660	1,660	1,660	1,660	1,660	1,660	0
Cross Timbers	13,166	13,166	13,166	13,166	13,166	13,166	0
Dockum	442,070	436,981	419,499	398,465	374,040	355,219	-20
Edwards (Balcones Fault Zone)	361,484	361,484	361,484	361,484	361,484	361,484	0
Edwards-Trinity (Plateau)/Pecos Valley[a]	420,825	420,825	420,825	420,825	420,825	420,825	0
Edwards-Trinity (Plateau)	7,100	7,100	7,100	7,100	7,100	7,100	0
Edwards-Trinity (Plateau)/Pecos Valley/Trinity[a]	479,515	479,515	479,515	479,515	479,515	479,515	0
Ellenburger-San Saba	40,399	40,403	40,399	40,403	40,399	40,403	0
Frio River Alluvium	2,145	2,145	2,145	2,145	2,145	2,145	0
Gulf Coast	2,095,126	2,036,198	2,079,608	2,116,543	2,138,782	2,154,640	3
Hickory	56,088	56,089	56,088	56,089	56,088	56,089	0
Hueco-Mesilla Bolsons	480,000	480,000	480,000	480,000	480,000	480,000	0
Igneous	11,716	11,715	11,712	11,711	11,711	11,711	0
Leona Gravel	16,630	16,630	16,630	16,630	16,630	16,630	0
Lipan	48,646	48,646	48,646	48,646	48,646	48,646	0
Marathon	7,327	7,327	7,327	7,327	7,327	7,327	0
Marble Falls	10,242	10,254	10,242	10,254	10,242	10,242	0
Nacatoch	15,651	15,650	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]	2,041,501	1,558,063	1,272,756	1,109,782	1,012,230	950,014	-54

Aquifer	2030	2040	2050	2060	2070	2080	Percent change from 2030
Ogallala/Rita Blanca[a]	556,185	452,114	379,087	323,340	280,372	247,045	-56
Ogallala	2,620,739	2,499,441	2,317,015	2,137,661	1,950,552	1,769,121	-33
Other	259,190	259,190	259,190	259,190	259,190	259,190	0
Pecos Valley	150	150	150	150	150	150	0
Queen City	161,757	162,328	163,207	164,195	164,354	164,353	2
Rustler	10,683	10,683	10,683	10,683	10,683	10,683	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	196,693	200,407	203,914	205,909	211,907	207,493	6
Sparta	25,418	27,808	30,367	33,062	35,851	35,851	41
Trinity	401,638	401,337	401,005	400,959	400,959	400,959	0
Trinity River Alluvium	3,913	3,913	3,913	3,913	3,913	3,913	0
West Texas Bolsons	80,296	80,004	79,802	79,672	79,488	79,305	-1
Woodbine	30,596	30,596	30,596	30,596	30,596	30,596	0
Yegua-Jackson	98,020	100,536	100,539	100,540	99,215	99,215	1
Texas	**12,504,217**	**11,799,240**	**11,366,742**	**11,054,762**	**10,783,452**	**10,491,201**	**-16**

[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)

Aquifer	2030	2040	2050	2060	2070	2080	Percent change from 2030
Austin Chalk	3,485	3,485	3,485	3,485	3,485	3,485	0
Blaine	31,754	31,713	31,721	31,728	31,736	31,743	0
Blossom	689	689	689	689	689	689	0
Bone Spring-Victorio Peak	68,620	68,620	68,620	68,620	68,620	68,620	0
Brazos River Alluvium	144,597	144,330	144,012	143,896	143,790	143,790	-1
Buda Limestone	525	525	525	525	525	525	0
Capitan Reef Complex	4,825	4,825	4,825	4,825	4,825	4,825	0
Carrizo-Wilcox	713,303	727,878	732,918	735,336	739,874	740,848	4
Colorado River Alluvium	1,488	1,488	1,488	1,488	1,488	1,488	0
Cross Timbers	5,371	5,354	5,353	5,358	5,379	5,388	0
Dockum	86,633	86,247	84,599	82,396	79,596	78,741	-9
Edwards (Balcones Fault Zone)	312,117	312,114	312,114	312,114	312,114	312,114	0
Edwards-Trinity (Plateau)/Pecos Valley[a]	195,713	198,388	198,397	196,178	195,664	195,078	0
Edwards-Trinity (Plateau)	2,128	2,128	2,128	2,128	2,128	2,128	0
Edwards-Trinity (Plateau)/Pecos Valley/Trinity[a]	252,508	254,055	250,028	240,788	227,379	214,198	-15
Ellenburger-San Saba	17,490	17,488	17,471	17,460	17,453	17,452	0
Frio River Alluvium	929	929	929	929	929	929	0
Gulf Coast	1,269,095	1,201,626	1,229,712	1,251,715	1,271,676	1,289,611	2
Hickory	28,203	30,508	30,568	30,538	30,505	30,467	8
Hueco-Mesilla Bolsons	141,978	141,998	142,017	142,036	142,053	142,069	0
Igneous	10,352	10,351	10,348	10,347	10,347	10,347	0
Leona Gravel	9,030	9,030	9,030	9,030	9,030	9,030	0
Lipan	46,182	47,624	47,626	47,626	47,625	47,625	3
Marathon	389	389	389	389	389	389	0
Marble Falls	617	596	582	570	566	571	-8
Nacatoch	6,242	6,273	6,258	6,245	6,257	6,257	0
Navasota River Alluvium	58	58	58	58	58	58	0
Nueces River Alluvium	5	5	5	5	5	5	0
Ogallala/Edwards-Trinity (High Plains)[a]	1,778,856	1,418,243	1,189,575	986,676	892,794	835,042	-53
Ogallala/Rita Blanca[a]	442,544	350,454	289,267	244,154	211,261	185,651	-58
Ogallala	1,186,661	1,154,599	1,098,407	1,043,225	991,995	950,932	-20

Aquifer	2030	2040	2050	2060	2070	2080	Percent change from 2030
Other	188,450	188,464	188,468	188,318	187,720	187,179	-1
Pecos Valley	150	150	150	150	150	150	0
Queen City	25,574	25,948	26,030	26,022	26,006	26,005	2
Rustler	8,631	8,631	8,631	8,631	8,631	8,631	0
San Bernard River Alluvium	-	-	-	-	-	-	na
San Jacinto River Alluvium	-	-	-	-	-	-	na
San Marcos River Alluvium	31	31	31	31	31	31	0
Seymour	175,619	175,076	177,127	177,984	174,704	176,834	1
Sparta	16,139	17,037	17,135	17,159	17,100	17,063	6
Trinity	262,808	261,392	262,253	262,925	263,424	263,911	0
Trinity River Alluvium	-	-	-	-	-	-	na
West Texas Bolsons	40,776	40,699	40,649	40,607	40,517	40,445	-1
Woodbine	19,395	19,678	19,941	20,190	20,490	21,035	9
Yegua-Jackson	24,821	24,872	24,828	24,823	24,822	24,842	0
Texas	**7,524,781**	**6,993,988**	**6,678,387**	**6,387,397**	**6,213,830**	**6,096,221**	**-19**

[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: Water needs

Table C-1. Annual water needs associated with water user groups by region and water use category (acre-feet)

Region	Water use category	2030	2040	2050	2060	2070	2080
A	Irrigation	427,488	552,889	524,337	498,292	473,453	456,154
	Livestock	9,285	11,430	11,597	11,768	11,943	12,122
	Manufacturing	1,522	3,522	5,269	7,182	8,624	11,890
	Municipal	4,748	12,422	18,725	25,116	29,493	33,790
A Total		**443,043**	**580,263**	**559,928**	**542,358**	**523,513**	**513,956**
B	Irrigation	5,007	6,491	7,974	9,458	10,942	12,734
	Manufacturing	0	0	4	49	95	146
	Municipal	341	640	983	1,458	2,019	2,760
	Steam-electric power	0	3	66	569	1,071	1,573
B Total		**5,348**	**7,134**	**9,027**	**11,534**	**14,127**	**17,213**
C	Irrigation	5,501	5,498	5,498	5,507	5,538	5,584
	Manufacturing	9,142	19,946	24,070	27,767	31,018	33,740
	Mining	123	211	890	2,587	5,105	8,473
	Municipal	220,512	467,639	709,949	933,232	1,132,540	1,301,192
	Steam-electric power	1,022	5,591	6,845	8,163	9,196	10,034
C Total		**236,300**	**498,885**	**747,252**	**977,256**	**1,183,397**	**1,359,023**
D	Irrigation	17,045	17,045	17,045	17,045	17,045	17,045
	Livestock	516	518	517	517	522	521
	Manufacturing	3,676	3,916	4,186	4,463	4,760	5,059
	Mining	1,890	1,870	1,850	1,832	1,811	1,807
	Municipal	30,388	33,955	36,666	38,971	42,029	45,560
	Steam-electric power	0	1,198	2,458	3,143	4,433	5,693
D Total		**53,515**	**58,502**	**62,722**	**65,971**	**70,600**	**75,685**
E	Irrigation	122,084	120,881	120,128	119,661	119,234	118,782
	Livestock	198	198	198	198	198	198
	Mining	6,719	6,724	6,730	6,733	6,734	6,734
	Municipal	33,039	37,195	39,834	41,563	43,319	45,100
	Steam-electric power	1,680	1,680	1,680	1,680	1,680	1,680
E Total		**163,720**	**166,678**	**168,570**	**169,835**	**171,165**	**172,494**
F	Irrigation	10,564	22,968	26,262	27,615	27,690	27,634
	Livestock	74	87	95	100	104	108
	Manufacturing	106	287	501	671	790	902
	Mining	20,660	22,117	20,762	16,848	12,239	9,872
	Municipal	8,815	12,384	21,413	29,960	40,081	53,366
	Steam-electric power	6,864	7,057	7,307	7,589	7,771	7,940

Region	Water use category	2030	2040	2050	2060	2070	2080
F Total		**47,083**	**64,900**	**76,340**	**82,783**	**88,675**	**99,822**
G	Irrigation	56,002	56,338	56,083	53,251	55,827	56,464
	Livestock	900	908	915	922	929	936
	Manufacturing	2,165	2,143	2,799	2,832	2,747	3,149
	Mining	13,675	14,256	14,757	15,138	14,444	14,736
	Municipal	98,482	171,071	253,104	330,935	419,609	509,644
	Steam-electric power	26,863	27,600	28,355	29,057	29,747	30,455
G Total		**198,087**	**272,316**	**356,013**	**432,135**	**523,303**	**615,384**
H	Irrigation	89,160	90,468	91,331	91,886	92,250	92,447
	Livestock	2,691	2,989	3,073	3,128	3,162	3,181
	Manufacturing	75,407	89,728	107,901	123,909	140,870	159,537
	Mining	3,920	4,045	4,168	4,297	4,427	4,565
	Municipal	205,943	360,261	418,801	462,176	499,878	538,879
	Steam-electric power	16,038	16,224	16,354	16,434	16,481	16,524
H Total		**393,159**	**563,715**	**641,628**	**701,830**	**757,068**	**815,133**
I	Irrigation	215	215	215	215	215	215
	Livestock	0	0	0	156	702	871
	Manufacturing	8,168	41,392	78,627	115,793	153,291	190,571
	Mining	702	761	818	873	952	1,097
	Municipal	6,879	7,405	8,149	8,587	8,992	9,532
	Steam-electric power	4,357	4,357	4,357	4,357	4,357	4,357
I Total		**20,321**	**54,130**	**92,166**	**129,981**	**168,509**	**206,643**
J	Irrigation	1,072	1,072	1,072	1,072	1,072	1,072
	Livestock	142	142	142	142	142	142
	Manufacturing	2	2	2	2	2	2
	Mining	83	89	98	106	113	121
	Municipal	10,415	10,744	11,017	11,459	11,906	12,333
J Total		**11,714**	**12,049**	**12,331**	**12,781**	**13,235**	**13,670**
K	Irrigation	302,217	287,925	274,021	260,492	247,327	234,520
	Manufacturing	1,485	1,778	2,082	2,397	2,723	3,063
	Mining	2,990	1,357	1,739	2,318	2,895	3,428
	Municipal	12,585	35,383	58,979	109,024	179,358	257,135
K Total		**319,277**	**326,443**	**336,821**	**374,231**	**432,303**	**498,146**
L	Irrigation	71,258	71,187	71,793	71,862	71,927	71,979
	Livestock	12	12	12	12	12	12
	Manufacturing	39,765	41,606	45,440	49,562	53,838	58,272
	Mining	34,771	37,867	40,936	43,930	46,782	20,956
	Municipal	38,660	69,433	111,065	184,152	264,266	361,827
	Steam-electric power	666	666	666	666	666	666

Region	Water use category	2030	2040	2050	2060	2070	2080
L Total		**185,132**	**220,771**	**269,912**	**350,184**	**437,491**	**513,712**
M	Irrigation	919,013	873,548	828,086	783,070	738,360	693,854
	Manufacturing	0	0	0	1	5	9
	Mining	3,604	3,605	3,606	3,608	3,675	0
	Municipal	24,355	32,442	42,823	46,375	50,400	54,449
M Total		**946,972**	**909,595**	**874,515**	**833,054**	**792,440**	**748,312**
N	Manufacturing	33,680	36,890	39,309	41,373	43,656	45,756
	Mining	113	123	118	109	120	101
	Municipal	7,291	6,975	6,520	5,948	5,304	9,721
N Total		**41,084**	**43,988**	**45,947**	**47,430**	**49,080**	**55,578**
O	Irrigation	556,207	598,815	327,941	32,425	30,923	28,460
	Municipal	11,475	19,072	30,699	43,503	55,197	65,346
O Total		**567,682**	**617,887**	**358,640**	**75,928**	**86,120**	**93,806**
P	Irrigation	9,331	9,331	9,331	9,331	9,331	9,331
	Manufacturing	3,679	4,313	4,334	4,355	4,377	4,401
P Total		**13,010**	**13,644**	**13,665**	**13,686**	**13,708**	**13,732**
Texas	Irrigation	2,592,164	2,714,671	2,361,117	1,981,182	1,901,134	1,826,275
	Livestock	13,818	16,284	16,549	16,943	17,714	18,091
	Manufacturing	178,797	245,523	314,524	380,356	446,796	516,497
	Mining	89,250	93,025	96,472	98,379	99,297	71,890
	Municipal	713,928	1,277,021	1,768,727	2,272,459	2,784,391	3,300,634
	Steam-electric power	57,490	64,376	68,088	71,658	75,402	78,922
Texas Total		**3,645,447**	**4,410,900**	**4,625,477**	**4,820,977**	**5,324,734**	**5,812,309**

Table C-2. Projected needs as a share of total demand (percent) for water user groups with identified water needs

Water supply needs expressed as a percent of the water user group's total demand provide an indicator of the severity of need. The larger the percent of an entity's total demand indicates a more severe potential shortage.

***Bolded values** indicate that the identified needs would remain unmet after recommended strategies for the entity are implemented. The table uses color-graded scale from 0 (green) to 100 percent (red). A dash indicates no identified need, and a value of zero indicates a need that is less than 1 percent of total demand.*

This table includes only water user groups with identified needs. A table with all water user groups is available on the [2027 State Water Plan webpage] at www.twdb.texas.gov/waterplanning/swp/2027/index.

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
410 WSC	D	Red River	Municipal	38	36	33	31	28	24
439 WSC	G	Bell	Municipal	-	-	10	19	25	28
Abilene	G	Taylor	Municipal	-	-	-	5	20	30
Ables Springs SUD	C; D	Hunt; Kaufman; Van Zandt	Municipal	9	22	33	**41**	45	48
Acton MUD	G	Hood; Johnson	Municipal	-	-	-	-	5	13
Addison	C	Dallas	Municipal	8	12	17	20	23	26
Alamo Heights	L	Bexar	Municipal	23	23	23	23	23	23
Aledo	C	Parker	Municipal	10	17	21	25	28	31
Allen	C	Collin	Municipal	9	22	33	**41**	45	48
Alto Rural WSC	I	Cherokee	Municipal	13	20	27	34	39	45
Alvin	H	Brazoria	Municipal	4	8	9	10	11	13
Alvord	C	Wise	Municipal	45	55	62	**66**	69	72
Amarillo	A	Potter; Randall	Municipal	9	19	27	35	40	43
Andrews	F	Andrews	Municipal	**10**	**20**	**35**	**46**	**55**	**62**
Anna	C	Collin	Municipal	37	61	69	**74**	77	79
Annetta	C	Parker	Municipal	-	-	-	-	1	11
Aqua WSC	G; K; L	Bastrop; Caldwell; Lee; Travis	Municipal	24	39	51	59	66	72
Argyle WSC	C	Denton	Municipal	-	21	37	43	49	52
Arlington	C	Tarrant	Municipal	14	24	29	**36**	40	44
Aspermont	G	Stonewall	Municipal	**15**	12	9	4	-	-
Atascosa Rural WSC	L	Bexar	Municipal	73	77	79	81	83	85
Athens	C; I	Henderson	Municipal	-	-	9	21	34	41
Aubrey	C	Denton	Municipal	22	38	48	47	53	56
Austin	K	Hays; Travis; Williamson	Municipal	-	-	-	7	16	25
Avalon Water Supply & Sewer Service	C	Ellis	Municipal	-	-	1	10	19	26
Axtell WSC	G	McLennan	Municipal	5	17	26	33	39	44
Azle	C	Parker; Tarrant	Municipal	33	41	48	**52**	57	61
B And B WSC	C	Navarro	Municipal	-	2	8	13	18	23

