

GAM run 03-19

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Texas Water Development Board
Groundwater Availability Modeling Section
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REQUESTOR:

Gary Westbrook, Post Oak Savannah Groundwater Conservation District.

DESCRIPTION OF REQUEST:

Post Oak Savannah Groundwater Conservation District requested the following from the Central Carrizo-Wilcox Groundwater Availability Model (GAM) in Milam and Burleson counties:

- Recharge values;
- Total storage above 3,000 feet (considered to be the limit of potable water);
- Pumpage scenario adding one well per year for ten years starting in central Burleson County and adding wells towards the northwest, with a pumping rate of 110,000 acre-feet per year per well; and
- Pumpage scenario adding 4 wells per year for ten years starting in central Burleson County and adding wells toward the northwest, with a pumping rate of 3,500 gpm (5,646 acre-feet/year) per well.

METHODS:

To address the request, we:

- Ran the predictive (2000-2050) model for the Central Carrizo-Wilcox aquifer Groundwater Availability Model (Dutton and others, 2003) and queried the budget files for the recharge in each aquifer layer in Milam and Burleson counties for a year with long-term average recharge.
- Estimated groundwater storage for the Carrizo and Simsboro aquifers by calculating layer thickness for each model cell (layer top elevation minus bottom elevation), multiplying by cell area (1 mi²) and specific yield, and summing all of the model cells within Milam and Burleson counties.
- Added one well per year at 110,000 acre-feet/year to the existing 2001-2030 pumpage scenario. One well per year was added beginning in 2003 until 2012 for a total of 10 wells. This volume is roughly equal to 7 percent of the total storage above 3,000 feet in the Simsboro aquifer in Burleson County.
- Added 4 wells per year at 3,500 gpm (5,646 acre-feet/year) to the existing 2001-2030 pumpage scenario. Four wells per year were added beginning in 2003 until 2012 for a total of 40 wells. This volume is roughly equal to 1.4 percent of the

total storage above 3,000 feet in the Simsboro aquifer in Burleson County. Modeled head distribution in the Simsboro aquifer was plotted for 2001, 2005, 2010, and 2015.

PARAMETERS AND ASSUMPTIONS:

For the pumping scenarios it is assumed that the pumpage in all other aquifers and in all other counties is what was modeled in the predictive GAM runs reported in Dutton and others (2003). Those pumping distributions are based on the regional water planning group demand predictions.

RESULTS:

Recharge

The long-term average Carrizo-Wilcox aquifer recharge values for Milam and Burleson counties is shown in Table 1.

Aquifer Storage

The total volume of storage above 3,000 feet in the Carrizo and Simsboro aquifers in Milam and Burleson counties is listed in Table 1. The total modeled pumping in Milam and Burleson counties from the predictive GAM runs (Dutton and others, 2003) based on the regional water planning group demand projections is also listed for comparison in Table 1.

Distribution of Heads in the Simsboro Aquifer

The first scenario, involving adding one well per year at a rate of 110,000 acre-feet per year, resulted in the model cells where the wells were located going dry. This suggests that 110,000 acre-feet per year within one model cell is more than can be sustained in the aquifer. The total pumping rate for the second scenario (4 wells at 5,676 acre-feet/year) is only 1/5 as much pumping and the model cells were able to sustain that volume of pumping. The locations of the additional wells for the second scenario are shown in Figure 1. Four wells were added per year; however, it is assumed that there are two wells per model cell. Several of the well sets are labeled with the year that they were added.

The distribution of head in the Simsboro aquifer for 2001 is shown in Figure 2 for comparison with the head distribution after the wells were added. The distribution of heads in the Simsboro for 2005 after 12 wells have been added is shown in Figure 3. Heads for 2010 after 36 wells have been added is shown in Figure 4. Finally, heads in 2015 after all 40 wells were added and pumped for an additional 3 years is shown in Figure 5.

Figure 2 shows that most of the heads in the Simsboro aquifer in Burleson County are greater than 200 feet above sea level. Figure 3 shows a cone of depression in 2005 centered around Burleson County after 12 wells were added. The Simsboro aquifer heads in Burleson County are simulated to be below sea level in 2005.

Figures 4 and 5 show an expanding cone of depression and in 2015 after all of the wells have been added the heads in central to northwest Burleson County are more than 1000 feet below sea level.

