Brackish Groundwater Data Collection: Edwards-Trinity (Plateau) Aquifer

October 19, 2017
Groundwater Management Area 7
Fredericksburg, TX
Presented by Andrea Croskrey
Brackish Resources Aquifer Characterization System (BRACS)

The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board's statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

Presentation Outline

Introduction to mapping brackish groundwater in the Edwards-Trinity Plateau Aquifer

- What is brackish groundwater?
- House Bill 30 (2015)
- Aquifer overview
- Data collected and data gaps
- Anticipated challenges
- Brackish groundwater sampling opportunity!
- Questions, comments, stakeholders input

Brackish Groundwater

Saltier than fresh water, less salty than seawater

Groundwater Salinity Classification	Salinity Zone Code	Total Dissolved Solids Concentration in milligrams per liter (mg/L)
Fresh	FR	0 to 1,000
Slightly Saline	SS	1,000 to 3,000
Moderately Saline	MS	3,000 to 10,000
Very Saline	VS	10,000 to 35,000
Brine	BR	Greater than 35,000

Drinking Water Limit

Major/Minor Texas Aquifers Mapped Limit*

Seawater

Classification modified from Winslow, A.G., and Kister, L.R., 1956, Saline-water resources of Texas: U.S. Geological Survey, Water-Supply Paper 1365, 105 p.

Brackish Groundwater Production Zones (BGPZ) 84th Texas Legislature, 2015

Directed TWDB to:

- ✓ Define brackish groundwater production zones
- ✓ Estimate productivity over 30 & 50 year periods
- ✓ Recommend groundwater monitoring
- ✓ Work with stakeholders and groundwater conservation districts
- ✓ Complete four aquifers December 2016
- ✓ Complete all aquifers December 2022

http://www.twdb.texas.gov/innovativewater/bracs/HB30.asp

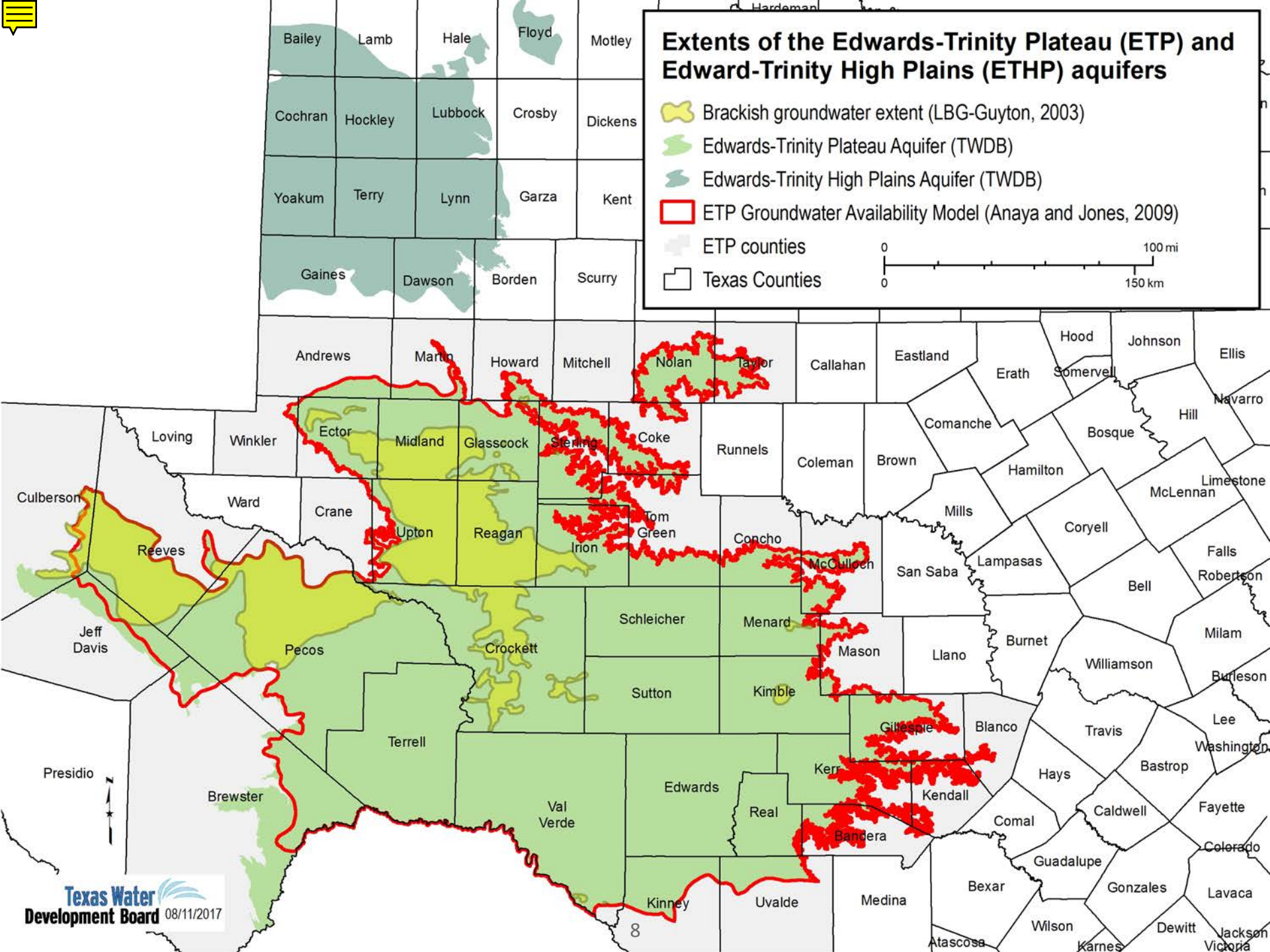
Brackish Groundwater Production Zones

Criteria designation:

