



Executive summary

Water for Texas
2017 State Water Plan
Texas Water Development Board

Quick facts

Texas' state water plans are based on future conditions that would exist in the event of 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.

Texas' population is expected to increase more than 70 percent between 2020 and 2070, from 29.5 million to 51 million, with over half of this growth occurring in Regions C and H. Water demands are projected to increase less significantly, by approximately 17 percent between 2020 and 2070, from 18.4 million to 21.6 million acre-feet per year.

Texas' existing water supplies—those that can already be relied on in the event of drought—are expected to decline by approximately 11 percent between 2020 and 2070, from 15.2 million to 13.6 million acre-feet per year.

Water user groups face a potential water shortage of 4.8 million acre-feet per year in 2020 and 8.9 million acre-feet per year in 2070 in drought of record conditions.

Approximately 5,500 water management strategies recommended in this plan would provide 3.4 million acre-feet per year in additional water supplies to water user groups in 2020 and 8.5 million acre-feet per year in 2070.

The estimated capital cost to design, construct, and implement the approximately 2,500 recommended water management strategy projects by 2070 is \$63 billion.

If strategies are not implemented, approximately one-third of Texas' population would have less than half the municipal water supplies they will require during a drought of record in 2070.

If Texas does not implement the state water plan, estimated annual economic losses resulting from water shortages would range from approximately \$73 billion in 2020 to \$151 billion in 2070.

Through SWIFT and other financial assistance programs, the TWDB has provided \$1.9 billion in financial assistance to approximately 60 state water plan projects recommended in the 2012 State Water Plan.

Why do we plan?

Texas is home to a thriving, diverse, and innovative economy. To ensure the ongoing vitality of our economy, Texas' citizens, water experts, and government agencies collaborate in a comprehensive water planning process. We plan so that Texans will have enough water in the future to sustain our cities and rural communities, our farms and ranches, and our homes and

businesses while also preserving the agricultural and natural resources that have defined Texas for generations.

Texas also has one of the fastest growing populations in the country. In 1950, only 8 million people lived in Texas. In 2010, approximately 25 million people called Texas home. By 2070, 51 million people are expected to live in the Lone Star State, all of whom will need water to work and live.

The goal of the water planning process is to ensure that we have adequate water supplies in times of drought. Water is Texas' most precious natural resource and is routinely threatened during our state's recurring periods of drought. Texas has a long history of drought, and there is no sign of that pattern changing; in fact, recent droughts remind us that more severe drought conditions could occur in the future. The drought of the 1950s is considered the "drought of record" for Texas and remains the benchmark for the water planning process.

Ensuring that we have adequate and affordable water supplies for all Texans requires advance planning. The Texas Water Development Board (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. Each new state water plan, which considers a 50-year horizon, must reflect and respond to changes in population, water supplies, technological improvements, economic shifts, project viability, and state policy.