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
B H P WSC	D	Hunt	Municipal	9	20	29	36	40	43
Baird	G	Callahan	Municipal	71	70	70	70	70	69
Baker Road MUD	H	Harris	Municipal	-	22	22	21	26	28
Balch Springs	C	Dallas	Municipal	8	12	17	20	23	26
Ballinger	F	Runnels	Municipal	51	55	60	65	68	71
Balmorhea	F	Reeves	Municipal	**9**	19	27	31	35	39
Bartlett	G	Bell; Williamson	Municipal	1	-	-	-	-	-
Barton Creek WSC	K	Travis	Municipal	18	24	28	32	36	40
Bastrop County WCID 2	K	Bastrop	Municipal	2	20	34	46	54	62
Bear Creek SUD	C	Collin; Rockwall	Municipal	9	22	33	**41**	45	48
Beaumont	I	Jefferson	Municipal	22	23	24	25	25	25
Becker Jiba WSC	C	Kaufman	Municipal	8	22	33	**41**	45	48
Bedford	C	Tarrant	Municipal	13	23	28	**34**	39	42
Bell County WCID 3	G	Bell	Municipal	**23**	**37**	**52**	**61**	**63**	**64**
Bells	C	Grayson	Municipal	40	45	48	51	54	57
Belton	G	Bell	Municipal	-	-	5	17	**25**	**30**
Ben Wheeler WSC	D; I	Smith; Van Zandt	Municipal	-	11	22	32	41	46
Benbrook Water Authority	C	Tarrant	Municipal	12	22	27	**32**	36	40
Benjamin	G	Knox	Municipal	**46**	**52**	45	63	40	92
Benton City WSC	L	Atascosa; Frio; Medina	Municipal	-	1	9	14	18	22
Bertram	K	Burnet	Municipal	55	65	71	75	79	82
Bethesda WSC	C; G	Johnson; Tarrant	Municipal	11	19	24	29	34	37
Bexar County WCID 10	L	Bexar	Municipal	29	37	43	47	51	55
Big Sandy	D	Upshur	Municipal	7	7	7	6	5	3
Big Spring	F	Howard	Municipal	-	7	19	28	34	39
Bistone Municipal Water Supply District	G	Limestone	Municipal	-	**25**	**63**	**68**	**61**	**100**
Black Rock WSC	C	Denton	Municipal	-	0	18	30	40	48
Blackland WSC	C	Rockwall	Municipal	9	22	33	**41**	45	48
Blaketree MUD 1 of Montgomery County	H	Montgomery	Municipal	4	19	30	37	41	45
Blooming Grove	C	Navarro	Municipal	-	2	8	13	19	23
Blue Bell Manor Utility	H	Harris	Municipal	-	20	21	22	21	21
Blue Ridge	C	Collin	Municipal	-	-	13	28	40	49
Blue Ridge West MUD	H	Fort Bend	Municipal	-	-	0	3	4	5
Boerne	L	Kendall	Municipal	-	10	34	**49**	**60**	**68**
Bois D Arc MUD	C; D	Fannin; Lamar	Municipal	-	14	26	36	46	56

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Bolivar WSC	C	Cooke; Denton; Wise	Municipal	24	38	47	54	61	68
Bonham	C	Fannin	Municipal	-	-	-	20	41	52
Booker	A	Lipscomb; Ochiltree	Municipal	22	25	30	36	40	45
Borden County Water System	F	Borden	Municipal	-	-	-	10	26	40
Borger	A	Hutchinson	Municipal	9	14	18	22	24	29
Bowie	B	Montague	Municipal	10	23	34	45	55	63
Boyd	C	Wise	Municipal	7	27	47	**57**	64	67
Brandon Irene WSC	C; G	Hill; Navarro	Municipal	**11**	**14**	**16**	19	23	**27**
Brazoria County FWSD 1	H	Brazoria	Municipal	4	7	9	11	11	15
Brazoria County MUD 2	H	Brazoria	Municipal	3	6	7	9	10	12
Brazoria County MUD 21	H	Brazoria	Municipal	4	6	8	8	8	9
Brazoria County MUD 25	H	Brazoria	Municipal	8	11	12	13	14	14
Brazoria County MUD 29	H	Brazoria	Municipal	28	30	32	33	33	34
Brazoria County MUD 31	H	Brazoria	Municipal	4	8	10	13	14	14
Brazoria County MUD 39	H	Brazoria	Municipal	45	52	53	56	58	58
Brazoria County MUD 55	H	Brazoria	Municipal	4	6	6	7	7	8
Brenham	G	Washington	Municipal	-	-	-	-	2	5
Briarcliff	K	Travis	Municipal	16	31	41	48	54	60
Bridgeport	C	Wise	Municipal	14	24	29	**36**	40	44
Brinker WSC	D	Hopkins	Municipal	23	27	28	30	32	34
Bronte	F	Coke	Municipal	71	73	75	77	79	81
Brownfield	O	Terry	Municipal	-	-	-	6	8	10
Bruceville Eddy	G	Falls; McLennan	Municipal	5	9	15	20	26	30
Brushy Creek MUD	G; K	Williamson	Municipal	**20**	**21**	21	22	**22**	**23**
Bryan	G	Brazos	Municipal	66	57	63	68	75	80
Buda	K	Hays	Municipal	-	1	17	28	38	47
Buena Vista-Bethel SUD	C	Ellis	Municipal	18	18	19	23	26	29
Bunker Hill Village	H	Harris	Municipal	-	-	-	0	-	-
Burleson	C; G	Johnson; Tarrant	Municipal	14	24	29	36	40	44
Burns Redbank WSC	D	Bowie	Municipal	100	100	100	100	100	100
C C Water Works	H	Chambers	Municipal	32	53	66	73	78	82
C Willow Water	L	Wilson	Municipal	-	7	15	21	27	33
Cactus Municipal Water System	A	Moore	Municipal	-	11	22	**32**	**40**	**48**
Caddo Basin SUD	C; D	Collin; Hunt	Municipal	9	22	33	**41**	45	48

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Cameron	G	Milam	Municipal	100	100	100	100	100	100
Camp Wood	J	Real	Municipal	100	100	100	100	100	100
Canton	D	Van Zandt	Municipal	-	-	-	-	8	14
Canyon	A	Randall	Municipal	-	12	24	34	42	49
Canyon Lake Water Service	K; L	Blanco; Comal; Hays; Medina; Travis	Municipal	1	2	16	23	42	54
Carrizo Hill WSC	L	Dimmit	Municipal	-	-	-	7	22	24
Carrollton	C	Dallas; Denton	Municipal	8	12	16	20	23	25
Cash SUD	C; D	Hopkins; Hunt; Rains; Rockwall	Municipal	-	-	-	-	0	9
Castroville	L	Medina	Municipal	46	50	55	61	65	68
Cedar Hill	C	Dallas	Municipal	8	12	16	20	23	25
Cedar Park	G; K	Travis; Williamson	Municipal	12	13	13	13	13	13
Cego-Durango WSC	G	Falls	Municipal	-	**12**	**22**	**29**	**37**	**45**
Celeste	D	Hunt	Municipal	13	17	20	23	25	27
Celina	C	Collin; Denton	Municipal	25	**50**	65	70	76	80
Central Bowie County WSC	D	Bowie	Municipal	100	100	100	100	100	100
Central Harris County Regional Water Authority	H	Harris	Municipal	16	36	36	37	38	39
Central Texas College District	G	Bell; Coryell	Municipal	**57**	**58**	**58**	**58**	**58**	**58**
Chalk Bluff WSC	G	McLennan	Municipal	-	-	4	14	21	28
Chandler	I	Henderson	Municipal	-	-	4	22	37	49
Chateau Woods MUD	H	Montgomery	Municipal	4	19	30	37	41	45
Chatfield WSC	C	Navarro	Municipal	-	2	8	13	18	23
Chatt WSC	G	Hill	Municipal	45	49	**52**	**55**	**60**	**62**
Chico	C	Wise	Municipal	7	12	15	**18**	21	23
Cibolo	L	Guadalupe	Municipal	-	-	3	17	29	39
Cisco	G	Eastland	Municipal	-	-	-	-	-	2
Clarksville	D	Red River	Municipal	40	33	22	12	-	-
Clear Water Estates Water System	L	Comal	Municipal	9	35	53	65	73	79
Cleburne	G	Johnson	Municipal	-	8	21	31	42	49
Clifton	G	Bosque	Municipal	-	0	11	21	29	34
Clyde	G	Callahan	Municipal	25	-	-	-	-	-
Coahoma	F	Howard	Municipal	-	7	19	28	34	39
Cockrell Hill	C	Dallas	Municipal	8	12	16	20	23	26
Coleman	F	Coleman	Municipal	100	100	100	100	100	100

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Coleman County SUD	F; G	Brown; Callahan; Coleman; Runnels; Taylor	Municipal	10	10	10	10	10	10
College Mound SUD	C	Kaufman	Municipal	28	37	49	**59**	64	67
College Station	G	Brazos	Municipal	32	31	40	49	48	47
Colleyville	C	Tarrant	Municipal	14	24	29	**36**	40	44
Collinsville	C	Grayson	Municipal	14	21	26	31	35	39
Combine WSC	C	Dallas; Kaufman	Municipal	8	12	16	20	23	26
Community WSC	C	Parker; Tarrant	Municipal	14	24	29	**36**	40	44
Concho Rural Water	F	Tom Green	Municipal	1	-	1	1	2	2
Conroe	H	Montgomery	Municipal	16	20	21	23	26	29
Conroe Resort Utilities	H	Montgomery	Municipal	3	19	31	37	41	45
Converse	L	Bexar	Municipal	19	18	18	18	18	18
Copeville WSC	C	Collin	Municipal	9	22	33	**41**	45	48
Coppell	C	Dallas; Denton	Municipal	8	12	16	20	23	26
Copperas Cove	G	Coryell; Lampasas	Municipal	-	**12**	**24**	**31**	**33**	**31**
Corbet WSC	C	Navarro	Municipal	-	2	8	13	18	23
Corinth	C	Denton	Municipal	0	28	45	51	56	60
Corinthian Point MUD 2	H	Montgomery	Municipal	1	5	11	15	18	20
Corix Utilities Texas Inc	F; G; K	Blanco; Burnet; Colorado; Lampasas; Llano; Matagorda; Mills; Mitchell; San Saba; Washington	Municipal	29	31	32	33	34	36
Corpus Christi	N	Nueces	Municipal	-	-	-	-	-	9
Corsicana	C	Navarro	Municipal	-	2	8	13	18	23
Cottonwood Shores	K	Burnet	Municipal	-	-	-	-	-	1
County Line SUD	L	Caldwell; Hays	Municipal	-	39	61	69	72	74
County-Other, Andrews	F	Andrews	Municipal	12	23	30	34	37	40
County-Other, Bastrop	K	Bastrop	Municipal	-	-	-	-	24	50
County-Other, Bee	N	Bee	Municipal	87	86	84	82	78	70
County-Other, Bell	G	Bell	Municipal	**67**	**71**	**72**	**70**	**65**	**54**
County-Other, Brazoria	H	Brazoria	Municipal	29	35	40	43	45	47
County-Other, Brazos	G	Brazos	Municipal	17	-	-	-	7	17
County-Other, Brooks	N	Brooks	Municipal	90	89	88	86	83	76
County-Other, Burnet	K	Burnet	Municipal	-	-	-	-	2	6
County-Other, Cameron	M	Cameron	Municipal	57	46	26	-	-	-

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
County-Other, Cass	D	Cass	Municipal	52	46	39	31	20	8
County-Other, Chambers	H	Chambers	Municipal	-	12	25	36	48	58
County-Other, Coke	F	Coke	Municipal	33	31	29	27	24	22
County-Other, Coleman	F	Coleman	Municipal	100	100	100	100	100	100
County-Other, Collin	C	Collin	Municipal	-	15	32	44	52	58
County-Other, Comal	L	Comal	Municipal	2	4	27	**67**	**75**	**81**
County-Other, Comanche	G	Comanche	Municipal	**51**	48	45	44	42	40
County-Other, Dallas	C	Dallas	Municipal	0	7	13	17	20	23
County-Other, Denton	C	Denton	Municipal	71	82	87	90	92	93
County-Other, Duval	N	Duval	Municipal	100	100	100	100	100	100
County-Other, Ellis	C	Ellis	Municipal	-	-	-	-	-	3
County-Other, Erath	G	Erath	Municipal	-	-	-	-	6	14
County-Other, Falls	G	Falls	Municipal	41	35	25	13	-	-
County-Other, Fannin	C	Fannin	Municipal	-	-	-	5	23	36
County-Other, Fisher	G	Fisher	Municipal	24	21	19	17	16	15
County-Other, Fort Bend	H	Fort Bend	Municipal	17	32	38	41	42	43
County-Other, Galveston	H	Galveston	Municipal	89	89	89	89	89	89
County-Other, Gillespie	K	Gillespie	Municipal	4	9	15	21	28	34
County-Other, Grayson	C	Grayson	Municipal	21	28	30	32	34	34
County-Other, Grimes	G	Grimes	Municipal	**25**	**26**	**27**	**27**	**27**	**27**
County-Other, Guadalupe	L	Guadalupe	Municipal	-	-	2	**27**	**44**	**56**
County-Other, Harris	H	Harris	Municipal	19	40	43	45	46	46
County-Other, Hays	K; L	Hays	Municipal	-	-	**25**	**63**	**77**	**84**
County-Other, Henderson	C; I	Henderson	Municipal	3	7	11	**16**	22	29
County-Other, Hidalgo	M	Hidalgo	Municipal	30	-	-	-	-	-
County-Other, Hill	G	Hill	Municipal	**63**	**64**	**68**	**71**	**74**	**75**
County-Other, Hood	G	Hood	Municipal	**62**	**66**	**69**	**71**	**64**	**60**
County-Other, Jim Wells	N	Jim Wells	Municipal	98	98	97	96	93	70
County-Other, Johnson	G	Johnson	Municipal	**5**	-	-	-	-	-
County-Other, Jones	G	Jones	Municipal	66	64	62	59	55	50
County-Other, Kaufman	C	Kaufman	Municipal	7	21	34	**41**	46	49
County-Other, Kendall	L	Kendall	Municipal	-	-	1	7	13	18
County-Other, Kent	G	Kent	Municipal	48	48	46	48	52	53
County-Other, Kerr	J	Kerr	Municipal	2	2	2	2	2	2
County-Other, Lamar	D	Lamar	Municipal	30	29	29	29	29	29

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
County-Other, Lee	G	Lee	Municipal	**42**	**42**	38	33	26	17
County-Other, Leon	H	Leon	Municipal	-	0	-	-	-	-
County-Other, Live Oak	N	Live Oak	Municipal	31	28	27	29	30	31
County-Other, Madison	H	Madison	Municipal	3	3	3	3	3	3
County-Other, McLennan	G	McLennan	Municipal	28	**44**	**46**	**47**	**49**	**53**
County-Other, Montague	B	Montague	Municipal	15	24	31	37	41	45
County-Other, Montgomery	H	Montgomery	Municipal	1	18	29	36	40	44
County-Other, Palo Pinto	G	Palo Pinto	Municipal	61	61	61	61	60	61
County-Other, Parker	C	Parker	Municipal	**24**	**52**	**68**	**76**	**82**	**85**
County-Other, Potter	A	Potter	Municipal	0	-	-	-	-	0
County-Other, Robertson	G	Robertson	Municipal	**26**	**19**	10	-	-	-
County-Other, Rockwall	C	Rockwall	Municipal	9	22	33	**41**	45	48
County-Other, Runnels	F	Runnels	Municipal	31	33	36	39	41	42
County-Other, San Jacinto	H	San Jacinto	Municipal	-	-	-	-	-	0
County-Other, Smith	D; I	Smith	Municipal	19	11	3	-	-	-
County-Other, Starr	M	Starr	Municipal	40	40	41	46	50	54
County-Other, Tarrant	C	Tarrant	Municipal	11	49	45	48	46	53
County-Other, Tom Green	F	Tom Green	Municipal	2	2	2	1	1	1
County-Other, Victoria	L	Victoria	Municipal	8	10	10	10	10	9
County-Other, Walker	H	Walker	Municipal	8	6	3	-	-	-
County-Other, Waller	H	Waller	Municipal	19	35	53	65	73	78
County-Other, Webb	M	Webb	Municipal	80	70	41	41	42	42
County-Other, Williamson	G; K	Williamson	Municipal	**62**	74	78	**80**	80	**79**
County-Other, Wise	C	Wise	Municipal	54	70	80	**86**	90	91
County-Other, Young	B; G	Young	Municipal	**34**	**37**	**39**	**44**	**43**	**45**
County-Other, Zapata	M	Zapata	Municipal	-	-	6	10	13	15
Crandall	C	Kaufman	Municipal	9	22	33	**41**	45	48
Crawford	G	McLennan	Municipal	39	46	51	56	60	64
Creedmoor-Maha WSC	K; L	Bastrop; Caldwell; Hays; Travis	Municipal	-	-	-	7	23	35
Crosby MUD	H	Harris	Municipal	-	7	7	10	14	14
Cross Country WSC	G	Bosque; McLennan	Municipal	-	6	14	22	29	**36**
Cross Timbers WSC	C	Denton	Municipal	9	29	42	46	50	56
Crowley	C; G	Johnson; Tarrant	Municipal	14	24	29	**36**	40	44

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Crystal Clear SUD	L	Comal; Guadalupe; Hays	Municipal	34	61	65	69	73	76
Culleoka WSC	C	Collin	Municipal	9	22	33	**41**	45	48
Cut & Shoot	H	Montgomery	Municipal	53	60	70	79	84	87
D & M WSC	I	Nacogdoches	Municipal	-	3	6	10	14	17
Dallas	C	Collin; Dallas; Denton	Municipal	8	12	16	20	23	26
Dalworthington Gardens	C	Tarrant	Municipal	14	24	30	**36**	41	44
Danbury	H	Brazoria	Municipal	4	6	7	7	8	10
Dawson	C	Navarro	Municipal	-	2	8	13	18	23
De Kalb	D	Bowie	Municipal	100	100	100	100	100	100
Decatur	C	Wise	Municipal	42	51	64	**70**	77	80
Deer Park	H	Harris	Municipal	0	-	-	-	-	0
Del Rio Utilities Commission	J	Val Verde	Municipal	66	66	66	67	67	67
Denison	C	Grayson	Municipal	44	55	62	67	72	74
Denton	C	Denton	Municipal	17	31	44	51	57	61
Denton County FWSD 1-A	C	Denton	Municipal	0	28	46	51	56	60
Denton County FWSD 10	C	Denton	Municipal	0	28	45	51	56	60
Denton County FWSD 11-C	C	Denton	Municipal	0	28	46	51	56	60
Denton County FWSD 7	C	Denton	Municipal	0	28	46	51	56	60
Desoto	C	Dallas	Municipal	8	12	16	20	23	26
Dobbin Plantersville WSC	G; H	Grimes; Montgomery	Municipal	8	19	28	34	41	46
Dodge Oakhurst WSC	H	San Jacinto; Walker	Municipal	-	-	7	17	28	40
Dog Ridge WSC	G	Bell	Municipal	11	**21**	**27**	**31**	**34**	**38**
Domestic Water	H	Montgomery	Municipal	3	19	30	37	42	45
Double Diamond Utilities	G	Hill; Johnson; Palo Pinto	Municipal	**26**	**28**	**34**	**39**	**43**	**49**
Douglas Utility	H	Harris	Municipal	-	20	21	22	21	21
Dripping Springs WSC	K	Hays	Municipal	20	44	62	68	68	68
Dumas	A	Moore	Municipal	-	33	50	57	61	66
Duncanville	C	Dallas	Municipal	8	12	17	20	23	26
Eagle Pass	M	Maverick	Municipal	-	-	1	5	9	12
East Cedar Creek FWSD	C	Henderson	Municipal	68	70	70	**70**	71	72
East Central SUD	L	Bexar; Guadalupe; Wilson	Municipal	48	54	59	62	65	68
East Crawford WSC	G	McLennan	Municipal	35	38	41	43	45	48

