GAM Run 10-050 MAG version 2

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Texas Water Development Board
Groundwater Availability Modeling Section
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EXECUTIVE SUMMARY:

The estimated total pumping from the Trinity Aquifer that achieves the desired future condition adopted by the members of Groundwater Management Area 9 declines from approximately 93,000 acre-feet per year to approximately 90,500 acre-feet per year between 2010 and 2060. This is summarized by county, regional water planning area, and river basin as shown in Table 1. The managed available groundwater, the amount available for permitting, for the groundwater conservation districts within Groundwater Management Area 9 decreases from approximately 66,000 acre-feet per year to approximately 53,000 acre-feet per year between 2010 and 2060 (Table 7)[1]. The pumping estimates were extracted from Scenario 6 of Groundwater Availability Modeling Task 10-005 (Hutchison, 2010), which meets the desired future condition adopted by the members of Groundwater Management Area 9.

REQUESTOR:

Mr. Ronald G. Fieseler of the Blanco Pedernales Groundwater Conservation District on behalf of Groundwater Management Area 9

DESCRIPTION OF REQUEST:

In a letter dated August 26, 2010 and received August 30, 2010, Mr. Ronald G. Fieseler provided the Texas Water Development Board (TWDB) with the desired future condition of the Trinity Aquifer adopted by the members of Groundwater Management Area 9. The desired future condition for the Trinity Aquifer in Groundwater Management Area 9, as described in Resolution No. 07-26-10-1, is:

"Hill Country Trinity Aquifer - allow for an increase in average drawdown of approximately 30 feet through 2060 consistent with "Scenario 6" in TWDB Draft GAM Task 10-005"

In response to receiving the adopted desired future condition, the Texas Water Development Board has estimated the managed available groundwater for the Trinity Aquifer for each groundwater conservation district within Groundwater Management Area 9.

METHODS:

The Texas Water Development Board previously completed several predictive groundwater availability model simulations of the Trinity Aquifer to assist the members of Groundwater Management Area 9 in developing a desired future condition for this aquifer. The location of Groundwater Management Area 9, the Trinity Aquifer, and the groundwater availability model cells that represent the aquifer are shown in Figure 1. As stated in Resolution No. 07-26-10-1, the management area considered Groundwater Availability Modeling (GAM) Task 10-005 (Hutchison, 2010) when developing a desired future condition for the Trinity Aquifer. Since the

[1] Version 2 of this report reflects updated exempt use estimates presented in Table 6. At the request of the district, the exempt use estimated by the Texas Water Development Board is now shown for Hays Trinity Groundwater Conservation District.

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desired future condition above is met in Scenario 6 of GAM Task 10-005, the estimated pumping for Groundwater Management Area 9 presented here was taken directly from that simulation. Please note that in GAM Task 10-005, the pumping was presented as an average of all years (2010 to 2060). We have reported this pumping by decade in the results below. The pumping was then divided by county, regional water planning area, river basin, and groundwater conservation district (Figure 2).

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the model run using the groundwater availability model for the Trinity Aquifer are described below:

- The results presented in this report are based on Scenario 6 of GAM Task 10-005 (Hutchison, 2010). See Hutchison (2010) for a full description of the methods, assumptions, and results of the model simulations.
- The recently updated groundwater availability model (version 2.01) for the Hill Country portion of the Trinity Aquifer developed by Jones and others (2009) was used for the simulations in GAM Task 10-005. See Mace and others (2000) and Jones and others (2009) for details on model construction, recharge, discharge, assumptions, and limitations.
- The model has four layers: Layer 1 represents the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, Layer 2 represents the Upper Trinity Aquifer, Layer 3 represents the Middle Trinity Aquifer, and Layer 4 represents the Lower Trinity Aquifer. Each scenario in GAM Task 10-005 consisted of a series of 387 separate 50-year model simulations, each with a different recharge configuration. Though the pumping input to the model was the same for each of the 387 simulations, the pumping output differed depending on the occurrence of inactive (or dry) cells. The results below represent the average pumping for the year shown among the simulations comprising Scenario 6 in Hutchison (2010).

