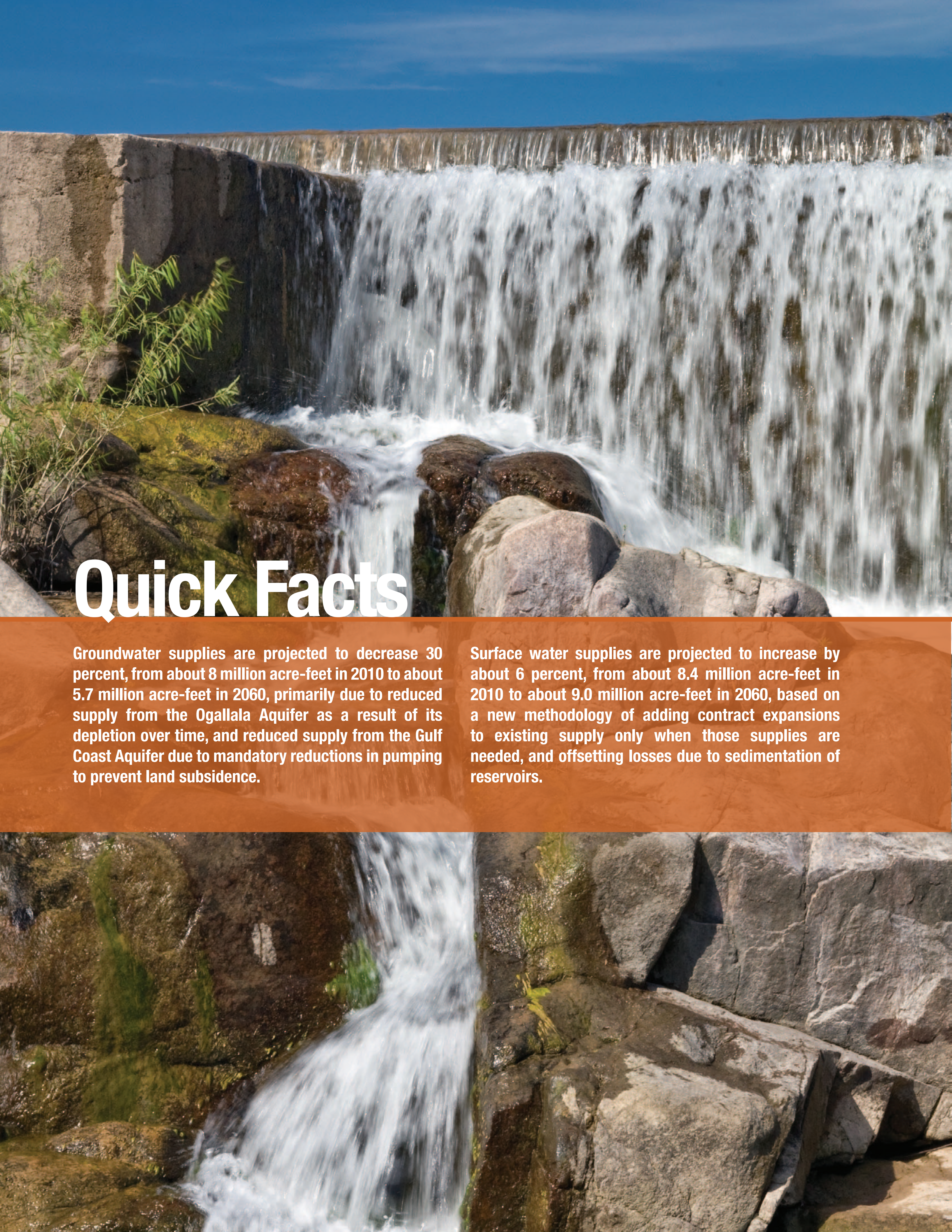


Quick Facts

Groundwater supplies are projected to decrease 30 percent, from about 8 million acre-feet in 2010 to about 5.7 million acre-feet in 2060, primarily due to reduced supply from the Ogallala Aquifer as a result of its depletion over time, and reduced supply from the Gulf Coast Aquifer due to mandatory reductions in pumping to prevent land subsidence.

Surface water supplies are projected to increase by about 6 percent, from about 8.4 million acre-feet in 2010 to about 9.0 million acre-feet in 2060, based on a new methodology of adding contract expansions to existing supply only when those supplies are needed, and offsetting losses due to sedimentation of reservoirs.

5 Water Supplies

Existing water supplies — the amount of water that can be produced with current permits, current contracts, and existing infrastructure during drought — are projected to decrease about 10 percent, from about 17.0 million acre-feet in 2010 to about 15.3 million acre-feet in 2060.

When planning to address water needs during a drought, it is important to know how much water is available now and how much water will be available in the future. Water supplies are traditionally from surface water and groundwater sources; however, water reuse and seawater desalination are expected to become a growing source of water over the next 50 years. Existing water supplies are those supplies that are physically and legally available now. In other words, existing supplies include water that providers have permits or contracts for now and are able to provide to water users with existing infrastructure such as reservoirs, pipelines, and well fields. Water availability, on the other hand, refers to how much water would be available if there were no legal or infrastructure limitations.

During their evaluation of existing water supplies, regional water planning groups determine how much water would be physically and legally available from existing sources under drought conditions with consideration of all existing permits, agreements, and infrastructure. To estimate existing water supplies, the planning groups use the state's surface water and groundwater availability models, when available. The state's existing water supplies—mainly from surface water, groundwater, and reuse water—are projected to decrease about 10 percent over the planning horizon, from about 17.0 million acre-feet in 2010 to about 15.3 million acre-feet in 2060 (Figure 5.1). Estimates of existing supplies compared to projected water demands are used by the planning groups to determine water supply needs or surpluses for individual water user groups.

FIGURE 5.1. PROJECTED EXISTING WATER SUPPLIES (ACRE-FEET PER YEAR).

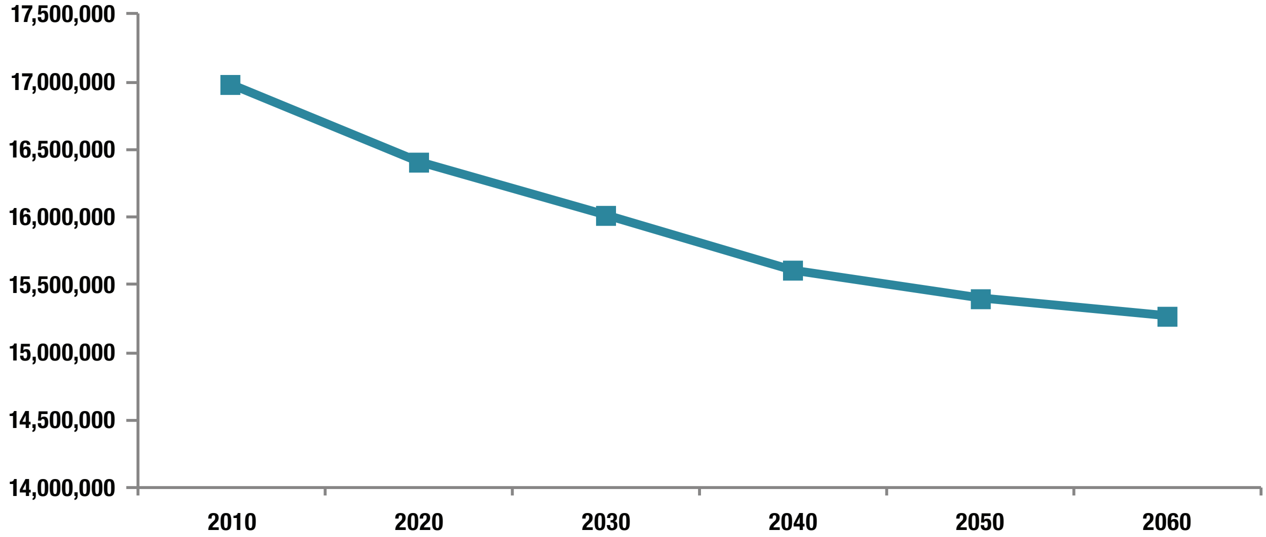


FIGURE 5.2. MAJOR RIVER BASINS OF TEXAS.