Figure ES.1 - Regional water planning areas

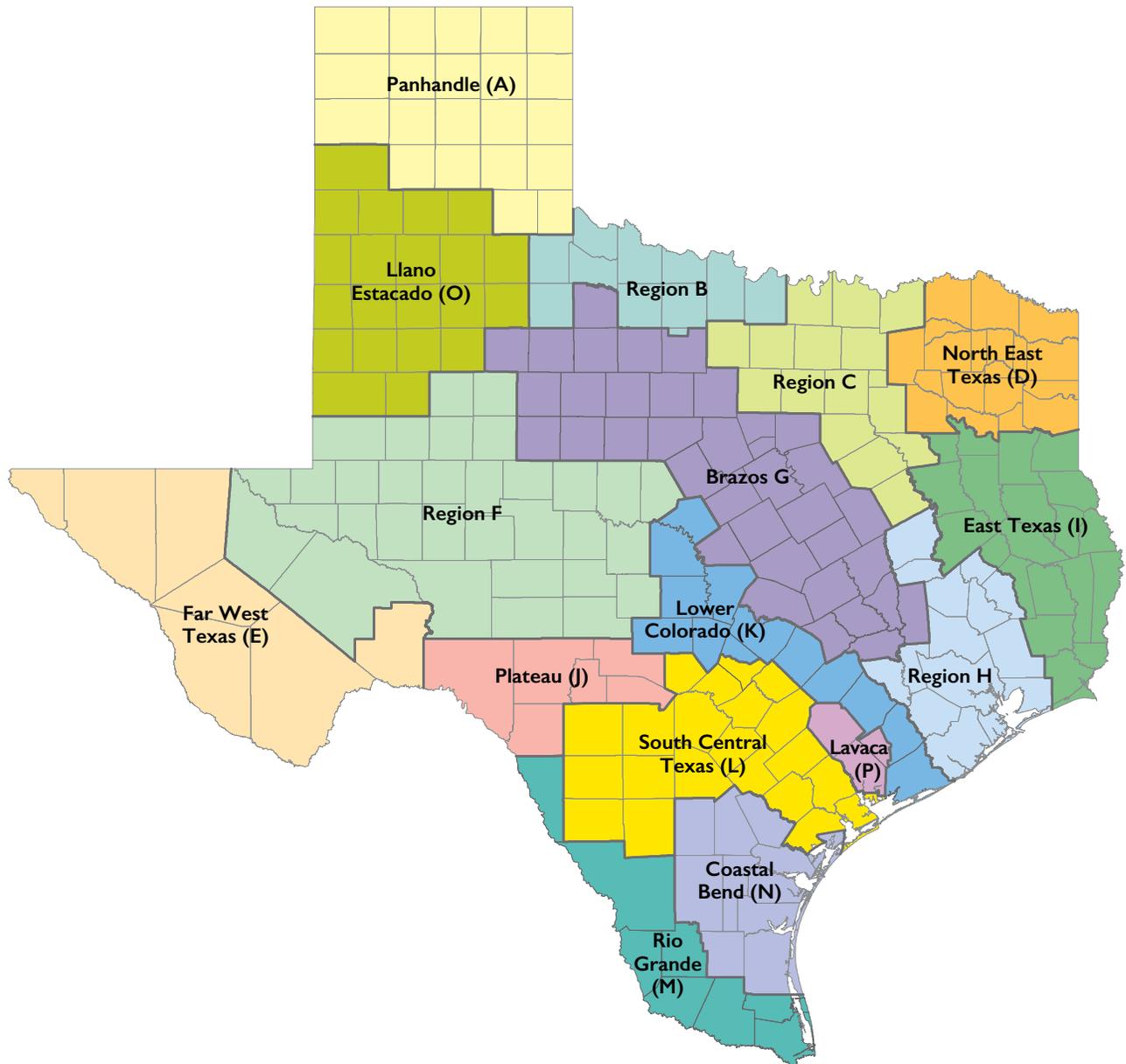
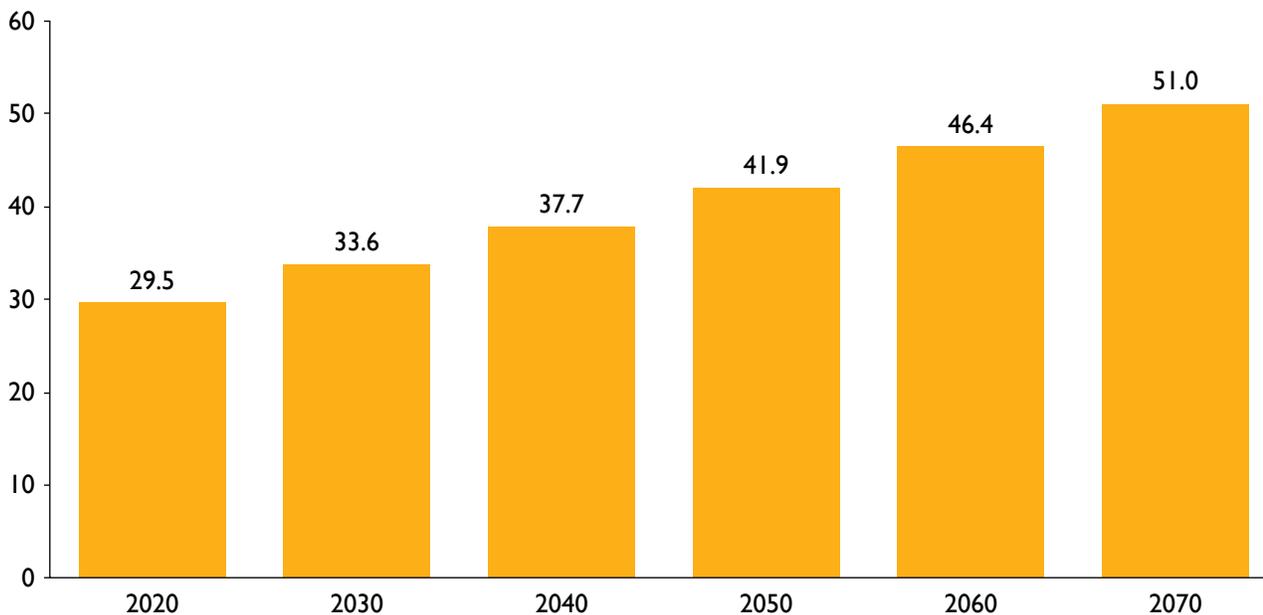


Figure ES.2 - Projected population in Texas (millions)



Water is critical to the future of Texas, and responsible planning ensures that we are addressing both the short- and long-term water needs of the state. Providing sufficient water supplies at reasonable costs presents new challenges with each planning cycle. Among those challenges are the increased costs of developing water supply projects that often require many years to implement.

How do we plan?

Since 1997, water planning in Texas has been based on a “bottom-up” approach focused at the regional level. The state is divided into 16 regional water planning areas (Figure ES.1). Each planning area is represented by a planning group that, on average, consists of about 23 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. Each planning group then identifies water shortages under drought of record conditions and recommends water management strategies (with cost estimates) to address those potential shortages. The bottom-up approach allows the planning groups to assess specific risks and uncertainties in their own regions and evaluate potential impacts of water management strategies on their region as well as on the state’s water, agricultural, and natural resources.

Once the planning groups adopt their regional water plans, the plans are sent to the TWDB for approval. The TWDB then prepares the state water plan based on the regional water plans.

The state water plan also serves as a guide for state water policy and includes the TWDB’s policy recommendations to the Texas Legislature. Each step of the water planning process is open to the public and provides numerous opportunities for public input.

How many Texans will there be?

The population in Texas is expected to increase 73 percent between 2020 and 2070, from 29.5 million¹

¹ Planning numbers presented throughout this plan have been rounded.

to 51 million people (Figure ES.2). Growth rates vary considerably throughout the state. For example, 30 counties are projected to at least double their population by 2070; the rest are expected to remain the same, decline, or grow only slightly. Over half of all the statewide population growth between 2020 and 2070 is expected to occur within Regions C (which includes the Dallas-Fort Worth metropolitan area) and H (which includes the Houston metropolitan area).

greatest total amount, from 5.2 million acre-feet per year in 2020 to 8.4 million in 2070. Agricultural irrigation demand is expected to decrease, from 9.4 million acre-feet per year in 2020 to about 7.8 million in 2070, due to more efficient irrigation systems, reduced groundwater supplies, and the transfer of water rights from agricultural to municipal users. Manufacturing and livestock demands are expected to increase, while mining demand is expected to decline over the next 50 years.

How much water will we require?

While the population is projected to increase 73 percent over the next 50 years, water demand in Texas is projected to increase by only 17 percent, from about 18.4 million acre-feet per year in 2020 to about 21.6 million in 2070 (Figure ES.3). Steam-electric (power generation) demand is expected to increase in greater proportion than any other water use category, from 953,000 acre-feet per year in 2020 to 1.7 million in 2070. Municipal demands are anticipated to grow by the

How much water do we have now?