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
East Fork SUD	C	Collin; Dallas; Rockwall	Municipal	9	22	33	**41**	45	48
East Garrett WSC	C	Ellis	Municipal	-	-	-	-	0	4
East Medina County SUD	L	Medina	Municipal	-	-	-	-	2	5
East Montgomery County MUD 6	H	Montgomery	Municipal	4	20	31	37	41	45
East Mountain Water System	D	Gregg; Upshur	Municipal	57	58	57	57	57	56
East Plantation UD	H	Montgomery	Municipal	4	19	30	41	44	48
East Rio Hondo WSC	M	Cameron	Municipal	-	-	2	12	16	20
East Texas MUD	D	Smith	Municipal	-	1	10	16	22	28
Ector County Utility District	F	Ector	Municipal	-	7	19	28	34	39
Eden	F	Concho	Municipal	**68**	**67**	**66**	**66**	**65**	**65**
Edgecliff	C	Tarrant	Municipal	14	24	30	**36**	40	44
Edinburg	M	Hidalgo	Municipal	4	11	15	17	18	19
Edom WSC	D; I	Henderson; Van Zandt	Municipal	40	43	45	47	49	49
El Dorado UD	H	Harris	Municipal	-	22	26	27	28	29
El Jardin WSC	M	Cameron	Municipal	14	15	16	16	15	15
El Oso WSC	L; N	Atascosa; Bee; Karnes; Live Oak; Wilson	Municipal	-	-	-	-	0	0
El Paso Water	E	El Paso	Municipal	22	24	25	26	27	28
El Sauz WSC	M	Starr	Municipal	37	42	45	46	48	49
El Tanque WSC	M	Starr	Municipal	12	-	-	-	-	-
Electra	B	Wichita	Municipal	3	6	7	8	8	9
Elgin	K	Bastrop; Travis	Municipal	-	**30**	**47**	**58**	**61**	**61**
Elm Creek WSC	G	Bell; Coryell; McLennan	Municipal	**14**	**16**	**19**	**23**	**27**	**31**
Elmendorf	L	Bexar	Municipal	-	-	-	3	22	44
Elmo WSC	C	Kaufman	Municipal	9	22	33	**41**	45	48
Ennis	C	Ellis	Municipal	7	14	21	28	34	39
Eula WSC	G	Callahan	Municipal	54	54	54	54	54	54
Euless	C	Tarrant	Municipal	10	18	22	**27**	30	33
Fair Oaks Ranch	L	Bexar; Comal; Kendall	Municipal	-	10	17	19	20	20
Fairview	C	Collin	Municipal	9	22	33	**41**	45	48
Far Hills UD	H	Montgomery	Municipal	1	10	17	22	26	29
Farmers Branch	C	Dallas	Municipal	8	12	16	20	23	26
Farmersville	C	Collin	Municipal	9	22	33	**41**	45	48
Fate	C	Rockwall	Municipal	9	22	33	**41**	45	48

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Fayette WSC	K; L	Bastrop; Fayette; Gonzales	Municipal	5	7	6	9	12	13
Fern Bluff MUD	G; K	Williamson	Municipal	0	4	8	9	9	9
Ferris	C	Ellis	Municipal	7	16	22	28	33	37
Files Valley WSC	C; G	Ellis; Hill	Municipal	16	21	25	29	33	36
First Colony MUD 9	H	Fort Bend	Municipal	-	1	4	6	8	10
Flat WSC	G	Coryell	Municipal	47	48	49	49	48	48
Florence	G	Williamson	Municipal	54	57	60	63	66	69
Flower Mound	C	Denton; Tarrant	Municipal	9	29	42	46	50	53
Forest Hill	C	Tarrant	Municipal	14	24	29	**36**	40	44
Forest Hills MUD	H	Harris	Municipal	-	7	7	7	39	5
Forney	C	Kaufman	Municipal	9	22	33	**41**	45	48
Forney Lake WSC	C	Kaufman	Municipal	9	22	33	**41**	45	48
Fort Belknap WSC	G	Stephens; Throckmorton; Young	Municipal	24	33	42	**51**	**52**	**60**
Fort Bend County FWSD 1	H	Brazoria; Fort Bend	Municipal	-	23	27	28	29	31
Fort Bend County FWSD 2	H	Fort Bend	Municipal	58	58	57	58	58	58
Fort Bend County MUD 115	H	Fort Bend	Municipal	-	1	6	7	9	10
Fort Bend County MUD 116	H	Fort Bend	Municipal	-	8	8	9	10	11
Fort Bend County MUD 121	H	Fort Bend	Municipal	60	60	60	60	60	60
Fort Bend County MUD 128	H	Fort Bend	Municipal	7	8	9	9	10	12
Fort Bend County MUD 129	H	Fort Bend	Municipal	-	1	2	3	4	6
Fort Bend County MUD 131	H	Fort Bend	Municipal	-	3	6	7	14	16
Fort Bend County MUD 149	H	Fort Bend	Municipal	-	0	2	2	2	3
Fort Bend County MUD 152	H	Fort Bend	Municipal	-	-	0	3	5	5
Fort Bend County MUD 155	H	Fort Bend	Municipal	-	11	19	24	28	30
Fort Bend County MUD 158	H	Fort Bend	Municipal	-	7	14	18	21	23
Fort Bend County MUD 162	H	Fort Bend	Municipal	-	-	4	9	19	23
Fort Bend County MUD 23	H	Fort Bend	Municipal	-	2	2	2	3	3
Fort Bend County MUD 24	H	Fort Bend	Municipal	-	5	5	5	6	6
Fort Bend County MUD 25	H	Fort Bend	Municipal	38	39	39	39	39	40
Fort Bend County MUD 26	H	Fort Bend	Municipal	-	3	4	7	8	10

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Fort Bend County MUD 42	H	Fort Bend	Municipal	-	3	4	6	7	8
Fort Bend County MUD 48	H	Fort Bend	Municipal	-	1	1	4	6	7
Fort Bend County MUD 49	H	Fort Bend	Municipal	10	10	10	10	12	12
Fort Bend County MUD 5	H	Fort Bend	Municipal	-	7	12	14	15	15
Fort Bend County WCID 2	H	Fort Bend; Harris	Municipal	31	34	35	36	37	38
Fort Bend County WCID 3	H	Fort Bend	Municipal	-	-	-	-	5	7
Fort Bliss and East Biggs	E	El Paso	Municipal	14	17	19	20	20	21
Fort Gates WSC	G	Coryell	Municipal	**40**	**42**	**42**	**42**	**42**	**42**
Fort Griffin SUD	G	Shackelford; Stephens; Throckmorton	Municipal	**5**	**6**	**9**	**11**	**4**	3
Fort Sam Houston	L	Bexar	Municipal	81	81	81	81	81	81
Fort Worth	C; G	Denton; Johnson; Parker; Tarrant; Wise	Municipal	15	25	30	**36**	41	45
Frisco	C	Collin; Denton	Municipal	5	19	30	**38**	42	45
Fritch	A	Carson; Hutchinson; Moore	Municipal	-	-	-	3	7	12
Fruitvale WSC	D	Van Zandt	Municipal	-	1	5	10	17	20
Fulshear	H	Fort Bend	Municipal	2	24	24	25	26	27
Gainesville	C	Cooke	Municipal	-	-	-	-	-	1
Galveston	H	Galveston	Municipal	-	-	0	2	4	6
Garden Ridge	L	Comal	Municipal	58	66	71	76	80	83
Garland	C	Dallas	Municipal	9	22	33	**41**	45	48
Gastonia Scurry SUD	C	Kaufman	Municipal	9	22	33	**41**	45	48
Gatesville	G	Coryell	Municipal	**25**	**30**	35	40	44	46
Georgetown	G; K	Bell; Burnet; Williamson	Municipal	27	**58**	**70**	**75**	**80**	**83**
Gholson WSC	G	Hill; McLennan	Municipal	-	-	**6**	14	22	**28**
Glen Rose	G	Somervell	Municipal	35	37	38	37	37	37
Glenn Heights	C	Dallas; Ellis	Municipal	7	12	16	19	22	25
Godley	G	Johnson	Municipal	-	6	17	24	**32**	**38**
Goforth SUD	K; L	Caldwell; Hays; Travis	Municipal	-	-	-	21	41	55
Goldthwaite	K	Mills	Municipal	18	17	17	17	17	17
Goodfellow Air Force Base	F	Tom Green	Municipal	20	15	20	25	30	34
Gordon	G	Erath; Palo Pinto	Municipal	**100**	**100**	**100**	100	100	100
Graham	G	Young	Municipal	**63**	**63**	**62**	**64**	**69**	69

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Granbury	G	Hood	Municipal	24	33	40	47	52	57
Grand Oaks MUD	H	Montgomery	Municipal	3	28	46	53	58	61
Grand Prairie	C	Dallas; Tarrant	Municipal	10	22	26	**30**	33	36
Grand Saline	D	Van Zandt	Municipal	26	27	25	24	25	23
Grandview	G	Johnson	Municipal	-	-	2	10	19	26
Granger	G	Williamson	Municipal	-	-	-	-	2	9
Grapevine	C	Tarrant	Municipal	10	17	21	**25**	29	31
Greater Gardendale WSC	F	Ector; Midland	Municipal	-	4	19	28	34	39
Green Trails MUD	H	Harris	Municipal	-	21	21	21	23	24
Green Valley SUD	L	Bexar; Comal; Guadalupe	Municipal	-	-	-	-	5	21
Greenville	D	Hunt	Municipal	66	71	74	76	78	80
Groesbeck	G	Limestone	Municipal	**100**	100	100	100	100	100
Gruver	A	Hansford	Municipal	21	22	23	24	25	26
Gunter	C	Grayson	Municipal	-	14	25	31	35	40
Hackberry	C	Denton	Municipal	9	22	33	**41**	45	48
Haltom City	C	Tarrant	Municipal	14	24	29	**36**	40	44
Harker Heights	G	Bell	Municipal	-	10	21	24	25	25
Harris County FWSD 27	H	Harris	Municipal	12	24	27	29	38	35
Harris County FWSD 58	H	Harris	Municipal	-	20	20	20	20	20
Harris County MUD 11	H	Harris	Municipal	-	8	8	8	7	7
Harris County MUD 119	H	Harris	Municipal	-	21	21	21	21	21
Harris County MUD 153	H	Harris	Municipal	-	21	22	23	25	25
Harris County MUD 154	H	Harris	Municipal	-	20	22	22	24	24
Harris County MUD 189	H	Harris	Municipal	-	22	23	23	25	27
Harris County MUD 216	H	Harris	Municipal	-	21	21	20	21	21
Harris County MUD 221	H	Harris	Municipal	-	20	21	22	23	24
Harris County MUD 261	H	Harris	Municipal	60	80	80	80	80	80
Harris County MUD 342	H	Harris	Municipal	-	21	31	35	35	36
Harris County MUD 345	H	Harris	Municipal	-	20	21	21	24	24
Harris County MUD 36	H	Harris	Municipal	-	22	38	42	42	43
Harris County MUD 361	H	Harris	Municipal	-	18	22	23	24	25
Harris County MUD 494	H	Harris	Municipal	-	21	24	26	28	28
Harris County MUD 50	H	Harris	Municipal	80	80	80	80	80	80

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Harris County MUD 58	H	Harris	Municipal	-	20	20	20	20	20
Harris County MUD 6	H	Harris	Municipal	-	15	15	15	15	15
Harris County UD 14	H	Harris	Municipal	-	20	21	21	21	21
Harris County UD 15	H	Harris	Municipal	-	20	20	20	21	22
Harris County WCID 1	H	Harris	Municipal	11	12	15	16	20	21
Harris County WCID 133	H	Harris	Municipal	-	21	21	21	21	21
Harris County WCID 70	H	Harris	Municipal	-	20	20	20	20	20
Harris County WCID 74	H	Harris	Municipal	-	20	22	22	22	22
Harrold WSC	B	Wichita; Wilbarger	Municipal	4	4	6	7	7	13
Haskell	G	Haskell	Municipal	**97**	**97**	98	99	100	100
Haslet	C	Tarrant	Municipal	14	24	29	36	40	44
Hays	K	Hays	Municipal	-	22	**45**	**60**	**70**	**76**
Hays County WCID 1	K	Hays	Municipal	11	10	10	10	10	10
Hays County WCID 2	K	Hays	Municipal	12	12	12	12	12	12
Heath	C	Kaufman; Rockwall	Municipal	9	22	33	**41**	45	48
Hewitt	G	McLennan	Municipal	23	22	22	22	22	22
Hickory Creek SUD	C; D	Collin; Fannin; Hunt	Municipal	**41**	**48**	**54**	**60**	**65**	**69**
Hidalgo County MUD 1	M	Hidalgo	Municipal	-	-	-	-	-	3
High Point WSC	C	Kaufman; Rockwall	Municipal	9	22	33	**41**	45	48
High Prairie WSC	H	Leon; Madison	Municipal	27	17	11	11	12	14
Highland Park WSC	G	Bosque; McLennan	Municipal	44	43	42	41	40	38
Highland Village	C	Denton	Municipal	0	15	25	27	30	33
Hilco United Services	C; G	Bosque; Ellis; Hill	Municipal	**24**	**27**	**30**	**32**	**35**	**38**
Hillcrest Village	H	Brazoria	Municipal	5	9	12	14	14	14
Hillsboro	G	Hill	Municipal	-	-	-	2	8	14
HMW SUD	H	Harris; Montgomery	Municipal	3	20	29	34	38	41
Hog Creek WSC	G	Bosque; McLennan	Municipal	**32**	**32**	**33**	32	31	30
Holly Springs WSC	D	Cass; Morris	Municipal	28	22	15	9	2	-
Hondo	L	Medina	Municipal	14	10	8	8	9	9
Honey Grove	C	Fannin	Municipal	-	10	20	30	40	50
Hooks	D	Bowie	Municipal	100	100	100	100	100	100
Horizon Regional MUD	E	El Paso	Municipal	33	35	37	37	38	38
Hornsby Bend Utility	K	Travis	Municipal	2	20	**32**	**41**	**48**	**55**
Horseshoe Bay	K	Burnet; Llano	Municipal	-	-	-	1	2	8

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Houston	H	Fort Bend; Harris; Montgomery	Municipal	13	23	25	26	25	25
Howe	C	Grayson	Municipal	14	28	37	44	50	55
Hudson Oaks	C	Parker	Municipal	11	19	24	29	33	36
Huntsville	H	Walker	Municipal	-	-	-	1	11	20
Hurst	C	Tarrant	Municipal	8	18	24	30	35	38
Hutchins	C	Dallas	Municipal	8	12	16	20	23	26
Hutto	G	Williamson	Municipal	52	66	76	82	87	91
Irrigation, Andrews	F	Andrews	Irrigation	31	39	43	47	49	51
Irrigation, Armstrong	A	Armstrong	Irrigation	-	-	3	11	21	29
Irrigation, Bailey	O	Bailey	Irrigation	1	9	6	-	-	-
Irrigation, Bandera	J	Bandera	Irrigation	59	59	59	59	59	59
Irrigation, Baylor	B	Baylor	Irrigation	-	-	-	-	-	6
Irrigation, Bell	G	Bell	Irrigation	30	30	30	31	31	31
Irrigation, Bosque	G	Bosque	Irrigation	-	-	-	-	9	21
Irrigation, Bowie	D	Bowie	Irrigation	52	52	52	52	52	52
Irrigation, Brazoria	H	Brazoria	Irrigation	65	66	66	67	67	67
Irrigation, Brown	F	Brown	Irrigation	4	4	4	4	4	4
Irrigation, Calhoun	L	Calhoun	Irrigation	88	88	88	88	88	88
Irrigation, Cameron	M	Cameron	Irrigation	70	69	68	66	65	64
Irrigation, Castro	O	Castro	Irrigation	33	46	47	-	-	-
Irrigation, Chambers	H	Chambers	Irrigation	10	10	10	10	10	10
Irrigation, Cochran	O	Cochran	Irrigation	44	43	40	35	33	30
Irrigation, Coleman	F	Coleman	Irrigation	86	86	86	86	86	86
Irrigation, Collin	C	Collin	Irrigation	0	0	0	0	0	0
Irrigation, Collingsworth	A	Collingsworth	Irrigation	33	38	39	43	43	38
Irrigation, Colorado	K	Colorado	Irrigation	32	30	29	27	25	22
Irrigation, Comanche	G	Comanche	Irrigation	35	35	35	36	36	36
Irrigation, Cooke	C	Cooke	Irrigation	-	-	-	-	-	3
Irrigation, Culberson	E	Culberson	Irrigation	40	40	40	40	40	40
Irrigation, Dallam	A	Dallam	Irrigation	36	46	49	52	54	56
Irrigation, Dawson	O	Dawson	Irrigation	-	-	-	-	1	1
Irrigation, Deaf Smith	O	Deaf Smith	Irrigation	15	27	25	1	1	1
Irrigation, Denton	C	Denton	Irrigation	-	-	-	0	1	2
Irrigation, Dimmit	L	Dimmit	Irrigation	92	92	92	92	92	92
Irrigation, Ector	F	Ector	Irrigation	-	-	3	13	19	25
Irrigation, Edwards	J	Edwards	Irrigation	5	5	5	5	5	5
Irrigation, El Paso	E	El Paso	Irrigation	42	41	41	40	40	40

