GAM RUN 17-030 MAG: MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, YEGUA-JACKSON, AND BRAZOS RIVER ALLUVIUM AQUIFERS IN GROUNDWATER MANAGEMENT AREA 12

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Groundwater Division
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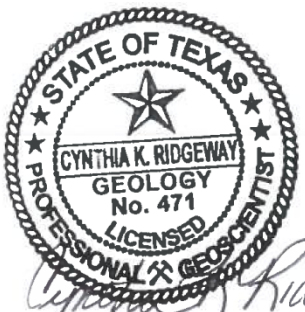
(512) 936-0883
December 15, 2017

Shirley C. Wade
12/15/17



Cynthia K. Ridgeway
12/15/17

Cynthia K. Ridgeway is the Manager of the Groundwater Availability Modeling Section and is responsible for oversight of work performed by Natalie Ballew under her direct supervision.

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EXECUTIVE SUMMARY:

This report presents modeled available groundwater for Groundwater Management Area 12 for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium aquifers by decade for the groundwater conservation districts (Tables 4 through 11 respectively) and for use in the regional water planning process (Tables 12 through 19 respectively). The total modeled available groundwater estimates for the Carrizo-Wilcox Aquifer range from approximately 135,000 acre-feet per year in 2010 to approximately 260,000 acre-feet per year in 2069 (Tables 4 through 7). The modeled available groundwater estimates for the Queen City Aquifer range from approximately 3,000 acre-feet per year in 2010 to approximately 7,000 acre-feet per year in 2069 (Table 8). The modeled available groundwater estimates for the Sparta Aquifer range from approximately 8,000 acre-feet per year in 2010 to approximately 24,000 acre-feet per year in 2069 (Table 9). The estimates were extracted from results of a model run using the groundwater availability model for the central part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (version 2.02). District representatives in Groundwater Management Area 12 prepared and approved the model run files that meet the desired future condition adopted for the Carrizo-Wilcox, Queen City, and Sparta Aquifers. The files were submitted to the Executive Administrator of the Texas Water Development Board (TWDB) on October 6, 2017, as part of the resubmittal of the Desired Future Conditions Explanatory Report for Groundwater Management Area 12.

The modeled available groundwater estimates for the Yegua-Jackson Aquifer range from approximately 31,000 acre-feet per year in 2010 to 27,000 acre-feet per year in 2069 (Table 10). The estimates were extracted from results of a model run using the groundwater availability model for the Yegua-Jackson Aquifer (version 1.01). District representatives prepared and approved the model run files that meet the desired future conditions adopted for the Yegua-Jackson Aquifer. The files were submitted to the Executive Administrator of the TWDB on July 5, 2017, as part of Groundwater Management Area 12's original submittal of the Explanatory Report.

The modeled available groundwater estimates for the Brazos River Alluvium Aquifer range from approximately 269,000 acre-feet per year in 2013 to approximately 214,000 acre-feet per year in 2070 (Table 11). The estimates were extracted from results of a model run using the groundwater availability model for the Brazos River Alluvium Aquifer (version 1.01). The model run was developed to meet the desired future conditions adopted by district representatives of Groundwater Management Area 12 for the Brazos River Alluvium Aquifer.

The Executive Administrator of the TWDB determined that the explanatory reports and other supporting files and materials for Groundwater Management Area 12 were administratively complete on October 31, 2017.

REQUESTOR:

Mr. Gary Westbrook, coordinator of Groundwater Management Area 12.

DESCRIPTION OF REQUEST:

In a letter dated October 5, 2017, Gary Westbrook, on behalf of Groundwater Management Area 12, provided the TWDB with the desired future conditions of the Carrizo-Wilcox (Hooper, Simsboro, Calvert Bluff, and Carrizo), Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium aquifers adopted by the groundwater conservation districts in Groundwater Management Area 12. The desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta aquifers are expressed as average drawdowns in feet from January 2000 through December 2069 (Table 1).

TABLE 1 ADOPTED DESIRED FUTURE CONDITIONS FOR THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS IN GROUNDWATER MANAGEMENT AREA 12. VALUES ARE AVERAGE AQUIFER DRAWDOWN IN FEET FROM JANUARY 2000 THROUGH DECEMBER 2069 (DANIEL B. STEPHENS AND ASSOCIATES AND OTHERS, 2017).

Groundwater Conservation District (GCD) or County	Sparta	Queen City	Carrizo	Calvert Bluff	Simsboro	Hooper
Brazos Valley GCD	12	12	61	125	295	207
Fayette County GCD	47*	64*	110*	NR	NR	NR
Lost Pines GCD	5	15	62	100	240	165
Mid-East Texas GCD	5	2	80	90	138	125
Post Oak Savannah GCD	28	30	67	149	318	205
Falls County	NP	NP	NP	NP	-2	27
Limestone County	NP	NP	NP	11	50	50
Navarro County	NP	NP	NP	-1	3	3
Williamson County	NP	NP	NP	-11	47	69
GMA12	16	16	75	114	228	168

*Fayette County GCD desired future conditions are for all of Fayette County.
NR = Not relevant; NP = Not present

The desired future condition for Fayette County Groundwater Conservation District is for all of Fayette County including both Groundwater Management Areas 12 and 15. The Calvert Bluff, Simsboro, and Hooper aquifers occur in Fayette County but are not used so they were declared non-relevant (NR in Table 1). The Sparta, Queen City, and Carrizo aquifers do not occur (NP in Table 1) in Falls, Limestone, Navarro, and Williamson counties. The Calvert Bluff Aquifer does not occur in Falls County.

Groundwater availability models are regional in scale and are developed with data from many sources with differing levels of confidence (refer to the Limitations section at the end of this report). Therefore, groundwater availability models — like all numerical models — generate predictions that contain some uncertainty. Considering this situation, Groundwater Management Area 12 considers the desired future conditions to be compatible and physically possible if the difference between the modeled drawdown results and the desired future condition drawdown targets are within a 10 percent or a 5-foot variance, whichever is greater, for the Carrizo-Wilcox, Queen City, and Sparta aquifers

with the exception of the Simsboro aquifer, which was held within a 5 percent or a 5-foot variance, whichever is greater (Daniel B. Stephens and Associates and others, 2017).

The desired future conditions for the Yegua-Jackson Aquifer are average drawdowns in feet from January 2010 through December 2069 (Table 2). The desired future condition for Fayette County Groundwater Conservation District is for all of Fayette County including both Groundwater Management Areas 12 and 15.

TABLE 2 ADOPTED DESIRED FUTURE CONDITIONS FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. VALUES ARE AVERAGE AQUIFER DRAWDOWN IN FEET FROM JANUARY 2010 THROUGH DECEMBER 2069 (DANIEL B. STEPHENS AND ASSOCIATES AND OTHERS, 2017).

Groundwater Conservation District (GCD)	Yegua	Jackson	Yegua-Jackson
Brazos Valley GCD	70	114	NA
Fayette County GCD	NA	NA	77*
Lost Pines GCD	NR	NR	NR
Mid-East Texas GCD	NA	NA	7
Post Oak Savannah GCD	NA	NA	100
GMA-12	NA	NA	65

*Fayette County GCD desired future conditions are for all of Fayette County.
NR = Not relevant; NA = Not applicable

Brazos Valley Groundwater Conservation District manages the Yegua and Jackson aquifers separately and adopted two separate desired future conditions. The other groundwater conservation districts manage the Yegua-Jackson Aquifer as a single-unit and adopted single desired future conditions for their districts. Lost Pines Groundwater Conservation District has declared the Yegua-Jackson Aquifer not relevant in their district. As with the Carrizo-Wilcox aquifers, Groundwater Management Area 12 considers the desired future conditions to be compatible and physically possible if the difference between the modeled drawdown results and the desired future condition drawdown targets are within a 10 percent or a 5-foot variance, whichever is greater, for the Yegua-Jackson Aquifer (Daniel B. Stephens and Associates and others, 2017).

In Groundwater Management Area 12 the desired future conditions for the Brazos River Alluvium consist of percent saturation values or decrease in saturated thickness for the Brazos Valley and Post Oak Savannah Groundwater Conservation Districts, respectively (Table 3).

TABLE 3 ADOPTED DESIRED FUTURE CONDITIONS FOR THE BRAZOS RIVER ALLUVIUM AQUIFER FOR GROUNDWATER MANAGEMENT AREA 12. (DANIEL B. STEPHENS AND ASSOCIATES AND OTHERS, 2017).

Groundwater Conservation District	County	Desired Future Condition
Brazos Valley	Brazos and Robertson	North of State Highway 21: Percent saturation shall average at least 30 percent of total well depth. South of State Highway 21: Percent Saturation shall average at least 40 percent of total well depth.
Post Oak Savannah	Burleson	A decrease in 6 feet in the average saturated thickness over the period from 2010 to 2070.
Post Oak Savannah	Milam	A decrease in 5 feet in average saturated thickness over the period from 2010 to 2070.

TWDB staff reviewed the model files associated with the desired future conditions, requested clarification on certain technical elements of the files, and received clarification on procedures and assumptions from Groundwater Management Area 12 in Appendix V of the re-submittal of the Explanatory Report on October 6, 2017, and via email on November 3, 2017. Questions for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers included whether drawdown averages and modeled available groundwater values were based on official aquifer extent or model extent, whether desired future conditions for Fayette County were for all of the county or for only the Groundwater Management Area 12 part, whether to include dry cells (dry cells are explained in the Methods section) in drawdown averaging, and which stress periods to use for drawdown calculations. In addition, the original model file submission for the Carrizo-Wilcox, Queen City, and Sparta aquifers (July 6, 2017) did not match the desired future conditions for the Lost Pines Groundwater Conservation District. The revised model files for the Carrizo-Wilcox, Queen City, and Sparta aquifers submitted on October 6, 2017, did match the desired future conditions for all of the groundwater conservation districts (Table 1) within the specified variance. All clarifications are included in the Parameters and Assumptions Section of this report.