The existing water supply—categorized as surface water, groundwater, and reuse water—is projected to decrease approximately 11 percent, from 15.2 million acre-feet per year in 2020 to about 13.6 million in 2070 (Figure ES.3). For planning purposes, the existing supply represents water supplies that are physically and legally available to be produced and delivered with current permits, current contracts, and existing infrastructure during drought of record conditions.

Figure ES.3 - Projected annual water demand and existing water supply in Texas (millions of acre-feet)

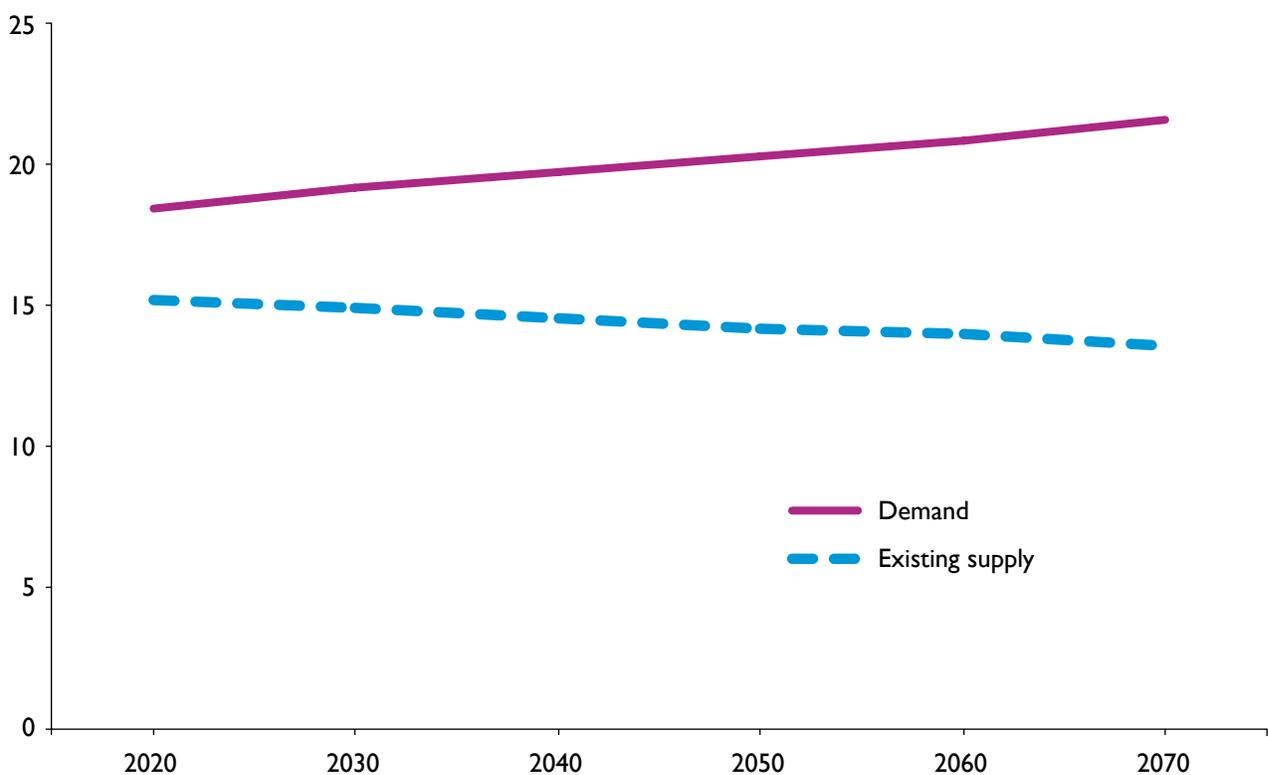
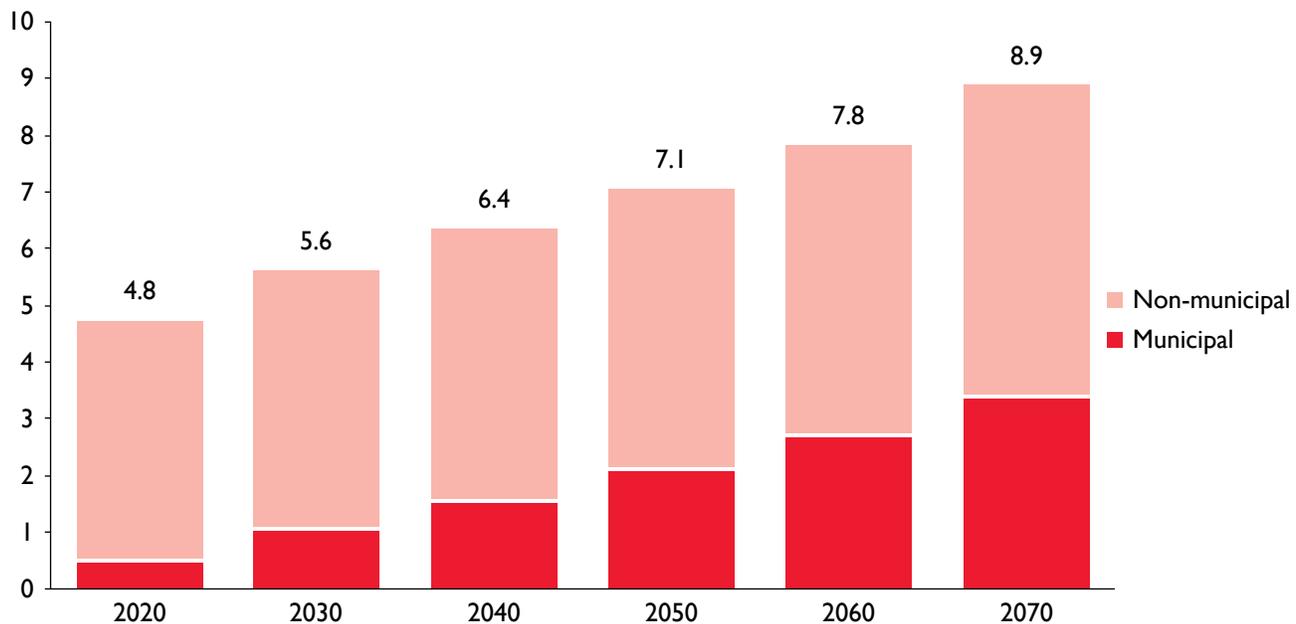


Figure ES.4 - Projected annual water needs in Texas (millions of acre-feet)



Existing surface water supplies are projected to decrease by about 1 percent, from 7.5 million acre-feet per year in 2020 to 7.4 million in 2070 due to sedimentation and changes in water contracts.

