

Study of Brackish Aquifers in Texas: Nacatoch and Blossom Aquifers

Northeast Texas (Region D) Regional Water Planning Meeting
Mount Pleasant, Texas
October 19, 2017



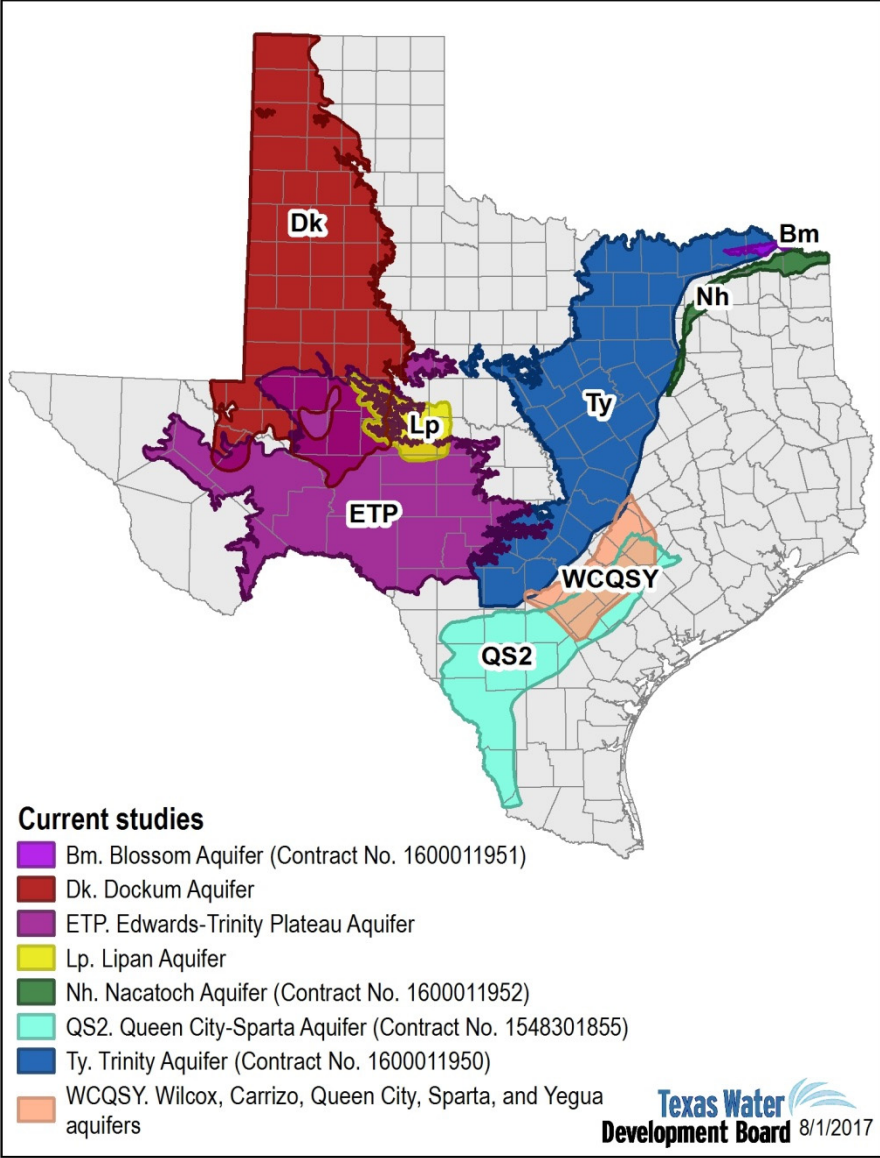
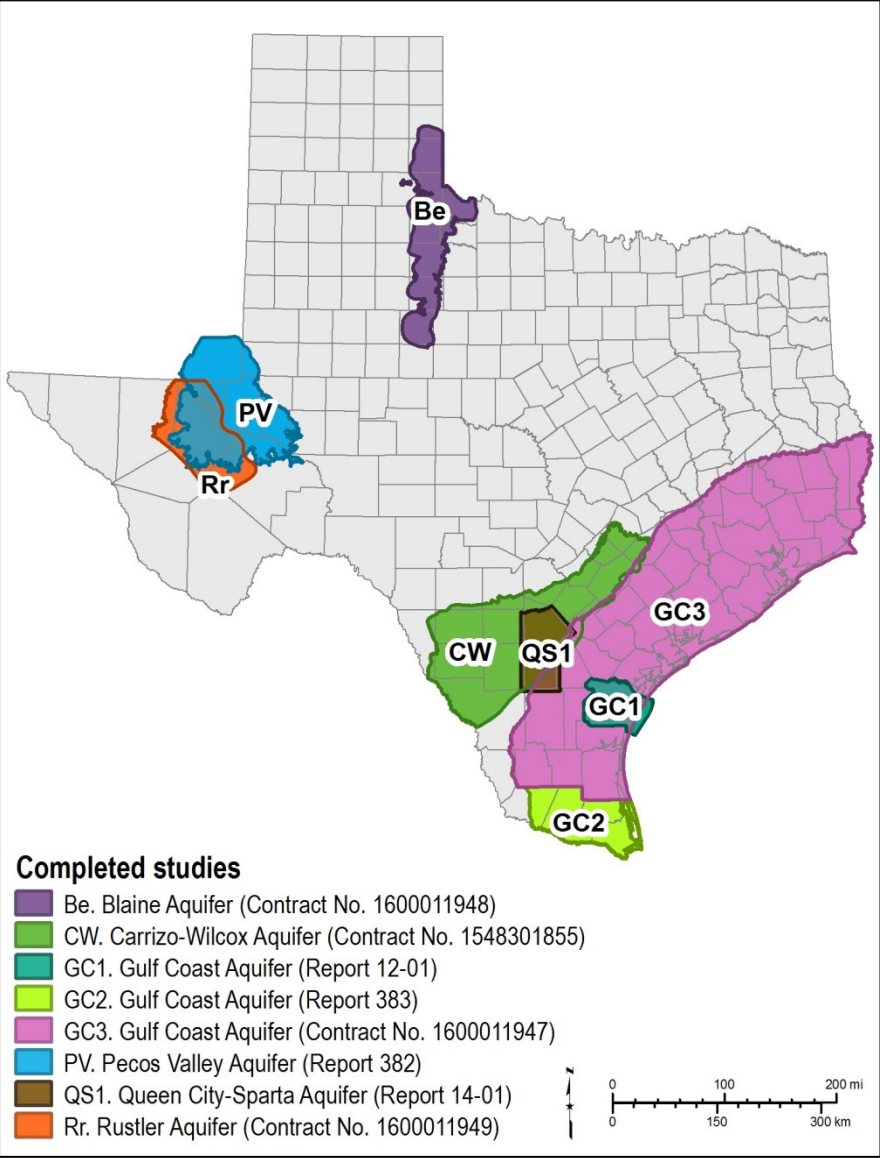
Disclaimer

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.

