North Central Texas Council of Governments

From the Ground Up: The Whys and Hows of Groundwater Protection

NCTCOG Webinar
February 12, 2025

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EPA United States Environmental Protection Agency

Texas Commission on Environmental Quality

North Central Texas Council of Governments
Environment & Development

www.nctcog.org/WaterResources

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Webinar Procedures

- The webinar is being recorded and will be posted to NCTCOG's website under the green banner called "Webinars" here:

  https://www.nctcog.org/envir/natural-resources/water-resources

- If you submitted an RSVP for this webinar, you will receive an email with the presentation slides and a link to the recording. If you did not RSVP and would like these webinar materials, please email aknox@nctcog.org.
- Please keep your microphone on mute until the Question-and-Answer period at the end of the presentations.
- Thank you!

Welcome and Introduction of Speakers

Webinar Agenda

- **"West of the Metroplex; Groundwater & Growth"-** Jill Nicole Garcia, PG
- **"Groundwater Quality and the Impacts of Increased Development"-** Corey Jones
- **"Groundwater Supply Concerns and Protection"**– Kaylin Garcia
- Time for Q & A after the presentations

Speaker Introduction

Jill Nicole Garcia, PG

Assistant General Manager, Upper Trinity Groundwater Conservation District

West of the Metroplex: Groundwater & Growth

Jill Nicole Garcia, P.G.
Assistant General Manager
Upper Trinity Groundwater Conservation District

PGCD
PRAIRIELANDS GROUNDWATER CONSERVATION DISTRICT
JOHNSON · ELLIS · HILL · SOMERVELL

UPPER TRINITY
GROUNDWATER CONSERVATION DISTRICT
HOOD · MONTAGUE · PARKER · WISE

NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT

Outline

Upper Trinity Groundwater Conservation District

- Groundwater Introduction
- State of Water Resources – North Texas
- Groundwater Studies & Modeling

Northern Trinity Groundwater Conservation District

- Groundwater Quality
- Development – Tarrant Co.

Prairielands Groundwater Conservation District

- Supply Concerns
- Conservation Initiatives

Questions and Connect

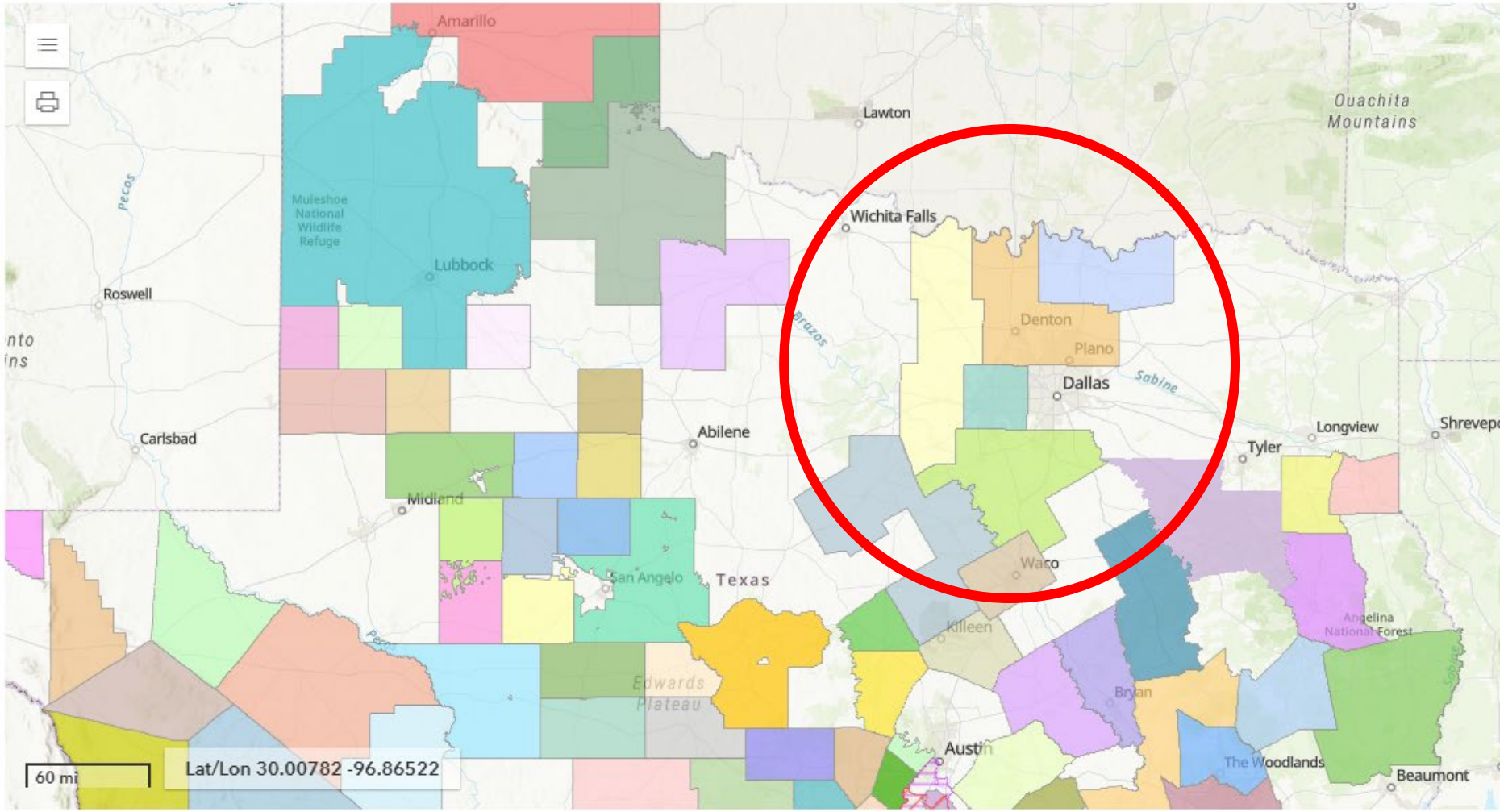
TAGD
TEXAS ALLIANCE OF GROUNDWATER DISTRICTS