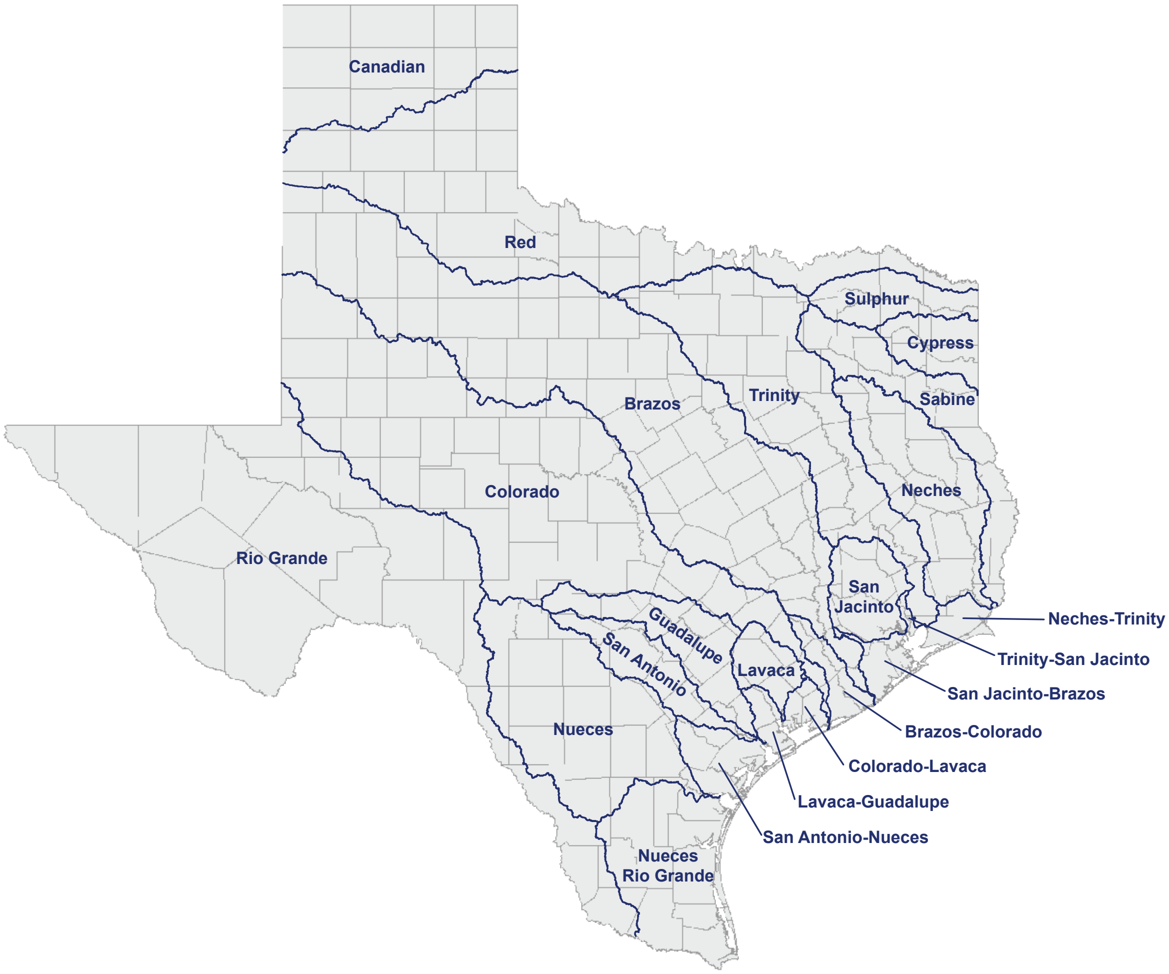
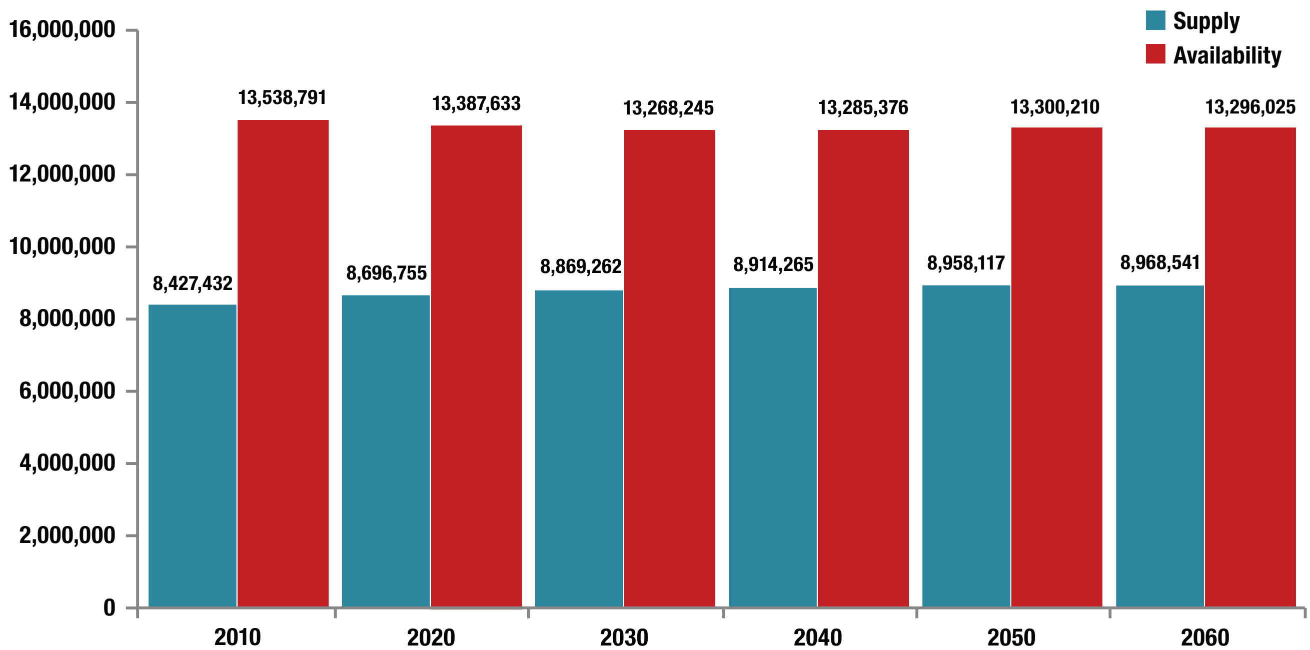


FIGURE 5.3. PROJECTED EXISTING SURFACE WATER SUPPLIES AND SURFACE WATER AVAILABILITY THROUGH 2060 (ACRE-FEET PER YEAR).



5.1 SURFACE WATER SUPPLIES

Surface water accounted for nearly 40 percent of the total 16.1 million acre-feet of water used in Texas in 2008, according to the latest TWDB Water Use Survey information available. The state has a vast array of surface waters, including rivers and streams, lakes and reservoirs, springs and wetlands, bays and estuaries, and the Gulf of Mexico. Texas' surface water resources include

- 15 major river basins and 8 coastal basins (Figure 5.2)
- 191,000 miles of streams and rivers
- 7 major and 5 minor estuaries

The 2007 State Water Plan included summaries of each of the 15 major river basins in Texas; these summaries are still current and are incorporated by reference in the 2012 State Water Plan. The river basin summaries included location maps; a description of the basin; and information on reservoir capacity and yield, surface water rights, and approximate surface water supply with implementation of water management strategies recommended in the 2007 State Water Plan.

Surface water is captured in 188 major water supply reservoirs (Appendix C)—those with a storage capacity of 5,000 acre-feet or more—and in over 2,000 smaller impoundments throughout the state. Nine of Texas' 16 planning regions rely primarily on surface water for their existing supplies and will continue to rely on this important resource through 2060. Surface water abundance generally matches precipitation patterns in Texas; annual yield from Texas' river basins, the average annual flow volume per unit of drainage area, varies from about 11.8 inches in the Sabine River Basin in east Texas to 0.1 inch in the Rio Grande Basin in west Texas.

5.1.1 EXISTING SURFACE WATER SUPPLIES

Existing surface water supplies represent the maximum amount of water legally and physically available from existing sources for use during drought

TABLE 5.1. EXISTING SURFACE WATER SUPPLIES BY RIVER BASIN (ACRE-FEET PER YEAR)

River Basin	2010	2020	2030	2040	2050	2060	Percent Change*
Brazos	1,273,273	1,271,586	1,275,209	1,277,160	1,277,876	1,278,589	0
Brazos-Colorado	21,433	21,485	21,536	21,591	21,654	21,662	1
Canadian	44,174	55,816	55,779	55,729	54,332	54,264	22
Colorado	994,305	989,650	990,151	991,147	992,524	991,281	-0
Colorado-Lavaca	4,298	4,298	4,298	4,298	4,298	4,298	0
Cypress	274,271	273,979	273,618	273,247	273,915	274,029	-0
Guadalupe	205,990	206,626	205,197	201,260	201,329	201,408	-2
Lavaca	79,354	79,354	79,354	79,354	79,354	79,354	0
Lavaca-Guadalupe	434	434	434	434	434	434	0
Neches	524,063	802,883	985,391	1,013,133	1,034,174	1,060,852	102
Neches-Trinity	79,066	79,066	79,066	79,066	79,066	79,067	0
Nueces	148,874	153,069	157,631	159,427	159,934	160,746	8
Nueces-Rio Grande	8,908	8,908	8,908	8,908	8,908	8,908	0
Red	342,559	328,060	323,901	319,524	314,769	309,339	-9
Rio Grande	1,150,631	1,144,214	1,138,329	1,132,278	1,125,801	1,119,901	-2
Sabine	691,243	670,275	650,091	649,761	649,841	648,341	-6
Sabine-Louisiana	235	235	235	235	235	235	0
San Antonio	61,259	61,259	61,258	61,258	61,257	61,256	0
San Antonio-Nueces	1,794	1,794	1,794	1,794	1,794	1,794	0
San Jacinto	202,592	202,952	203,117	203,113	203,126	203,133	0
San Jacinto-Brazos	27,450	27,434	27,501	27,545	27,597	27,645	0
Sulphur	308,788	311,559	316,552	321,336	325,577	333,513	8
Trinity	1,943,370	1,962,750	1,970,841	1,993,645	2,021,370	2,009,621	3
Trinity-San Jacinto	39,068	39,069	39,071	39,022	38,952	38,871	0
Total	**8,427,432**	**8,696,755**	**8,869,262**	**8,914,265**	**8,958,117**	**8,968,541**	**6**

*Percent represents the percent change from 2010 through 2060.

conditions. Most planning regions base their estimates of existing surface water supplies on firm yield, the maximum volume of water a reservoir can provide each year under a repeat of the drought of record. Some regions, however, base their plans and estimates of existing supply on safe yield, the annual amount of water that can be withdrawn from a reservoir for a period of time longer than the drought of record, often one to two years. Use of safe yield in planning allows a buffer to account for climate variability, including the possibility of a drought that might be worse than the drought of record.

