

# Recharge to and Discharge from the Edwards Aquifer in the San Antonio Area, Texas, 1995

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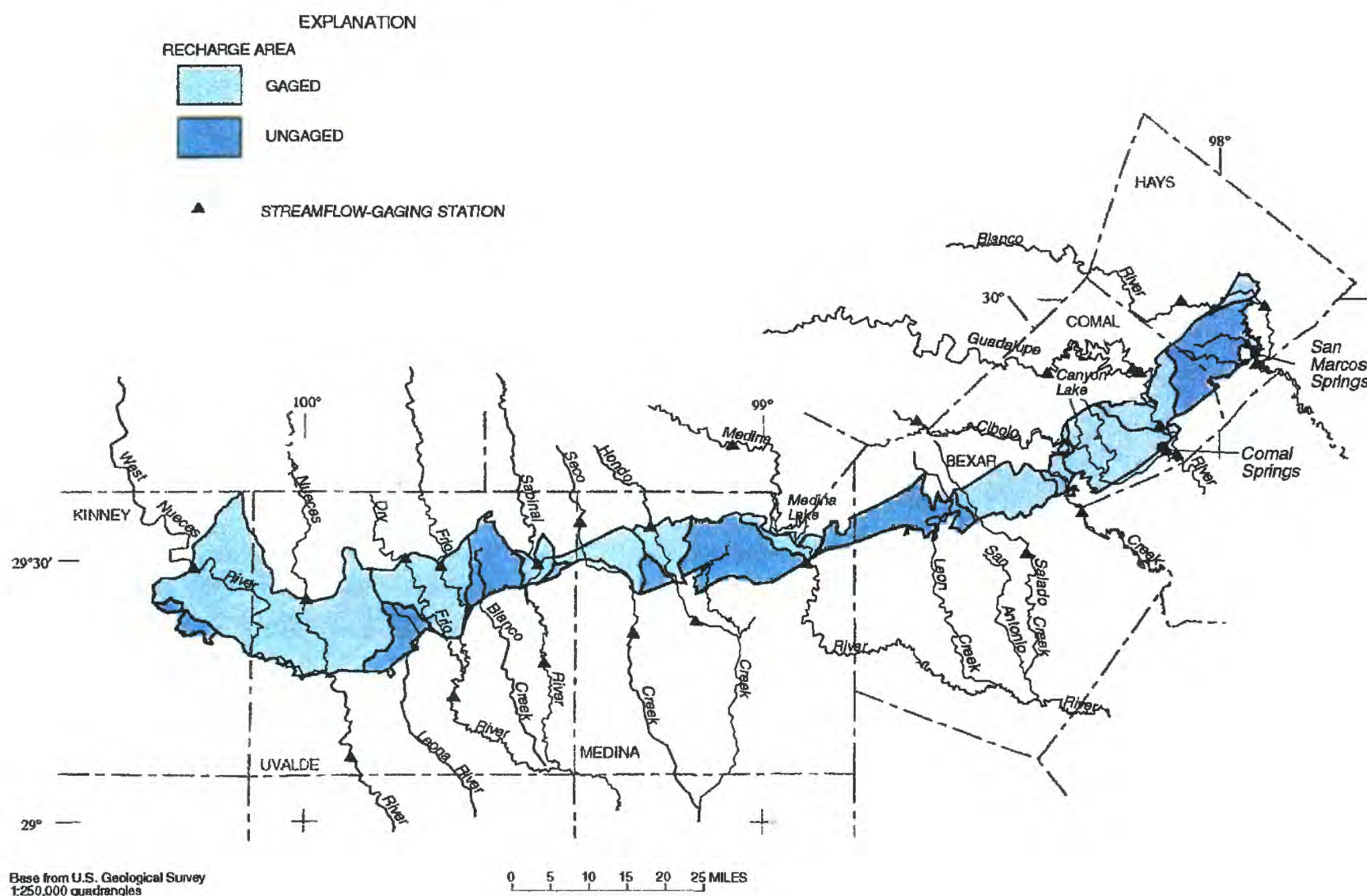
The Edwards aquifer is the sole source of public water supply for more than 1 million people in the San Antonio area and supplies large quantities of water for agriculture, industry, and the military. The dissolutioned, faulted limestone aquifer is the major source of water for Bexar, Comal, Hays, Medina, and Uvalde Counties. The annual compilation of estimates of ground-water recharge to and discharge from the Edwards aquifer is part of a continuing program of the U.S. Geological Survey (USGS) in cooperation with the Edwards Underground Water District (EUWD).

