MEMO

TO: Simone Kiel, P.E., Freese and Nichols, and the Region F Water Planning Group

FROM: Kristie Laughlin, P.G. and James Beach, P.G., WSP USA

SUBJECT: **Region F Groundwater Availability Volumes**

DATE: **October 8, 2018**

Introduction

This memo is being distributed to key members of the regional and joint planning groups prior to finalization of the Region F Technical Memorandum. The goals of this memo are:

1) to inform stakeholders, planners and water users of the 2021 groundwater availability volumes and methodologies used to derive these volumes for Region F,

2) solicit feedback from stakeholders, planners, and water users regarding any specific availability volumes for which they may like to contribute input and/ or local knowledge that might revise the groundwater availability volumes, and

3) incorporate any revisions to volume changes into the Technical Memorandum prior to finalization.

This memo summarizes 2021 MAG volumes, non-relevant aquifer groundwater availability volumes, and other (undifferentiated) aquifer availability volumes. The methodology used to derive the non-relevant and other aquifer volumes are noted or described either within this memo or the associated tables.

Region F MAGs

Region F includes portions of Groundwater Management Areas (GMAs) 2, 3, 7 and 8. The MAG estimates that were developed during the latest round of joint planning are summarized in Table 1. This table compares the total of all MAG estimates for each county in Region F for the current and previous joint planning cycles. All units are acre-feet per year (afy). The difference in volumes between joint planning cycles 1 and 2 is color-coded to indicate an increase in the MAG volume (with black numbers) or a decrease in the MAG (shown with red numbers and parentheses). For decade 2020, the previous MAGs totaled 1,003,925 acre-feet per year (afy) for entire region. The current MAGs total 985,937 afy for 2020. Overall, there has been a decrease ranging from 17,988 afy for decade 2020 to a maximum decrease of 38,604 afy for decade 2040. Some of the anticipated decreases in MAG volumes were discussed by Bill Hutchison at a previous meeting of the RWPG.

Nomenclature Changes

The three major aquifer MAGs have been lumped since the last planning cycle. The Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers (ETPPVT) have been combined into one MAG volume where applicable. Also, with the introduction of regions to the North Trinity Woodbine GAM, the Trinity Aquifer formation / member nomenclature in GMA8 has expanded since the last planning cycle to include the Antlers, the Travis Peak and the Twin Mountains formations. This only affects Brown County in Region F.

MAG change to Non-MAG

The three seemingly largest MAG decreases for individual counties appear to be in Tom Green (decrease of 39,787 afy in 2020), Midland (decrease of 31,343 afy in 2020), and Mitchell (decrease of 14,018 afy in 2020) Counties. However, these are not real decreases in availability but are a result of the aquifers being declared as non-relevant. For aquifers that were designated to be non-relevant in this joint planning cycle, the previous MAG volume estimates were transferred over to the non-relevant availability volume without revision. There are comments in Table 1 indicating if the aquifer was determined to be non-relevant. These are discussed in greater detail in the Non-MAG portion of this memo.

Maps of the relevant and non-relevant portions of major and minor aquifers are included as Figures 1 through 4. Figure 5 is a map of the GCDs within Region F.

MAG Availability Volume Changes

The Ogallala is relevant only in Glasscock County, however, this is the largest real decrease in MAG volume estimates summarized in Table 1. The total MAG decrease in Glasscock County ranges from 13,424 to 8,092 afy. To help determine which aquifer this decrease can be attributed to, the current MAG volumes by aquifer are detailed in Table 2, and the 2016 MAG volumes are detailed in Table 3. A comparison of the MAGs listed for Glasscock County in Tables 2 and 3, indicates that the MAG volume for the Edwards-Trinity (Plateau) and Pecos Valley and Trinity Aquifers remains relatively unchanged at 65,186 afy (give or take). However, the previous Ogallala and Edwards-Trinity (High Plains) Aquifers MAG has decreased from 21,322 afy to 7,925 afy for the year 2020, which accounts for the largest availability decrease in any one county in Region F during this planning cycle.