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Irrigation, Ellis	C	Ellis	Irrigation	20	20	20	20	20	20
Irrigation, Fannin	C	Fannin	Irrigation	43	43	43	43	43	43
Irrigation, Floyd	O	Floyd	Irrigation	25	16	3	-	-	-
Irrigation, Gaines	O	Gaines	Irrigation	31	35	26	6	6	7
Irrigation, Galveston	H	Galveston	Irrigation	96	96	96	96	96	96
Irrigation, Gillespie	K	Gillespie	Irrigation	3	3	3	3	3	3
Irrigation, Goliad	L	Goliad	Irrigation	6	1	-	-	-	-
Irrigation, Grimes	G	Grimes	Irrigation	27	27	27	27	27	27
Irrigation, Guadalupe	L	Guadalupe	Irrigation	2	2	2	2	2	2
Irrigation, Hale	O	Hale	Irrigation	49	63	56	0	0	0
Irrigation, Hall	A	Hall	Irrigation	47	39	36	33	34	38
Irrigation, Hamilton	G	Hamilton	Irrigation	24	24	24	25	25	25
Irrigation, Harrison	D	Harrison	Irrigation	85	85	85	85	85	85
Irrigation, Hartley	A	Hartley	Irrigation	43	57	61	64	66	68
Irrigation, Haskell	G	Haskell	Irrigation	17	16	17	16	17	17
Irrigation, Hidalgo	M	Hidalgo	Irrigation	65	64	62	61	60	58
Irrigation, Hockley	O	Hockley	Irrigation	22	18	14	-	-	-
Irrigation, Hopkins	D	Hopkins	Irrigation	97	97	97	97	97	97
Irrigation, Hudspeth	E	Hudspeth	Irrigation	13	13	13	13	13	13
Irrigation, Hunt	D	Hunt	Irrigation	61	61	61	61	61	61
Irrigation, Hutchinson	A	Hutchinson	Irrigation	-	-	-	-	-	3
Irrigation, Irion	F	Irion	Irrigation	59	59	59	59	59	59
Irrigation, Jackson	P	Jackson	Irrigation	1	1	1	1	1	1
Irrigation, Johnson	G	Johnson	Irrigation	45	45	45	45	45	45
Irrigation, Karnes	L	Karnes	Irrigation	20	20	81	81	81	81
Irrigation, Kerr	J	Kerr	Irrigation	5	5	5	5	5	5
Irrigation, Kimble	F	Kimble	Irrigation	48	48	48	48	48	48
Irrigation, Knox	G	Knox	Irrigation	28	29	28	21	27	28
Irrigation, La Salle	L	La Salle	Irrigation	9	9	9	9	9	9
Irrigation, Lamar	D	Lamar	Irrigation	58	58	58	58	58	58
Irrigation, Lamb	O	Lamb	Irrigation	36	52	39	-	-	-
Irrigation, Lampasas	G	Lampasas	Irrigation	28	29	29	30	31	32
Irrigation, Lavaca	P	Lavaca	Irrigation	6	6	6	6	6	6
Irrigation, Leon	H	Leon	Irrigation	0	0	0	0	0	0
Irrigation, Liberty	H	Liberty	Irrigation	21	21	21	21	21	21
Irrigation, Lubbock	O	Lubbock	Irrigation	22	31	21	5	5	5
Irrigation, Lynn	O	Lynn	Irrigation	-	-	-	1	1	1
Irrigation, Madison	H	Madison	Irrigation	45	45	45	45	45	45

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Irrigation, Martin	F	Martin	Irrigation	1	12	18	20	18	15
Irrigation, Matagorda	K	Matagorda	Irrigation	85	85	84	84	83	83
Irrigation, Maverick	M	Maverick	Irrigation	36	34	32	29	27	24
Irrigation, McLennan	G	McLennan	Irrigation	5	5	5	5	5	5
Irrigation, Medina	L	Medina	Irrigation	43	43	43	43	44	44
Irrigation, Menard	F	Menard	Irrigation	11	11	11	11	11	11
Irrigation, Mills	K	Mills	Irrigation	68	68	68	68	68	68
Irrigation, Mitchell	F	Mitchell	Irrigation	14	14	14	14	13	13
Irrigation, Montgomery	H	Montgomery	Irrigation	3	17	26	32	36	39
Irrigation, Moore	A	Moore	Irrigation	35	38	39	41	44	47
Irrigation, Nolan	G	Nolan	Irrigation	74	74	74	73	73	73
Irrigation, Oldham	A	Oldham	Irrigation	6	6	6	6	6	12
Irrigation, Palo Pinto	G	Palo Pinto	Irrigation	69	69	70	70	70	71
Irrigation, Parker	C	Parker	Irrigation	12	10	9	8	7	6
Irrigation, Parmer	O	Parmer	Irrigation	50	59	53	12	10	8
Irrigation, Rains	D	Rains	Irrigation	5	5	5	5	5	5
Irrigation, Randall	A	Randall	Irrigation	2	13	25	35	45	54
Irrigation, Red River	D	Red River	Irrigation	71	71	71	71	71	71
Irrigation, Robertson	G	Robertson	Irrigation	18	18	19	19	19	19
Irrigation, San Saba	K	San Saba	Irrigation	16	16	16	16	16	16
Irrigation, Sherman	A	Sherman	Irrigation	11	19	20	21	22	24
Irrigation, Starr	M	Starr	Irrigation	90	89	89	88	88	88
Irrigation, Stephens	G	Stephens	Irrigation	80	80	80	80	80	80
Irrigation, Sterling	F	Sterling	Irrigation	-	-	-	-	-	17
Irrigation, Swisher	O	Swisher	Irrigation	0	15	16	4	4	3
Irrigation, Taylor	G	Taylor	Irrigation	38	38	38	38	38	38
Irrigation, Terrell	E	Terrell	Irrigation	5	5	5	5	5	5
Irrigation, Terry	O	Terry	Irrigation	-	-	-	0	2	2
Irrigation, Tom Green	F	Tom Green	Irrigation	-	15	16	16	17	18
Irrigation, Trinity	H; I	Trinity	Irrigation	39	39	39	39	39	39
Irrigation, Uvalde	L	Uvalde	Irrigation	35	35	35	35	35	35
Irrigation, Victoria	L	Victoria	Irrigation	2	2	2	2	2	2
Irrigation, Webb	M	Webb	Irrigation	33	31	29	26	23	21
Irrigation, Wharton	K; P	Wharton	Irrigation	37	36	35	34	33	32
Irrigation, Wichita	B	Wichita	Irrigation	19	24	30	35	41	47
Irrigation, Willacy	M	Willacy	Irrigation	79	78	78	77	76	75
Irrigation, Williamson	G	Williamson	Irrigation	56	57	57	57	57	57
Irrigation, Wilson	L	Wilson	Irrigation	2	2	2	2	2	2

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Irrigation, Wise	C	Wise	Irrigation	2	3	3	**4**	5	5
Irrigation, Yoakum	O	Yoakum	Irrigation	**22**	**31**	**25**	-	-	-
Irrigation, Young	B; G	Young	Irrigation	**93**	**93**	**93**	**93**	**93**	**93**
Irrigation, Zapata	M	Zapata	Irrigation	**75**	**74**	**74**	**73**	**72**	**71**
Irrigation, Zavala	L	Zavala	Irrigation	**33**	**33**	**33**	**33**	**33**	**33**
Irving	C	Dallas	Municipal	**32**	**38**	**40**	**42**	**44**	**46**
Itasca	G	Hill	Municipal	**16**	**18**	**19**	**21**	22	**24**
Jacobs WSC	I	Rusk	Municipal	-	-	-	-	7	14
Jarrell-Schwertner	G	Bell; Williamson	Municipal	**38**	**43**	**46**	**49**	**51**	**54**
Johnson City	K	Blanco	Municipal	-	-	-	2	7	13
Johnson County SUD	C; G	Johnson; Tarrant	Municipal	-	11	23	33	42	49
Johnston Water Utility	H	Montgomery	Municipal	36	63	73	78	81	83
Jonah Water SUD	G	Williamson	Municipal	**35**	**55**	**67**	**75**	**80**	**84**
Jonestown WSC	K	Travis	Municipal	13	27	39	49	58	65
Josephine	C; D	Collin; Hunt	Municipal	9	22	33	**41**	45	48
Junction	F	Kimble	Municipal	**100**	100	100	100	100	100
Justin	C	Denton	Municipal	-	14	35	43	51	56
Katy	H	Fort Bend; Harris; Waller	Municipal	14	15	16	15	15	16
Kaufman	C	Kaufman	Municipal	9	22	33	**41**	45	48
Kaufman County Development District 1	C	Kaufman	Municipal	9	22	33	**41**	45	48
Kaufman County MUD 11	C	Kaufman	Municipal	9	22	33	**41**	45	48
Kaufman County MUD 14	C	Kaufman	Municipal	9	22	33	**41**	45	48
Keenan WSC	H	Montgomery	Municipal	4	19	31	37	42	45
Keller	C	Tarrant	Municipal	14	24	29	**36**	40	44
Kemp	C	Kaufman	Municipal	14	24	30	**36**	40	44
Kempner WSC	G; K	Bell; Burnet; Coryell; Lampasas	Municipal	29	25	24	26	27	28
Kendall West Utility	L	Kendall	Municipal	-	-	7	25	39	49
Kennedale	C	Tarrant	Municipal	2	16	22	**28**	34	38
Kerens	C	Navarro	Municipal	-	3	8	14	19	23
Kermit	F	Winkler	Municipal	-	-	-	-	-	8
Kerrville	J	Kerr	Municipal	18	22	24	28	31	34
Kerrville South Water	J	Kerr	Municipal	15	19	21	25	28	31
Killeen	G	Bell	Municipal	-	-	-	-	**7**	**16**
Kings Manor MUD	H	Harris; Montgomery	Municipal	18	35	43	48	51	53
Kingsland WSC	K	Burnet; Llano	Municipal	-	-	1	9	22	33

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Kirby	L	Bexar	Municipal	16	25	27	27	27	27
Knox City	G	Knox	Municipal	**96**	**97**	98	99	100	100
Krum	C	Denton	Municipal	-	19	35	42	49	54
KT Water Development	L	Comal	Municipal	54	71	80	86	89	92
Kyle	L	Hays	Municipal	-	-	0	11	14	16
La Coste	L	Bexar; Medina	Municipal	2	-	-	1	2	4
La Grulla	M	Starr	Municipal	59	62	64	65	66	67
La Joya	M	Hidalgo	Municipal	39	43	45	46	47	48
La Marque	H	Galveston	Municipal	-	5	8	11	13	15
La Villa	M	Hidalgo	Municipal	-	11	19	18	17	17
Ladonia	C	Fannin	Municipal	-	17	42	61	68	68
Lago Vista	K	Travis	Municipal	-	18	42	54	57	59
Lake Bonanza WSC	H	Montgomery	Municipal	3	19	31	37	41	45
Lake Cities Municipal Utility Authority	C	Denton	Municipal	0	28	45	51	56	60
Lake Conroe Hills MUD	H	Montgomery	Municipal	4	19	30	37	41	45
Lake Jackson	H	Brazoria	Municipal	4	6	7	7	7	7
Lake Worth	C	Tarrant	Municipal	12	21	26	**32**	36	40
Lamesa	O	Dawson	Municipal	-	4	9	14	13	13
Lampasas	G	Lampasas	Municipal	28	35	41	46	49	48
Lancaster	C	Dallas	Municipal	8	12	16	20	23	26
Lancaster MUD 1	C	Dallas	Municipal	8	12	16	20	23	26
Lawn	G	Taylor	Municipal	-	-	20	20	20	19
Lazy River Improvement District	H	Montgomery	Municipal	3	18	29	35	39	43
Leander	G; K	Travis; Williamson	Municipal	41	**53**	**56**	**56**	**56**	**56**
Leon Valley	L	Bexar	Municipal	43	53	53	53	53	53
Leonard	C	Fannin	Municipal	-	16	37	53	66	77
Levi WSC	G	Falls; McLennan	Municipal	**18**	**21**	**27**	**30**	**34**	**38**
Lewisville	C	Dallas; Denton	Municipal	8	12	17	20	23	26
Liberty Hill	G	Williamson	Municipal	-	-	-	18	35	47
Liberty Utilities Silverleaf Water	D; I	Smith; Wood	Municipal	-	-	-	-	4	7
Lindale Rural WSC	D; I	Smith	Municipal	-	6	11	14	17	20
Lipan	G	Hood	Municipal	-	-	-	6	13	20
Little Elm	C	Denton	Municipal	9	22	33	**41**	45	48
Little Hope Moore WSC	D	Van Zandt	Municipal	9	14	20	24	29	31
Live Oak	L	Bexar	Municipal	12	12	12	12	13	12
Livestock, Andrews	F	Andrews	Livestock	37	44	48	50	52	54

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Livestock, Bandera	J	Bandera	Livestock	7	7	7	7	7	7
Livestock, Brazoria	H	Brazoria	Livestock	**14**	**17**	**19**	**21**	**21**	**21**
Livestock, Comanche	G	Comanche	Livestock	**23**	**23**	**23**	**23**	**23**	**23**
Livestock, Edwards	J	Edwards	Livestock	11	11	11	11	11	11
Livestock, Galveston	H	Galveston	Livestock	**90**	**90**	**90**	**90**	**90**	**90**
Livestock, Harris	H	Harris	Livestock	**65**	**81**	**81**	**81**	**81**	**81**
Livestock, Hartley	A	Hartley	Livestock	8	15	16	16	17	18
Livestock, Hays	K; L	Hays	Livestock	0	0	0	0	0	0
Livestock, Henderson	C; I	Henderson	Livestock	-	-	-	-	8	13
Livestock, Hopkins	D	Hopkins	Livestock	5	5	5	5	5	5
Livestock, Houston	I	Houston	Livestock	-	-	-	3	12	12
Livestock, Hudspeth	E	Hudspeth	Livestock	1	1	1	1	1	1
Livestock, Jeff Davis	E	Jeff Davis	Livestock	38	38	38	38	38	38
Livestock, Kerr	J	Kerr	Livestock	**8**	**8**	**8**	**8**	**8**	**8**
Livestock, Lamar	D	Lamar	Livestock	**8**	**8**	**8**	**8**	**8**	**8**
Livestock, Leon	H	Leon	Livestock	3	3	3	3	3	3
Livestock, Liberty	H	Liberty	Livestock	54	54	54	54	54	54
Livestock, Madison	H	Madison	Livestock	**96**	**96**	**96**	**96**	**96**	**96**
Livestock, Montgomery	H	Montgomery	Livestock	3	19	31	37	41	45
Livestock, Moore	A	Moore	Livestock	60	63	**63**	**64**	**64**	**64**
Livestock, Palo Pinto	G	Palo Pinto	Livestock	**5**	**6**	**6**	**6**	**7**	**7**
Livestock, Presidio	E	Presidio	Livestock	0	0	0	0	0	0
Livestock, Sabine	I	Sabine	Livestock	-	-	-	15	14	14
Livestock, Somervell	G	Somervell	Livestock	**14**	**14**	**14**	**14**	**14**	**14**
Livestock, Van Zandt	D	Van Zandt	Livestock	10	10	10	10	10	10
Livingston	H	Polk	Municipal	-	-	-	-	-	4
Llano	K	Llano	Municipal	85	85	85	85	85	85
Lockhart	L	Caldwell	Municipal	-	-	3	10	16	21
Longhorn Town UD	H	Harris	Municipal	-	20	20	20	20	21
Lower Valley Water District	E	El Paso	Municipal	39	41	43	43	44	44
Lubbock	O	Lubbock	Municipal	20	31	44	57	65	70
Lucas	C	Collin	Municipal	9	22	33	**41**	45	48
Luce Bayou PUD	H	Harris	Municipal	-	48	49	49	49	50
Lytle	L	Atascosa; Bexar; Medina	Municipal	33	37	41	43	47	50
M E N WSC	C	Navarro	Municipal	-	2	8	13	19	23
Mabank	C; D	Henderson; Kaufman; Van Zandt	Municipal	14	24	29	**36**	40	44

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
MacBee SUD	C; D	Hunt; Kaufman; Van Zandt	Municipal	-	-	-	-	18	34
Macedonia Eylau MUD 1	D	Bowie	Municipal	100	100	100	100	100	100
Madera Valley WSC	F	Reeves	Municipal	**2**	10	17	21	25	29
Madisonville	H	Madison	Municipal	20	6	-	-	-	-
Magnolia	H	Montgomery	Municipal	3	28	46	53	58	61
Malakoff	C	Henderson	Municipal	-	-	-	3	8	12
Manor	K	Travis	Municipal	19	26	32	33	42	**51**
Mansfield	C; G	Ellis; Johnson; Tarrant	Municipal	61	64	70	**77**	76	75
Manufacturing, Andrews	F	Andrews	Manufacturing	**12**	**23**	**29**	**33**	**36**	**39**
Manufacturing, Angelina	I	Angelina	Manufacturing	38	40	41	43	44	45
Manufacturing, Bell	G	Bell	Manufacturing	48	50	52	54	55	57
Manufacturing, Bexar	L	Bexar	Manufacturing	**0**	**4**	**7**	**10**	**13**	**16**
Manufacturing, Bowie	D	Bowie	Manufacturing	98	98	98	98	98	98
Manufacturing, Brazoria	H	Brazoria	Manufacturing	10	12	16	19	22	25
Manufacturing, Burleson	G	Burleson	Manufacturing	20	23	26	28	31	34
Manufacturing, Burnet	K	Burnet	Manufacturing	23	24	25	26	26	27
Manufacturing, Caldwell	L	Caldwell	Manufacturing	**64**	67	69	71	72	74
Manufacturing, Calhoun	L	Calhoun	Manufacturing	-	**0**	**3**	**7**	**10**	**13**
Manufacturing, Camp	D	Camp	Manufacturing	95	96	96	96	96	96
Manufacturing, Chambers	H	Chambers	Manufacturing	15	16	16	17	17	18
Manufacturing, Coleman	F	Coleman	Manufacturing	100	100	100	100	100	100
Manufacturing, Collin	C	Collin	Manufacturing	8	21	32	**39**	43	46
Manufacturing, Cooke	C	Cooke	Manufacturing	-	-	-	-	-	3
Manufacturing, Dallas	C	Dallas	Manufacturing	6	11	16	20	22	25
Manufacturing, Denton	C	Denton	Manufacturing	1	4	20	31	41	47
Manufacturing, Eastland	G	Eastland	Manufacturing	-	-	-	-	-	**21**
Manufacturing, Ellis	C	Ellis	Manufacturing	**22**	**21**	**23**	**26**	**29**	**32**
Manufacturing, Erath	G	Erath	Manufacturing	21	15	9	6	1	-
Manufacturing, Fort Bend	H	Fort Bend	Manufacturing	36	36	37	37	37	38
Manufacturing, Gillespie	K	Gillespie	Manufacturing	14	17	20	23	26	29
Manufacturing, Grayson	C	Grayson	Manufacturing	28	52	54	55	57	57
Manufacturing, Gregg	D	Gregg	Manufacturing	-	2	6	9	12	16
Manufacturing, Hamilton	G	Hamilton	Manufacturing	85	86	86	87	88	88
Manufacturing, Harris	H	Harris	Manufacturing	12	13	14	15	16	17
Manufacturing, Henderson	C	Henderson	Manufacturing	**67**	**68**	**69**	**71**	**72**	**73**
Manufacturing, Howard	F	Howard	Manufacturing	-	3	7	10	11	13

