



EDWARDS AQUIFER
AUTHORITY

HYDROLOGIC DATA FACT SHEETS

2019

PRECIPITATION IN THE EDWARDS
AQUIFER REGION

2019 Precipitation in the Edwards Aquifer Region

The Edwards Aquifer Authority (EAA) monitors precipitation throughout the region using a network of 74 real-time rain gauges. Rainfall data is used as input for watershed computer models that can provide estimates of monthly recharge to the aquifer. Collected over several years or decades, the extensive database of rainfall information can also be useful for monitoring climate trends, evaluating relationships between rainfall and aquifer levels, or for understanding how global-scale phenomena such as “El Nino” (which refers to above-average sea surface temperatures in the equatorial region of the Pacific Ocean) may affect rainfall in Central Texas.

The locations of the EAA rain gauges are shown in Figure 1. In general, rain gauges are not always reliable indicators of total rainfall over a region. Rainfall can vary 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. NEXRAD (Next-Generation Radar) data from the National Weather Service (NWS) provides a potential solution to the limitations of individual rain gauges because it provides continuous coverage of the entire region based on overlapping coverage from NEXRAD Doppler radar stations in Brackettville, Corpus Christi, New Braunfels, and Granger, Texas. However, NEXRAD measures reflectivity of precipitation near ground level and not the actual amount of precipitation as measured by rain gauges. For this reason, EAA takes a two-step approach by performing a quality review of the rain gauge data each month and 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 × 4 km pixels over the entire region of interest that extends back to January 1, 2003.

Figure 2 shows the calibrated NEXRAD coverage area with a color map indicating total 2019 rainfall for each 16-km² pixel. The high degree of spatial variability in rainfall totals can be seen, with the highest rainfall total of 36.7 inches in Travis County at the northeastern edge of the coverage area and the lowest total of 11.1 inches in Kinney County at the southwestern edge of the coverage area. The trend of decreasing rainfall from northeast to southwest is typical of the South-Central Texas region. The average rainfall over the entire coverage area was 20.7 inches.

Figure 2 also shows delineations of the nine watershed catchment areas that contain streams that cross the Edwards Aquifer recharge zone. The rainfall over these watersheds is of interest because their catchment areas convey water to the Edwards Aquifer recharge zone and the data can be used as input to the EAA’s HSPF (Hydrologic Simulation Program—Fortran) models to estimate recharge. Table 1 provides the 2019 area-averaged rainfall totals for the nine watersheds obtained from the calibrated NEXRAD data.

Figure 1. Locations of Precipitation Gauging Stations.