The next largest decrease in total MAG volumes occurs in Ward County (6,387 afy). These decreases can be attributed to the Dockum, Capitan, and Rustler Aquifers, which have decreased available volume 4,850 afy, 948 afy, and 555 afy, respectively. The third largest decrease in available volume occurs in Reeves County, which can be attributed to the Dockum (2,431 afy), Capitan (1,007 afy), and the ETPPVT (667 afy). This is slightly offset by an increase for the Rustler Aquifer of 411 afy. All other total MAG volume decreases per county range from 1,913 afy (Crane County) to 1 afy (Coke County).

Martin, Howard, and McCulloch Counties had the largest increases in MAG volumes, which can be attributed solely to the Ogallala Aquifer for Martin and Howard Counties and primarily to the Hickory Aquifer in McCulloch County.

Partial MAGs

Note that there are two districts located within the Edwards-Trinity (Plateau) Aquifer that have declared this aquifer to be non-relevant for planning purposes, Therefore, both the Lipan-Kickapoo WCD and the Hickory UWCD1 counties may have both a partial MAG (for the portions of counties outside of the district) and a non-MAG (for portions of applicable counties located within the districts).

Region F Non-MAGs

Non-MAGs encompass both the aquifers designated as non-relevant and other (or undifferentiated) aquifers. The newly designated Crosstimbers Aquifer has been incorporated with the Other (undifferentiated) aquifers in Region F.

Non-Relevant Aquifers

Tables 4 and 5 summarize the non-relevant aquifer availability volume estimates for this planning cycle. Table 4 contains notes regarding the methodology or source of the availability volume estimates. The total non-relevant availability volume for this planning cycle is 119,395 afy.

Aquifers declared non-relevant for this planning cycle are as follows:

GMA2 (Gam Run 16-028 MAG):

- Pecos Valley Aquifer in Andrews County
- Edwards-Trinity (Plateau) Aquifer in Andrews, Martin and Howard Counties

GMA3 (Gam Run 16-027 MAG Final):

- Capitan Reef in Crane, Loving, and Reeves Counties
- Rustler in Crane County

GMA7 (Gam Run 16-026 MAG Version 2):

- Blaine, Igneous, Lipan, Marble Falls, and Seymour Aquifers
- Edwards-Trinity (Plateau) Aquifer in Hickory UWCD1, Lipan-Kickapoo WCD, Lone Wolf GCD, and Wes-Tex GCD
- Ellenburger-San Saba Aquifer in Llano County
- Dockum Aquifer outside of Santa Rita GCD and Middle Pecos GCD
- Ogallala Aquifer outside of Glasscock County

GMA8 (Gam Run 17-029 MAG):

- No aquifers that are within Region F

Other Aquifers

Table 6 details the Other (undifferentiated) Aquifer volume estimates. The total availability from other aquifers is 32,220 afy. The methodology for these volume estimates is derived from the maximum four-year historical annual pumping that occurred in years 2012 through 2015. Historical pumping data are based upon TWDB water use surveys. One exception to this methodology is for the Pecos County volume of 10,000 afy for water from the Capitan Aquifer via the San Andres Formation.

San Andres Formation Estimated Groundwater Availability

In 1957, there were at least 27 groundwater wells completed in the San Andres Formation in northern Pecos County near Imperial, Texas. The wells were flowing at the surface when they were drilled but due to continuous discharge and decreasing formation pressure, only about eight of these wells currently flow. In 1957, the withdrawals were estimated to have been 10,000 acre-feet. An additional quantity of over 3,000 acre-feet was estimated to be available from this source. Uses included irrigation, secondary recovery via waterflooding, and livestock. Water quality was characterized by total dissolved solid concentrations that exceed 5,000 milligrams per liter, hydrogen sulfide gas presence in the groundwater, and sulphur that precipitates out upon oxidation at the surface (Armstrong and McMillion, 1961).

Based on proximity and local geological structure data, the source of this water is likely the Capitan Reef Complex, which is located about four miles to the west of the flowing San Andres Formation wells. The underlying San Andres Formation is structurally high in the area west of Imperial, functions as the base of the backreef sequence, and has good hydrogeological communication with the Capitan Reef Complex (Standen and others, 2009).

Measurement of discharge from two flowing wells (C-83 and C-88) using weirs was performed in 2015.

- Measured flow from C-83 was 215 gallons per minute (gpm) in November, 2015. Historically, measured flow from this well varied from 1,330 to 900 gpm between April and August, 1957.
- Measured flow from C-88 was 900 to 1,200 gpm in 2015. In 1957 the flow from this well was measured at 900 gpm.