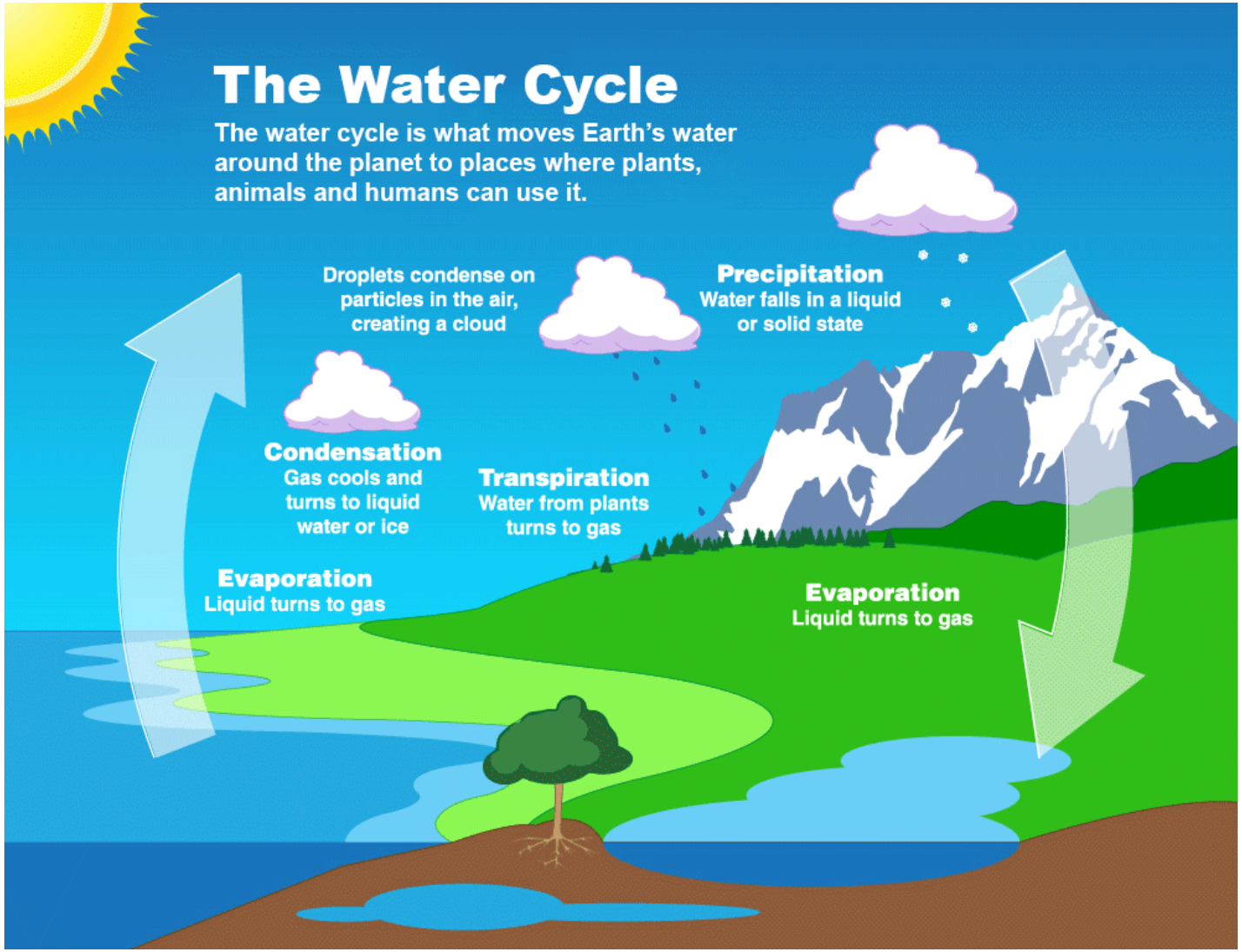
User Guide | Feedback

TAGD GCD Index

Layers

- GCD Boundaries
- GMA Boundaries
- Texas Counties
- Major Aquifers
- Minor Aquifers
- Geologic Atlas of TX

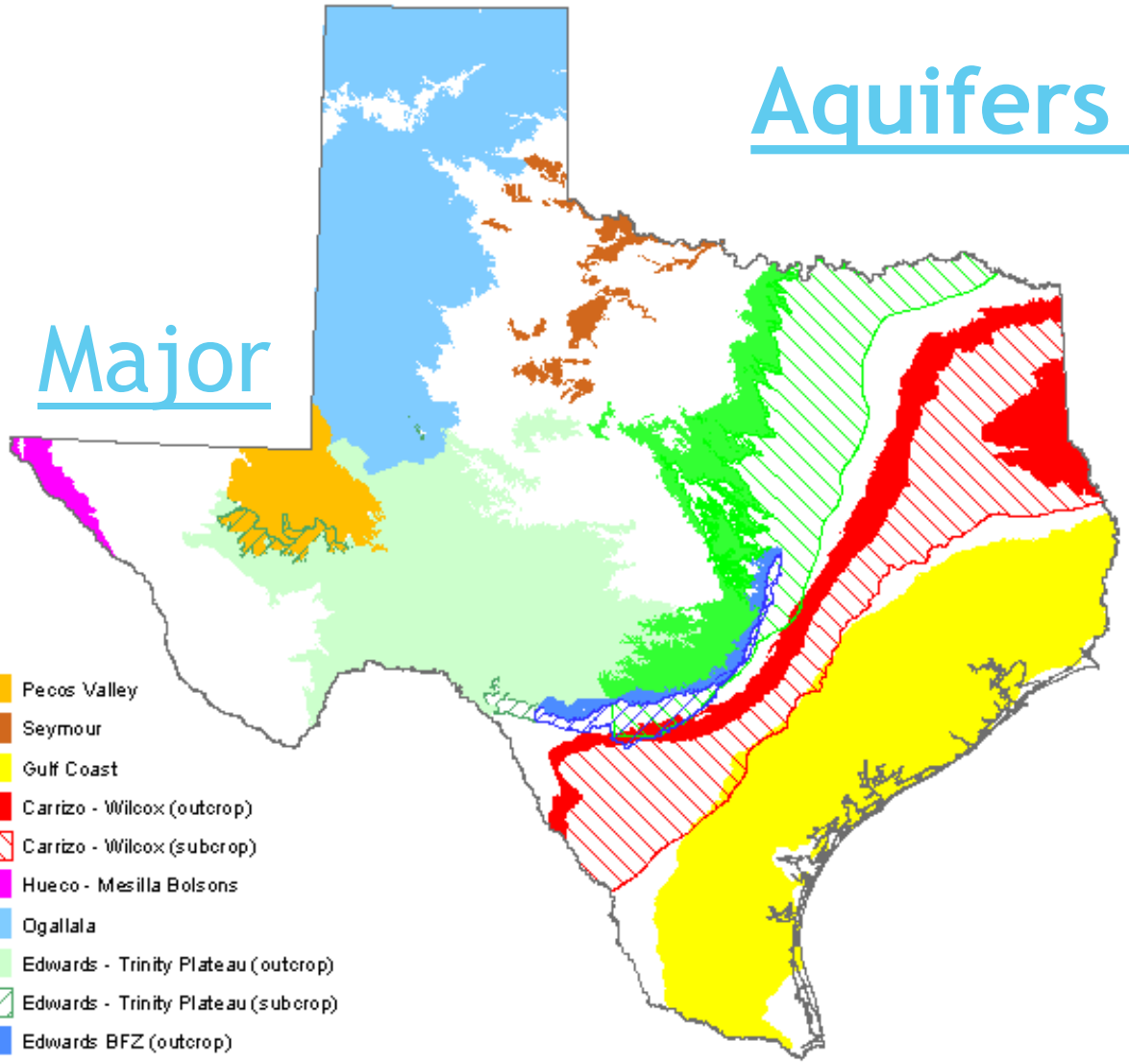



The Water Cycle
The water cycle is what moves Earth's water around the planet to places where plants, animals and humans can use it.
Droplets condense on particles in the air, creating a cloud
Precipitation
Water falls in a liquid or solid state
Condensation
Gas cools and turns to liquid water or ice
Transpiration
Water from plants turns to gas
Evaporation
Liquid turns to gas
Evaporation
Liquid turns to gas