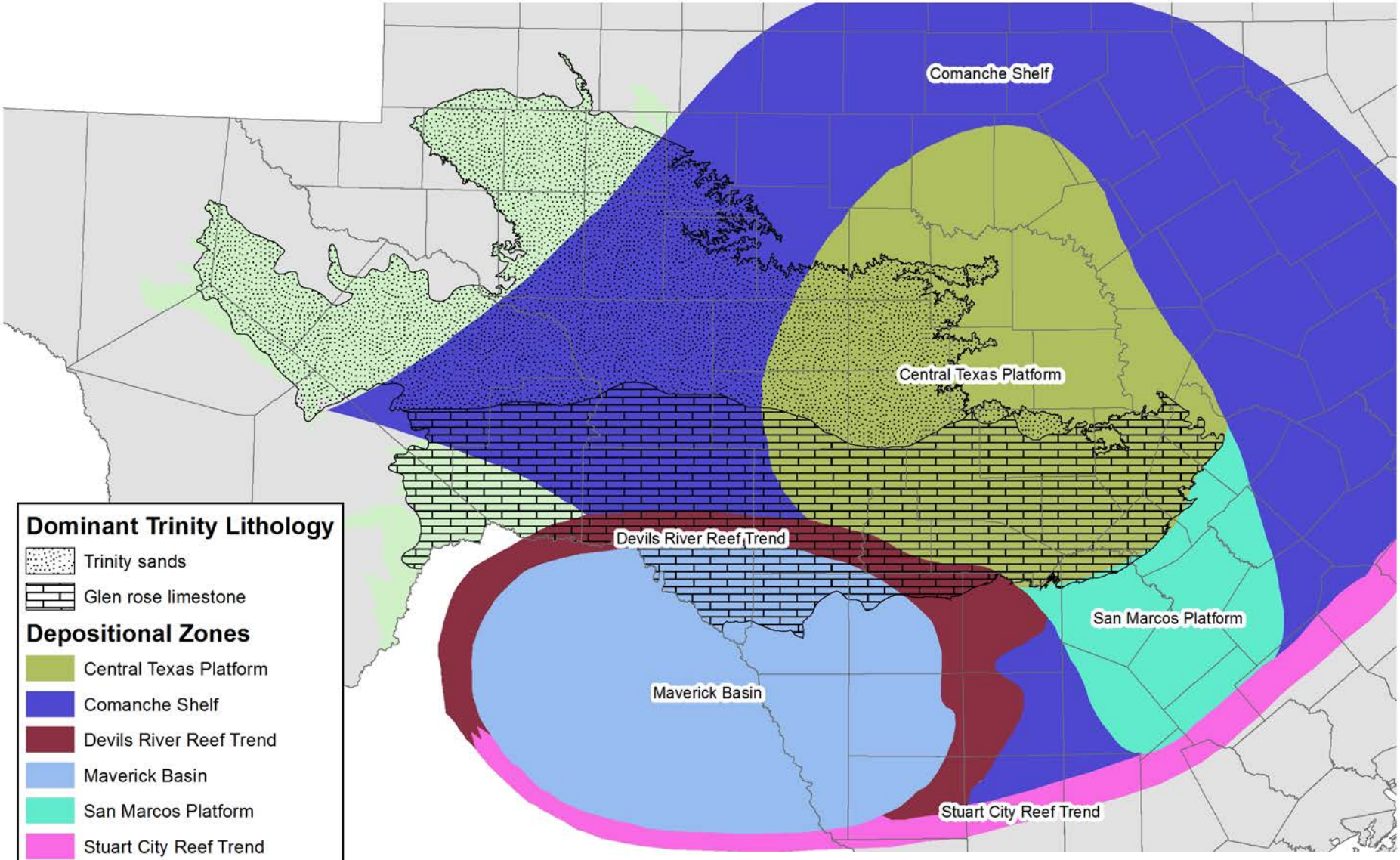
Must have brackish water	In areas of the state with moderate to high availability and productivity
Must have hydrogeologic barriers	sufficient to prevent significant impacts to fresh water availability or quality
Cannot be within these boundaries	Edwards Aquifer within the Edwards Aquifer Authority, Barton Springs-Edwards Aquifer Conservation District, Harris-Galveston Subsidence District, or Fort Bend Subsidence District
Cannot be already in use	Brackish water already serving as a significant source of water supply for municipal, domestic, or agricultural
Cannot be used for wastewater injection	permitted under Title 2 of Texas Water Code, Chapter 27

Aquifer Overview

- Edwards Group and Trinity Group (limestones, dolostones, sands)
- Elevation from <1,000 to >4,500 feet above mean sea level
- Average freshwater thickness 433 feet
- Current extent TDS 100-3,000 mg/L
- Intersects:
  - 41 Texas Counties
  - 30 Groundwater Conservation Districts
  - 6 Groundwater Management Areas
  - 6 Regional Water Planning Groups


Extents of the Edwards-Trinity Plateau (ETP) and Edward-Trinity High Plains (ETHP) aquifers
Brackish groundwater extent (LBG-Guyton, 2003)
Edwards-Trinity Plateau Aquifer (TWDB)
Edwards-Trinity High Plains Aquifer (TWDB)
ETP Groundwater Availability Model (Anaya and Jones, 2009)
ETP counties
Texas Counties
0
100 mi
0
150 km
Bailey
Lamb
Hale
Floyd
Motley
Cochran
Hockley
Lubbock
Crosby
Dickens
Yoakum
Terry
Lynn
Garza
Kent
Gaines
Dawson
Borden
Scurry
Andrews
Martin
Howard
Mitchell
Nolan
Taylor
Callahan
Eastland
Erath
Hood
Somervell
Johnson
Ellis
Navarro
Hill
Bosque
Comanche
Hamilton
Limestone
McLennan
Mills
Coryell
Falls
Robertson
Bell
Milam
Burleson
Williamson
Travis
Lee
Washington
Bastrop
Fayette
Colorado
Lavaca
Gonzales
Guadalupe
Bexar
Wilson
Dewitt
Jackson
Victoria
Karnes
Atascosa
Comal
Hays
Caldwell
Blanco
Gillespie
Kerr
Kendall
Bandera
Real
Edwards
Kinney
Uvalde
Medina
Val Verde
Terrell
Presidio
Brewster
Jeff Davis
Reeves
Culberson
Loving
Winkler
Ward
Crane
Ector
Midland
Glasscock
Upton
Reagan
Irion
Sterling
Coke
Runnels
Coleman
Brown
Tom Green
Concho
McCulloch
San Saba
Lampasas
Llano
Mason
Burnet
Menard
Schleicher
Crockett
Pecos
Sutton
Kimble
Texas Water Development Board 08/11/2017