Brackish Groundwater Production Zones

- In 2015, the 84th Texas Legislature passed House Bill 30, directing the TWDB to
 - (1) identify and designate brackish groundwater production zones in four aquifers and to report to the legislature by December 1, 2016,
 - (2) determine the volumes of groundwater that a brackish groundwater production zone can produce over 30- and 50-year periods without causing significant impact to water availability or water quality,
 - (3) work with groundwater conservation districts and stakeholders, and
 - (4) make recommendations on reasonable monitoring to observe the effects of brackish groundwater production within the zone.
- Furthermore, the TWDB shall identify and designate brackish groundwater production zones in all aquifers in the state by the legislatively mandated date of December 1, 2022.
- www.twdb.texas.gov/innovativewater/bracs/HB30.asp

Brackish Resources Aquifer Characterization System (BRACS) Program



Contract Team

Nacatoch Aquifer

- Project Management
LBG-Guyton Associates, Kristie Laughlin
- Structure and Stratigraphy
Bureau of Economic Geology, Scott Hamlin
- Well Log Interpretation
Collier Consulting, Inc., Lou Fleischhauer

Blossom Aquifer

- Project Management
 - Structure and Stratigraphy
 - Well Log Interpretation
- } LBG-Guyton Associates



Groundwater Salinity Classification

Groundwater salinity classification	Range in TDS ^a (mg/L) ^b	General description
Fresh	Less than 1,000	Drinking Water
Slightly saline	1,001 to 3,000	Downdip Aquifer Limit
Moderately saline	3,001 to 10,000	Downdip Study Area Limit
Very saline	10,000 to 35,000	Outside of Project Scope
Brine	Over 35,000	Seawater

^a TDS = total dissolved solids.

^b Mg/L = milligrams per liter.

Source: Modified from Winslow and Kister (1956).

Brackish Groundwater Production Zones

Criteria designation:

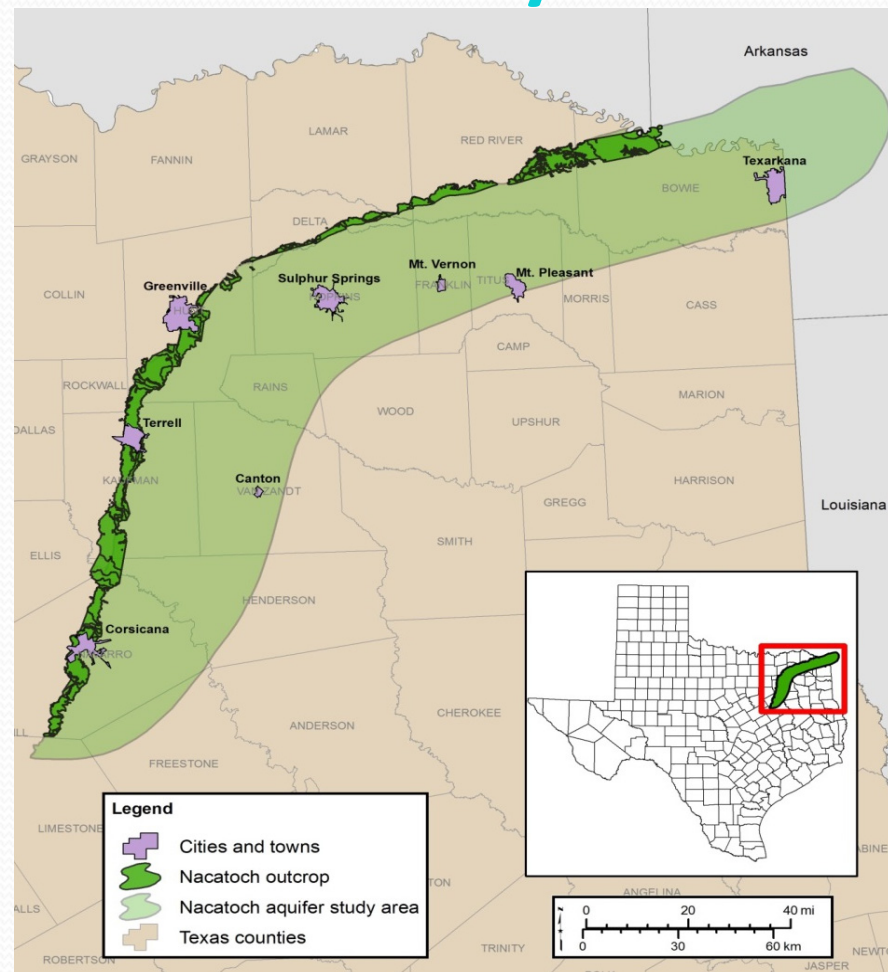
Must have brackish water	In areas of the state with moderate to high availability and productivity
Must have hydrogeologic barriers	sufficient to prevent significant impacts to fresh water availability or quality
Cannot be within these boundaries	Edwards Aquifer within the Edwards Aquifer Authority, 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



Nacatoch Aquifer

Nacatoch Aquifer Study Area

- Study area from the GAM excluding Oklahoma and Arkansas portions of the aquifer
- Area includes outcrop plus all data locations used to estimate water quality
- Mexia-Talco Fault Zone