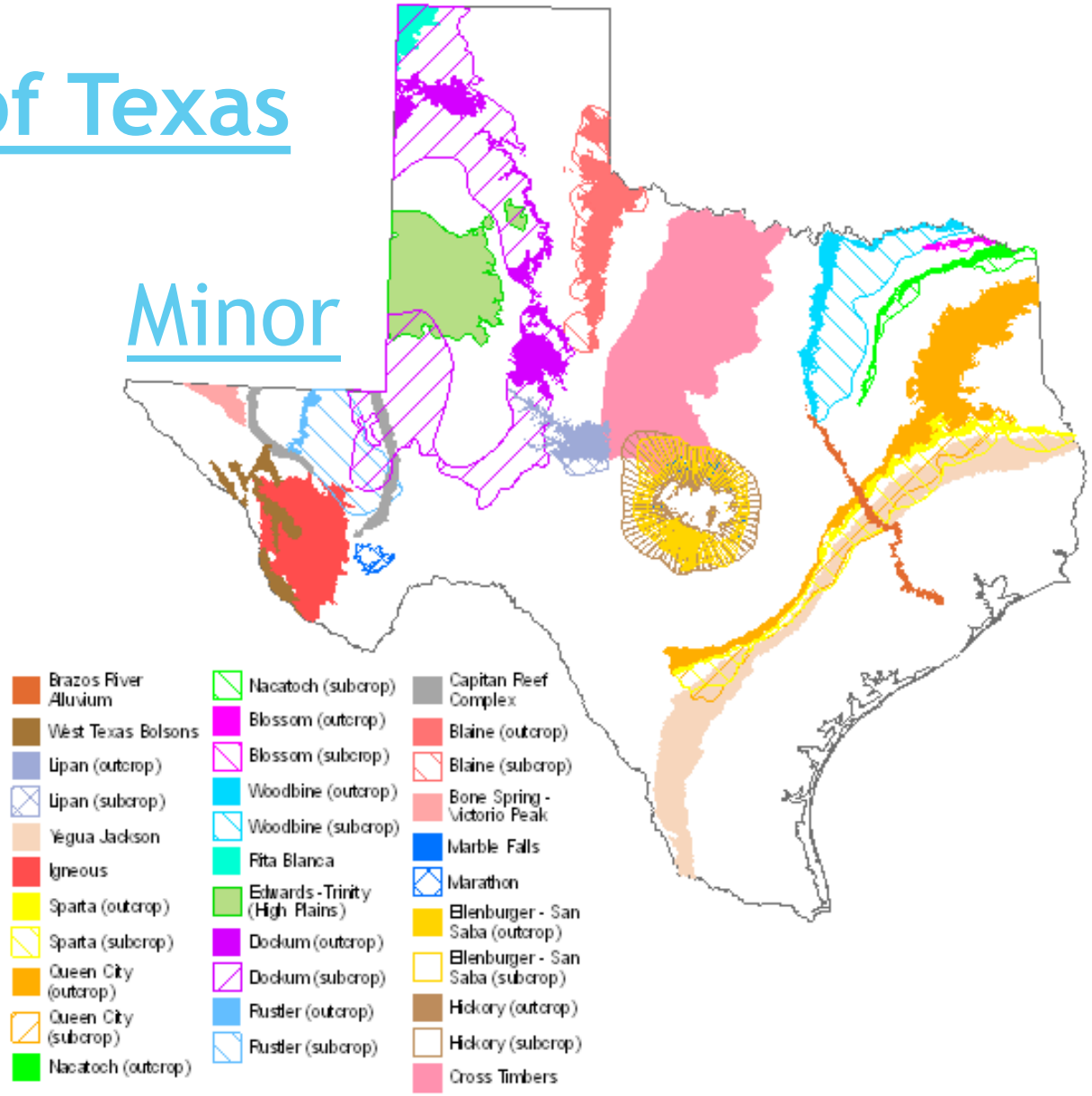
How Groundwater Moves

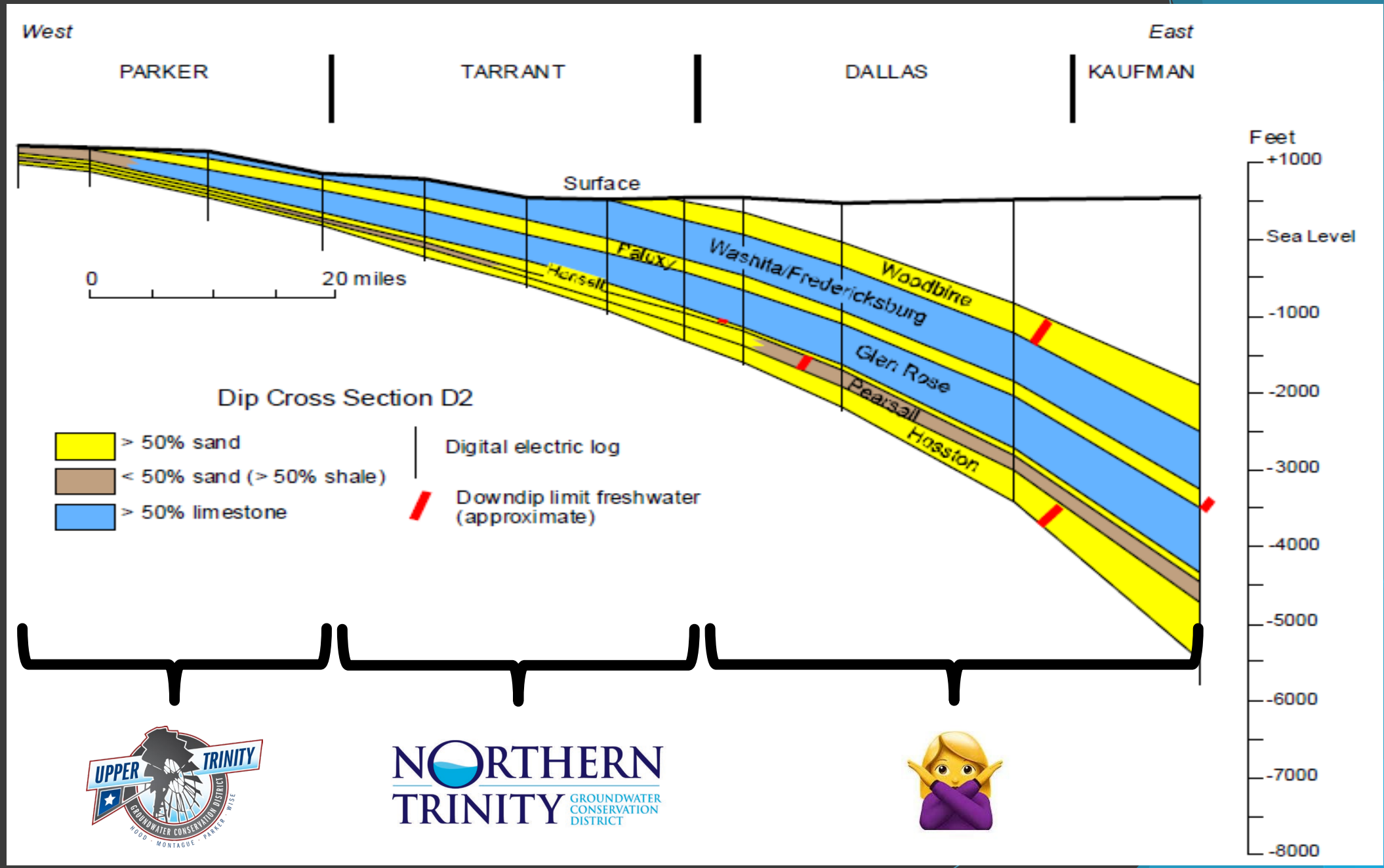
Aquifers of Texas

Major

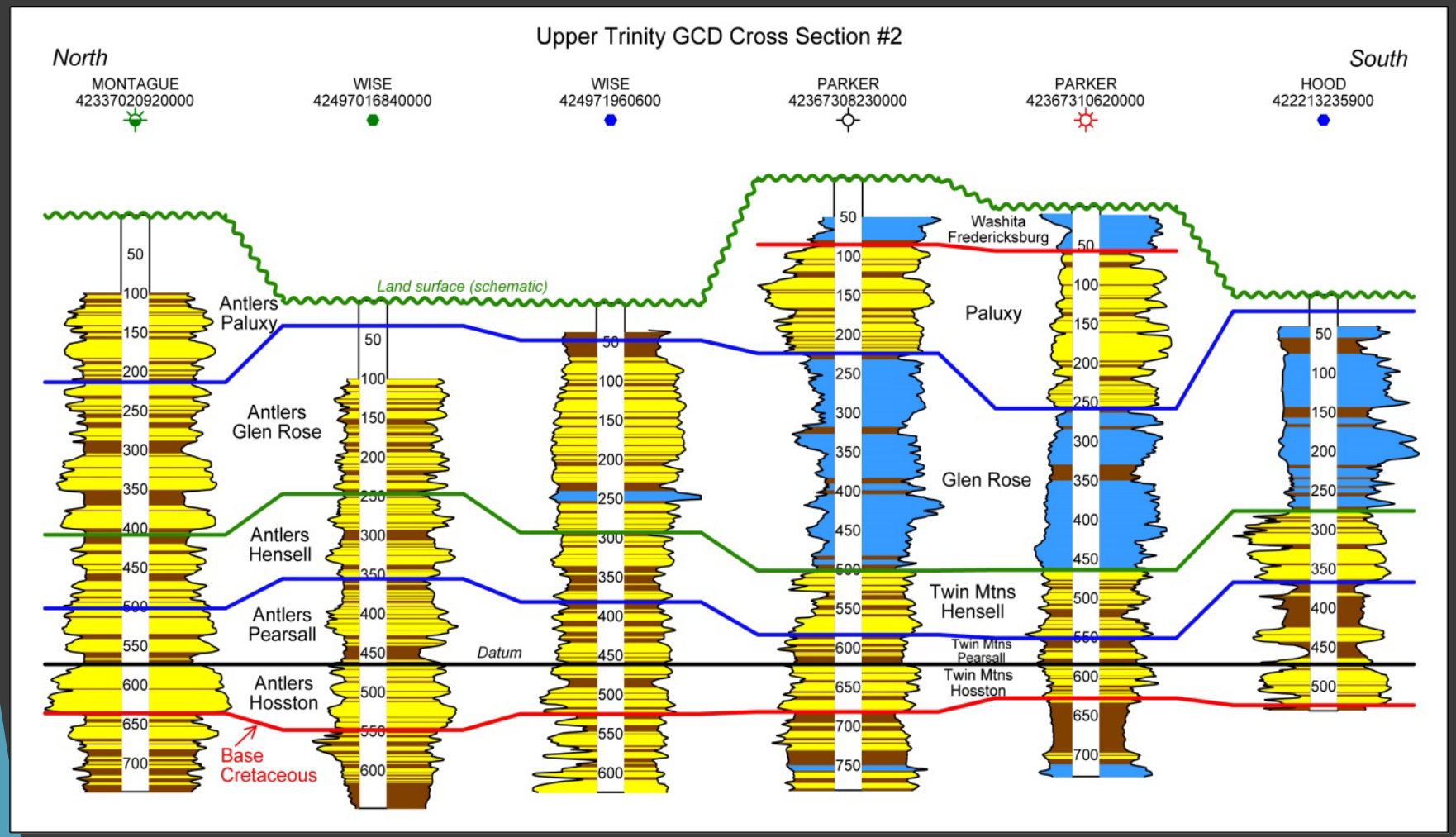


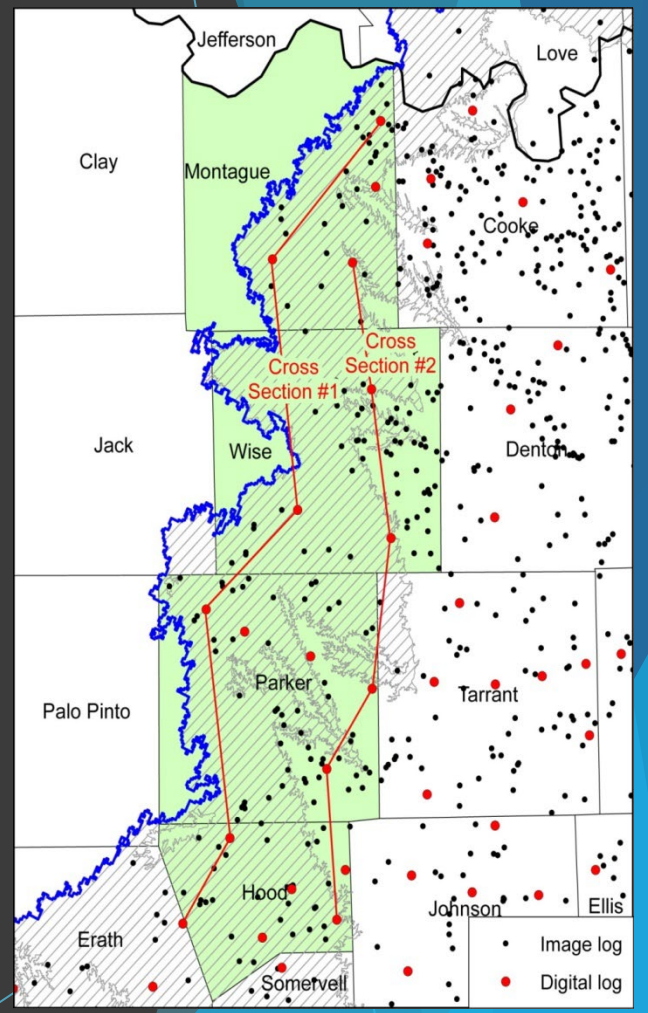
Minor



