EUWCD

EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT

Groundwater Management Plan

Proposed Adoption on Novemebr 21, 2025

Table of Contents

TABLES

FIGURES

APPENDICES

MISSION STATEMENT:

The Evergreen Underground Water Conservation District (EUWCD or District) was created by the Texas Legislature to protect and conserve the groundwater resources of Atascosa, Frio, Karnes, and Wilson counties, through local management in coordination with Groundwater Management Areas 13 and 15 (GMA 13 and GMA 15). The District directs its efforts for the conservation, preservation, protection, recharging, and prevention of waste of groundwater in groundwater reservoirs or their subdivisions. The District's rules and management plan are based on the best available science, within the laws and rules in effect.

TIME PERIOD FOR THIS PLAN:

This plan becomes effective upon adoption by the EUWCD Board of Directors and subsequent approval by the Texas Water Development Board (TWDB). The management plan is based on a five-year planning period; however, the plan may be revised at any time to ensure that it is consistent with the District's Rules, practices, and adopted desired future conditions. The District's Board of Directors shall re-adopt the management plan, with or without revisions, at least every five years.

STATEMENT OF GUIDING PRINCIPLES:

Atascosa, Frio, Karnes, and Wilson counties rely on the local groundwater supplies to meet their drinking water, industrial, agricultural, domestic, and livestock needs. Therefore, the local groundwater resources are vital to the area's health, economy, and environment. The District believes this valuable resource can be managed in a reasonable manner through conservation, education, and regulation. The overall management goal will be a sustainable supply of water from local groundwater resources, while recognizing the need to balance protection of rights of private landowners with the responsibility of managing the area's groundwater resources for future generations. A basic understanding of local aquifers and their hydrogeological properties, as well as quantification of available water supplies, is the foundation for development of prudent management strategies. The Carrizo-Wilcox Aquifer, as well as the minor aquifers in the area, must be conserved and preserved for future generations, to the extent allowed by law and made possible through implementation of scientific data and information collected by the District. This Management plan is intended as a tool for the District to provide continuity and consistency in decision making and to develop an understanding of local aquifer conditions for implementation of proper groundwater management policies.

The District has a responsibility to continually monitor aquifer conditions. As conditions warrant, this document may be modified to best serve the District in meeting its goals. The District will review and re-adopt this plan every five years.

DISTRICT INFORMATION

Creation

The Evergreen Underground Water Conservation District was created by the Texas Legislature under Section 59 of Article XVI of the Texas Constitution and Acts of May, 1965, 59th Leg. R.S., ch. 197, 1965 Tex. Gen. Laws 398; as amended by Acts of May 25, 1967, 60th Leg., R.S. ch. 1272, 1967 Tex. Gen. Laws 1676; Acts of May 30, 1983, 68th Leg., R.S., ch. 484, 1983 Tex. Gen. Laws 2852; and Acts of May 17, 1985, 69th Leg., R.S., ch. 438, 1985 Tex. Gen. Laws 2984; Acts 2023, 88th R.S., ch. 371, General and Special Laws of Texas; and the non-conflicting provisions of Chapter 36, Texas Water Code.

Location and Extent

The District encompasses Atascosa, Frio, Wilson, and Karnes Counties. The boundaries of the District are coterminous with the counties' boundaries. This includes approximately 3,917 square miles.

Background

The District's Board of Directors consists of nine (9) members. Each county elects two directors to the Board and one director is appointed by the Governor.

Authority/Regulatory Framework

In the preparation of its management plan, the District followed all procedures and satisfied all requirements of Chapter 36 of the Texas Water Code (TWC) and Chapter 356 of the TWDB rules contained in Title 30 of the Texas Administrative Code (TAC). The District exercises the powers it was granted and authorized to use by and through the special and general laws that govern it.

Groundwater Resources of the Evergreen Underground Water Conservation

District

There are major and minor aquifers within the EUWCD, with all of the aquifers composed principally of unconsolidated sediments of sand, silt, clay and shale. The general locations of the aquifers are shown in Figures 1 and 2.

The major aquifers in EUWCD are:

- the Carrizo-Wilcox Aquifer spanning from the northern boundaries of Frio, Atascosa, and Wilson counties to the southern boundaries of the same counties. The Carrizo-Wilcox

Aquifer also occurs in the north part of Karnes County and extends to the south boundary of the county but is not pumped with wells in the south part of the county; and
- the Gulf Coast Aquifer System in Karnes County.

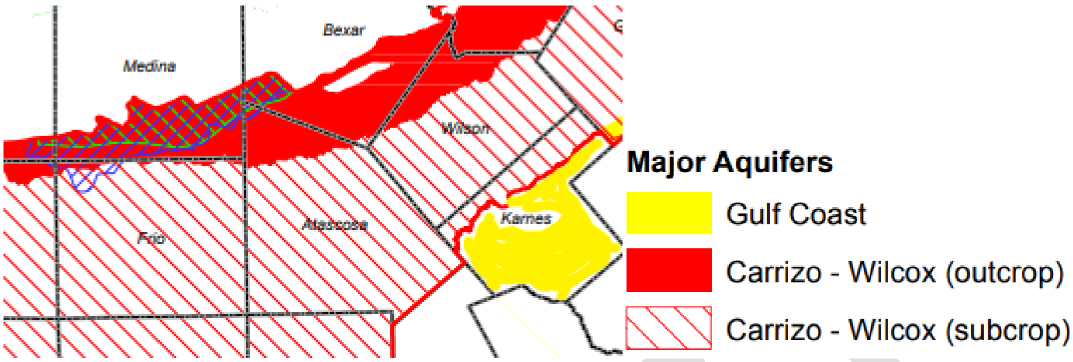


Figure 1. General Areal Extent of Major Aquifers.

The minor aquifers in EUWCD are:
- the Queen City Aquifer in Frio, Atascosa, and Wilson Counties;
- the Sparta Aquifer in Frio, Atascosa, and Wilson Counties; and
- the Yegua Jackson Aquifer in southern Atascosa and Wilson counties and Karnes County.

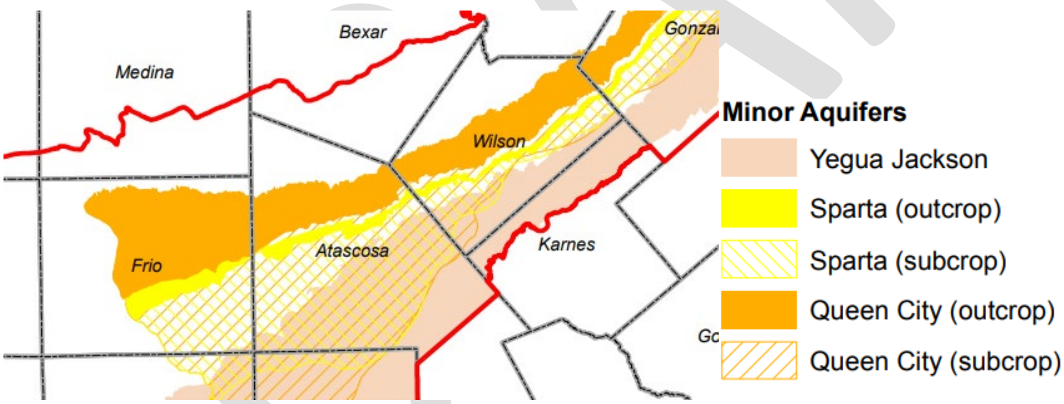


Figure 2. General Areal Extent of Minor Aquifers

The vertical sequence of the aquifers is provided in Table 1, with the age of the aquifers increasing from Holocene to Paleocene. The Carrizo is the most prolific water-yielding unit and is part of the Carrizo-Wilcox Aquifer. The Queen City, Sparta and Yegua-Jackson aquifers provide small to large quantities of water to wells. A large pumping rate is defined as 200 gallons per minute or more. The Gulf Coast Aquifer System, located in most of Karnes County, can provide small to large quantities of water to properly constructed and thoroughly developed wells.

Table 1. Generalized Stratigraphic Section

<table>
<tr><th>EPOCH</th><th colspan="2">Hydrogeologic Unit</th></tr>
<tr><td>Holocene</td><td rowspan="3">Chicot Aquifer</td><td rowspan="7">Gulf Coast Aquifer</td></tr>
<tr><td>Pleistocene</td></tr>
<tr><td>Pliocene</td></tr>
<tr><td rowspan="3">Miocene</td><td>Evangeline Aquifer</td></tr>
<tr><td>Burkeville Confining Unit</td></tr>
<tr><td rowspan="2">Jasper Aquifer</td></tr>
<tr><td rowspan="2">Oligocene</td></tr>
<tr><td colspan="2">aquitard</td></tr>
<tr><td rowspan="5">Eocene</td><td colspan="2">Yegua-Jackson Aquifer</td></tr>
<tr><td colspan="2">Sparta Aquifer</td></tr>
<tr><td colspan="2">Queen City Aquifer</td></tr>
<tr><td colspan="2">aquitard</td></tr>
<tr><td colspan="2" rowspan="2">Carrizo-Wilcox Aquifer</td></tr>
<tr><td>Paleocene</td></tr>
</table>

The primary freshwater aquifers in the Carrizo-Wilcox toYegua Jackson sequence consist of sandy fluvial and deltaic sediments, while marine silts and clays act as aquitards separating the water-yielding zones. Within the District, the Wilcox Group is subdivided into a lower, middle and upper unit. The lower Wilcox is composed of sands and clays and the middle Wilcox can be composed of interbedded sediments that are predominated by clay and silt with limited sand. The upper Wilcox is composed of a greater percentage sand than the middle Wilcox and is located just below the Carrizo Aquifer. Just below the Wilcox Group is the Midway Formation, a marine clay confining unit. Each of the aquifers dip downward toward the Gulf Coast at rates of up to about 100 to 130 feet per mile. (Deeds and Kelley, 2003:Fisher and McGowen, 1967).

The sediments of the Gulf Coast Aquifer system were deposited under fluvial-deltaic to shallow-marine environments. The sediments are composed of sand, silt, clay, shale and gravel. The aquifer system can provide small to large quantities of water to properly constructed and thoroughly developed wells. Hydrostratigraphic units in the system, from oldest to youngest include: the Catahoula confining system, the Jasper Aquifer, the Burkeville confining system, the Evangeline Aquifer, and the Chicot Aquifer. Each of the aquifer units dip downward to the southeast toward the Gulf Coast. A detailed discussion of the geology of the aquifer system is given in (Mace and others, 2006).

Topography and Drainage

Natural topography in the District ranges from gently hilly terrain in portions of the north parts of Atascosa, Frio, and Wilson counties, to relatively flat terrain along a substantial amount of the Cibolo Creek, San Antonio, Atascosa, and Frio rivers corridors. Land surface elevations above sea level for the District area are shown on Figure 3. Land surface elevations range from about 750 feet above sea level, near the City of Lytle and in the north part of Frio County, to about 200 feet above sea level along the Atascosa River in the very south part of Atascosa County. Thus, the higher land surface elevations occur in the north parts of the District, with land surface elevation generally decreasing toward the Gulf Coast.

The Frio and Atascosa rivers have stream gradients of about five to six feet per mile indicative of the gently sloping terrain that they drain in the District. The San Antonio River and Cibolo Creek have stream gradients of from three to five feet per mile, also indicative of the flat to gently sloping terrain that the streams drain.

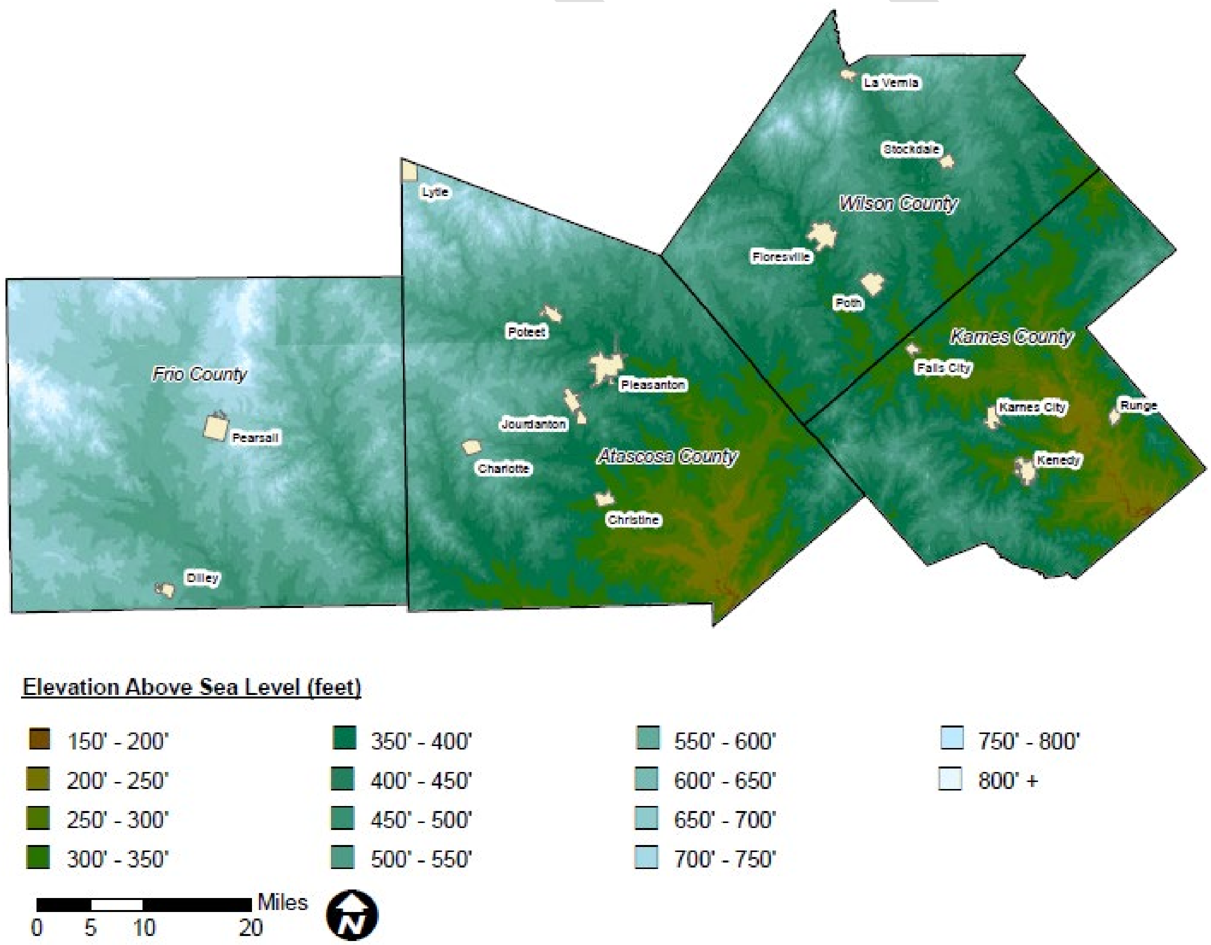


Figure 3. Land Surface Elevations above Sea Level for the District

Surface Water Supplies of Atascosa, Frio, Karnes and Wilson Counties

Atascosa, Frio, Karnes, and Wilson counties are within the Region L Regional Water Planning Group (RLWPG) sometimes referred to as South Central Texas L. Each regional water group supplies their specific assessments to the TWDB for incorporation into the 2017 Texas State Water Plan.

Projected surface water supplies are the maximum amount of surface water available from existing sources for use during drought of record conditions that is physically and legally available for use. These are the existing surface water supply volumes that, without implementing any recommended water management strategies, could be used during a drought by water user groups located within the specified geographic area. For the District, the projected surface water supplies in the 2017 Texas State Water Plan are estimated to be about 3,117 acre-feet per in the year 2070. These are essentially run-of-river rights and lake or pond supplies.

Surface water sources include any water resources where water is obtained directly from a surface water body. This would include rivers, streams, creeks, lakes, ponds, and tanks. In the state of Texas, all waters contained in a watercourse (rivers, natural streams and lakes, and storm water, flood water, and rainwater of every river, natural stream, canyon, ravine, depression, and watershed) are waters of the State and thus belong to the State. The State grants individuals, municipalities, water suppliers and industries the right to divert and use this water through water rights permits. Water rights are considered property rights and can be bought, sold, or transferred with State approval. These permits are issued based on the concept of prior appropriation, or “first-in-time, first-in-right.” Water rights issued by the State generally fall into two major categories: run-of-river rights and stored water rights. Within the District, almost all of the water rights are run-of-river rights.

In addition to the water rights permits issued by the State, individual landowners may use State waters without a specific permit for certain types of uses. The most common of these uses is domestic and livestock use. These types of water sources are generally referred to as “Local Supply Sources.” Many individuals with land along a river or stream that still have an old riparian right can also divert a reasonable amount of water for domestic and livestock uses without a permit.

REQUIRED ESTIMATES: 31 TAC 356.5(a)(5)(A)-(G)

Modeled Available Groundwater

Section 36.001 of the TWC defines modeled available groundwater (MAG) as “the amount of water that the Executive Administrator [of the TWDB] determines may be produced on an average annual basis to achieve a desired future condition established under §36.108.” Desired future condition (DFC) is defined in §36.001 of the TWC as “a quantitative description, adopted in accordance with §36.108 of the Texas Water Code, of the desired condition of the groundwater resources in a management area at one or more specified future times." The District participates in the joint planning process in GMAs 13 and 15, as defined per TWC §36.108, and established DFCs for aquifers within the District. GMA 13 encompasses most of the District, except for the south part of Karnes County, which is in GMA 15.

DFCs Adopted by GMAs 13 and 15.

GMA 13 chose to adopt a GMA-wide DFC for the Carrizo-Wilcox, Queen City, and Sparta aquifers, to be applicable for the period from the end of 2012 to the year 2080. The DFC for the Yegua-Jackson Aquifer is applicable for Karnes County and is for the period from 2010 to 2080. GMA 15 adopted a DFC for the Gulf Coast Aquifer that is applicable to Karnes County and spans from 2000 to 2080. For each of the aquifers in the counties, the areas covered are as defined by the stratigraphy used in the TWDB Groundwater Availability Model for the Southern Carrizo-Wilcox Aquifer GAM and the TWDB Central Gulf Coast GAM.

GMA 13

Adopted DFCs and MAGs for the counties in the District within GMA 13 are provided in Table 2 and on succeeding pages, as provided by the GAM Run 21-018 MAG report.
https://www.twdb.texas.gov/groundwater/docs/GAMruns/GR21-018_MAG.pdf

Table 2. Adopted Aquifer DFCs based on the Average Threshold that occurs between January 2012 and 2080. Yegua Jackson (2010-2080)

Aquifer System	Artesian Head Reduction (ft)
Carrizo-Wilcox, Queen City, and Sparta combined for all of GMA 13	48
Yegua-Jackson in Karnes County	1

Resolutions to Adopt Desired Future Conditions, November 19, 2021, Groundwater Management Area 13 Resolutions 21-02 and 21-03 (Carrizo-Wilcox, Queen City, Sparta and Yegua-Jackson aquifers).

The TWDB's MAG Estimates based on GMA 13 adopted DFCs include the following:

Carrizo -Wilcox Aquifer

Table 3. MAG for the Carrizo-Wilcox Aquifer is summarized by county in GMA 13 for each decade between 2020 and 2080. Results are in acre feet per year (ac-ft/yr).

County	2020	2030	2040	2050	2060	2070	2080
Atascosa	51,924	54,397	55,329	56,828	58,406	59,982	59,982
Frio	114,827	86,995	85,143	82,950	81,018	79,131	79,131
Karnes	693	758	843	931	1,001	1,043	1,043
Wilson	38,229	38,284	43,604	68,609	105,947	125,670	125,670

Queen City

Table 4. MAG for the Queen City Aquifer is summarized by county in GMA 13 for each decade between 2020 and 2080. Results are in ac-ft/yr.

County	2020	2030	2040	2050	2060	2070	2080
Atascosa	4,070	4,525	4,537	4,495	4,390	4,285	4,285
Frio	6,702	4,533	4,380	4,231	4,066	3,927	3,927
Wilson	2,631	1,423	1,267	1,123	1,000	892	892

Sparta

Table 5. MAG for the Sparta Aquifer is summarized by county in GMA 13 for each decade between 2020 and 2080. Results are in ac-ft/yr.

County	2020	2030	2040	2050	2060	2070	2080
Atascosa	1,218	1,187	1,043	998	961	932	932
Frio	897	623	603	576	557	534	534
Wilson	335	182	163	144	128	114	114

Yegua-Jackson

Table 6. MAG for the Yegua-Jackson Aquifer is summarized by county in GMA 13 for each decade between 2020 and 2080. Results are in ac-ft/yr.

County	2020	2030	2040	2050	2060	2070	2080
Karnes	2,013	2,013	2,013	2,013	2,013	2,013	2,013

GMA 15

As provided by the GAM Run 21-020 MAG report:
https://www.twdb.texas.gov/groundwater/docs/GAMruns/GR21-020_MAG.pdf

Table 7. Adopted Aquifer DFC for Karnes County based on the Average Threshold that occurs between January 2010 and December 2080.

Aquifer System	Artesian Head Reduction (ft)
Gulf Coast Aquifer	22

Resolution to Adopt Desired Future Conditions, October 14, 2021, Groundwater Management Are 15 Resolution 2021-01 (Gulf Coast Aquifer).

Gulf Coast Aquifer System

Table 8.MAG for the Gulf Coast Aquifer System is summarized for Karnes County for each decade between 2020 and 2080. Results are in ac-ft/yr.

County	2020	2030	2040	2050	2060	2070	2080
Karnes	10,694	10,525	3,404	3,399	3,227	2,952	2,949

Historical Water Use Data

Data from the TWDB Estimated Historical Water Use Datasets are included in Appendix A, provide annual historical water use estimates from 2010 to 2017, the most recent years of record availability. The table includes groundwater and surface water accounting for municipal, manufacturing, steam electric, irrigation, mining, and livestock usage. Within the District, irrigation is the largest water use category.

Annual Recharge from Precipitation

Scope: This is the recharge to aquifers from precipitation falling on outcrop areas of the aquifers within the District. Additional recharge to aquifers occurs in areas outside the District.

Methodology: Using data from the TWDB GAM Run 19-013, the average annual estimated recharge from all of the aquifers with outcrops in the District is 93,366 acre-feet per year (ac-ft/yr) with a breakdown by aquifer given in Table 4.

Annual Volume of Water Discharging to Surface Water

Scope: This includes groundwater discharging from each aquifer within the District to springs and surface water bodies including lakes, streams, and rivers.

Methodology: Using data from the TWDB GAM Run 19-013, Table 4 summarizes the flow from each aquifer to surface water springs, lakes, streams, and rivers.