Determining Managed Available Groundwater

As defined in Chapter 36 of the Texas Water Code, “managed available groundwater” is the amount of water that may be permitted. The pumping output from groundwater availability models, however, represents the total amount of pumping from the aquifer. The total pumping includes uses of water both subject to permitting and exempt from permitting. Examples of exempt uses include domestic, livestock, and oil and gas exploration. Each district may also exempt additional uses as defined by its rules or enabling legislation.

Since exempt uses are not available for permitting, it is necessary to account for them when determining managed available groundwater. To do this, the Texas Water Development Board developed a standardized method for estimating exempt use for domestic and livestock purposes based on projected changes in population and the distribution of domestic and livestock wells in the area. Because other exempt uses can vary significantly from district to district, and there is much higher uncertainty associated with estimating use due to oil and gas exploration, estimates of exempt pumping outside domestic and livestock uses have not been included. If the district believes it has a more appropriate estimate of exempt pumping, they may submit it, along with a description of how it was developed, to the Texas Water Development Board for consideration.

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Once established, the estimates of exempt pumping are subtracted from the total pumping output from the groundwater availability model to yield the estimated managed available groundwater for permitting purposes.

RESULTS:

The estimated total pumping from the Trinity Aquifer in Groundwater Management Area 9 that achieves the above desired future condition decreases from approximately 93,000 acre-feet per year in 2010 to 90,500 acre-feet per year in 2060. This pumping has been divided by county, regional water planning area, and river basin for each decade between 2010 and 2060 for use in the regional water planning process (Table 1).

The total pumping estimates are also summarized by county, regional water planning area, river basin, and groundwater conservation district as shown in tables 2, 3, 4, and 5, respectively. In Table 5, note that the pumping is totaled both excluding and including areas outside of a groundwater conservation district. Table 6 contains the estimates of exempt pumping in each groundwater conservation district due to domestic and livestock uses. The managed available groundwater, the difference between the total pumping in the districts (Table 5, excluding non-district areas) and the estimated exempt use (Table 6) is shown in Table 7.

REFERENCES:

Hutchison, William R., 2010, GAM Task 10-005, Texas Water Development Board GAM Task 10-005 Report, 13 p.

Jones, I.C., Anaya, R. and Wade, S., 2009, Groundwater Availability Model for the Hill Country portion of the Trinity Aquifer System, Texas, Texas Water Development Board unpublished report,193 p.

Mace, R.E., Chowdhury, A.H., Anaya, R., and Way, S-C., 2000, Groundwater availability of the Trinity Aquifer, Hill Country Area, Texas—Numerical simulations through 2050: Texas Water Development Board Report 353, 119 p.

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Table 1: Estimated total annual pumping for the Trinity Aquifer in Groundwater Management Area 9. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Bandera	J	Guadalupe	76	76	76	76	76	76
		Nueces	903	903	903	903	903	903
		San Antonio	6,305	6,305	6,305	6,305	6,305	6,305
Bexar	L	San Antonio	24,856	24,856	24,856	24,856	24,856	24,856
Blanco	K	Colorado	1,322	1,322	1,322	1,322	1,322	1,322
		Guadalupe	1,251	1,251	1,251	1,251	1,251	1,251
Comal	L	Guadalupe	6,906	6,906	6,906	6,906	6,906	6,906
		San Antonio	3,308	3,308	3,308	3,308	3,308	3,308
Hays	K	Colorado	4,721	4,710	4,707	4,706	4,706	4,706
	L	Guadalupe	4,410	4,410	4,410	4,410	4,410	4,410
Kendall	L	Colorado	135	135	135	135	135	135
		Guadalupe	6,028	6,028	6,028	6,028	6,028	6,028
		San Antonio	4,976	4,976	4,976	4,976	4,976	4,976
Kerr	J	Colorado	318	318	318	318	318	318
		Guadalupe	15,646	14,129	14,056	13,767	13,450	13,434
		Nueces	0	0	0	0	0	0
		San Antonio	471	471	471	471	471	471
Medina	L	Nueces	1,575	1,575	1,575	1,575	1,575	1,575
		San Antonio	925	925	925	925	925	925
Travis	K	Colorado	8,920	8,672	8,655	8,643	8,627	8,598
Total			**93,052**	**91,276**	**91,183**	**90,881**	**90,548**	**90,503**