Groundwater supplies are projected to decrease 24 percent, from 7.2 million acre-feet per year in 2020 to 5.4 million in 2070. This decrease is primarily due to reduced supply from the Ogallala Aquifer (as a result of its depletion over time) and the Gulf Coast Aquifer (due to mandatory reductions in pumping to prevent land surface subsidence). Policy decisions made by groundwater conservation districts through the groundwater management area joint planning process also resulted in numerous changes to groundwater availability.

Do we have enough water for the future?

Because our existing water supply is not enough to meet our future demand for water during times of drought, Texas would need to provide 8.9 million acre-feet of *additional* water supplies, including in the form of water savings through conservation, to meet its demand for water in 2070. In the event of a recurrence of the drought of record in 2020, the

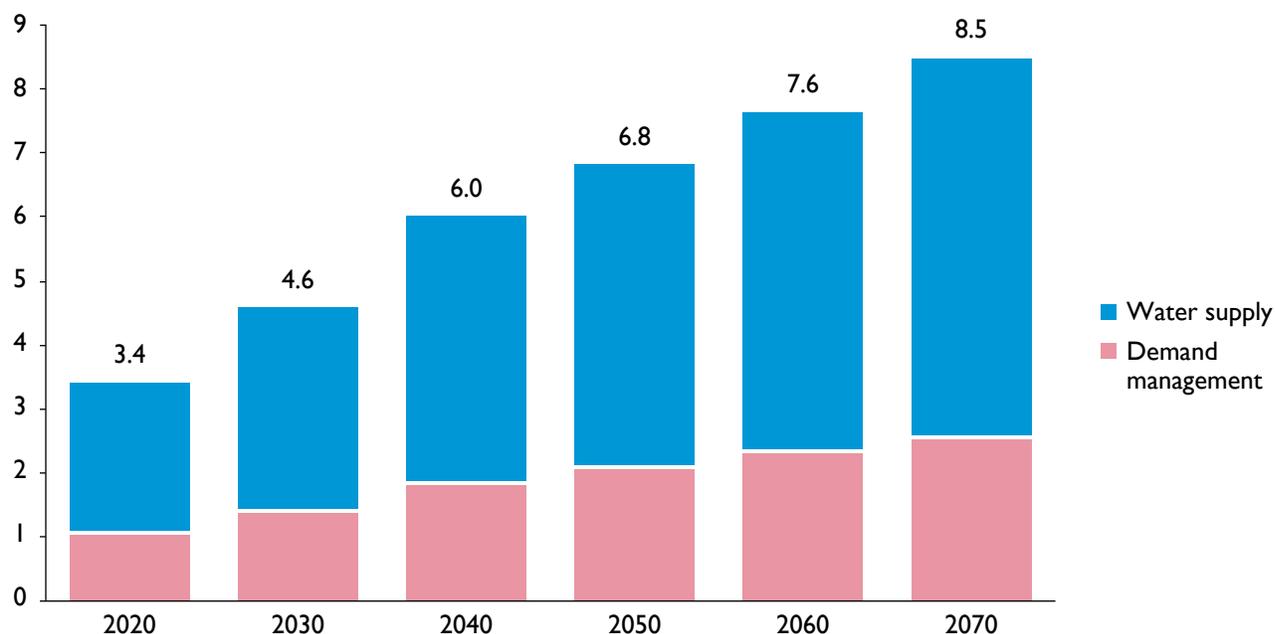
state would face an immediate need for 4.8 million acre-feet per year in additional water supplies (Figure ES.4). Of that, 11 percent, (511,000 acre-feet) would be required for municipal water users, who face the largest water demand increase over the next 50 years. Total needs are projected to increase by 87 percent between 2020 and 2070, from 4.8 million to 8.9 million acre-feet per year. In 2070, 3.4 million acre-feet per year, or 38 percent of the total needs, is associated with municipal users.

What can we do to get more water?

When the projected demand for water exceeds the existing supply, the planning groups recommend water management strategies—specific plans and associated projects—to either provide additional water supply or reduce water demand. Water management strategies include conservation, new reservoirs, groundwater wells, water reuse, seawater and groundwater desalination, and more.

In the 2017 State Water Plan, planning groups recommended approximately 5,500 water management strategies and approximately 2,500 specific

Figure ES.5 - Annual volume of recommended water management strategies (millions of acre-feet)



water management strategy projects to increase the water supply. Strategies may or may not require new water infrastructure—referred to as water management strategy projects—to be developed. If implemented, these strategies would provide 8.5 million acre-feet per year in additional water supplies to water user groups by 2070 (Figure ES.5).

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.

By 2070, about 30 percent of the total volume of these strategies would be in the form of demand management. Demand management refers to measures that reduce the need for additional water, such as conservation and drought management. Drought management includes activities that temporarily restrict water use for certain types of activities and businesses.

Surface water resources, including new reservoirs, compose the greatest portion of the recommended water management strategy supplies in 2070 at approximately 45 percent. Reuse is

expected to provide approximately 14 percent, groundwater resources approximately 10 percent, and seawater desalination about 1 percent of additional supplies to water user groups (Figure ES.6).