Table 9.GAM Recharge and Discharge Estimates

Management Plan Requirements	Aquifer or Confining Unit	Results ac-ft/yr
Estimated annual amount of recharge from precipitation to the District	Gulf Coast Aquifer System	1,196
	Yegua-Jackson Aquifer	42,086
	Sparta Aquifer	6,150
	Queen City Aquifer	23,084
	Carrizo-Wilcox Aquifer	20,850
	Edwards (Balcones Fault Zone) Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Gulf Coast Aquifer System	1,496
	Yegua-Jackson Aquifer	46,062
	Sparta Aquifer	4,407
	Queen City Aquifer	7,097
	Carrizo-Wilcox Aquifer	3,621
	Edwards (Balcones Fault Zone) Aquifer	0

Source: TWDB GAM Run 19-013

Annual Flow Into/Out and Between Aquifers

Scope: Flow into and out of the District is described as lateral flow within the aquifers between the District and adjacent counties. Flow between aquifers describes the vertical flow, or leakage, between aquifers. Estimates of flow into the District from each aquifer are provided in the Table 5.

Methodology: Using data from the TWDB GAM Run 19-013, annual flow into/out and between aquifers was estimated. Groundwater flow estimate results are provided in Table 5.

Table 10.GAM Flow Estimates

Management Plan Requirements	Aquifer or Confining Unit	Results ac-ft/yr
	Gulf Coast Aquifer System	746

Estimated annual volume of flow into the District within each aquifer in the District	Yegua-Jackson Aquifer	2,679
	Sparta Aquifer	73
	Queen City Aquifer	79
	Carrizo-Wilcox Aquifer	72,094
	Edwards (Balcones Fault Zone) Aquifer	70
Estimated annual volume of flow out of the District within each aquifer in the District	Gulf Coast Aquifer System	1,198
	Yegua-Jackson Aquifer	4,578
	Sparta Aquifer	864
	Queen City Aquifer	1,716
	Carrizo-Wilcox Aquifer	15,081
	Edwards (Balcones Fault Zone) Aquifer	0
Estimated net annual volume of flow between each aquifer in the District	Flow from the Catahoula Formation[1] into underlying Yegua-Jackson units	627
	Flow from the Yegua-Jackson Aquifer into the Catahoula Formation	41
	Flow from the Yegua-Jackson Aquifer into downdip Yegua-Jackson units	228
	Flow from the Sparta Aquifer into overlying younger units	970
	Flow from the Sparta Aquifer System into the Weches confining unit	4,486
	Flow from the Sparta Aquifer into downdip units	1,096
	Flow into the Queen City Aquifer from the Weches confining unit	6,259
	Flow into the Reklaw confining unit from the Queen City Aquifer	7,282
	Flow from the Queen City Aquifer into downdip units	527
	Flow into the Carrizo-Wilcox Aquifer from the overlying Reklaw confining unit	18,695
	Flow from the Carrizo-Wilcox Aquifer into downdip units	2,313

[1] In and near the outcrop the Catahoula Formation is considered part of the Gulf Coast Aquifer System. Extracted from the groundwater availability model for the Yegua-Jackson Aquifer. GAM Run 19-013 report.

	Flow between Edwards (Balcones Fault Zone) Aquifer and other aquifers	NA[2]

Source: TWDB GAM Run 19-013

The same GAMs were used to develop the estimates of recharge from precipitation and other components of the aquifer water flow budgets, as were used to develop the DFCs for the aquifers in the 2016 planning cycle. References regarding the GAMs used to develop the flow budgets are also given at the conclusion of TWDB report GAM Run 19-013, included as Appendix B.

Projected Surface Water Supply

Surface water is currently allocated by the Texas Commission on Environmental Quality (TCEQ) for the use and benefit of all people of the State. Anyone seeking a new water right must submit an application to the TCEQ. The TCEQ then determines whether or not the permit will be issued and permit conditions. The water right grants a certain quantity of water to be diverted and/or stored, a priority date, and other conditions, which may include a maximum diversion rate and in stream flow restrictions to protect existing water rights and environmental flows.

Select Water Solutions, LLC is the largest active surface water right holder within the District. There are currently 21,429.94 ac-ft of surface water rights permitted in the basin (TCEQ, 2025), see Figure 4 for the locations of the permitted surface water rights. The use of surface water from a river or stream in the District is limited to run-of -river rights or riparian rights mainly for irrigation. Water also is used from surface water ponds and reservoirs in the District, mainly for livestock and the irrigation of small tracts of land.

[2] Not applicable. Model assumes a no-flow boundary at the base. GAM Run 19-013 report.

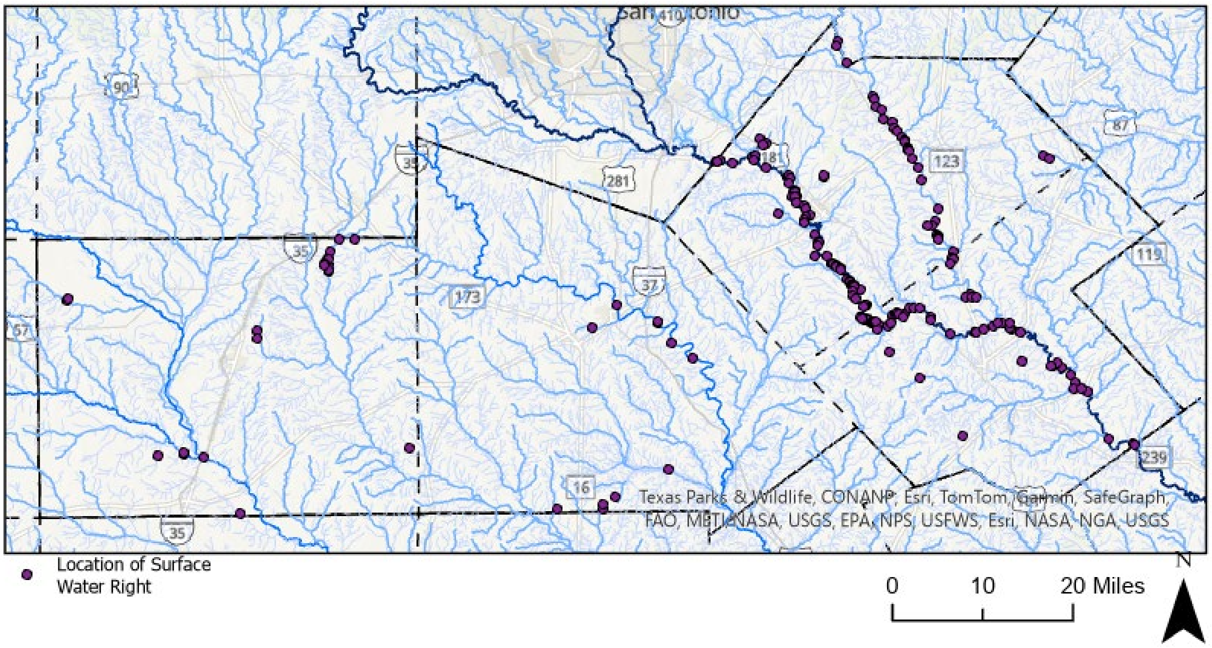


Figure 4.Locations of Surface Water Withdrawal Locations.

Water use data obtained from the TWDB for 2023 show that surface water usage in the District was approximately 3,700 ac-ft, comprising about three percent of overall District-wide water use and 17.3% of the permitted surface rights.

Projected surface water supplies are described in the 2022 Texas State Water Plan and are referenced Appendix A. The projected surface water supplies include run-of-river and local (surface water pond or reservoir) supplies and a small surface water supply for the City of La Vernia backed by stored water in Canyon Lake.

Projected Water Demands

The Region L Water Planning Group (RLWPG) and local water use data indicate that total water demands for the District could be 177,032 and 181,834 ac-ft/yr respectively, by 2030 and 2070. These numbers include use from all available groundwater and surface water sources within the District and represents a 16.4% and 27.2% increase,respectively, in demand from the previous 2017 projections (TWDB, 2022).

Current and projected water demands by user group within each county in the District through the year 2070 are described in Appendix A. These estimates are in the current 2022 Texas State Water Plan. Projected water demands were adjusted in the 2022 Texas State Water Plan, compared to the 2017 Texas State Water Plan as believed appropriate by the water planners. The District will continue to work to collect accurate data about current groundwater production, as well as projected demands for water. This information will be provided to the TWDB for inclusion in future regional and state water plans. As indicated in the regional water plan, the water demand projections take into account population growth, rainfall, and conservation measures to be taken by each user group.

Projected Water Supply Needs

The District has considered the future needs projects in the 2022 Texas State Water Plan. The projected need for additional water supplies stated in the 2022 Texas State Water Plan clearly indicates needs in irrigation (Frio, Karnes, and Wilson Counties) mining (Karnes County), and municipal. Municipal needs exist for City of Lytle, City of Pearsall, El Oso WSC, Karnes City, City of Elmendorf, Oak Hills, and SS WSC. The total amount of the additional water supply needs within the District are 22,287 ac-ft/yr by 2070. This is a 561% increase from the estimated water supply needs in the 2017 state water plan and represents 12% of the estimated water demand in 2070.

Projected water supply needs, based on projections in the 2022 Texas State Water Plan, are included in Appendix A. Negative values (listed in red) indicate a projected water supply need. The plan identifies recommended water strategies for these needs.

Projected Water Management Strategies to Meet Future Supply Needs

The projected water management strategies, as given in the 2022 Texas State Water Plan, are included in Appendix A. It is estimated that by 2070, projects developing 6,455 ac-ft/yr from the Carrizo-Wilcox Aquifer, and 552 ac-ft/yr from the Yegua-Jackson will be implemented. Most of the future water development is projected to occur in Wilson County, by SS WSC, City of Floresville, and Oak Hills WSC. An additional 1,282 ac-ft of demand projection, through strategies such as municipal water conservation and drought management, is estimated to occur by 2070.

Natural or Artificial Recharge of Groundwater Resources

Estimate of Average Recharge to the Groundwater Resources within the District.

Aquifers within the District receive recharge from infiltration of precipitation and water from streams that cross aquifer outcrops. Estimated general locations of aquifer outcrops within the District are shown on Figures 1 and 2. Recharge to aquifers within the District can occur outside District boundaries, as an aquifer outcrop extends to the north into an adjoining county, or to the east and west of the District.

An estimate of recharge to the Edwards (Balcones Fault Zone) Aquifer in the very north part of the District is zero, based on the results of TWDB GAM Run 19-013.

Estimates of average recharge for the Carrizo-Wilcox Aquifer have been less than one inch per year based on water flow budgets developed by the TWDB. TWDB GAM Run 19-013 provides estimates of recharge for the aquifer systems and they are given in Table 4 along with estimates of recharge for the other aquifers discussed in the following paragraphs. Based on areas of the aquifer outcrops within the District, the resulting estimate of recharge to the Carrizo-Wilcox Aquifer is about 20,850 ac-ft/yr. With a higher amount of precipitation in the east part of the District recharge rates in that area could be higher than in the west part of the District. Additional recharge occurs outside the District, which contributes to the total recharge to the aquifer system.

The Queen City Aquifer is composed of fine-grained sands with interbedded clay. The outcrop area also can contain alternating areas of sands and other areas of lower permeability silt or clay. The TWDB GAM Run 19-013, estimates that the recharge to the Queen City Aquifer within the District is about 23,084 ac-ft/yr.

The Sparta Aquifer is composed of quartz sand with a small amount of interbedded clay within the aquifer thickness. Recharge to the aquifer via infiltrated precipitation and stream flow is estimated at about 6,150 ac-ft/yr in the TWDB GAM Run 19-013.

The Yegua-Jackson Aquifer is composed of sandstone, clay, and lignite beds in some areas. The outcrop area is extensive in the District as shown on Figure 3. Estimated recharge to the Yegua-Jackson aquifer is about 42,086 ac-ft/yr, based on the TWDB GAM Run 19-013.

The outcrop for the Gulf Coast Aquifer System occurs in Karnes County. It is estimated, based on the TWDB GAM Run 19-013, that recharge to the Gulf Coast Aquifer System is about 1,196 ac-ft/yr.

How Natural or Artificial Recharge of Groundwater Within the District Might Be Increased.

Recharge enhancement may increase the amount of groundwater available from the aquifers within the District. Increasing recharge can be difficult in geologic environments that occur within the District because of the modest level of in District precipitation t. Recharge might be enhanced by the construction of rainfall runoff retention structures on ephemeral streams in outcrop areas with higher permeability sediments such as the Carrizo Aquifer outcrop. Further study of the surface geology and soil characteristics in the District may result in the identification of areas with porous soils that could provide sites for enhanced recharge or test sites for recharge investigations.

Management of Groundwater Supplies – 31 TAC 356.52(a)(4)

Groundwater conservation districts have statutorily been designated as Texas' preferred method of groundwater management through the rules developed, adopted, and promulgated by individual groundwater districts, as authorized by Chapter 36 of the TWC and the individual district's enabling act (TWC §36.0015). The EUWCD may manage groundwater supplies, in part, by adopting rules that regulate the spacing and production of wells, to minimize drawdown of the water table or reduction of artesian pressure, to control subsidence, to prevent interference between wells, to prevent degradation of water quality, or to prevent waste (TWC §36.116).

The EUWCD, as authorized by law, has adopted the following groundwater management strategies in its rules (https://evergreenuwcd.org/wp-content/uploads/2025/07/Resolution-2025-04-25-Rules-Amendment.pdf):

Registration of Exempt Wells

All exempt wells, as defined in EUWCD, shall be registered with the District. New exempt wells shall be registered with the District prior to drilling.

Permitting of Non-Exempt Wells

All non-exempt wells in the District shall be permitted. No person shall construct or drill a new non-exempt well without first obtaining a production permit from the District.

Well Spacing

Well spacing must comply with TDLR rules. Additionally, all new permitted wells and registered oil and gas wells shall be spaced a minimum of one foot for each gallon per minute of production capability from all existing permitted and registered wells producing from the same aquifer.

Groundwater Production Limits

Subject to limitations imposed upon withdrawals as specified under the District's rules, a person may be permitted to produce wells on their property, or property for which person can show possession of groundwater rights, up to a maximum production of 652,000 gallons per acre per year (approximately 2 ac-ft/yr).

The allowance shall not exceed 75 percent of the annual production capability of the well, or the annual production allowance based upon the acres of groundwater rights owned or leased by the applicant, at the time the application is filed.

The maximum production rate may be further limited in the Production Permit based on the evaluation of the studies that may be required to be submitted with the application to prevent waste and achieve water conservation, minimize as far as practicable the drawdown of the water table or the reduction of artesian pressure, including but not limited to enforce the adopted DFCs for the aquifer(s), and lessen interference between wells.

Retail public water utilities may only claim acreage within their CCN or service area if:

- the well is located or to be located within their CCN or service area;
- the well meets the District's spacing rules; and
- the production limit shall not exceed 600 gallons/service connection/day.

Large Scale Groundwater Production Pumping Projects

An entity with permitted groundwater pumping wells located within the District capable of yielding greater than 5,000 acre-feet of groundwater annually from 2,500 acres or more of contiguous property shall, prior to the production of groundwater, install monitoring wells.

Permits for Production of Brackish Groundwater

A person may be permitted to produce brackish groundwater from a well(s) on their property, or property for which person can show possession of groundwater rights, up to a maximum production of 3 acre-feet/acre/year.

Actions Based on Aquifer Response to Pumping

The District shall use its well monitoring program to assess aquifer levels in the District and the effects caused by groundwater production to enforce the District's adopted desired future conditions for the aquifers and to conserve and preserve groundwater availability and protect groundwater users and groundwater ownership and rights.

The District shall adopt threshold average aquifer drawdown amounts that will be used to initiate groundwater management responses that will be implemented to enforce the District's adopted DFCs of the aquifers and to conserve and preserve groundwater availability and protect groundwater users and groundwater ownership and rights.

The District will incorporate these management strategies into its rules and will register, permit, and monitor wells accordingly.

Methodology to Track District Progress in Achieving Management Goals 31 TAC 356.52 (a)(4)

An annual report will be developed by the General Manager and District staff and provided to the District's Board of Directors. The Annual Report will cover activities of the District including information on the District's performance regarding achieving the District's management goals and objectives. The Annual Report will be delivered to the District Board within 60 days following the completion of the District's calendar year, beginning with the calendar year that starts on January 1, 2020. A copy of the Annual Report, upon adoption, will be kept on file and available for public inspection at the District's office.

Included in the annual report is an assessment of the District's achievement of the desired future conditions, including the summary and analysis of monitoring data. The assessment methods utilized to assess each DFC (See Table 6) are as follows:

Table 11. Desired Future Conditions Approved for Aquifers in the EUWCD

Desired Future Condition	Aquifer	Counties	Base Year	End Year	Assessment Method
75 percent of saturated thickness in the outcrop remains	Carrizo-Wilcox, Queen City, and Sparta	All	2012	2080	1
Average drawdown is 1 ft (+/- 1 ft)	Yegua-Jackson	Karnes	2010	2080	2
Drawdown shall not exceed 22 ft	Gulf Coast	Karnes	2000	2080	2
Average drawdown shall not exceed 49 ft (+/- 5 ft) or less	Carrizo-Wilcox, Queen City, and Sparta	GMA 13	2012	2080	3

Average drawdown shall not exceed 49 ft (+/- 5 ft) or less	Gulf Coast	GMA 15	2000	2080	3

The saturated thickness present in 2012 was estimated from water levels measured along the outcrop/subcrop boundary transect in 2012 and the floor of the Carrizo Aquifer. The depth of 75% of this saturated thickness is then calculated. Each year, the December (or other winter) measurements along the transect are averaged and then compared to the 75% depth. See Figure 5 for a visual explanation.

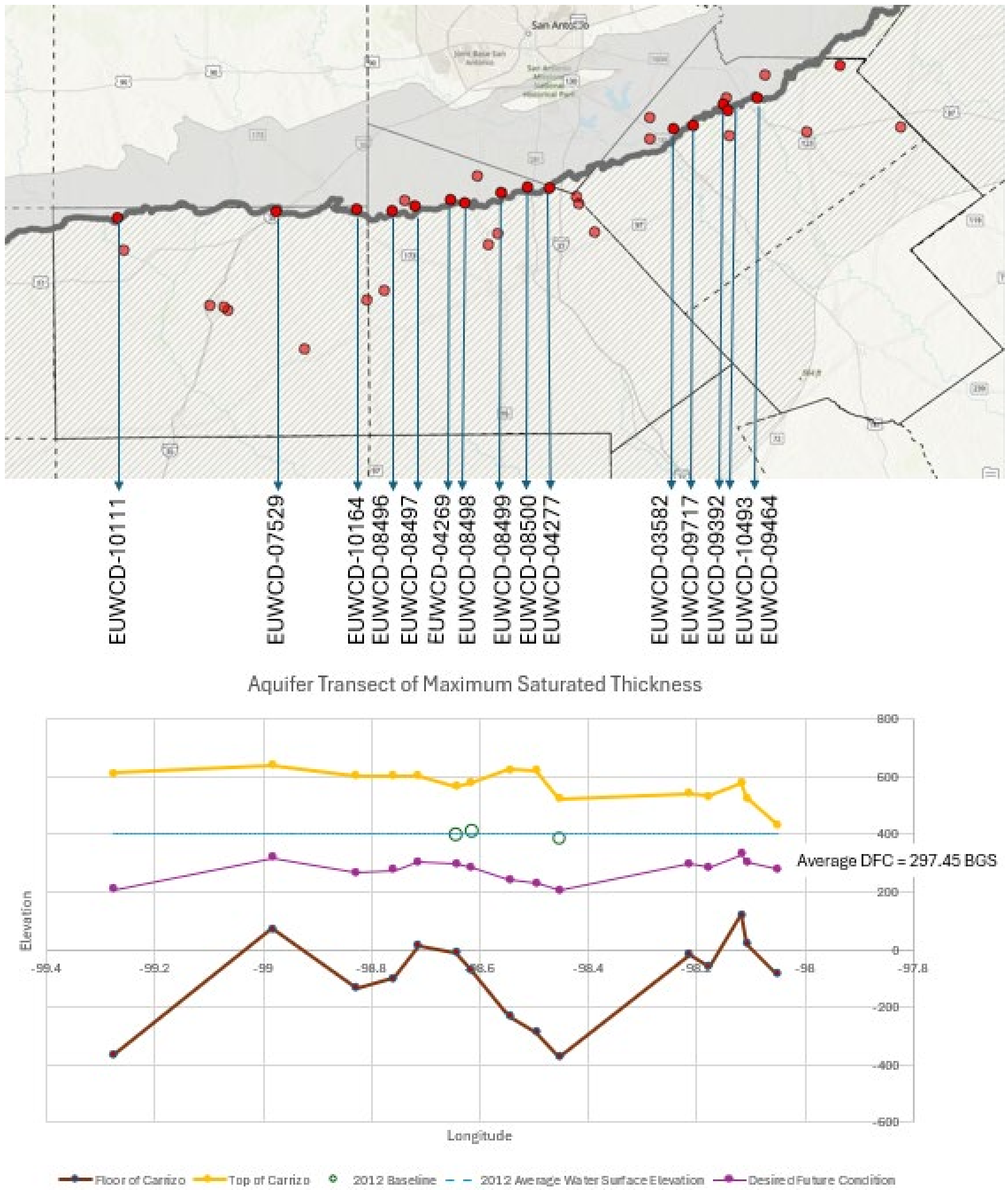


Figure 5.Assessment of Desired Future Conditions with Monitoring Data

The baseline water level across Karnes County for each aquifer by interpolating from available monitoring and submitted drillers reports. The difference between the last winter observation for the management year is compared to the baseline water level for that location (as estimated from the interpolated dataset) to calculate drawdown. The average drawdown is then compared to the DFC.

Monitoring data is submitted to the applicable Groundwater Management Area. The observed water level across the groundwater management area is compared to corresponding observations from the baseline year, and the drawdown calculated. The drawdown is then averaged across the Groundwater Management Area.

Actions, Procedures, Performance, and Avoidance for District Implementation of Management Plan 31 TAC 356.52 (a)(4)

The District will act on goals and directives established in this District Management plan. The District will use the objectives and provisions of the Management plan as a guideline in its policy implementation and decision-making. In both its daily operations and long-term planning efforts, the District will continuously strive to comply with the initiatives and standards created by the Management plan.

The District will amend rules in accordance with Chapter 36 of the TWC and rules will be followed and enforced. The District may amend the District rules as necessary to comply with changes to Chapter 36 of the TWC and to ensure the best management of the groundwater within the District. Development and enforcement of the rules of the District will be based on the best scientific and technical evidence available to the District.

The District will encourage public cooperation and coordination in implementation of the District Management plan. All operations and activities of the District will be performed in a manner that best encourages cooperation with appropriate state, regional, and local water entities, as well as landowners and the general public. Meetings of the District's Board of Directors will be noticed and conducted in accordance with the Texas Open Meetings Act. The District will also make available for public inspection all official documents, reports, records, and minutes of the District, in compliance with the Texas Public Information Act.

For information concerning rules of the District, visit the District's website:
www.evergreenuwcd.org/rules.html

Management Goals and Objectives 31 TAC 356.52(a)(1)

Unless indicated otherwise, performance on goals will be measured annually. The Management plan will be subject to review at least every five years, and modification will be made as deemed appropriate. Information describing programs, policies, and actions taken by the District to meet goals and objectives established by the District will be included in the Annual Report prepared by the General Manager and presented to the District's Board of Directors.