Groundwater Management Area 12 did not submit model files for the Brazos River Alluvium Aquifer, so the TWDB developed a predictive scenario using the calibrated historical groundwater availability model of the Brazos River Alluvium Aquifer. The TWDB

received clarification from Groundwater Management Area 12 on September 18, 2017, that the assumptions used for the predictive scenario were acceptable. Groundwater Management Area 12 provided additional clarification to the TWDB on November 3, 2017, that the small portion of the Brazos River Alluvium located in Falls County was considered not relevant for Groundwater Management Area 12.

METHODS:

We ran the groundwater availability model for the central part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (Figures 1 through 4) using the model files prepared and approved by districts in Groundwater Management Area 12 and submitted with the explanatory report (Daniel B. Stephens and Associates and others, 2017). Model-estimated water levels were extracted and drawdowns were calculated for the year 2069 (stress period 95). Average drawdown was calculated for each groundwater conservation district for each individual aquifer. The calculated drawdown average was compared with the desired future conditions (Table 1) to verify that the pumping scenario achieved the desired future conditions within 10 percent or 5-foot variance (5 percent or 5-foot variance for the Simsboro Aquifer).

As noted in the clarifications, cells that became dry during the simulation were excluded from the drawdown averaging. Dry cells occur during a model run when the simulated water level in a cell falls below the bottom of the cell, and when this occurs the cell is deactivated. If high pumpage is the primary factor for a cell going dry, the models are implying that the pumping may create drawdowns that may locally partially dewater the aquifer. This typically is simulated in the shallow or thin portions of the unconfined area of the aquifers. In the groundwater availability models used for Groundwater Management Area 12, when a model deactivates a cell, that cell is inactive for the rest of the simulation. It is important to identify why a cell went dry and address the causes. In reality, the aquifer will probably not go dry because pumping will become uneconomical before the aquifer is fully dewatered in any particular area.

The groundwater availability model for the Yegua-Jackson Aquifer (Figures 5 and 6) was run using the model files submitted on July 26, 2017, and drawdowns were calculated for the year 2069. Average drawdowns were calculated for Brazos Valley, Fayette County, Mid-East Texas and Post Oak Savannah Groundwater Conservation Districts. For Brazos Valley Groundwater Conservation District separate drawdown averages were calculated for the Yegua and Jackson Aquifers. For the other districts average drawdown was calculated for all layers combined. Based on clarifications, the reference period (or starting point) for drawdown calculation was stress period 39 (January 2010). As specified in the clarifications, cells that became dry during the simulation were excluded from the

averaging. The calculated drawdown averages were compared with the desired future to verify that the pumping scenario achieved the desired future conditions (Table 2) within 10 percent or 5-foot variance.

We developed a predictive model scenario for the Brazos River Alluvium Aquifer based on the calibrated historical groundwater availability model. We extended the model period from 2012 to 2070 by adding 58 annual stress periods and we used average recharge and average streamflow for 2013 to 2070. The pumping distribution for 2013 through 2070 is based on the average annual pumping for 2012 and the pumping amounts were adjusted uniformly within each groundwater conservation district to achieve the desired future conditions (Table 3).

We calculated the average percent saturation of the aquifer for the two areas within Brazos Valley Groundwater Conservation District by determining the ratio of the saturated thickness to the total alluvium thickness for each model cell in 2070 and averaging the ratios for all cells within the groundwater district areas (north of Highway 21 and south of Highway 21). The total alluvium thickness was used as an estimate for total well depth. The decrease in average saturated thickness in Post Oak Savannah Groundwater Conservation District was calculated by subtracting the average saturated thickness in 2070 from the average saturated thickness in 2010. The desired future conditions were achieved within one foot or one percentage point with the exception that it was not possible to decrease percent saturation in the Brazos Valley Groundwater Conservation District south of Highway 21 below 45 percent, because the model would not converge with additional pumping.

The modeled available groundwater values for aquifers in Groundwater Management Area 12 were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Tables 4 through 11 present the modeled available groundwater values (annual pumping rates to achieve the desired future conditions) for each aquifer by county and groundwater conservation district. Tables 12 through 19 present the modeled available groundwater (annual pumping rates to achieve the desired future conditions) for each aquifer by county, river basin, and regional water planning area.

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:

This section describes the parameters and assumptions for the modeled available groundwater estimates:

Carrizo-Wilcox, Queen City, and Sparta aquifers

- We used Version 2.02 of the groundwater availability model for the central part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Dutton and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the central 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 Calvert Bluff (Layer 6), the Simsboro (Layer 7), and the Hooper (Layer 8).
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- Drawdowns were based on water levels in December 2069 (stress period 95) and water levels in January 2000 (stress period 25).
- Drawdown averages and modeled available groundwater values were based on the extent of the model area within Groundwater Management Area 12 rather than the official aquifer boundaries.
- The drawdown average for Fayette County Groundwater Conservation District was based on all of Fayette County including areas in Groundwater Management Areas 12 and 15.
- Drawdowns for cells where water levels dropped below the base elevation of the cell causing the cell to become inactive (dry cells) were excluded from the averaging.
- Modeled available groundwater values are extracted from the model output files and do not include pumping in dry cells or inactive cells.

- A tolerance of 10 percent (5 percent for the Simsboro) or 5 feet was assumed when comparing desired future conditions (Table 1, average drawdown values per county) to model drawdown results.
- Estimates of modeled available groundwater from the model simulation were rounded to whole numbers.

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).
- The end of the calibration period was extended from 1997 to 2009 (Oliver, 2010).
- Drawdowns were based on water levels in December 2069 (stress period 99) and water levels from December 2009/January 2000 (stress period 39).
- Drawdown averages and modeled available groundwater values were based on the extent of the model area within Groundwater Management Area 12 rather than the official aquifer boundaries.
- The drawdown average for Fayette County Groundwater Conservation District was based on all of Fayette County including areas in Groundwater Management Area 12 and Groundwater Management Area 15.
- Drawdown for cells where water levels dropped below the base elevation of the cell causing the cell to become inactive (dry cells) were excluded from the averaging.
- Modeled available groundwater values are extracted from the model output files and do not include pumping in dry cells or inactive cells.
- A tolerance of 10 percent or 5 feet was assumed when comparing desired future conditions (Table 2, average drawdown values per county) to model drawdown results.

- Estimates of modeled available groundwater from the model simulation were rounded to whole numbers.

Brazos River Alluvium Aquifer

- We used version 1.01 of the groundwater availability model for the Brazos River Alluvium Aquifer released on December 16, 2016. See Ewing and Jigmond (2016) for assumptions and limitations of the model.
- The groundwater availability model for the Brazos River Alluvium Aquifer contains three layers. Layers 1 and 2 represent the Brazos River Alluvium Aquifer and Layer 3 represents the surficial portions of the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Gulf Coast aquifers as well as various geologic units of the Cretaceous System.
- The model was run with MODFLOW-USG (unstructured grid; Panday and others, 2013).
- Perennial rivers and streams were simulated using the MODFLOW Streamflow-Routing package and ephemeral streams were simulated using the MODFLOW River package. Springs were simulated using the MODFLOW Drain package.
- Average streamflow and recharge conditions were assumed for the predictive modeling period of 2013 through 2070.
- The pumping distribution during the predictive model years (2013 through 2070) is based on the average pumping distribution from the last year of the historical model (2012).
- Dry cells do not occur in the groundwater availability model for the Brazos River Alluvium Aquifer; however, pumping is reduced by the model code (MODFLOW USG) to prevent model cells from going dry during the simulation. All reported modeled available groundwater values are extracted from the budget output files rather than from the well file input package and reflect what was actually pumping in the model.
- A tolerance of one foot or 5 percent (whichever was greater) was assumed when comparing desired future conditions to average saturated thickness decline or percent saturation values.
- Estimates of modeled available groundwater from the model simulation were rounded to whole numbers.

RESULTS:

The modeled available groundwater estimates for the Carrizo-Wilcox Aquifer range from approximately 135,000 acre-feet per year in 2010 to approximately 260,000 acre-feet per year in 2069 (Tables 4 through 7). The modeled available groundwater estimates for the Queen City Aquifer range from approximately 3,000 acre-feet per year in 2010 to approximately 7,000 acre-feet per year in 2069 (Table 8). The modeled available groundwater estimates for the Sparta Aquifer range from approximately 8,000 acre-feet per year in 2010 to approximately 24,000 acre-feet per year in 2069 (Table 9). The modeled available groundwater is summarized by groundwater conservation district and county for the Hooper, Simsboro, Calvert Bluff, Carrizo, Queen City, and Sparta aquifers (Tables 4, 5, 6, 7, 8, and 9 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 Hooper, Simsboro, Calvert Bluff, Carrizo, Queen City, and Sparta aquifers (Tables 12, 13, 14, 15, 16, and 17 respectively). Small differences in values between table summaries are due to rounding.

The modeled available groundwater estimates for the Yegua-Jackson Aquifer range from approximately 31,000 acre-feet per year in 2010 to 27,000 acre-feet per year in 2069 (Table 10). The modeled available groundwater for the Yegua-Jackson Aquifer is summarized by groundwater conservation district and county (Table 10) and by county, river basin, and regional water planning area for use in the regional water planning process (Table 18). Small differences in values between table summaries are due to rounding.

The modeled available groundwater estimates for the Brazos River Alluvium Aquifer range from approximately 269,000 acre-feet per year in 2013 to 214,000 acre-feet per year in 2070 (Table 11). The modeled available groundwater for the Brazos River Alluvium Aquifer is summarized by groundwater conservation district and county (Table 11) and by county, river basin, and regional water planning area for use in the regional water planning process (Table 19). Small differences in values between table summaries are due to rounding.