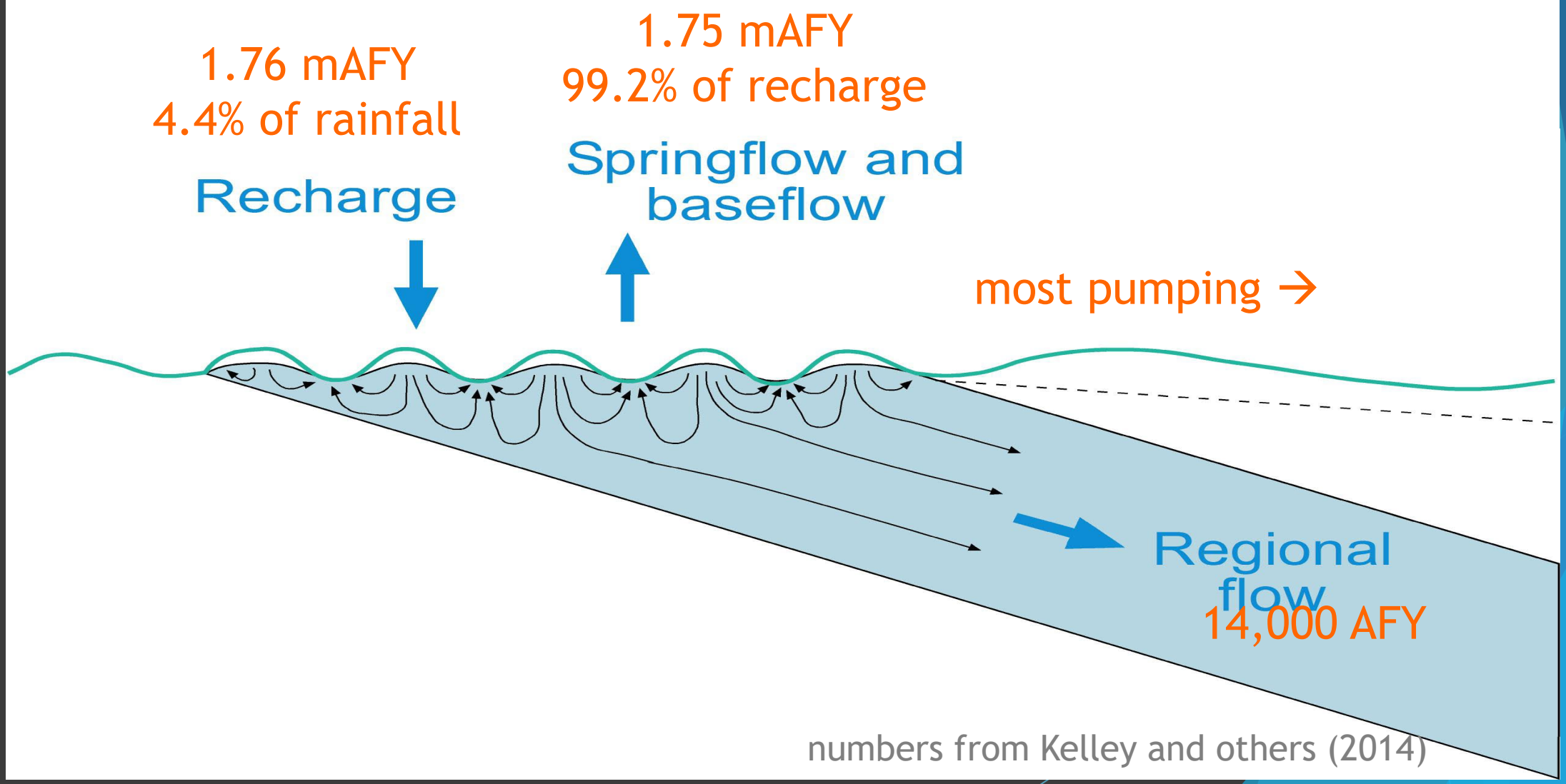

West
East
PARKER
TARRANT
DALLAS
KAUFMAN
Feet
+1000
Sea Level
-1000
-2000
-3000
-4000
-5000
-6000
-7000
-8000
Surface
0
20 miles
Paluxy
Woodbine
Washita/Fredericksburg
Glen Rose
Pearsall
Hosston
Dip Cross Section D2
> 50% sand
< 50% sand (> 50% shale)
> 50% limestone
Digital electric log
Downdip limit freshwater (approximate)
UPPER TRINITY
GROUNDWATER CONSERVATION DISTRICT
HOOD · MONTAGUE · PARKER · WISE
NORTHERN TRINITY
GROUNDWATER CONSERVATION DISTRICT