Depositional Zones



Modified from Figure 3-22, Anaya, R., and Jones, I.C., 2009, Groundwater Availability Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers of Texas, Texas Water Development Board Report 373

Regional Stratigraphic Nomenclature

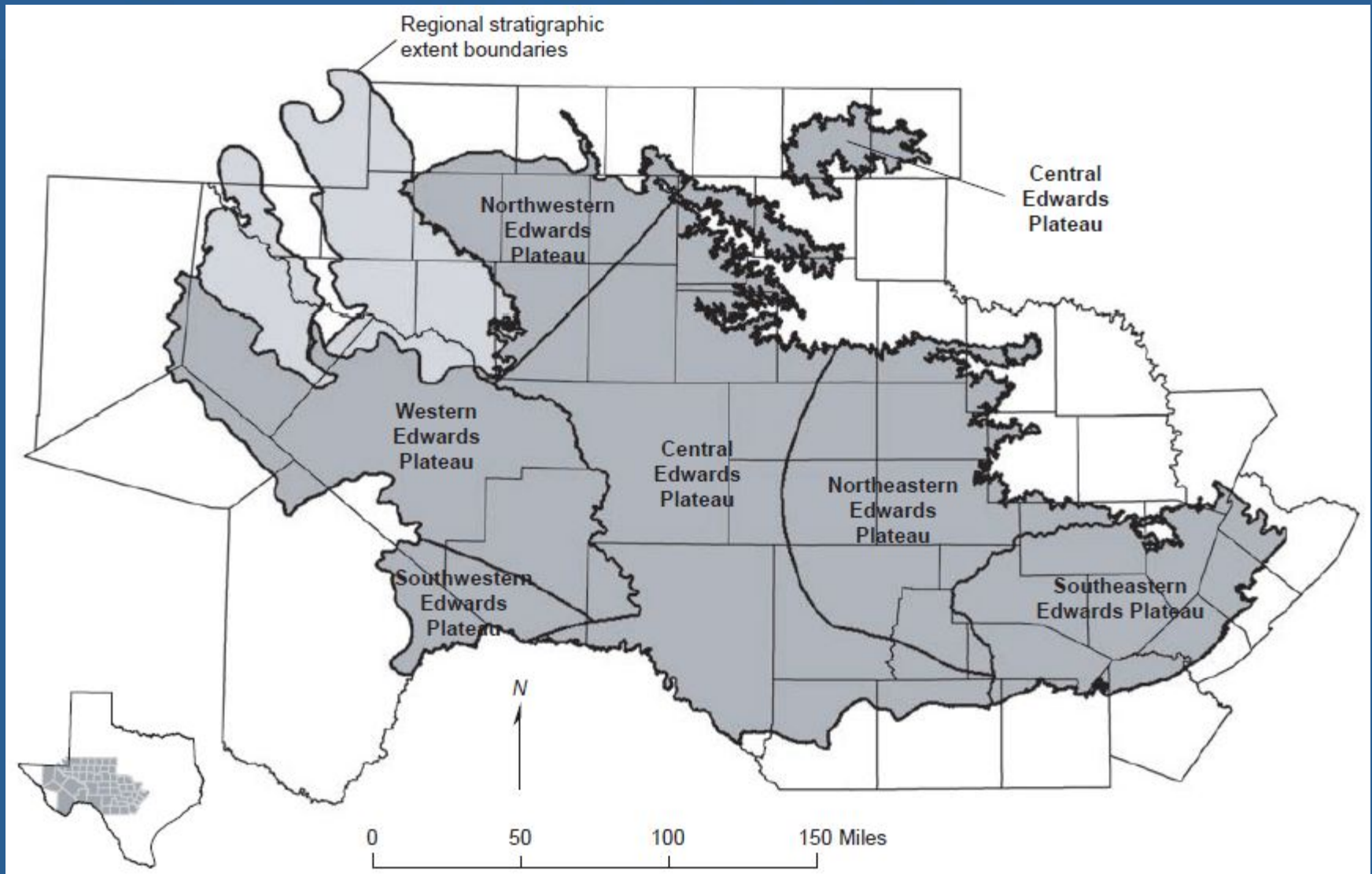


Figure 5-1. Regional extents of stratigraphic nomenclature for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity (Hill Country) aquifer systems.

Anaya, R., and Jones, I.C., 2009, Groundwater Availability Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers of Texas, Texas Water Development Board Report 373