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Table 2: Estimated total pumping for the Trinity Aquifer summarized by county in Groundwater Management Area 9 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Bandera	7,284	7,284	7,284	7,284	7,284	7,284
Bexar	24,856	24,856	24,856	24,856	24,856	24,856
Blanco	2,573	2,573	2,573	2,573	2,573	2,573
Comal	10,214	10,214	10,214	10,214	10,214	10,214
Hays	9,131	9,120	9,117	9,116	9,116	9,116
Kendall	11,139	11,139	11,139	11,139	11,139	11,139
Kerr	16,435	14,918	14,845	14,556	14,239	14,223
Medina	2,500	2,500	2,500	2,500	2,500	2,500
Travis	8,920	8,672	8,655	8,643	8,627	8,598
Total	**93,052**	**91,276**	**91,183**	**90,881**	**90,548**	**90,503**

Table 3: Estimated total pumping for the Trinity Aquifer summarized by regional water planning area in Groundwater Management Area 9 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
J	23,719	22,202	22,129	21,840	21,523	21,507
K	16,214	15,955	15,935	15,922	15,906	15,877
L	53,119	53,119	53,119	53,119	53,119	53,119
Total	**93,052**	**91,276**	**91,183**	**90,881**	**90,548**	**90,503**

Table 4: Estimated total pumping for the Trinity Aquifer summarized by river basin in Groundwater Management Area 9 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Colorado	15,416	15,157	15,137	15,124	15,108	15,079
Guadalupe	34,317	32,800	32,727	32,438	32,121	32,105
Nueces	2,478	2,478	2,478	2,478	2,478	2,478
San Antonio	40,841	40,841	40,841	40,841	40,841	40,841
Total	**93,052**	**91,276**	**91,183**	**90,881**	**90,548**	**90,503**

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Table 5: Estimated total pumping for the Trinity Aquifer summarized by groundwater conservation district (GCD) in Groundwater Management Area 9 for each decade between 2010 and 2060. Results are in acre-feet per year. RA refers to River Authority. GWD refers to Groundwater District

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Bandera County RA & GWD	7,284	7,284	7,284	7,284	7,284	7,284
Blanco-Pedernales GCD	2,573	2,573	2,573	2,573	2,573	2,573
Cow Creek GCD	10,622	10,622	10,622	10,622	10,622	10,622
Hays Trinity GCD	9,109	9,098	9,095	9,094	9,094	9,094
Headwaters GCD	16,435	14,918	14,845	14,556	14,239	14,223
Medina County GCD	2,500	2,500	2,500	2,500	2,500	2,500
Trinity Glen Rose GCD	25,511	25,511	25,511	25,511	25,511	25,511
Total (district areas)	**74,034**	**72,506**	**72,430**	**72,140**	**71,823**	**71,807**
No District	19,018	18,770	18,753	18,741	18,725	18,696
Total (including non-district areas)	**93,052**	**91,276**	**91,183**	**90,881**	**90,548**	**90,503**

Table 6: Estimates of exempt use for the Trinity Aquifer in Groundwater Management Area 9 by groundwater conservation district (GCD) for each decade between 2010 and 2060. Results are in acre-feet per year. RA refers to River Authority, GWD refers to Groundwater District.

Groundwater Conservation District	Source	Year					
		2010	2020	2030	2040	2050	2060
Bandera County RA & GWD	T	2,062	2,939	3,850	4,351	4,493	4,787
Blanco-Pedernales GCD	T	587	681	771	849	935	1,033
Cow Creek GCD	T	2,287	3,255	4,285	5,144	5,853	6,543
Hays Trinity GCD	T	1,484	1,978	2,490	3,004	3,622	4,108
Headwaters GCD	T	911	1,015	1,065	1,096	1,165	1,199
Medina County GCD	T	96	119	140	158	177	193
Trinity Glen Rose GCD	T	444	452	462	494	523	548
Total		**7,871**	**10,439**	**13,063**	**15,096**	**16,768**	**18,411**

Note: T = Estimated exempt use calculated by TWDB

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Table 7: Estimates of managed available groundwater for the Trinity Aquifer in Groundwater Management Area 9 by groundwater conservation district (GCD) for each decade between 2010 and 2060. Results are in acre-feet per year. RA refers to River Authority, GWD refers to Groundwater District.