In 2015, total flow from the two wells was over 2 million gallons per day (mgd), which is equivalent to 2,280 acre-feet per year (afy) (LBG-Guyton, 2015). If this average is applied to the eight flowing wells, it gives an estimate of nearly 9,000 afy. The Middle Pecos district recently indicated that several of the eight flowing wells produce between one to 2.5 mgd. Assuming this applies to four wells, this indicates groundwater availability estimates ranging between 4,480 afy and 11,200 afy for the more productive wells.

For the purposes of regional water planning, WSP believes that an availability estimate of 10,000 afy is reasonable for this planning cycle. This estimate only includes discharge from flowing wells and does not consider impacts from groundwater pumping, subsidence, or water quality.

REFERENCES

Armstrong, C.A., and McMillion, L.G., 1961. Geology and Groundwater Resources of Pecos County, Texas, Bulletin 6106 prepared by the U.S. Geological Survey and the Texas Board of Water Engineers in cooperation with Pecos County, 2 volumes.

LBG-Guyton Associates, 2015. Preliminary Compilation of Hydrogeologic Information Collected on the MRK Wells, Pecos County, Texas, 38 p.

Standen and others, 2009. Capitan Reef Complex Structure and Stratigraphy, prepared for Texas Water Development Board Contract No. 0804830794, 63 p.