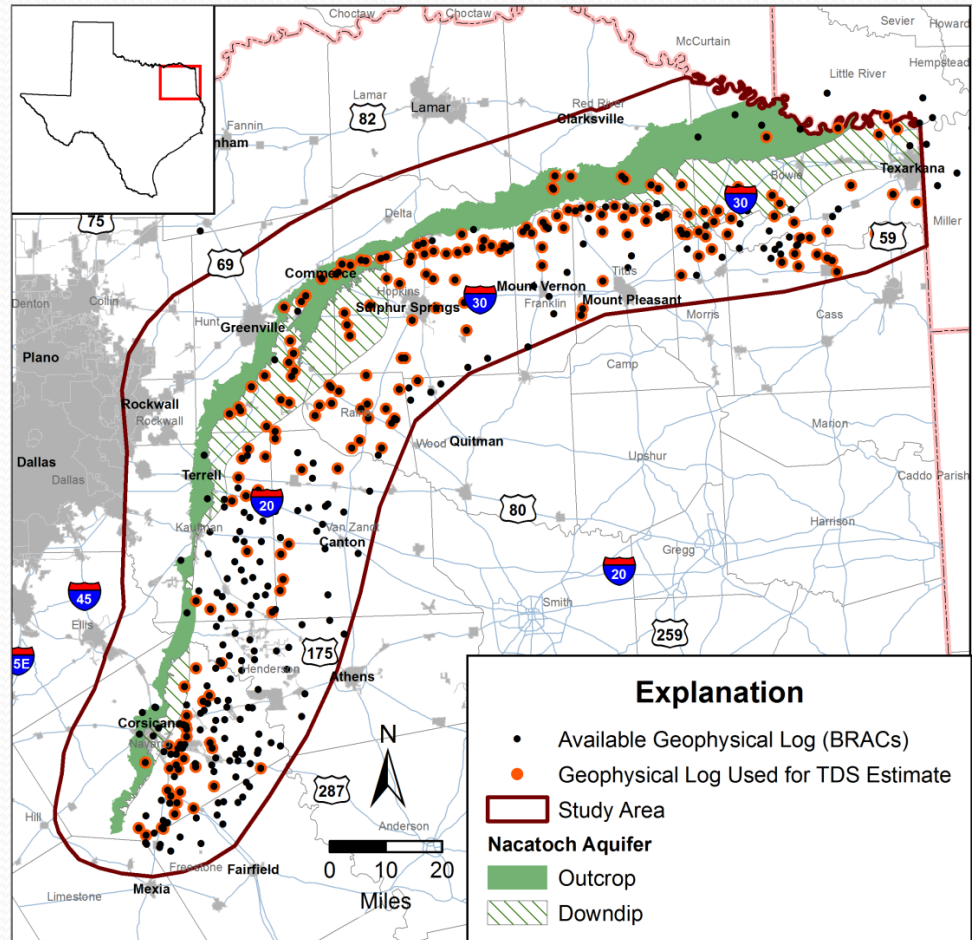


Nacatoch Aquifer Geology

System	Group	Stratigraphic units		Maximum thickness (feet)	Lithology	Water-bearing properties
Quaternary		Alluvium and fluvial terrace deposits		80	Sand, silt, clay and gravel.	Yields small to moderate quantities of fresh to slightly saline water.
Cretaceous	Navarro	Upper Navarro Clay	Kemp Clay	400	Clay, calcareous, silty, medium-dark gray.	Not known to yield water.
		Upper Navarro Marl	Corsicana Marl	20	Mudstone, sandy and hard calcareous sandstone and siltstone.	Not known to yield water.
		Nacatoch Sand		450	<u>Alternating sequences of fine-grained quartz sand and mudstone.</u>	Yields small to moderate quantities of fresh to slightly saline water near the outcrop.
		Lower Navarro Clay	Neylandville Marl	125	Clay, calcareous, silty, sandy, medium-gray.	Not known to yield water.
	Taylor	Marlbrook Marl		1,500	Clay, marl, mudstone and chalk.	Not known to yield water.

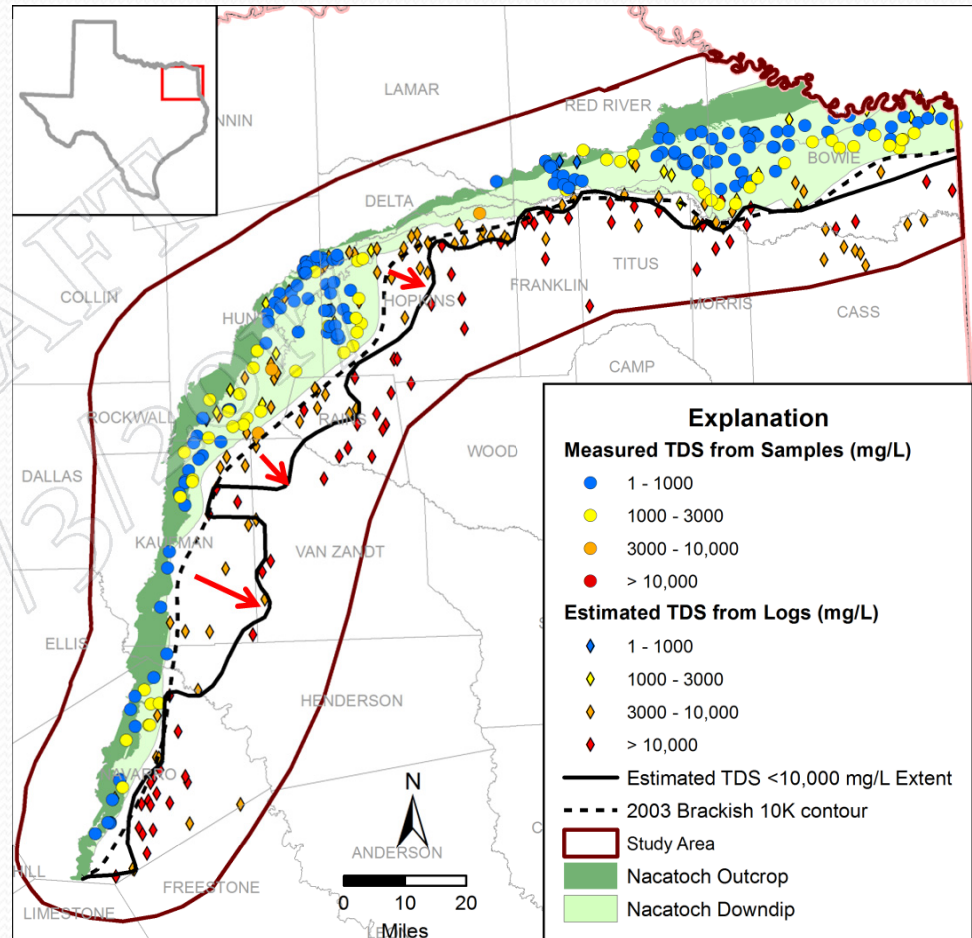
Nacatoch Aquifer Log Data

- 413 geophysical logs were available in the BRACs database
- 309 logs were used to estimate TDS using the Minimum Rwa method



Nacatoch Aquifer TDS (2017)

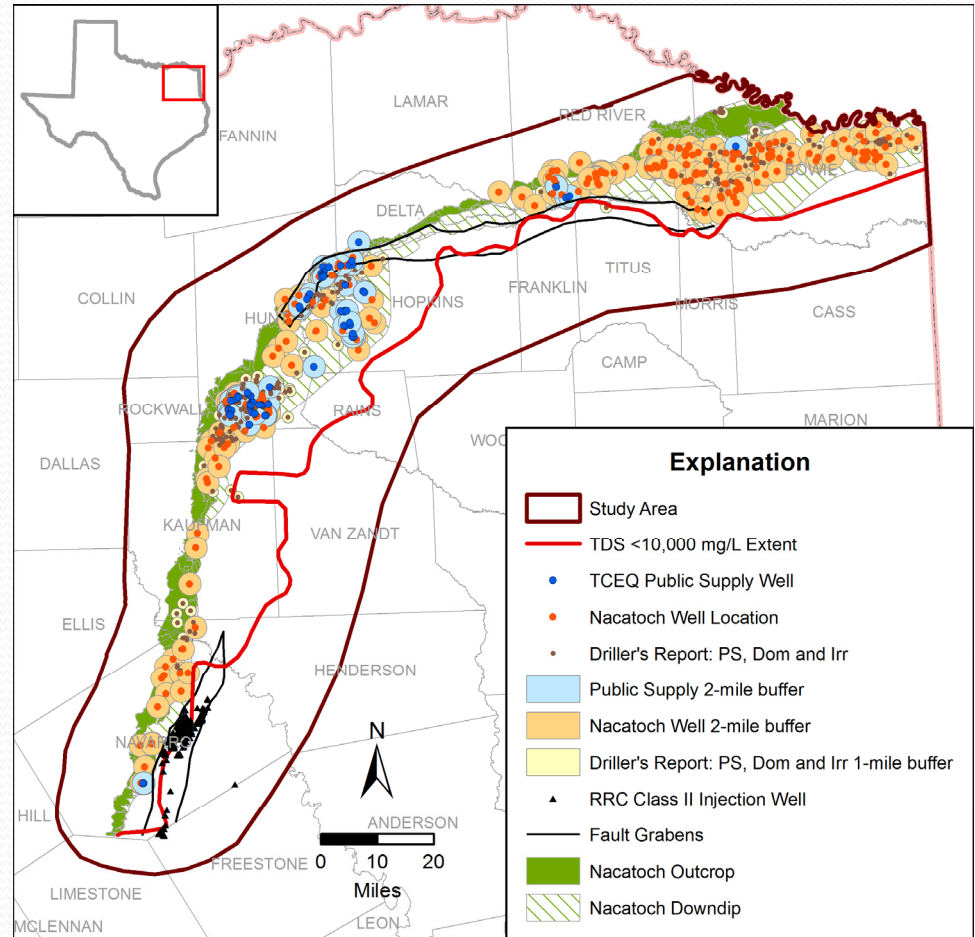
- Dwdip extent of moderately saline waters based on geophysical log estimates
- Comparison of 10,000 mg/L TDS extents between 2003 and 2017
- Current study indicates an expanded area of moderately saline groundwater in some areas (Kaufman, Van Zandt, Henderson, Rains and Hopkins Counties) compared to previous estimate
- Expanded areas suggest that the fault zone does not have as much control on the distribution of groundwater salinity in these areas as it does where the grabens are located