Management Goals:

1. Providing for the Most Efficient Use of Groundwater:

Objective 1a. – Require existing and new non-exempt wells constructed within the boundaries of the District to be permitted by the District and operated in accordance with District Rules. In addition, the District will require all exempt wells constructed within the District boundaries to be registered with the District.

Performance Standard – The number of exempt and permitted wells registered within the District will be reported annually in the District's Annual Report submitted to the District's Board of Directors.

Objective 1b. – Each month the District will monitor the volume of water produced from all municipal and Rural water supply entities in the District.

Performance Standard – A table showing the annual production volumes reported to the District by the Municipal and Rural water supply entities in the District will be included in the Annual Report of District Activities made to the Board of Directors each year.

Objective 1c – Each year the District will request production reports from the operators of 600 agricultural irrigation wells in the District.

Performance Standard – A table showing production volumes reported to the District from the agricultural irrigation well operators in the District will be included in the Annual Report of District Activities made to the Board of Directors each year.

Objective 1d – Each month the District will measure the water levels in 20 water wells.

Performance Standard – A table showing the monthly water level measurements made by the District will be included in the Annual Report of District Activities made to the Board of Directors each year.

2. Controlling and Preventing Waste of Groundwater:

Objective 2a – Each year the District will conduct an on-site investigation of all reports of waste of groundwater within two working days of the time of the receipt of report to the District.

Performance Standard – A discussion of the waste of groundwater observed by the District each year, including the number of reports of the waste of groundwater received by the District and the District response to the report, will be included in the Annual Report of District Activities made to the Board of Directors each year.

3. Addressing Conjunctive Surface Water Management Issues:

Objective 3a - Encourage the use of surface water supplies where available to meet the needs of specific user groups within the District.

Performance Standard- The District will participate in the Region L Regional Water Planning process by attending at least two Region L meetings annually and will encourage the development of surface supplies where appropriate. This activity and involvement will be discussed in the Annual Report presented to the District Board of Directors.

4. Addressing Natural Resource Issues that Impact the Use and Availability of groundwater and which are Impacted by the Use of Groundwater

4**Objective 4a** – Each year the District will sample at least eight water wells in the District, two per county, for chemical analysis of water quality for chemical constituents of concern.
Performance Standard – A table giving the results of the chemical analyses of the water quality samples taken by the District each year will be included in the Annual Report of District Activities made to the Board of Directors each year.
Performance Standard – A discussion of whether any instances of groundwater contamination or issues of concern were noted in the water quality sample analyses will be included in the Annual Report of District Activities made to the Board of Directors each year.

5. Addressing Drought Conditions:

Objective 5a – At least each quarter, the District will download at least one updated U.S. Drought Monitor map posted on The National Drought Mitigation Center at the University of Nebraska Lincoln website (https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?TX) and check for periodic updates to drought conditions as posted on the Texas Water Development Board website.

Performance Standard – at least quarterly, the District will assess the status of drought in the District and prepare a quarterly briefing to the Board of Directors. The downloaded U.S. Drought Monitoring maps and drought report will be included with copies of the quarterly briefing in the Annual Report of District Activities made to the Board of Directors each year.
Performance Standard –the District will put the following link to the TWDB drought page as a resource https://www.waterdatafortexas.org/drought

6. Addressing Water Conservation:

Objective 6a - Each year the District will provide conservation focused education through the District website and through two (2) in-person workshops, talks, or events.

Performance Standard – Each year the District will brief the Board of Directors regarding conservation articles, links, of flyers, and blog postings (4) posted on the website and a summary of the in-person events (2) in which the District participates.

7. Addressing Desired Future Conditions

Objective 7a - The District monitors groundwater levels and evaluates whether the average change in groundwater levels is in conformance with the DFCs. The District will estimate the total annual groundwater production based on water use reports and other relevant information and compare these production estimates to the MAGs.

Performance Standard – Each year the District will summarize the monitoring activities in the annual report including average change in groundwater levels and estimated annual groundwater production.

8. Addressing Precipitation Enhancement

Objective 8a – The District participates in a cloudseeding program and plans on continuing this effort. Rainfall enhancement is conducted using cloud seeding techniques where aircraft release microscopic particles of silver iodide and calcium chloride into thunderstorms to increase rainfall efficiency. Any positive results from the cloudseeding program are estimated to be gauged over years of the collection and evaluation of precipitation data.

Performance Standard – Each year the District will brief the Board of Directors with a report of its cloudseeding program and the collection and evaluation of precipitation data.

Management Goals Determined Not to be Applicable to the Evergreen Underground Water Conservation District

Controlling and Preventing Subsidence:

The report "Final Report: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping TWDB Contract Number

1648302062" prepared by LRE Water for the Texas Water Development Board in 2017 was reviewed while considering the potential for significant subsidence occurring due to groundwater pumping. (http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp). A summary of the report findings for each of the major and minor aquifers in the district can be found in Figures 6, 7, and 8 along with references to the section and figure outlining the report findings.

The Carrizo-Wilcox Aquifer in the District is composed of the Carrizo Sand and the immediately below Wilcox units. The Carrizo has and will continue to provide substantial amounts of water whereas the Wilcox has and is estimated to continue to provide small amounts of water. The Carrizo Sand is composed principally of moderate to high permeability sand with minor amounts of clay. The Wilcox is composed of interbedded layers of fine sand and clay. With the minor amounts of clay in the Carrizo Sand and small amount of pumping from the Wilcox Aquifer, there is not a significant risk of subsidence occurring due to groundwater pumping (Reference Section 4.2.2). There is acknowledgement in the report that the risk of subsidence is less in the southern part of the Carrizo-Wilcox Aquifer than where it occurs in the central and northern parts of the Texas (See Figure 6)

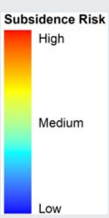
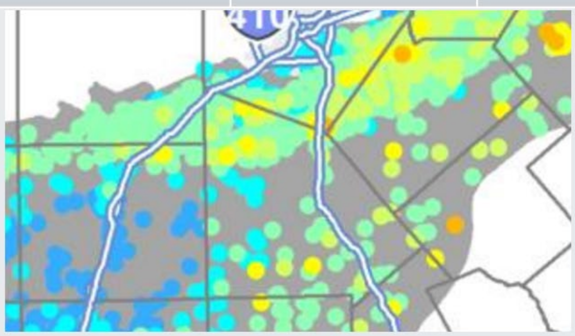
Aquifer:	**Carrizo- Wilcox**		
Report Section Reviewed	4.2.2	Figure	4.7 (pg 4-13)
			
Summary:			
Within the District, the risk for subsidence is low to medium with some areas of elevated risk in the outcrop.			

Figure 6.Subsidence Assessment for the Carrizo-Wilcox Aquifers

Subsidence risk of the Gulf Coast Aquifer is high but generally limited to the confined zones of the Jasper, Evangeline, and Chicot Aquifers. Within the District, the aquifer is primarily unconfined, and according to the assessment, (See Figure 7) "at lower risk of subsidence due primarily to the lower clay thicknesses" (LRE, pg 4-41).

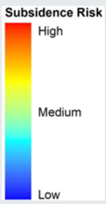
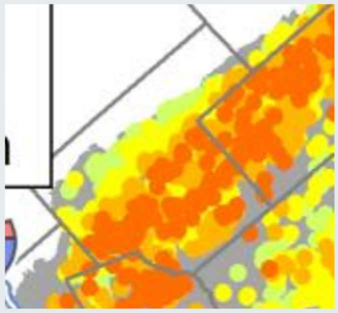
Aquifer:	Gulf Cost Aquifer System		
Report Section Reviewed	4.2.4	Figure	4.23 (pg 4-42)
			
Summary:			
Within the district, the risk of subsidence is high, however the unconfined zones of the Jasper, Evangeline, and Chocot have lower risk, due to lower clay thickness.			

Figure 7.Subsidence Assessment for the Gulf Coast Aquifer System.

The Queen City is composed of fluvio-deltaic sands with interbedded clays and is predicted to have medium risk of subsidence (LRE, pg. 4-192). The Sparta Aquifer is also composed of sand layers with interbedded clays and silts. Within the district, the risk is generally medium (LRE, pg. 4-212). Similarly, the Yegua-Jackson Aquifer generally exhibits medium to higher risk of subsidence (LRE, 4-235) (See Figure 8) However, due to limited pumping from these aquifers, there is not believed to be significant risk of subsidence occurring due to future groundwater pumping from the aquifer.

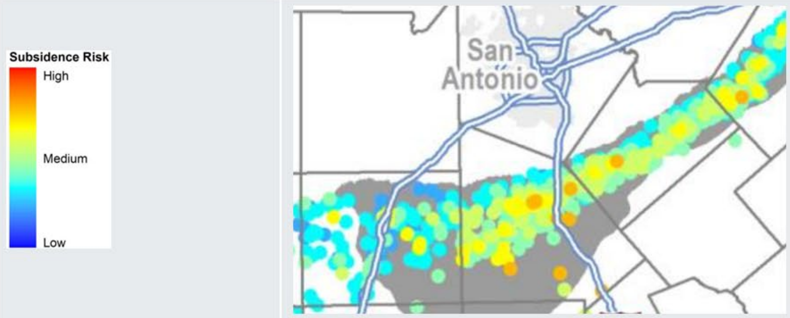
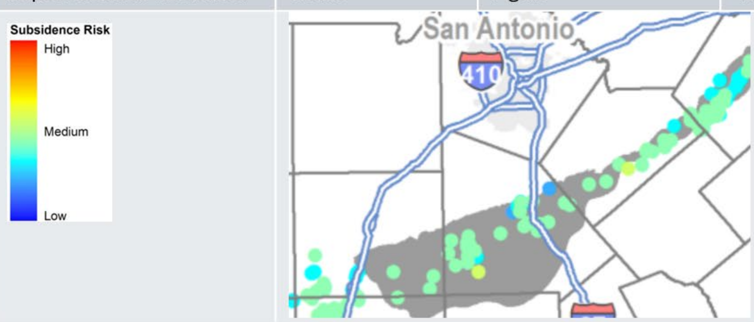
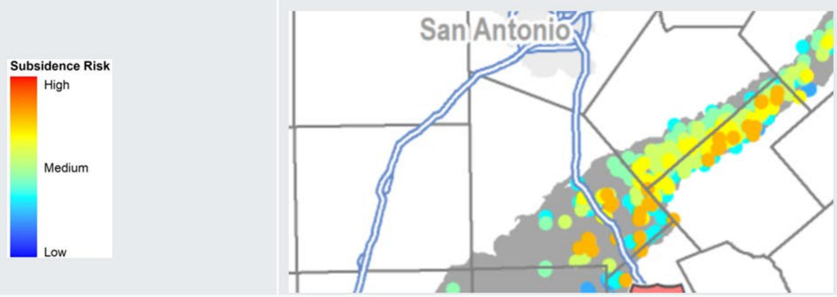
Aquifer:	Queen City		
Report Section Reviewed	4.3.15	Figure	4.122 (pg 4-193)
			
Within the District, the Queen City has a medium to low risk, primarily due to unconsolidated clastic lithology. The potential for subsidence exists but is not significant.			
Aquifer:	**Sparta**		
Report Section Reviewed	4.3.18	Figure	4.136 (pg 4-213)
			
Within the district, the Sparta has a medium risk. While the potential for subsidence exists but is not significant.			
Aquifer:	**Yegua-Jackson**		
Report Section Reviewed	4.3.21	Figure	4.151 (pg 4-236)
			
Within the district, the Yegua-Jackson has a medium to high risk for subsidence, primarily where wells are pumping from deeper areas of the aquifer.			

Figure 8. Subsidence Assessment for Minor Aquifers within the EUWCD.

Based on the information presented in the report, there is not believed to be a significant risk of subsidence occurring due to future groundwater pumping from the aquifer. A management goal addressing controlling and preventing subsidence is not appropriate at this time.

However, the District has implemented rules to requiring that permits be issued subject to terms and provisions necessary to prevent subsidence (Rule 7.3(c), including a requirement that applications for transport permits incorporate a hydrogeologic study that include information describing the projected effect on subsidence (Rule 11.3(b)(2). In addition, the District developed guidance for hydrogeologic studies recommend that applicants utilize the TWDB subsidence tool to document and estimate the risk of subsidence for the well site and thresholds and requirements for implementing a monitoring plan.

Addressing Rainwater Harvesting:

The District is supportive of activities related to rainwater harvesting, however, the District does not currently have a rainwater harvesting financial incentive program. A management goal addressing rainwater harvesting is not appropriate at this time.

Addressing Recharge Enhancement:

Increasing recharge can be difficult in geologic environments that occur within the District because of the modest level of precipitation that occurs in the District. Recharge might be enhanced by the construction of rainfall runoff retention structures on ephemeral streams in outcrop areas with higher permeability sediments such as the Carrizo Aquifer outcrop. Further study of the surface geology and soil characteristics in the District is needed to determine the identification of areas with porous soils that could provide sites for enhanced recharge or test sites for recharge investigations. The District encourages and supports the use of Aquifer Storage and Recovery projects as a means of water conservation in the future. Until further studies are conducted for future projects, a management goal addressing recharge enhancement is not appropriate at this time.

Addressing Brush Control:

In the west part of the District mesquite and thorny brush occur and cover a substantial amount of the land. Some mesquite and thorny brush also occur in the east part of the District along with more hardwood trees. Over the District in general, there are areas of improved pasture and cultivated land. Brush control is currently left to the individual land owners to manage their land and practice brush control for water conservation. A management goal addressing brush control is not appropriate at this time.

References

Deeds, N., Kelley, V., Fryar, D., Whallon, A.J., and Dean, K.E., 2003, Groundwater Availability Model for the Southern Carrizo-Wilcox Aquifer: Contract report to the Texas Water Development Board, 452 p., http://www.twdb.texas.gov/groundwater/models/gam/czwxs/CZWX S Full Report.pdf.

Fisher, W.L., and McGowen, J. H., 1967, Depositional systems in the Wilcox Group of Texas and their relationship to the occurrence of oil and gas: Gulf Coast Association of Geological Societies Transactions, v. 17, p. 105-125

LRE. 2017. Final Report: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping-TWDB Contract Number: 1648302062. Published March 21, 2017. Available at http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp.

Mace and others, Aquifers of the Gulf Coast of Texas, 2006, Texas Water Development Board Report 365, 312 p.

TCEQ.2024. Active Water Rights. TCEQ Water Rights Permitting Team. Available at https://www.tceq.texas.gov/permitting/water_rights/wr-permitting/wrwud.

TWDB. 2022. *Water for Texas: 2022 State Water Plan*. Texas Water Development Board.

Appendix A – Estimated Historical Water Use And 2022 Texas State Water Plan Datasets

TWDB Estimated Historical Groundwater Use and 2022 State Water Plan Datasets

Evergreen Underground Water Conservation District

Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Department
stephen.allen@twdb.texas.gov
(512) 463-7317
October 26, 2025

GROUNDWATER MANAGEMENT PLAN DATA

This set of water data tables (part one of a two-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each table addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan review checklist. The checklist can be found at this web address:

https://www.twdb.texas.gov/groundwater/docs/GCD/GCD_Mgmt_Plan_Checklist_2025.pdf

The five tables included in part one of this data package are:

TWDB Historical Water Use Survey (WUS)

- Estimated Historical Water Use (checklist item 2)

State Water Plan (SWP)

- Projected Surface Water Supplies (checklist item 6),
- Projected Water Demands (checklist item 7),
- Projected Water Supply Needs (checklist item 8),
- Projected Water Management Strategies (checklist item 9)

Part two of the two-part package is the groundwater availability model (GAM) run report for the district (checklist items 3 through 5). The district should have received, or will receive, this report from the TWDB Groundwater Modeling Department. Questions about the GAM can be directed to the Groundwater Modeling Team at GAM@twdb.texas.gov.

DISCLAIMER:

Data presented in these tables are the most up to date WUS and SWP data available as of 10/26/2025. Although it does not happen often, these data are subject to change pending the availability of more accurate WUS data or an amendment to the 2022 SWP. District personnel should review the data table values and correct any discrepancies to ensure approval of their groundwater management plan.

The WUS data can be verified at this web address:

https://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/

The 2022 SWP data can be verified by contacting WRPdatarequests@twdb.texas.gov

The values presented in the data tables are county based. In cases where groundwater conservation districts cover only a portion of one or more counties the data values are modified with an apportioning multiplier to create new values that more accurately represent conditions within district boundaries. The multiplier used in the following formula is a land area ratio: (data value * (land area of district in county / land area of county)). For two of the four SWP tables (Projected Surface Water Supplies and Projected Water Demands) only the county-wide water user group (WUG) data values (county other, manufacturing, steam electric power, irrigation, mining, and livestock) are modified using the multiplier. WUG values for municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained when they are located within the district and eliminated when they are located outside (we offer districts the opportunity to review this determination).

The county values in two of the SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not apportioned because district-specific values are not required to be presented in the groundwater management plan. However, a district is required to “consider” the county values in these two tables by drafting a short summary of the needs and strategies values in the groundwater management plan.

In the WUS table every category of water use (including municipal) is apportioned. Staff determined that breaking down the annual municipal values into individual WUGs was too complex.

TWDB recognizes that the apportioning formula used is not ideal but it is the best available process with respect to time and staffing constraints. If a district believes it has data that are more accurate, they can add those data to the plan with an explanation of how the data were derived. Apportioning percentages that the TWDB used are listed above each applicable table.

For additional questions regarding this data, please contact GWMPlans (GWMPlans@twdb.texas.gov)

Estimated Historical Water Use
TWDB Historical Water Use Survey (WUS) Data

ATASCOSA COUNTY *100% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	7,802	10	7,766	4,708	22,331	878	43,495
	SW	15	0	0	0	0	219	234
2022	GW	8,162	12	4,475	4,852	29,893	911	48,305
	SW	18	0	0	0	0	228	246
2021	GW	7,342	9	2,306	4,133	21,728	1,102	36,620
	SW	20	0	0	0	0	276	296
2020	GW	7,880	12	3,135	6,159	24,940	1,142	43,268
	SW	22	0	182	0	0	286	490
2019	GW	6,460	11	4,739	4,787	20,477	1,127	37,601
	SW	0	0	383	0	0	282	665
2018	GW	6,518	19	2,883	5,607	21,068	1,125	37,220
	SW	0	0	297	0	0	282	579
2017	GW	6,410	51	2,411	7,962	22,519	1,090	40,443
	SW	0	0	249	0	0	273	522
2016	GW	6,296	48	1,718	5,036	18,673	1,136	32,907
	SW	0	0	175	0	0	284	459
2015	GW	6,527	50	2,507	3,478	21,939	1,126	35,627
	SW	0	0	279	0	0	282	561
2014	GW	7,028	52	4,712	5,750	29,323	1,100	47,965
	SW	0	0	524	0	0	275	799

FRIO COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	4,173	1	692	0	58,255	523	63,644
	SW	0	0	0	0	0	348	348
2022	GW	3,994	1	1,837	21	60,723	543	67,119
	SW	0	0	0	0	0	362	362
2021	GW	3,719	1	623	31	32,480	562	37,416
	SW	0	0	0	0	0	375	375
2020	GW	3,407	0	1,442	34	63,806	573	69,262
	SW	0	0	160	0	0	382	542
2019	GW	3,340	0	1,968	29	68,772	573	74,682
	SW	0	0	220	0	0	382	602
2018	GW	2,518	0	1,003	43	63,689	573	67,826
	SW	0	0	111	0	0	382	493
2017	GW	3,418	0	1,671	43	63,570	555	69,257
	SW	0	0	186	0	0	370	556
2016	GW	3,245	0	660	40	60,913	731	65,589
	SW	0	0	73	0	0	488	561
2015	GW	3,266	0	644	54	57,809	703	62,476
	SW	0	0	72	0	0	468	540
2014	GW	3,512	0	985	88	70,601	717	75,903
	SW	0	0	109	0	0	478	587

KARNES COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	3,660	49	8,028	0	800	481	13,018
	SW	0	0	0	0	190	393	583
2022	GW	3,219	8	7,909	0	2,577	500	14,213
	SW	0	0	0	0	182	409	591
2021	GW	3,992	11	7,329	0	717	454	12,503
	SW	0	0	0	0	94	371	465
2020	GW	3,709	63	6,596	0	805	468	11,641
	SW	0	0	732	0	128	382	1,242
2019	GW	3,838	63	14,438	0	840	463	19,642
	SW	0	0	1,604	0	147	378	2,129
2018	GW	3,680	63	12,556	0	549	463	17,311
	SW	0	0	1,394	0	194	378	1,966
2017	GW	3,728	50	10,019	0	604	447	14,848
	SW	0	0	1,113	0	180	366	1,659
2016	GW	3,791	50	5,903	0	563	446	10,753
	SW	0	0	655	0	158	365	1,178
2015	GW	3,591	45	6,677	0	427	437	11,177
	SW	0	0	742	0	376	359	1,477
2014	GW	3,997	72	8,878	0	915	428	14,290
	SW	0	0	987	0	413	352	1,752

WILSON COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	8,425	2	828	0	10,617	1,189	21,061
	SW	10	0	70	0	949	793	1,822
2022	GW	9,924	2	1,004	0	10,616	1,243	22,789
	SW	13	0	0	0	1,601	829	2,443
2021	GW	9,292	2	174	0	9,470	930	19,868
	SW	14	0	0	0	545	620	1,179
2020	GW	7,787	5	237	0	10,795	960	19,784
	SW	11	0	21	0	764	641	1,437
2019	GW	6,856	10	450	0	10,852	950	19,118
	SW	0	0	48	0	609	633	1,290
2018	GW	6,403	9	104	0	10,358	949	17,823
	SW	0	0	12	0	401	633	1,046
2017	GW	6,493	50	0	0	11,986	917	19,446
	SW	0	0	0	0	400	611	1,011
2016	GW	5,854	57	82	0	10,387	890	17,270
	SW	222	0	9	0	627	593	1,451
2015	GW	6,037	50	0	0	9,550	880	16,517
	SW	222	0	0	0	923	586	1,731
2014	GW	6,078	39	440	0	12,568	860	19,985
	SW	226	0	49	0	756	573	1,604

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

ATASCOSA COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	Livestock, Atascosa	Nueces	Nueces Livestock Local Supply	754	754	754	754	754	754
		Sum of Projected Surface Water Supplies (acre-feet)		**754**	**754**	**754**	**754**	**754**	**754**

FRIO COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	Livestock, Frio	Nueces	Nueces Livestock Local Supply	441	441	441	441	441	441
		Sum of Projected Surface Water Supplies (acre-feet)		**441**	**441**	**441**	**441**	**441**	**441**