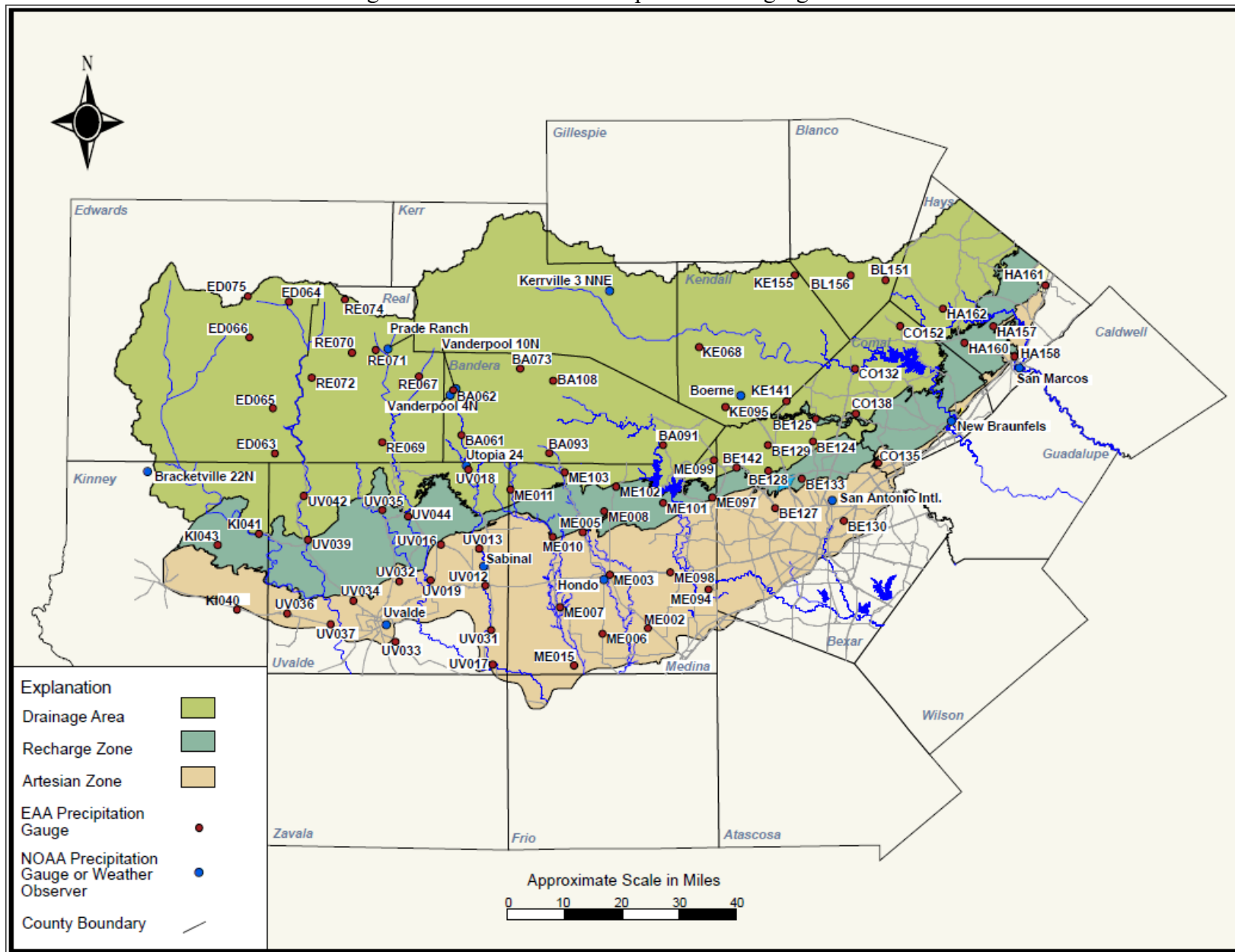


Figure 2. Gauge-Calibrated NEXRAD Rainfall Distribution for 2019

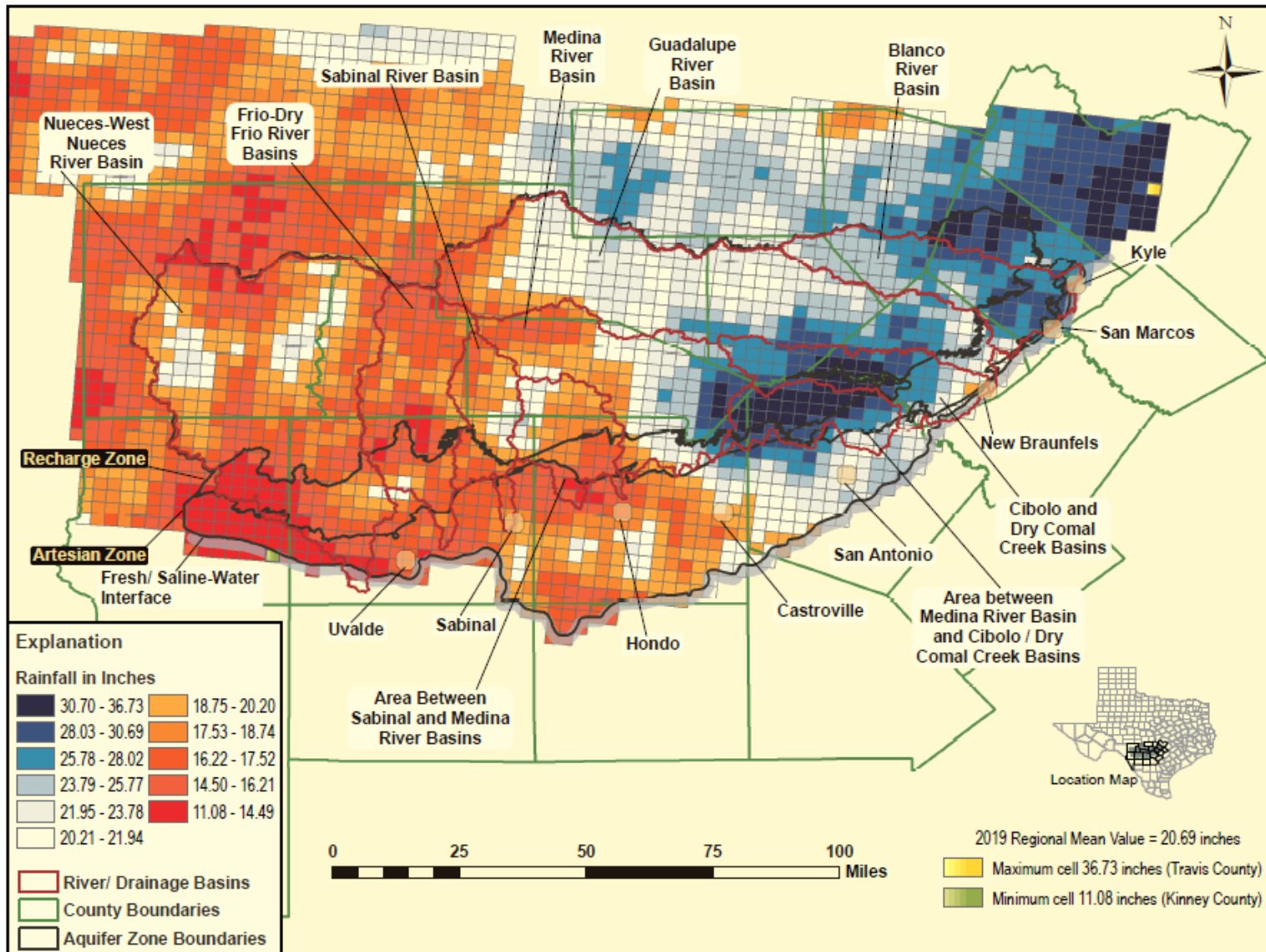


Table 1. 2019 Rainfall Totals for Nine Delineated Contributing Zone Watershed Areas.

Gauge	2019 Area Average Rainfall (inches)
Nueces-West Nueces River Basins	17.3
Frio-Dry Frio River Basins	16.5
Sabinal River Basin	18.4
Area Between Sabinal and Medina River Basins	17.9
Medina River Basin	21.5
Area Between Medina River and Cibolo Creek Basins	29.9
Cibolo and Dry Comal Creek Basins	27.3
Guadalupe River Basin	22.4
Blanco River Basin	26.2

Generally, the calibrated NEXRAD rainfall totals is considered the best available representation of the annual rainfall total in the region. However, because the timeframe covered by EAA’s calibrated NEXRAD rainfall data does not begin until year 2003, it is not yet suited for evaluating long term historical trends in annual rainfall. For this type of 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 many other weather parameters going back to early in the 20th century. These historical data can be obtained online from the National Centers for Environmental Information (formerly the National Climatic Data Center) at <http://www.ncdc.noaa.gov/cdo-web/search>. Data from the EAA’s rain gauge network or calibrated NEXRAD database may be obtained from EAA upon request.