Groundwater Conservation District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Bandera County RA & GWD	5,222	4,345	3,434	2,933	2,791	2,497
Blanco-Pedernales GCD	1,986	1,892	1,802	1,724	1,638	1,540
Cow Creek GCD	8,335	7,367	6,337	5,478	4,769	4,079
Hays Trinity GCD	7,625	7,120	6,605	6,090	5,472	4,986
Headwaters GCD	15,524	13,903	13,780	13,460	13,074	13,024
Medina County GCD	2,404	2,381	2,360	2,342	2,323	2,307
Trinity Glen Rose GCD	25,067	25,059	25,049	25,017	24,988	24,963
Total	**66,163**	**62,067**	**59,367**	**57,044**	**55,055**	**53,396**

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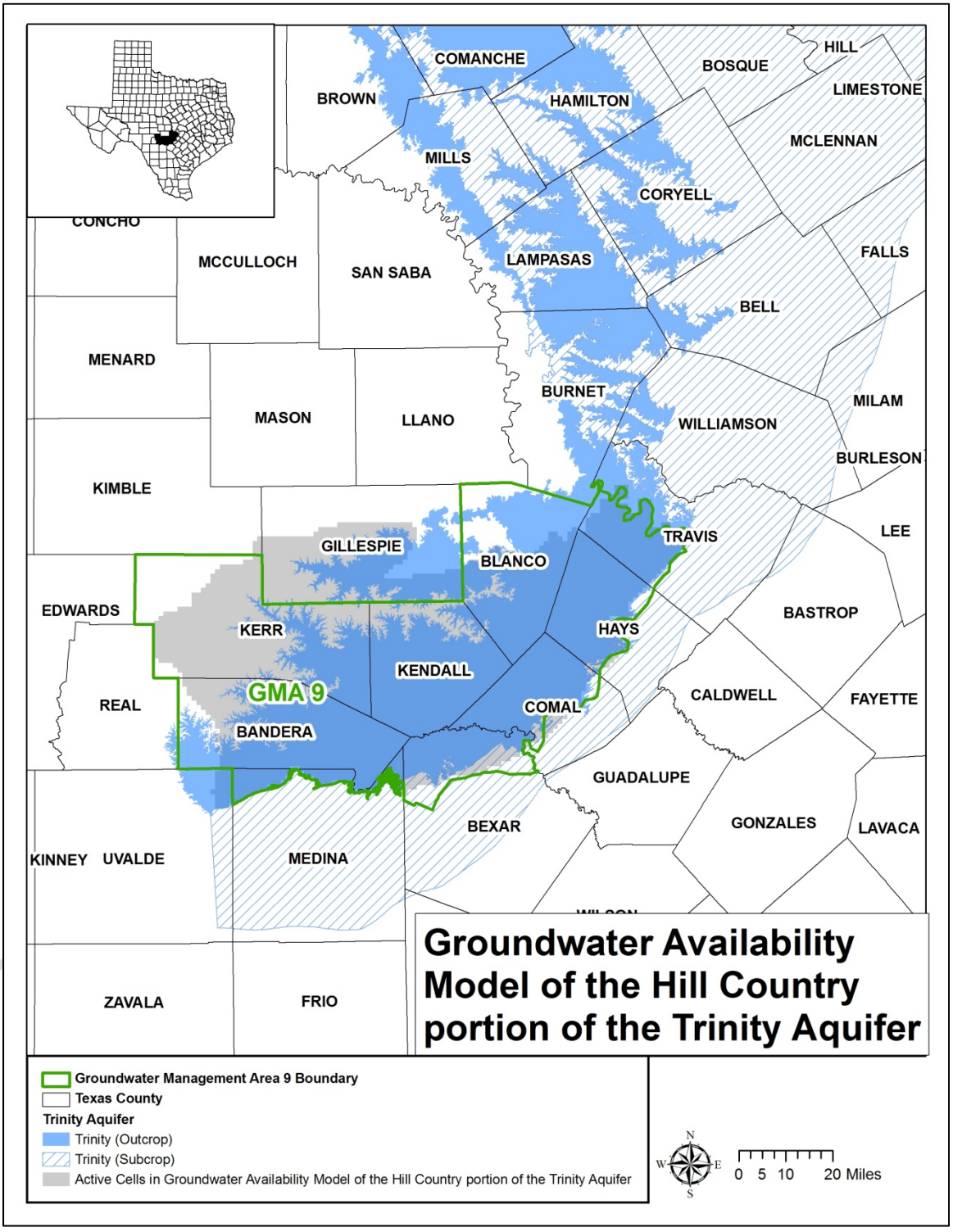

Figure 1: Map showing the areas covered by the groundwater availability model for the Trinity Aquifer.