KARNES COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	Irrigation, Karnes	San Antonio	San Antonio Run-of-River	100	100	100	100	100	100
L	Livestock, Karnes	Guadalupe	Guadalupe Livestock Local Supply	20	20	20	20	20	20
L	Livestock, Karnes	San Antonio	San Antonio Livestock Local Supply	547	548	548	549	558	558
L	Livestock, Karnes	San Antonio-Nueces	San Antonio-Nueces Livestock Local Supply	10	10	10	10	10	10
		Sum of Projected Surface Water Supplies (acre-feet)		**677**	**678**	**678**	**679**	**688**	**688**

WILSON COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	County-Other, Wilson	San Antonio	San Antonio Run-of-River	0	0	0	0	0	0
L	East Central SUD	San Antonio	Canyon Lake/Reservoir	136	148	142	130	121	112
L	Irrigation, Wilson	San Antonio	San Antonio Run-of-River	1,073	1,073	1,073	1,073	1,073	1,073
L	La Vernia	San Antonio	Canyon Lake/Reservoir	270	270	270	270	270	270
L	La Vernia	San Antonio	Guadalupe Run-of-River	130	130	130	130	130	130
L	Livestock, Wilson	Guadalupe	Guadalupe Livestock Local Supply	93	93	93	93	93	93
L	Livestock, Wilson	Nueces	Nueces Livestock Local Supply	2	2	2	2	2	2

L	Livestock, Wilson	San Antonio	Nueces Livestock Local Supply	91	91	91	91	91	91
L	Livestock, Wilson	San Antonio	San Antonio Livestock Local Supply	759	759	759	759	759	759
	Sum of Projected Surface Water Supplies (acre-feet)			**2,554**	**2,566**	**2,560**	**2,548**	**2,539**	**2,530**

Projected Water Demands
TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

ATASCOSA COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Benton City WSC	Nueces	950	1,070	1,185	1,300	1,414	1,523
L	Benton City WSC	San Antonio	117	132	146	161	175	188
L	Charlotte	Nueces	339	381	420	461	502	540
L	County-Other, Atascosa	Nueces	865	978	1,081	1,194	1,312	1,451
L	County-Other, Atascosa	San Antonio	3	4	4	4	5	5
L	Irrigation, Atascosa	Nueces	29,647	29,647	29,647	29,647	29,647	29,647
L	Irrigation, Atascosa	San Antonio	299	299	299	299	299	299
L	Jourdanton	Nueces	1,021	1,153	1,276	1,402	1,527	1,645
L	Livestock, Atascosa	Nueces	1,673	1,673	1,673	1,673	1,673	1,673
L	Lytle	Nueces	628	708	783	859	936	1,008
L	Manufacturing, Atascosa	Nueces	58	97	97	97	97	97
L	McCoy WSC	Nueces	896	1,002	1,102	1,207	1,314	1,414
L	Mining, Atascosa	Nueces	4,081	4,043	3,935	3,212	2,478	2,043
L	Pleasanton	Nueces	2,432	2,750	3,045	3,347	3,645	3,925
L	Poteet	Nueces	478	530	579	632	687	740
L	San Antonio Water System	Nueces	412	444	475	506	538	538
L	San Antonio Water System	San Antonio	63	71	78	85	93	100
L	Steam-Electric Power, Atascosa	Nueces	8,427	8,427	8,427	8,427	8,427	8,427
		Sum of Projected Water Demands (acre-feet)	**52,389**	**53,409**	**54,252**	**54,513**	**54,769**	**55,263**

FRIO COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Benton City WSC	Nueces	67	72	76	81	86	90
L	County-Other, Frio	Nueces	411	435	468	500	529	556
L	Dilley	Nueces	1,091	1,182	1,262	1,345	1,424	1,497
L	Irrigation, Frio	Nueces	78,183	78,183	78,183	78,183	78,183	78,183
L	Livestock, Frio	Nueces	882	882	882	882	882	882
L	Mining, Frio	Nueces	1,217	1,250	1,178	986	620	390
L	Moore WSC	Nueces	112	121	130	138	146	154
L	Pearsall	Nueces	2,021	2,181	2,323	2,471	2,616	2,750
L	Steam-Electric Power, Frio	Nueces	124	124	124	124	124	124
		Sum of Projected Water Demands (acre-feet)	**84,108**	**84,430**	**84,626**	**84,710**	**84,610**	**84,626**

KARNES COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	County-Other, Karnes	Guadalupe	11	12	12	11	11	11
L	County-Other, Karnes	Nueces	8	8	8	7	7	7
L	County-Other, Karnes	San Antonio	410	415	410	409	408	408
L	County-Other, Karnes	San Antonio-Nueces	5	5	5	5	5	5
L	El Oso WSC	Guadalupe	8	8	8	8	8	8
L	El Oso WSC	Nueces	23	23	23	23	23	23
L	El Oso WSC	San Antonio	671	676	664	657	656	656
L	El Oso WSC	San Antonio-Nueces	6	6	6	6	6	6
L	Falls City	San Antonio	141	142	140	139	139	139
L	Irrigation, Karnes	Guadalupe	42	42	42	42	42	42
L	Irrigation, Karnes	Nueces	71	71	71	71	71	71
L	Irrigation, Karnes	San Antonio	881	881	881	881	881	881
L	Irrigation, Karnes	San Antonio-Nueces	29	29	29	29	29	29
L	Karnes City	San Antonio	608	611	599	593	592	592
L	Kenedy	San Antonio	1,411	1,436	1,424	1,422	1,421	1,421
L	Livestock, Karnes	Guadalupe	38	38	38	38	38	38
L	Livestock, Karnes	Nueces	60	60	60	60	60	60
L	Livestock, Karnes	San Antonio	966	966	966	966	966	966
L	Livestock, Karnes	San Antonio-Nueces	22	22	22	22	22	22
L	Manufacturing, Karnes	San Antonio	131	155	155	155	155	155
L	Mining, Karnes	Guadalupe	152	115	77	40	2	0
L	Mining, Karnes	Nueces	253	192	129	66	4	0
L	Mining, Karnes	San Antonio	2,022	1,535	1,031	530	28	2
L	Mining, Karnes	San Antonio-Nueces	101	77	51	26	1	0
L	Runge	San Antonio	263	264	260	259	258	258
L	Sunko WSC	San Antonio	30	30	30	29	29	29
		Sum of Projected Water Demands (acre-feet)	**8,363**	**7,819**	**7,141**	**6,494**	**5,862**	**5,829**

WILSON COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	County-Other, Wilson	Guadalupe	33	31	26	20	6	6
L	County-Other, Wilson	Nueces	37	35	30	23	7	7
L	County-Other, Wilson	San Antonio	806	750	648	495	159	159
L	East Central SUD	San Antonio	204	243	252	249	249	249
L	El Oso WSC	San Antonio	46	55	64	72	80	88
L	Elmendorf	San Antonio	4	5	6	7	8	8
L	Floresville	San Antonio	1,933	2,335	2,731	3,094	3,447	3,767
L	Irrigation, Wilson	Nueces	6,690	6,690	6,690	6,690	6,690	6,690
L	Irrigation, Wilson	San Antonio	8,728	8,728	8,728	8,728	8,728	8,728
L	La Vernia	San Antonio	409	494	578	655	730	797

L	Livestock, Wilson	Guadalupe	117	117	117	117	117	117
L	Livestock, Wilson	Nueces	117	117	117	117	117	117
L	Livestock, Wilson	San Antonio	1,655	1,655	1,655	1,655	1,655	1,655
L	Manufacturing, Wilson	San Antonio	40	43	43	43	43	43
L	McCoy WSC	Nueces	43	51	58	66	73	80
L	McCoy WSC	San Antonio	3	4	5	5	6	7
L	Mining, Wilson	Guadalupe	174	140	105	71	36	18
L	Mining, Wilson	Nueces	174	140	105	71	36	18
L	Mining, Wilson	San Antonio	1,581	1,268	955	640	327	168
L	Nixon	Guadalupe	1	2	2	2	2	2
L	Oak Hills WSC	San Antonio	921	1,111	1,299	1,472	1,639	1,791
L	Picosa WSC	Nueces	3	4	4	5	5	6
L	Picosa WSC	San Antonio	237	279	321	359	400	437
L	Poth	San Antonio	381	455	529	597	665	727
L	S S WSC	San Antonio	2,203	2,886	3,645	4,418	5,378	5,911
L	Steam-Electric Power, Wilson	Guadalupe	2,439	2,439	2,439	2,439	2,439	2,439
L	Stockdale	San Antonio	391	470	549	621	692	756
L	Sunko WSC	Guadalupe	4	5	6	7	7	8
L	Sunko WSC	San Antonio	685	822	957	1,082	1,206	1,317
		Sum of Projected Water Demands (acre-feet)	**30,059**	**31,374**	**32,664**	**33,820**	**34,947**	**36,116**

Projected Water Supply Needs
TWDB 2022 State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

ATASCOSA COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Benton City WSC	Nueces	401	265	144	29	-83	-187
L	Benton City WSC	San Antonio	49	33	18	4	-10	-23
L	Charlotte	Nueces	759	717	678	637	596	558
L	County-Other, Atascosa	Nueces	452	486	521	558	596	604
L	County-Other, Atascosa	San Antonio	12	11	11	11	10	10
L	Irrigation, Atascosa	Nueces	3,412	3,364	3,324	3,295	3,276	3,276
L	Irrigation, Atascosa	San Antonio	206	206	206	206	206	206
L	Jourdanton	Nueces	1,229	1,097	974	848	723	605
L	Livestock, Atascosa	Nueces	0	0	0	0	0	0
L	Lytle	Nueces	-277	-363	-441	-519	-597	-669
L	Manufacturing, Atascosa	Nueces	0	0	0	0	0	0
L	McCoy WSC	Nueces	1,078	967	863	755	646	543
L	Mining, Atascosa	Nueces	0	0	0	0	0	0
L	Pleasanton	Nueces	2,596	2,278	1,983	1,681	1,383	1,103
L	Poteet	Nueces	328	276	227	174	119	66
L	San Antonio Water System	Nueces	-412	-444	-475	-506	-538	-538
L	San Antonio Water System	San Antonio	-63	-71	-78	-85	-93	-100
L	Steam-Electric Power, Atascosa	Nueces	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet)		**-752**	**-878**	**-994**	**-1,110**	**-1,321**	**-1,517**

FRIO COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Benton City WSC	Nueces	28	18	9	2	-5	-11
L	County-Other, Frio	Nueces	149	125	92	60	31	4
L	Dilley	Nueces	1,056	965	885	802	723	650
L	Irrigation, Frio	Nueces	0	0	-1,838	-3,612	-5,332	-7,146
L	Livestock, Frio	Nueces	0	0	0	0	0	0
L	Mining, Frio	Nueces	0	0	0	0	0	0
L	Moore WSC	Nueces	3,921	3,912	3,903	3,895	3,887	3,879
L	Pearsall	Nueces	-611	-771	-913	-1,061	-1,206	-1,340
L	Steam-Electric Power, Frio	Nueces	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet)		**-611**	**-771**	**-2,751**	**-4,673**	**-6,543**	**-8,497**

KARNES COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	County-Other, Karnes	Guadalupe	8	23	23	23	23	23
L	County-Other, Karnes	Nueces	0	0	0	0	0	0
L	County-Other, Karnes	San Antonio	17	22	27	27	27	27
L	County-Other, Karnes	San Antonio-Nueces	16	16	16	16	16	16
L	El Oso WSC	Guadalupe	0	0	0	-1	-2	-2
L	El Oso WSC	Nueces	-2	-2	-1	-1	-5	-5
L	El Oso WSC	San Antonio	-33	-44	-22	-27	-149	-156
L	El Oso WSC	San Antonio-Nueces	0	-1	-1	0	0	0
L	Falls City	San Antonio	79	91	103	109	113	113
L	Irrigation, Karnes	Guadalupe	268	268	268	268	268	268
L	Irrigation, Karnes	Nueces	-29	-29	-29	-29	-29	-29
L	Irrigation, Karnes	San Antonio	-222	-222	-781	-781	-781	-781
L	Irrigation, Karnes	San Antonio-Nueces	-17	-17	-17	-17	-17	-17
L	Karnes City	San Antonio	-319	-305	-280	-267	-256	-232
L	Kenedy	San Antonio	427	402	414	416	417	417
L	Livestock, Karnes	Guadalupe	3	3	3	3	3	3
L	Livestock, Karnes	Nueces	73	73	73	73	73	73
L	Livestock, Karnes	San Antonio	744	744	470	471	480	480
L	Livestock, Karnes	San Antonio-Nueces	2	2	2	2	2	2
L	Manufacturing, Karnes	San Antonio	0	0	-113	-155	-155	-155
L	Mining, Karnes	Guadalupe	0	0	0	0	0	0
L	Mining, Karnes	Nueces	-217	-156	-94	-35	24	26
L	Mining, Karnes	San Antonio	-1,611	-1,124	-620	-119	-13	-1
L	Mining, Karnes	San Antonio-Nueces	-100	-76	-50	-25	0	1
L	Runge	San Antonio	0	0	0	0	0	0
L	Sunko WSC	San Antonio	34	23	16	10	6	4
		Sum of Projected Water Supply Needs (acre-feet)	**-2,550**	**-1,976**	**-2,008**	**-1,457**	**-1,407**	**-1,378**

WILSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	County-Other, Wilson	Guadalupe	92	94	99	105	119	119
L	County-Other, Wilson	Nueces	58	60	65	72	88	88
L	County-Other, Wilson	San Antonio	450	506	608	761	1,097	1,097
L	East Central SUD	San Antonio	107	96	73	48	28	7
L	El Oso WSC	San Antonio	-2	-3	-2	-2	-20	-22
L	Elmendorf	San Antonio	0	-1	-2	-3	-4	-5
L	Floresville	San Antonio	553	151	-245	-608	-961	-1,281
L	Irrigation, Wilson	Nueces	-3,390	-3,405	-3,417	-3,428	-3,582	-3,882
L	Irrigation, Wilson	San Antonio	3,429	3,429	3,429	3,429	3,429	3,429
L	La Vernia	San Antonio	690	605	521	444	369	302

L	Livestock, Wilson	Guadalupe	0	0	0	0	0	0
L	Livestock, Wilson	Nueces	0	0	0	0	0	0
L	Livestock, Wilson	San Antonio	0	0	0	0	0	0
L	Manufacturing, Wilson	San Antonio	0	0	0	0	0	0
L	McCoy WSC	Nueces	53	50	46	42	37	31
L	McCoy WSC	San Antonio	4	4	4	3	2	3
L	Mining, Wilson	Guadalupe	0	0	0	0	0	0
L	Mining, Wilson	Nueces	0	0	0	0	0	0
L	Mining, Wilson	San Antonio	0	0	0	0	0	0
L	Nixon	Guadalupe	8	15	14	13	12	11
L	Oak Hills WSC	San Antonio	-468	-658	-846	-1,019	-1,186	-1,338
L	Picosa WSC	Nueces	1	0	0	-1	-1	-2
L	Picosa WSC	San Antonio	65	23	-19	-57	-98	-135
L	Poth	San Antonio	249	175	101	33	-35	-97
L	S S WSC	San Antonio	-425	-1,108	-1,867	-2,640	-3,600	-4,133
L	Steam-Electric Power, Wilson	Guadalupe	0	0	0	0	0	0
L	Stockdale	San Antonio	529	450	371	299	228	164
L	Sunko WSC	Guadalupe	4	4	3	3	2	1
L	Sunko WSC	San Antonio	768	641	513	394	275	166
		Sum of Projected Water Supply Needs (acre-feet)	**-4,285**	**-5,175**	**-6,398**	**-7,758**	**-9,487**	**-10,895**

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

ATASCOSA COUNTY

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Benton City WSC, Nueces (L)							
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Atascosa]	0	0	0	0	83	187
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	0	0	0	0	0	32
		0	**0**	**0**	**0**	**83**	**219**
Benton City WSC, San Antonio (L)							
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Atascosa]	0	0	0	0	10	23
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	0	0	0	0	0	4
		0	**0**	**0**	**0**	**10**	**27**
Charlotte, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	8	27	33	43	57	73
		8	**27**	**33**	**43**	**57**	**73**
Jourdanton, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	38	125	232	326	382	442
		38	**125**	**232**	**326**	**382**	**442**
Lytle, Nueces (L)							
Drought Management - Lytle	DEMAND REDUCTION [Atascosa]	14	0	0	0	0	0
Edwards Transfers	Edwards-BFZ Aquifer [Medina]	274	308	343	380	454	492
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	20	72	127	151	183	216
		308	**380**	**470**	**531**	**637**	**708**
Pleasanton, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	95	307	565	846	985	1,130
		95	**307**	**565**	**846**	**985**	**1,130**
San Antonio Water System, Nueces (L)							
Drought Management - SAWS	DEMAND REDUCTION [Atascosa]	21	53	76	81	86	86
FE - SAWS ASR Treatment Plant Expansion	Carrizo-Aquifer ASR [Bexar]	0	57	56	55	54	51
FE - SAWS Western Integration Pipeline	Carrizo-Wilcox Aquifer [Gonzales]	1	1	1	1	1	1

FE - SAWS Western Integration Pipeline	Canyon Lake/Reservoir [Reservoir]	1	5	5	5	5	5
FE - SAWS Western Integration Pipeline	Guadalupe Run-of-River [Hays]	1	1	1	1	1	1
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	386	326	266	278	209	202
Reuse - SAWS - Reuse Water Programs	Direct Reuse [Bexar]	0	8	8	25	41	61
SAWS - Expanded Brackish Wilcox Project	Carrizo-Wilcox Aquifer [Wilson]	0	0	34	33	100	93
SAWS - Expanded Brackish Wilcox Project (GW Conversion)	Carrizo-Wilcox Aquifer [Wilson]	0	0	0	0	14	13
SAWS - Expanded Local Carrizo	Carrizo-Wilcox Aquifer [Bexar]	0	0	35	34	34	32
SAWS Advanced Meter Infrastructure	DEMAND REDUCTION [Atascosa]	2	2	2	0	0	0
		412	**453**	**484**	**513**	**545**	**545**

San Antonio Water System, San Antonio (L)

Drought Management - SAWS	DEMAND REDUCTION [Atascosa]	3	9	12	14	15	16
FE - SAWS ASR Treatment Plant Expansion	Carrizo-Aquifer ASR [Bexar]	0	9	9	9	9	10
FE - SAWS Western Integration Pipeline	Canyon Lake/Reservoir [Reservoir]	0	1	1	1	1	1
Municipal Water Conservation	DEMAND REDUCTION [Atascosa]	60	52	44	46	36	37
Reuse - SAWS - Reuse Water Programs	Direct Reuse [Bexar]	0	1	1	4	7	11
SAWS - Expanded Brackish Wilcox Project	Carrizo-Wilcox Aquifer [Wilson]	0	0	6	6	18	18
SAWS - Expanded Brackish Wilcox Project (GW Conversion)	Carrizo-Wilcox Aquifer [Wilson]	0	0	0	0	2	2
SAWS - Expanded Local Carrizo	Carrizo-Wilcox Aquifer [Bexar]	0	0	6	6	6	6
SAWS Advanced Meter Infrastructure	DEMAND REDUCTION [Atascosa]	0	0	0	0	0	0
		63	**72**	**79**	**86**	**94**	**101**
Sum of Projected Water Management Strategies (acre-feet)		**924**	**1,364**	**1,863**	**2,345**	**2,793**	**3,245**

FRIO COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Benton City WSC, Nueces (L)							
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Atascosa]	0	0	0	0	5	11
Municipal Water Conservation	DEMAND REDUCTION [Frio]	0	0	0	0	0	2
		0	**0**	**0**	**0**	**5**	**13**
County-Other, Frio, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Frio]	0	0	0	0	0	1
		0	**0**	**0**	**0**	**0**	**1**

Dilley, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Frio]	50	145	248	362	453	501
		50	**145**	**248**	**362**	**453**	**501**
Moore WSC, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Frio]	5	14	24	27	31	36
		5	**14**	**24**	**27**	**31**	**36**
Pearsall, Nueces (L)							
Drought Management - Pearsall	DEMAND REDUCTION [Frio]	26	0	0	0	0	0
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Frio]	807	807	1,614	1,614	1,614	1,614
Municipal Water Conservation	DEMAND REDUCTION [Frio]	81	247	434	496	573	655
		914	**1,054**	**2,048**	**2,110**	**2,187**	**2,269**
Sum of Projected Water Management Strategies (acre-feet)		**969**	**1,213**	**2,320**	**2,499**	**2,676**	**2,820**

KARNES COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
County-Other, Karnes, Guadalupe (L)							
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	0	0	0	0	0	1
		0	**0**	**0**	**0**	**0**	**1**
County-Other, Karnes, San Antonio (L)							
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	0	0	0	1	11	20
		0	**0**	**0**	**1**	**11**	**20**
El Oso WSC, Guadalupe (L)							
Local Gulf Coast Aquifer Development	Gulf Coast Aquifer System [Bee]	1	1	1	1	1	1
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	0	1	1	2	2	2
		1	**2**	**2**	**3**	**3**	**3**
El Oso WSC, Nueces (L)							
Local Gulf Coast Aquifer Development	Gulf Coast Aquifer System [Bee]	3	3	3	3	1	3
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	1	3	4	5	5	6
		4	**6**	**7**	**8**	**6**	**9**
El Oso WSC, San Antonio (L)							
Drought Management - El Oso WSC	DEMAND REDUCTION [Karnes]	13	0	0	0	0	0
Local Gulf Coast Aquifer Development	Gulf Coast Aquifer System [Bee]	2	2	6	7	36	33
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	26	73	120	138	150	163

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
		41	**75**	**126**	**145**	**186**	**196**
El Oso WSC, San Antonio-Nueces (L)							
Local Gulf Coast Aquifer Development	Gulf Coast Aquifer System [Bee]	1	1	1	1	1	1
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	0	1	1	1	1	1
		1	**2**	**2**	**2**	**2**	**2**
Falls City, San Antonio (L)							
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	6	17	26	36	39	42
		6	**17**	**26**	**36**	**39**	**42**
Karnes City, San Antonio (L)							
Drought Management - Karnes City	DEMAND REDUCTION [Karnes]	23	0	0	0	0	0
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Karnes]	0	0	15	92	92	92
Local Carrizo Aquifer With Conversion	Carrizo-Wilcox Aquifer [Karnes]	134	134	119	42	42	42
Local Yegua Jackson Aquifer with Conversion	Yegua-Jackson Aquifer [Karnes]	310	310	310	310	310	310
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	21	63	84	91	102	114
		488	**507**	**528**	**535**	**546**	**558**
Kenedy, San Antonio (L)							
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	86	200	304	409	505	593
		86	**200**	**304**	**409**	**505**	**593**
Manufacturing, Karnes, San Antonio (L)							
Local Yegua Jackson Aquifer Development	Yegua-Jackson Aquifer [Karnes]	0	0	232	231	242	242
		0	**0**	**232**	**231**	**242**	**242**
Runge, San Antonio (L)							
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	10	28	46	55	59	64
		10	**28**	**46**	**55**	**59**	**64**
Sunko WSC, San Antonio (L)							
Municipal Water Conservation	DEMAND REDUCTION [Karnes]	1	1	1	2	2	3
		1	**1**	**1**	**2**	**2**	**3**
	Sum of Projected Water Management Strategies (acre-feet)	**638**	**838**	**1,274**	**1,427**	**1,601**	**1,733**