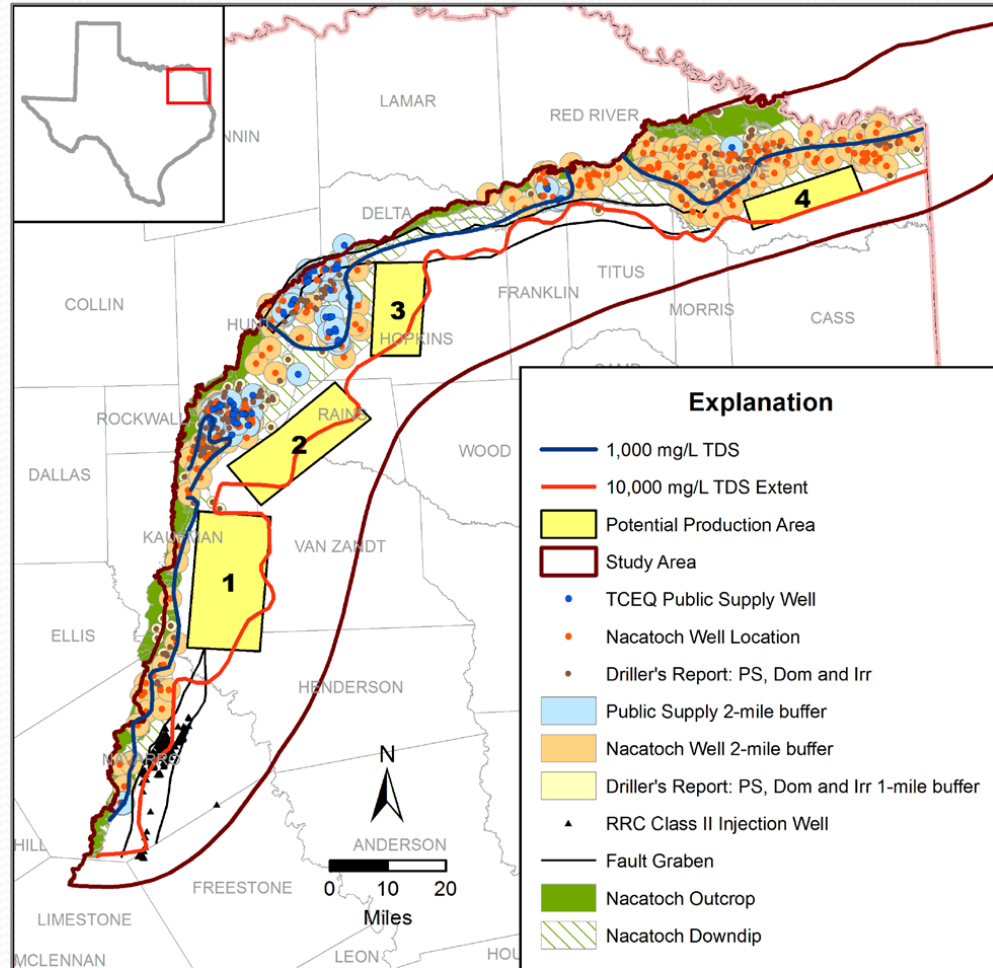
Nacatoch Exclusion Items

Applicable exclusion items include:

- Wells: public supply, irrigation, and domestic use with one to two-mile buffers.
- Wells completed with total depths that leave less than 200 feet of vertical separation from the Nacatoch (alluvium wells)
- Injection wells completed in zones with less than 400 feet of vertical separation from the Nacatoch. These are located in the southern fault graben.