Annual ground-water recharge estimates are based on data collected from a network of streamflow- and rainfall-gaging stations (operated by the USGS, EUWD, and National Oceanic and Atmospheric Administration) and on assumptions that the runoff characteristics of gaged areas relate to ungaged areas (Puente, 1978). Annual ground-water discharge estimates are compiled from the following: (1) springflow data collected by the USGS; (2) pumpage data for public water supply, industry, and the military reported by pumpers to the Texas Water Development Board, EUWD, and USGS; (3) pumpage data for irriga-

tion wells obtained from the Nueces-Frio-Sabinal Soil and Water Conservation District, Medina Valley Soil and Water Conservation District, and U.S. Department of Agriculture, in conjunction with irrigated-acreage data supplied by the U.S. Department of Agriculture; (4) irrigated-acreage estimates from the Bexar-Medina-Atascosa Counties Water Control and Improvement District No. 1; and (5) pumpage for domestic supply, stock, and miscellaneous use estimated by the USGS.

## Ground-Water Recharge

Recharge to the Edwards aquifer is derived mainly from seepage into the aquifer from streams that cross the outcrop of the aquifer and direct infiltration of precipitation on the outcrop. The watershed areas used for estimating recharge to the Edwards aquifer in the San Antonio area have been modified slightly from the areas described by Puente (1978) to reflect existing data-collection sites. Recharge in the Guadalupe River Basin is not included because the net recharge to the aquifer in this basin is negligible (Puente, 1978). The watershed areas are based on surface- and ground-water divides.



Location of recharge area and major springs, San Antonio area, Texas. (Modified from Puente, 1978.)

The estimated annual recharge for 1995 is 531,300 acre-feet (acre-ft). The estimated annual recharge for 1934–95 ranges from 43,700 acre-ft in 1956 to 2,486,000 acre-ft in 1992. The average and median estimated annual recharge for 1934–95 are 674,200 and 547,100 acre-ft, respectively.

## Ground-Water Discharge

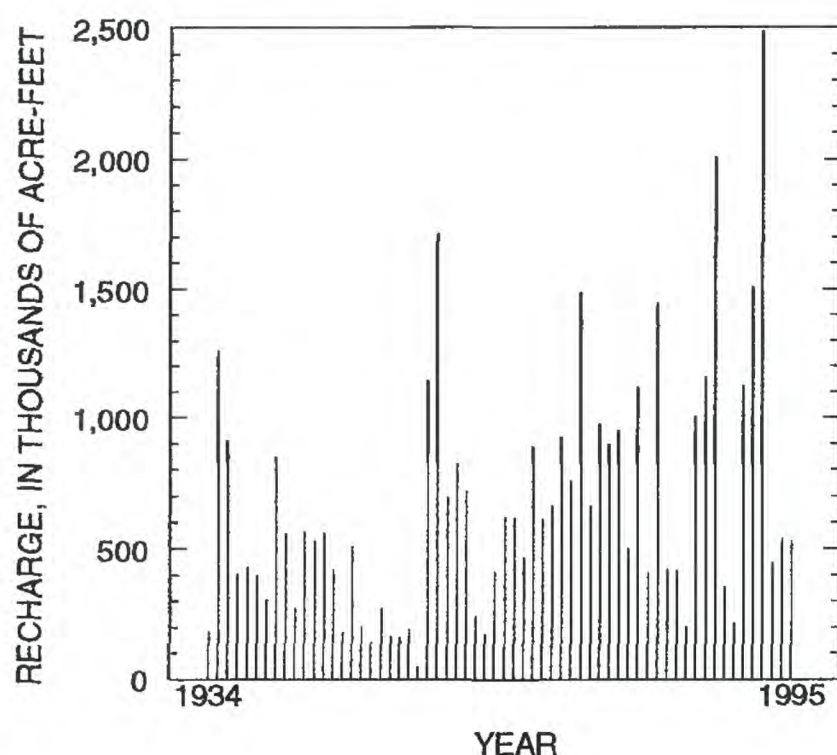
Discharge from the Edwards aquifer is by wells and springs. The major discharge from wells primarily is in Bexar, Medina, and Uvalde Counties. Most of the well discharge in Bexar County in 1995 was used for public water supply and the military. Other well discharge in Bexar County, along with most of the discharge from large-capacity wells in Uvalde and Medina Counties, irrigated about 93,000 acres during 1995. The remaining discharge (primarily from wells in Bexar County) in 1995 supplied industry, domestic uses, stock, and miscellaneous uses.