WILSON COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
County-Other, Wilson, San Antonio (L)							
Municipal Water Conservation	DEMAND REDUCTION [Wilson]	0	0	0	0	0	4
		0	**0**	**0**	**0**	**0**	**4**

El Oso WSC, San Antonio (L)							
Drought Management - El Oso WSC	DEMAND REDUCTION [Wilson]	1	0	0	0	0	0
Local Gulf Coast Aquifer Development	Gulf Coast Aquifer System [Bee]	5	6	7	8	6	9
Municipal Water Conservation	DEMAND REDUCTION [Wilson]	2	6	12	15	18	22
		8	**12**	**19**	**23**	**24**	**31**
Elmendorf, San Antonio (L)							
Drought Management – Elmendorf	DEMAND REDUCTION [Wilson]	0	0	0	0	0	0
Entity Purchase to Meet Shortages - SAWS	Carrizo-Wilcox Aquifer [Bexar]	1	2	3	4	4	5
		1	**2**	**3**	**4**	**4**	**5**
Floresville, San Antonio (L)							
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Wilson]	0	0	828	828	1,654	1,656
Municipal Water Conservation	DEMAND REDUCTION [Wilson]	79	270	523	819	1,118	1,283
		79	**270**	**1,351**	**1,647**	**2,772**	**2,939**
La Vernia, San Antonio (L)							
Municipal Water Conservation	DEMAND REDUCTION [Wilson]	15	55	109	157	188	219
		15	**55**	**109**	**157**	**188**	**219**
Oak Hills WSC, San Antonio (L)							
Drought Management - Oak Hills WSC	DEMAND REDUCTION [Wilson]	28	0	0	0	0	0
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Wilson]	475	675	875	1,050	1,200	1,350
Municipal Water Conservation	DEMAND REDUCTION [Wilson]	30	72	101	142	192	248
		533	**747**	**976**	**1,192**	**1,392**	**1,598**
Picosa WSC, Nueces (L)							
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Wilson]	0	0	0	1	1	2
		0	**0**	**0**	**1**	**1**	**2**
Picosa WSC, San Antonio (L)							
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Wilson]	0	0	19	57	98	135
		0	**0**	**19**	**57**	**98**	**135**
Poth, San Antonio (L)							
Local Carrizo Aquifer Development	Carrizo-Wilcox Aquifer [Wilson]	0	0	0	0	35	97
Municipal Water Conservation	DEMAND REDUCTION [Wilson]	7	9	14	25	43	64
		7	**9**	**14**	**25**	**78**	**161**
S S WSC, San Antonio (L)							
CRWA - Wells Ranch (Phase 3)	Carrizo-Wilcox Aquifer [Guadalupe]	345	1,123	1,882	2,655	2,479	2,869
Drought Management - S S WSC	DEMAND REDUCTION [Wilson]	95	0	0	0	0	0

	Municipal Water Conservation	DEMAND REDUCTION [Wilson]	0	0	0	0	16	159
	SS WSC - Brackish Carrizo-Wilcox Groundwater	Carrizo-Wilcox Aquifer [Wilson]	0	0	0	0	992	992
	SS WSC - Brackish Carrizo-Wilcox Groundwater (GW Conversion)	Carrizo-Wilcox Aquifer [Wilson]	0	0	0	0	128	128
			440	**1,123**	**1,882**	**2,655**	**3,615**	**4,148**
Stockdale, San Antonio (L)								
	Municipal Water Conservation	DEMAND REDUCTION [Wilson]	13	49	98	143	171	201
			13	**49**	**98**	**143**	**171**	**201**
Sunko WSC, Guadalupe (L)								
	Municipal Water Conservation	DEMAND REDUCTION [Wilson]	0	0	0	0	1	1
			0	**0**	**0**	**0**	**1**	**1**
Sunko WSC, San Antonio (L)								
	Municipal Water Conservation	DEMAND REDUCTION [Wilson]	16	31	46	69	103	141
			16	**31**	**46**	**69**	**103**	**141**
	Sum of Projected Water Management Strategies (acre-feet)		**1,112**	**2,298**	**4,517**	**5,973**	**8,447**	**9,585**

Appendix B – TWDB GAM Run 19-013

GAM Run 19-013: Evergreen Underground Water Conservation District Groundwater Management Plan

Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-936-0883
April 30, 2019

STATE OF TEXAS
SHIRLEY C. WADE
GEOLOGY
No. 525
LICENSED
PROFESSIONAL GEOSCIENTIST

Shirley C. Wade
4/30/19

This page is intentionally blank.

GAM RUN 19-013: EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT GROUNDWATER MANAGEMENT PLAN

Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-936-0883
April 30, 2019

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2011), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the Executive Administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the Executive Administrator.

The TWDB provides data and information to the Evergreen Underground Water Conservation District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or stephen.allen@twdb.texas.gov. Part 2 is the required groundwater availability modeling information and this information includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;

2. for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface-water bodies, including lakes, streams, and rivers; and

3. the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The groundwater management plan for the Evergreen Underground Water Conservation District should be adopted by the district on or before December 16, 2020 and submitted to the Executive Administrator of the TWDB on or before January 15, 2021. The current management plan for the Evergreen Underground Water Conservation District expires on March 16, 2021.

We used four groundwater availability models to estimate the management plan information for the aquifers within the Evergreen Underground Water Conservation District. Information for the Edwards (Balcones Fault Zone) Aquifer is from the GWSIM-IV groundwater availability model for the San Antonio segment of the Edwards (Balcones Fault Zone) Aquifer (Thorkildsen and McElhaney, 1992; Klemt and others, 1979). Information for the Carrizo-Wilcox, Queen City, and Sparta aquifers is from version 2.01 of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (Kelley and others, 2004). Information for the Yegua-Jackson Aquifer is from version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer (Deeds and others, 2010). Information for the Gulf Coast Aquifer System is from version 1.01 of the groundwater availability model for the central portion of the Gulf Coast Aquifer System (Chowdhury and others, 2004).

This report replaces the results of GAM Run 15-004 (Goswami, 2015), as the approach used for analyzing model results has been since refined. Tables 1 through 6 summarize the groundwater availability model data required by statute and Figures 1 through 6 show the area of the models from which the values in the tables were extracted. If, after review of the figures, the Evergreen Underground Water Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the four groundwater availability models mentioned above were used to estimate information for the Evergreen Underground Water Conservation District management plan. Water budgets were extracted for the (post 1980) historical model periods for the Edwards (Balcones Fault Zone) Aquifer (1980 through 1989), Carrizo-Wilcox, Queen City, and Sparta aquifers (1980 through 1999), Yegua-Jackson Aquifer (1980 through 1997) and Gulf Coast Aquifer System (1980 through 1999). With the exception of GWSIM-IV, we used ZONEBUDGET Version 3.01 (Harbaugh, 2009) to extract water budgets from the model results. The average annual water budget values for recharge, surface-water outflow, inflow to the district, and outflow from the district for the aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Edwards (Balcones Fault Zone) Aquifer

- We used the GWSIM-IV model of the San Antonio Segment of the Edwards (Balcones Fault Zone) Aquifer. See Thorkildsen and McElhaney (1992) and Klemt and others (1979) for assumptions and limitations of the GWSIM-IV groundwater availability model.
- The GWSIM-IV model contains one layer representing the Edwards (Balcones Fault Zone) Aquifer and the associated limestone.
- This model was run to analyze the groundwater flow entering and leaving Evergreen Underground Water Conservation District.
- Lateral flows, leakage, and reduction in recharge volumes are reported in the model output files. GWSIM-IV reduces recharge when calculated heads exceed the elevation of the top of the aquifer.

Carrizo-Wilcox, Queen City, and Sparta aquifers

- We used version 2.01 of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Deeds and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
- This groundwater availability model includes eight layers, which generally represent the Sparta Aquifer (Layer 1), the Weches Formation confining unit (Layer 2), the Queen City Aquifer (Layer 3), the Reklaw Formation confining unit (Layer 4), the Carrizo Formation (Layer 5), the Upper Wilcox Unit (Layer 6), the Middle Wilcox Unit (Layer 7), and the Lower Wilcox Unit (Layer 8).
- Water budgets for the district were determined for the Sparta Aquifer (Layer 1), the Queen City Aquifer (Layer 3), and the Carrizo-Wilcox Aquifer (Layers 5 through 8, collectively).
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

Yegua-Jackson Aquifer

- We used version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.
- This groundwater availability model includes five layers that represent the outcrop of the Yegua-Jackson Aquifer and younger overlying units—the Catahoula Formation (Layer 1), the upper portion of the Jackson Group (Layer 2), the lower portion of the Jackson Group (Layer 3), the upper portion of the Yegua Group (Layer 4), and the lower portion of the Yegua Group (Layer 5).
- An overall water budget for the district was determined for the Yegua-Jackson Aquifer (Layer 1 through Layer 5, collectively, for the portions of the model that represent the Yegua-Jackson Aquifer).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

Gulf Coast Aquifer System

- We used version 1.01 of the groundwater availability model for the central part of the Gulf Coast Aquifer System for this analysis. See Chowdhury and others (2004) and Waterstone and others (2003) for assumptions and limitations of the groundwater availability model.
- The model has four layers which represent the Chicot Aquifer (Layer 1), the Evangeline Aquifer (Layer 2), the Burkeville Confining Unit (Layer 3), and the Jasper Aquifer and parts of the Catahoula Formation in direct hydrologic communication with the Jasper Aquifer (Layer 4).
- Water budgets for the district were determined for the Gulf Coast Aquifer System (Layers 1 through 4, collectively).
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- Because this model assumes a no-flow boundary condition at the base we used version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer to investigate groundwater flows between the Catahoula Formation and the base of the Gulf Coast Aquifer System. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model for the Yegua-Jackson Aquifer.

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifers according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Edwards (Balcones Fault Zone), Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers and the Gulf Coast Aquifer System located within Evergreen Underground Water Conservation District and averaged over the historical calibration periods, as shown in Tables 1 through 6.

1. Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.

2. Surface-water outflow—the total water discharging from the aquifer (outflow) to surface-water features such as streams, reservoirs, and springs.

3. Flow into and out of district—the lateral flow within the aquifer between the district and adjacent counties.

4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

The information needed for the district's management plan is summarized in Tables 1 through 6. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

TABLE 1. SUMMARIZED INFORMATION FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FOR EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards (Balcones Fault Zone) Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Edwards (Balcones Fault Zone) Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	70
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	0
Estimated net annual volume of flow between each aquifer in the district	Flow to other aquifers	NA[1]

[1]Not applicable. Model assumes a no-flow boundary at the base.

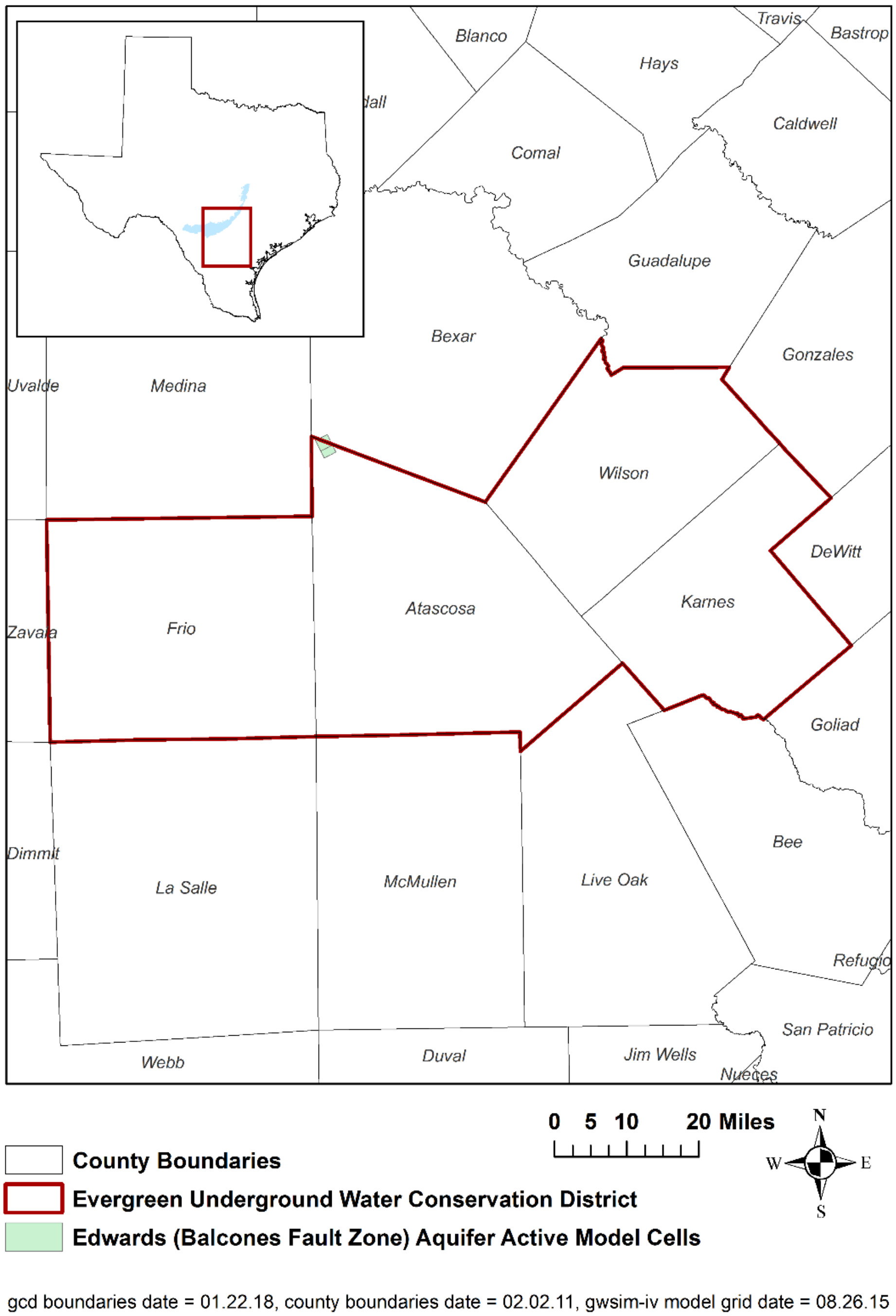


FIGURE 1 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 2. SUMMARIZED INFORMATION FOR THE CARRIZO-WILCOX AQUIFER FOR EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Carrizo-Wilcox Aquifer	20,850
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Carrizo-Wilcox Aquifer	3,621
Estimated annual volume of flow into the district within each aquifer in the district	Carrizo-Wilcox Aquifer	72,094
Estimated annual volume of flow out of the district within each aquifer in the district	Carrizo-Wilcox Aquifer	15,081
Estimated net annual volume of flow between each aquifer in the district	Flow into the Carrizo-Wilcox Aquifer from the overlying Reklaw confining unit	18,695
	Flow from the Carrizo-Wilcox Aquifer into downdip units	2,313

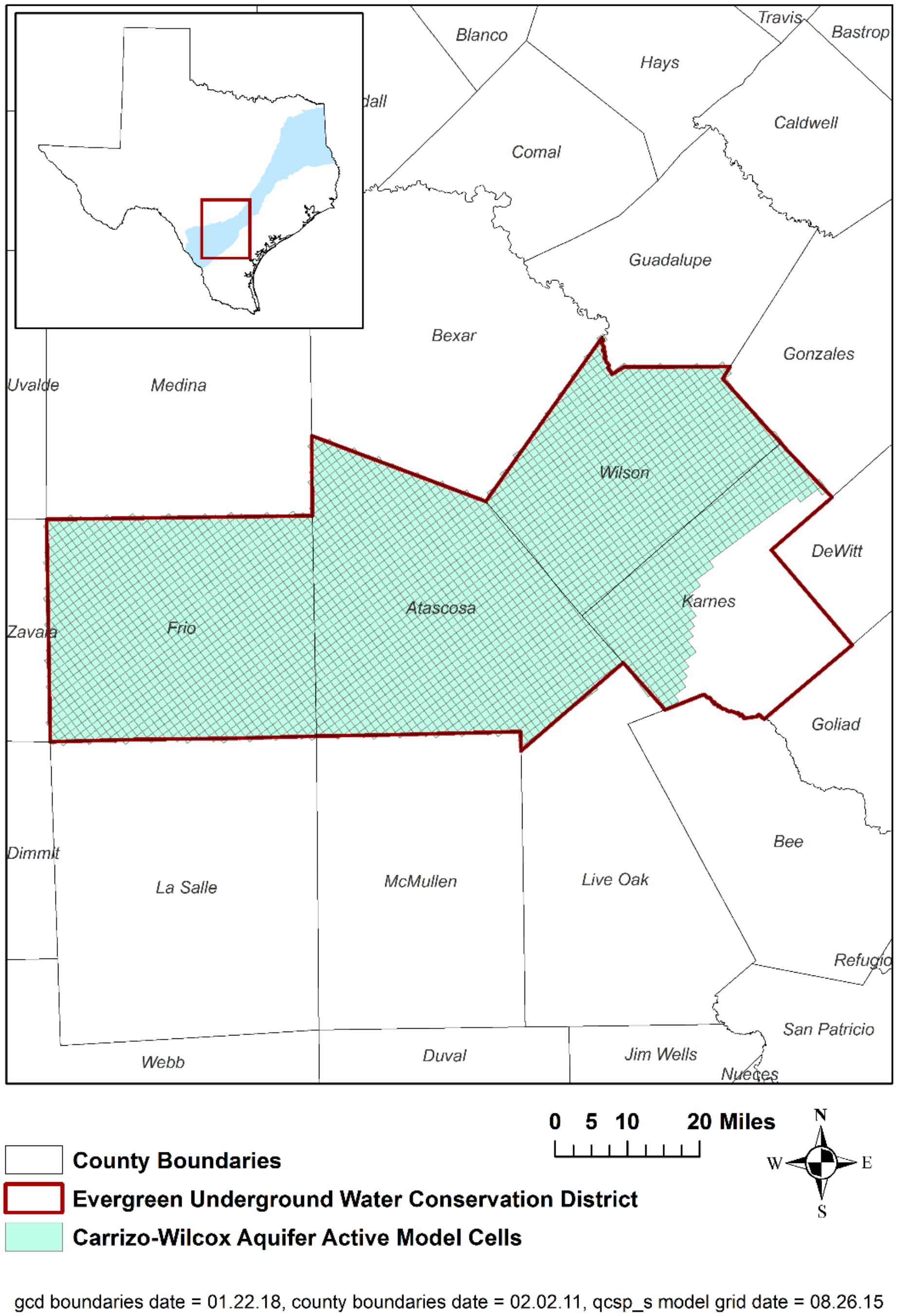


FIGURE 2 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE CARRIZO-WILCOX AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 3. SUMMARIZED INFORMATION FOR THE QUEEN CITY AQUIFER FOR EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Queen City Aquifer	23,084
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Queen City Aquifer	7,097
Estimated annual volume of flow into the district within each aquifer in the district	Queen City Aquifer	79
Estimated annual volume of flow out of the district within each aquifer in the district	Queen City Aquifer	1,716
Estimated net annual volume of flow between each aquifer in the district	Flow into the Queen City Aquifer from the Weches confining unit	6,259
	Flow into the Reklaw confining unit from the Queen City Aquifer	7,282
	Flow from the Queen City Aquifer into downdip units	527