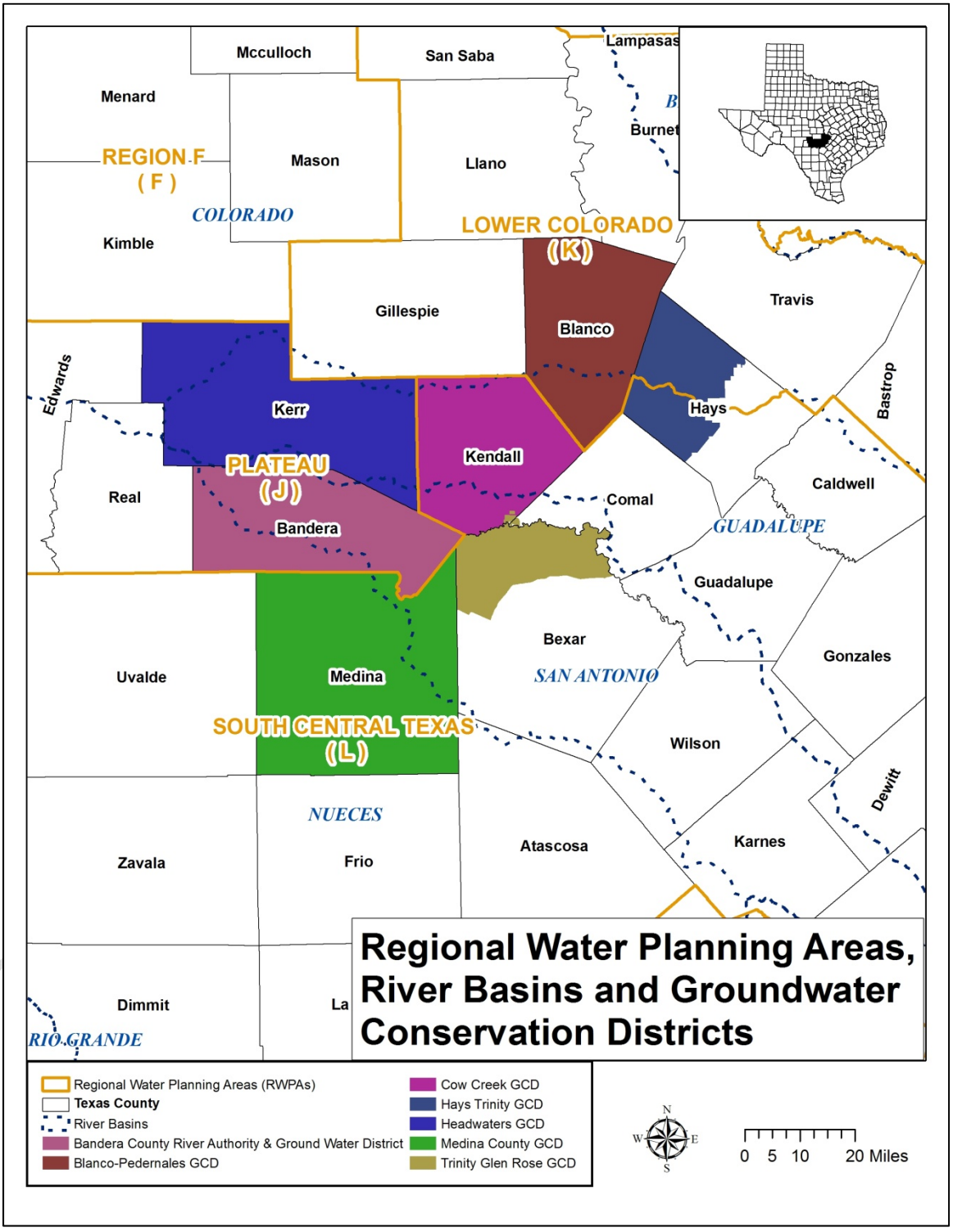

Figure 2: Map showing regional water planning areas (RWPAs), groundwater conservation districts (GCDs), counties, and river basins in Groundwater Management Area 9.