REFERENCES:

Dutton, A. R., Harden, R., Nicot, J. P., and O' Rourke, D., 2003, Groundwater Availability Model for the Central part of the Carrizo-Wilcox Aquifer in Texas: Final Report prepared for the Texas Water Development Board.

Table 1. Recharge and total aquifer storage in Milam and Burleson counties.

County	Average Recharge (acre-ft/year)	Modeled 2050 pumpage (acre-ft)	Storage above 3000 feet depth (acre-ft)				
			Carrizo	Simsboro	Total	2%	5%
Milam	30,425	-23,060	3,000,000	17,000,000	20,000,000	400,000	1,000,000
Burleson	48	-3,664	21,000,000	16,000,000	37,000,000	740,000	1,850,000
Total	30,472	-26,724	24,000,000	33,000,000	57,000,000	1,140,000	2,850,000

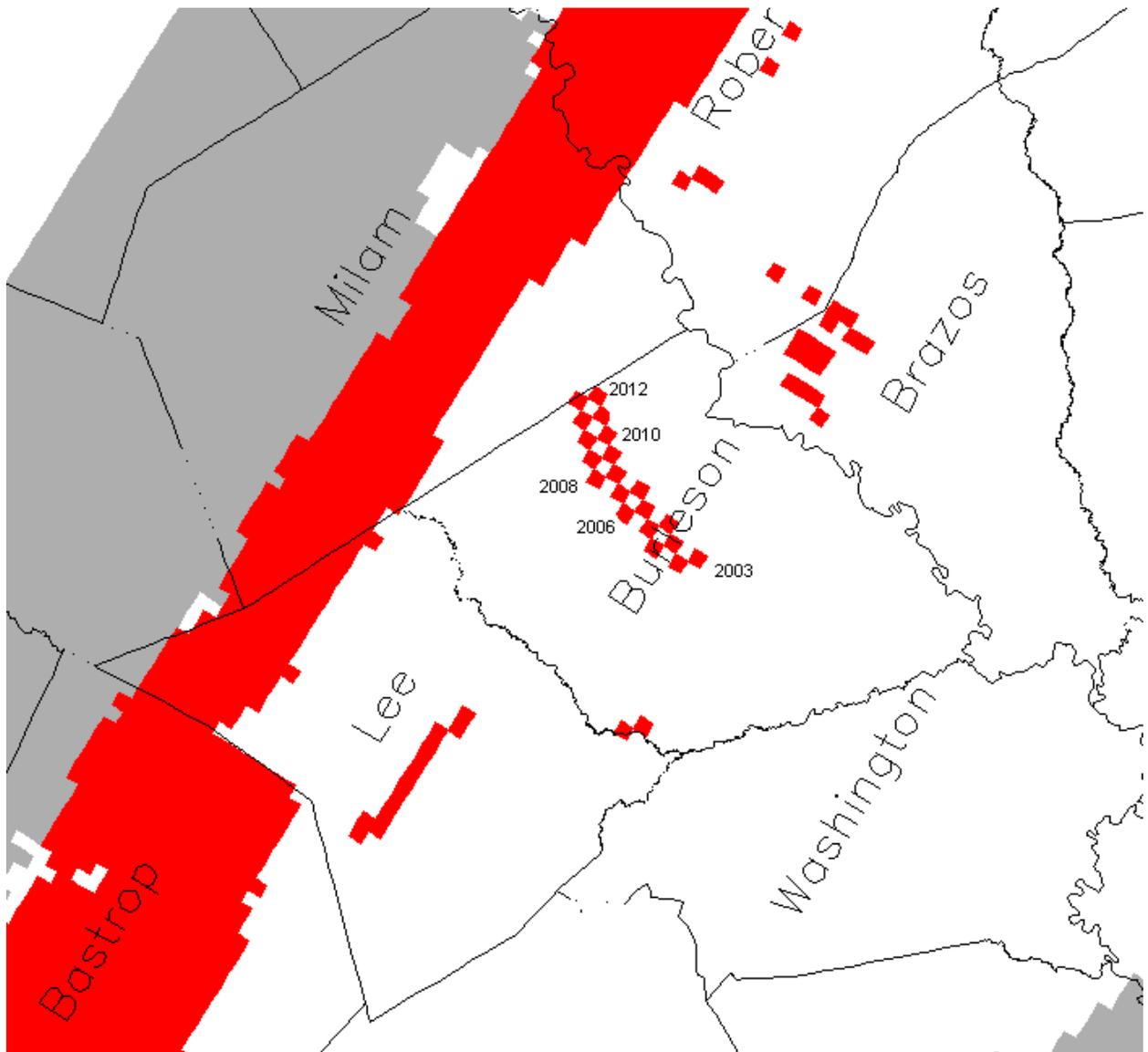


Figure 1. Red (or shaded) squares indicate the location of model grid cells with pumping. The pumping wells added for the new scenario are located in central to northwest Burleson County. The simulation years when the grid cells were added are indicated for select grid cells. It is assumed that there are two wells per model cell and two cells were added per year beginning in 2003. A total of 4 wells were added per year until 2012.

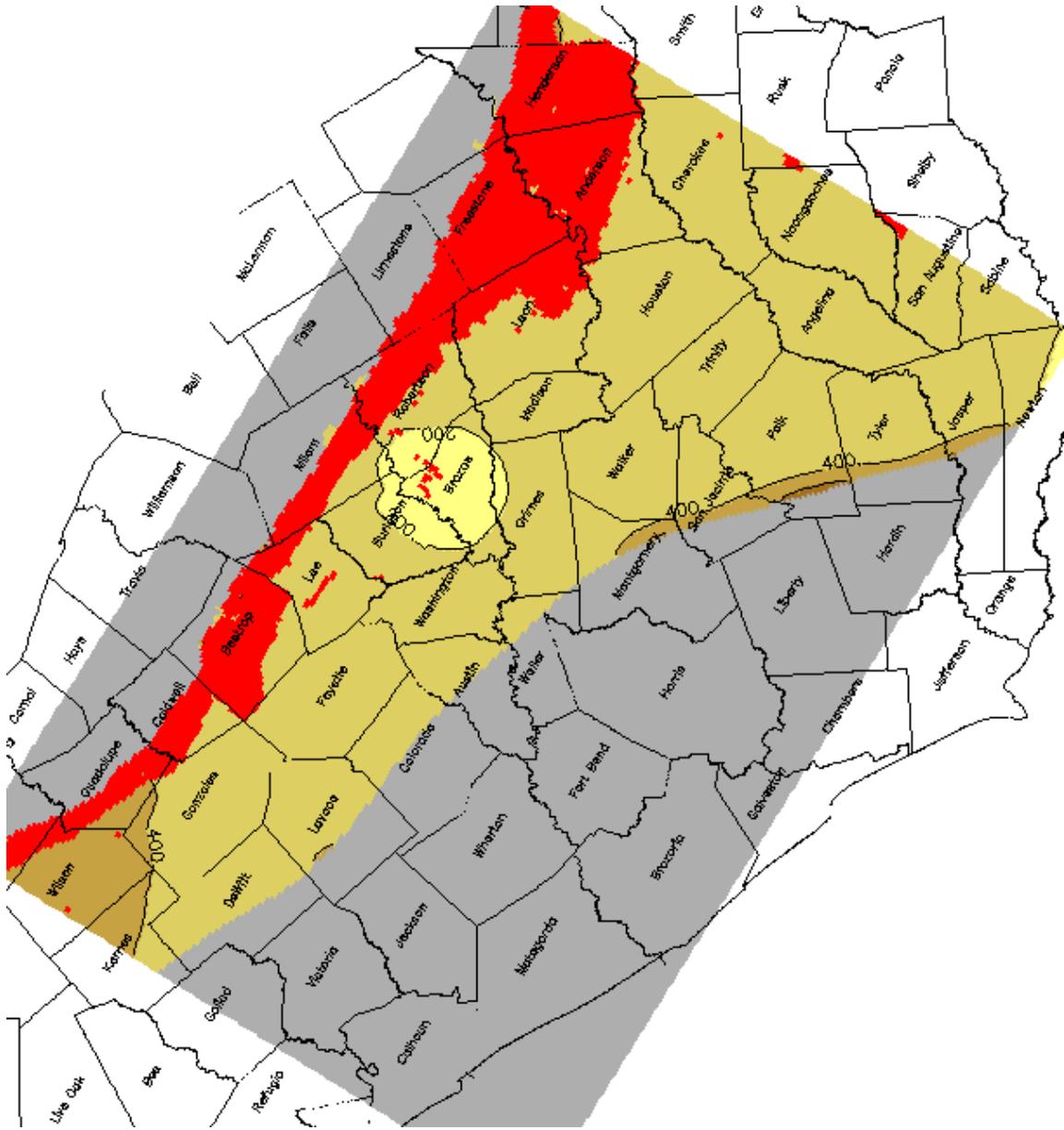


Figure 2. Heads in the Simsboro (feet above sea level) in 2001 before wells were added.