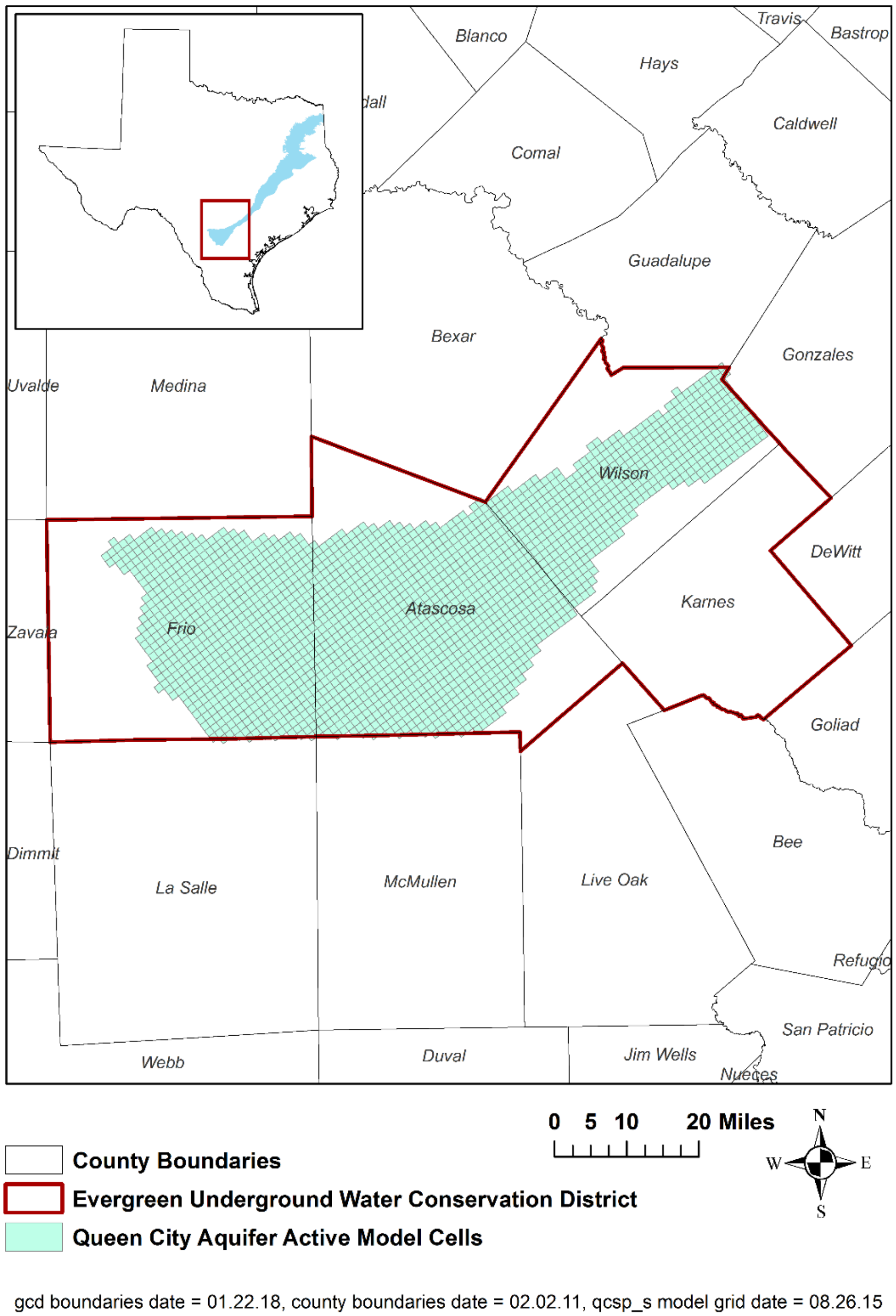
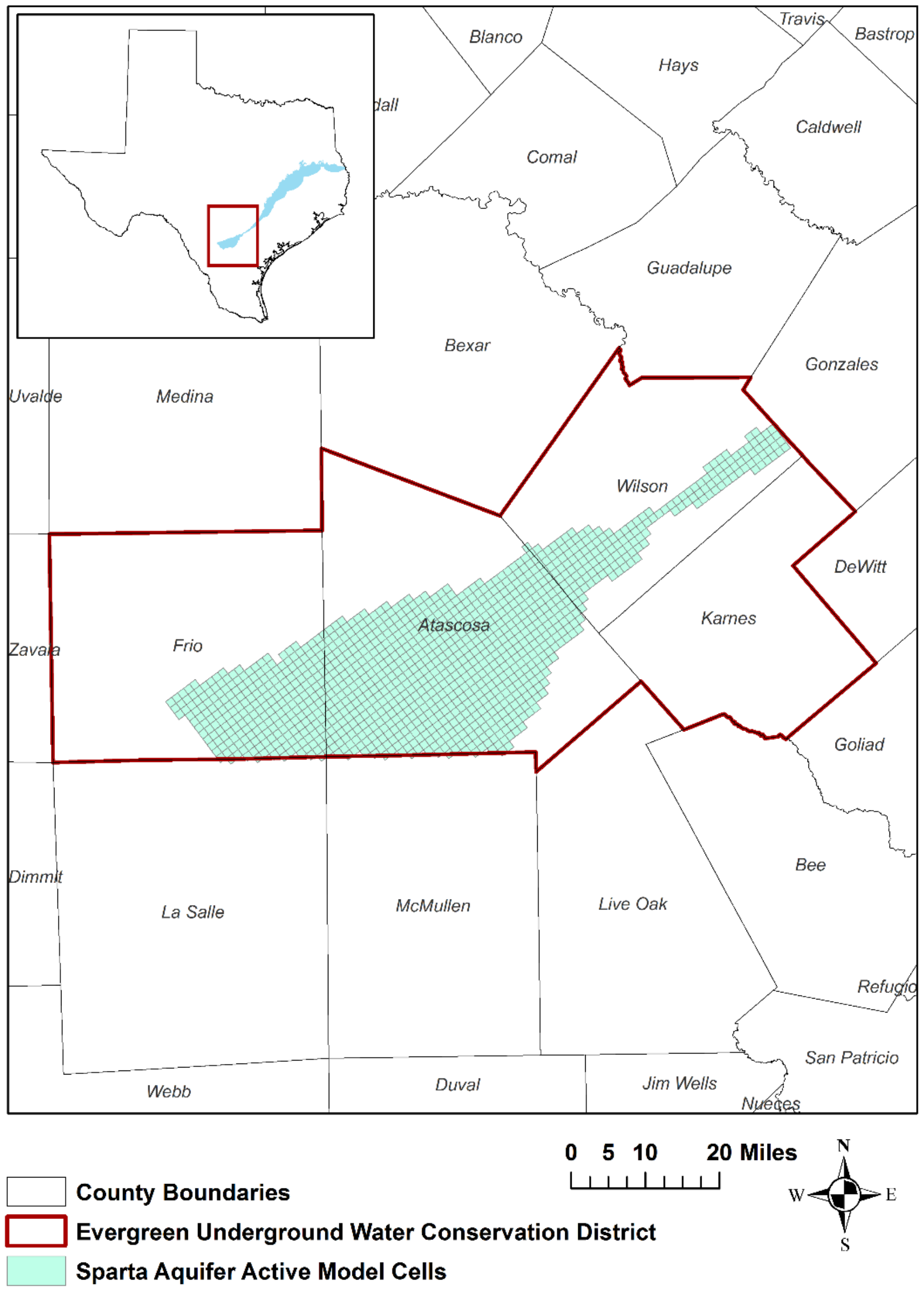


FIGURE 3 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE QUEEN CITY AQUIFER FROM WHICH THE INFORMATION IN TABLE 3 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 4. SUMMARIZED INFORMATION FOR THE SPARTA AQUIFER SYSTEM FOR EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Sparta Aquifer	6,150
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Sparta Aquifer	4,407
Estimated annual volume of flow into the district within each aquifer in the district	Sparta Aquifer	73
Estimated annual volume of flow out of the district within each aquifer in the district	Sparta Aquifer	864
Estimated net annual volume of flow between each aquifer in the district	Flow from the Sparta aquifer into overlying younger units	970
	Flow from the Sparta Aquifer System into the Weches confining unit	4,486
	Flow from the Sparta Aquifer into downdip units	1,096



gcd boundaries date = 01.22.18, county boundaries date = 02.02.11, qcsp_s model grid date = 08.26.15

FIGURE 4 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SPARTA AQUIFER FROM WHICH THE INFORMATION IN TABLE 4 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 5. SUMMARIZED INFORMATION FOR THE YEGUA-JACKSON AQUIFER FOR EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Yegua-Jackson Aquifer	42,086
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Yegua-Jackson Aquifer	46,062
Estimated annual volume of flow into the district within each aquifer in the district	Yegua-Jackson Aquifer	2,679
Estimated annual volume of flow out of the district within each aquifer in the district	Yegua-Jackson Aquifer	4,578
Estimated net annual volume of flow between each aquifer in the district	Flow from the Yegua-Jackson Aquifer into the Catahoula	41
	Flow from the Yegua-Jackson Aquifer into downdip Yegua-Jackson units	228

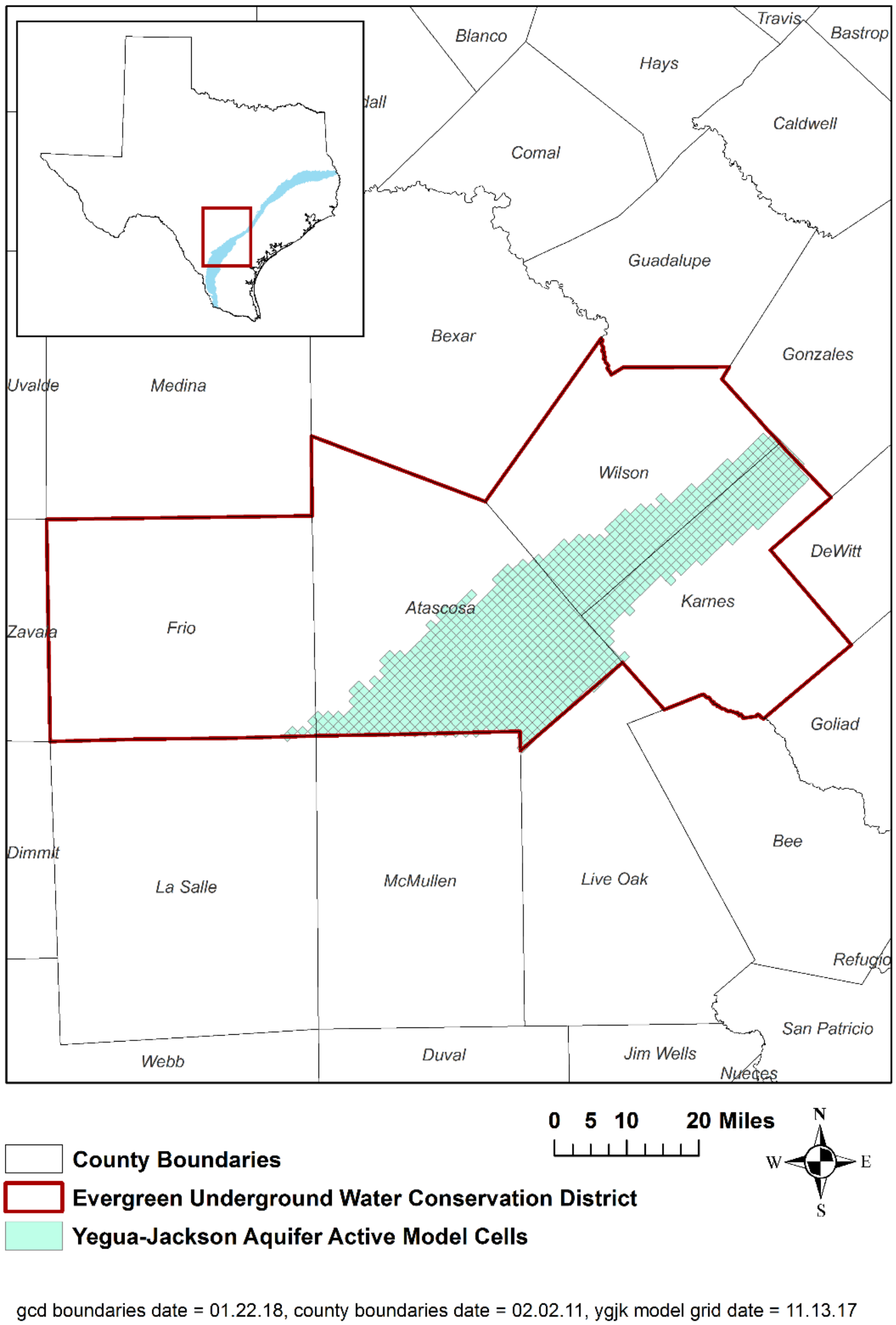


FIGURE 5 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE YEGUA-JACKSON AQUIFER FROM WHICH THE INFORMATION IN TABLE 5 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 6. SUMMARIZED INFORMATION FOR THE GULF COAST AQUIFER SYSTEM FOR EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Gulf Coast Aquifer System	1,196
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Gulf Coast Aquifer System	1,496
Estimated annual volume of flow into the district within each aquifer in the district	Gulf Coast Aquifer System	746
Estimated annual volume of flow out of the district within each aquifer in the district	Gulf Coast Aquifer System	1,198
Estimated net annual volume of flow between each aquifer in the district	Flow from the Catahoula Formation[2] into underlying Yegua-Jackson units	627

[2] In and near the outcrop the Catahoula Formation is considered part of the Gulf Coast Aquifer System. Extracted from the groundwater availability model for the Yegua-Jackson Aquifer.

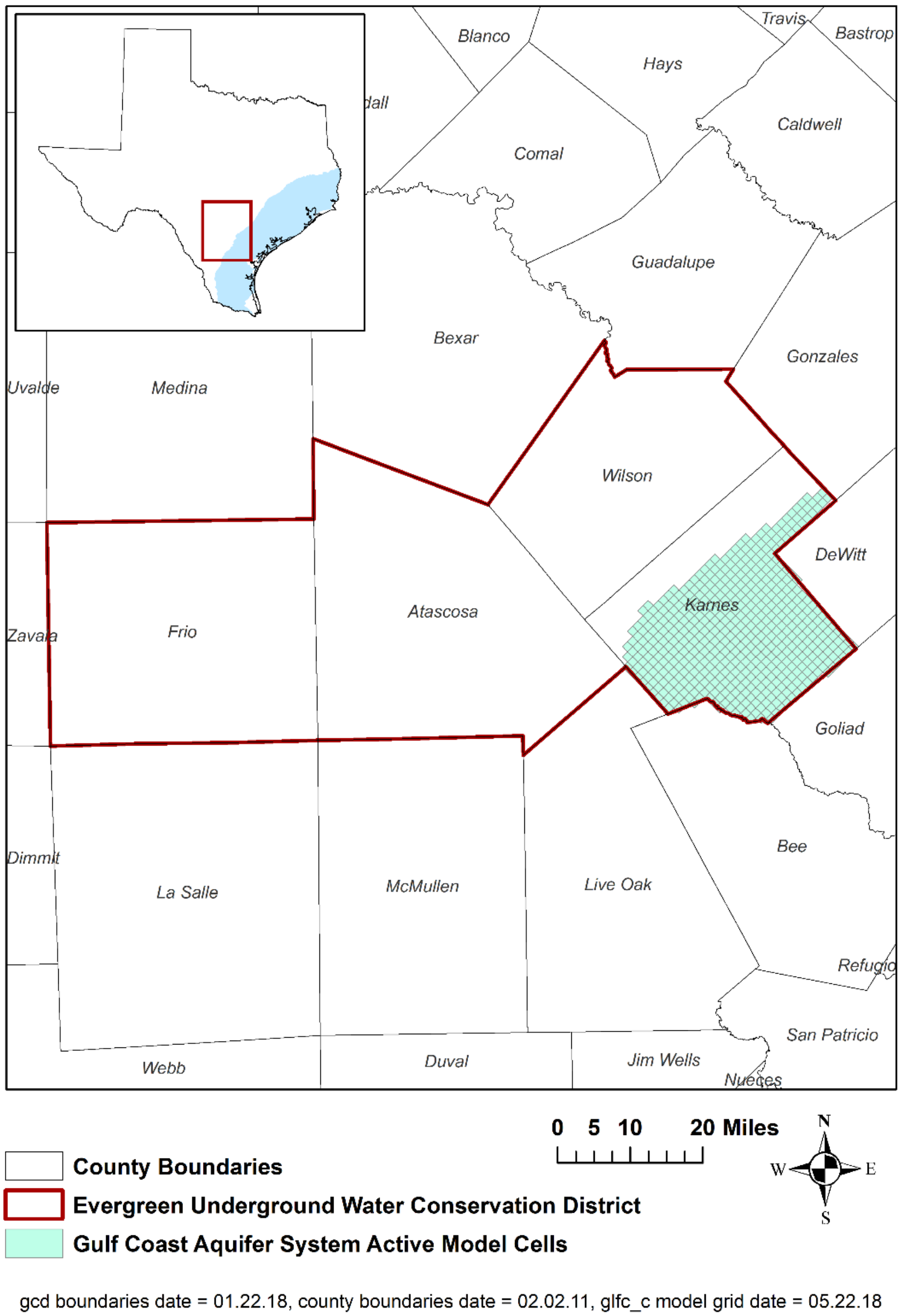


FIGURE 6 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE GULF COAST AQUIFER SYSTEM FROM WHICH THE INFORMATION IN TABLE 6 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS:

The groundwater models used in completing this analysis are the best available scientific tools that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historical groundwater flow conditions includes the assumptions about the location in the aquifer where historical pumping was placed. Understanding the amount and location of historical pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historical time periods.

Because the application of the groundwater models was designed to address regional-scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historical precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Chowdhury, Ali. H., Wade, S., Mace, R.E., and Ridgeway, C., 2004, Groundwater Availability Model of the Central Gulf Coast Aquifer System: Numerical Simulations through 1999- Model Report, 114 p., http://www.twdb.texas.gov/groundwater/models/gam/glfc_c/TWDB_Recalibration_Report.pdf.

Deeds, N., Kelley, V., Fryar, D., Jones, T., Whallon, A.J., and Dean, K.E., 2003, Groundwater Availability Model for the Southern Carrizo-Wilcox Aquifer: Contract report to the Texas Water Development Board, 452 p., http://www.twdb.texas.gov/groundwater/models/gam/czwx_s/CZWX_S_Full_Report.pdf.

Deeds, N. E., Yan, T., Singh, A., Jones, T. L., Kelley, V. A., Knox, P. R., and Young, S. C., 2010, Groundwater availability model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p., http://www.twdb.texas.gov/groundwater/models/gam/ygjk/YGJK_Model_Report.pdf.

Goswami, R. R., 2015, GAM Run 15-004: Evergreen Underground Water Conservation District Management Plan, 24 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR15-004.pdf

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models: U.S. Geological Survey Groundwater Software.

Harbaugh, A. W., Banta, E. R., Hill, M. C., and McDonald, M. G., 2000, MODFLOW-2000, the U.S. Geological Survey modular ground-water model -- User guide to modularization concepts and the Ground-Water Flow Process: U.S. Geological Survey Open-File Report 00-92, 121 p.

Harbaugh, A. W., and McDonald, M. G., 1996, User's documentation for MODFLOW-96, an update to the U.S. Geological Survey modular finite-difference ground-water flow model: U.S. Geological Survey Open-File Report 96–485, 56 p.

Kelley, V. A., Deeds, N. E., Fryar, D. G., and Nicot, J. P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: Contract report to the Texas Water Development Board, 867 p., http://www.twdb.texas.gov/groundwater/models/gam/qcsp/QCSP_Model_Report.pdf?d=1737.9650000000001.

Klemt, W. B., Knowles, T. R., Elder, G. and Sieh, T., 1979, Ground-water resources and model applications for the Edwards (Balcones Fault Zone) aquifer in the San Antonio region, Texas: Texas Department of Water Resources Report 239, 88 p., http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWReports/R239/R239.pdf.

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf.

Thorkildsen, D., and McElhaney, P.D., 1992, Model Refinement and Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas: Texas Water Development Board Report 340, 33 p., http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWReports/Individual%20Report%20htm%20files/Report%20340.htm.

Waterstone Environmental Hydrology and Engineering Inc. and Parsons, 2003, Groundwater availability of the Central Gulf Coast Aquifer: Numerical Simulations to 2050, Central Gulf Coast, Texas Contract report to the Texas Water Development Board, 157 p.

Appendix C – Public Notices Regarding Hearing Related to Plan Adoption

EUWCD

Evergreen Underground Water Conservation District
110 Wyoming Blvd
Pleasanton, TX 78064

NOTICE OF PUBLIC HEARING
OF THE EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT BOARD OF DIRECTORS

at the Pleasanton Lions Club Texas, 114 Wyoming Blvd.,
Pleasanton, Atascosa County, Texas
Friday, November 21, 2025, at 9:00 a.m.

a) Call Permit Hearing to Order

b) Public Comments

c) Permit Hearing for the adoption of the **District Management Plan**:

A copy of the proposed Management Plan may be reviewed either at the Evergreen Underground Water Conservation District Office from 9:00 am to 4:00 pm, Monday through Friday, or online at the District website at www.evergreenuwcd.org.

All interested persons are welcome to attend the public hearing and make comments concerning the District Management Plan. The proposed Management Plan is available for inspection onsite at the District Office during regular business hours beginning November 10, 2025 and on our district website at evergreenuwcd.org on the page listed below:

District Overview> Meetings > EUWCD-Meetings > November 21, 2025

For more information, please call the District Office at 830-569-4186 or email at info@evergreenuwcd.org.

Appendix D – Letters Coordinating with Regional Surface Water Management

Appendix E –EUWCD Board of Directors Resolution Adopting the Management Plan

Appendix F – Minutes of EUWCD Board of Directors Meetings Related to the Public Hearings for and Adoption of the Management Plan

Appendix G– EUWCD Contact Information

District Staff

Aarin Teague, General Manager

Samantha Nicholson, Permit Coordinator

Steffinnie Mannifield, Natural Resources Specialist

Jaime Griffin, Business Coordinator

Physical Address:

110 Wyoming Blvd.

Pleasanton, Texas 78064

Mailing Address:

110 Wyoming Blvd.

Pleasanton, Texas 78064

Telephone Numbers:

830-569-4186

www.evergreenuwcd.org

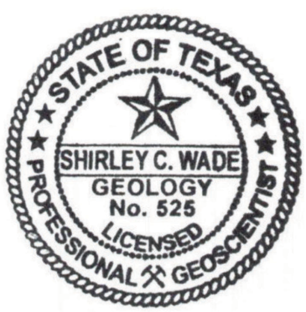
aarin.teague@evergreenuwcd.org

info@evergreenuwcd.org

Appendix H – TWDB GAM Run 21-018

GAM RUN 21-018 MAG:
MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS IN GROUNDWATER MANAGEMENT AREA 13

Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 936-0883
July 25, 2022



Shirley C. Wade
7/25/22

This page is intentionally left blank.

GAM Run 21-018 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers in Groundwater Management Area 13

Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 936-0883
July 25, 2022

EXECUTIVE SUMMARY:

The modeled available groundwater for Groundwater Management Area 13 for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers is summarized by decade for the groundwater conservation districts (Tables 1 through 4 respectively) and for use in the regional water planning process (Tables 5 through 8 respectively). The modeled available groundwater estimates for the Carrizo-Wilcox Aquifer range from approximately 470,000 acre-feet per year in 2020 to approximately 575,000 acre-feet per year in 2080 (Table 1). The modeled available groundwater estimates for the Queen City Aquifer range from approximately 23,000 acre-feet per year in 2020 to approximately 18,000 acre-feet per year in 2080 (Table 2). The modeled available groundwater estimates for the Sparta Aquifer range from approximately 6,000 acre-feet per year in 2020 to approximately 4,000 acre-feet per year in 2080 (Table 3). The estimates for the Carrizo-Wilcox, Queen City, and Sparta Aquifers were extracted from the results of a model run using the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (version 2.01). The modeled available groundwater estimates for the Yegua-Jackson Aquifer are approximately 6,700 acre-feet per year from 2020 to 2080 (Table 4). The estimates for the Yegua-Jackson Aquifer were extracted from the results of a model run using the groundwater availability model for the Yegua-Jackson Aquifer (version 1.01). The explanatory report and other materials submitted to the TWDB were determined to be administratively complete on April 15, 2022.

REQUESTOR:

Ms. Kelley Cochran, coordinator of Groundwater Management Area 13.

DESCRIPTION OF REQUEST:

The desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta aquifers described in Resolution 21-02 from Groundwater Management Area 13, adopted November 19, 2021, are:

- *"The first desired future condition for the Carrizo-Wilcox, Queen City and Sparta aquifers in Groundwater Management Area 13 is that 75 percent of the saturated thickness in the outcrop at the end of 2012 remains in 2080. Due to the limitations of the current Groundwater Availability Model, this desired future condition cannot be simulated as documented during 2016 Joint Planning in GMA 13 Technical Memorandum 16-08 (Hutchison, 2017a)."*
- *"In addition, a secondary proposed desired future condition for the Carrizo-Wilcox, Queen City, and Sparta aquifers in Groundwater Management Area 13 is an average drawdown of 49 feet (+/- 5 feet) for all of GMA 13. The drawdown is calculated from the end of 2012 conditions to the year 2080. This desired future condition is consistent with simulation "GMA13_2019_001" summarized during a meeting of Groundwater Management Area 13 members on March 19, 2021."*

The desired future conditions for the Yegua-Jackson Aquifer described in Resolution 21-03 from Groundwater Management Area 13, adopted November 19, 2021 are:

- *"For Gonzales County, the average drawdown from 2010 to 2080 is 3 feet (+/- 1 foot)."*
- *"For Karnes County, the average drawdown from 2010 to 2080 is 1 foot (+/- 1 foot)."*
- *"For all other counties in GMA 13, the Yegua-Jackson is classified as not relevant for purposes of joint planning."*

The Edwards (Balcones Fault Zone), Gulf Coast, and Trinity aquifers were declared not relevant for purposes of joint planning by Groundwater Management Area 13 in Resolution 21-01 (Groundwater Management Area 13 Joint Planning Committee and others, 2022; Appendix B).