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Manufacturing, Hutchinson	A	Hutchinson	Manufacturing	-	-	-	-	-	8
Manufacturing, Jackson	P	Jackson	Manufacturing	24	26	26	27	27	27
Manufacturing, Jasper	I	Jasper	Manufacturing	1	4	8	11	14	17
Manufacturing, Jefferson	I	Jefferson	Manufacturing	3	17	29	37	44	50
Manufacturing, Jim Wells	N	Jim Wells	Manufacturing	9	12	15	18	21	24
Manufacturing, Kaufman	C	Kaufman	Manufacturing	9	22	33	**41**	45	48
Manufacturing, Kendall	L	Kendall	Manufacturing	**93**	**94**	**94**	**94**	**94**	**95**
Manufacturing, Kimble	F	Kimble	Manufacturing	70	70	70	70	70	70
Manufacturing, Lampasas	G	Lampasas	Manufacturing	**25**	**26**	**27**	**28**	**28**	**24**
Manufacturing, Leon	H	Leon	Manufacturing	-	4	7	10	14	17
Manufacturing, Limestone	G	Limestone	Manufacturing	**90**	**90**	**90**	**90**	**90**	**90**
Manufacturing, Lipscomb	A	Lipscomb	Manufacturing	12	15	18	22	25	29
Manufacturing, Matagorda	K	Matagorda	Manufacturing	4	4	5	6	6	7
Manufacturing, Maverick	M	Maverick	Manufacturing	-	-	-	1	4	8
Manufacturing, McLennan	G	McLennan	Manufacturing	19	16	13	11	8	11
Manufacturing, Montgomery	H	Montgomery	Manufacturing	44	55	62	67	70	73
Manufacturing, Moore	A	Moore	Manufacturing	7	13	**18**	**23**	**27**	**31**
Manufacturing, Navarro	C	Navarro	Manufacturing	0	2	8	13	19	23
Manufacturing, Nolan	G	Nolan	Manufacturing	8	11	15	18	21	24
Manufacturing, Nueces	N	Nueces	Manufacturing	67	73	78	82	86	87
Manufacturing, Palo Pinto	G	Palo Pinto	Manufacturing	64	66	67	68	69	70
Manufacturing, Parker	C	Parker	Manufacturing	6	9	11	16	18	21
Manufacturing, Potter	A	Potter	Manufacturing	5	14	21	28	32	36
Manufacturing, Randall	A	Randall	Manufacturing	9	19	27	35	39	43
Manufacturing, Real	J	Real	Manufacturing	**100**	**100**	**100**	**100**	**100**	**100**
Manufacturing, Rockwall	C	Rockwall	Manufacturing	9	22	33	**41**	45	48
Manufacturing, Shelby	I	Shelby	Manufacturing	45	48	53	55	58	59
Manufacturing, Smith	D; I	Smith	Manufacturing	-	-	1	4	15	16
Manufacturing, Tarrant	C	Tarrant	Manufacturing	13	24	29	35	40	43
Manufacturing, Taylor	G	Taylor	Manufacturing	7	10	100	**100**	**100**	100
Manufacturing, Tyler	I	Tyler	Manufacturing	66	67	69	70	71	72
Manufacturing, Upshur	D	Upshur	Manufacturing	93	93	93	94	94	94
Manufacturing, Van Zandt	D	Van Zandt	Manufacturing	62	63	64	65	67	68
Manufacturing, Victoria	L	Victoria	Manufacturing	**99**	**99**	**99**	**99**	**99**	**99**

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Manufacturing, Washington	G	Washington	Manufacturing	17	20	23	26	28	31
Manufacturing, Wichita	B	Wichita	Manufacturing	-	-	0	5	9	14
Manufacturing, Wilson	L	Wilson	Manufacturing	**8**	**11**	**14**	**16**	**20**	**23**
Manufacturing, Wise	C	Wise	Manufacturing	3	5	5	6	7	7
Manufacturing, Wood	D	Wood	Manufacturing	48	50	52	54	55	57
Manufacturing, Young	G	Young	Manufacturing	9	8	8	5	2	5
Manufacturing, Zavala	L	Zavala	Manufacturing	**100**	**100**	**100**	**100**	**100**	**100**
Manvel	H	Brazoria	Municipal	7	40	55	60	64	67
Marble Falls	K	Burnet	Municipal	-	4	4	4	4	4
Markout WSC	C	Kaufman	Municipal	39	48	62	**74**	80	85
Mart	G	McLennan	Municipal	**58**	56	53	48	42	34
Martindale WSC	L	Caldwell; Guadalupe	Municipal	-	22	29	36	42	48
Mason Creek UD	H	Harris	Municipal	-	21	21	21	22	23
Maud	D	Bowie	Municipal	100	100	100	100	100	100
Maxwell SUD	L	Caldwell; Hays	Municipal	-	-	6	30	48	53
McAllen	M	Hidalgo	Municipal	4	13	24	26	28	30
McCoy WSC	L; N	Atascosa; Live Oak; Wilson	Municipal	-	-	-	4	9	15
McGregor	G	McLennan	Municipal	**10**	15	19	23	27	31
McKinney	C	Collin	Municipal	9	22	33	**41**	45	48
Meadowcreek MUD	H	Fort Bend	Municipal	-	-	2	3	4	4
Meadowlakes	K	Burnet	Municipal	**61**	**63**	**65**	**67**	**69**	**70**
Meadows Place	H	Fort Bend; Harris	Municipal	-	-	1	5	6	8
Melissa	C	Collin	Municipal	13	28	40	**47**	51	53
Memorial Villages Water Authority	H	Harris	Municipal	43	43	46	47	46	46
Menard	F	Menard	Municipal	17	11	4	2	-	-
Mesquite	C	Dallas	Municipal	9	22	33	**41**	45	48
Mexia	G	Limestone	Municipal	**96**	**94**	**93**	**92**	**93**	**92**
Miami	A	Roberts	Municipal	-	-	4	12	20	27
Mid-Tex Utilities	K	Hays; Travis	Municipal	-	100	100	100	100	100
Midland	F	Midland	Municipal	-	-	-	-	7	19
Midlothian	C	Ellis	Municipal	6	12	18	24	29	33
Miles	F	Runnels	Municipal	-	-	-	-	6	12
Military Highway WSC	M	Cameron; Hidalgo	Municipal	1	2	3	2	2	2
Miller Grove WSC	D	Hopkins; Rains	Municipal	16	20	22	24	27	29

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Millersview-Doole WSC	F	Concho; McCulloch; Runnels; Tom Green	Municipal	-	-	9	24	36	46
Milligan WSC	C	Collin	Municipal	9	22	33	**41**	45	48
Mineral Wells	C; G	Palo Pinto; Parker	Municipal	25	32	39	45	49	54
Mining, Andrews	F	Andrews	Mining	**47**	**51**	**46**	**29**	-	-
Mining, Angelina	I	Angelina	Mining	48	50	52	54	56	57
Mining, Atascosa	L	Atascosa	Mining	**41**	**43**	**45**	**47**	**49**	-
Mining, Austin	H	Austin	Mining	52	57	62	66	69	72
Mining, Bee	N	Bee	Mining	10	10	10	10	10	-
Mining, Borden	F	Borden	Mining	**16**	**16**	**10**	-	-	-
Mining, Brazoria	H	Brazoria	Mining	65	70	73	76	78	80
Mining, Brazos	G	Brazos	Mining	39	39	40	40	41	41
Mining, Brewster	E	Brewster	Mining	7	7	9	9	9	9
Mining, Burleson	G	Burleson	Mining	**64**	**64**	**64**	**64**	**64**	**64**
Mining, Burnet	K	Burnet	Mining	-	-	3	12	20	25
Mining, Comal	L	Comal	Mining	**25**	**36**	**44**	**51**	**56**	**59**
Mining, Crane	F	Crane	Mining	-	-	**2**	**8**	**0**	**6**
Mining, Crockett	F	Crockett	Mining	**38**	**36**	**29**	**12**	-	-
Mining, Culberson	E	Culberson	Mining	**67**	**67**	**67**	**67**	**67**	**67**
Mining, Dimmit	L	Dimmit	Mining	**89**	**89**	**89**	**89**	**89**	-
Mining, Eastland	G	Eastland	Mining	**98**	**97**	**98**	**98**	**98**	**98**
Mining, Edwards	J	Edwards	Mining	67	67	67	67	67	67
Mining, Fannin	C	Fannin	Mining	-	-	4	27	43	52
Mining, Frio	L	Frio	Mining	**67**	**67**	**67**	**67**	**67**	-
Mining, Gonzales	L	Gonzales	Mining	**55**	**55**	**56**	**56**	**56**	-
Mining, Grimes	G	Grimes	Mining	40	40	40	40	41	41
Mining, Guadalupe	L	Guadalupe	Mining	**56**	**56**	**56**	**56**	**56**	-
Mining, Harris	H	Harris	Mining	90	90	90	90	90	90
Mining, Harrison	D	Harrison	Mining	**69**	**68**	**67**	**67**	**66**	**66**
Mining, Haskell	G	Haskell	Mining	**100**	**100**	**100**	**100**	**100**	**100**
Mining, Hays	K; L	Hays	Mining	15	17	19	21	24	26
Mining, Henderson	C; I	Henderson	Mining	8	8	8	8	17	44
Mining, Hood	G	Hood	Mining	68	70	72	74	75	75
Mining, Hudspeth	E	Hudspeth	Mining	10	13	14	15	15	15
Mining, Irion	F	Irion	Mining	**56**	**56**	**54**	**48**	**33**	**4**
Mining, Karnes	L	Karnes	Mining	**75**	**75**	**75**	**75**	**75**	-
Mining, Kaufman	C	Kaufman	Mining	-	-	17	35	48	58

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Mining, Kerr	J	Kerr	Mining	37	37	37	37	37	37
Mining, La Salle	L	La Salle	Mining	90	90	90	90	90	-
Mining, Liberty	H	Liberty	Mining	42	47	52	55	58	60
Mining, Limestone	G	Limestone	Mining	86	85	83	82	74	75
Mining, Llano	K	Llano	Mining	88	-	-	-	-	-
Mining, Loving	F	Loving	Mining	56	56	56	56	56	56
Mining, Madison	H	Madison	Mining	73	73	73	73	73	73
Mining, Martin	F	Martin	Mining	1	8	12	12	9	5
Mining, Maverick	M	Maverick	Mining	74	74	74	74	75	-
Mining, Medina	L	Medina	Mining	70	73	75	76	77	78
Mining, Milam	G	Milam	Mining	92	93	92	92	92	92
Mining, Mills	K	Mills	Mining	96	96	97	97	97	97
Mining, Mitchell	F	Mitchell	Mining	14	14	14	14	13	13
Mining, Montgomery	H	Montgomery	Mining	3	19	29	38	41	45
Mining, Navarro	C	Navarro	Mining	-	-	-	-	7	23
Mining, Nolan	G	Nolan	Mining	6	6	6	6	7	7
Mining, Nueces	N	Nueces	Mining	11	12	11	10	11	11
Mining, Palo Pinto	G	Palo Pinto	Mining	96	96	96	97	97	97
Mining, Parker	C	Parker	Mining	-	-	-	-	15	29
Mining, Polk	H; I	Polk	Mining	50	50	50	50	50	50
Mining, San Jacinto	H	San Jacinto	Mining	45	45	45	45	45	45
Mining, Smith	I	Smith	Mining	74	75	76	77	78	79
Mining, Somervell	G	Somervell	Mining	64	66	68	69	70	71
Mining, Sterling	F	Sterling	Mining	50	55	59	65	74	83
Mining, Taylor	G	Taylor	Mining	74	75	76	76	76	77
Mining, Throckmorton	G	Throckmorton	Mining	7	7	7	7	7	7
Mining, Uvalde	L	Uvalde	Mining	50	53	56	59	61	63
Mining, Val Verde	J	Val Verde	Mining	-	6	13	19	23	28
Mining, Victoria	L	Victoria	Mining	87	87	88	88	88	89
Mining, Ward	F	Ward	Mining	17	18	18	19	20	20
Mining, Washington	G	Washington	Mining	89	89	89	89	89	89
Mining, Williamson	G; K	Williamson	Mining	51	59	65	70	74	77
Mining, Wise	C	Wise	Mining	4	7	12	17	23	30
Mining, Wood	D	Wood	Mining	11	10	10	9	8	7
Mining, Zavala	L	Zavala	Mining	74	74	74	74	74	-
Mission	M	Hidalgo	Municipal	-	3	7	9	11	13
Mont Belvieu	H	Chambers	Municipal	20	33	35	43	49	54
Montgomery	H	Montgomery	Municipal	2	14	23	28	31	34

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Montgomery County MUD 105	H	Montgomery	Municipal	3	19	30	37	42	45
Montgomery County MUD 112	H	Montgomery	Municipal	3	19	30	37	41	45
Montgomery County MUD 115	H	Montgomery	Municipal	16	27	34	39	41	45
Montgomery County MUD 119	H	Montgomery	Municipal	3	19	30	37	41	45
Montgomery County MUD 127	H	Montgomery	Municipal	16	27	34	39	41	45
Montgomery County MUD 137	H	Montgomery	Municipal	3	30	47	55	59	63
Montgomery County MUD 139	H	Montgomery	Municipal	3	19	30	37	41	45
Montgomery County MUD 15	H	Montgomery	Municipal	35	48	56	60	63	65
Montgomery County MUD 18	H	Montgomery	Municipal	1	7	12	16	18	21
Montgomery County MUD 19	H	Montgomery	Municipal	3	19	31	37	41	45
Montgomery County MUD 24	H	Montgomery	Municipal	5	-	-	-	-	-
Montgomery County MUD 56	H	Montgomery	Municipal	4	19	31	37	41	45
Montgomery County MUD 8	H	Montgomery	Municipal	2	9	15	19	21	24
Montgomery County MUD 83	H	Montgomery	Municipal	4	19	30	37	41	45
Montgomery County MUD 88	H	Montgomery	Municipal	3	19	30	37	41	45
Montgomery County MUD 89	H	Montgomery	Municipal	3	19	30	37	41	45
Montgomery County MUD 9	H	Montgomery	Municipal	18	31	40	47	51	55
Montgomery County MUD 94	H	Montgomery	Municipal	3	19	30	37	41	45
Montgomery County MUD 98	H	Montgomery	Municipal	1	3	6	9	11	14
Montgomery County MUD 99	H	Montgomery	Municipal	-	-	-	-	-	1
Montgomery County UD 2	H	Montgomery	Municipal	5	31	42	49	54	58
Montgomery County UD 3	H	Montgomery	Municipal	2	5	9	12	16	19
Montgomery County UD 4	H	Montgomery	Municipal	-	-	11	19	23	28
Montgomery County WCID 1	H	Montgomery	Municipal	3	19	30	37	41	45
Mount Houston Road MUD	H	Harris	Municipal	-	21	21	21	21	20
Mount Zion WSC	C	Rockwall	Municipal	9	22	33	**41**	45	48
Mountain Peak SUD	C; G	Ellis; Johnson	Municipal	57	68	74	**79**	83	85
MSEC Enterprises	G; H	Grimes; Montgomery	Municipal	4	17	28	35	39	43
Multi County WSC	G	Coryell; Hamilton; Lampasas	Municipal	38	38	37	36	36	35

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Munday	G	Knox	Municipal	**96**	**97**	98	99	100	100
Murphy	C	Collin	Municipal	9	22	33	**41**	45	48
Mustang SUD	C	Collin; Denton; Grayson	Municipal	9	31	48	54	59	62
Myrtle Springs WSC	D	Van Zandt	Municipal	9	26	37	46	53	59
Nash	D	Bowie	Municipal	100	100	100	100	100	100
Nash Forreston WSC	C	Ellis	Municipal	-	-	-	-	3	10
Natalia	L	Medina	Municipal	2	-	4	6	7	4
Navarro Mills WSC	C; G	Hill; Navarro	Municipal	-	-	3	8	13	18
Nevada SUD	C	Collin; Rockwall	Municipal	9	22	33	**41**	45	48
New Boston	D	Bowie	Municipal	94	94	94	94	94	94
New Braunfels	L	Comal; Guadalupe	Municipal	-	24	45	59	68	74
New Caney MUD	H	Montgomery	Municipal	3	19	30	37	41	45
New Hope SUD	D	Wood	Municipal	31	31	30	28	25	22
Newark	C	Wise	Municipal	5	25	48	**64**	76	81
Nitsch and Son Utility	H	Harris	Municipal	-	20	20	20	20	20
Nocona	B	Montague	Municipal	-	-	-	8	15	22
North Alamo WSC	M	Cameron; Hidalgo; Willacy	Municipal	37	42	45	46	46	47
North Austin MUD 1	K	Travis; Williamson	Municipal	-	100	100	100	100	100
North Belt UD	H	Harris	Municipal	-	20	28	31	31	32
North Bosque WSC	G	McLennan	Municipal	-	-	5	15	25	33
North Channel Water Authority	H	Harris	Municipal	19	18	17	17	17	16
North Collin SUD	C	Collin	Municipal	9	22	33	**41**	45	48
North Farmersville WSC	C	Collin	Municipal	8	22	34	**41**	45	48
North Forest MUD	H	Harris	Municipal	-	20	20	20	20	22
North Fort Bend Water Authority	H	Fort Bend; Harris; Waller	Municipal	32	35	37	38	39	40
North Green MUD	H	Harris	Municipal	-	13	15	16	17	17
North Harris County Regional Water Authority	H	Harris; Montgomery	Municipal	36	56	57	57	58	58
North Hopkins WSC	D	Hopkins	Municipal	20	23	24	26	28	29
North Hunt SUD	C; D	Delta; Fannin; Hunt	Municipal	49	48	46	45	44	42
North Kaufman WSC	C	Kaufman	Municipal	9	22	33	**41**	45	48
North Richland Hills	C	Tarrant	Municipal	14	24	29	**36**	40	44
North Runnels WSC	F; G	Runnels; Taylor	Municipal	**100**	**100**	**100**	**100**	**100**	**100**
North Zulch MUD	H	Madison	Municipal	24	11	1	-	-	-