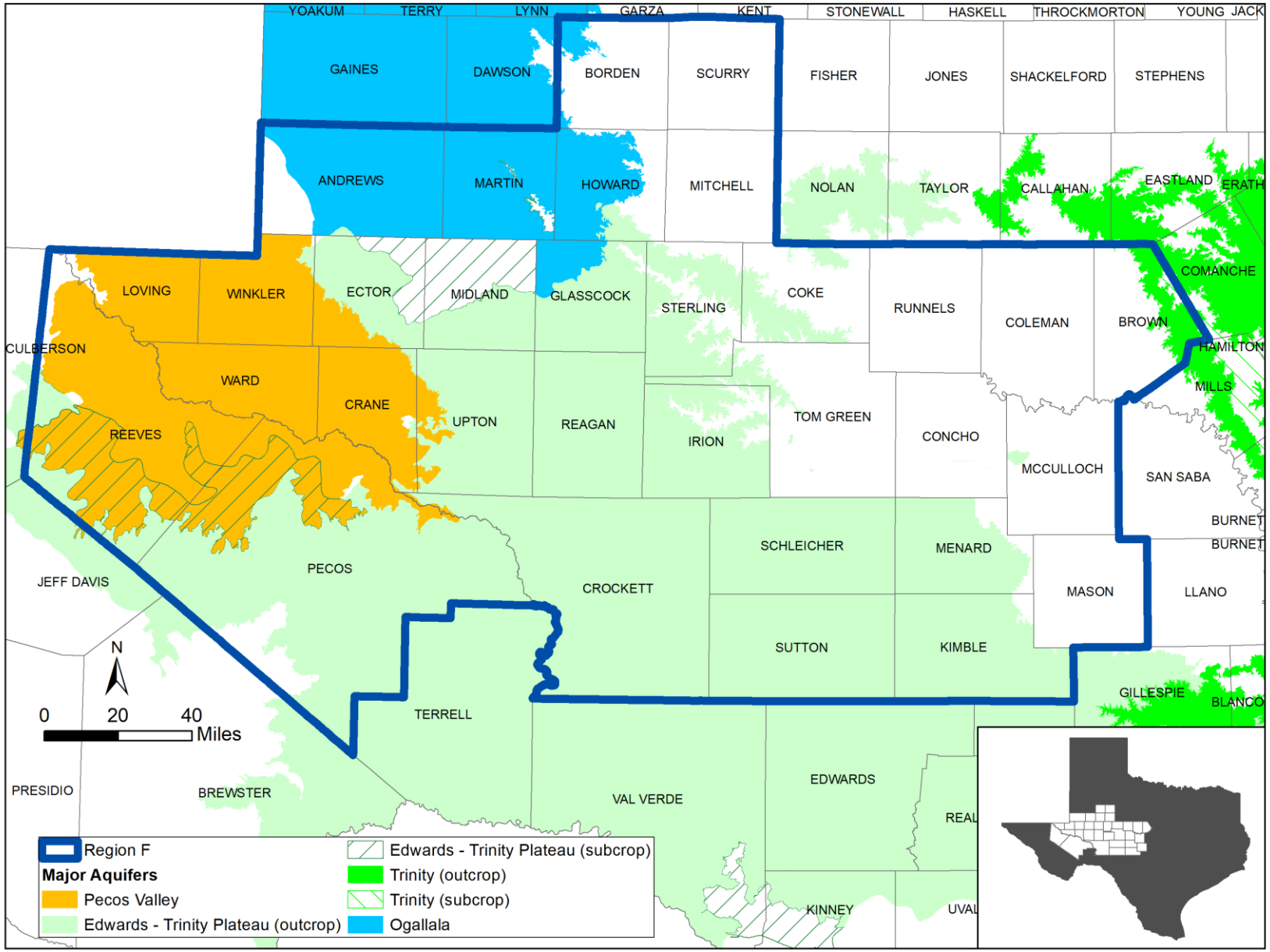

Figure 1. Relevant Major Aquifers

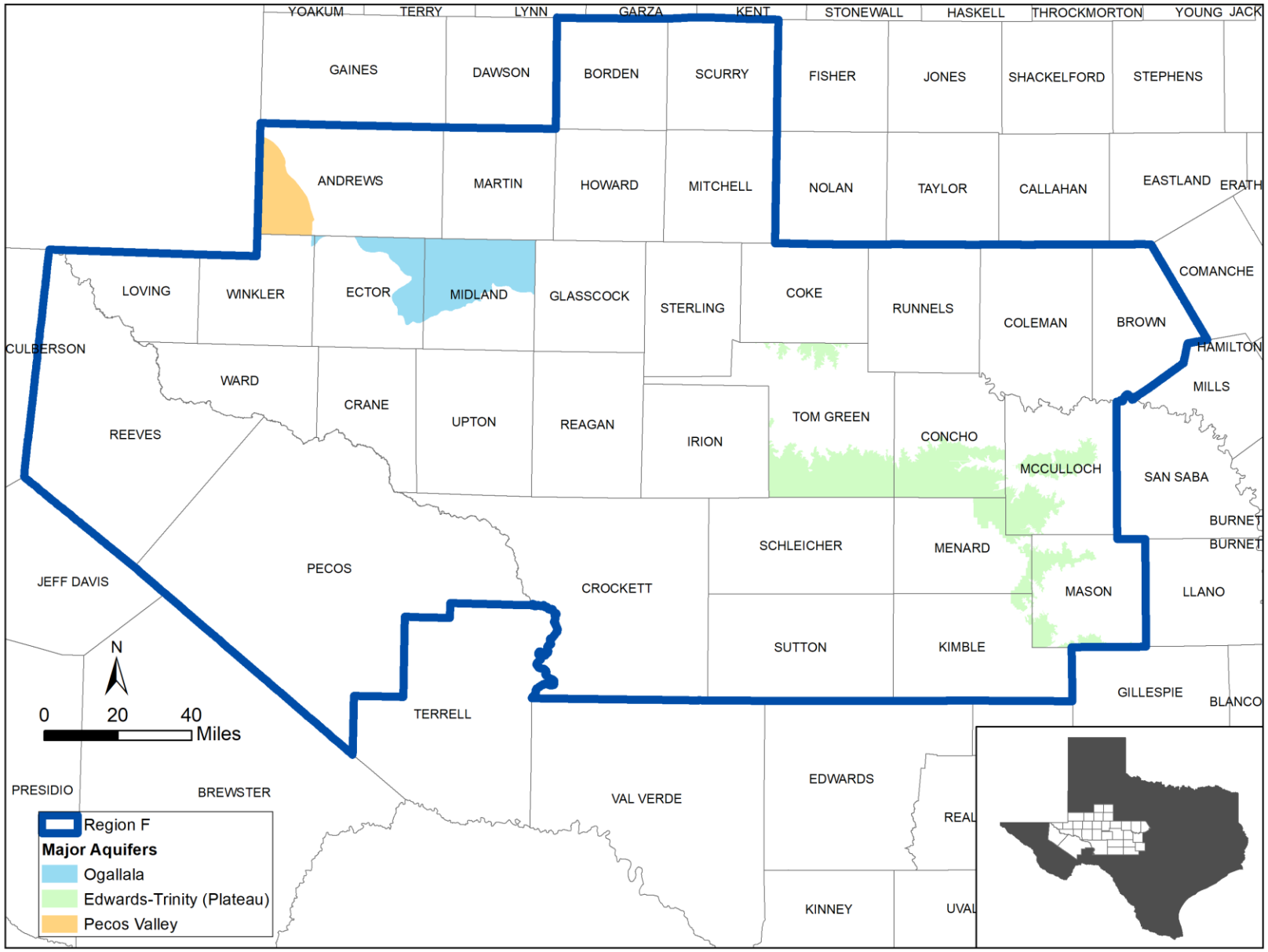