On January 14, 2022, Dr. Jordan Furnans, on behalf of Groundwater Management Area 13, submitted the Desired Future Conditions Packet to the TWDB. TWDB staff reviewed the model files associated with the desired future conditions and received clarifications on procedures and assumptions from the Groundwater Management Area 13 Technical Coordinator on March 3, 2022, and on March 7, 2022. Groundwater Management Area 13 adopted two desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta Aquifers and they were not mutually compatible in the groundwater availability model. The technical coordinator for the groundwater management area confirmed that their intention was for the modeled available groundwater values to be based on the secondary desired future condition and MODFLOW pumping simulation GMA13_2019_001 (Groundwater Management Area 13 Joint Planning Committee and others, 2022; Appendix 2). The first proposed desired future condition was not intended for the calculation of modeled available groundwater.

The model run pumping file, which meets the secondary desired future condition adopted by district representatives of Groundwater Management Area 13 for the Carrizo-Wilcox, Queen City, and Sparta Aquifers, was submitted to the TWDB as supplemental information for the original submittal on February 9, 2022. The model run files, which meet the desired future conditions adopted by district representatives of Groundwater Management Area 13 for the Yegua-Jackson Aquifer, were submitted to the TWDB on January 14, 2022, as part of the Desired Future Conditions Explanatory Report for Groundwater Management Area 13.

In an email dated March 3, 2022, the Technical Coordinator and consultant for Groundwater Management Area 13 confirmed that they intended to use the end of 2011 as the reference year for the drawdown calculations for the Carrizo-Wilcox, Queen City, and Sparta aquifers and they intended to use the end of 2009 as the reference year for the Yegua-Jackson Aquifer. In an email dated March 7, 2022, they also confirmed that the confining unit model layers representing the Reklaw and Weches formations should be included in the desired future condition calculation of average drawdown for the combined Carrizo-Wilcox, Queen City, and Sparta aquifers.

All clarifications are included in the Parameters and Assumptions Section of this report.

METHODS:

The groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (Figures 1 through 3) was run using the model files submitted with the explanatory reports (Groundwater Management Area 13 Joint Planning Committee and others, 2022) on January 14 and February 9, 2022. Model-calculated water levels were extracted for the years 2011 (stress period 12) and 2080 (stress period 81). An overall drawdown average was calculated for the entire Groundwater Management Area 13 using all model layers in the average. As described in the Technical Memorandum submitted with the Explanatory Report on January 14, 2022 (Furnans, 2022) drawdowns for cells that became dry during the simulation (water level dropped below the base of the cell) were calculated as the reference year water level elevation minus the elevation of the model cell bottom. The calculated drawdown average was compared with the desired future condition of 49 feet to verify that the pumping scenario achieved the desired future conditions within the stated tolerance of five feet.

The groundwater availability model for the Yegua-Jackson Aquifer (Figure 4) was run using the model files submitted on January 14, 2022. Model-calculated water levels were extracted for the years 2009 (stress period 39) and 2080 (stress period 110). County-wide average drawdowns were calculated for Gonzales and Karnes counties within Groundwater Management Area 13 by averaging the drawdown values for all model layers. There were no dry cells in Karnes County or Gonzales County, so no additional dry cell calculations were needed. The calculated drawdown averages were compared with the desired future conditions for Gonzales and Karnes counties to verify that the pumping scenario achieved the desired future conditions within the stated tolerance of one foot.

The modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Annual pumping rates by aquifer are presented by county and groundwater conservation district, subtotaled by groundwater conservation district, and then summed for Groundwater Management Area 13 (Tables 1 through 4). Annual pumping rates by aquifer are also presented by county, river basin, and regional water planning area within Groundwater Management Area 13 (Tables 5 through 8) in order to be consistent with the format used in the regional water planning process.

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code (2011), “modeled available groundwater” is the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the modeled available groundwater estimates are described below:

Carrizo-Wilcox, Queen City, and Sparta aquifers

- We used Version 2.01 of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Deeds and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
- This groundwater availability model includes eight layers, which generally represent the Sparta Aquifer (Layer 1), the Weches Confining Unit (Layer 2), the Queen City Aquifer (Layer 3), the Reklaw Confining Unit (Layer 4), the Carrizo (Layer 5), the Upper Wilcox (Layer 6), the Middle Wilcox (Layer 7), and the Lower Wilcox (Layer 8). Since the model extends beyond the official TWDB aquifer extents, please note that model layers 1 and 3 instead represent geologic units equivalent to the Sparta and Queen City aquifers, respectively, in those areas falling outside of the official aquifer extents.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- Although the original groundwater availability model was only calibrated to 1999, an analysis during the second round of joint planning (Hutchison, 2017b) verified that the model satisfactorily matched measured water levels for the period from 1999 to 2011. For this reason, TWDB considers it acceptable to use the end of 2011 as the reference year for drawdown calculations.
- Drawdown averages and modeled available groundwater values were based on the TWDB defined aquifer boundaries rather than the model extent.
- Drawdowns for cells that became dry during the simulation (water level dropped below the base of the cell) were calculated as the reference year water level elevation minus the elevation of the model cell bottom. Pumping in dry cells was excluded from the modeled available groundwater calculations for the decades after the cell went dry.
- A tolerance of five feet was assumed when comparing desired future conditions to modeled drawdown results. This tolerance was specified by the GMA in their definition of the desired future conditions.
- Estimates of modeled available groundwater from the model simulation were rounded to the nearest whole number.
- The verification calculation for the desired future conditions is based on an average of all model layers (Layers 1 through 8). The modeled available groundwater

calculations are based on Layer 1 for the Sparta Aquifer, Layer 3 for the Queen City Aquifer, and the sum of Layers 5 through 8 for the Carrizo-Wilcox Aquifer.

Yegua-Jackson Aquifer

- We used version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.
- This groundwater availability model includes five layers which represent the outcrop of the Yegua-Jackson Aquifer and younger overlying units—the Catahoula Formation (Layer 1), the upper portion of the Jackson Group (Layer 2), the lower portion of the Jackson Group (Layer 3), the upper portion of the Yegua Group (Layer 4), and the lower portion of the Yegua Group (Layer 5).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- Although the original groundwater availability model was only calibrated to 1997, a TWDB analysis (Oliver, 2010) verified that the model satisfactorily matched measured water levels for the period from 1997 to 2009. For this reason, TWDB considers it acceptable to use the end of 2009 as the reference year for drawdown calculations.
- Drawdown averages and modeled available groundwater values were based on the TWDB-defined aquifer boundaries rather than the model extent.
- No dry cells occurred in the simulation in Gonzales County or Karnes County. As these were the only counties with defined desired future conditions, no dry cell considerations were required during the verification calculation for the desired future conditions. Pumping in dry cells was excluded from the modeled available groundwater calculations for the decades after the cell went dry.
- A tolerance of one foot was assumed when comparing desired future conditions to modeled drawdown results. This tolerance was specified by the GMA in their definition of the desired future conditions.
- Estimates of modeled available groundwater from the model simulation were rounded to the nearest whole number.
- The verification calculation for the desired future conditions is based on an average of all model layers representing the Yegua or Jackson formations (Layers 1 through 5). The modeled available groundwater calculations are the sum of all model layers representing the Yegua or Jackson formations (Layers 1 through 5).

RESULTS:

The modeled available groundwater estimates for the Carrizo-Wilcox Aquifer range from approximately 470,000 acre-feet per year in 2020 to approximately 575,000 acre-feet per year in 2080 (Table 1). The modeled available groundwater estimates for the Queen City Aquifer range from approximately 23,000 acre-feet per year in 2020 to approximately 18,000 acre-feet per year in 2080 (Table 2). The modeled available groundwater estimate for the Sparta Aquifer ranges from approximately 6,000 acre-feet per year in 2020 to approximately 4,000 acre-feet per year in 2080 (Table 3). The modeled available groundwater is summarized by groundwater conservation district and county for the Carrizo-Wilcox, Queen City, and Sparta aquifers (Tables 1, 2, and 3 respectively). The modeled available groundwater has also been summarized by county, river basin, and regional water planning area for use in the regional water planning process for the Carrizo-Wilcox, Queen City, and Sparta aquifers (Tables 5, 6, and 7 respectively). Small differences in values between table summaries are due to rounding.

The modeled available groundwater estimate for the Yegua-Jackson Aquifer is approximately 7,000 acre-feet per year from 2020 to 2080 (Table 4). The modeled available groundwater for the Yegua-Jackson Aquifer is summarized by groundwater conservation district and county (Table 4) and by county, river basin, and regional water planning area for use in the regional water planning process (Table 8). Small differences of values between table summaries are due to rounding.

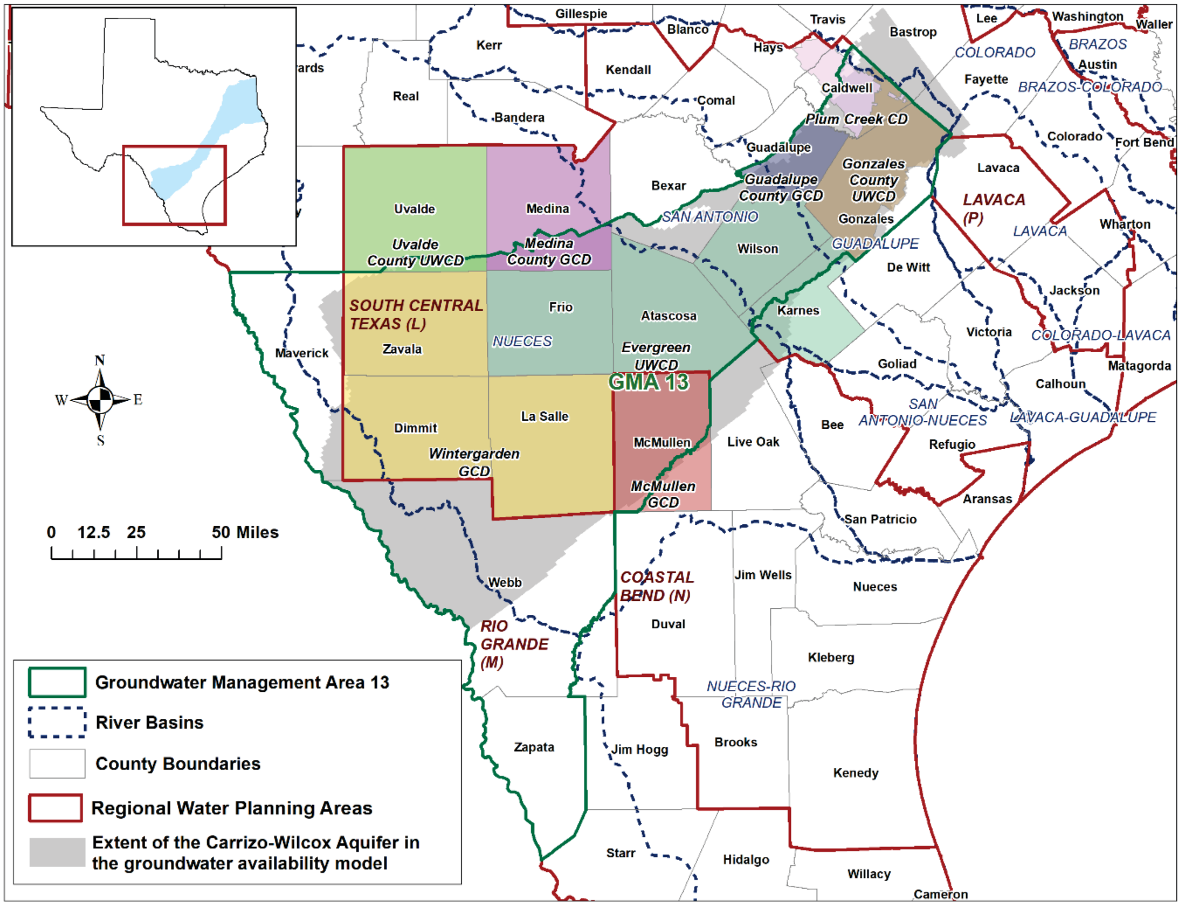


FIGURE 1. GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE CARRIZO-WILCOX AQUIFER.

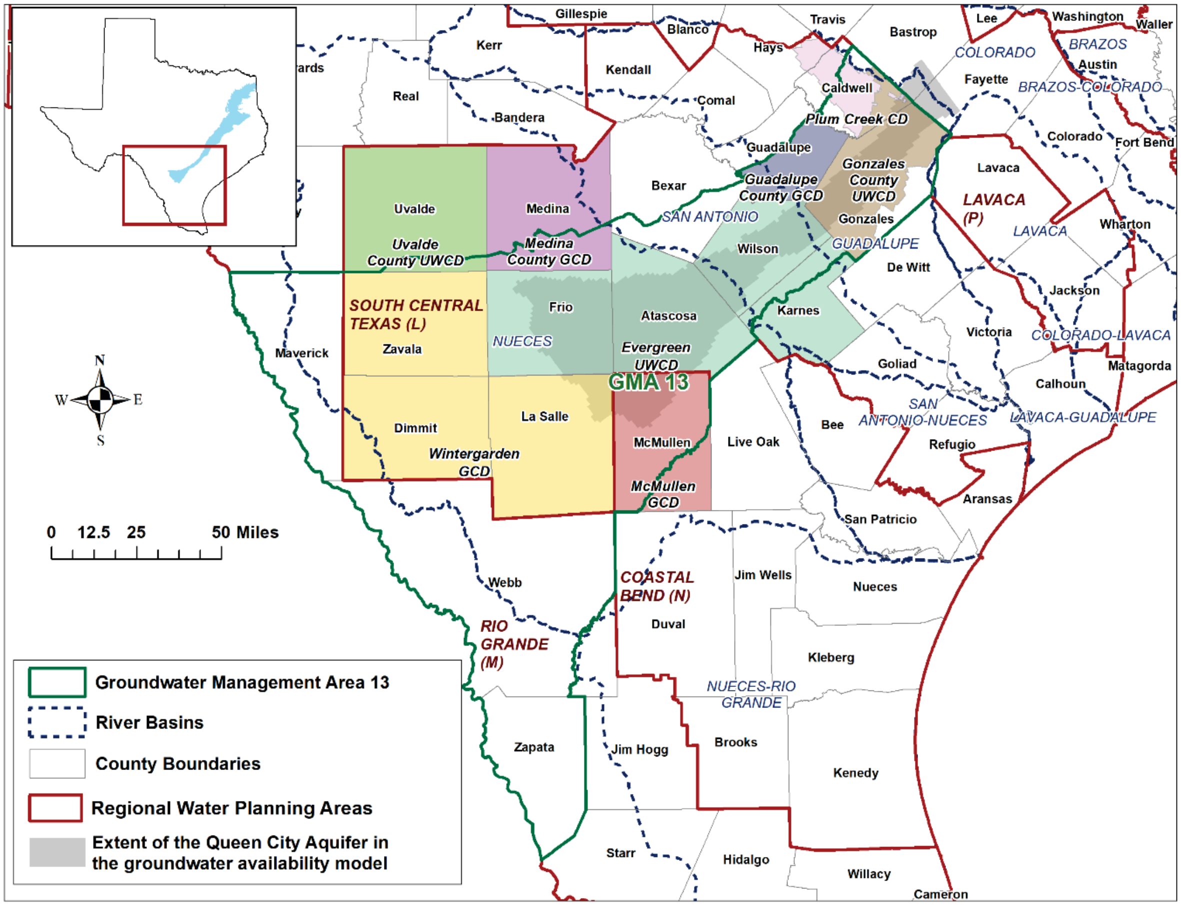


FIGURE 2. GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE QUEEN CITY AQUIFER.

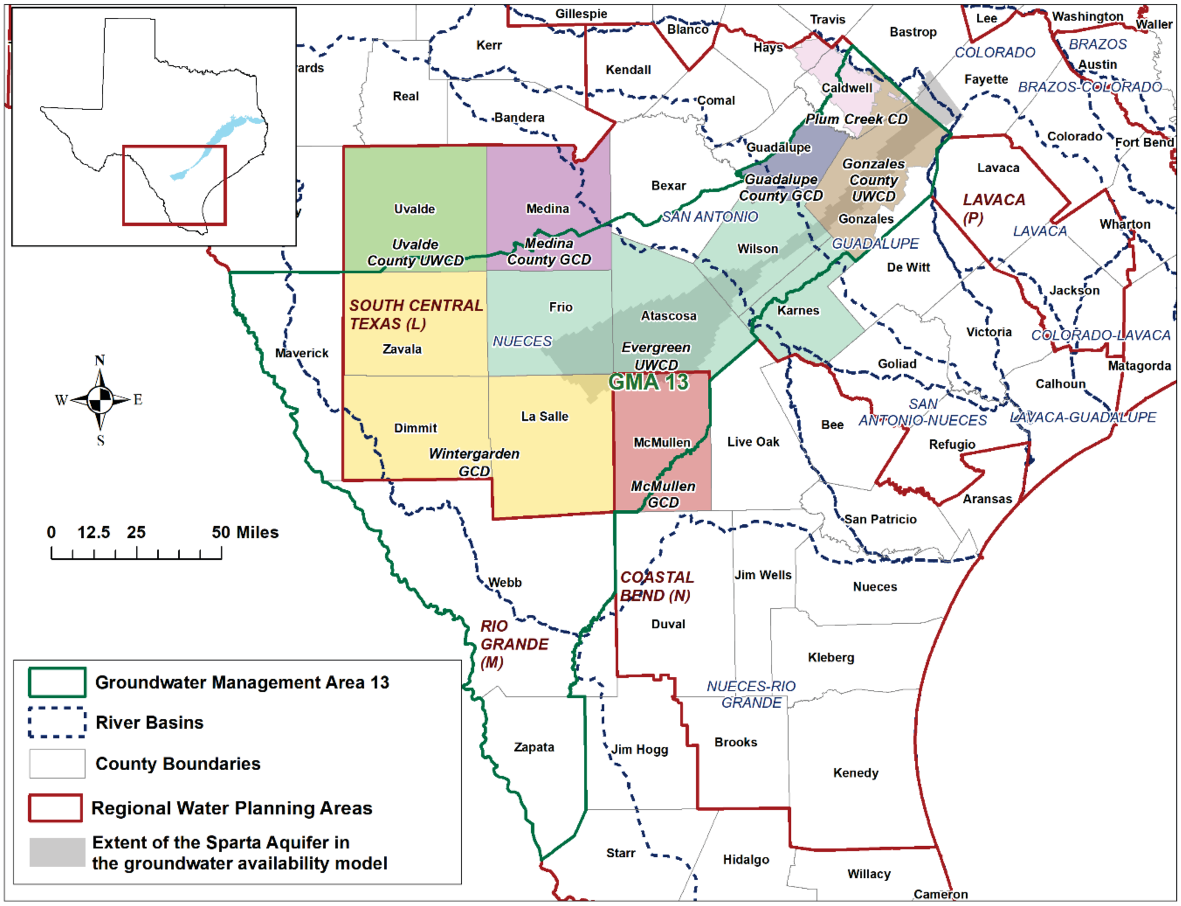


FIGURE 3. **GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE SPARTA AQUIFER.**

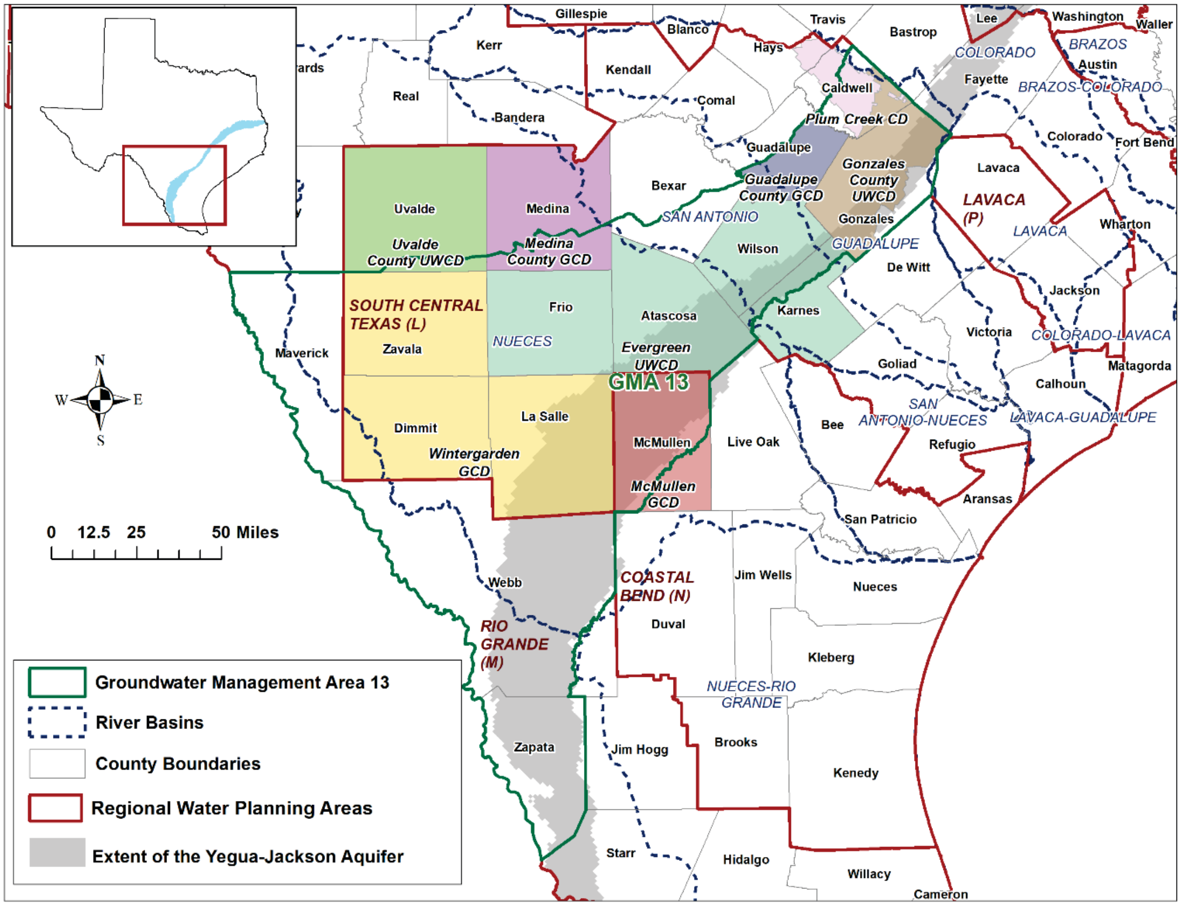


FIGURE 4. GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE YEGUA-JACKSON AQUIFER.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Carrizo-Wilcox	51,924	54,397	55,329	56,828	58,406	59,982	59,982
Evergreen UWCD	Frio	Carrizo-Wilcox	114,827	86,995	85,143	82,950	81,018	79,131	79,131
Evergreen UWCD	Karnes	Carrizo-Wilcox	693	758	843	931	1,001	1,043	1,043
Evergreen UWCD	Wilson	Carrizo-Wilcox	38,229	38,284	43,604	68,609	105,947	125,670	125,670
Evergreen UWCD Total		**Carrizo-Wilcox**	**205,673**	**180,434**	**184,919**	**209,318**	**246,372**	**265,826**	**265,826**
Gonzales County UWCD	Caldwell	Carrizo-Wilcox	468	9,472	16,401	25,510	30,087	30,087	30,087
Gonzales County UWCD	Gonzales	Carrizo-Wilcox	60,431	76,265	90,788	102,373	102,747	103,707	96,161
Gonzales County UWCD Total		**Carrizo-Wilcox**	**60,899**	**85,737**	**107,189**	**127,883**	**132,834**	**133,794**	**126,248**
Guadalupe County GCD	**Guadalupe**	**Carrizo-Wilcox**	**55,637**	**39,563**	**41,668**	**43,315**	**42,118**	**42,199**	**41,659**
McMullen GCD	**McMullen**	**Carrizo-Wilcox**	**7,789**	**7,768**	**4,867**	**4,854**	**4,854**	**4,854**	**4,854**
Medina County GCD	**Medina**	**Carrizo-Wilcox**	**2,635**	**2,628**	**2,635**	**2,628**	**2,628**	**2,628**	**2,628**
Plum Creek CD	**Caldwell**	**Carrizo-Wilcox**	**17,673**	**15,366**	**16,335**	**16,965**	**15,562**	**19,509**	**19,468**
Uvalde County UWCD	**Uvalde**	**Carrizo-Wilcox**	**0**[1]	**0**	**0**	**0**	**0**	**0**	**0**