Regional Stratigraphic Nomenclature

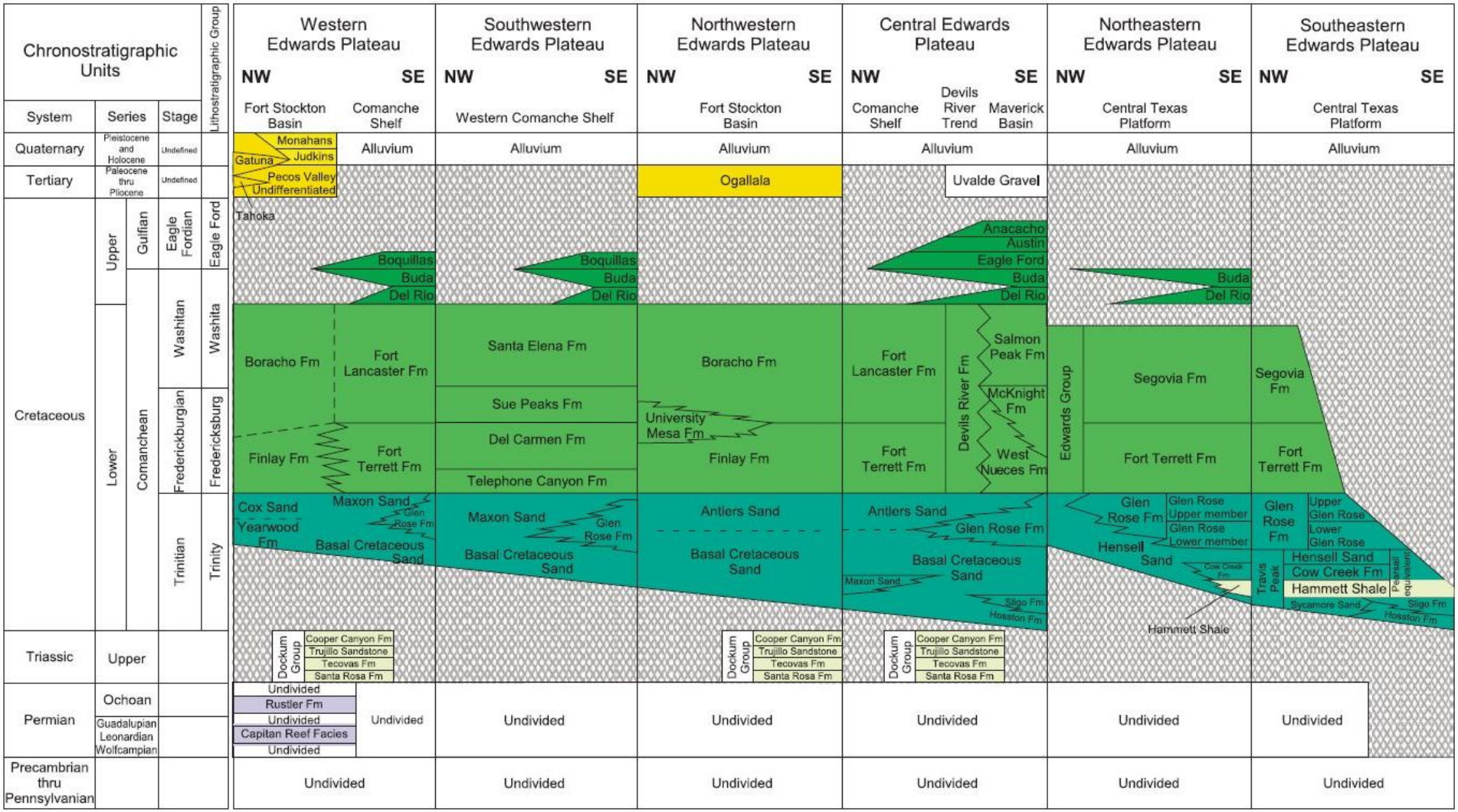
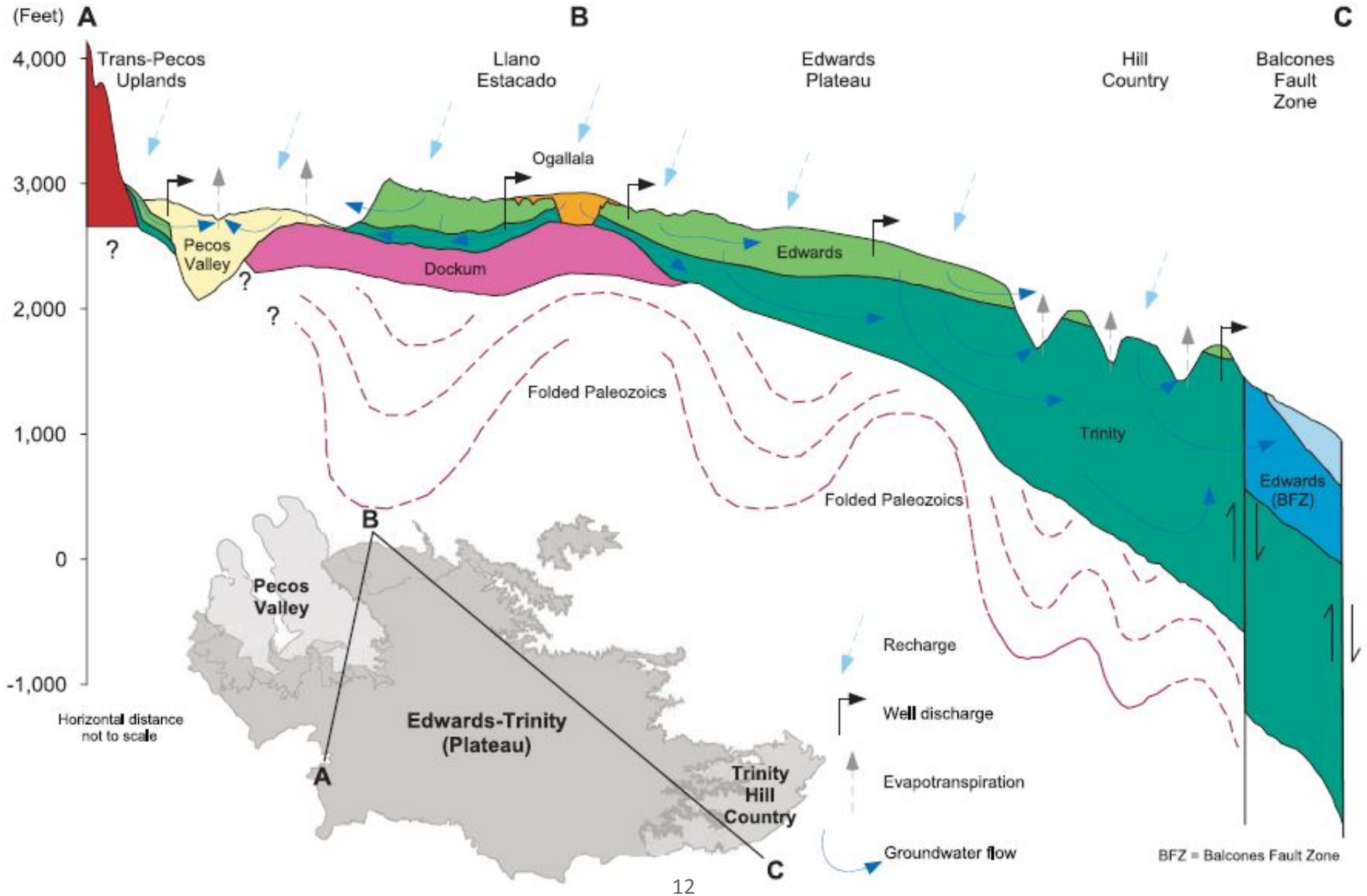