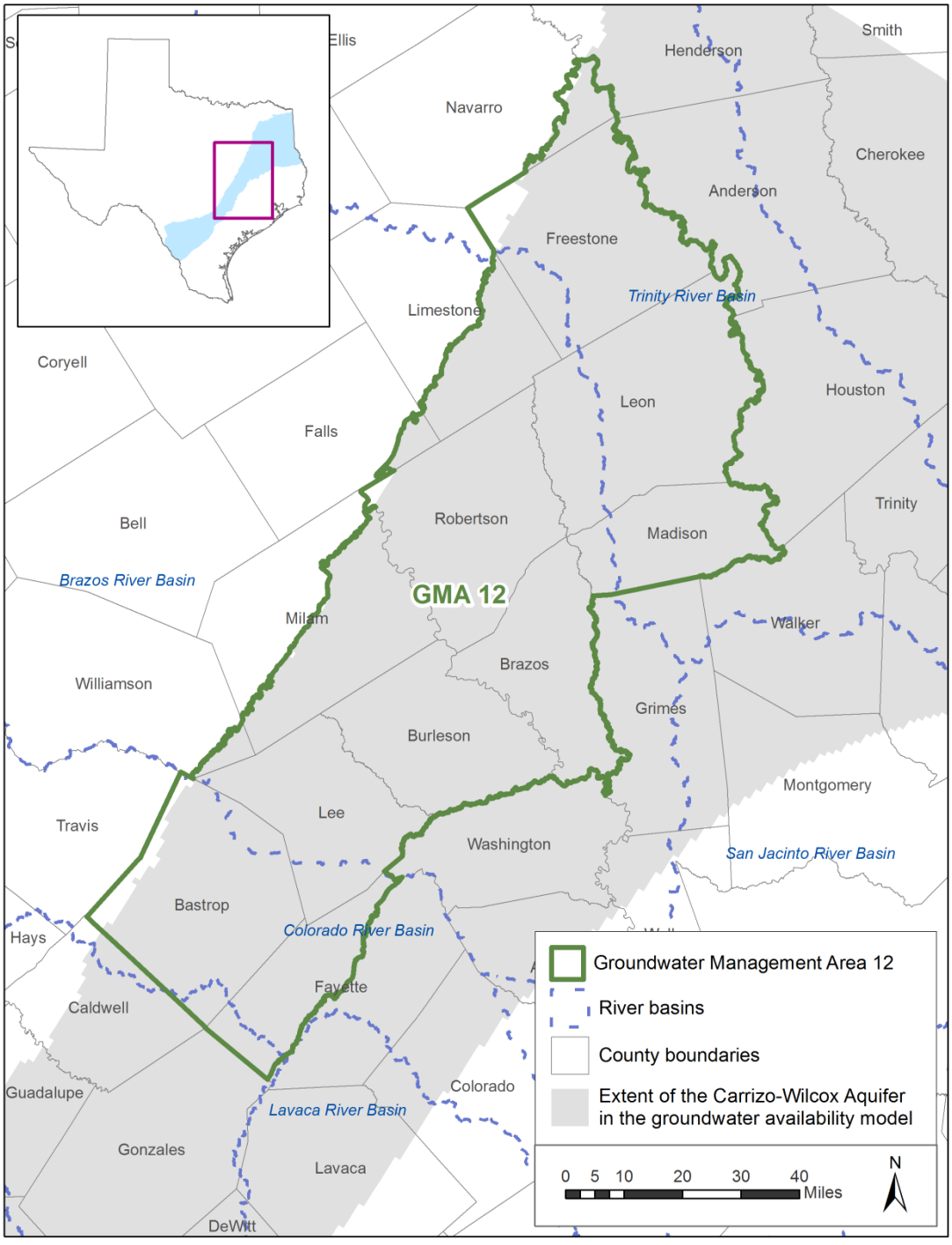

FIGURE 1. GROUNDWATER MANAGEMENT AREA 12 BOUNDARY, RIVER BASINS, AND COUNTIES OVERLAIN ON THE EXTENT OF THE CARRIZO-WILCOX AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE CENTRAL PORTION OF THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS.

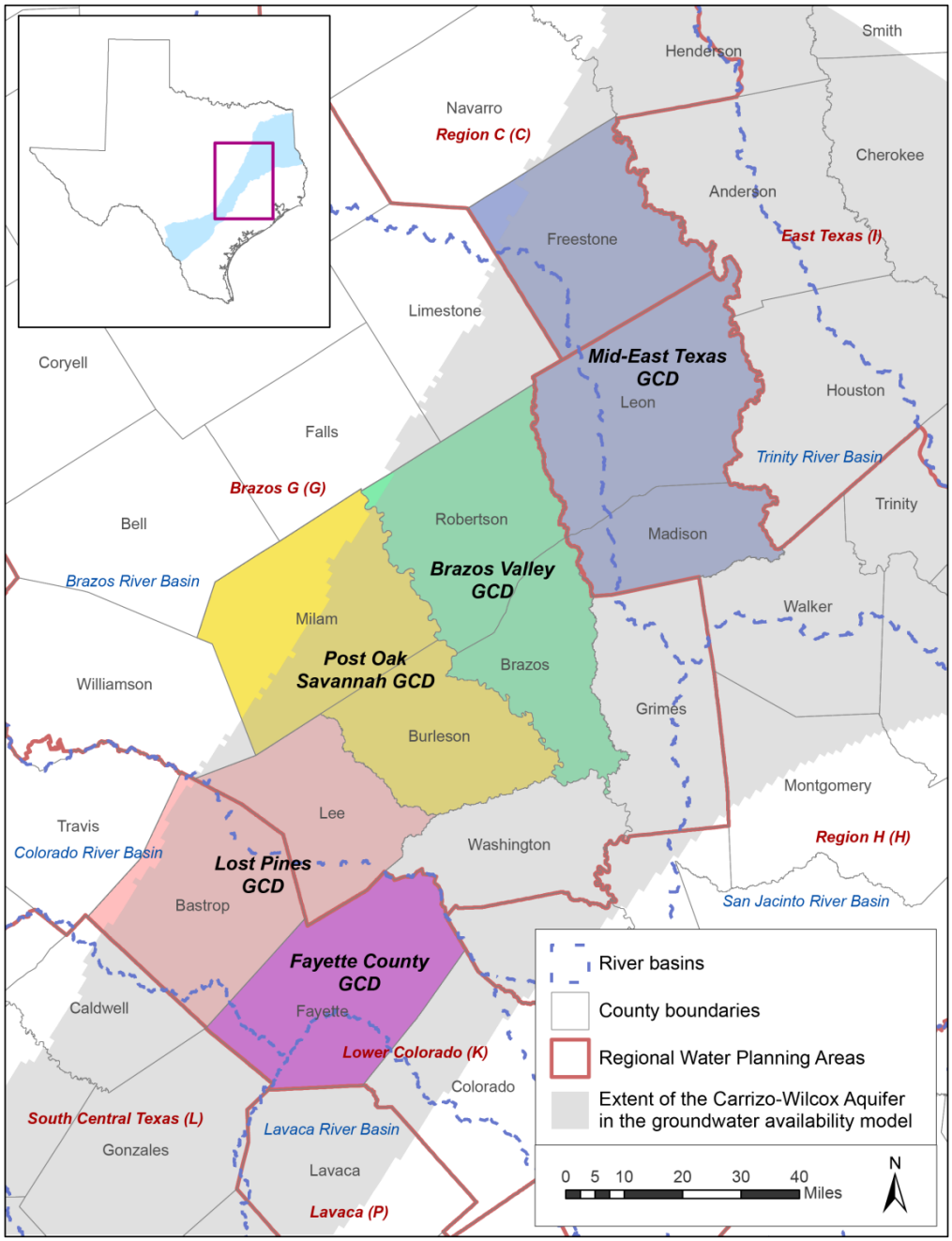

FIGURE 2. REGIONAL WATER PLANNING AREAS , RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS(GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE CARRIZO-WILCOX AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE CENTRAL PORTION OF THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS.

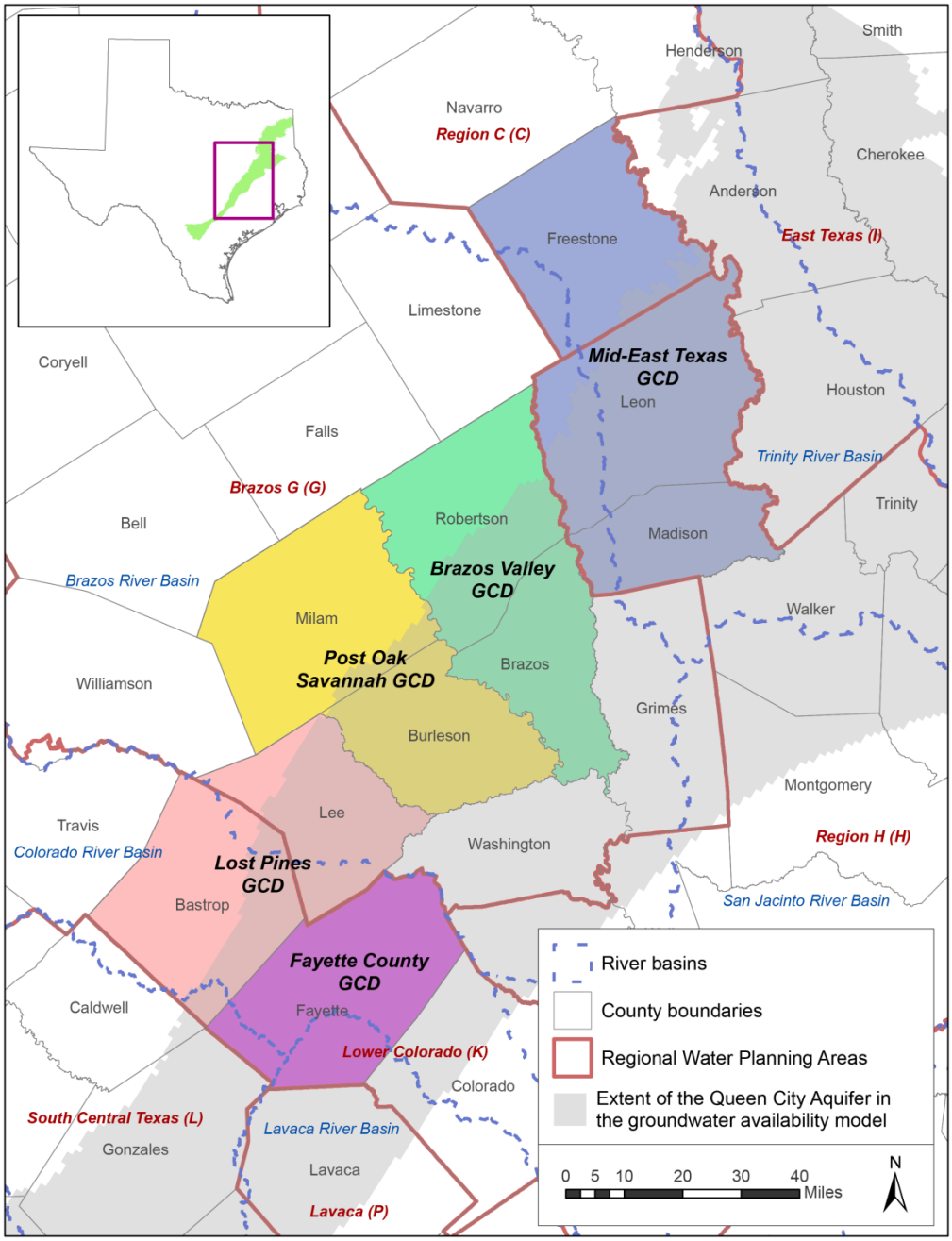

FIGURE 3. REGIONAL WATER PLANNING AREAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE QUEEN CITY AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE CENTRAL PORTION OF THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS.