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Northeast Harris County MUD 1	H	Harris	Municipal	80	80	80	80	80	80
Northlake	C	Denton	Municipal	5	26	40	**45**	50	54
Northtown MUD	K	Travis	Municipal	-	100	100	100	100	100
Northwest Grayson County WCID 1	C	Grayson	Municipal	18	26	32	37	41	45
Northwest Harris County MUD 16	H	Harris	Municipal	-	21	22	22	24	26
Nueces County WCID 3	N	Nueces	Municipal	98	98	98	98	98	98
Oak Hills WSC	L	Bexar; Wilson	Municipal	54	60	65	70	74	78
Oak Ridge North	H	Montgomery	Municipal	2	14	22	28	31	34
Oak Ridge South Gale WSC	C	Grayson	Municipal	40	52	59	65	70	72
Odessa	F	Ector; Midland	Municipal	-	7	19	28	34	39
Ovilla	C	Dallas; Ellis	Municipal	8	12	16	20	23	26
Oyster Creek	H	Brazoria	Municipal	2	3	3	4	3	3
Palmer	C	Ellis	Municipal	7	16	22	28	33	37
Palmer Plantation MUD 1	H	Fort Bend	Municipal	-	0	0	0	1	3
Paloma Creek North	C	Denton	Municipal	0	28	45	51	56	60
Paloma Creek South	C	Denton	Municipal	0	28	46	51	56	60
Paloma Lake MUD 1	G	Williamson	Municipal	**24**	**25**	**26**	**26**	**26**	**26**
Paloma Lake MUD 2	G	Williamson	Municipal	**26**	**28**	**28**	**28**	**28**	**28**
Pampa Municipal Water System	A	Gray	Municipal	-	7	21	30	35	36
Panorama Village	H	Montgomery	Municipal	1	5	8	11	13	15
Parker	C	Collin	Municipal	9	22	33	**41**	45	48
Parker County SUD	C	Parker	Municipal	-	-	8	32	**50**	**63**
Pasadena	H	Harris	Municipal	27	27	28	28	28	28
Patton Village	H	Montgomery	Municipal	3	19	31	37	42	45
Pearland	H	Brazoria; Fort Bend; Harris	Municipal	1	1	2	2	2	2
Pearsall	L	Frio	Municipal	15	26	32	32	33	35
Pecos	F	Reeves	Municipal	**35**	42	48	51	55	58
Pelican Bay	C	Tarrant	Municipal	-	-	-	-	22	42
Perryton Municipal Water System	A	Ochiltree	Municipal	-	-	-	2	11	20
Pflugerville	K	Travis	Municipal	-	-	-	7	19	29
Pharr	M	Hidalgo	Municipal	20	24	26	28	29	30
Picosa WSC	L	Wilson	Municipal	7	19	29	35	41	47
Pilot Point	C	Denton; Grayson	Municipal	23	19	38	45	48	49
Pine Ridge WSC	D	Smith; Van Zandt	Municipal	-	-	-	-	-	**4**

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Pinehurst Decker Prairie WSC	H	Montgomery	Municipal	3	19	30	37	41	45
Pinewood Community	H	Harris	Municipal	-	22	23	24	27	27
Plano	C	Collin; Denton	Municipal	9	22	33	**41**	45	48
Plantation MUD	H	Fort Bend	Municipal	-	-	3	4	4	6
Poetry WSC	C; D	Hunt; Kaufman	Municipal	9	22	33	**41**	45	48
Point Aquarius MUD	H	Montgomery	Municipal	-	3	8	12	15	17
Ponder	C	Denton	Municipal	44	58	67	73	77	81
Port Mansfield PUD	M	Willacy	Municipal	29	41	51	61	69	75
Porter SUD	H	Montgomery	Municipal	15	42	60	70	77	84
Post Oak SUD	C; G	Hill; Limestone; Navarro	Municipal	-	2	8	13	18	23
Potosi WSC	G	Callahan; Taylor	Municipal	74	77	79	81	83	85
Pottsboro	C	Grayson	Municipal	32	43	50	55	60	63
Prairie Hill WSC	G	Limestone; McLennan	Municipal	**100**	**100**	**100**	**100**	**100**	**100**
Primera	M	Cameron	Municipal	4	25	35	41	46	49
Princeton	C	Collin	Municipal	9	22	33	**41**	45	48
Prosper	C	Collin; Denton	Municipal	9	22	33	**41**	45	48
Providence Village WCID	C	Denton	Municipal	0	28	45	51	56	60
Quadvest	H; K; P	Brazoria; Fort Bend; Harris; Jackson; Liberty; Matagorda; Montgomery; Walker; Waller	Municipal	3	18	29	35	39	42
R C H WSC	C	Rockwall	Municipal	9	22	33	**41**	45	48
R P M WSC	D; I	Henderson; Smith; Van Zandt	Municipal	7	8	8	7	6	5
Ramey WSC	D	Wood	Municipal	-	-	-	-	11	22
Ranch Crest Water	H	Montgomery	Municipal	4	19	31	38	42	45
Rayford Road MUD	H	Montgomery	Municipal	2	13	21	26	29	32
Red Oak	C	Ellis	Municipal	8	12	16	20	23	26
Red River Authority of Texas	A; B; C; G; O	Childress; Clay; Collingsworth; Cottle; Dickens; Donley; Foard; Grayson; Hall; Hardeman; King; Knox; Montague; Motley; Wilbarger	Municipal	1	4	6	8	10	13
Redwater	D	Bowie	Municipal	84	83	83	83	83	82

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Reno (Parker)	C	Parker; Tarrant	Municipal	10	26	38	**48**	55	61
Reunion Ranch WCID	K	Hays	Municipal	-	23	45	61	70	77
Rhome	C	Wise	Municipal	11	31	53	**68**	78	84
Rice Water Supply and Sewer Service	C	Ellis; Navarro	Municipal	-	2	8	13	18	23
Richardson	C	Collin; Dallas	Municipal	9	22	33	**41**	45	48
Richland Hills	C	Tarrant	Municipal	11	20	25	**31**	35	39
Richmond	H	Fort Bend	Municipal	44	45	50	55	60	64
Richwood	H	Brazoria	Municipal	4	6	6	6	6	6
Rio Grande City	M	Starr	Municipal	17	22	25	28	30	32
Rio Vista	G	Hill; Johnson	Municipal	**1**	**0**	**0**	**0**	**11**	**22**
Rio WSC	M	Starr	Municipal	24	35	41	41	41	41
River Oaks	C	Tarrant	Municipal	14	24	29	**36**	40	44
River Plantation MUD	H	Montgomery	Municipal	2	13	21	28	31	34
Riverbend Water Resources District	D	Bowie	Municipal	100	100	100	100	100	100
Roanoke	C	Denton	Municipal	14	24	29	36	40	44
Robert Lee	F	Coke	Municipal	**100**	100	100	100	100	100
Robinson	G	McLennan	Municipal	-	6	18	28	37	45
Rockdale	G	Milam	Municipal	-	-	-	-	0	1
Rockett SUD	C	Dallas; Ellis	Municipal	7	16	22	28	33	37
Rocksprings	J	Edwards	Municipal	38	38	38	38	38	37
Rockwall	C	Rockwall	Municipal	9	22	33	**41**	45	48
Rolling Fork PUD	H	Harris	Municipal	9	30	32	33	32	32
Rollingwood	K	Travis	Municipal	-	100	100	100	100	100
Roma	M	Starr	Municipal	-	-	-	2	5	8
Roman Forest Consolidated MUD	H	Montgomery	Municipal	4	19	30	37	41	45
Roscoe	G	Nolan	Municipal	48	46	44	43	42	42
Rose Hill SUD	C	Kaufman	Municipal	9	22	33	**41**	45	48
Rosenberg	H	Fort Bend	Municipal	25	31	35	37	38	39
Rotan	G	Fisher	Municipal	2	9	21	29	35	41
Round Rock	G; K	Travis; Williamson	Municipal	-	8	**23**	27	30	**32**
Rowlett	C	Dallas; Rockwall	Municipal	9	22	33	**41**	45	48
Royal Valley Utilities	H	Fort Bend	Municipal	-	6	8	14	15	17
Royse City	C; D	Collin; Hunt; Rockwall	Municipal	9	22	33	**41**	45	48
Runaway Bay	C	Wise	Municipal	14	24	29	**36**	40	44
Runge	L	Karnes	Municipal	-	-	-	-	-	3
S U N WSC	G	Fisher; Jones; Taylor	Municipal	6	11	18	23	29	35

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Sachse	C	Collin; Dallas	Municipal	9	22	33	**41**	45	48
Saginaw	C	Tarrant	Municipal	14	24	29	**36**	40	44
Saint Jo	B	Montague	Municipal	-	-	-	8	18	26
Salado WSC	G	Bell	Municipal	-	-	5	15	24	32
San Angelo	F	Tom Green	Municipal	20	15	20	25	30	34
San Antonio Water System	L	Atascosa; Bexar; Comal; Medina	Municipal	-	-	0	4	7	11
San Diego MUD 1	N	Duval; Jim Wells	Municipal	13	13	14	14	15	15
San Marcos	L	Caldwell; Hays	Municipal	1	15	29	37	41	44
Sanger	C	Denton	Municipal	-	16	29	37	44	49
Sardis Lone Elm WSC	C	Ellis	Municipal	-	31	46	51	53	55
Schertz	L	Bexar; Comal; Guadalupe	Municipal	-	16	29	39	47	54
Scottsville	D	Harrison	Municipal	36	42	43	48	52	56
Seagoville	C	Dallas	Municipal	8	12	17	20	23	26
Sedona Lakes MUD 1	H	Brazoria	Municipal	8	11	12	13	14	14
Seguin	L	Guadalupe	Municipal	-	-	-	-	-	2
Seis Lagos UD	C	Collin	Municipal	9	22	33	**41**	45	48
Selma	L	Bexar; Comal; Guadalupe	Municipal	33	44	52	58	63	68
Seminole	O	Gaines	Municipal	23	28	32	34	37	39
Sequoia Improvement District	H	Harris	Municipal	-	20	20	20	19	19
Shady Hollow MUD	K	Travis	Municipal	-	100	100	100	100	100
Shallowater	O	Lubbock	Municipal	-	-	-	0	44	50
Shamrock Municipal Water System	A	Wheeler	Municipal	-	-	-	-	18	51
Sharyland WSC	M	Hidalgo	Municipal	-	-	4	6	7	8
Shavano Park	L	Bexar	Municipal	9	19	27	32	38	43
Shenandoah	H	Montgomery	Municipal	3	19	30	37	41	45
Sheppard Air Force Base	B	Wichita	Municipal	-	-	4	9	14	19
Sherman	C	Grayson	Municipal	15	29	32	34	36	38
Skidmore WSC	N	Bee	Municipal	21	23	25	28	32	35
Slaton	O	Lubbock	Municipal	45	63	75	87	91	96
Snyder	F	Scurry	Municipal	-	7	19	28	34	39
Somervell County Water District	G	Somervell	Municipal	16	16	13	13	12	11
Sonterra MUD	G	Williamson	Municipal	**41**	**63**	**74**	**81**	**85**	**88**
South Buda WCID 1	L	Hays	Municipal	-	17	45	62	72	79
South Cleveland WSC	H	Liberty	Municipal	-	-	-	10	26	37
South Ellis County WSC	C	Ellis; Navarro	Municipal	21	34	44	**51**	58	63

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
South Grayson SUD	C	Collin; Grayson	Municipal	20	30	39	45	51	56
South Rains SUD	D	Rains	Municipal	-	4	9	15	20	25
Southern Montgomery County MUD	H	Montgomery	Municipal	1	8	13	16	18	20
Southern Utilities	D; I	Cherokee; Rusk; Smith	Municipal	-	-	-	-	1	3
Southern Water	H	Harris	Municipal	-	20	23	24	23	23
Southlake	C	Denton; Tarrant	Municipal	14	24	29	**36**	40	44
Southwest Fannin County SUD	C	Fannin; Grayson	Municipal	-	14	24	32	40	47
Splendora	H	Liberty; Montgomery	Municipal	17	40	59	70	76	78
Spring Creek UD	H	Montgomery	Municipal	3	19	30	37	41	45
Spring Meadows MUD	H	Harris	Municipal	-	0	-	-	-	-
Spring Valley WSC	G	McLennan	Municipal	-	8	17	26	33	40
Springs Hill WSC	L	Guadalupe; Wilson	Municipal	0	31	41	49	56	61
Springtown	C	Parker	Municipal	12	22	28	**39**	46	50
Staff WSC	G	Eastland; Stephens	Municipal	-	-	-	-	2	9
Stanley Lake MUD	H	Montgomery	Municipal	1	7	12	15	18	20
Stanton	F	Martin	Municipal	10	22	35	45	53	60
Steam-Electric Power, Anderson	I	Anderson	Steam-electric power	100	100	100	100	100	100
Steam-Electric Power, Austin	H	Austin	Steam-electric power	100	100	100	100	100	100
Steam-Electric Power, Brazos	G	Brazos	Steam-electric power	48	45	45	45	45	45
Steam-Electric Power, Ector	F	Ector	Steam-electric power	**2**	**3**	5	8	10	11
Steam-Electric Power, El Paso	E	El Paso	Steam-electric power	19	19	19	19	19	19
Steam-Electric Power, Freestone	C	Freestone	Steam-electric power	-	**21**	**25**	**29**	**33**	**36**
Steam-Electric Power, Harris	H	Harris	Steam-electric power	56	56	56	56	56	56
Steam-Electric Power, Henderson	C; I	Henderson	Steam-electric power	**94**	**48**	**48**	**48**	**48**	**48**
Steam-Electric Power, Howard	F	Howard	Steam-electric power	-	6	14	21	25	29
Steam-Electric Power, Jack	C	Jack	Steam-electric power	14	24	29	**36**	40	44
Steam-Electric Power, Johnson	G	Johnson	Steam-electric power	30	30	30	30	30	30
Steam-Electric Power, Kaufman	C	Kaufman	Steam-electric power	1	3	4	**5**	5	6
Steam-Electric Power, Limestone	G	Limestone	Steam-electric power	**13**	**14**	**14**	**15**	**15**	**16**
Steam-Electric Power, Mitchell	F	Mitchell	Steam-electric power	**100**	**100**	**100**	**100**	**100**	**100**
Steam-Electric Power, Montgomery	H	Montgomery	Steam-electric power	3	5	7	8	8	9

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Steam-Electric Power, Robertson	G	Robertson	Steam-electric power	**17**	**18**	18	19	19	**20**
Steam-Electric Power, Somervell	G	Somervell	Steam-electric power	**20**	**21**	**22**	**22**	**23**	**23**
Steam-Electric Power, Tarrant	C	Tarrant	Steam-electric power	1	18	22	**27**	30	33
Steam-Electric Power, Titus	D	Titus	Steam-electric power	-	**4**	**8**	**11**	**15**	**19**
Steam-Electric Power, Victoria	L	Victoria	Steam-electric power	**21**	**21**	**21**	**21**	**21**	**21**
Steam-Electric Power, Wichita	B	Wichita	Steam-electric power	-	15	20	25	25	30
Steam-Electric Power, Wilbarger	B	Wilbarger	Steam-electric power	-	-	1	10	18	27
Steam-Electric Power, Wise	C	Wise	Steam-electric power	14	24	29	**36**	40	44
Steam-Electric Power, Young	G	Young	Steam-electric power	**73**	**75**	**78**	**75**	**71**	**75**
Steamboat Mountain WSC	G	Taylor	Municipal	68	74	78	82	84	86
Stephens Regional SUD	G	Stephens; Throckmorton	Municipal	8	19	19	19	19	19
Stephenville	G	Erath	Municipal	-	-	-	-	**8**	**18**
Sterling City	F	Sterling	Municipal	-	-	12	34	48	58
Stinnett	A	Hutchinson	Municipal	-	-	-	-	11	23
Stratford	A	Sherman	Municipal	23	22	19	29	55	69
Strawn	G	Palo Pinto	Municipal	11	11	10	10	9	8
Suburban Utility	H	Harris	Municipal	0	8	24	27	28	28
Sugar Land	H	Fort Bend	Municipal	18	19	20	21	22	23
Sunnyvale	C	Dallas	Municipal	9	22	33	**41**	45	48
Sunset Valley	K	Travis	Municipal	-	86	86	86	86	86
Sweeny	H	Brazoria	Municipal	3	5	6	7	7	7
Sweetwater	G	Nolan	Municipal	8	7	5	4	2	0
T & W Water Service	H	Liberty; Montgomery	Municipal	3	17	26	31	35	37
Talty SUD	C	Kaufman	Municipal	9	22	33	**41**	45	48
Taylor	G	Williamson	Municipal	**59**	**72**	**79**	**84**	**87**	**89**
TDCJ Chase Field	N	Bee	Municipal	0	0	0	0	0	0
TDCJ Darrington Unit	H	Brazoria	Municipal	7	11	12	13	14	14
TDCJ Eastham Unit	I	Houston	Municipal	10	10	10	10	10	10
TDCJ Ferguson Unit	H	Madison	Municipal	17	5	-	-	-	-
TDCJ Ramsey Area	H	Brazoria	Municipal	5	7	8	9	9	9
Temple	G	Bell	Municipal	-	1	11	19	26	32
Terra Southwest	C	Denton	Municipal	1	7	15	22	27	32
Terrell	C	Kaufman	Municipal	9	22	33	**41**	45	48
Texarkana	D	Bowie	Municipal	100	100	100	100	100	100

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Texas A&M University	G	Brazos	Municipal	**42**	**38**	38	38	38	38
Texas A&M University Commerce	D	Hunt	Municipal	64	64	64	64	64	64
Texas State Technical College	G	McLennan	Municipal	**17**	17	17	17	17	17
Texas State University	L	Hays	Municipal	35	35	35	35	35	35
The Bitter Creek WSC	G	Fisher; Nolan	Municipal	56	57	59	61	62	65
The Colony	C	Denton	Municipal	7	13	19	**22**	26	28
The Commons Water Supply	H	Harris	Municipal	-	20	20	20	20	20
The Grove WSC	G	Bell; Coryell	Municipal	-	-	**2**	**4**	**5**	**15**
The Oaks WSC	L	Bexar	Municipal	22	31	37	42	47	51
The Woodlands	H	Montgomery	Municipal	2	12	19	23	26	30
Thorndale	G	Milam	Municipal	**24**	**28**	**32**	**36**	**40**	**44**
Throckmorton	G	Throckmorton	Municipal	**66**	**70**	76	83	91	100
Thunderbird UD	H	Fort Bend	Municipal	-	2	5	6	7	9
Tioga	C	Grayson	Municipal	30	41	48	53	58	62
Tolar	G	Hood	Municipal	-	-	8	19	28	37
Tomball	H	Harris	Municipal	-	24	31	34	37	38
Travis County MUD 10	K	Travis	Municipal	5	30	43	52	59	65
Travis County MUD 2	K	Travis	Municipal	2	21	**33**	**42**	**50**	**56**
Travis County MUD 4	K	Travis	Municipal	-	-	-	-	-	7
Travis County WCID 10	K	Travis	Municipal	-	2	7	12	17	22
Travis County WCID 17	K	Travis	Municipal	-	14	26	35	43	50
Travis County WCID 20	K	Travis	Municipal	29	29	29	29	29	29
Travis County WCID Point Venture	K	Travis	Municipal	30	42	52	61	68	73
Tri SUD	D	Morris; Titus	Municipal	100	100	100	100	100	100
Trinidad	C	Henderson	Municipal	20	29	34	**40**	45	48
Trinity Bay Conservation District	H; I	Chambers; Jefferson	Municipal	-	-	-	-	4	10
Trophy Club MUD 1	C	Denton; Tarrant	Municipal	3	14	19	26	31	35
Two Way SUD	C	Cooke; Grayson	Municipal	13	17	30	36	43	46
U & F WSC	F	Borden; Scurry	Municipal	-	1	1	2	2	2
Union WSC	M	Starr	Municipal	56	58	60	61	62	63
Uvalde	L	Uvalde	Municipal	19	17	14	12	8	5
Valley Ranch MUD 1	H	Montgomery	Municipal	11	-	-	-	-	-
Van Alstyne	C	Grayson	Municipal	5	51	69	**75**	81	84
Varner Creek UD	H	Brazoria	Municipal	3	6	6	7	7	8
Venus	G	Johnson	Municipal	-	-	3	7	9	11