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.7). The types of recommended strategies depended on the region, available water resources, and water needs.

Some planning groups recommended strategies that, if implemented, would provide more water than may be required to meet their region's water needs 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;
- unanticipated reduction in existing water supplies;
- the occurrence of a drought worse than the drought of record;

Figure ES.6 - Share of recommended water management strategies by water resource in 2070

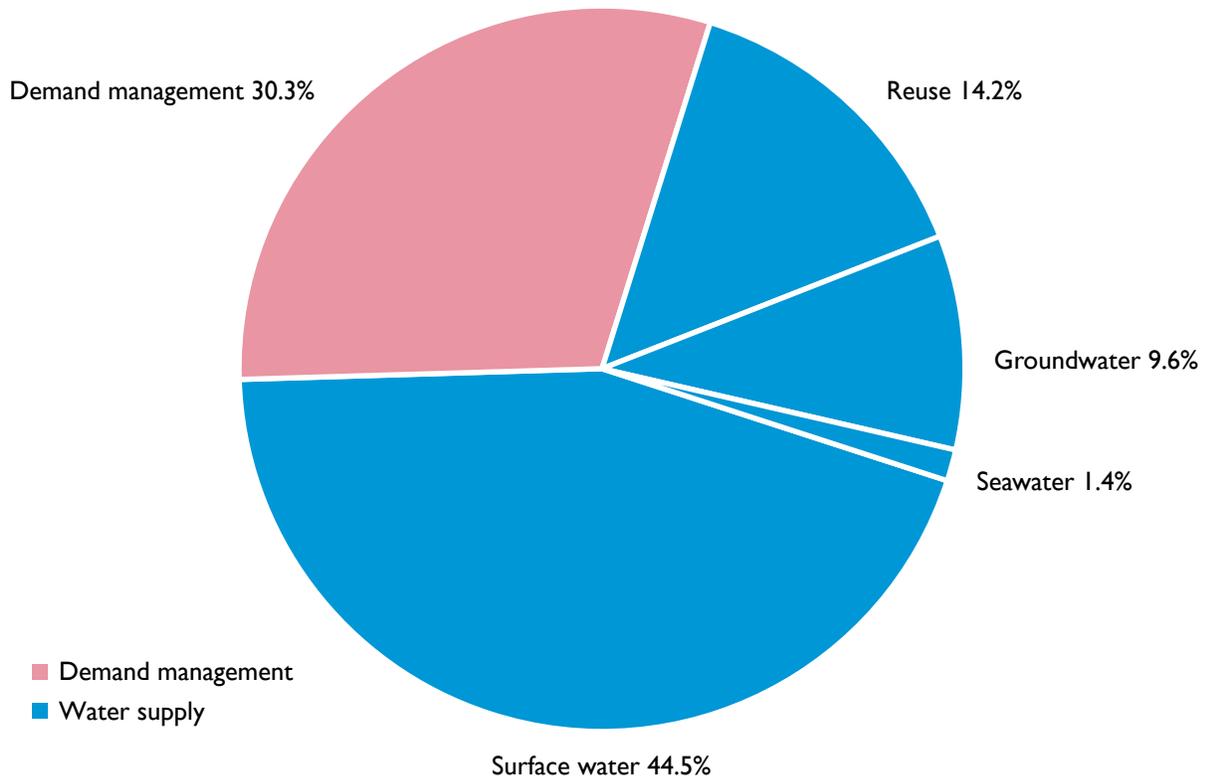


Figure ES.7 - Share of recommended water management strategies by strategy type in 2070