Figure 5-2. Stratigraphic chart of the Edwards-Trinity (Plateau) and Pecos Valley aquifers and the Hill Country part of the Trinity Aquifer (modified from Barker and Ardis, 1996).
Fm= formation

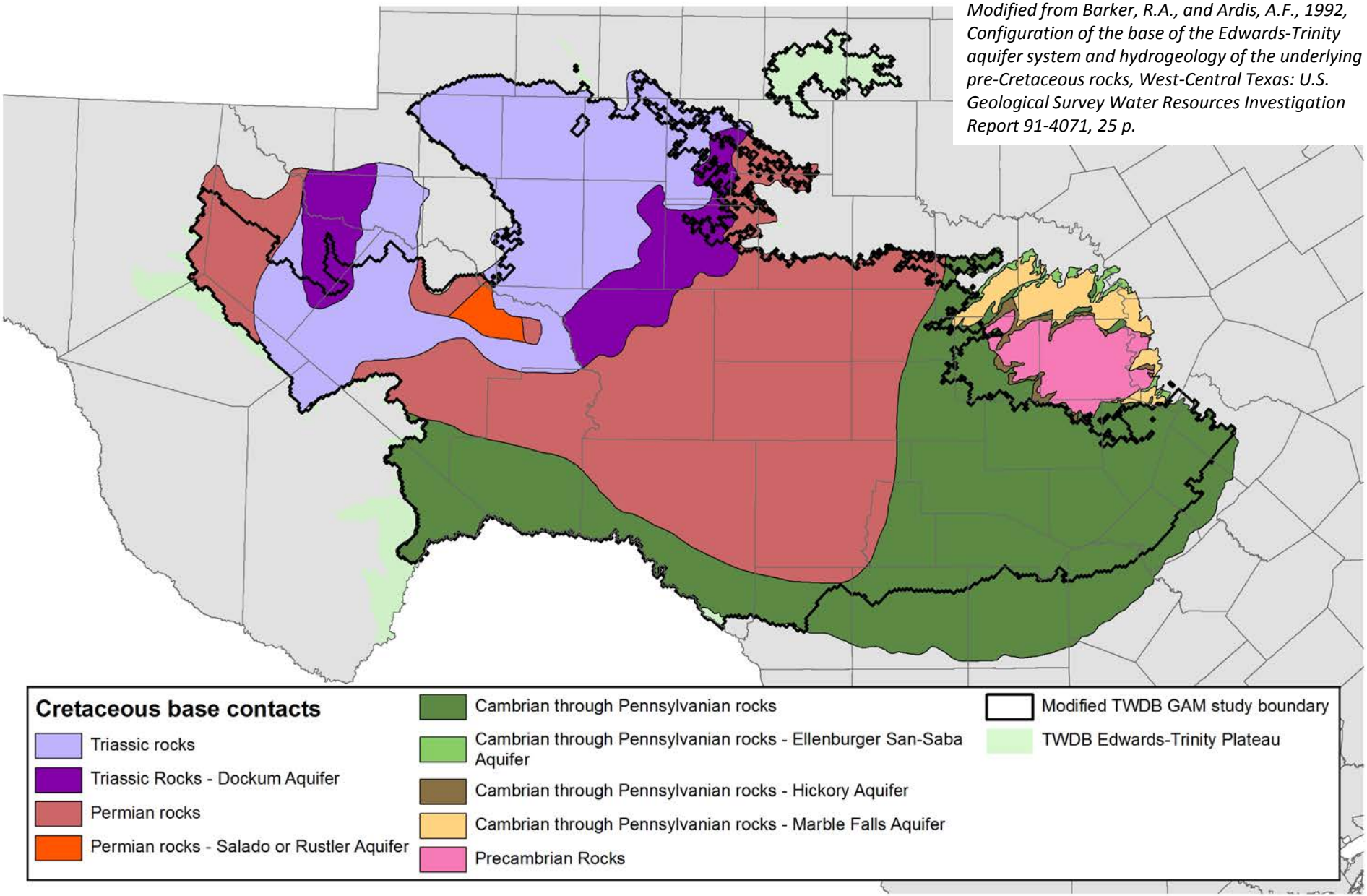
Anaya, R., and Jones, I.C., 2009, Groundwater Availability Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers of Texas, Texas Water Development Board Report 373