Total existing surface water supplies in Texas were 8.4 million acre-feet in 2010; these supplies are projected to increase to 9.0 million acre-feet by 2060 (Figure 5.3). The amount of existing supplies was determined by the planning groups based on a combination of firm yields and safe yields.

Existing surface water supplies are greatest in the Trinity, Brazos, and Rio Grande river basins (Table 5.1). Existing supplies increase the most from 2010 to 2060 for the Neches River Basin as additional surface water is made available through existing contracts. The increase in contracted water through 2060 is greater than the loss of existing surface water supply that occurs due to reservoir sedimentation. Decreases in the amount of existing surface water supplies can occur due to loss of reservoir capacity to sedimentation. The 2007 State Water Plan also showed a decreasing trend in surface water supply due to sedimentation.

TABLE 5.2. SURFACE WATER AVAILABILITY BY RIVER BASIN (ACRE-FEET PER YEAR)

River Basin	2010	2020	2030	2040	2050	2060	Percent Change*
Brazos	1,641,169	1,653,791	1,594,374	1,586,831	1,579,328	1,571,832	-4
Brazos-Colorado	21,433	21,485	21,536	21,591	21,654	21,662	1
Canadian	48,136	68,105	68,064	68,024	67,984	67,947	41
Colorado	1,170,052	1,149,068	1,154,169	1,183,249	1,189,432	1,225,451	5
Colorado-Lavaca	4,298	4,298	4,298	4,298	4,298	4,298	0
Cypress	378,087	377,847	377,607	377,367	377,127	376,887	0
Guadalupe	273,961	273,890	273,820	273,749	273,678	273,607	0
Lavaca	79,374	79,374	79,374	79,374	79,374	79,374	0
Lavaca-Guadalupe	434	434	434	434	434	434	0
Neches	2,328,154	2,324,792	2,321,431	2,318,067	2,314,705	2,311,367	-1
Neches-Trinity	79,070	79,070	79,070	79,070	79,070	79,071	0
Nueces	185,920	184,902	183,884	182,866	181,851	180,843	-3
Nueces-Rio Grande	8,922	8,922	8,922	8,922	8,922	8,922	0
Red	578,732	574,363	569,966	565,463	560,798	556,427	-4
Rio Grande	1,184,415	1,176,889	1,169,864	1,162,838	1,155,812	1,149,286	-3
Sabine	1,837,834	1,834,362	1,830,796	1,827,234	1,823,675	1,820,110	-1
Sabine-Louisiana	235	235	235	235	235	235	0
San Antonio	61,259	61,259	61,258	61,258	61,257	61,256	0
San Antonio-Nueces	1,794	1,794	1,794	1,794	1,794	1,794	0
San Jacinto	324,110	320,570	316,835	312,931	309,044	305,151	-6
San Jacinto-Brazos	58,791	58,775	51,026	51,070	51,122	51,170	-13
Sulphur	524,561	522,307	519,889	517,755	515,332	513,224	-2
Trinity	2,708,894	2,571,944	2,540,440	2,561,796	2,604,123	2,596,498	-4
Trinity-San Jacinto	39,156	39,157	39,159	39,160	39,161	39,179	0
Total	**13,538,791**	**13,387,633**	**13,268,245**	**13,285,376**	**13,300,210**	**13,296,025**	**-2**

*Percent represents the percent change from 2010 through 2060.

5.1.2 SURFACE WATER AVAILABILITY

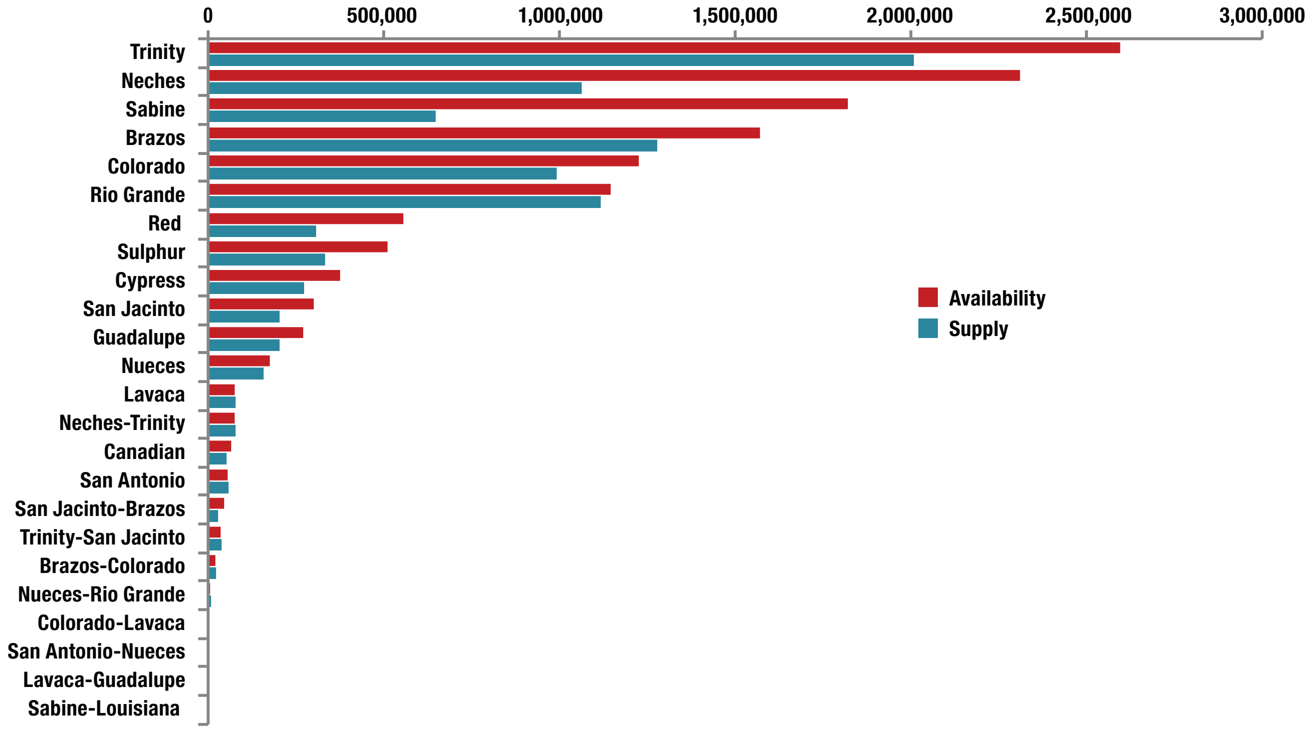
Surface water availability is derived from water availability models, computer-based simulations developed by the Texas Commission on Environmental Quality that predict the amount of water that would be available for diversion under a specified set of conditions. Surface water availability represents the maximum amount of water available each year during the drought of record regardless of legal or physical availability. Total surface water availability in Texas in 2010 is estimated at 13.5 million acre-feet per year and decreases to 13.3 million acre-feet per year (Figure 5.3) by 2060. Water availability is the greatest in the Trinity, Neches, and Sabine river basins for the 2010 to 2060 period (Table 5.2). Loss of some surface water availability is due to reservoir sedimentation.

Surface water availability projections equal or exceed existing supplies in all river basins in the state (Figure 5.4). The Neches and Sabine river basins, where availability exceeds supply by 2 million acre-feet in 2060, show the greatest potential to increase surface water supplies in the future.

5.1.3 FUTURE IMPACTS TO AVAILABILITY: ENVIRONMENTAL FLOWS

The concept of environmental flows refers to the water required to maintain healthy and productive rivers and estuaries—bays or inlets, often at the mouth of a river, in which large quantities of freshwater and seawater mix together. State law requires consideration of environmental flows in Texas' regional water planning and surface water permitting processes.

FIGURE 5.4. EXISTING SURFACE WATER SUPPLIES AND SURFACE WATER AVAILABILITY IN 2060 BY RIVER BASIN (ACRE-FEET PER YEAR).