Trinity Aquifer – Layers





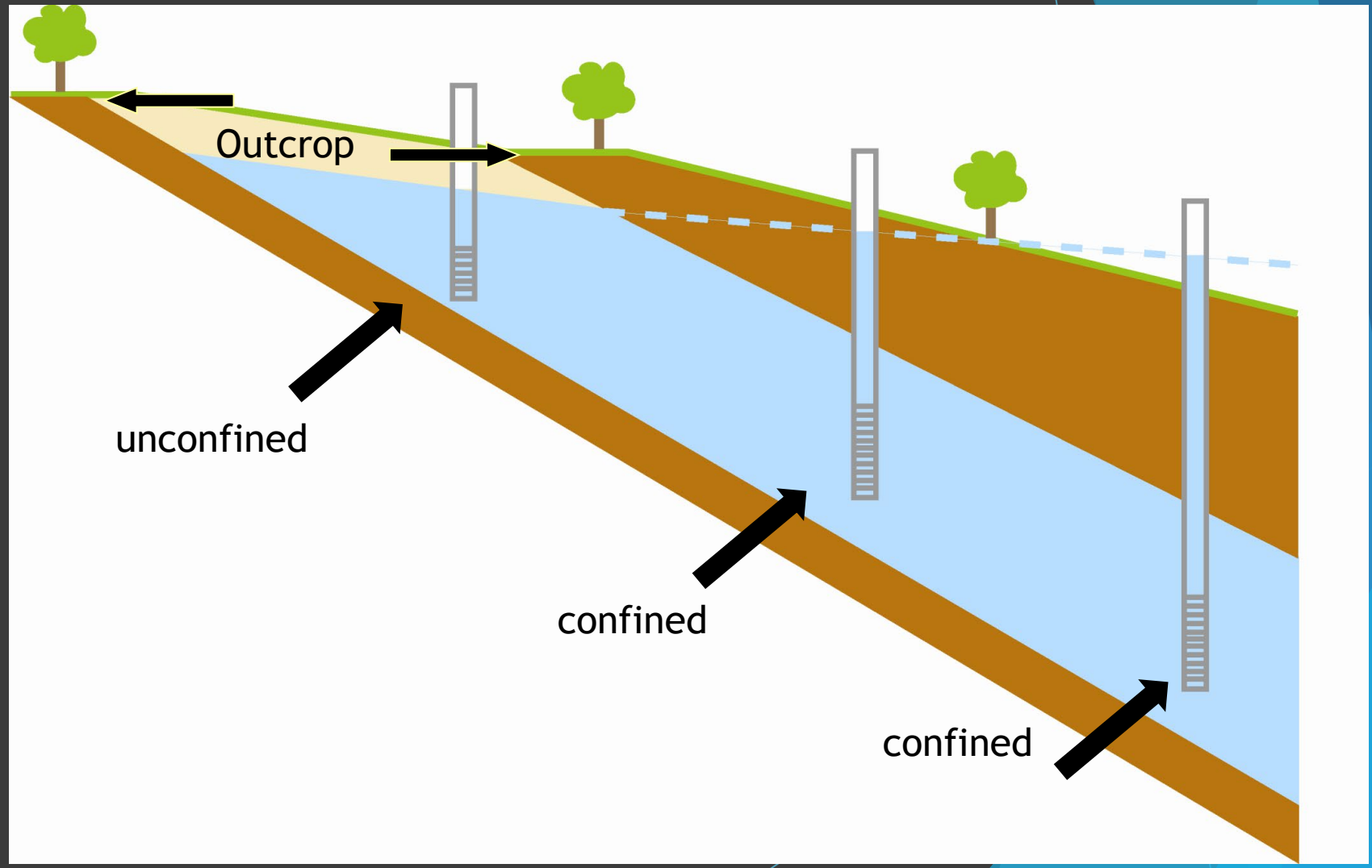
Trinity Aquifer Recharge



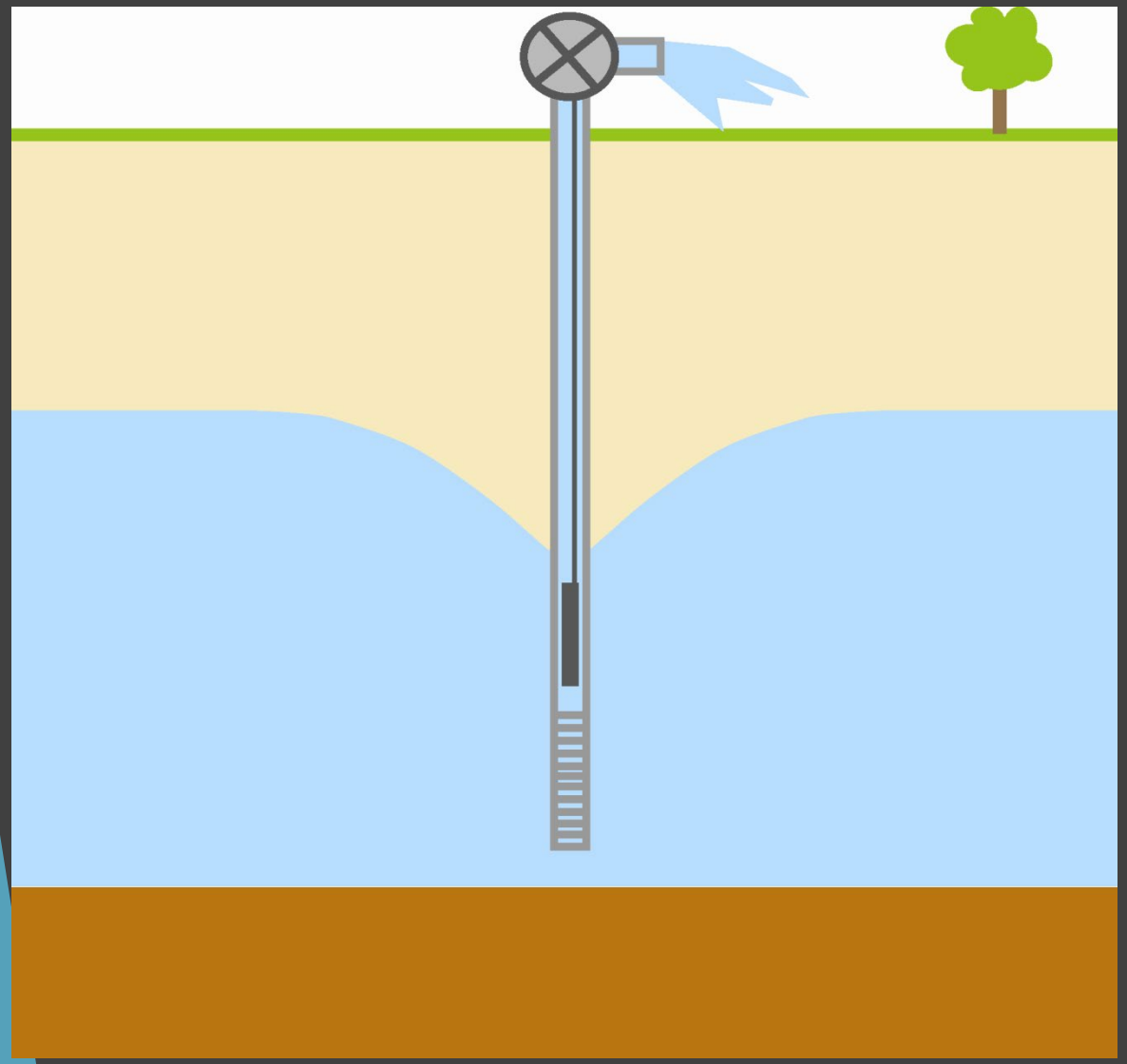
numbers from Kelley and others (2014)