Nacatoch Potential Production Areas



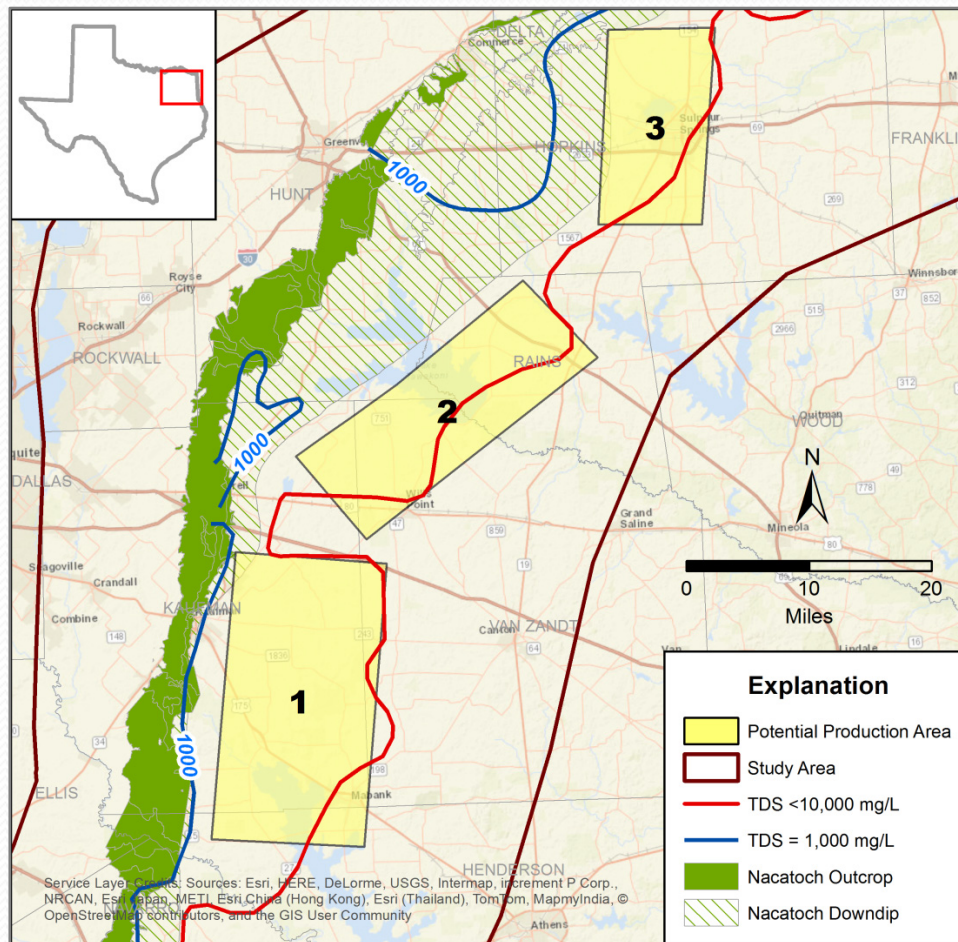
Nacatoch Potential Production Areas

Estimated Depth to top Nacatoch

- 1 400 – 1,000 feet
- 2 450 – 1,350
- 3 500 - 650

Net Sand Thickness

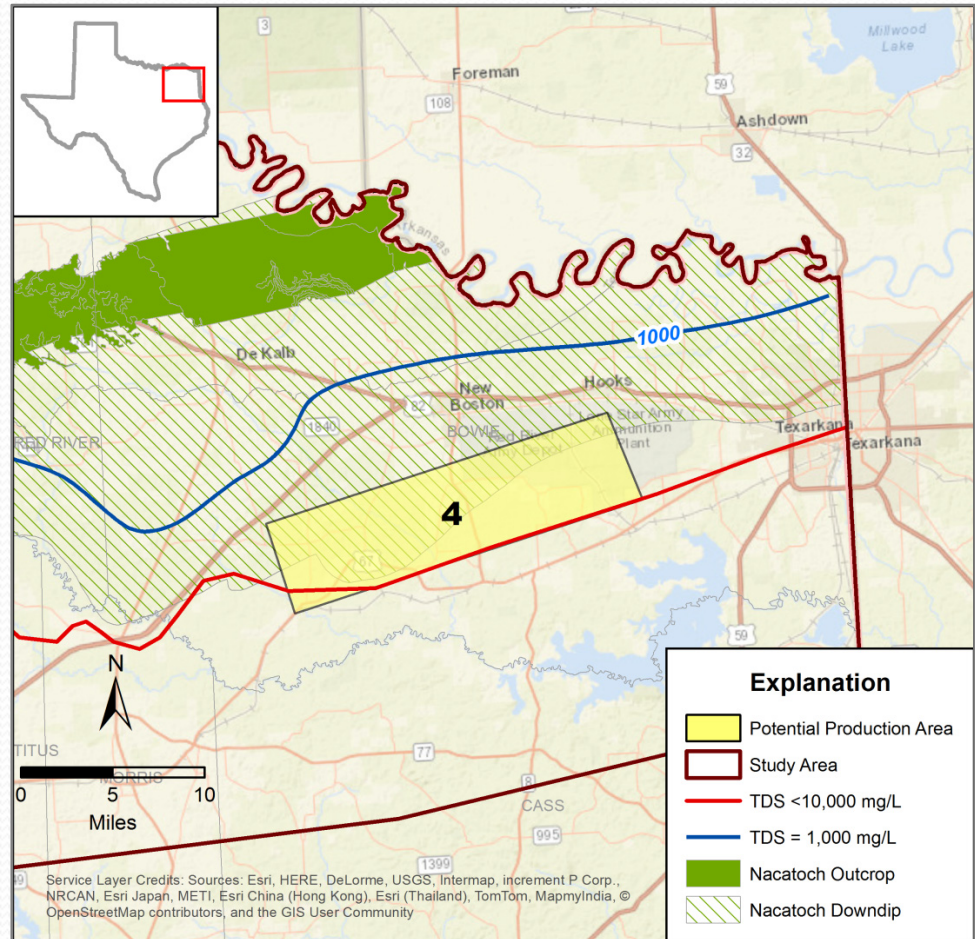
- 1 0 - 40 feet
- 2 30 - 70
- 3 25 - 65



Nacatoch Potential Production Areas

Estimated Depth to top Nacatoch
700 – 1,000 feet

Net Sand Thickness
30 - 100 feet

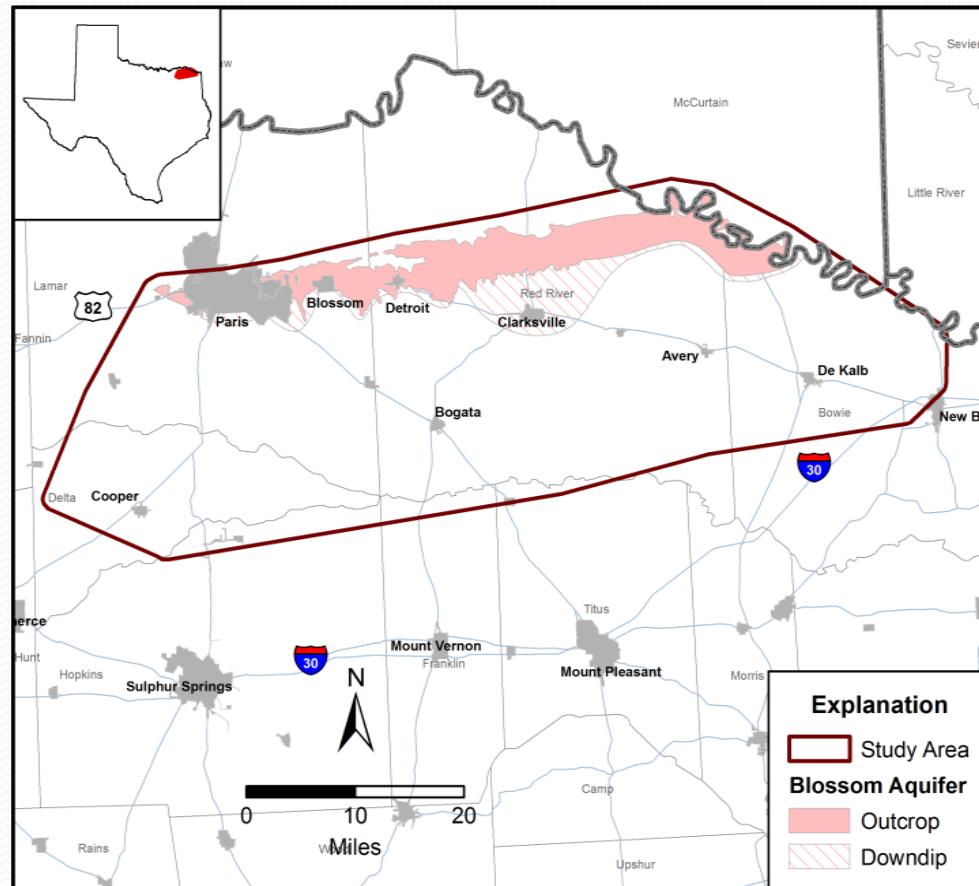




Blossom Aquifer

Blossom Aquifer Study Area

- Study area includes eastern Lamar, Red River and western Bowie Counties
- Area includes outcrop plus all data locations used to estimate water quality