Early studies of the effect of freshwater inflow upon the bays and estuaries of Texas led to a series of publications for all of Texas' major estuaries in the 1980s, with subsequent updates in the 1990s and 2000s. Instream flow needs—the amount of water needed in a stream to adequately provide for downstream uses occurring within the stream channel—were first developed for Texas' rivers using the "Lyon's method," and later the Consensus Criteria for Environmental Flow Needs for water supply planning. Senate Bill 2, passed by the 77th Texas Legislature in 2001, directed TWDB, the Texas Commission on Environmental Quality, and the Texas Parks and Wildlife Department to work together to maintain data collection programs and conduct studies to develop appropriate methodologies for determining environmental flows needed to protect rivers and streams.

Although methodologies had been established for developing environmental flow needs prior to 2007, there was a desire among stakeholders for more certainty in how the methodologies would be applied in the evaluation and permitting of new water supply projects. Senate Bill 3, passed by the 80th Texas Legislature in 2007, addressed these issues and led to a new approach in developing environmental flow needs for the state's major rivers and estuaries in an accelerated, science-based process with stakeholder input.

Environmental flow recommendations resulting from the Senate Bill 3 process are scheduled to be completed for the Sabine-Neches, Trinity-San Jacinto, Brazos, Colorado-Lavaca, Guadalupe-San Antonio, Nueces, and Rio Grande river basins and their associated bays by 2012. Standards and rules for these systems are scheduled to be set by the Texas Commission on Environmental Quality in 2013 and to be available for use in developing the 2017 State Water Plan. No schedule has been set for the remaining river basins in Texas.

Planning groups consider the impacts of recommended water management strategies on a number of resources, including instream flows and bay and estuary freshwater inflows. Senate Bill 3 rules for environmental flows for Texas' rivers and estuaries had not been adopted while the 2011 regional water plans were being developed; therefore, they were not considered in development of the 2012 State Water Plan. The regional water planning groups must meet all state laws when developing regional water plans and must therefore consider Senate Bill 3 environmental flow standards that are in place when developing future plans.

Beginning with the 2011 to 2016 planning cycle, regional water plans will consider environmental flow standards as they are developed and adopted by the Texas Commission on Environmental Quality as a result of the Senate Bill 3 environmental flow process. These new standards will be incorporated, as appropriate, within the surface water availability models that planning groups use to assess current surface water supplies and to evaluate and recommend water management strategies. In basins that do not have environmental flow standards in place, other site-specific studies or the Consensus Criteria for Environmental Flow Needs will continue to be considered, as in previous planning cycles.

5.2 GROUNDWATER SUPPLIES

Groundwater is and will continue to be an important source of water for Texas. Before 1940, groundwater provided less than 1 million acre-feet of water per year to Texans. Since the drought of record in the 1950s, groundwater production has been about 10 million acre-feet per year. In 2008, according to the latest TWDB Water Use Survey information available, groundwater provided 60 percent of the 16.1 million acre-feet of water used in the state. Farmers used about 80 percent of this groundwater to irrigate crops. Municipalities used about 15 percent of all the groundwater in 2008, meeting about 35 percent of their total water demands.

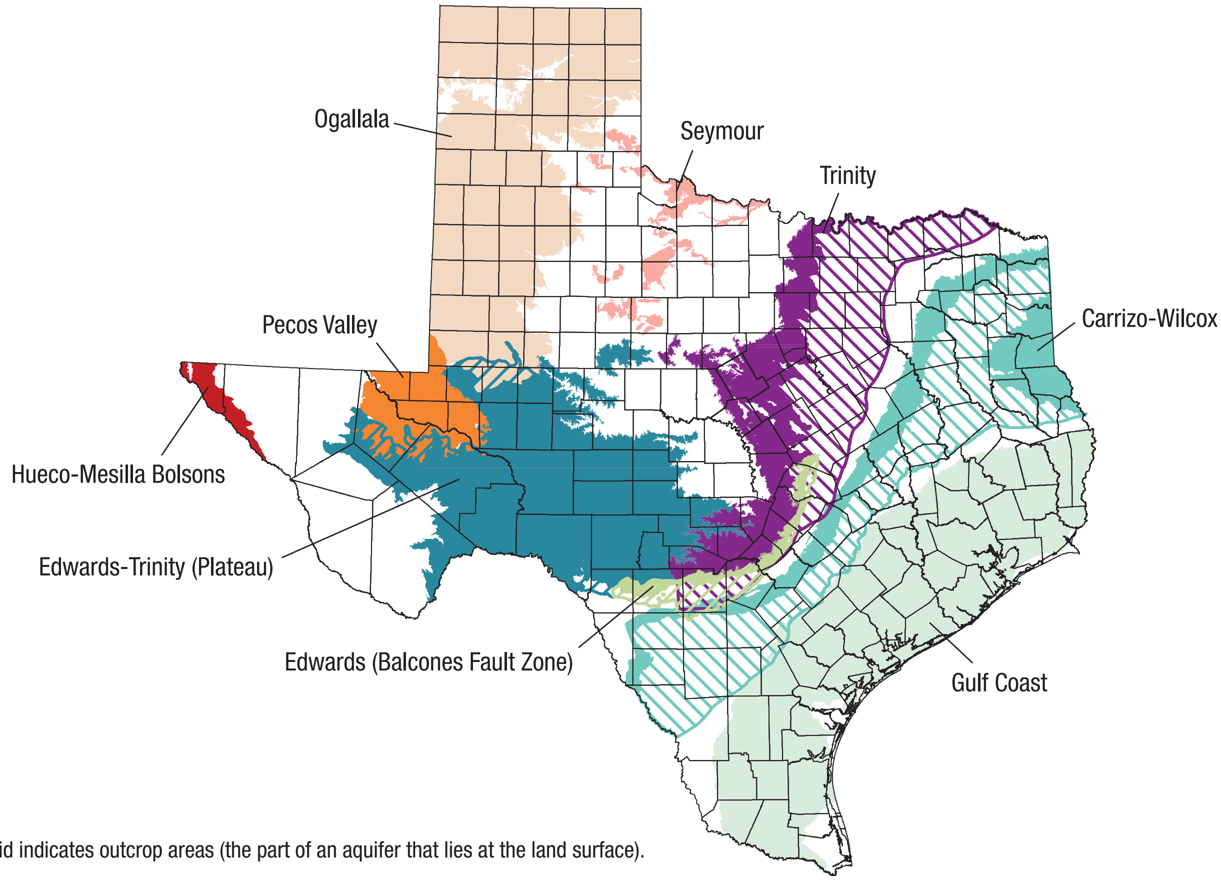
TWDB recognizes 30 major and minor aquifers, each with their own characteristics and ability to produce water. Along with a number of other local, state, and federal agencies, TWDB monitors the water quality and water levels of these aquifers. This information assists groundwater managers and regional water planning groups in estimating groundwater supplies and availability. It is also used in groundwater availability models, developed by TWDB to aid groundwater managers and water planners in better understanding and using this vital natural resource in Texas.

Texas has a number of aquifers that are capable of producing groundwater for municipal, industrial, and agricultural uses. TWDB recognizes 9 major aquifers that produce large amounts of water over large areas (Figure 5.5), and 21 minor aquifers that produce minor amounts of water over large areas or large amounts of water over small areas (Figure 5.6). The 2007 State Water Plan included summaries of each of the 30 major and minor aquifers in Texas; these summaries are still current and are incorporated by reference in the 2012 State Water Plan. The aquifer summaries include location maps; a discussion and list of aquifer properties and characteristics; and projections of groundwater supplies, including supplies to be obtained from implementing water management strategies from the 2007 State Water Plan.

5.2.1 EXISTING GROUNDWATER SUPPLIES

Existing groundwater supplies represent the amount of groundwater that can be produced with current

FIGURE 5.5. THE MAJOR AQUIFERS OF TEXAS.