Unconfined and Confined Groundwater Systems

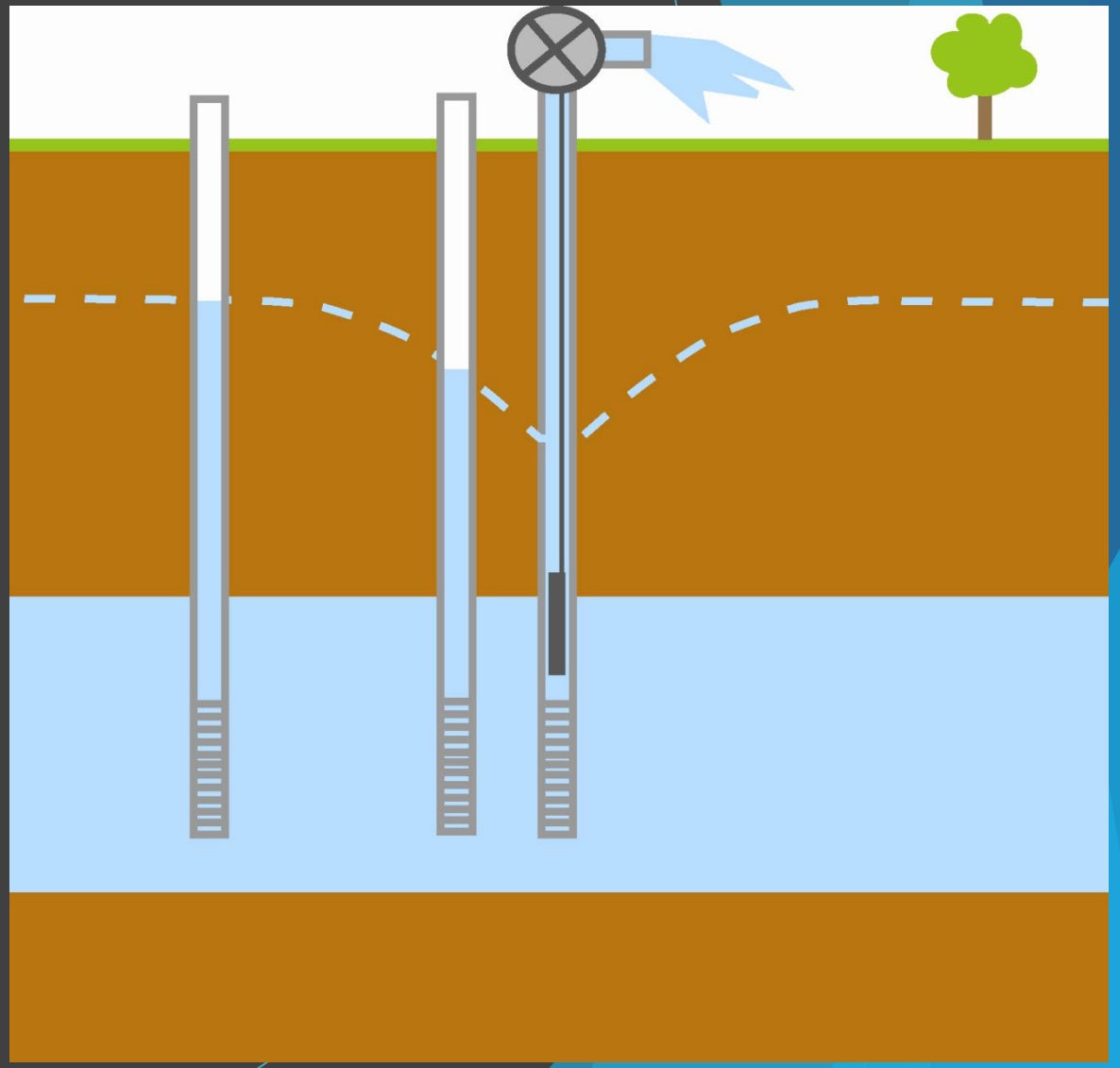
Artesian Well: a well that produces water at the Earth's surface unaided, from pressure below ground.



