GAM run 05-31

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REQUESTOR:

Bill Couch on behalf of the Medina County Groundwater Conservation District.

DESCRIPTION OF REQUEST:

What are the average annual recharge rates for the Trinity (Hill Country) and Carrizo-Wilcox aquifers within Medina County?

METHODS:

To address the request, we:

- Extracted the model recharge cell values (feet per day) from the Trinity (Hill Country) and southern part of the Queen City and Sparta aquifers Groundwater Availability Models (GAMs) from model stress periods representing average annual recharge conditions. The southern part of the Queen City and Sparta aquifers GAM includes the updated version of the Carrizo-Wilcox aquifer model.
- Imported the model recharge cell values into a Geographic Information System, converted the recharge values into feet per year, and intersected them with Texas county boundaries to select all recharge cells within Medina County.
- Calculated the average annual recharge from each of the three GAMs within Medina County as acre-feet per year and inches per year.

PARAMETERS AND ASSUMPTIONS:

Recharge for the Trinity (Hill Country) GAM was estimated using baseflow analyses and rainfall distributions for a 27 month period between December1974 and March 1977 and then refined during the model calibration process (Mace and others, 2000). Recharge for the southern part of the Queen City and Sparta aquifers GAM was estimated using a nonlinear function of average annual precipitation adjusted for topography and underlying geologic formation permeabilities and then refined during the model calibration process (Kelley and others, 2004).

Each of the GAMs include various uncertainties in the calibration of recharge based on the (1) conceptualizations of the recharge process, (2) methodologies used to estimate recharge, and (3) implementation of recharge within each of the different GAMs. The

reader is encouraged to review the assumptions and limitations for each of the GAMs (Mace and others, 2000 and Kelley and others, 2004) for more detailed explanations.

RESULTS:

Recharge rates for Medina County were calculated as total average annual volume of recharge per year (acre-feet per year) and as average annual depth of recharge per unit area per year (inches per year) from the Trinity (Hill Country) and the southern part of the Carrizo-Wilcox aquifers are listed (Table 1). The recharge areas for each of the aquifers within Medina County are also given (Table 1).

Table 1. Recharge rates for Medina County.

Aquifer	Recharge (acre-feet/year)	Recharge (inches/year)	Recharge area ($miles^2$)
Trinity (Hill Country)	8,900	1.4	121
Southern Carrizo-Wilcox	13,700	0.8	342

The spatial distribution of average annual recharge rates for active model cells of the Trinity (Hill Country) and southern part of the Queen City and Sparta aquifers GAMs within Medina County is shown in Figure 1.

REFERENCES:

Kelley, V. A., Deeds, N. E., Fryar, D. G., and Nicot, J-P, with Jones, T. L., Dutton, A. R., Bruehl, G., Unger-Holtz, T., and Machin, J. L., 2004, Groundwater Availability Model for the Queen City and Sparta aquifers: Final Report prepared for the Texas Water Development Board.

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, 117 p.

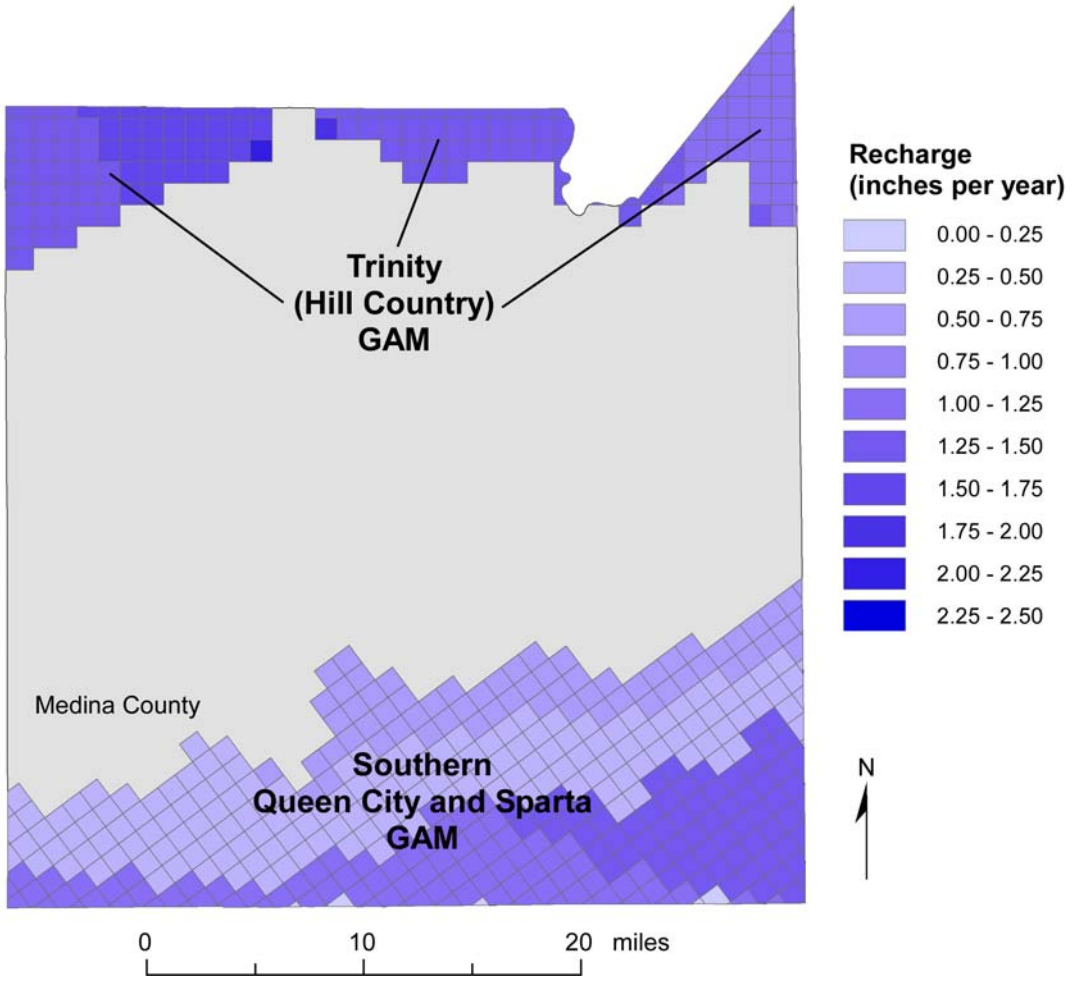

Figure 1. Distribution of average annual recharge rates for active model cells of the Trinity (Hill Country) GAM and the southern part of the Carrizo-Wilcox aquifer contained within the Queen City and Sparta aquifer GAM within Medina County.