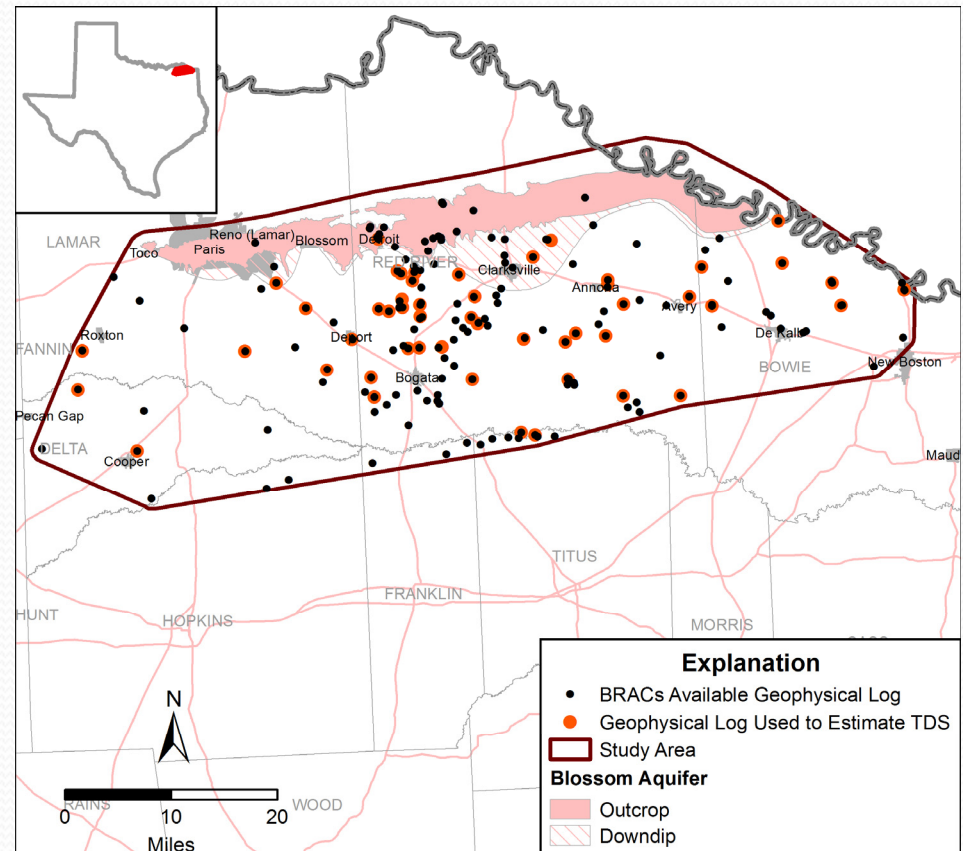


Blossom Aquifer Stratigraphy

Era/ System	Series	Group	Formation	Maximum thickness (feet)	Lithology	Water-bearing properties
Cenozoic/ Quaternary	Recent		Alluvium	75	Sand, silt, clay and gravel	Yields small to moderate quantities of fresh to slightly saline water
	Pleistocene		Fluviatile, terrace deposits			
Mesozoic/ Cretaceous	Gulf	Taylor	Marbrook Marl, Pecan Gap Chalk, Wolfe City – Ozan Formation	1,500	Clay, marl, shale, chalk, mudstone, and sandstone, very fine-grained	Not known to yield significant quantities of water
		Austin	Gober Chalk	300	Chalk, discontinuous	Yields small to moderate quantities of water
			Brownstown	220	Clay or shale	
			Blossom Sand	400 (formation) 80 (lower sand only)	Fine to medium sand (upper and lower) interbedded with marl and chalky marl	
			Bonham	530	Clay or shale	
		Ector	80	Chalk		
Eagle Ford	650	Shale with thin beds of sandstone and limestone	Not known to yield water			

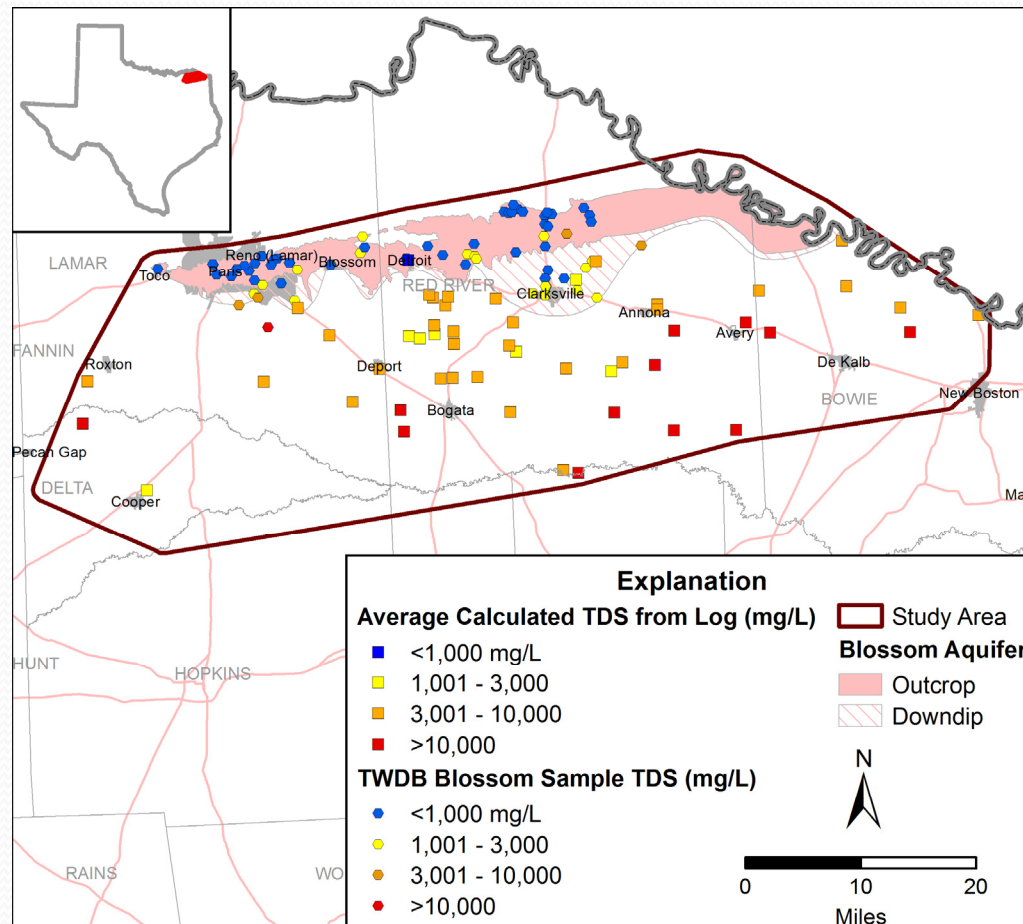
Blossom Aquifer Log Data

- 169 geophysical logs were available from the BRACs database and additional Q-logs
- 52 logs were remaining after 15 were omitted due to questionable log header values associated with mud filtrate and mud resistivity