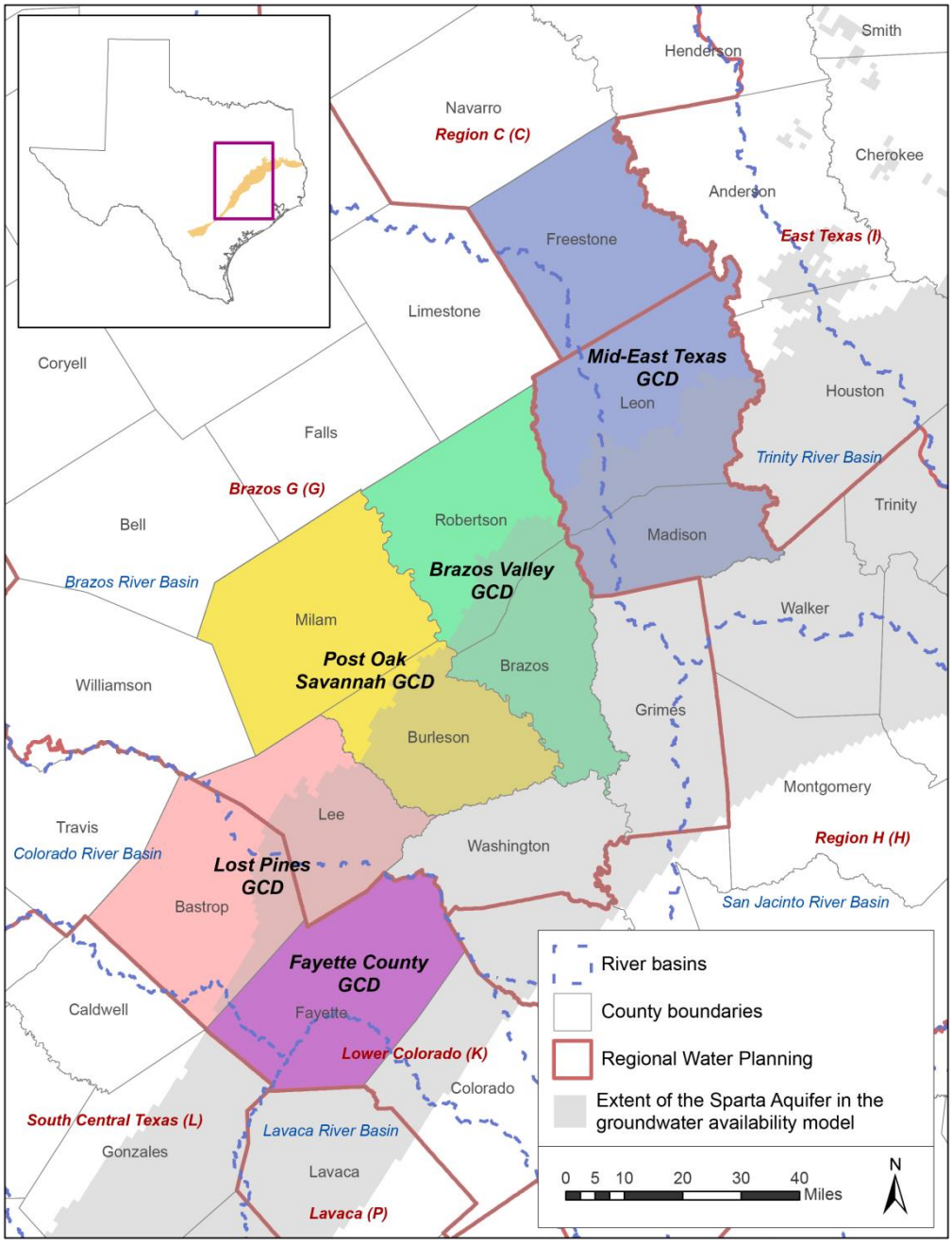

FIGURE 4. REGIONAL WATER PLANNING AREAS, RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE SPARTA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE CENTRAL PORTION OF THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS.

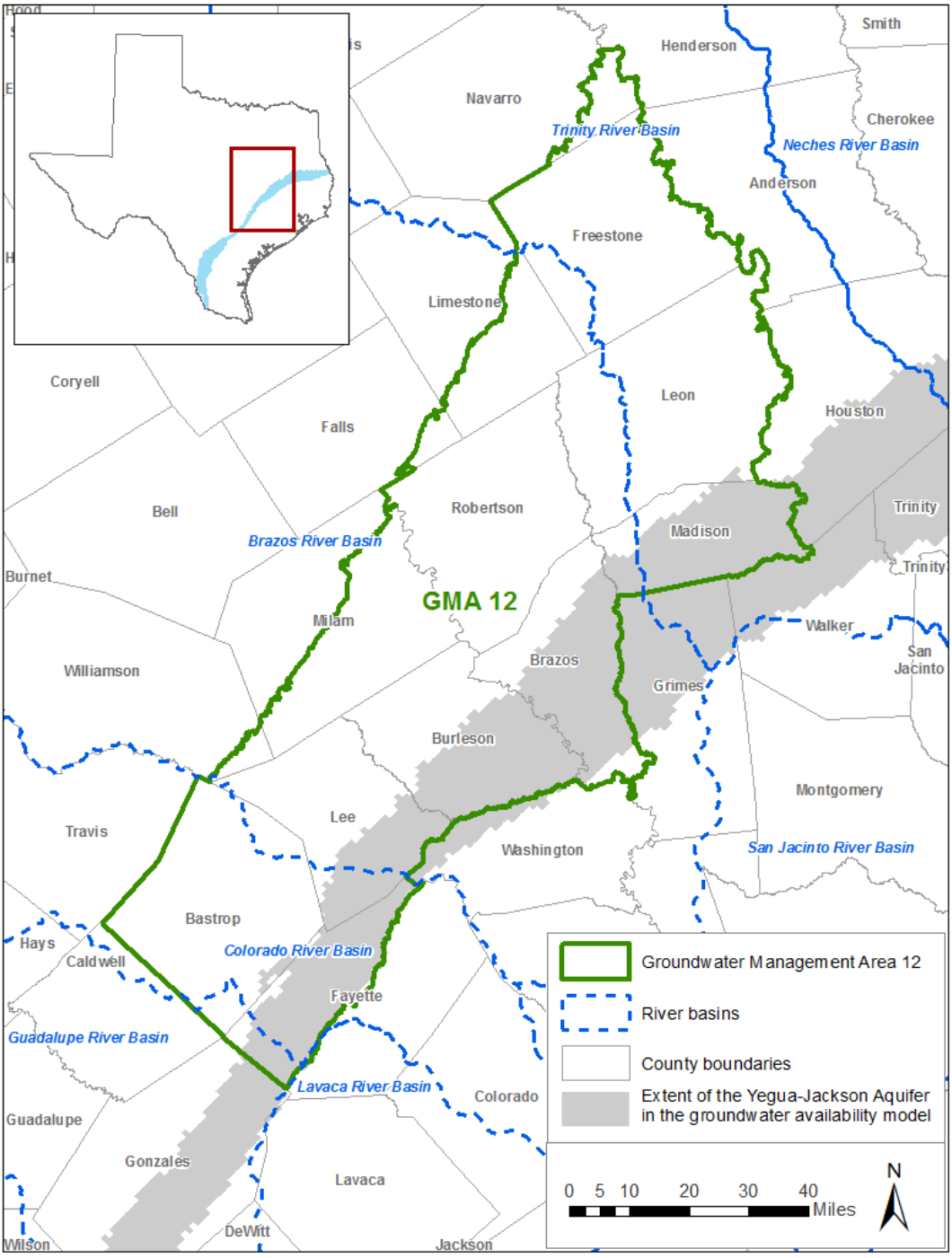

FIGURE 5. GROUNDWATER MANAGEMENT AREA 12 BOUNDARY, RIVER BASINS, AND COUNTIES OVERLAIN ON THE EXTENT OF THE YEGUA-JACKSON AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL.