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Victoria	L	Victoria	Municipal	50	51	51	51	51	50
View Caps WSC	G	Taylor	Municipal	38	42	45	48	51	54
Ville Dalsace Water Supply	L	Medina	Municipal	74	76	77	78	79	80
Waco	G	McLennan	Municipal	16	24	31	38	44	**48**
Wake Village	D	Bowie	Municipal	100	100	100	100	100	100
Walker County SUD	H	Walker	Municipal	3	3	3	3	3	2
Waller	H	Harris; Waller	Municipal	19	29	27	26	26	25
Walnut Creek SUD	C	Parker; Wise	Municipal	20	26	47	**64**	74	80
Watauga	C	Tarrant	Municipal	14	24	29	**36**	40	44
Waxahachie	C	Ellis	Municipal	18	18	20	26	38	47
Weatherford	C	Parker	Municipal	5	20	32	42	49	56
Webb County	M	Webb	Municipal	-	-	12	11	10	9
Wellborn SUD	G	Brazos; Robertson	Municipal	-	6	20	32	42	50
Wellington Municipal Water System	A	Collingsworth	Municipal	-	50	50	50	50	50
Wells Branch MUD	K	Travis; Williamson	Municipal	-	100	100	100	100	100
West Cedar Creek MUD	C	Henderson; Kaufman	Municipal	14	24	29	**36**	40	44
West Columbia	H	Brazoria	Municipal	4	6	7	8	8	10
West Harris County MUD 6	H	Harris	Municipal	-	21	21	21	21	21
West Harris County Regional Water Authority	H	Fort Bend; Harris	Municipal	25	48	49	49	50	51
West Travis County Public Utility Agency	K	Hays; Travis	Municipal	13	35	49	60	68	74
West University Place	H	Harris	Municipal	29	28	28	28	29	30
West Wise SUD	C	Wise	Municipal	14	24	30	**36**	41	44
Westfield Garden Park	H	Harris	Municipal	60	80	80	80	80	80
Westlake	C	Tarrant	Municipal	14	24	29	36	40	44
Westover Hills	C	Tarrant	Municipal	14	24	29	**36**	40	44
Westwood North WSC	H	Montgomery	Municipal	3	19	30	37	41	45
Westworth Village	C	Tarrant	Municipal	14	24	29	**36**	40	44
Wheeler	A	Wheeler	Municipal	9	28	47	63	73	79
White Oak	D	Gregg	Municipal	2	3	3	1	-	-
White Oak WSC	H	Montgomery	Municipal	3	19	30	37	41	45
White Settlement	C	Tarrant	Municipal	10	18	23	28	33	36
Whitesboro	C	Grayson	Municipal	4	12	17	22	26	30
Whitewright	C	Fannin; Grayson	Municipal	-	8	14	19	24	28
Whitney	G	Hill	Municipal	-	2	4	5	5	7
Wichita Falls	B	Wichita	Municipal	-	-	-	-	0	2

Entity	Region	County	Category	2030	2040	2050	2060	2070	2080
Wickson Creek SUD	G	Brazos; Grimes; Robertson	Municipal	-	-	4	19	31	**41**
Williamson County MUD 11	G	Williamson	Municipal	12	38	54	65	72	77
Williamson County WSID 3	G; K	Travis; Williamson	Municipal	**12**	**31**	**45**	**55**	**63**	**69**
Willow Park	C	Parker	Municipal	6	13	18	**24**	29	33
Wilmer	C	Dallas	Municipal	8	12	16	20	23	26
Wimberley WSC	L	Hays	Municipal	-	11	37	55	66	73
Windermere Utility	K	Travis	Municipal	23	24	24	24	24	24
Windfern Forest Utility District	H	Harris	Municipal	60	80	80	80	80	80
Wingert Water Systems	L	Comal	Municipal	22	31	40	41	41	41
Winona	D	Smith	Municipal	6	15	20	25	28	31
Winters	F	Runnels	Municipal	**100**	**100**	**100**	**100**	**100**	**100**
Wolfforth	O	Lubbock	Municipal	-	-	16	22	26	28
Wood Branch Village	H	Montgomery	Municipal	3	19	30	37	41	45
Wood Trace MUD 1	H	Montgomery	Municipal	3	17	29	36	39	43
Woodbine WSC	C	Cooke; Grayson	Municipal	-	3	5	5	6	6
Woodcreek MUD	H	Harris	Municipal	-	20	20	20	20	20
Woodland Oaks Utility	H	Montgomery	Municipal	3	19	30	37	41	45
Woodridge MUD	H	Montgomery	Municipal	11	-	-	-	-	-
Woodrow Osceola WSC	G	Hill	Municipal	81	82	82	82	83	83
Wylie	C	Collin	Municipal	9	22	33	**41**	45	48
Wylie Northeast SUD	C	Collin	Municipal	9	22	33	**41**	45	48

Table C-3. Major water provider water needs in 2030 and 2080 by reporting region* (acre-feet)

Reporting region	Major water provider name	2030	2080
A	Amarillo	5,170	31,112
A	Borger	1,341	4,863
A	Canadian River Municipal Water Authority	22,540	64,858
A	Greenbelt Municipal & Industrial Water Authority	0	0
B	Wichita Falls	0	13,574
B	Wichita WCID 2	6,181	13,767
C	Dallas	54,955	235,168
C	Fort Worth	47,617	222,311
C	North Texas MWD	45,106	417,311
C	Tarrant Regional WD	89,715	483,530
C	Trinity River Authority	9,100	27,581
C	Upper Trinity RWD	4,325	126,181
D	Bi County WSC	0	0
D	Bright Star Salem SUD	0	0
D	Cash SUD	365	283
D	Cherokee Water Company	0	0
D	Commerce	516	516
D	Cooper	0	0
D	Emory	527	525
D	Franklin County WD	1,464	3,224
D	Gladewater	0	0
D	Golden WSC	0	0
D	Grand Saline	0	0
D	Greenville	1,898	1,431
D	Hughes Springs	0	0
D	Kilgore	0	0
D	Lamar County WSD	139	139
D	Longview	6,985	6,987
D	Marshall	0	0
D	Mount Pleasant	0	0
D	Northeast Texas MWD	30,822	31,146
D	Paris	0	0
D	Point	0	0
D	Riverbend Water Resources District	46,038	114,561
D	Sabine River Authority	29,736	46,580
D	Sulphur River MWD	1,072	1,072

Reporting region	Major water provider name	2030	2080
D	Sulphur Springs	132	414
D	Texarkana	57,388	57,415
D	Titus County FWD 1	15,276	17,976
D	Tri SUD	0	0
D	White Oak	0	0
E	El Paso County WID 1	80,914	77,281
E	El Paso Water	26,149	36,243
E	Horizon Regional MUD	7,970	8,798
E	Lower Valley Water District	2,820	3,424
F	Brown County WID 1	0	0
F	Colorado River MWD	0	29,128
F	Midland	0	7,274
F	Odessa	0	25,284
F	San Angelo	3,740	8,711
G	439 WSC	0	672
G	Abilene	0	13,974
G	Acton MUD	0	407
G	Alvarado	0	0
G	Anson	0	0
G	Aquilla WSD	0	0
G	Arlington	10,831	46,600
G	Bell County WCID 1	8,270	9,900
G	Bell County WCID 3	374	2,237
G	Bellmead	0	0
G	Belton	0	2,706
G	Bethesda WSC	837	4,900
G	Bistone Municipal Water Supply District	1,795	1,698
G	Bluebonnet WSC	228	454
G	Brandon Irene WSC	62	170
G	Brazos River Authority	86,953	137,257
G	Brenham	0	195
G	Bruceville Eddy	41	744
G	Brushy Creek MUD	790	914
G	Bryan	13,216	41,065
G	Burleson	1,121	6,513
G	Cameron	1,428	1,242
G	Cedar Park	2,575	2,921

Reporting region	Major water provider name	2030	2080
G	Central Texas WSC	6,553	6,469
G	Cisco	0	12
G	Cleburne	0	6,060
G	Clifton	0	380
G	College Station	7,548	17,056
G	Colorado River MWD	7,897	17,260
G	Copperas Cove	0	3,297
G	Corix Utilities Texas Inc	745	1,333
G	Coryell City Water Supply District	0	0
G	Cross Country WSC	0	375
G	Dog Ridge WSC	102	516
G	Double Diamond Utilities	712	2,188
G	Dublin	0	0
G	Eastland County WSD	1,012	1,170
G	Fern Bluff MUD	2	111
G	FHLM WSC	0	0
G	Files Valley WSC	143	418
G	Fort Hood	0	0
G	Fort Worth	47,580	222,274
G	Gatesville	1,287	2,246
G	Georgetown	12,995	164,009
G	Gholson WSC	0	246
G	Giddings	0	0
G	Gordon	166	161
G	Graham	2,124	2,418
G	Granbury	767	3,259
G	Harker Heights	0	2,443
G	Hewitt	740	729
G	Hilco United Services	328	612
G	Hillsboro	0	550
G	Huntsville	0	3,831
G	Hutto	1,400	12,601
G	Jarrell-Schwertner	3,583	6,384
G	Johnson County SUD	1,025	10,230
G	Jonah Water SUD	2,201	19,652
G	Keene	0	0
G	Kempner WSC	971	961

Reporting region	Major water provider name	2030	2080
G	Killeen	0	6,217
G	Lacy Lakeview	0	0
G	Lampasas	432	977
G	Leander	9,578	17,375
G	Liberty Hill	0	1,416
G	Lower Colorado River Authority	11,047	11,483
G	Mansfield	20,115	50,783
G	Manville WSC	0	0
G	Marlin	0	0
G	McGregor	253	1,011
G	Mexia	1,678	1,452
G	Mineral Wells	1,109	2,322
G	Morgans Point Resort	0	0
G	Mountain Peak SUD	4,591	20,015
G	Navasota	0	0
G	North Bosque WSC	0	370
G	North Central Texas Municipal Water Authority	1,482	1,629
G	Palo Pinto County MWD 1	3,670	4,588
G	Potosi WSC	857	1,682
G	Robinson	0	2,598
G	Rockdale	0	17
G	Round Rock	0	12,093
G	Salado WSC	0	1,413
G	Salt Fork Water Quality Corporation	0	0
G	Somervell County Water District	238	166
G	Sonterra MUD	936	9,638
G	Southwest Milam WSC	0	0
G	Stamford	0	0
G	Steamboat Mountain WSC	732	2,029
G	Stephenville	0	1,260
G	Sweetwater	1,098	958
G	Tarrant Regional WD	82,273	395,617
G	Taylor	2,090	10,996
G	Temple	0	13,239
G	Texas A&M University	4,349	3,988
G	Texas State Technical College	336	335
G	Upper Leon MWD	0	0

Reporting region	Major water provider name	2030	2080
G	Venus	0	33
G	Waco	7,269	28,244
G	Wellborn SUD	0	6,553
G	West Central Texas MWD	235	0
G	Wickson Creek SUD	0	2,876
G	Williamson County MUD 11	106	2,714
G	Williamson County WSID 3	118	1,963
G	Woodway	0	0
H	Brazos River Authority	0	34,032
H	Brazosport Water Authority	3,553	5,519
H	Chambers-Liberty Counties Navigation District	0	0
H	Dow Inc	0	35,183
H	Gulf Coast Water Authority	7,051	11,225
H	Houston	193,467	435,710
H	Huntsville	0	3,831
H	Lower Neches Valley Authority	0	0
H	Missouri City	12	706
H	North Fort Bend Water Authority	22,222	49,663
H	North Harris County Regional Water Authority	52,229	95,332
H	NRG	37,701	14,835
H	San Jacinto River Authority	53,617	151,993
H	Trinity River Authority	0	0
H	West Harris County Regional Water Authority	19,879	44,350
I	Angelina & Neches River Authority	0	75,399
I	Angelina Nacogdoches WCID 1	0	0
I	Athens Municipal Water Authority	0	4,145
I	Beaumont	7,008	8,789
I	Carthage	0	0
I	Center	1,139	1,652
I	Houston County WCID 1	0	0
I	Jacksonville	0	0
I	Lower Neches Valley Authority	0	0
I	Lufkin	0	0
I	Nacogdoches	0	0
I	Panola County FWSD 1	0	0
I	Port Arthur	0	0
I	Sabine River Authority	0	0

Reporting region	Major water provider name	2030	2080
I	Tyler	0	0
I	Upper Neches River Municipal Water Authority	33,137	43,259
J	Del Rio Utilities Commission	8,608	8,741
K	Austin	2,800	102,860
K	Lower Colorado River Authority	302	90,395
L	Canyon Lake Water Service	0	18,379
L	Guadalupe-Blanco River Authority	0	0
L	New Braunfels	0	88,362
L	San Antonio Water System	0	40,390
L	San Marcos	90	15,788
M	Agua SUD	0	0
M	Alamo	0	0
M	Bayview Irrigation District 11	12,433	12,472
M	Brownsville	0	0
M	Brownsville Irrigation District	23,392	23,466
M	Cameron County Irrigation District 10	16,003	16,080
M	Cameron County Irrigation District 2	106,039	107,251
M	Cameron County Irrigation District 6	48,396	48,624
M	Delta Lake Irrigation District	30,071	29,862
M	Donna Irrigation District-Hidalgo County 1	12,929	12,836
M	Eagle Pass	0	1,486
M	East Rio Hondo WSC	0	1,216
M	Edinburg	451	2,565
M	Harlingen	0	0
M	Harlingen Irrigation District-Cameron County 1	14,502	14,575
M	Hidalgo County Irrigation District 1	16,381	16,307
M	Hidalgo County Irrigation District 16	4,976	4,946
M	Hidalgo County Irrigation District 2	24,101	23,985
M	Hidalgo County Irrigation District 6	6,222	6,189
M	Hidalgo County WID 3	2,066	2,063
M	Hidalgo-Cameron County Irrigation District 9	26,223	26,047
M	La Feria Irrigation District-Cameron County 3	13,391	12,398
M	Laguna Madre Water District	0	0
M	Laredo	0	0
M	McAllen	5,011	18,730
M	Military Highway WSC	0	0
M	Mission	0	2,764

Reporting region	Major water provider name	2030	2080
M	North Alamo WSC	12,939	19,740
M	Pharr	1,803	3,244
M	Rio Grande City	214	1,109
M	San Benito	0	0
M	San Juan	0	0
M	Sharyland WSC	0	1,516
M	Southmost Regional Water Authority	0	0
M	United Irrigation District	19,118	19,173
M	Weslaco	0	0
N	Alice	0	0
N	Corpus Christi	33,672	50,889
N	San Patricio MWD	1,454	1,951
N	South Texas Water Authority	0	0
N	Nueces County WCID 3	3,383	3,370
O	Canadian River Municipal Water Authority	3,943	20,875
O	Lubbock	10,641	61,830
O	Mackenzie Municipal Water Authority	0	0
O	Red River Authority of Texas	0	0
O	White River MWD	0	0
P	Lavaca Navidad River Authority	3,679	4,401

[*] *Major water providers are entities designated by each regional planning group as particularly significant to the region's water supply. They may be water user groups, wholesale water providers, or both, and an entity may be designated as a major water provider in more than one region. Each region determines which entities are designated as major water providers, aggregates and calculates their water needs by category of use, and reports this information in the regional water plan. Needs presented in Table C-3 are based on regional water plan reported data, with surplus values set to zero. For entities designated as a major water provider by multiple regions, the statewide major water provider needs total reflected in Section 6.4 includes needs for those entities as reported by the entity's primary region only.*

Appendix D: Socioeconomic impact regional summary and dashboards

The TWDB assists the regional water planning groups by evaluating the social and economic impacts of not meeting identified water needs for a single year under conditions similar to the 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 the socioeconomic impact reports for all regions (Table D-1).

The regional water plan impact estimates presented in this table and the online dashboards differ slightly from the results included in Chapter 6. This is primarily due to a difference in the water needs used to estimate the impacts. The results presented here and included in the regional water plans and online dashboard reflect an analysis conducted in the spring of 2025 that used needs from the draft regional plans. Some water needs changed somewhat in the final regional water plans, and the statewide impact estimates in Chapter 6 are based on these final needs available in October 2025.

Full socioeconomic impact reports for all 16 planning regions are available on the TWDB socioeconomic impact analysis webpage (www.twdb.texas.gov/waterplanning/data/analysis).