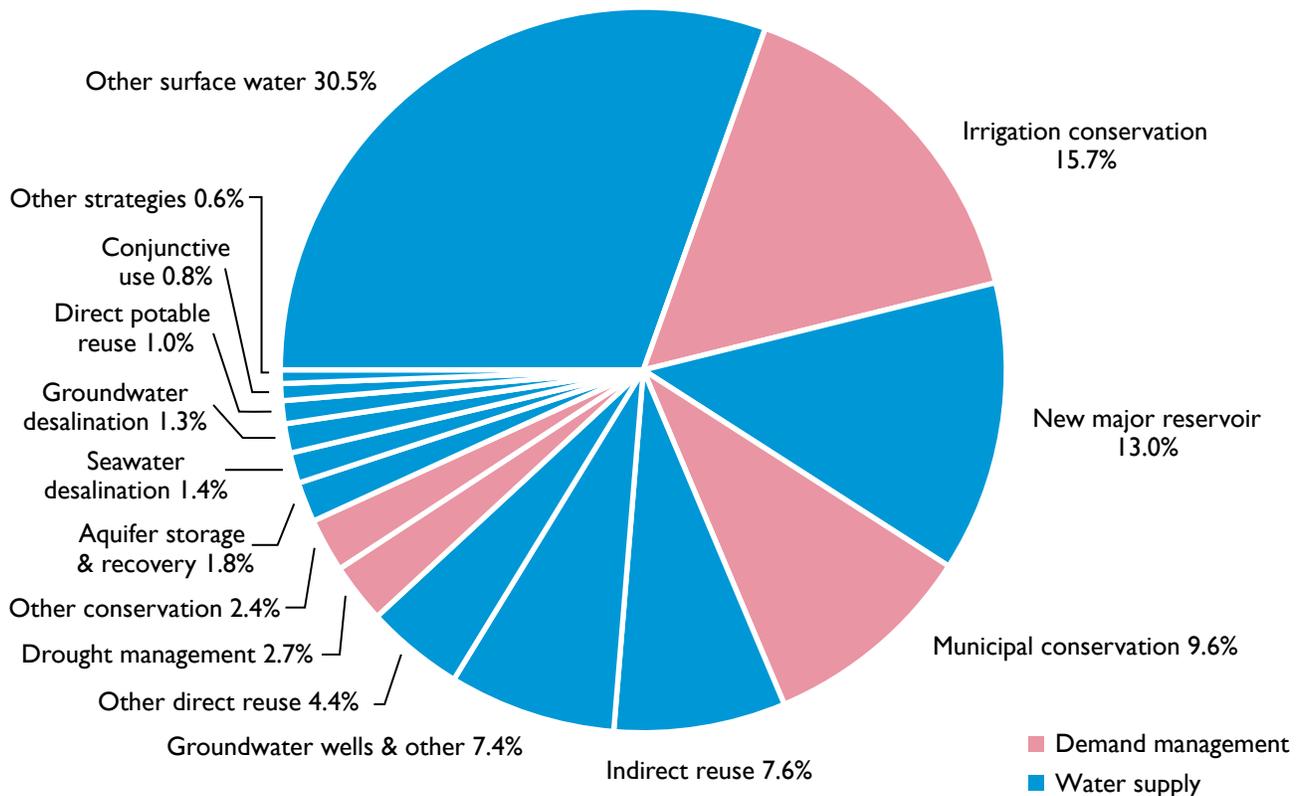


Figure ES.8 - Annual water supply needs and needs met by the plan by region in 2070 (acre-feet)

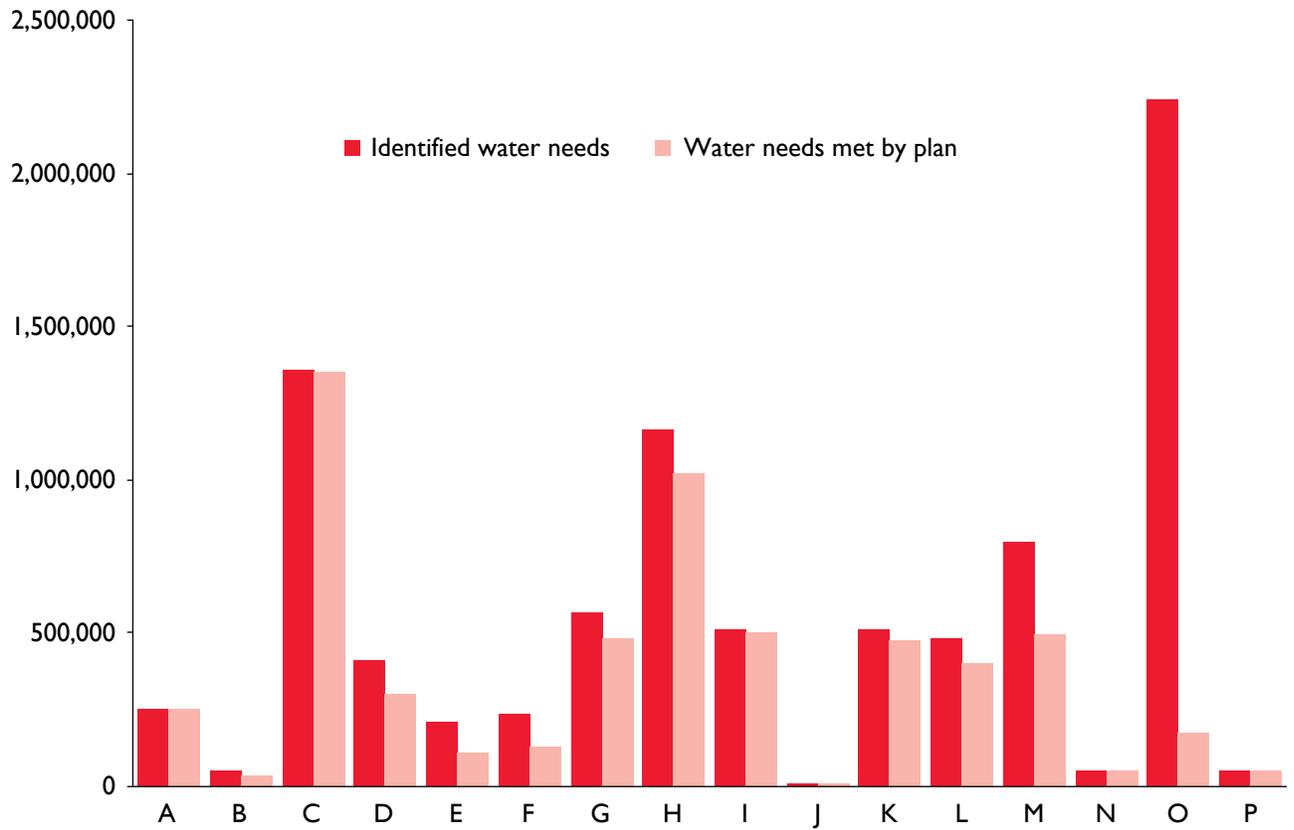
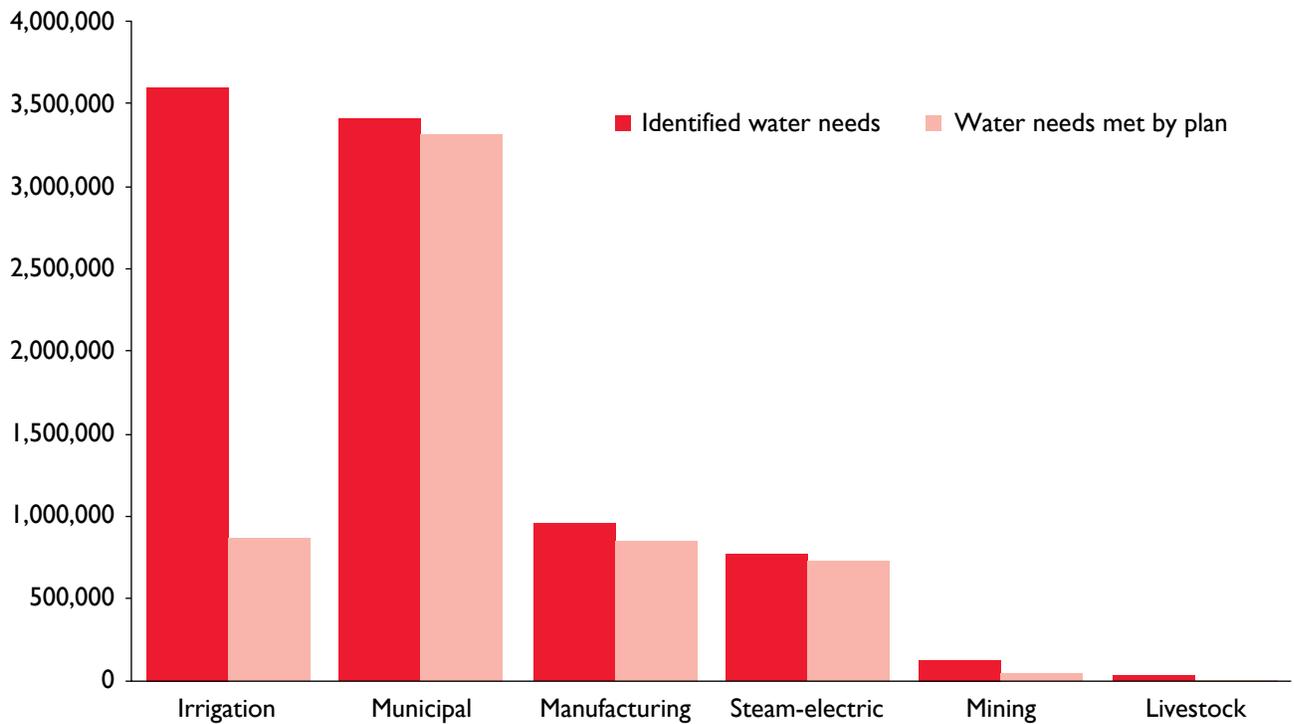