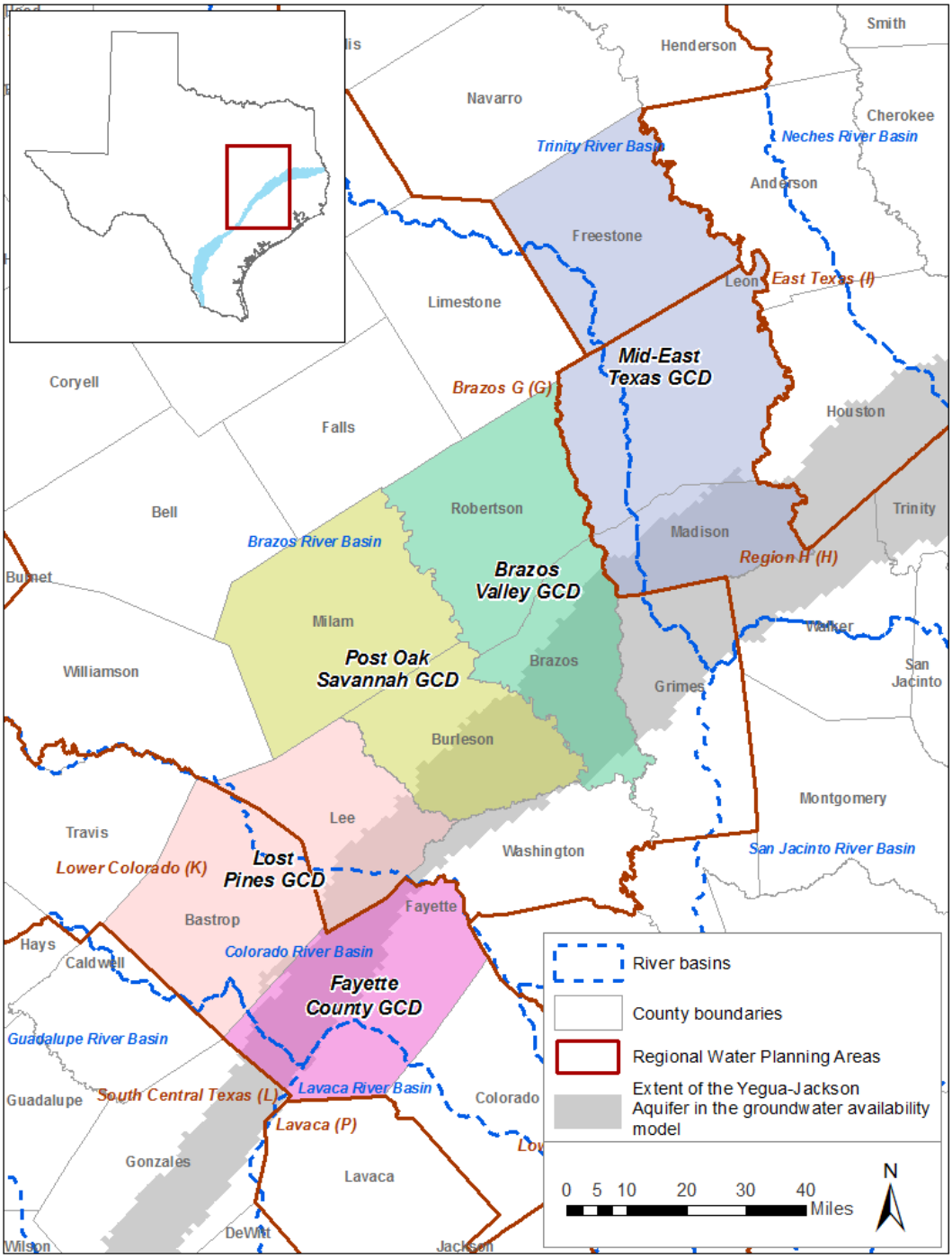

FIGURE 6. REGIONAL WATER PLANNING AREAS, RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE YEGUA-JACKSON AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL.

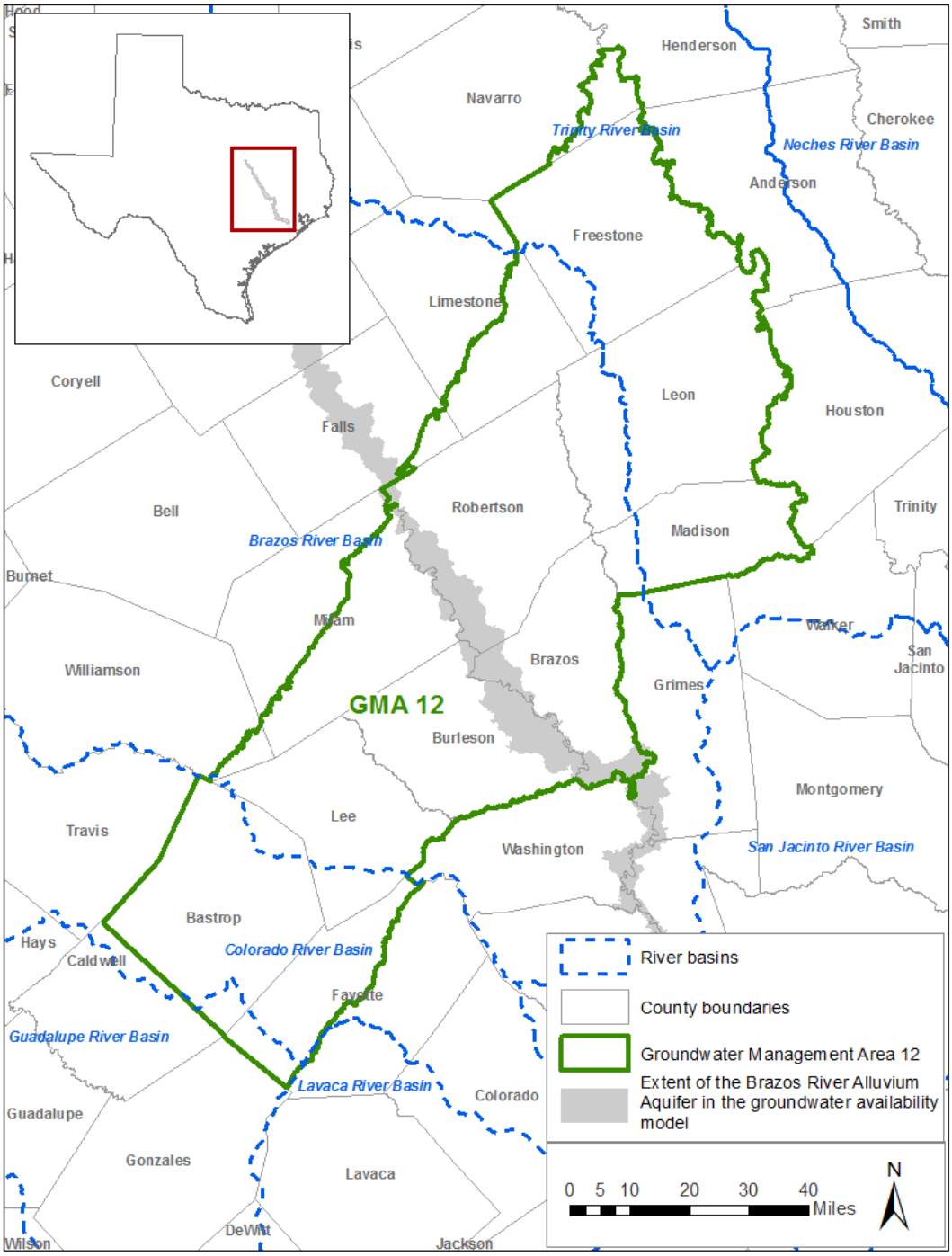

FIGURE 7. GROUNDWATER MANAGEMENT AREA 12 BOUNDARY, RIVER BASINS, AND COUNTIES OVERLAIN ON THE EXTENT OF THE BRAZOS RIVER ALLUVIUM AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL.

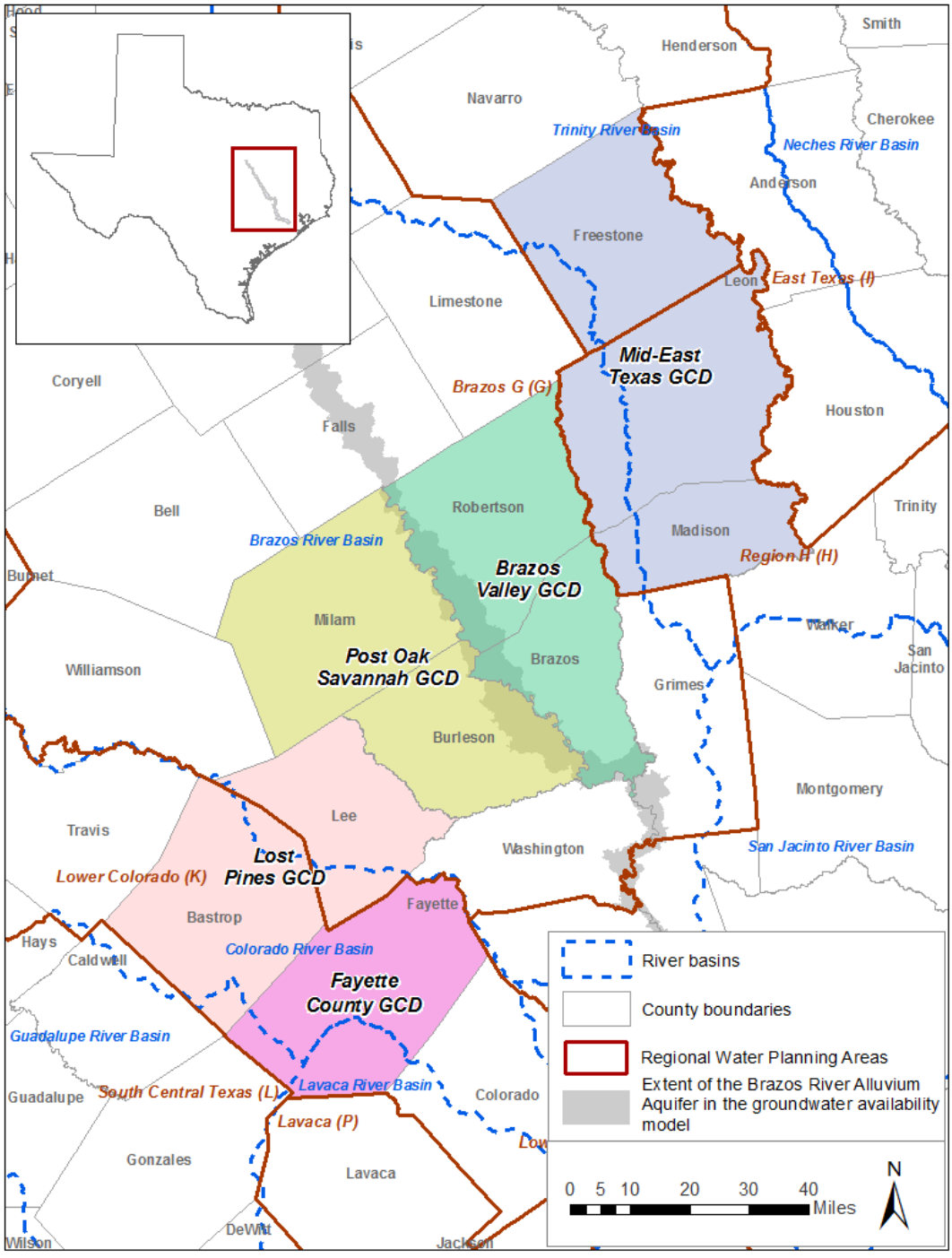

FIGURE 8 **REGIONAL WATER PLANNING AREAS, RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE BRAZOS RIVER ALLUVIUM AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL.**