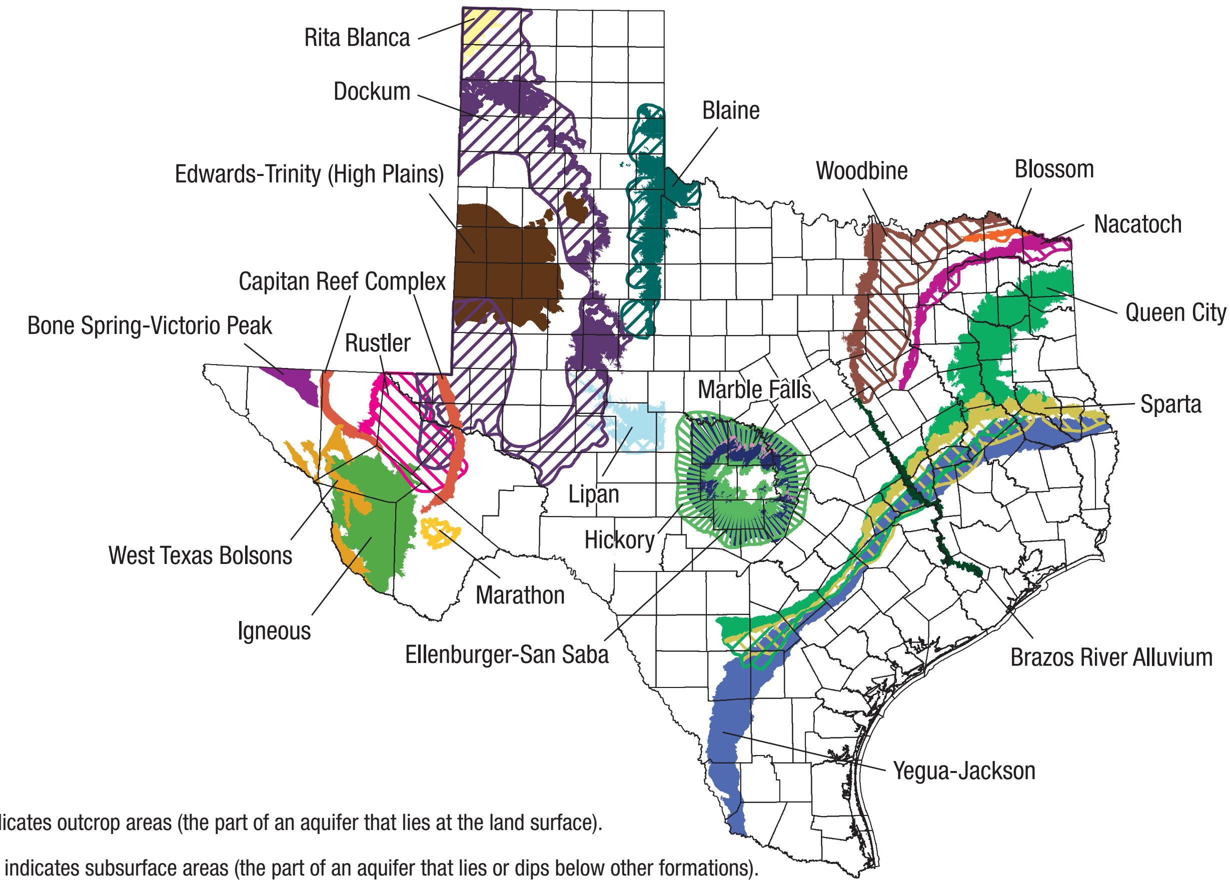
Solid indicates outcrop areas (the part of an aquifer that lies at the land surface).

Hatched indicates subsurface areas (the part of an aquifer that lies or dips below other formations).

permits and existing infrastructure. Because permits and existing infrastructure limit how much groundwater can be produced, existing groundwater supply can be—and often is—less than the total amount that can be physically produced from an aquifer. A permit represents a legal limit on how much water can be produced. Therefore, even though a group of wells may be able to pump 2,000 acre-feet per year, the supply is limited to 1,000 acre-feet per year if the permit is for 1,000 acre-feet per year. On the other hand, if the permit is for 2,000 acre-feet per year but existing infrastructure—that is, current wells—can only pump 1,000 acre-feet per year, then the groundwater supply is 1,000 acre-feet per year. By calculating groundwater supply, water planners know how much groundwater can be used with current infrastructure and what needs to be done to meet needs in the future (for example, larger pumps, new wells, or pipelines).

Existing groundwater supplies were about 8.1 million acre-feet per year in 2010 and will decline 30 percent over the planning horizon, to about 5.7 million acre-feet per year by 2060 (Figure 5.7, Table 5.3). This decline is due primarily to reduced supplies from the Ogallala and Gulf Coast aquifers: annual Ogallala Aquifer supplies are projected to decline by about 2 million acre-feet per year by 2060 as a result of depletion, while annual Gulf Coast Aquifer supplies are projected to decline by about 210,000 acre-feet per year by 2060 due to mandatory reductions in pumping to prevent land surface subsidence (Figure 5.8). In

FIGURE 5.6. THE MINOR AQUIFERS OF TEXAS.



Solid indicates outcrop areas (the part of an aquifer that lies at the land surface).

Hatched indicates subsurface areas (the part of an aquifer that lies or dips below other formations).

The Edwards-Trinity (High Plains) and Rita Blanca aquifers are both entirely subsurface.

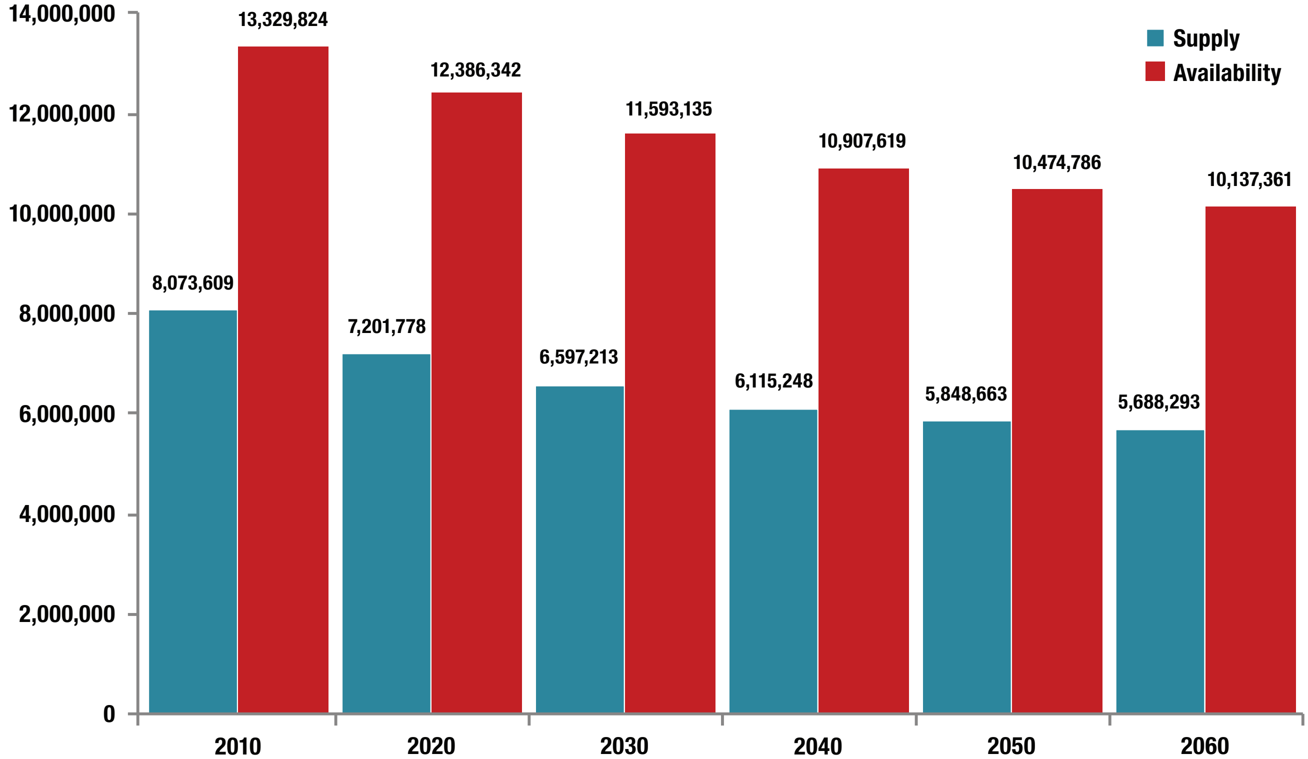
most cases, existing groundwater supplies either remain constant over the planning horizon or decrease by 2060.

5.2.2 GROUNDWATER AVAILABILITY

Groundwater availability is the amount of water from an aquifer that is available for use regardless of legal or physical availability. One might think that the amount of groundwater available for use is all of the water in the aquifer; however, that may not—and probably is not—the case. Groundwater availability is limited by existing infrastructure, as well as by law, groundwater management district goals, and state rules. For example, the Texas Legislature directed the subsidence districts in Fort Bend, Galveston, and Harris counties to decrease and limit groundwater production to prevent land subsidence, the sinking of the land's surface. Another example is the Edwards (Balcones Fault Zone) Aquifer, most of which is regulated by the Edwards Aquifer Authority, which was created by the Texas Legislature to manage and protect the aquifer system by limiting groundwater production.

To determine groundwater availability, planning groups used one of two policies: sustainability, in which an aquifer can be pumped indefinitely; or planned depletion, in which an aquifer is drained over a period of time. Total groundwater availability in 2010 is about 13.3 million acre-feet per year (Table 5.4). Because of projected declines in the Dockum, Edwards-Trinity (High Plains), Gulf Coast, Ogallala,

FIGURE 5.7. PROJECTED EXISTING GROUNDWATER SUPPLIES AND GROUNDWATER AVAILABILITY THOUGH 2060 (ACRE-FEET PER YEAR).



Rita Blanca, and Seymour aquifers, availability decreases to 10.1 million acre-feet per year by 2060.

5.2.3 GROUNDWATER SUPPLY TRENDS

The groundwater availability numbers established by the regional water planning groups for the 2011 regional water plans vary from those established by the regional planning groups in the 2007 State Water Plan. In some counties, planning groups increased their estimates of groundwater availability, and in other counties, planning groups decreased their estimates of groundwater availability. Table 5.5 summarizes these changes in terms of volume (acre-feet per year) by decade, with "no significant change" defined as an increase or decrease of less than 1,000 acre-feet per year. Table 5.6 summarizes these changes in terms of percent change from the 2007 State Water Plan, with "no significant change" defined as an increase or decrease of less than 10 percent of the 2007 State Water Plan groundwater availability.