Figure 2. Non-relevant Major Aquifers

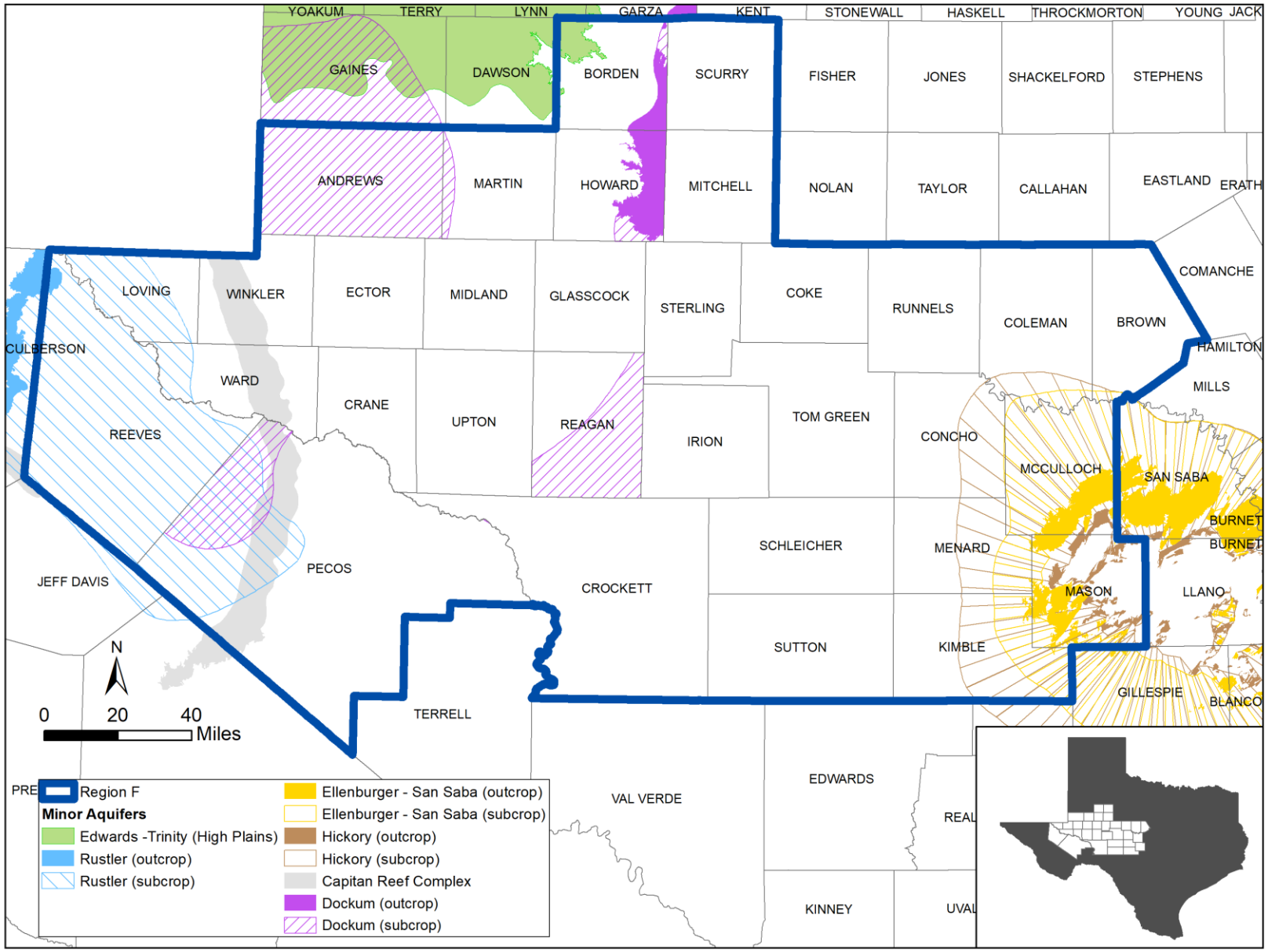