Figure ES.9 - Annual water supply needs and needs met by the plan by water use category in 2070 (acre-feet)



- water system operation, treatment losses, and operational safety factors; and
- potential difficulties in financing and implementing water supply projects.

Are all the water supply needs met?

Only one planning group (Region P) was able to recommend water management strategies capable of meeting the needs for all water user groups. The remaining 15 planning groups were unable to identify feasible strategies that met Texas' planning requirements and that would meet all of the needs in their regions (Figure ES.8).

Statewide, the majority of water needs associated with municipal, manufacturing, and steam-electric water user groups are met by the plan in 2070 (Figure ES.9). However, approximately 2.9 million acre-feet of water supply needs remain unmet by this plan in 2020, increasing to approximately 3.1 million acre-feet in 2070 (Figure ES.10). Irrigation represents the vast majority (ranging from 90 percent to 96 percent) of unmet needs in all decades. At least some unmet water supply needs occur for all categories of water user groups in the plan. 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 this does not prevent an entity from pursuing additional water supplies.

How much will it cost?

The estimated total capital cost of the 2017 State Water Plan, which represents the capital costs of all recommended water management strategies and projects in the 2016 regional water plans, is \$63 billion. These costs include the funds needed to permit, design, acquire water rights and land, and construct projects necessary to implement the recommended strategies. The vast majority of the cost, approximately \$59.5 billion, is associated with projects sponsored by municipal water user groups and wholesale water providers that also provide water to municipal water users.

What if we do nothing?

Texas would suffer significant economic losses should recommended water management strategies not be implemented and another drought of record, or worse, occur. Economic modeling indicates that Texas businesses and workers could lose approximately \$73 billion in income

Figure ES.10 - Statewide annual water supply needs that are unmet by the plan (acre-feet)

