

2023

PRECIPITATION



**EDWARDS AQUIFER
AUTHORITY**

2023 PRECIPITATION IN THE EDWARDS AQUIFER REGION

The Edwards Aquifer Authority (EAA) monitors precipitation throughout the region using a network of 78 real-time rain gauges. Rainfall data are used as an input for watershed models that provide estimates of recharge to the aquifer. Collected over several decades, the extensive database of rainfall information is also useful for monitoring climate trends, evaluating relationships between rainfall and aquifer levels, and understanding how global scale phenomena such as “El Niño” (term referencing above-average sea surface temperatures in the equatorial region of the Pacific Ocean) influence rainfall in Central Texas.

The locations of EAA rain gauges are shown in **Figure 1**. In general, rain gauges are not always reliable indicators of total rainfall over a region. Rainfall varies greatly over relatively short distances, and a gauge only reflects rainfall at a specific point. Additionally, gauges are susceptible to occasional malfunctions such as clogging, battery or electronic failure, or physical damage. Next-Generation Radar (NEXRAD) data from the National Weather Service (NWS) provides a potential solution to the limitations of individual rain gauges. NEXRAD Doppler weather radars provide overlapping and continuous coverage of the entire region. Unlike rain gauges, NEXRAD does not measure the actual amount of rainfall, rather it measures reflectivity of precipitation near ground level. For this reason, EAA takes a two-step approach to precipitation analysis. This approach involves performing a quality

review of the rain gauge data each month using the operational rain gauge data as a “ground-truth” to calibrate the NWS NEXRAD data. The resulting product is a dataset of hourly rainfall totals for a grid of 4 km x 4 km pixels over the entire region of interest extending back to January 1, 2003.

Figure 2 shows the calibrated NEXRAD coverage area with a thematic map indicating total 2023 rainfall for each 16-km² pixel. The high degree of spatial variability in rainfall totals across the region is apparent, with the highest rainfall total of 38.74 inches (983.996 mm) in eastern Bandera and northern Medina County and the lowest total of 14.43 inches (366.522 mm) in central Kinney County. The trend of decreasing rainfall from east to west is typical of the South-Central Texas region. The average rainfall for 2023 over the entire coverage area was 23.32 inches (592.328 mm).

Figure 2 also delineates the ten watershed catchment areas that intersect the Edwards Aquifer Recharge Zone. Rainfall over these watersheds is of interest because their catchment areas convey water to the Edwards Aquifer. These data are used as a variable in the EAA’s Hydrologic Simulation Program – Fortran (HSPF) models to estimate recharge. **Table 1** provides the 2023 area-averaged rainfall totals for the ten watersheds obtained from the calibrated NEXRAD data.

Generally, the calibrated NEXRAD rainfall totals are considered the best available representation of annual rainfall totals in the

region. However, evaluating long-term historical trends in annual rainfall is not yet suitable due to EAA’s calibrated NEXRAD rainfall data only dating back to 2003. For long-term analysis, we rely on data at individual rain gauges that have been in place for many decades. Several NWS stations throughout the region have long-term records for rainfall and various other weather parameters dating back to the early

20th century. These historical data are available from the National Centers for Environmental Information (NCEI). Climate data for the State of Texas, along with data from the EAA rain gauge network, are available from the TexMesonet. Calibrated NEXRAD database files are available from the EAA upon request at:

data@edwardsaquifer.org.

EAA rainfall data: <https://www.edwardsaquifer.org/science-maps/aquifer-data/rainfall-data/>

TexMesonet: <https://www.texmesonet.org/>

NCEI data: <https://www.ncei.noaa.gov/cdo-web/>

Table 1. 2023 rainfall averages for Contributing Zone watershed catchment areas.

Basin	2023 Area Average Rainfall (inches)
Guadalupe River Basin	20.72
Medina River Basin	27.06
Blanco River Basin	23.57
Sabinal River Basin	26.26
Cibolo – Dry Comal Creek Basins	25.03
Area Between Medina River and Cibolo Creek Basins	23.64
Area Between Sabinal and Medina River Basins	26.19
Cibolo – Dry Comal Creek Basins	23.01
Frio – Dry Frio River Basin	25.54
Nueces – West Nueces River Basin	22.48

Figure 1. EAA Rain Gauge Locations.