TABLE 4 MODELED AVAILABLE GROUNDWATER FOR THE HOOPER AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Brazos Valley GCD	Brazos	Hooper	0	0	0	0	0	0	0
Brazos Valley GCD	Robertson	Hooper	836	1,446	1,884	1,942	2,000	2,000	2,000
Brazos Valley GCD Total[1]		**Hooper**	**836**	**1,447**	**1,884**	**1,942**	**2,000**	**2,000**	**2,000**
Fayette County GCD[1,2]	**Fayette**	**Hooper**	NR	NR	NR	NR	NR	NR	NR
Lost Pines GCD	Bastrop	Hooper	357	651	781	953	1,176	1,179	1,139
Lost Pines GCD	Lee	Hooper	17	62	76	95	119	117	116
Lost Pines GCD Total[1]		**Hooper**	**374**	**713**	**857**	**1,048**	**1,295**	**1,296**	**1,255**
Mid-East Texas GCD	Freestone	Hooper	3,006	4,341	4,578	4,814	5,051	5,288	5,501
Mid-East Texas GCD	Leon	Hooper	0	0	0	0	0	0	0
Mid-East Texas GCD	Madison	Hooper	0	0	0	0	0	0	0
Mid-East Texas GCD Total[1]		**Hooper**	**3,006**	**4,341**	**4,578**	**4,814**	**5,051**	**5,288**	**5,501**
Post Oak Savannah GCD	Burleson	Hooper	19	1,085	1,515	1,623	1,623	1,623	1,623
Post Oak Savannah GCD	Milam	Hooper	5,366	1,874	2,623	2,811	2,811	2,800	2,800
Post Oak Savannah GCD Total[1]		**Hooper**	**5,385**	**2,960**	**4,139**	**4,433**	**4,433**	**4,422**	**4,422**

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
No District-County	Falls	Hooper	726	727	734	741	749	749	749
No District-County	Limestone	Hooper	1,488	1,382	1,410	1,444	1,496	1,496	1,414
No District-County	Navarro	Hooper	16	11	11	11	11	11	11
No District-County	Williamson	Hooper	5	5	5	5	5	5	5
No District-County Total[1]		**Hooper**	**2,235**	**2,125**	**2,160**	**2,201**	**2,261**	**2,261**	**2,178**
GMA 12 Total[1]		**Hooper**	**11,836**	**11,586**	**13,617**	**14,439**	**15,040**	**15,267**	**15,357**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. NR: Groundwater Management Area 12 declared the Hooper Aquifer not relevant in these areas.

TABLE 5 MODELED AVAILABLE GROUNDWATER FOR THE SIMSBORO AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Brazos Valley GCD	Brazos	Simsboro	35,086	41,115	44,120	45,681	50,208	53,404	53,404
Brazos Valley GCD	Robertson	Simsboro	37,236	41,673	42,061	42,468	42,794	42,794	42,794
Brazos Valley GCD Total[1]		**Simsboro**	**72,322**	**82,788**	**86,182**	**88,149**	**93,002**	**96,198**	**96,198**
Fayette County GCD [2]	**Fayette**	**Simsboro**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
Lost Pines GCD	Bastrop	Simsboro	8,508	14,253	15,673	16,311	17,334	15,947	16,279
Lost Pines GCD	Lee	Simsboro	1,860	17,993	17,221	17,031	17,179	14,896	14,024
Lost Pines GCD Total[1]		**Simsboro**	**10,368**	**32,246**	**32,895**	**33,342**	**34,513**	**30,843**	**30,304**
Mid-East Texas GCD	Freestone	Simsboro	1,254	3,582	3,589	3,585	3,552	3,550	3,550
Mid-East Texas GCD	Leon	Simsboro	263	3,359	3,457	3,538	3,617	3,623	3,623
Mid-East Texas GCD	Madison	Simsboro	0	0	0	0	0	0	0
Mid-East Texas GCD Total[1]		**Simsboro**	**1,517**	**6,941**	**7,046**	**7,124**	**7,169**	**7,173**	**7,173**

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Post Oak Savannah GCD	Burleson	Simsboro	627	17,687	21,616	25,103	28,858	30,409	30,409
Post Oak Savannah GCD	Milam	Simsboro	10,702	20,783	16,284	14,940	17,171	18,094	18,094
Post Oak Savannah GCD Total[1]		**Simsboro**	**11,329**	**38,470**	**37,900**	**40,042**	**46,028**	**48,503**	**48,503**
No District-County	Falls	Simsboro	139	140	141	143	146	146	146
No District-County	Limestone	Simsboro	9,801	9,753	9,850	9,992	10,235	10,235	10,235
No District-County	Navarro	Simsboro	6	4	4	4	4	4	4
No District-County	Williamson	Simsboro	2	2	2	2	2	2	2
No District Total		**Simsboro**	**9,948**	**9,899**	**9,997**	**10,141**	**10,387**	**10,387**	**10,387**
GMA 12 Total[1]		**Simsboro**	**105,484**	**170,343**	**174,020**	**178,799**	**191,099**	**193,104**	**192,565**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. NR: Groundwater Management Area 12 declared the Simsboro Aquifer not relevant in these areas.

TABLE 6 MODELED AVAILABLE GROUNDWATER FOR THE CALVERT BLUFF AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Brazos Valley GCD	Brazos	Calvert Bluff	0	0	0	0	0	0	0
Brazos Valley GCD	Robertson	Calvert Bluff	776	1,764	1,757	1,758	1,757	1,757	1,757
Brazos Valley GCD Total[1]		**Calvert Bluff**	**776**	**1,764**	**1,757**	**1,758**	**1,757**	**1,757**	**1,757**
Fayette County GCD[2]	**Fayette**	**Calvert Bluff**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
Lost Pines GCD	Bastrop	Calvert Bluff	1,534	2,063	2,462	2,970	3,613	3,774	3,873
Lost Pines GCD	Lee	Calvert Bluff	50	161	169	211	296	209	111
Lost Pines GCD Total[1]		**Calvert Bluff**	**1,584**	**2,224**	**2,631**	**3,181**	**3,909**	**3,983**	**3,984**
Mid-East Texas GCD	Freestone	Calvert Bluff	878	754	734	728	714	714	714
Mid-East Texas GCD	Leon	Calvert Bluff	2,817	2,819	2,953	3,065	3,189	3,201	3,201
Mid-East Texas GCD	Madison	Calvert Bluff	4	0	0	0	0	0	0
Mid-East Texas GCD Total[1]		**Calvert Bluff**	**3,698**	**3,573**	**3,687**	**3,793**	**3,903**	**3,915**	**3,915**

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Post Oak Savannah GCD	Burleson	Calvert Bluff	0	87	87	87	87	87	87
Post Oak Savannah GCD	Milam	Calvert Bluff	1,713	949	949	949	949	949	949
Post Oak Savannah GCD Total[1]		**Calvert Bluff**	**1,713**	**1,036**	**1,036**	**1,036**	**1,036**	**1,036**	**1,036**
No District-County	Limestone	Calvert Bluff	248	218	223	228	235	235	235
No District-County	Navarro	Calvert Bluff	0	0	0	0	0	0	0
No District-County	Williamson	Calvert Bluff	1	2	2	2	3	2	1
No District Total		**Calvert Bluff**	**248**	**220**	**225**	**230**	**237**	**237**	**236**
GMA 12 Total[1]		**Calvert Bluff**	**8,020**	**8,817**	**9,336**	**9,998**	**10,842**	**10,927**	**10,927**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. NR: Groundwater Management Area 12 declared the Calvert Bluff Aquifer not relevant in these areas.

TABLE 7 MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Brazos Valley GCD	Brazos	Carrizo	1,196	3,717	3,724	3,737	3,761	3,763	3,763
Brazos Valley GCD	Robertson	Carrizo	887	1,707	1,698	1,713	1,730	1,731	1,731
Brazos Valley GCD Total[1]		**Carrizo**	**2,083**	**5,425**	**5,422**	**5,450**	**5,491**	**5,494**	**5,494**
Fayette County GCD	**Fayette[2]**	**Carrizo**	**37**	**5,474**	**5,474**	**5,474**	**5,474**	**5,474**	**5,474**
Lost Pines GCD	Bastrop	Carrizo	2,408	4,692	5,308	6,042	7,929	8,205	8,295
Lost Pines GCD	Lee	Carrizo	2,089	2,926	3,050	3,221	3,871	3,847	3,757
Lost Pines GCD Total[1]		**Carrizo**	**4,496**	**7,618**	**8,358**	**9,263**	**11,800**	**12,052**	**12,052**
Mid-East Texas GCD	Freestone	Carrizo	44	369	366	357	347	346	346
Mid-East Texas GCD	Leon	Carrizo	694	8,108	8,051	8,110	8,193	8,200	8,200
Mid-East Texas GCD	Madison	Carrizo	1,478	2,861	2,770	2,656	2,554	2,543	2,543
Mid-East Texas GCD Total[1]		**Carrizo**	**2,216**	**11,339**	**11,187**	**11,123**	**11,095**	**11,090**	**11,090**
Post Oak Savannah GCD	Burleson	Carrizo	647	4,383	4,821	5,698	5,917	6,575	6,575
Post Oak Savannah GCD	Milam	Carrizo	23	322	355	419	435	484	484
Post Oak Savannah GCD Total[1]		**Carrizo**	**670**	**4,705**	**5,176**	**6,117**	**6,352**	**7,058**	**7,058**
GMA 12 Total[1]		**Carrizo**	**9,502**	**34,560**	**35,616**	**37,427**	**40,211**	**41,167**	**41,167**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)