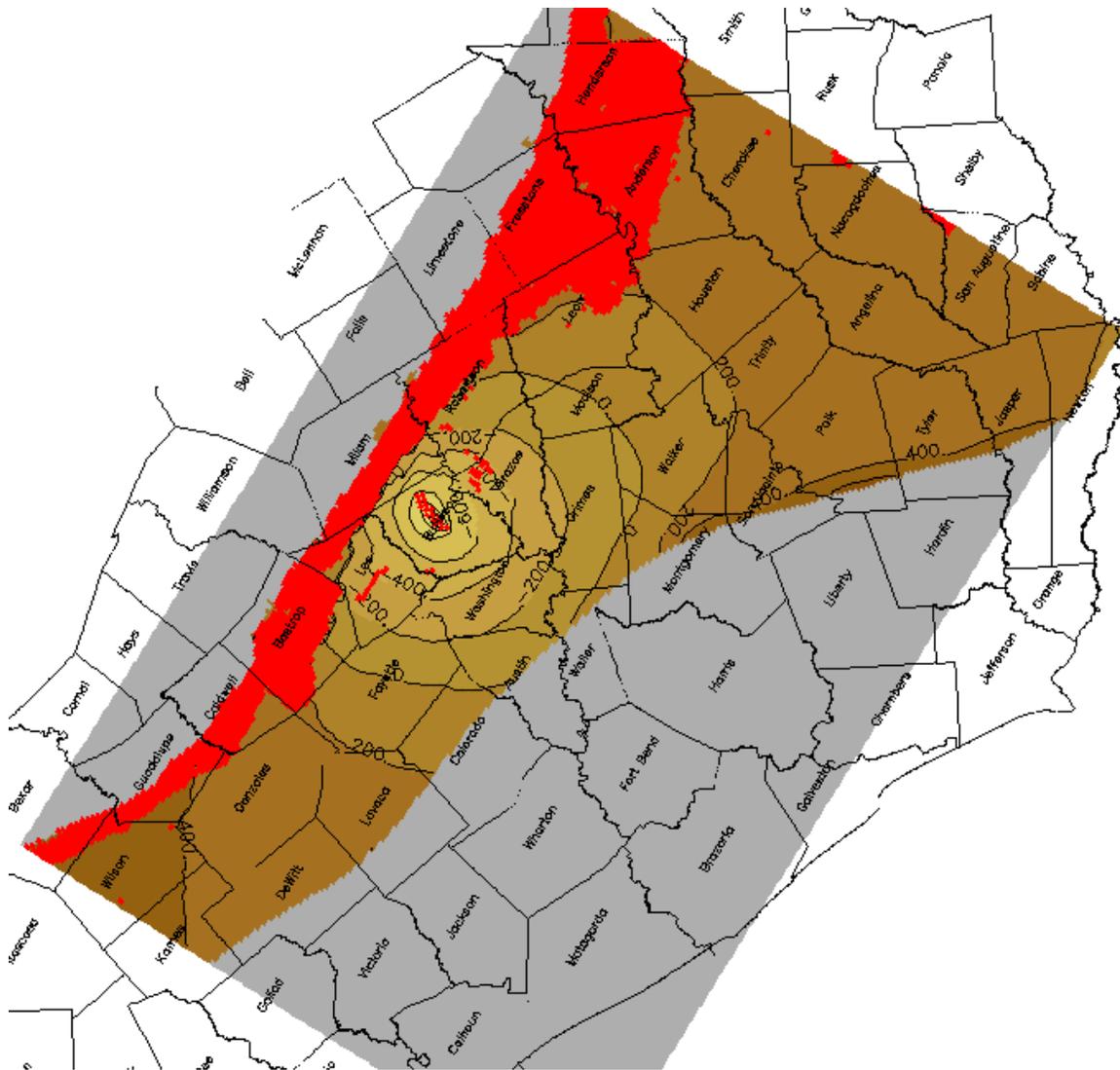


Figure 4. Heads in the Simsboro (feet above sea level) in 2010 after 36 wells at 3,500 gpm have been added. The wells were added beginning in central Burselon County and additional wells were added towards the northwest.