Table D-1. Socioeconomic impact regional summary

Region	Impact measures	2030	2040	2050	2060	2070	2080
A	Income losses (millions)*	$544	$1,100	$1,758	$2,800	$3,663	$4,633
A	At risk job losses	4,703	9,437	14,905	23,724	30,768	38,394
A	Tax losses on production and imports (millions)*	$15	$43	$83	$144	$201	$270
A	At risk population out-migration	674	1,351	2,134	3,397	4,406	5,498
B	Income losses (millions)*	$1	$2	$6	$27	$59	$103
B	At risk job losses	17	46	93	154	300	537
B	Tax losses on production and imports (millions)*	$0	$0	$0	$0	$1	$2
B	At risk population out-migration	2	7	13	22	43	77
C	Income losses (millions)*	$6,867	$21,726	$32,069	$44,969	$56,590	$64,787
C	At risk job losses	48,082	138,298	204,344	283,649	353,542	404,362
C	Tax losses on production and imports (millions)*	$185	$613	$951	$1,375	$1,766	$2,068
C	At risk population out-migration	6,885	19,804	29,262	40,618	50,627	57,905
D	Income losses (millions)*	$8,587	$8,993	$9,403	$9,871	$10,447	$11,085
D	At risk job losses	62,325	65,310	68,145	71,484	75,471	79,685
D	Tax losses on production and imports (millions)*	$342	$354	$365	$378	$393	$411
D	At risk population out-migration	8,925	9,352	9,758	10,237	10,807	11,411
E	Income losses (millions)*	$6,342	$6,349	$6,356	$6,359	$6,362	$6,363
E	At risk job losses	10,243	10,318	10,369	10,392	10,413	10,433
E	Tax losses on production and imports (millions)*	$554	$555	$555	$555	$555	$556
E	At risk population out-migration	1,467	1,477	1,485	1,488	1,491	1,494
F	Income losses (millions)*	$11,555	$11,775	$10,787	$8,647	$6,784	$6,008
F	At risk job losses	31,450	32,354	30,169	24,843	20,345	19,160
F	Tax losses on production and imports (millions)*	$1,610	$1,630	$1,470	$1,141	$854	$722
F	At risk population out-migration	4,504	4,633	4,320	3,557	2,913	2,744
G	Income losses (millions)*	$9,244	$9,714	$11,019	$11,697	$12,133	$13,097
G	At risk job losses	41,068	46,695	59,306	67,542	75,426	86,417
G	Tax losses on production and imports (millions)*	$684	$707	$764	$793	$803	$844
G	At risk population out-migration	5,881	6,687	8,493	9,672	10,801	12,375
H	Income losses (millions)*	$10,802	$14,782	$19,074	$23,676	$29,117	$35,971

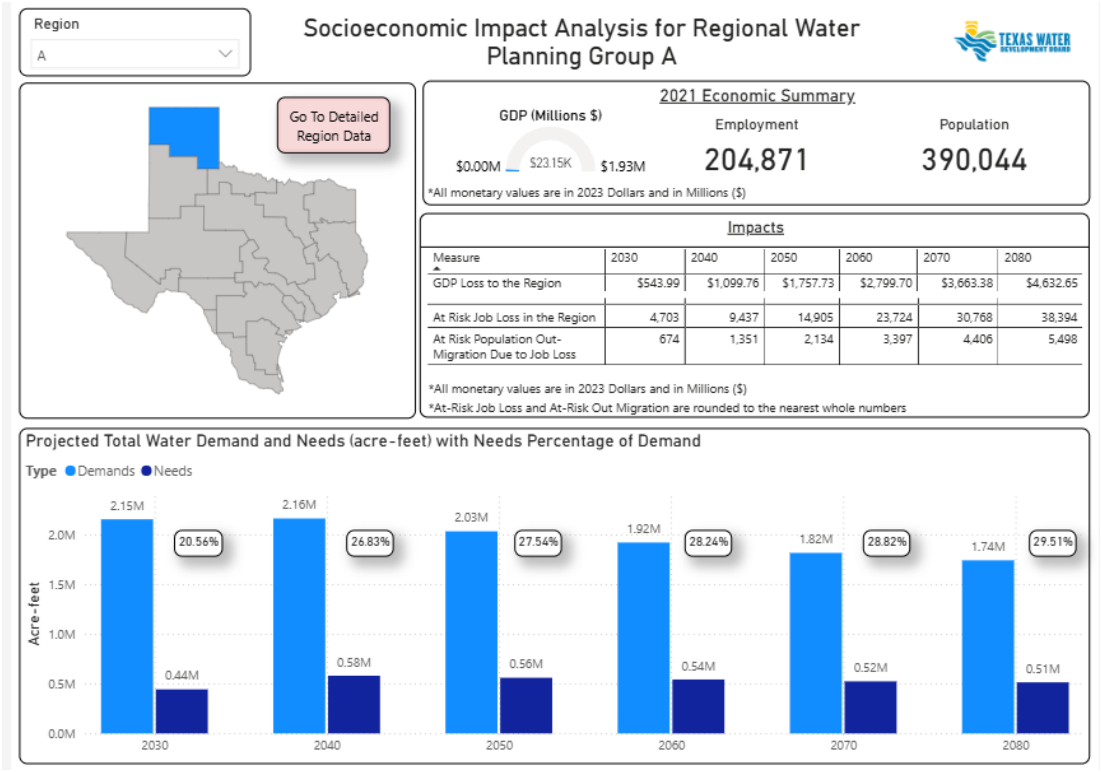
Region	Impact measures	2030	2040	2050	2060	2070	2080
H	At risk job losses	59,628	87,035	109,536	132,529	158,576	191,244
H	Tax losses on production and imports (millions)*	$540	$755	$1,024	$1,317	$1,670	$2,116
H	At risk population out-migration	8,539	12,463	15,686	18,978	22,708	27,386
I	Income losses (millions)*	$2,414	$4,689	$10,784	$19,208	$26,567	$32,643
I	At risk job losses	17,185	26,215	48,414	78,723	106,029	128,337
I	Tax losses on production and imports (millions)*	$113	$267	$692	$1,280	$1,789	$2,215
I	At risk population out-migration	2,461	3,754	6,933	11,273	15,183	18,378
J	Income losses (millions)*	$52	$55	$58	$63	$69	$76
J	At risk job losses	875	921	965	1,043	1,132	1,226
J	Tax losses on production and imports (millions)*	$3	$3	$3	$3	$3	$4
J	At risk population out-migration	125	132	138	149	162	176
K	Income losses (millions)*	$527	$516	$706	$987	$1,550	$2,415
K	At risk job losses	5,019	5,671	7,375	9,705	14,889	23,167
K	Tax losses on production and imports (millions)*	$23	$19	$27	$41	$65	$100
K	At risk population out-migration	719	812	1,056	1,390	2,132	3,318
L	Income losses (millions)*	$29,830	$30,815	$32,126	$33,578	$35,289	$16,763
L	At risk job losses	148,463	156,161	167,856	180,974	196,508	145,580
L	Tax losses on production and imports (millions)*	$2,711	$2,774	$2,850	$2,929	$3,019	$712
L	At risk population out-migration	21,260	22,362	24,037	25,916	28,140	20,847
M	Income losses (millions)*	$2,820	$2,824	$2,851	$2,854	$2,907	$288
M	At risk job losses	11,543	11,518	11,868	11,828	11,951	5,574
M	Tax losses on production and imports (millions)*	$316	$317	$319	$319	$326	$7
M	At risk population out-migration	1,653	1,649	1,699	1,694	1,711	798
N	Income losses (millions)*	$11,606	$12,709	$13,540	$14,248	$15,033	$15,761
N	At risk job losses	49,181	53,813	57,287	60,241	63,515	66,605
N	Tax losses on production and imports (millions)*	$612	$671	$715	$752	$794	$833
N	At risk population out-migration	7,043	7,706	8,204	8,626	9,095	9,538
O	Income losses (millions)*	$268	$381	$409	$411	$523	$623
O	At risk job losses	3,486	5,143	5,960	6,325	8,059	9,602
O	Tax losses on production and imports (millions)*	$1	$5	$14	$21	$27	$33
O	At risk population out-migration	499	736	854	906	1,154	1,375
P	Income losses (millions)*	$2,152	$2,818	$2,841	$2,864	$2,888	$2,914
P	At risk job losses	13,562	17,739	17,882	18,023	18,171	18,336
P	Tax losses on production and imports (millions)*	$94	$123	$124	$125	$126	$127
P	At risk population out-migration	1,942	2,540	2,561	2,581	2,602	2,626

** Year 2023 dollars, rounded.*

Interactive dashboard

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 interactive Socioeconomic Impact Analysis Dashboard (Figure D-1) at www.twdb.texas.gov/waterplanning/data/analysis. The dashboard displays water demands and needs, as well as potential social and economic impacts of not meeting water needs for a single year under drought-of-record conditions.

Figure D-1. TWDB Socioeconomic Impact Analysis Dashboard



Appendix E: Reported implementation status of large projects as of October 2025

Table E-1. Current progress and status of milestones for certain large projects as reported in the 2026 regional water plans*

								Permitting status (as applicable)						Planning, design, and construction status				
						Sponsor actions		State water right permitting		Federal permitting		Other permitting		Geotech/ Design	Land acquisition		Construction	
Project type	**Project name**	**Region**	**Sponsor**	**Online decade**	**Capital cost**	**Local action taken**	**Sponsor funds spent**	**Apply for water right**	**Water right issued**	**Apply for 404 permit**	**404 permit issued**	**Begun**	**Complete**	**Begun**	**Begun**	**Complete**	**Begun**	**Complete**
Aquifer storage and recovery (>10,000 AFY)	Austin – Aquifer Storage and Recovery	K	Austin	2040	$1,526,577,000													
	Bryan ASR (Carrizo-Wilcox)	G	Bryan	2030	$110,082,000													
	Lubbock CRMWA Aquifer Storage and Recovery	O	Lubbock	2080	$194,659,000													
	LCRA – Aquifer Storage and Recovery	K	Lower Colorado River Authority	2050	$1,009,936,000													
	Medina County Regional ASR	L	East Medina County SUD; Yancey WSC	2040	$442,087,000													
Aquifer storage and recovery (>10,000 AFY); Brackish groundwater desalination (>10,000 AFY); New reservoir	GBRA WaterSECURE	L	Guadalupe-Blanco River Authority	2040	$6,185,869,000													
Brackish groundwater desalination (>10,000 AFY)	CRWA Expanded Brackish Carrizo-Wilcox Project	L	Canyon Regional Water Authority	2040	$332,516,000													
	EV Ranch Brackish Groundwater Desalination	N	Corpus Christi	2030	$1,102,062,000													
	Evangeline/Laguna Treated Groundwater	N	Corpus Christi	2030	$486,499,000													
	Gonzales & Guadalupe Brackish Partnership Project	L	County Line SUD; Maxwell SUD; Municipal county-other (Caldwell)	2040	$421,443,000													
	SAWS Expanded Brackish Groundwater Project	L	San Antonio Water System	2040	$319,181,000													
	SAWS Regional Wilcox Project	L	San Antonio Water System	2050	$1,267,722,000													
	Southmost RWA Phase 4 SRWA Wellfield and WTP Expansion	M	Southmost Regional Water Authority	2030	$177,392,000													
	West Texas Water Partnership	F	Abilene; Midland; San Angelo	2040	$796,828,000													
Direct potable reuse (>5,000 AFY)	Advanced Water Purification at the Bustamante WWTP	E	El Paso Water	2030	$295,417,000													
	ARWA DPR (Phase 3) Project	L	Alliance Regional Water Authority	2060	$119,879,000													
	City of Corpus Christi Oso WWTP Reuse	N	Corpus Christi	2040	$614,038,000													

								Permitting status (as applicable)						Planning, design, and construction status				
						Sponsor actions		State water right permitting		Federal permitting		Other permitting		Geotech/ Design	Land acquisition		Construction	
Project type	**Project name**	**Region**	**Sponsor**	**Online decade**	**Capital cost**	**Local action taken**	**Sponsor funds spent**	**Apply for water right**	**Water right issued**	**Apply for 404 permit**	**404 permit issued**	**Begun**	**Complete**	**Begun**	**Begun**	**Complete**	**Begun**	**Complete**
Direct potable reuse (>5,000 AFY)	Georgetown Reclamation	G	Georgetown	2030	$494,826,000													
	Lubbock County – Lubbock Direct Potable Reuse to North Water Treatment Plant	O	Lubbock	2030	$169,550,000													
	Lubbock County – Lubbock DPR to NWWTP	O	Lubbock	2070	$127,576,000													
	Midland Potable Reuse	F	Midland	2030	$120,346,000													
	New Braunfels Potable Reuse	L	New Braunfels	2050	$74,504,000													
	Southside WWTP Potable Reuse Phase I and II	M	Brownsville	2050	$52,618,000													
New reservoir	Allens Creek Reservoir	H	Brazos River Authority	2040	$493,919,561													
	Banco Morales Reservoir	M	Brownsville	2040	$14,638,000													
	Beaumont West Regional Reservoir	I	Lower Neches Valley Authority	2030	$252,586,000													
	Brushy Creek Reservoir	G	Marlin	2040	$59,720,000													
	Cedar Ridge Reservoir	G	Abilene	2040	$540,102,000													
	Coryell County OCR	G	Multi County WSC	2050	$120,699,000													
	Dow Harris Reservoir Expansion	H	Brazosport Water Authority; Dow Inc	2030	$564,553,742													
	DWU Main Stem Balancing OCR	C	Dallas	2050	$1,767,099,000													
	EKCRWSP Off-Channel Surface Water Storage	J	Municipal county-other (Kerr)	2040	$39,053,000													
	GBRA Lower Basin New Appropriation OCR	L	Guadalupe-Blanco River Authority	2040	$249,823,000													
	Groesbeck Off Channel Reservoir- Groesbeck	G	Groesbeck	2040	$35,278,000													
	HCDD#1 – Delta Panchita Reservoir	M	Hidalgo County Drainage District 1	2040	$89,113,000													
	HCDD#1 – Engleman Reservoir	M	Hidalgo County Drainage District 1	2050	$33,665,000													
	HCDD#1 – Santa Cruz Reservoir	M	Hidalgo County Drainage District 1	2030	$120,121,000													
	Jim Bertram Lake 7	O	Lubbock	2040	$482,917,000													
	Lake Columbia	I	Angelina and Neches River Authority	2040	$486,368,000													
	Lake Creek Reservoir	G	North Central Texas Municipal Water Authority	2050	$236,072,000													
	Lake Ringgold	B	Wichita Falls	2040	$559,953,000													
	Lavaca River OCR	P	Lavaca Navidad River Authority	2040	$392,561,000													

								Permitting status (as applicable)						Planning, design, and construction status				
						Sponsor actions		State water right permitting		Federal permitting		Other permitting		Geotech/ Design	Land acquisition		Construction	
Project type	**Project name**	**Region**	**Sponsor**	**Online decade**	**Capital cost**	**Local action taken**	**Sponsor funds spent**	**Apply for water right**	**Water right issued**	**Apply for 404 permit**	**404 permit issued**	**Begun**	**Complete**	**Begun**	**Begun**	**Complete**	**Begun**	**Complete**
New reservoir	LCRA New OCR	K	Lower Colorado River Authority	2050	$4,072,661,000													
	Local Balancing Storage	N	Nueces County WCID 3	2030	$26,014,000													
	Marvin Nichols Reservoir	C	North Texas MWD; Tarrant Regional WD; Upper Trinity Regional WD	2070	$7,364,973,000													
	New Throckmorton Reservoir	G	Throckmorton	2050	$89,139,000													
	Riverside Regulating Reservoir	E	Irrigation (El Paso)	2040	$9,922,500													
	Sabine River OCR	C	Dallas	2080	$903,296,000													
	Tehuacana Reservoir	C	Tarrant Regional WD	2050	$575,134,000													
	Turkey Peak Reservoir	G	Palo Pinto County MWD 1	2030	$200,789,000													
Seawater desalination	Corpus Christi Barney Davis	N	Corpus Christi	2040	$582,000,000													
	Corpus Christi Inner Harbor	N	Corpus Christi	2030	$1,233,812,464													
	Corpus Christi La Quinta Channel	N	Corpus Christi	2040	$1,141,000,000													
	GCWA Coastal Desalination	H	Gulf Coast Water Authority	2040	$283,297,581													
	Laguna Madre Water District Seawater Desalination Plant	M	Laguna Madre Water District	2030	$127,001,000													
	LCRA – Seawater Desalination	K	Lower Colorado River Authority	2060	$3,559,691,000													
	Port of Corpus Christi Authority Seawater Desalination – Harbor Island	N	Port of Corpus Christi Authority	2030	$3,456,000,000													
	Port of Corpus Christi Authority Seawater Desalination – La Quinta Channel	N	Port of Corpus Christi Authority	2040	$844,000,000													

** Colors indicate milestones achieved. Activities are shown in a generalized order of execution but are not sequential and may occur simultaneously. Some activities may not be applicable to all projects. Status based on information reported in the 2026 regional water plans submitted to the TWDB in October 2025.*

- Local action taken to authorize expenditures
- Sponsor funds spent
- Applied for state water right
- State water right issued
- Applied for Federal 404 permit
- Federal 404 permit issued
- Applied for other key permit
- Other key permit issued
- Geotech/design started
- Land acquisition started
- Land acquisition complete
- Construction started
- Construction is complete, and project is operating.

> – greater than
AFY – acre-feet per year
ASR – aquifer storage and recovery
DPR – direct potable reuse
OCR – off-channel reservoir
SUD – special utility district
WSC – water supply corporation
WTP – water treatment plant
WWTP – wastewater treatment plant

Appendix F: Supplemental content

The following supplemental content is available on the 2027 State Water Plan webpage at www.twdb.texas.gov/waterplanning/swp/2027.

Additional maps

- Groundwater conservation districts
- Existing major water supply reservoirs
- Recommended new major water supply reservoirs

Supporting data spreadsheets

- **Projected needs of every water user group, as a share of total demand (percent)** – Water supply needs expressed as a percent of the water user group's total demand provide an indicator of the severity of need. The larger the percent of an entity's total demand indicates a more severe potential shortage. This spreadsheet includes the information presented in Appendix C, Table C-2, for all water user groups.
- **List of recommended water management strategies** by water user group, with associated strategy supply volume.
- **List of recommended water management strategy projects**, with associated sponsors, costs, and online date.
- **Temporary emergency response options for entities with a population of 7,500 or less that rely on a sole source of water** as determined by the regional water planning groups in the 2026 regional water plans.
- **Municipal gallons per capita per day (GPCD) goals** as determined by the regional water planning groups in the 2026 regional water plans.

Interactive tools and dashboards

- **Interactive state water plan** (2027.texasstatewaterplan.org) – A TWDB website that allows water users statewide take an up-close look at data in the 2027 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.
- **State water plan analysis dashboard** – A TWDB interactive dashboard that allows users to analyze water user group needs, demands, and existing supplies on a more localized level. Users can see the severity of a water user group's water needs, how these needs change over time, how these needs could be met by recommended water management strategies, and to what level the water user group relies on purchased versus self-supplied water supplies (anticipated to be available in 2027).

Regional and county summaries

- **2026 Regional Water Plan Summaries** – Overview documents of each of the 2026 Regional Water Plans (anticipated to be available by November 2026).
- **Water supply planning county summaries** – Looking for a summary of planning information for your county? These documents summarize key water supply planning information for each county in Texas and highlight available TWDB water supply planning and drought resources (anticipated to be available by November 2026).