Figure 3. Relevant Minor Aquifers

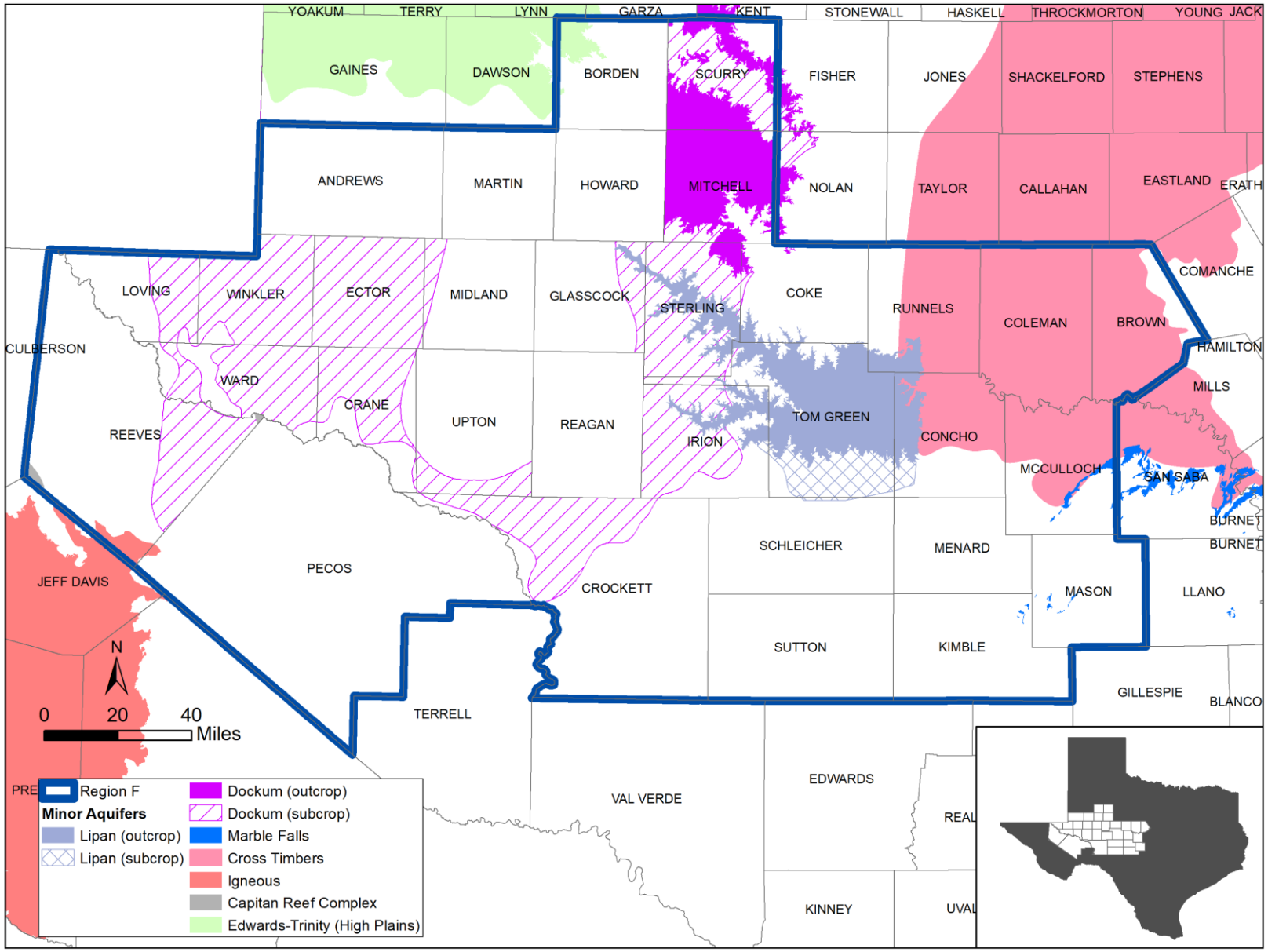

Figure 4. Non-relevant