Conceptual Cross Section: Report 373



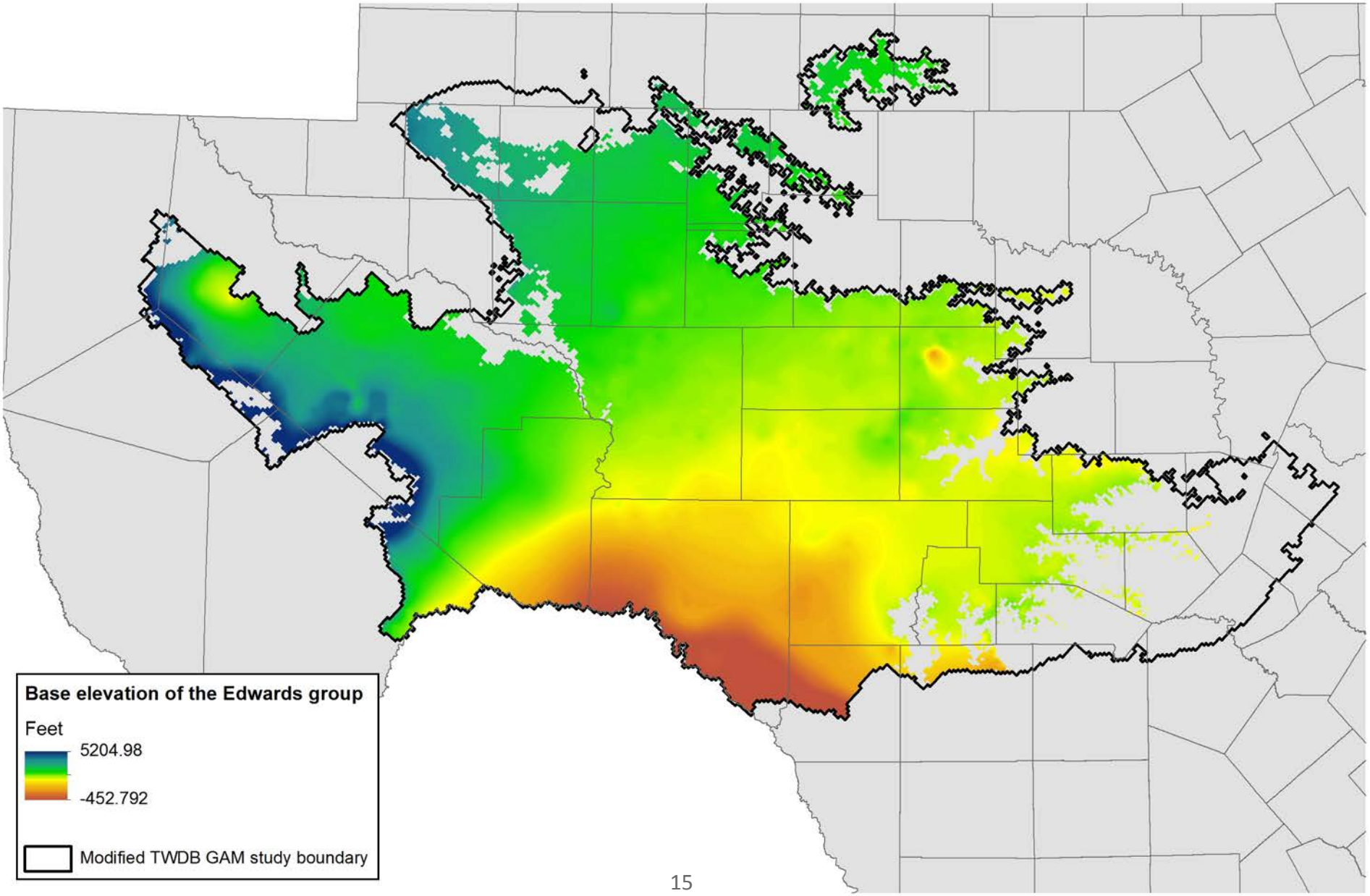
Variable Platform Base

Modified from Barker, R.A., and Ardis, A.F., 1992, Configuration of the base of the Edwards-Trinity aquifer system and hydrogeology of the underlying pre-Cretaceous rocks, West-Central Texas: U.S. Geological Survey Water Resources Investigation Report 91-4071, 25 p.