5.2.4 POTENTIAL FUTURE IMPACTS RELATING TO GROUNDWATER AVAILABILITY

Future regional water plans may be impacted by the amount of groundwater that will be considered as available to meet water demands as determined through the state's desired future conditions planning process. They may also be impacted by groundwater permitting processes that limit the term of the permit or allow for reductions in originally permitted amounts.

In 2005, the 79th Legislature passed House Bill 1763, which modified the Texas Water Code regarding how groundwater availability is determined in Texas. Among the changes, House Bill 1763 regionalized decisions on groundwater availability and required

TABLE 5.3. EXISTING GROUNDWATER SUPPLIES FOR THE MAJOR AND MINOR AQUIFERS (ACRE-FEET PER YEAR)

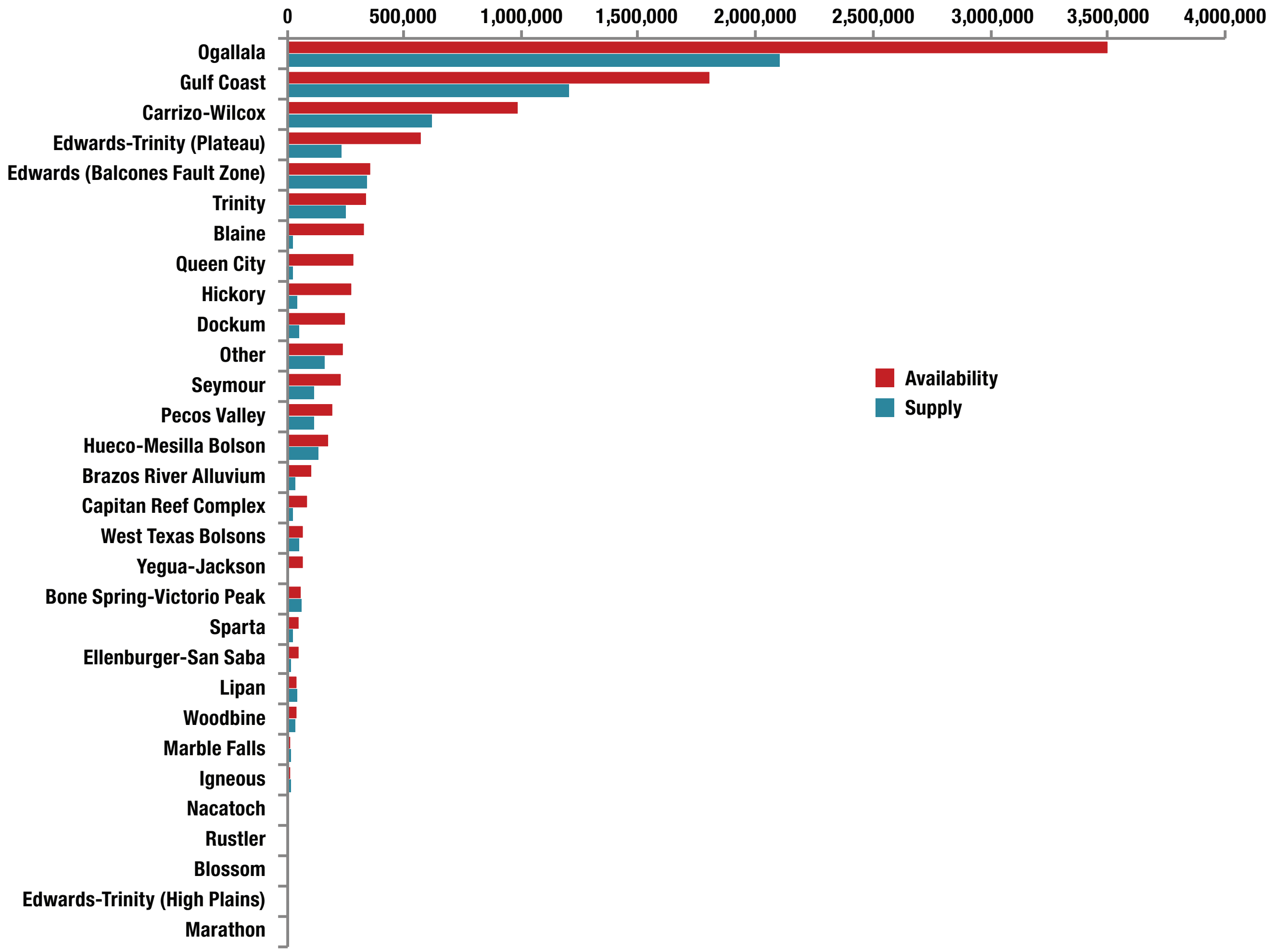
Aquifer	2010	2020	2030	2040	2050	2060	Percent Change*
Blaine	32,267	28,170	27,702	27,122	25,759	24,496	-24
Blossom	815	815	815	815	815	815	0
Bone Spring-Victorio Peak	63,000	63,000	63,000	63,000	63,000	63,000	0
Brazos River Alluvium	39,198	38,991	38,783	38,783	38,783	38,783	-1
Capitan Reef Complex	23,144	24,669	25,743	26,522	27,017	27,327	18
Carrizo-Wilcox	622,443	627,813	628,534	619,586	614,425	616,855	-1
Dockum	55,585	55,423	61,510	59,837	58,429	57,086	3
Edwards (Balcones Fault Zone)	338,778	338,702	338,828	338,794	338,775	338,763	0
Edwards-Trinity (High Plains)	4,160	3,580	2,802	2,335	2,065	2,065	-50
Edwards-Trinity (Plateau)	225,409	225,450	225,468	225,467	225,467	225,472	0
Ellenburger-San Saba	21,786	21,778	21,776	21,776	21,831	21,886	0
Gulf Coast	1,378,663	1,242,949	1,191,798	1,186,142	1,176,918	1,166,310	-15
Hickory	49,037	49,126	49,205	49,279	49,344	49,443	1
Hueco-Mesilla Bolson	131,826	131,826	131,826	131,826	131,826	131,826	0
Igneous	13,946	13,946	13,946	13,946	13,946	13,946	0
Lipan	42,523	42,523	42,523	42,523	42,523	42,523	0
Marathon	148	148	148	148	148	148	0
Marble Falls	13,498	13,498	13,498	13,498	13,498	13,522	0
Nacatoch	3,733	3,822	3,854	3,847	3,808	3,776	1
Ogallala and Rita Blanca	4,187,892	3,468,454	2,911,789	2,448,437	2,202,499	2,055,245	-51
Other	159,688	159,789	159,820	159,822	159,827	159,896	0
Pecos Valley	120,029	114,937	114,991	115,025	115,071	115,125	-4
Queen City	26,441	26,507	26,574	26,438	26,507	26,556	0
Rustler	2,469	2,469	2,469	2,469	2,469	2,469	0
Seymour	142,021	132,045	128,882	127,530	124,863	122,205	-14
Sparta	25,395	25,373	25,359	24,919	24,924	24,933	-2
Trinity	254,384	250,837	250,544	250,392	249,291	249,040	-2
West Texas Bolsons	52,804	52,804	52,804	52,804	52,804	52,804	0
Woodbine	34,173	34,036	33,932	33,876	33,741	33,688	-1
Yegua-Jackson	8,354	8,298	8,290	8,290	8,290	8,290	-1
Total	**8,073,609**	**7,201,778**	**6,597,213**	**6,115,248**	**5,848,663**	**5,688,293**	**-30**

*Percent represents the percent change from 2010 through 2060.

regional water planning groups to use groundwater availability figures from the groundwater conservation districts. In 2011, the 82nd Texas Legislature replaced the term "managed available groundwater" with "modeled available groundwater," effective September 1, 2011. Modeled available groundwater represents the total amount of groundwater, including both permitted and exempt uses, that can be produced from the aquifer in an average year, that achieves a "desired future condition," a description of how the aquifer will look in the future. Managed available groundwater was the amount of groundwater production not including uses that were exempt from permitting that would achieve the desired future condition. From a regional water planning and state water planning perspective, the use of modeled available groundwater considers all uses—those permitted by groundwater conservation districts as well as those uses that are exempt from permitting.

Before House Bill 1763, each groundwater conservation district defined groundwater availability for its jurisdiction and included it in their groundwater management plans under the name "total usable amount of groundwater." As a result of the passage of House Bill 1763, districts are now working together in each designated groundwater management area (Figure 5.9) to develop and adopt desired future

FIGURE 5.8. GROUNDWATER SUPPLY AND GROUNDWATER AVAILABILITY IN 2060 BY AQUIFER (ACRE-FEET PER YEAR).



conditions for their groundwater resources. The districts then submit these desired future conditions to TWDB. TWDB, in turn, provides estimates of "modeled available groundwater"—the new term in statute for groundwater availability—to the districts for inclusion in their groundwater management plans and to the regional water planning groups for inclusion in their regional water plans.