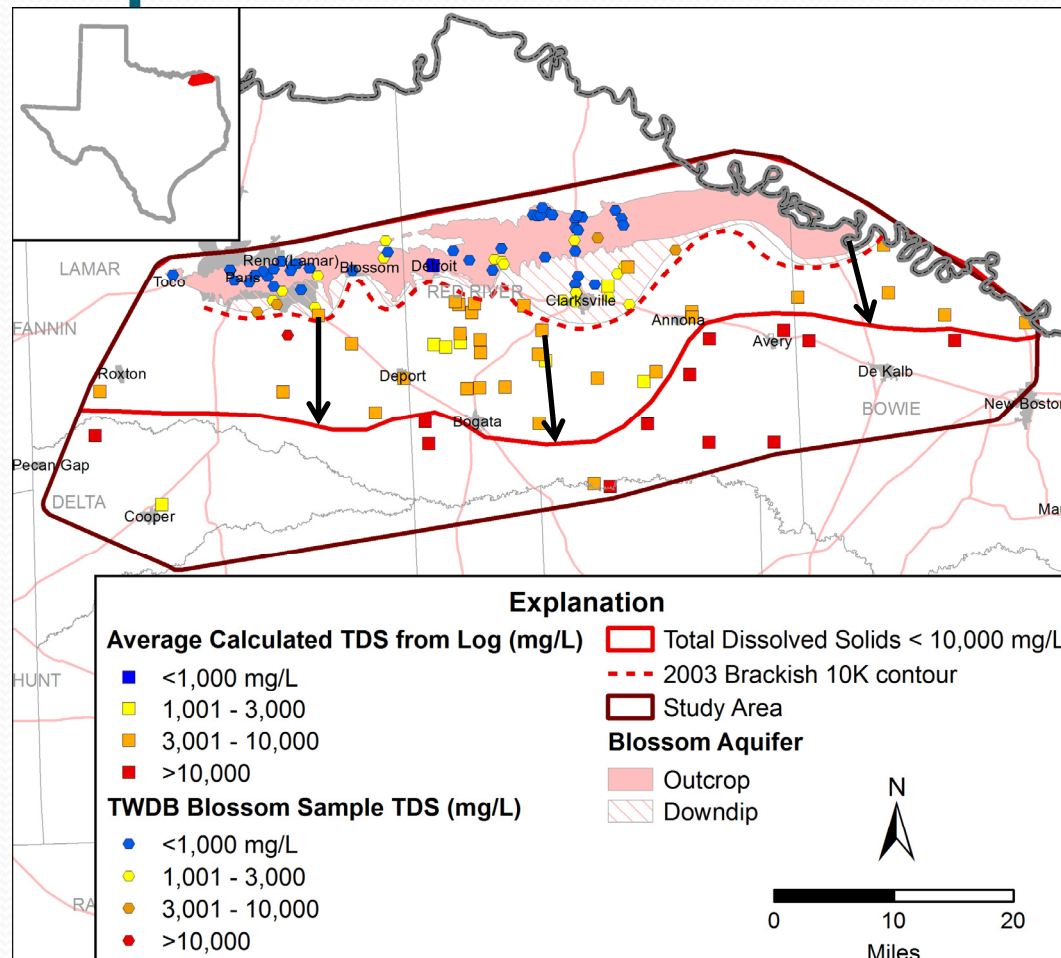
Blossom Aquifer TDS (2017)

- Analytical samples and geophysical log estimates mapped collectively
- These data suggest that TDS can vary quite a bit over short distances



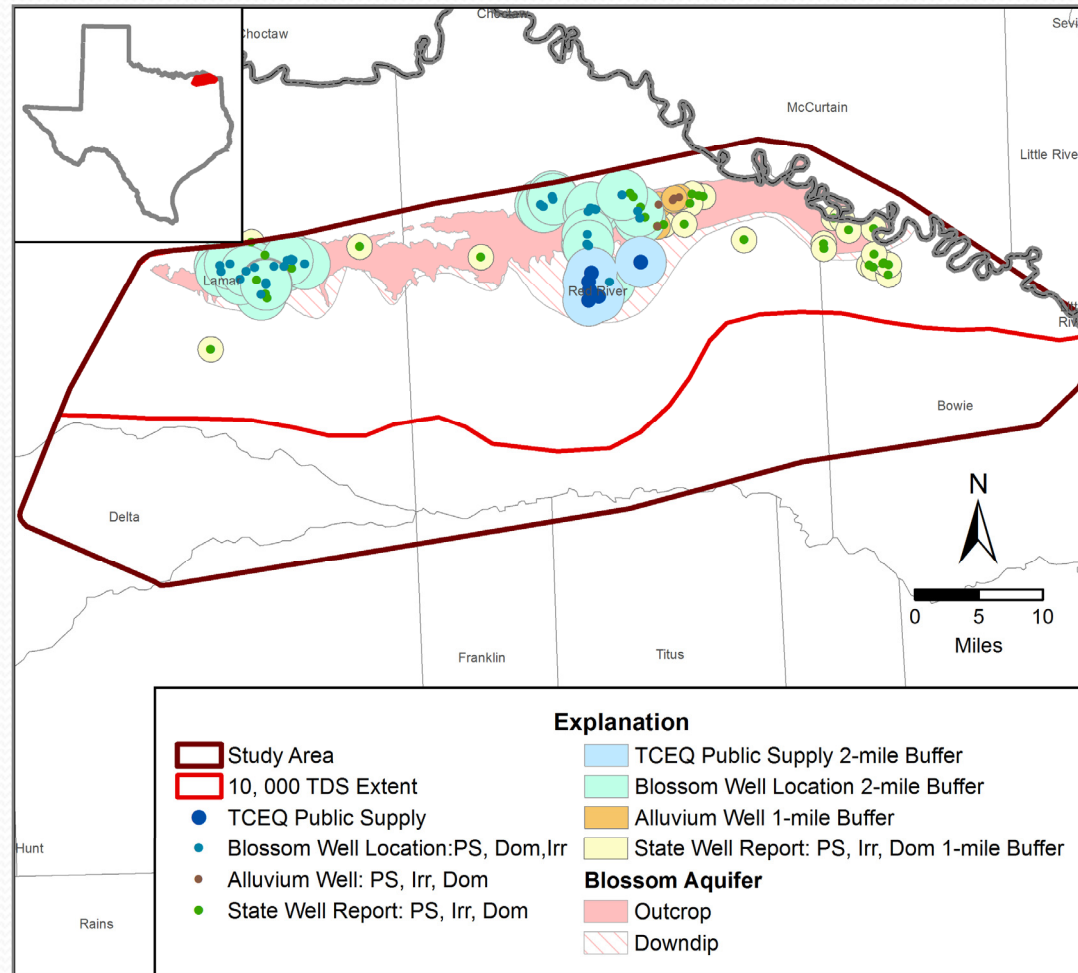
Blossom Aquifer 10K Extent

- Comparison of 10,000 mg/L TDS extents between 2003 and 2017 studies
- Current study indicates an expanded area of moderately saline groundwater compared to previous estimate