[1] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 1 (CONTINUED)

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Wintergarden GCD	Dimmit	Carrizo-Wilcox	**3,895**	**3,885**	**3,895**	**3,885**	**3,885**	**3,885**	**3,885**
Wintergarden GCD	La Salle	Carrizo-Wilcox	**6,554**	**6,536**	**6,554**	**6,536**	**6,536**	**6,536**	**6,536**
Wintergarden GCD	Zavala	Carrizo-Wilcox	**38,303**	**36,675**	**35,399**	**35,204**	**35,006**	**34,831**	**34,540**
Wintergarden GCD Total		**Carrizo-Wilcox**	**48,752**	**47,096**	**45,848**	**45,625**	**45,427**	**45,252**	**44,961**
No District-County	Bexar	Carrizo-Wilcox	69,727	68,451	68,928	68,739	67,653	67,849	67,849
No District-County	Caldwell	Carrizo-Wilcox	39	39	39	39	39	39	39
No District-County	Gonzales	Carrizo-Wilcox	0[2]	0	0	0	0	0	0
No District-County	Maverick	Carrizo-Wilcox	547	545	547	545	545	276	276
No District-County	Webb	Carrizo-Wilcox	912	910	912	910	910	910	910
No District-County Total		**Carrizo-Wilcox**	**71,225**	**69,945**	**70,426**	**70,233**	**69,147**	**69,074**	**69,074**
Total for GMA 13		**Carrizo-Wilcox**	**470,283**	**448,537**	**473,887**	**520,821**	**558,942**	**583,136**	**574,718**

[2] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Queen City	4,070	4,525	4,537	4,495	4,390	4,285	4,285
Evergreen UWCD	Frio	Queen City	6,702	4,533	4,380	4,231	4,066	3,927	3,927
Evergreen UWCD	Wilson	Queen City	2,631	1,423	1,267	1,123	1,000	892	892
Evergreen UWCD Total		**Queen City**	**13,403**	**10,481**	**10,184**	**9,849**	**9,456**	**9,104**	**9,104**
Gonzales County UWCD	Caldwell	Queen City	4,842	4,829	4,557	4,545	4,545	3,977	3,977
Gonzales County UWCD	Gonzales	Queen City	4,973	4,960	4,973	4,960	4,960	4,500	4,500
Gonzales County UWCD Total		**Queen City**	**9,815**	**9,789**	**9,530**	**9,505**	**9,505**	**8,477**	**8,477**
Guadalupe County GCD	**Guadalupe**	**Queen City**	**0**[3]	**0**	**0**	**0**	**0**	**0**	**0**
McMullen GCD	**McMullen**	**Queen City**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Plum Creek CD	**Caldwell**	**Queen City**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wintergarden GCD	**La Salle**	**Queen City**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Total for GMA 13		**Queen City**	**23,222**	**20,274**	**19,718**	**19,358**	**18,965**	**17,585**	**17,585**

[3] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Sparta	1,218	1,187	1,043	998	961	932	932
Evergreen UWCD	Frio	Sparta	897	623	603	576	557	534	534
Evergreen UWCD	Wilson	Sparta	335	182	163	144	128	114	114
Evergreen UWCD Total		**Sparta**	**2,450**	**1,992**	**1,809**	**1,718**	**1,646**	**1,580**	**1,580**
Gonzales County UWCD	**Gonzales**	**Sparta**	**3,524**	**2,451**	**2,457**	**2,451**	**2,451**	**2,451**	**2,451**
McMullen GCD	**McMullen**	**Sparta**	**0**[4]	**0**	**0**	**0**	**0**	**0**	**0**
Wintergarden GCD	**La Salle**	**Sparta**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total for GMA 13		**Sparta**	**5,974**	**4,443**	**4,266**	**4,169**	**4,097**	**4,031**	**4,031**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Karnes	Yegua-Jackson	2,013	2,013	2,013	2,013	2,013	2,013	2,013
Gonzales County UWCD	Gonzales	Yegua-Jackson	4,155	4,155	4,155	4,155	4,155	4,155	4,155
No District-County	Gonzales	Yegua-Jackson	573	573	573	573	573	573	573
Total for GMA 13		**Yegua-Jackson**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**

[4] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 5. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Carrizo-Wilcox	54,310	55,241	56,739	58,316	59,890	59,890
Atascosa	L	San Antonio	Carrizo-Wilcox	87	88	89	90	92	92
Bexar	L	Nueces	Carrizo-Wilcox	38,762	38,993	39,134	39,134	39,287	39,287
Bexar	L	San Antonio	Carrizo-Wilcox	29,689	29,935	29,605	28,519	28,562	28,562
Caldwell	L	Colorado	Carrizo-Wilcox	0[5]	0	0	0	0	0
Caldwell	L	Guadalupe	Carrizo-Wilcox	24,877	32,775	42,514	45,688	49,635	49,594
Dimmit	L	Nueces	Carrizo-Wilcox	3,765	3,775	3,765	3,765	3,765	3,765
Dimmit	L	Rio Grande	Carrizo-Wilcox	120	120	120	120	120	120
Frio	L	Nueces	Carrizo-Wilcox	86,995	85,143	82,950	81,018	79,131	79,131
Gonzales	L	Guadalupe	Carrizo-Wilcox	76,265	90,788	102,373	102,747	103,707	96,161
Gonzales	L	Lavaca	Carrizo-Wilcox	0	0	0	0	0	0
Guadalupe	L	Guadalupe	Carrizo-Wilcox	32,400	34,200	35,631	34,655	34,736	34,345
Guadalupe	L	San Antonio	Carrizo-Wilcox	7,163	7,468	7,684	7,463	7,463	7,314
Karnes	L	Guadalupe	Carrizo-Wilcox	0	0	0	0	0	0
Karnes	L	Nueces	Carrizo-Wilcox	0	0	0	0	0	0
Karnes	L	San Antonio	Carrizo-Wilcox	758	843	931	1,001	1,043	1,043
La Salle	L	Nueces	Carrizo-Wilcox	6,536	6,554	6,536	6,536	6,536	6,536
Medina	L	Nueces	Carrizo-Wilcox	2,623	2,630	2,623	2,623	2,623	2,623

[5] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 5 (CONTINUED)

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Medina	L	San Antonio	Carrizo-Wilcox	5	5	5	5	5	5
Uvalde	L	Nueces	Carrizo-Wilcox	0[6]	0	0	0	0	0
Wilson	L	Guadalupe	Carrizo-Wilcox	443	653	762	3,870	3,982	3,982
Wilson	L	Nueces	Carrizo-Wilcox	10,774	11,171	11,578	12,027	12,546	12,546
Wilson	L	San Antonio	Carrizo-Wilcox	27,067	31,780	56,269	90,050	109,142	109,142
Zavala	L	Nueces	Carrizo-Wilcox	36,675	35,399	35,204	35,006	34,831	34,540
Maverick	M	Nueces	Carrizo-Wilcox	542	544	542	542	273	273
Maverick	M	Rio Grande	Carrizo-Wilcox	3	3	3	3	3	3
Webb	M	Nueces	Carrizo-Wilcox	890	892	890	890	890	890
Webb	M	Rio Grande	Carrizo-Wilcox	20	20	20	20	20	20
McMullen	N	Nueces	Carrizo-Wilcox	7,768	4,867	4,854	4,854	4,854	4,854
GMA 13 Total			**Carrizo-Wilcox**	**448,537**	**473,887**	**520,821**	**558,942**	**583,136**	**574,718**

[6] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 6. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Queen City	4,525	4,537	4,495	4,390	4,285	4,285
Caldwell	L	Guadalupe	Queen City	4,829	4,557	4,545	4,545	3,977	3,977
Frio	L	Nueces	Queen City	4,533	4,380	4,231	4,066	3,927	3,927
Gonzales	L	Guadalupe	Queen City	4,960	4,973	4,960	4,960	4,500	4,500
Guadalupe	L	Guadalupe	Queen City	0[7]	0	0	0	0	0
La Salle	L	Nueces	Queen City	1	1	1	1	1	1
Wilson	L	Guadalupe	Queen City	106	95	84	75	67	67
Wilson	L	Nueces	Queen City	181	161	143	127	114	114
Wilson	L	San Antonio	Queen City	1,136	1,011	896	798	711	711
McMullen	N	Nueces	Queen City	3	3	3	3	3	3
GMA 13 Total			**Queen City**	**20,274**	**19,718**	**19,358**	**18,965**	**17,585**	**17,585**

[7] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 7. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Sparta	1,187	1,043	998	961	932	932
Frio	L	Nueces	Sparta	623	603	576	557	534	534
Gonzales	L	Guadalupe	Sparta	2,451	2,457	2,451	2,451	2,451	2,451
La Salle	L	Nueces	Sparta	0[8]	0	0	0	0	0
Wilson	L	Guadalupe	Sparta	12	11	10	9	8	8
Wilson	L	Nueces	Sparta	19	17	15	13	12	12
Wilson	L	San Antonio	Sparta	151	135	119	106	94	94
McMullen	N	Nueces	Sparta	0	0	0	0	0	0
GMA 13 Total			**Sparta**	**4,443**	**4,266**	**4,169**	**4,097**	**4,031**	**4,031**

[8] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 8. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Frio	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Gonzales	L	Guadalupe	Yegua-Jackson	4,709	4,709	4,709	4,709	4,709	4,709
Gonzales	L	Lavaca	Yegua-Jackson	19	19	19	19	19	19
Karnes	L	Guadalupe	Yegua-Jackson	292	292	292	292	292	292
Karnes	L	Nueces	Yegua-Jackson	91	91	91	91	91	91
Karnes	L	San Antonio	Yegua-Jackson	1,630	1,630	1,630	1,630	1,630	1,630
La Salle	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Wilson	L	Guadalupe	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Wilson	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Wilson	L	San Antonio	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Webb	M	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Webb	M	Rio Grande	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Zapata	M	Rio Grande	Yegua-Jackson	NR	NR	NR	NR	NR	NR
McMullen	N	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
GMA 13 Total			**Yegua-Jackson**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**

NR: Groundwater Management Area 13 declared the Yegua-Jackson Aquifer not relevant in these areas.

LIMITATIONS:

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historic time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and groundwater levels in the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Deeds, N., Kelley, V., Fryar, D., Jones, T., Whallon, A.J., and Dean, K.E., 2003, Groundwater Availability Model for the Southern Carrizo-Wilcox Aquifer: Contract report to the Texas Water Development Board, 452 p., http://www.twdb.texas.gov/groundwater/models/gam/czwx_s/CZWX_S_Full_Report.pdf.

Deeds, N. E., Yan, T., Singh, A., Jones, T. L., Kelley, V. A., Knox, P. R., and Young, S. C., 2010, Groundwater availability model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p., http://www.twdb.texas.gov/groundwater/models/gam/ygjk/YGJK_Model_Report.pdf.

Furnans, J., 2022, Technical Memorandum: Groundwater Availability Modeling Technical Elements, Memo to Groundwater Management Area 13, 5p.

Groundwater Management Area 13 Joint Planning Committee, Furnans, J., and Keester, M., 2022, 2021 Joint Planning Desired Future Conditions Explanatory Report, 510 p.

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.

Harbaugh, A.W. and McDonald, M.G., 1996, User's documentation for MODFLOW-96, an update to the U.S. Geological Survey Modular Finite-Difference Ground-Water Flow Model: U.S. Geological Survey, Open-File Report 96-485.

Harbaugh, A. W., Banta, E. R., Hill, M. C., and McDonald, M. G., 2000, MODFLOW-2000, the U.S. Geological Survey modular ground-water model -- User guide to modularization concepts and the Ground-Water Flow Process: U.S. Geological Survey Open-File Report 00-92, 121 p.

Hutchison, W.R., 2017a, GMA 13 Technical Memorandum 16-08 Final, Sparta, Queen City, and Carrizo-Wilcox Aquifers: Summary of Scenario 9 Drawdown and Outcrop Results, 13 p.

Hutchison, W.R., 2017b, GMA 13 Technical Memorandum 17-01 Final, Extension of GAM Calibration Period for Carrizo-Wilcox, Queen City, and Sparta Aquifers, 81p.

Kelley, V.A., Deeds, N.E., Fryar, D.G., and Nicot, J.P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: Contract report to the Texas Water Development Board, 867 p.

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Oliver, W., 2010, GAM Task 10-012 Model Run Report: Texas Water Development Board, GAM Task 10-012 Report, 48 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/Task10-012.pdf

Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf.

APPENDIX A

Total Pumping Associated with Modeled Available Groundwater Run for the Carrizo-Wilcox Aquifer Split by Model Layers for Groundwater Management Area 13

TABLE A.1. TOTAL PUMPING SPLIT BY MODEL LAYERS FROM THE MODELED AVAILABLE GROUNDWATER RUN FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. THE VALUES ARE SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Carrizo	50,266	52,745	53,671	55,176	56,754	58,330	58,330
Evergreen UWCD	Atascosa	Upper Wilcox	250	249	250	249	249	249	249
Evergreen UWCD	Atascosa	Middle Wilcox	224	223	224	223	223	223	223
Evergreen UWCD	Atascosa	Lower Wilcox	1,184	1,180	1,184	1,180	1,180	1,180	1,180
Evergreen UWCD	Frio	Carrizo	114,827	86,995	85,143	82,950	81,018	79,131	79,131
Evergreen UWCD	Frio	Upper Wilcox	0[9]	0	0	0	0	0	0
Evergreen UWCD	Frio	Middle Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Frio	Lower Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Karnes	Carrizo	693	758	843	931	1,001	1,043	1,043
Evergreen UWCD	Karnes	Upper Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Karnes	Middle Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Karnes	Lower Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Wilson	Carrizo	36,086	32,648	34,096	35,482	36,994	38,730	38,730
Evergreen UWCD	Wilson	Upper Wilcox	125	125	125	125	125	125	125
Evergreen UWCD	Wilson	Middle Wilcox	125	125	125	125	125	125	125
Evergreen UWCD	Wilson	Lower Wilcox	1,893	5,386	9,258	32,877	68,703	86,690	86,690
Evergreen UWCD Total		**Carrizo-Wilcox**	**205,673**	**180,434**	**184,919**	**209,318**	**246,372**	**265,826**	**265,826**

[9] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1. (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Gonzales County UWCD	Caldwell	Carrizo	453	9,457	16,386	25,495	30,072	30,072	30,072
Gonzales County UWCD	Caldwell	Upper Wilcox	15	15	15	15	15	15	15
Gonzales County UWCD	Caldwell	Middle Wilcox	0[10]	0	0	0	0	0	0
Gonzales County UWCD	Caldwell	Lower Wilcox	0	0	0	0	0	0	0
Gonzales County UWCD	Gonzales	Carrizo	47,131	51,908	55,242	55,832	56,206	57,166	49,620
Gonzales County UWCD	Gonzales	Upper Wilcox	0	0	0	0	0	0	0
Gonzales County UWCD	Gonzales	Middle Wilcox	11,096	15,563	20,114	24,556	24,556	24,556	24,556
Gonzales County UWCD	Gonzales	Lower Wilcox	2,204	8,794	15,432	21,985	21,985	21,985	21,985
Gonzales County UWCD Total		**Carrizo-Wilcox**	**60,899**	**85,737**	**107,189**	**127,883**	**132,834**	**133,794**	**126,248**
Guadalupe County GCD	Guadalupe	Carrizo	28,943	14,834	14,627	14,532	14,224	14,624	14,624
Guadalupe County GCD	Guadalupe	Upper Wilcox	0	0	0	0	0	0	0

[10] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1 (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Guadalupe County GCD	Guadalupe	Middle Wilcox	6,609	6,373	7,926	9,428	9,207	9,075	8,986
Guadalupe County GCD	Guadalupe	Lower Wilcox	20,085	18,356	19,115	19,355	18,687	18,500	18,049
Guadalupe County GCD Total		**Carrizo-Wilcox**	**55,637**	**39,563**	**41,668**	**43,315**	**42,118**	**42,199**	**41,659**
McMullen County GCD	McMullen	Carrizo	7,789	7,768	4,867	4,854	4,854	4,854	4,854
McMullen County GCD	McMullen	Upper Wilcox	0[11]	0	0	0	0	0	0
McMullen County GCD	McMullen	Middle Wilcox	0	0	0	0	0	0	0
McMullen County GCD	McMullen	Lower Wilcox	0	0	0	0	0	0	0
McMullen County GCD Total		**Carrizo-Wilcox**	**7,789**	**7,768**	**4,867**	**4,854**	**4,854**	**4,854**	**4,854**
Medina County GCD	Medina	Carrizo	517	515	517	515	515	515	515
Medina County GCD	Medina	Upper Wilcox	0	0	0	0	0	0	0
Medina County GCD	Medina	Middle Wilcox	1,252	1,249	1,252	1,249	1,249	1,249	1,249
Medina County GCD	Medina	Lower Wilcox	866	864	866	864	864	864	864
Medina County GCD Total		**Carrizo-Wilcox**	**2,635**	**2,628**	**2,635**	**2,628**	**2,628**	**2,628**	**2,628**
Plum Creek CD	Caldwell	Carrizo	0	1,990	5,048	5,709	6,046	9,993	9,993
Plum Creek CD	Caldwell	Upper Wilcox	0	0	0	0	0	0	0
Plum Creek CD	Caldwell	Middle Wilcox	5,733	5,717	5,733	5,717	3,977	3,977	3,936
Plum Creek CD	Caldwell	Lower Wilcox	11,940	7,659	5,554	5,539	5,539	5,539	5,539
Plum Creek CD Total		**Carrizo-Wilcox**	**17,673**	**15,366**	**16,335**	**16,965**	**15,562**	**19,509**	**19,468**

[11] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1 (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Uvalde County GCD	Uvalde	Carrizo	0[12]	0	0	0	0	0	0
Uvalde County GCD	Uvalde	Upper Wilcox	0	0	0	0	0	0	0
Uvalde County GCD	Uvalde	Middle Wilcox	0	0	0	0	0	0	0
Uvalde County GCD	Uvalde	Lower Wilcox	0	0	0	0	0	0	0
Uvalde County GCD Total		**Carrizo-Wilcox**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wintergarden GCD	Dimmit	Carrizo	2,722	2,715	2,722	2,715	2,715	2,715	2,715
Wintergarden GCD	Dimmit	Upper Wilcox	993	990	993	990	990	990	990
Wintergarden GCD	Dimmit	Middle Wilcox	142	142	142	142	142	142	142
Wintergarden GCD	Dimmit	Lower Wilcox	38	38	38	38	38	38	38
Wintergarden GCD	La Salle	Carrizo	4,597	4,584	4,597	4,584	4,584	4,584	4,584
Wintergarden GCD	La Salle	Upper Wilcox	1,957	1,952	1,957	1,952	1,952	1,952	1,952
Wintergarden GCD	La Salle	Middle Wilcox	0	0	0	0	0	0	0
Wintergarden GCD	La Salle	Lower Wilcox	0	0	0	0	0	0	0
Wintergarden GCD	Zavala	Carrizo	27,969	26,368	25,065	24,897	24,699	24,524	24,233
Wintergarden GCD	Zavala	Upper Wilcox	6,329	6,312	6,329	6,312	6,312	6,312	6,312
Wintergarden GCD	Zavala	Middle Wilcox	3,683	3,673	3,683	3,673	3,673	3,673	3,673
Wintergarden GCD	Zavala	Lower Wilcox	322	322	322	322	322	322	322
Wintergarden GCD Total		**Carrizo-Wilcox**	**48,752**	**47,096**	**45,848**	**45,625**	**45,427**	**45,252**	**44,961**
No District-County	Bexar	Carrizo	43,057	42,939	43,346	43,227	43,227	43,423	43,423
No District-County	Bexar	Upper Wilcox	10	10	10	10	10	10	10
No District-County	Bexar	Middle Wilcox	58	58	58	58	58	58	58
No District-County	Bexar	Lower Wilcox	26,602	25,444	25,514	25,444	24,358	24,358	24,358

[12] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1 (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
No District-County	Caldwell	Carrizo	NP[13]	NP	NP	NP	NP	NP	NP
No District-County	Caldwell	Upper Wilcox	NP	NP	NP	NP	NP	NP	NP
No District-County	Caldwell	Middle Wilcox	39	39	39	39	39	39	39
No District-County	Caldwell	Lower Wilcox	0[14]	0	0	0	0	0	0
No District-County	Gonzales	Carrizo	0	0	0	0	0	0	0
No District-County	Gonzales	Upper Wilcox	0	0	0	0	0	0	0
No District-County	Gonzales	Middle Wilcox	0	0	0	0	0	0	0
No District-County	Gonzales	Lower Wilcox	0	0	0	0	0	0	0
No District-County	Maverick	Carrizo	543	541	543	541	541	272	272
No District-County	Maverick	Upper Wilcox	0	0	0	0	0	0	0
No District-County	Maverick	Middle Wilcox	2	2	2	2	2	2	2
No District-County	Maverick	Lower Wilcox	2	2	2	2	2	2	2
No District-County	Web	Carrizo	898	896	898	896	896	896	896
No District-County	Web	Upper Wilcox	13	13	13	13	13	13	13
No District-County	Web	Middle Wilcox	1	1	1	1	1	1	1
No District-County	Web	Lower Wilcox	0	0	0	0	0	0	0
No District-County Total		**Carrizo-Wilcox**	**71,225**	**69,945**	**70,426**	**70,233**	**69,147**	**69,074**	**69,074**
Total for GMA 13		**Carrizo-Wilcox**	**470,283**	**448,537**	**473,887**	**520,821**	**558,942**	**583,136**	**574,718**

[13] NP: The aquifer is not present in this part of the county.
[14] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

Appendix I – TWDB GAM Run 21-020

DRAFT