Statute required that groundwater conservation districts in groundwater management areas submit their desired future conditions to TWDB by September 1, 2010. However, for the regional water planning groups to be required to include managed available groundwater values in their 2011 regional water plans, desired future conditions had to be submitted to TWDB before January 1, 2008, allowing TWDB to estimate managed available groundwater values. The inclusion of managed available groundwater values in the regional water plans for desired future conditions submitted to TWDB after that date was at the discretion of the regional water planning groups.

Because most of the desired future conditions were adopted after 2008, regional water planning groups generally had to use their own estimates of groundwater availability to meet their statutory deadlines for adoption of their regional water

TABLE 5.4. GROUNDWATER AVAILABILITY FOR THE MAJOR AND MINOR AQUIFERS (ACRE-FEET PER YEAR)

Aquifer	2010	2020	2030	2040	2050	2060	Percent Change*
Blaine	326,950	325,700	325,700	325,700	325,700	325,700	0
Blossom	2,273	2,273	2,273	2,273	2,273	2,273	0
Bone Spring-Victorio Peak	63,000	63,000	63,000	63,000	63,000	63,000	0
Brazos River Alluvium	108,183	108,183	108,183	108,183	108,183	108,183	0
Capitan Reef Complex	86,150	86,150	86,150	86,150	86,150	86,150	0
Carrizo-Wilcox	1,002,648	1,002,073	994,513	994,391	994,367	994,367	-1
Dockum	382,188	342,266	337,070	305,244	277,270	252,570	-34
Edwards (Balcones Fault Zone)	350,682	350,932	353,432	353,532	356,182	357,782	2
Edwards-Trinity (High Plains)	4,160	3,580	2,802	2,335	2,065	2,065	-50
Edwards-Trinity (Plateau)	572,598	572,598	572,598	572,598	572,598	572,598	0
Ellenburger-San Saba	50,339	50,339	50,339	50,339	50,339	50,339	0
Gulf Coast	1,898,091	1,816,285	1,776,213	1,775,997	1,776,384	1,775,991	-6
Hickory	275,089	275,089	275,089	275,089	275,089	275,089	0
Hueco-Mesilla Bolson	178,000	178,000	178,000	178,000	178,000	178,000	0
Igneous	15,100	15,100	15,100	15,100	15,100	15,100	0
Lipan	48,535	48,535	48,535	48,535	48,535	48,535	0
Marathon	200	200	200	200	200	200	0
Marble Falls	17,679	17,679	17,679	17,679	17,679	17,679	0
Nacatoch	10,494	10,494	10,494	10,494	10,494	10,494	0
Ogallala and Rita Blanca	6,379,999	5,561,382	4,832,936	4,179,979	3,773,018	3,459,076	-46
Other	238,192	238,209	238,202	238,174	238,144	238,154	0
Pecos Valley	200,451	200,451	200,451	200,451	200,451	200,451	0
Queen City	291,336	291,336	291,336	291,336	291,336	291,336	0
Rustler	2,492	2,492	2,492	2,492	2,492	2,492	0
Seymour	243,173	242,173	228,527	228,527	228,527	228,527	-6
Sparta	54,747	54,747	54,747	54,747	54,747	54,747	0
Trinity	342,192	342,193	342,191	342,191	341,580	341,580	0
West Texas Bolsons	70,746	70,746	70,746	70,746	70,746	70,746	0
Woodbine	44,905	44,905	44,905	44,905	44,905	44,905	0
Yegua-Jackson	69,232	69,232	69,232	69,232	69,232	69,232	0
Total	**13,329,824**	**12,386,342**	**11,593,135**	**10,907,619**	**10,474,786**	**10,137,361**	**-24**

*Percent represents the percent change from 2010 through 2060.

plans. The groundwater conservation districts in groundwater management areas 8 and 9 were the only ones to submit desired future conditions for some of its aquifers by that deadline (Table 5.7). By the fourth round of regional water planning (2011 to 2016), managed available groundwater numbers that are based on the districts' desired future conditions will be available for use in all regional water plans.

In the next round of regional water planning (2011 to 2016), planning groups will be required to use modeled available groundwater volumes to determine water supply needs in their regions. As a result, there will be some groundwater availability estimates that are lower than the regional water planning group's groundwater availability estimates in prior regional plans. This situation may impact the amount of water supply needs and strategies in the plan. If needs are greater or strategies cannot be implemented due to unavailable supplies, regional water planning groups and those looking to implement water management strategies will have to consider other sources of water. It is also important to note that despite what is shown in this plan for groundwater availability, the managed available groundwater and a groundwater conservation district's associated permitting process will ultimately dictate whether or not a particular strategy can be implemented.

TABLE 5.5. NUMBER OF COUNTIES WHERE THERE IS A DECREASE, NO SIGNIFICANT CHANGE, OR INCREASE IN GROUNDWATER AVAILABILITY BETWEEN 2007 STATE WATER PLAN AND 2011 REGIONAL WATER PLANS (ACRE-FEET PER YEAR)

Decade	Decrease of more than 1,000 acre-feet per year	Decrease of less than 1,000 acre-feet per year or increase of less than 1,000 acre-feet per year	Increase of more than 1,000 acre-feet per year
2010	20	170	64
2020	22	169	63
2030	22	169	63
2040	23	170	61
2050	26	169	59
2060	29	170	55

Groundwater permitting processes that provide for limited term-permits or that allow for reductions in a permit holder's allocations over a short period of time could also impact the certainty and feasibility of water management strategies and may require looking at strategies that use other sources of water than groundwater.

5.3 REUSE SUPPLIES

Reuse refers to the use of groundwater or surface water that has already been beneficially used. The terms "reclaimed water," "reused water," and "recycled water" are used interchangeably in the water industry. As defined in the Texas Water Code, reclaimed water is domestic or municipal wastewater that has been treated to a quality suitable for beneficial use. Reuse or reclaimed water is not the same as graywater, that is, untreated household water from sinks, showers, and baths.

There are two types of water reuse: direct reuse and indirect reuse. Direct reuse refers to the introduction of reclaimed water via pipelines, storage tanks, and other necessary infrastructure directly from a water reclamation plant to a distribution system. For example, treating wastewater and then piping it to an industrial center or a golf course would be considered direct reuse. Indirect reuse is the use of water, usually treated effluent, which is placed back into a water supply source such as a lake, river, or aquifer, and then retrieved to be used again. Indirect reuse projects that involve a watercourse require a "bed and banks" permit from the state, which authorizes the permit holder to convey and subsequently divert water in a watercourse or stream. Both direct and indirect reuse can be applied for potable—suitable for drinking—and non-potable—suitable for uses other than drinking—purposes.

Water reuse has been growing steadily in Texas over the past two decades. A recent survey of Texas water producers revealed that in 2010 approximately 62,000 acre-feet per year of water was used as direct reuse and 76,000 acre-feet per year of water was used as bed and banks permitted indirect reuse. The number of entities receiving permits from the Texas Commission on Environmental Quality for direct non-potable water reuse rose from 1 in 1990 to 187 by June 2010. Evidence of the increasing interest and application of indirect reuse is also illustrated by several large and successful projects that have been implemented by the Tarrant Regional Water District and the Trinity River Authority in the Dallas-Fort Worth area.

Like surface water and groundwater, the amount of existing water reuse supplies is based on the amount of water that can be produced with current permits and existing infrastructure. The planning groups estimated that the existing supplies in 2010 were approximately 482,000 acre-feet per year. Reuse supplies will increase to about 614,000 acre-feet per year by 2060 (Figure 5.10, Table 5.8). Existing water supplies from direct and indirect reuse by 2060 for 16 regional water planning areas are shown in Figure 5.11 and Figure 5.12. The amount of existing supply from direct reuse was about 279,000 acre-feet per year in 2010, and indirect reuse was approximately 203,000

TABLE 5.6. NUMBER OF COUNTIES WHERE THERE IS A DECREASE, NO SIGNIFICANT CHANGE, OR INCREASE IN GROUNDWATER AVAILABILITY BETWEEN 2007 STATE WATER PLAN AND 2011 REGIONAL 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
2010	19	183	52
2020	19	182	51
2030	18	183	53
2040	20	182	52
2050	21	182	51
2060	22	182	50

TABLE 5.7. SUMMARY OF MANAGED AVAILABLE GROUNDWATER VALUES INCLUDED IN THE 2011 REGIONAL WATER PLANS

Regional water planning area	Groundwater management area	Aquifer
B	8	Trinity (Montague County)
C	8	Trinity, Woodbine
D	8	Woodbine
F	8	Trinity (Brown County)
G	8	Brazos River Alluvium, Woodbine, and Edwards (Balcones Fault Zone)
K	8	Edwards (Balcones Fault Zone), Hickory, Ellenburger-San Saba, Marble Falls
L	9	Edwards Group of the Edwards-Trinity (Plateau)

TABLE 5.8. PROJECTED EXISTING SUPPLY OF WATER FROM WATER REUSE (ACRE-FEET PER YEAR)

Region	Reuse type	2010	2020	2030	2040	2050	2060
A	Direct reuse	25,129	28,928	30,620	32,528	34,598	37,577
C	Direct reuse	34,552	33,887	32,413	31,465	30,731	30,340
C	Indirect reuse	148,134	197,929	240,590	261,827	269,412	276,789
D	Direct reuse	83,642	78,247	72,821	67,505	68,761	77,635
E	Direct reuse	6,000	6,000	6,000	6,000	6,000	6,000
E	Indirect reuse	38,031	38,031	38,031	38,031	38,031	38,031
F	Direct reuse	19,015	19,309	19,459	19,609	19,759	19,909
G	Direct reuse	17,344	17,344	17,344	17,344	17,344	17,344
H	Indirect reuse	0	0	438	14,799	14,840	14,866
I	Direct reuse	1,518	1,533	1,546	1,559	1,570	1,584
I	Indirect reuse	16,559	13,687	13,687	13,687	13,687	13,687
L	Direct reuse	16,049	16,049	16,049	16,049	16,049	16,049
M	Direct reuse	24,677	24,677	24,677	24,677	24,677	24,677
O	Direct reuse	51,514	35,071	35,822	36,737	37,853	39,213
	Total direct	**279,440**	**261,045**	**256,751**	**253,473**	**257,342**	**270,328**
	Total indirect	**202,724**	**249,647**	**292,746**	**328,344**	**335,970**	**343,373**
	Total reuse	**482,164**	**510,692**	**549,497**	**581,817**	**593,312**	**613,701**

FIGURE 5.9. GROUNDWATER MANAGEMENT AREAS IN TEXAS.