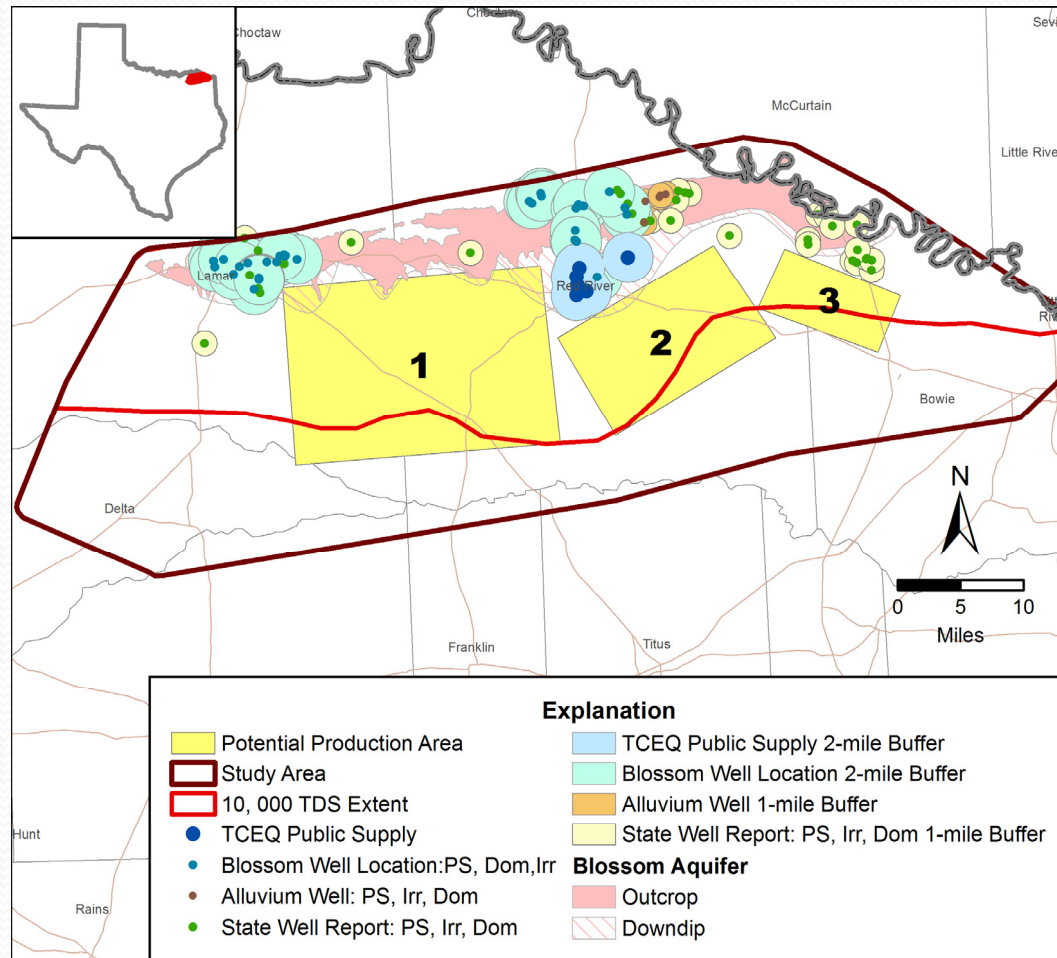


Blossom Exclusion Items

- Wells: public supply, irrigation, and domestic use
- These wells are completed in the Blossom or overlying alluvium



Blossom Potential Production Areas



Blossom Potential Production Areas

Depth to Top of Blossom

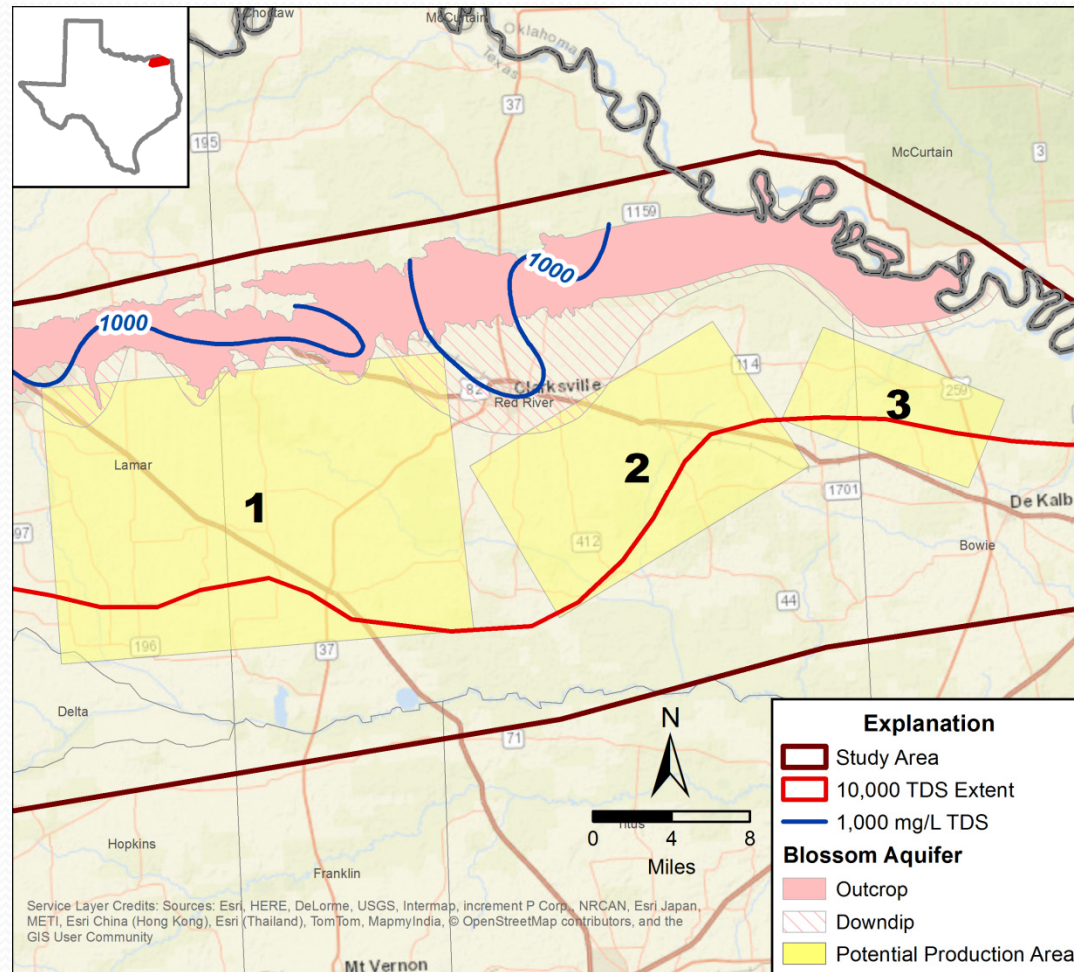
- 1 0 - 1,400 feet
- 2 200 - 1,400
- 3 150 - 1,050

Depth to Top of Lower Sand

- 1 50 - 1,500 feet
- 2 700 - 1,500
- 3 650 - 1,350

Lower Sand Thickness

- 1 30 - 70 feet
- 2 60 - 80
- 3 45 - 90



What happens next?

- The delineation of potential production areas presented today are draft and open to public comment
- This presentation will be publicly available at the TWDB BRACS website; Stakeholders will receive an email when it is posted
 - www.twdb.texas.gov/innovativewater/bracs/HB30.asp
- Stakeholders should send their comments to the TWDB
 - Nacatoch Aquifer -Jean Perez, jean.perez@twdb.texas.gov
 - Blossom Aquifer -Alan Andrews, alan.andrews@twdb.texas.gov
- The Final Report will be posted to the TWDB website
- Brackish Groundwater Production Zones will be designated by the TWDB at a public board meeting in Spring 2018
- Stakeholders will receive an email with the meeting date, time, and location

Questions or Comments?