Minor and Other Aquifers

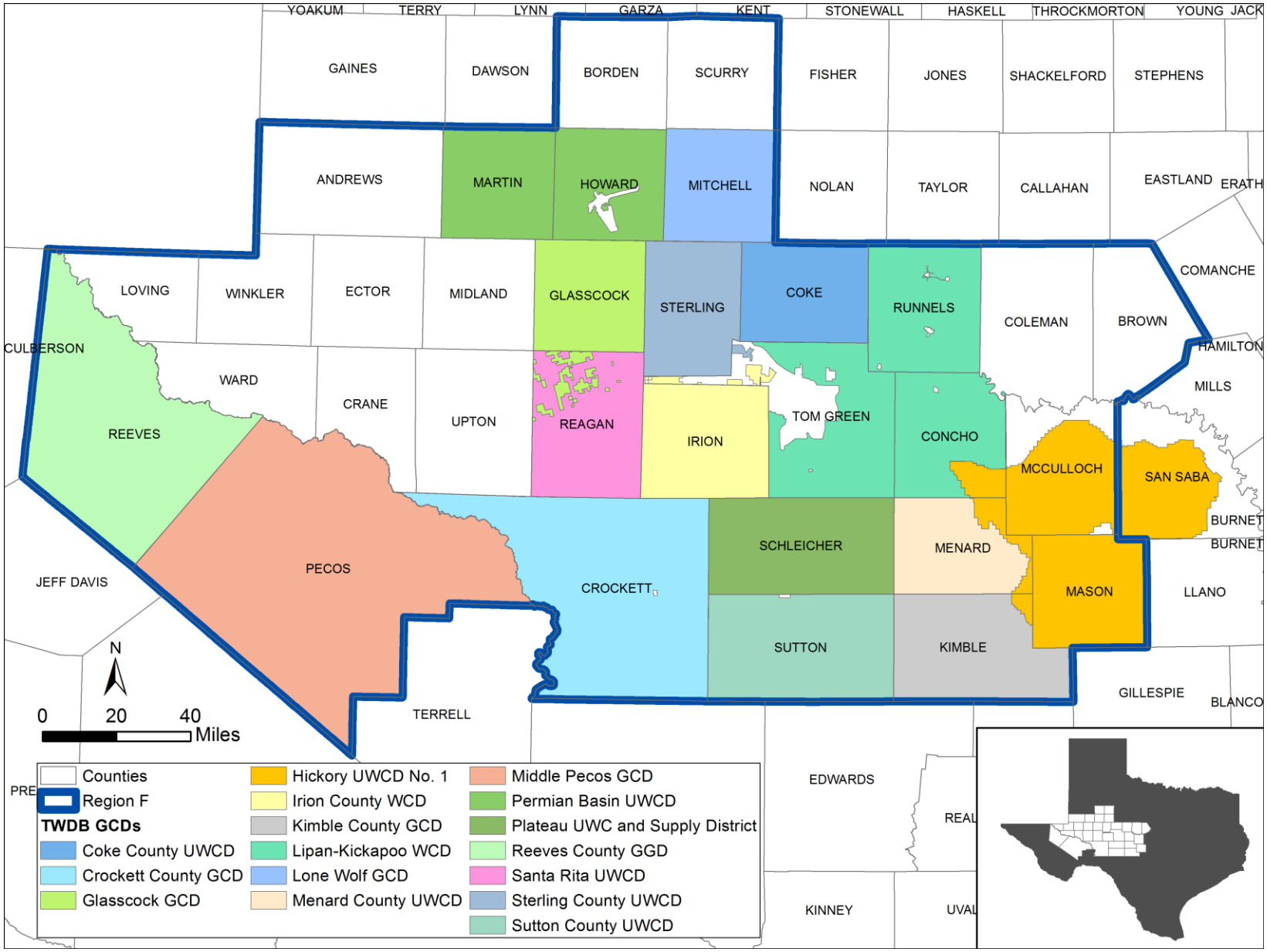

Figure 5. GCDs within Region F