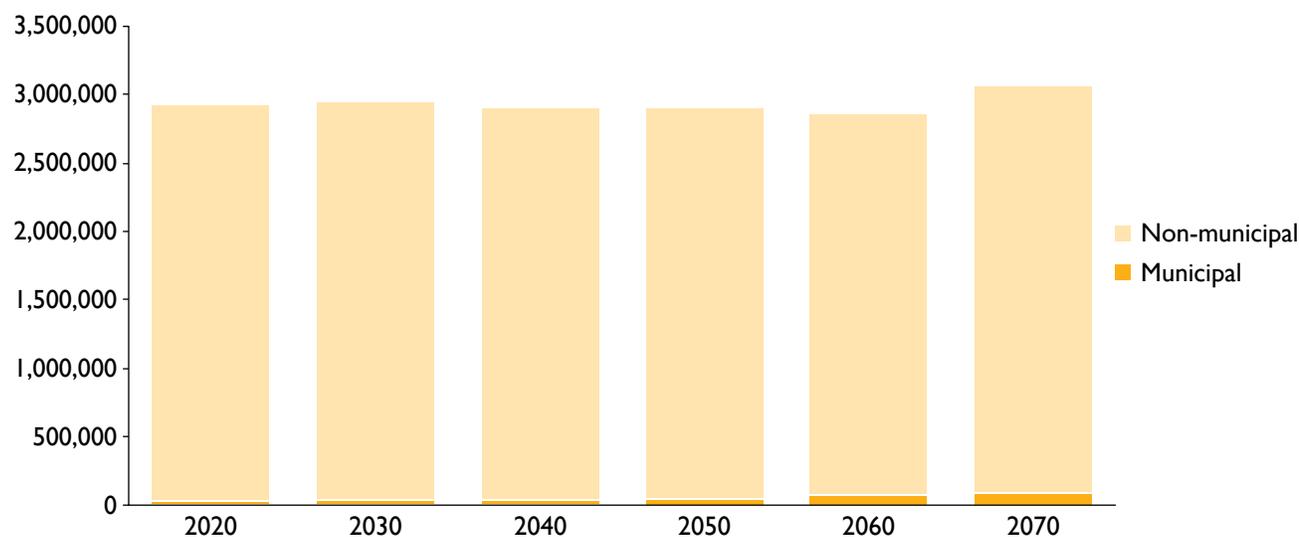
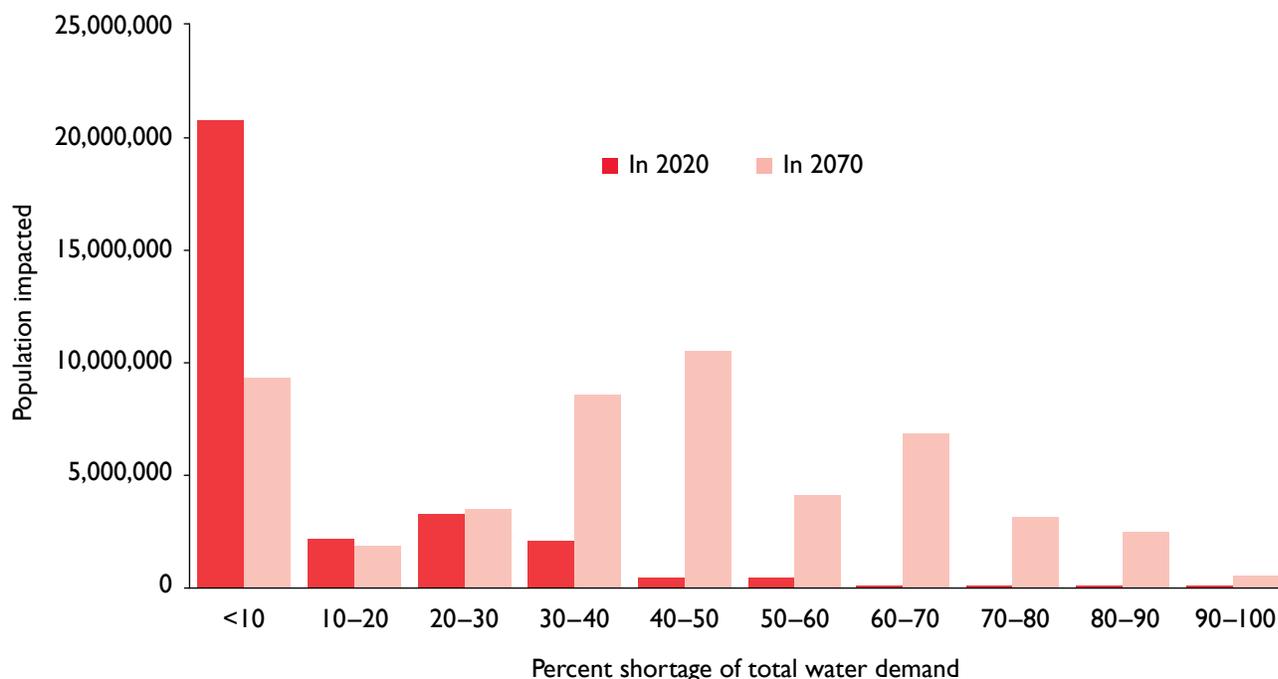


Figure ES.11 - Municipal water needs for statewide population in 2020 and 2070



annually in 2020 and \$151 billion annually in 2070. Job losses could total approximately 424,000 in 2020 and 1.3 million in 2070. This estimate does not include additional drought impacts such as those to dry land farming and other activities not associated directly with water needs identified by the plan, nor does it include the potential for greater impacts due to a drought worse than the drought of record.

If we do nothing, approximately 82 percent of Texans would face at least a 10 percent water shortage in their cities and residences in 2070, and approximately one-third of Texas’ municipal water users would have less than half of the water supplies that they require to live and work by 2070 (Figure ES.11).

How are strategies in the state water plan funded?

Sponsors of strategies, such as cities or wholesale water providers, must take action to develop water projects and conservation measures, many of which will require financial assistance. Water

providers surveyed during the planning process reported an anticipated need of \$36.2 billion in state financial assistance to implement strategies in their regions. Of this amount, approximately \$35 billion is for strategies associated with municipal water suppliers or wholesale water providers. Cities, communities, and individuals can ask their water providers to apply for state financing for water projects.

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 SWIFT² program assists communities in developing and optimizing water supply projects at cost-effective rates. The program provides low-interest loans, extended repayment terms, deferral of loan repayments, and incremental repurchase

² 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.

terms for projects with state ownership aspects. To be eligible for the SWIFT program, a project and its associated capital costs must be included in the state water plan. In addition to SWIFT, the TWDB has several state and federally funded financial assistance programs that may be utilized to fund projects in the state water plan.

What have we done already to implement water management strategies in the previous plan?

Since adoption of the 2012 State Water Plan, the TWDB has provided more than \$1.9 billion in financial assistance to help implement approximately 60 state water plan projects that are associated with approximately 1 million acre-feet per year of additional water supply. Many water management strategy projects are currently in various stages of being implemented across the state, including groundwater wells, conservation, and reservoir projects.

What more can we do?

Planning groups made a number 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. Based on their recommendations and other policy considerations, the TWDB

recommends the following to improve water resources management in the state and facilitate the implementation of the 2017 State Water Plan:

Issue 1: Unique stream segment designation

The legislature should designate the five river or stream segments of unique ecological value recommended by the 2016 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).

Issue 2: Unique reservoir site designation

The legislature should designate for protection under Texas Water Code §16.051(g) three sites of unique value for the construction of reservoirs as recommended in the 2016 regional water plans: Coryell County Off-Channel Reservoir, Millers Creek Off-Channel Reservoir, and Parkhouse II (North).

Issue 3: Timing of the adoption of desired future conditions with respect to the state and regional water planning cycles

The legislature should require that the next set of desired future conditions be adopted collectively by the district representatives of each groundwater management area by January 5, 2022, and every five years thereafter and require that the regional water plans under development as of that same date be consistent with those adopted desired future conditions in effect on that date.



Approximately 5,500 recommended water management strategies, including conservation, would provide approximately 8.5 million acre-feet per year in additional water supplies to water user groups in 2070