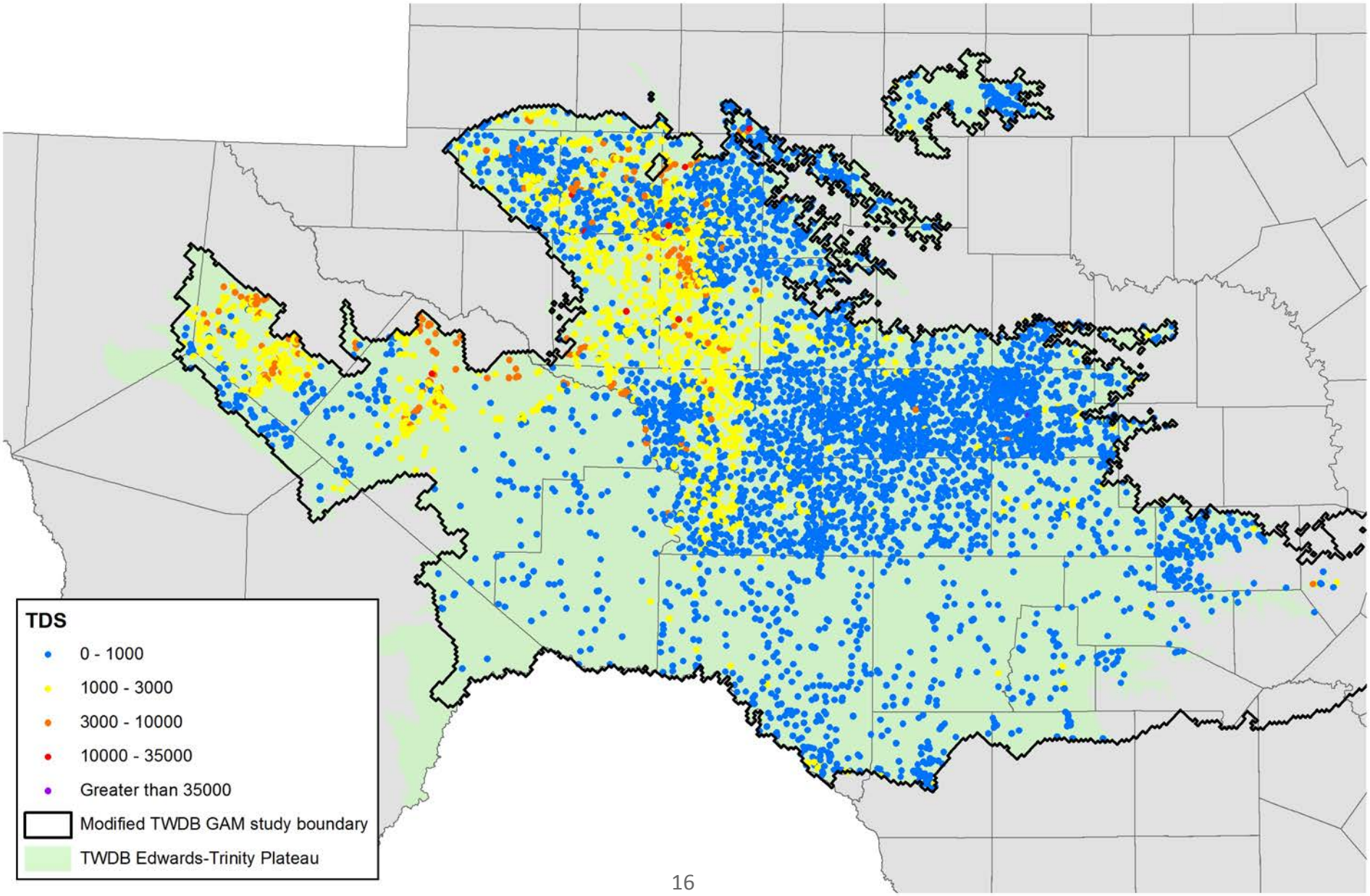


Data Collected (so far) and Data Gaps

TWDB Groundwater Availability Model



TWDB Groundwater Database



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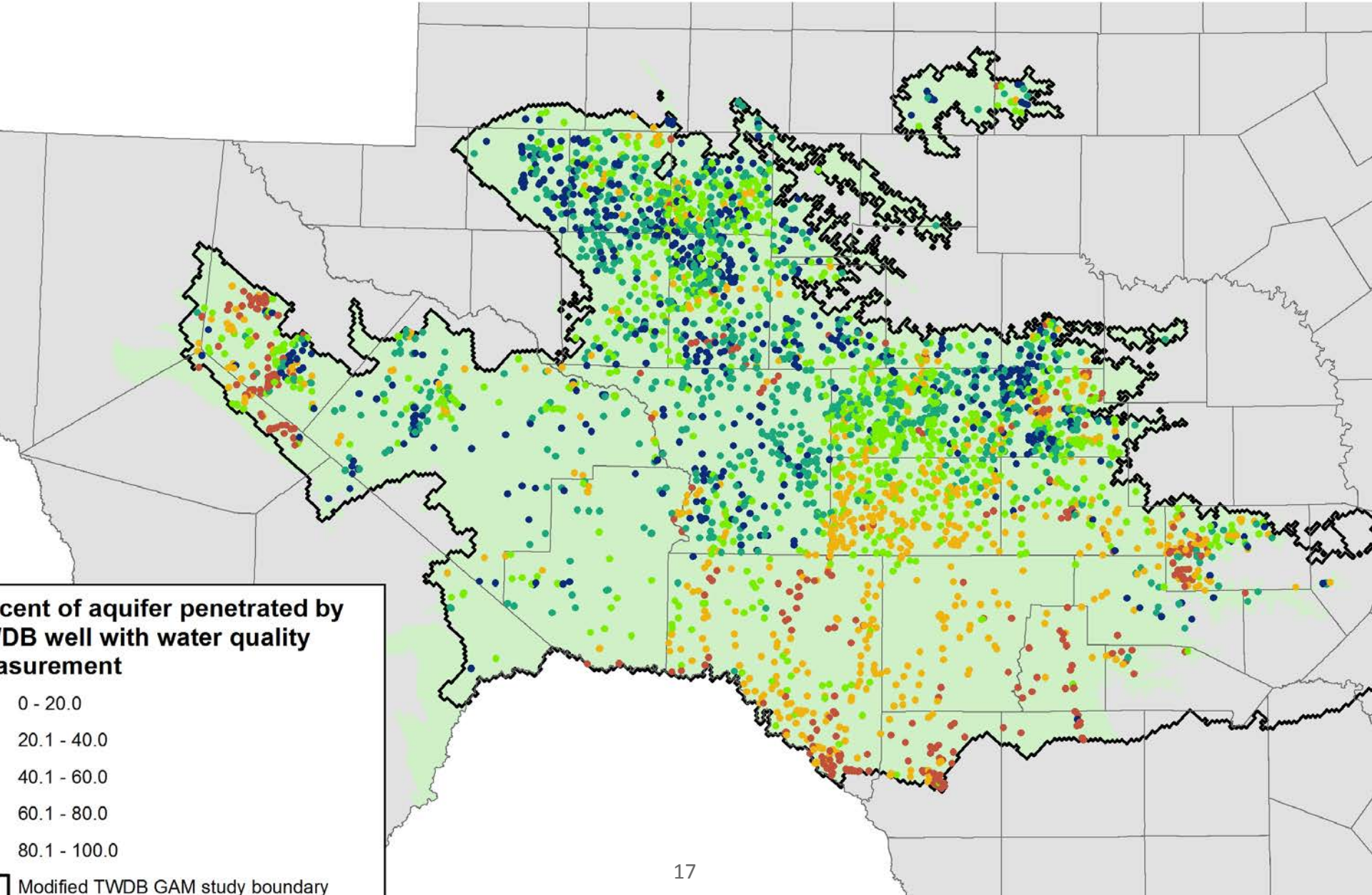
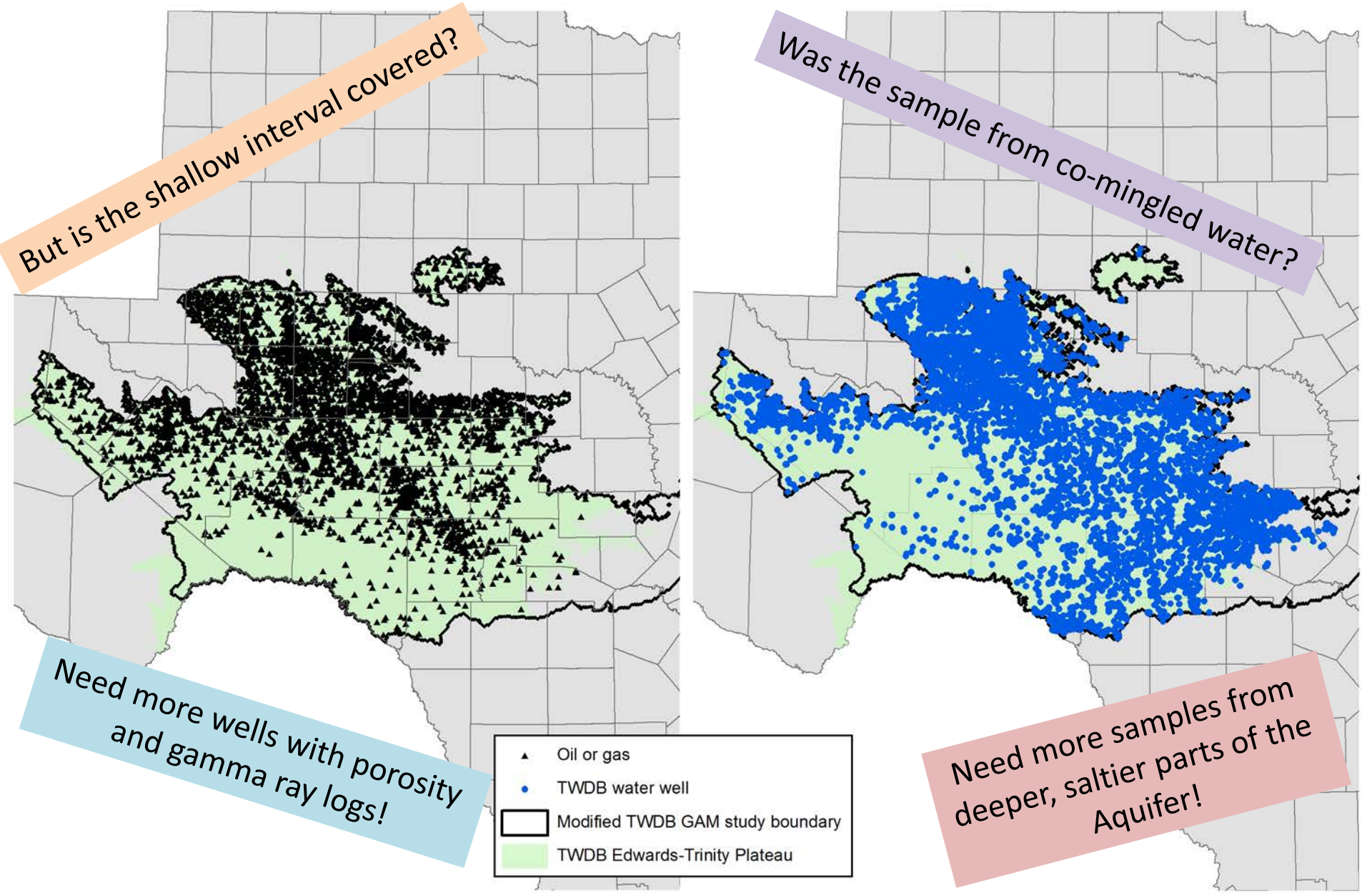