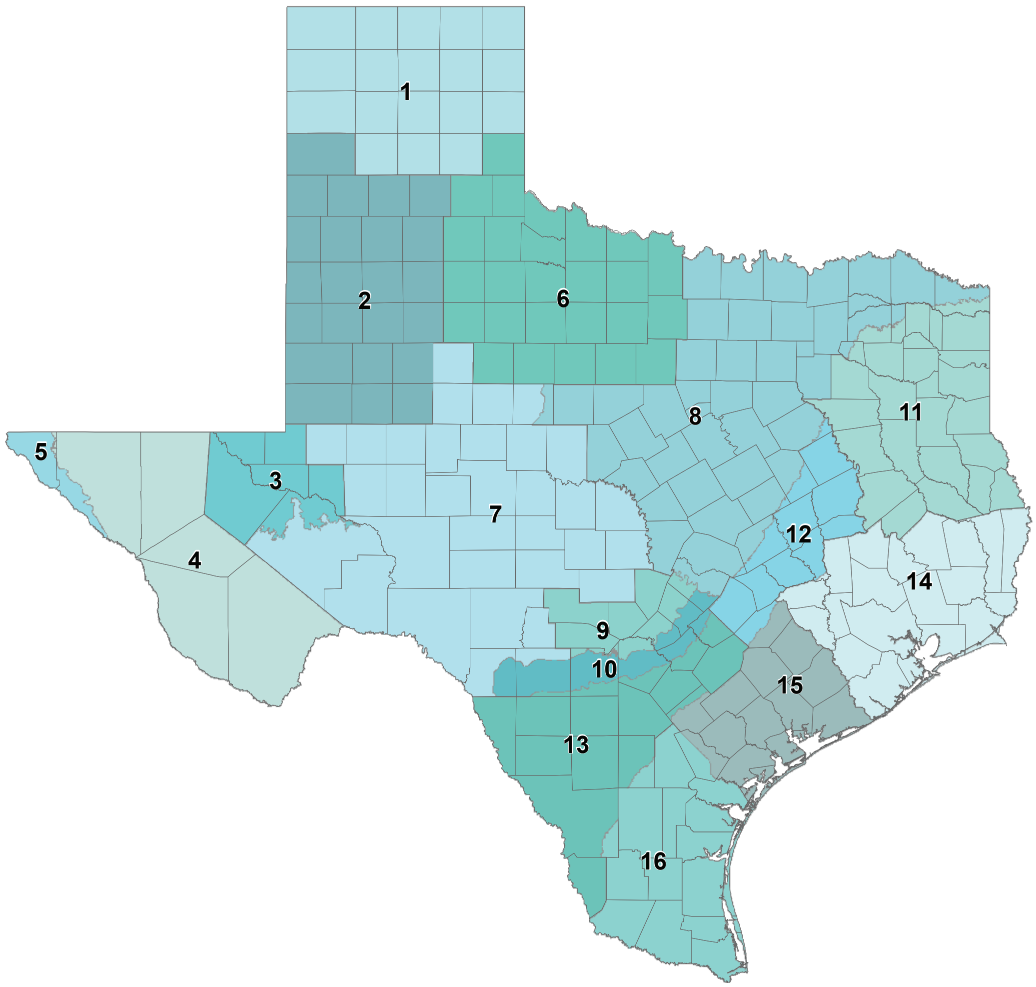


FIGURE 5.10. PROJECTED EXISTING WATER REUSE SUPPLIES THROUGH 2060 (ACRE-FEET PER YEAR).

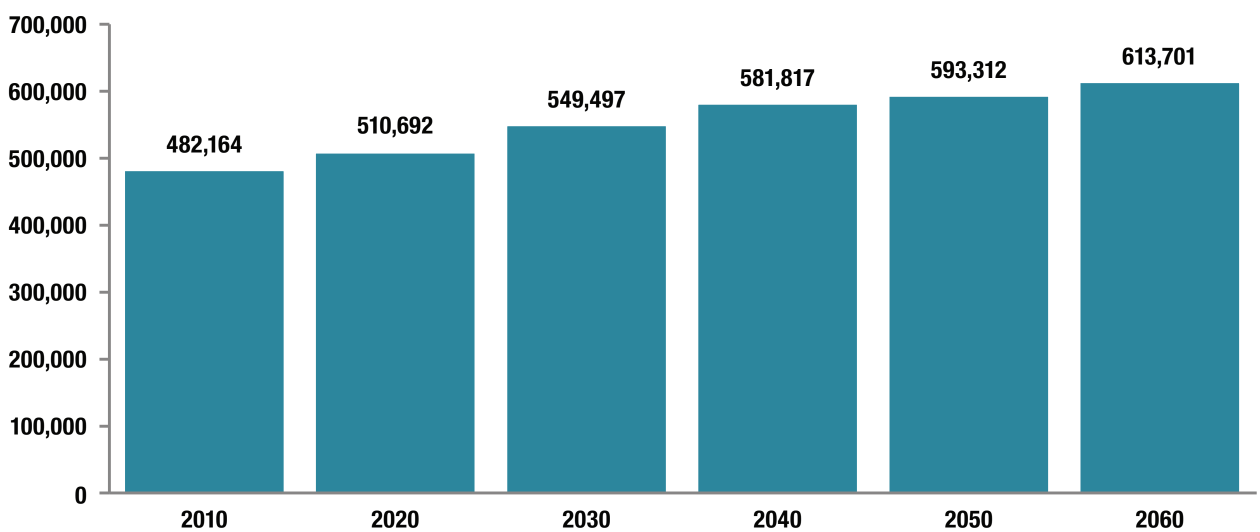


FIGURE 5.11. EXISTING INDIRECT REUSE SUPPLIES THROUGH 2060 BY REGION (ACRE-FEET PER YEAR).

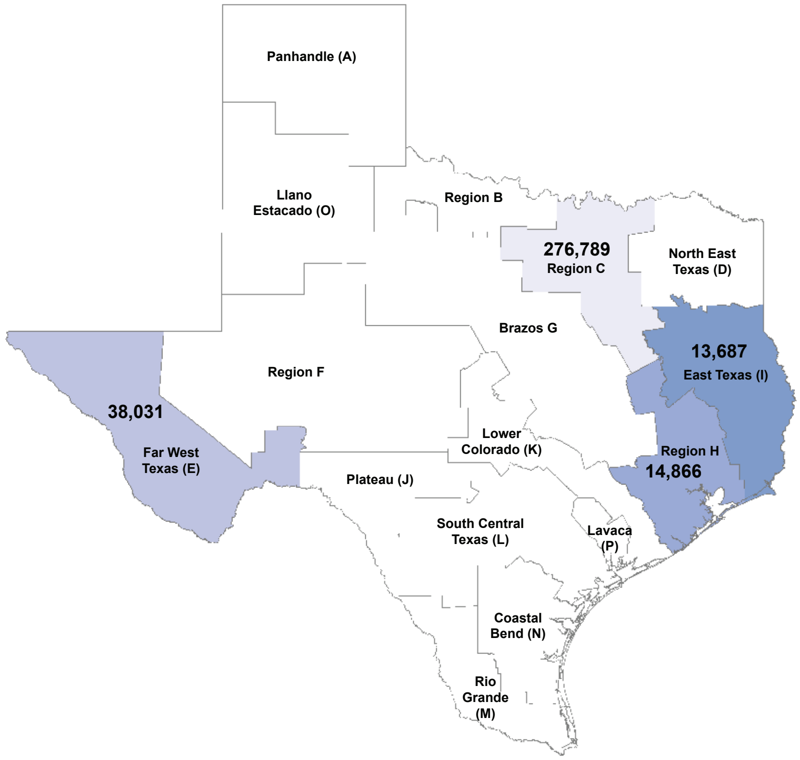


FIGURE 5.12. EXISTING DIRECT REUSE SUPPLIES THROUGH 2060 BY REGION (ACRE-FEET PER YEAR).