TABLE 8 MODELED AVAILABLE GROUNDWATER FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Brazos Valley GCD	Brazos	Queen City	541	836	883	887	891	891	891
Brazos Valley GCD	Robertson	Queen City	0	368	309	309	309	309	309
Brazos Valley GCD Total[1]		**Queen City**	**541**	**1,204**	**1,192**	**1,196**	**1,200**	**1,200**	**1,200**
Fayette County GCD	**Fayette[2]**	**Queen City**	**268**	**2,708**	**2,708**	**2,708**	**2,708**	**2,708**	**2,708**
Lost Pines GCD	Bastrop	Queen City	192	558	541	523	505	486	467
Lost Pines GCD	Lee	Queen City	394	757	774	792	810	829	848
Lost Pines GCD Total[1]		**Queen City**	**587**	**1,315**	**1,315**	**1,315**	**1,315**	**1,315**	**1,315**
Mid-East Texas GCD	Freestone	Queen City	0	0	0	0	0	0	0
Mid-East Texas GCD	Leon	Queen City	624	594	594	594	594	594	594
Mid-East Texas GCD	Madison	Queen City	148	380	380	380	380	380	380
Mid-East Texas GCD Total[1]		**Queen City**	**772**	**974**	**974**	**974**	**974**	**974**	**974**
Post Oak Savannah GCD	Burleson	Queen City	685	416	447	447	447	447	447
Post Oak Savannah GCD	Milam	Queen City	20	53	56	56	56	56	56
Post Oak Savannah GCD Total[1]		**Queen City**	**705**	**469**	**504**	**504**	**504**	**504**	**504**
GMA 12 Total[1]		**Queen City**	**2,873**	**6,669**	**6,693**	**6,696**	**6,700**	**6,701**	**6,700**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)

TABLE 9 MODELED AVAILABLE GROUNDWATER FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Brazos Valley GCD	Brazos	Sparta	3,745	5,404	6,505	7,507	8,509	8,509	8,509
Brazos Valley GCD	Robertson	Sparta	16	510	510	510	510	510	510
Brazos Valley GCD Total[1]		**Sparta**	**3,760**	**5,914**	**7,015**	**8,017**	**9,019**	**9,019**	**9,019**
Fayette County GCD	**Fayette[2]**	**Sparta**	**1,176**	**2,831**	**2,825**	**2,803**	**2,794**	**2,802**	**2,802**
Lost Pines GCD	Bastrop	Sparta	81	907	904	902	898	896	895
Lost Pines GCD	Lee	Sparta	218	1,483	1,487	1,490	1,492	1,495	1,498
Lost Pines GCD Total[1]		**Sparta**	**299**	**2,390**	**2,391**	**2,391**	**2,391**	**2,391**	**2,392**
Mid-East Texas GCD	Leon	Sparta	86	21	21	21	21	21	21
Mid-East Texas GCD	Madison	Sparta	1,401	3,320	3,322	3,322	3,322	3,322	3,322
Mid-East Texas GCD Total[1]		**Sparta**	**1,487**	**3,341**	**3,343**	**3,343**	**3,343**	**3,343**	**3,343**
Post Oak Savannah GCD	**Burleson**	**Sparta**	**988**	**2,246**	**4,042**	**5,613**	**6,735**	**6,735**	**6,735**
GMA 12 Total[1]		**Sparta**	**7,709**	**16,721**	**19,616**	**22,167**	**24,282**	**24,291**	**24,292**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)

TABLE 10 MODELED AVAILABLE GROUNDWATER FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Brazos Valley GCD	Brazos	Jackson	4,411	4,404	4,402	4,402	4,402	4,402	4,402
Brazos Valley GCD	Brazos	Yegua	2,452	2,452	2,452	2,452	2,452	2,452	2,452
Brazos Valley GCD Total[1]		**Yegua-Jackson**	**6,863**	**6,856**	**6,854**	**6,854**	**6,854**	**6,854**	**6,854**
Fayette County GCD[1]	**Fayette[3]**	**Yegua-Jackson**	**9,262**	**9,262**	**9,262**	**9,262**	**9,262**	**9,261**	**9,261**
Lost Pines GCD[2]	Bastrop	Yegua-Jackson	NR	NR	NR	NR	NR	NR	NR
Lost Pines GCD[2]	Lee	Yegua-Jackson	NR	NR	NR	NR	NR	NR	NR
Lost Pines GCD Total[1,2]		**Yegua-Jackson**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
Mid-East Texas GCD	Leon	Yegua-Jackson	0	0	0	0	0	0	0
Mid-East Texas GCD	Madison	Yegua-Jackson	809	809	809	809	809	809	809
Mid-East Texas GCD Total[1]		**Yegua-Jackson**	**809**	**809**	**809**	**809**	**809**	**809**	**809**
Post Oak Savannah GCD[1]	**Burleson**	**Yegua-Jackson**	**14,544**	**14,544**	**12,576**	**12,564**	**12,478**	**12,326**	**10,200**
GMA 12 Total[1]		**Yegua-Jackson**	**31,478**	**31,471**	**29,501**	**29,489**	**29,403**	**29,250**	**27,124**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. NR: Groundwater Management Area 12 declared the Yegua-Jackson Aquifer not relevant in these areas .
3. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)

TABLE 11 MODELED AVAILABLE GROUNDWATER FOR THE BRAZOS RIVER ALLUVIUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 12 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2013 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2013	2020	2030	2040	2050	2060	2070
Brazos Valley GCD	Brazos	Brazos River Alluvium	122,785	81,581	80,311	80,081	79,976	79,913	79,872
Brazos Valley GCD	Robertson	Brazos River Alluvium	66,608	61,161	57,959	57,633	57,544	57,503	57,480
Brazos Valley GCD Total[1]		Brazos River Alluvium	**189,393**	**142,742**	**138,270**	**137,714**	**137,520**	**137,416**	**137,351**
Post Oak Savannah GCD	Burleson	Brazos River Alluvium	28,515	28,472	28,418	28,414	28,414	28,414	28,413
Post Oak Savannah GCD	Milam	Brazos River Alluvium	50,626	47,818	47,785	47,779	47,775	47,773	47,771
Post Oak Savannah GCD Total[1]		Brazos River Alluvium	**79,142**	**76,290**	**76,203**	**76,193**	**76,189**	**76,186**	**76,185**
No District-County[2]	Falls	Brazos River Alluvium	NR	NR	NR	NR	NR	NR	NR
GMA 12 Total1		**Brazos River Alluvium**	**268,535**	**219,032**	**214,473**	**213,907**	**213,709**	**213,602**	**213,536**

1. Individual estimates are rounded and may not always sum up to the total value displayed.
2. NR: Groundwater Management Area 12 declared the Brazos River Alluvium Aquifer not relevant in these areas.

TABLE 12 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE HOOPER AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. VALUES 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	2020	2030	2040	2050	2060
Bastrop	K	Brazos	Hooper	0	0	0	0	0
Bastrop	K	Colorado	Hooper	651	781	953	1,176	1,179
Bastrop	K	Guadalupe	Hooper	0	0	0	0	0
Brazos	G	Brazos	Hooper	0	0	0	0	0
Burleson	G	Brazos	Hooper	1,085	1,515	1,623	1,623	1,623
Falls	G	Brazos	Hooper	727	734	741	749	749
Fayette	K	Colorado	Hooper	NR	NR	NR	NR	NR
Fayette	K	Guadalupe	Hooper	NR	NR	NR	NR	NR
Fayette	K	Lavaca	Hooper	NR	NR	NR	NR	NR
Freestone	C	Brazos	Hooper	518	543	568	593	619
Freestone	C	Trinity	Hooper	3,823	4,035	4,246	4,458	4,669
Lee	G	Brazos	Hooper	59	72	90	112	111
Lee	G	Colorado	Hooper	3	4	5	7	6
Leon	H	Brazos	Hooper	0	0	0	0	0
Leon	H	Trinity	Hooper	0	0	0	0	0
Limestone	G	Brazos	Hooper	1,382	1,410	1,444	1,496	1,496
Madison	H	Brazos	Hooper	0	0	0	0	0
Madison	H	Trinity	Hooper	0	0	0	0	0
Milam	G	Brazos	Hooper	1,874	2,623	2,811	2,811	2,800
Navarro	C	Trinity	Hooper	11	11	11	11	11
Robertson	G	Brazos	Hooper	1,446	1,884	1,942	2,000	2,000

Williamson	G	Brazos	Hooper	5	5	5	5	5
Williamson	G	Colorado	Hooper	0	0	0	0	0
GMA 12 Total			**Hooper**	**11,584**	**13,617**	**14,439**	**15,041**	**15,268**

NR: Groundwater Management Area 12 declared the Hooper Aquifer not relevant in these areas.