The estimated annual discharge from wells and springs during 1995 is 761,000 acre-ft. The estimated annual discharge from wells and springs during 1934–95 ranges from 388,800 acre-ft in 1955 to 1,130,000 acre-ft in 1992. The average and

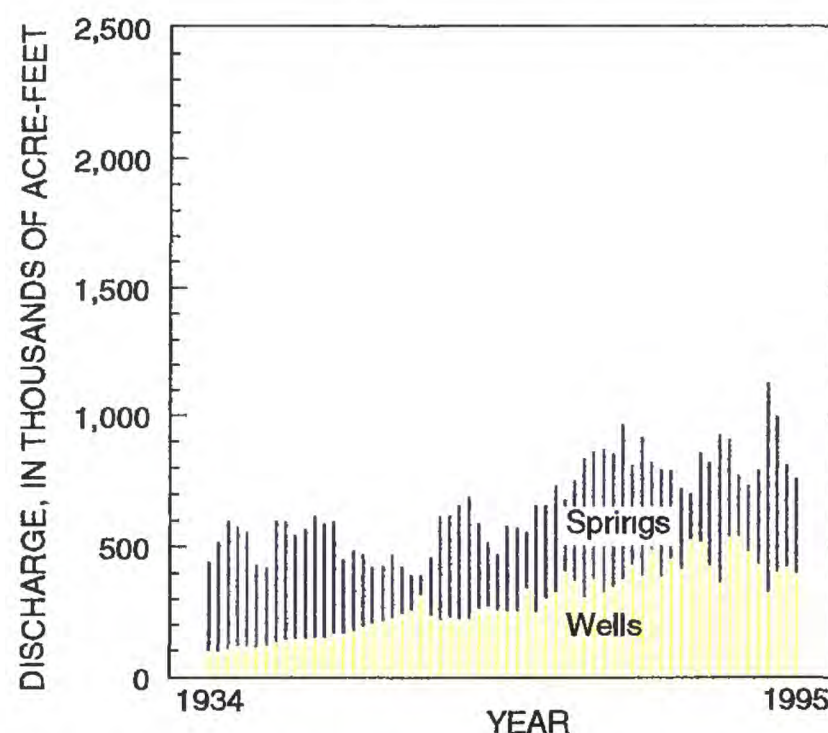
median estimated annual discharge from wells and springs for 1934–95 are 657,400 acre-ft and 618,200 acre-ft, respectively.

In 1995, well discharge accounted for approximately 52 percent of the estimated annual discharge. The 1934–95 estimated annual discharge from wells ranges from 101,900 acre-ft in 1934 to 542,400 acre-ft in 1989. The percentage of 1995 well discharge by county is as follows: Bexar, 67 percent; Uvalde, 16 percent; Medina, 9 percent; Comal, 4 percent; Hays, 3 percent; and Kinney, less than 1 percent. Approximately 24 percent of the well discharge in 1995 was used for irrigation.

San Marcos and Comal Springs discharge accounted for about 87 percent (315,100 acre-ft) of springflow during 1995. The remaining spring discharge was from Hueco Springs in Comal County, San Antonio and San Pedro Springs in Bexar County, and Leona River Springs in Uvalde County. Discharge from Leona River Springs includes underflow from the Edwards aquifer into gravels of the Leona Formation along the stream. The 1934–95 estimated annual discharge from springs ranged from 69,800 acre-ft in 1956 to 802,800 acre-ft in 1992; the average for the period is 365,800 acre-ft and the median is 372,600 acre-ft.



Estimated annual recharge to the Edwards aquifer, 1934–95.



Estimated annual well and spring discharge from the Edwards aquifer, 1934–95.

### Reference

Puente, Celso, 1978, Method of estimating natural recharge to the Edwards aquifer in the San Antonio area, Texas: U.S. Geological Survey Water-Resources Investigations Report 78–10, 34 p.

### U.S. DEPARTMENT OF THE INTERIOR U.S. GEOLOGICAL SURVEY

For more information on technical reports and data related to the Edwards aquifer contact:



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