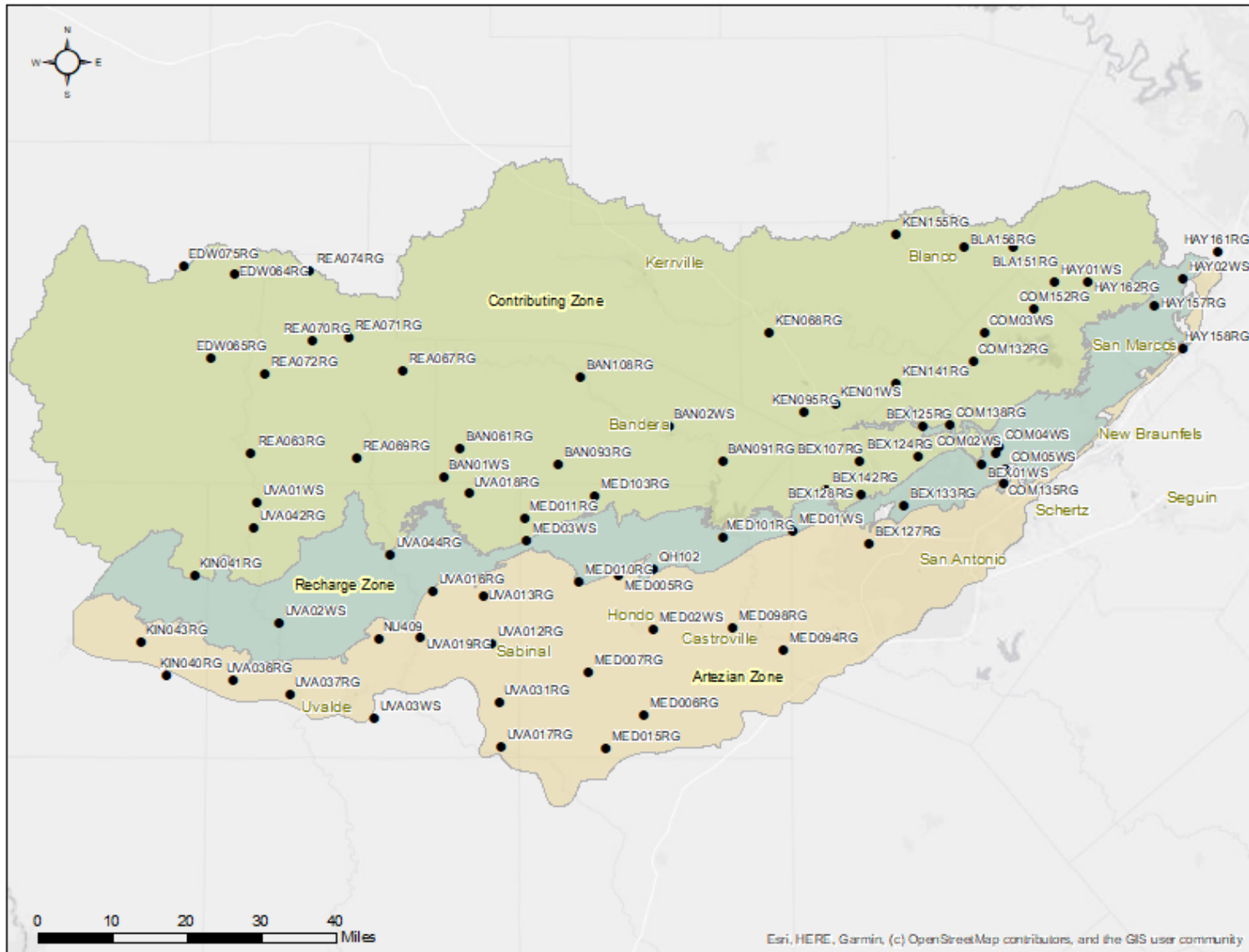


Figure 2. Map of 2023 precipitation totals for gauge calibrated NEXRAD coverage area.