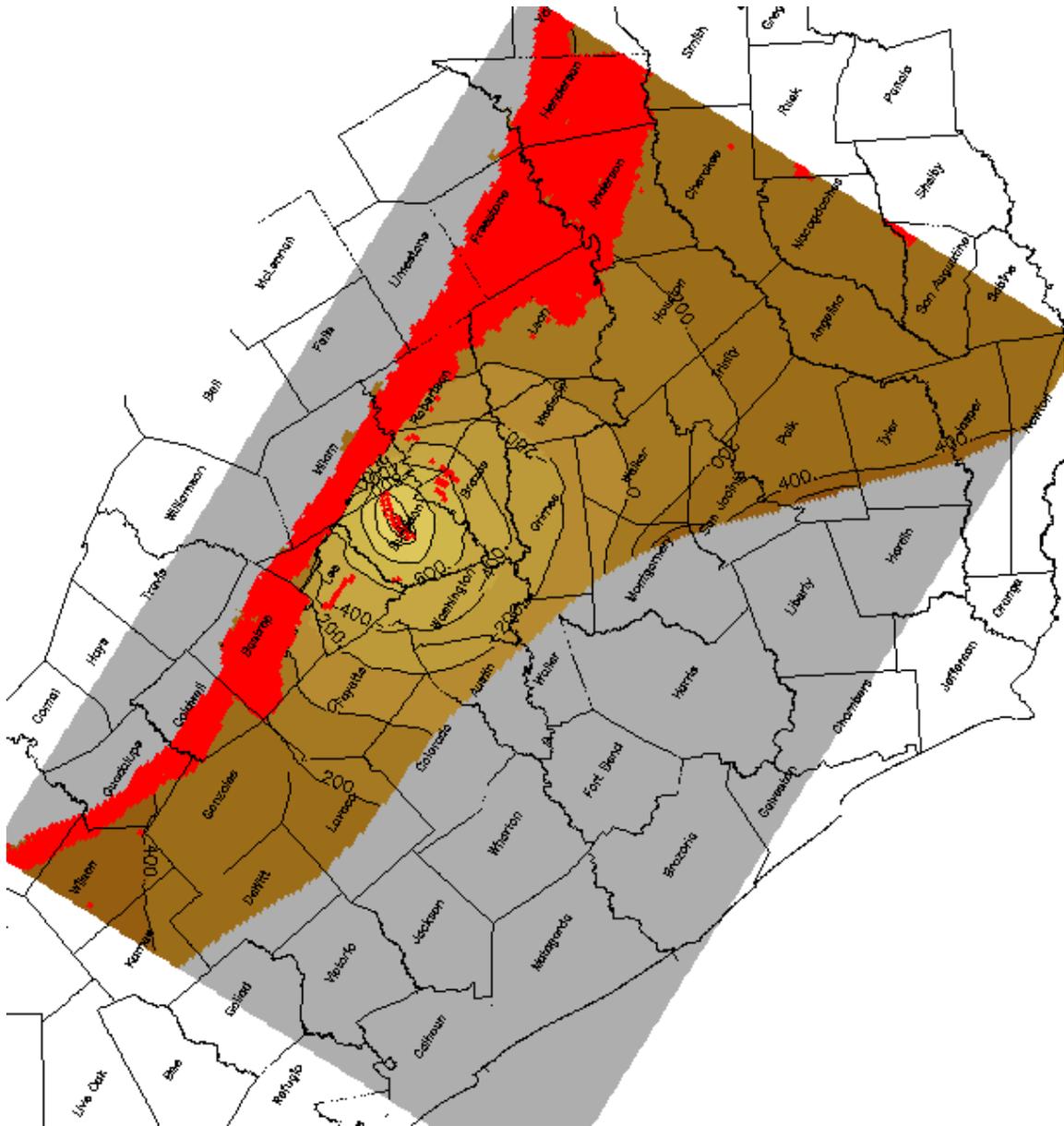


Figure 5. Heads in the Simsboro (feet above sea level) in 2015 after 40 wells at 3,500 gpm have been added and pumped for three additional years.