Data Gap: Southern and downdip portions of the aquifer



Anticipated Challenges

- Stratigraphy and lithology needs to match logs
  - *Review hydrostratigraphy/geophysical well log correlations by Allan Clark (USGS)*
- Variability of aquifer characteristics in karst aquifers
- Few measured brackish groundwater quality with anion/cation balance error +/-5% and known well construction
- Calculated TDS methodology
  - *Test Schultz, A.L., 1992, Using Geophysical Logs in the Edwards Aquifer to Estimate Water Quality Along the Freshwater/Saline-water Interface (Uvalde, Texas to San Antonio, Texas), Prepare for the Edwards Underground Water District, San Antonio, Texas, 59p. methodology*
- Few geophyisical log suites (G, R, P) at shallow depth
- Shaley limestones (strat picks, WQ calc, aquifer properties)
- Data from Mexico?

Next Steps

- Map stratigraphy, lithology, measured water quality, calculated water quality, aquifer properties, and existing use
- Calculate the volume of fresh, slightly saline, moderately saline, and very saline groundwater
- Host stakeholder meetings to discuss potential production area analysis
- PPA impact analysis
- Final report(s), study completion meeting(s), and stakeholder comment solicitation
- Board possibly designates brackish groundwater production zones (BGPZ)

Measured Water Quality Opportunity!

TWDB Water Quality Program

- TWDB's ambient groundwater quality sampling program is designed to monitor the quality of groundwater in the State.
- Major and minor aquifers in Texas are monitored for groundwater quality on a 4-year cycle.
- TWDB also conducts water-quality evaluations for groundwater studies, Groundwater Management Areas, well control activities, and through cooperative agreements with other entities.

Desired Well Characteristics for Measured Water Quality

Required:

- Brackish water wells tend to be deeper
- Accessible by TWDB staff
- Well has to be in good working condition
- Competent casing throughout
- Has to have a pump
- Has to have an untreated collection point as close to the wellhead as possible
- Area to discharge purge water for 15-30 minutes to obtain a representative sample

Desired:

- Lithology
- Well construction information
- Publicly available geophysical well logs

Benefits to Cooperating with TWDB to collect Measured Water Quality

- Free lab analysis (costs are normally about $400)
- Broad suite of analytes run including:
  - Calcium, magnesium, potassium, iron, sulfate, chloride, fluoride, silicate, phosphate
  - Parameters are tailored to each aquifer and may differ accordingly
- Improving community's scientific knowledge of the aquifer
- Great starting point to treat well water
- Data for science, not regulation
- Consult TWDB User manual 51

Boghici R., 2003. A Field Manual for Groundwater Sampling: Texas Water Development Board User Manual 51, 47 p.

Questions, Comments, and Input from Stakeholders

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http://www.twdb.texas.gov/innovativewater/bracs/studies/Edwards_Trinity/index.asp