TABLE 13 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE SIMSBORO AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. VALUES 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	2020	2030	2040	2050	2060
Bastrop	K	Brazos	Simsboro	398	529	653	776	765
Bastrop	K	Colorado	Simsboro	13,855	15,145	15,658	16,558	15,182
Bastrop	K	Guadalupe	Simsboro	0	0	0	0	0
Brazos	G	Brazos	Simsboro	41,115	44,120	45,681	50,208	53,404
Burleson	G	Brazos	Simsboro	17,687	21,616	25,103	28,858	30,409
Falls	G	Brazos	Simsboro	140	141	143	146	146
Fayette	K	Colorado	Simsboro	NR	NR	NR	NR	NR
Fayette	K	Guadalupe	Simsboro	NR	NR	NR	NR	NR
Fayette	K	Lavaca	Simsboro	NR	NR	NR	NR	NR
Freestone	C	Brazos	Simsboro	685	673	668	657	657
Freestone	C	Trinity	Simsboro	2,897	2,916	2,917	2,895	2,893
Lee	G	Brazos	Simsboro	17,993	17,221	17,031	17,179	14,896
Lee	G	Colorado	Simsboro	0	0	0	0	0
Leon	H	Brazos	Simsboro	553	555	563	575	576
Leon	H	Trinity	Simsboro	2,807	2,902	2,976	3,042	3,047
Limestone	G	Brazos	Simsboro	9,753	9,850	9,992	10,235	10,235
Madison	H	Brazos	Simsboro	0	0	0	0	0
Madison	H	Trinity	Simsboro	0	0	0	0	0
Milam	G	Brazos	Simsboro	20,783	16,284	14,940	17,171	18,094
Navarro	C	Trinity	Simsboro	4	4	4	4	4

Robertson	G	Brazos	Simsboro	41,673	42,061	42,468	42,794	42,794
Williamson	G	Brazos	Simsboro	2	2	2	2	2
GMA 12 Total			**Simsboro**	**170,345**	**174,019**	**178,799**	**191,100**	**193,104**

NR: Groundwater Management Area 12 declared the Simsboro Aquifer not relevant in these areas.

TABLE 14 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE CALVERT BLUFF AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. VALUES 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	2020	2030	2040	2050	2060
Bastrop	K	Brazos	Calvert Bluff	97	104	122	154	134
Bastrop	K	Colorado	Calvert Bluff	1,958	2,349	2,837	3,446	3,627
Bastrop	K	Guadalupe	Calvert Bluff	9	9	11	13	12
Brazos	G	Brazos	Calvert Bluff	0	0	0	0	0
Burleson	G	Brazos	Calvert Bluff	87	87	87	87	87
Fayette	K	Colorado	Calvert Bluff	NR	NR	NR	NR	NR
Fayette	K	Guadalupe	Calvert Bluff	NR	NR	NR	NR	NR
Fayette	K	Lavaca	Calvert Bluff	NR	NR	NR	NR	NR
Freestone	C	Brazos	Calvert Bluff	130	127	126	124	124
Freestone	C	Trinity	Calvert Bluff	624	607	602	590	590
Lee	G	Brazos	Calvert Bluff	161	169	211	296	209
Lee	G	Colorado	Calvert Bluff	0	0	0	0	0
Leon	H	Brazos	Calvert Bluff	585	589	590	590	592
Leon	H	Trinity	Calvert Bluff	2,235	2,364	2,475	2,600	2,609
Limestone	G	Brazos	Calvert Bluff	218	223	228	235	235
Madison	H	Brazos	Calvert Bluff	0	0	0	0	0
Madison	H	Trinity	Calvert Bluff	0	0	0	0	0
Milam	G	Brazos	Calvert Bluff	949	949	949	949	949
Navarro	C	Trinity	Calvert Bluff	0	0	0	0	0
Robertson	G	Brazos	Calvert Bluff	1,764	1,757	1,758	1,757	1,757
Williamson	G	Brazos	Calvert Bluff	2	2	2	3	2
GMA 12 Total			**Calvert Bluff**	**8,819**	**9,336**	**9,998**	**10,844**	**10,927**

NR: Groundwater Management Area 12 declared the Calvert Bluff Aquifer not relevant in these areas.

TABLE 15 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE CARRIZO AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. VALUES 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	2020	2030	2040	2050	2060
Bastrop	K	Brazos	Carrizo	257	214	185	303	214
Bastrop	K	Colorado	Carrizo	4,232	4,931	5,721	7,390	7,835
Bastrop	K	Guadalupe	Carrizo	203	163	136	235	155
Brazos	G	Brazos	Carrizo	3,717	3,724	3,737	3,761	3,763
Burleson	G	Brazos	Carrizo	4,383	4,821	5,698	5,917	6,575
Fayette[1]	K	Colorado	Carrizo	4,565	4,565	4,565	4,565	4,565
Fayette[1]	K	Guadalupe	Carrizo	909	909	909	909	909
Fayette[1]	K	Lavaca	Carrizo	0	0	0	0	0
Freestone	C	Trinity	Carrizo	369	366	357	347	346
Lee	G	Brazos	Carrizo	2,249	2,268	2,335	2,881	2,752
Lee	G	Colorado	Carrizo	677	782	886	991	1,095
Leon	H	Brazos	Carrizo	2,474	2,260	2,172	2,186	2,188
Leon	H	Trinity	Carrizo	5,634	5,791	5,938	6,008	6,012
Madison	H	Brazos	Carrizo	381	371	352	335	334
Madison	H	Trinity	Carrizo	2,481	2,399	2,304	2,219	2,210
Milam	G	Brazos	Carrizo	322	355	419	435	484
Robertson	G	Brazos	Carrizo	1,707	1,698	1,713	1,730	1,731
GMA 12 Total			**Carrizo**	**34,560**	**35,617**	**37,427**	**40,212**	**41,168**

1. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)

TABLE 16 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. VALUES 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	2020	2030	2040	2050	2060
Bastrop	K	Brazos	Queen City	49	47	46	44	42
Bastrop	K	Colorado	Queen City	353	333	311	288	264
Bastrop	K	Guadalupe	Queen City	156	161	166	173	180
Brazos	G	Brazos	Queen City	836	883	887	891	891
Burleson	G	Brazos	Queen City	416	447	447	447	447
Fayette[1]	K	Colorado	Queen City	2,278	2,278	2,278	2,278	2,278
Fayette[1]	K	Guadalupe	Queen City	430	430	430	430	430
Fayette[1]	K	Lavaca	Queen City	0	0	0	0	0
Freestone	C	Trinity	Queen City	0	0	0	0	0
Lee	G	Brazos	Queen City	709	713	716	721	727
Lee	G	Colorado	Queen City	48	61	75	89	102
Leon	H	Brazos	Queen City	245	245	245	245	245
Leon	H	Trinity	Queen City	349	349	349	349	349
Madison	H	Brazos	Queen City	1	1	1	1	1
Madison	H	Trinity	Queen City	379	379	379	379	379
Milam	G	Brazos	Queen City	53	56	56	56	56
Robertson	G	Brazos	Queen City	368	309	309	309	309
GMA 12 Total			**Queen City**	**6,670**	**6,692**	**6,695**	**6,700**	**6,700**

1. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)

TABLE 17 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. VALUES 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	2020	2030	2040	2050	2060
Bastrop	K	Brazos	Sparta	89	87	85	84	82
Bastrop	K	Colorado	Sparta	785	784	783	782	781
Bastrop	K	Guadalupe	Sparta	33	33	33	33	33
Brazos	G	Brazos	Sparta	5,404	6,505	7,507	8,509	8,509
Burleson	G	Brazos	Sparta	2,246	4,042	5,613	6,735	6,735
Fayette[1]	K	Colorado	Sparta	1,659	1,649	1,626	1,612	1,619
Fayette[1]	K	Guadalupe	Sparta	1,172	1,176	1,177	1,182	1,183
Fayette[1]	K	Lavaca	Sparta	0	0	0	0	0
Lee	G	Brazos	Sparta	1,279	1,274	1,269	1,263	1,256
Lee	G	Colorado	Sparta	204	213	221	230	238
Leon	H	Brazos	Sparta	0	0	0	0	0
Leon	H	Trinity	Sparta	21	21	21	21	21
Madison	H	Brazos	Sparta	7	9	9	9	9
Madison	H	Trinity	Sparta	3,313	3,313	3,313	3,313	3,313
Robertson	G	Brazos	Sparta	510	510	510	510	510
GMA 12 Total			**Sparta**	**16,722**	**19,616**	**22,167**	**24,283**	**24,289**

1. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)

TABLE 18 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. 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	2020	2030	2040	2050	2060
Bastrop	K	Colorado	Yegua-Jackson	NR	NR	NR	NR	NR
Brazos	G	Brazos	Yegua-Jackson	6,856	6,854	6,854	6,854	6,854
Burleson	G	Brazos	Yegua-Jackson	14,544	12,576	12,564	12,478	12,326
Fayette[1]	K	Colorado	Yegua-Jackson	7,075	7,075	7,075	7,075	7,074
Fayette[1]	K	Guadalupe	Yegua-Jackson	694	694	694	694	694
Fayette[1]	K	Lavaca	Yegua-Jackson	1,493	1,493	1,493	1,493	1,493
Lee	G	Brazos	Yegua-Jackson	NR	NR	NR	NR	NR
Lee	G	Colorado	Yegua-Jackson	NR	NR	NR	NR	NR
Leon	H	Trinity	Yegua-Jackson	0	0	0	0	0
Madison	H	Brazos	Yegua-Jackson	8	8	8	8	8
Madison	H	Trinity	Yegua-Jackson	802	802	802	802	802
GMA 12 Total			**Yegua-Jackson**	**31,471**	**29,501**	**29,489**	**29,403**	**29,250**

1. Modeled available groundwater values for Fayette County include all of the county (GMA 12 and GMA 15 portions)
2. NR: Groundwater Management Area 12 declared the Yegua-Jackson Aquifer not relevant in these areas.

TABLE 19 MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE BRAZOS RIVER ALLUVIUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 12. 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	2020	2030	2040	2050	2060	2070
Brazos	G	Brazos	Brazos River Alluvium	81,581	80,311	80,081	79,976	79,913	79,872
Burleson	G	Brazos	Brazos River Alluvium	28,472	28,418	28,414	28,414	28,414	28,413
Falls	G	Brazos	Brazos River Alluvium	NR	NR	NR	NR	NR	NR
Milam	G	Brazos	Brazos River Alluvium	47,818	47,785	47,779	47,775	47,773	47,771
Robertson	G	Brazos	Brazos River Alluvium	61,161	57,959	57,633	57,544	57,503	57,480
GMA 12 Total			**Brazos River Alluvium**	**219,032**	**214,473**	**213,907**	**213,709**	**213,602**	**213,536**

NR: Groundwater Management Area 12 declared the Brazos River Alluvium 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.

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