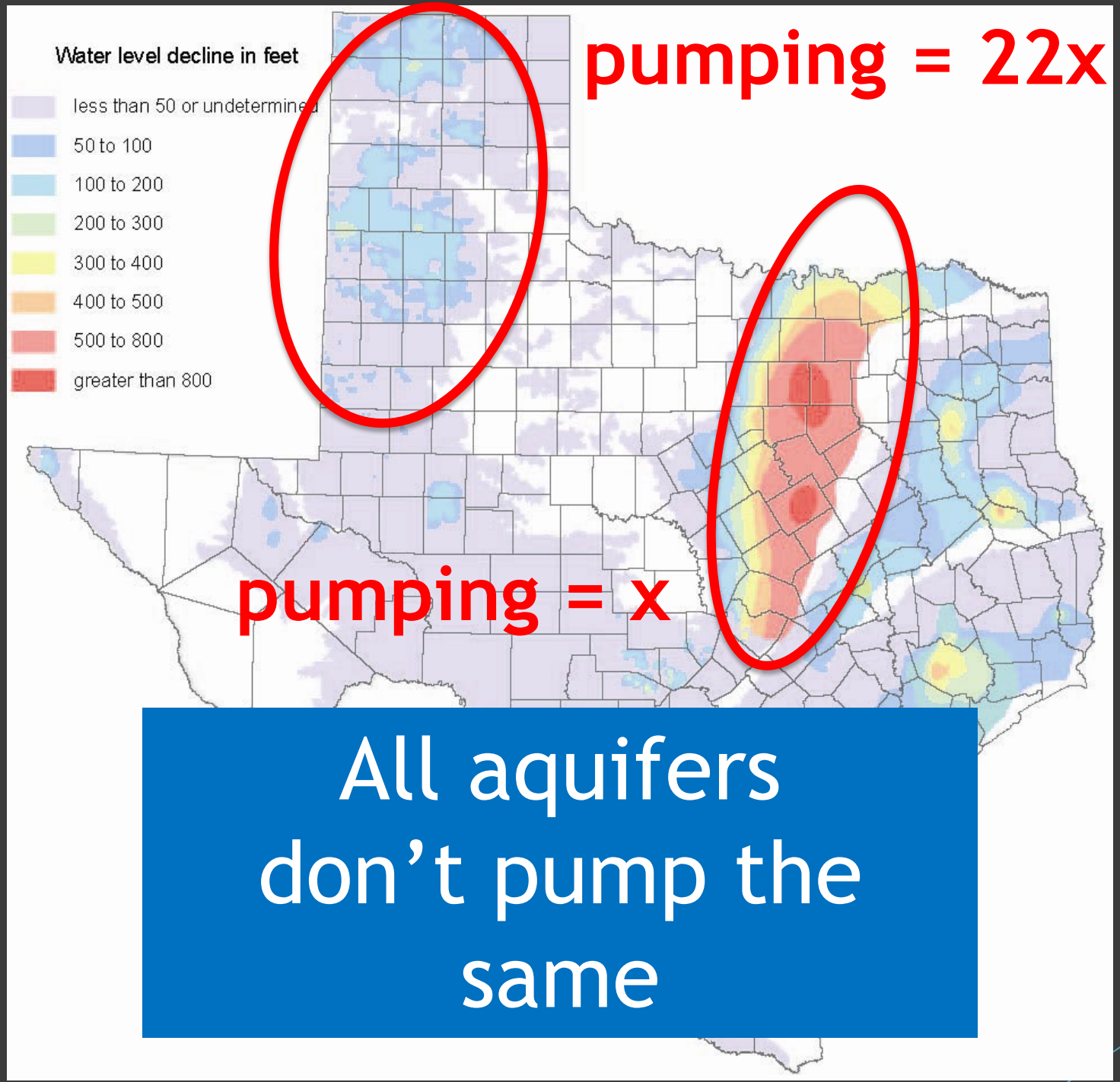
pumping unconfined



pumping confined



Water Wells: High and Low Volume



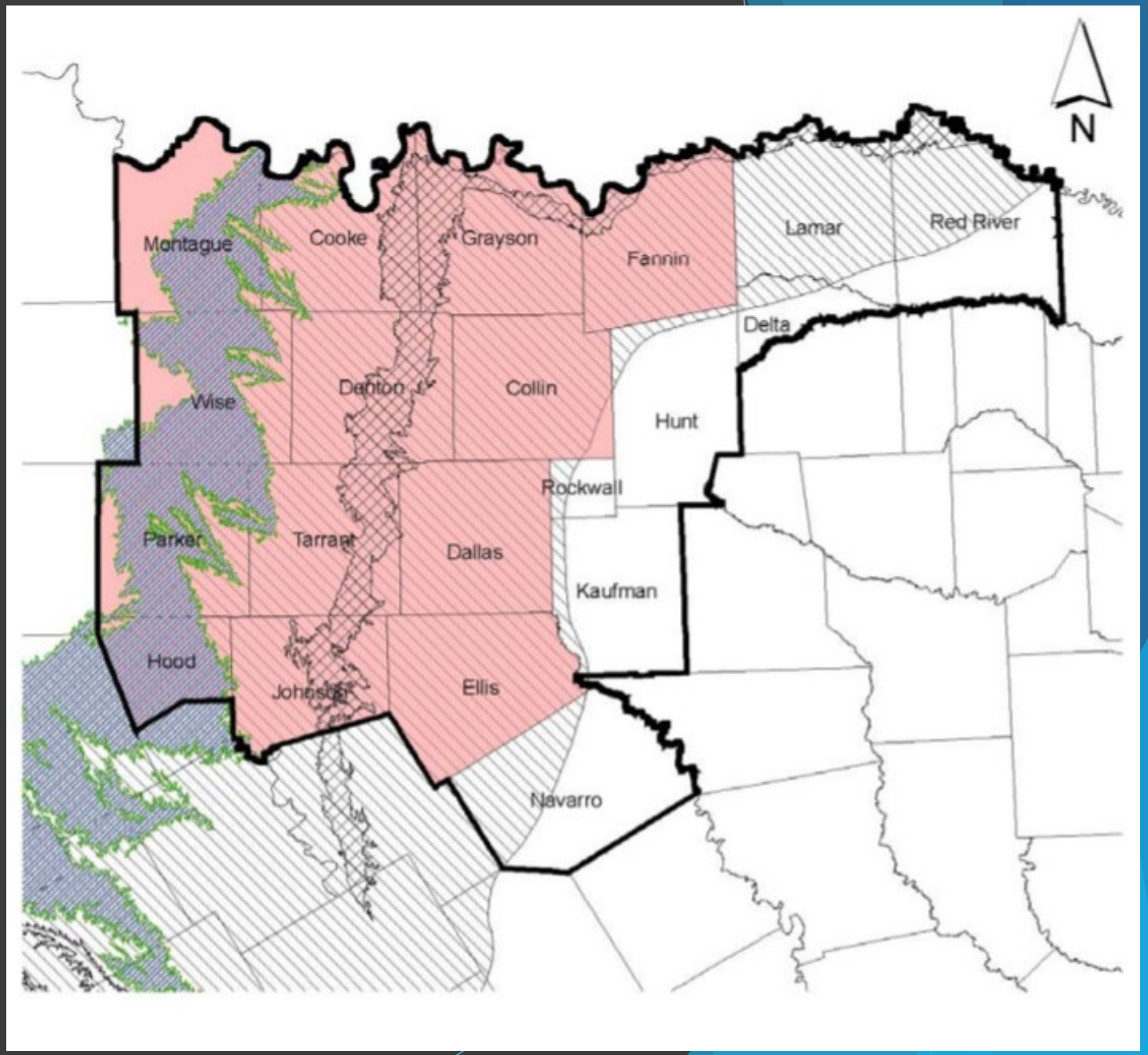
Texas Water Development Board (TWDB) Report on Water Level Decline

Total water-level declines in the major aquifers

PGMA – Priority Groundwater Management Area

Program to identify areas of Texas experiencing, or expected to experience, critical groundwater problems and encourage the creation of Groundwater Conservation Districts (GCDs) for those areas. Relevant reports, studies, maps, and rules.

To enable effective management of the state's groundwater resources in areas where critical groundwater problems exist or may exist in the future, the Legislature has authorized TCEQ, the **Texas Water Development Board (TWDB)**, and the **Texas Parks and Wildlife Department (TPWD)** to study, identify, and delineate Priority Groundwater Management Areas (PGMAs) and initiate the creation of GCDs within those areas, if necessary.

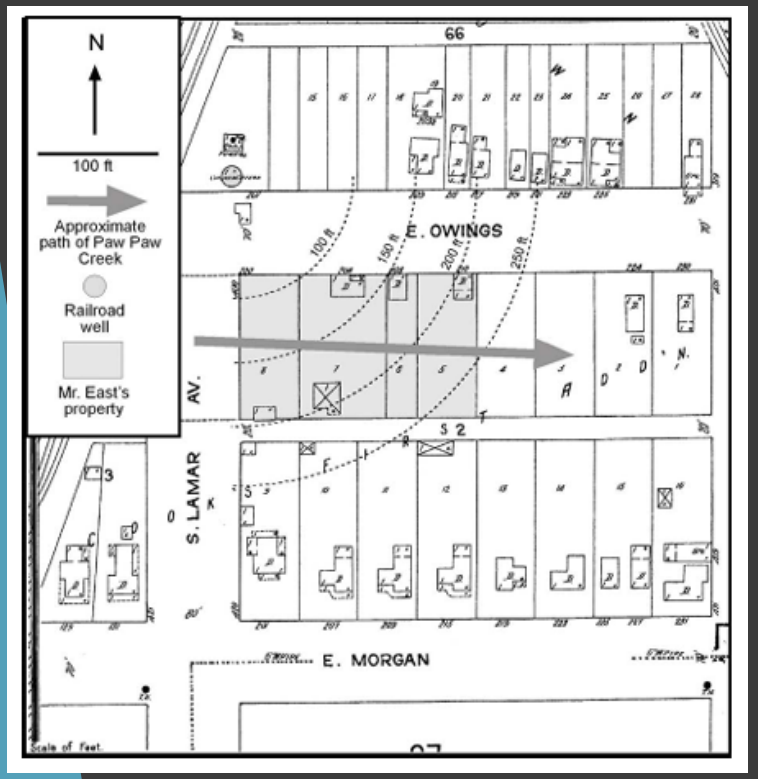


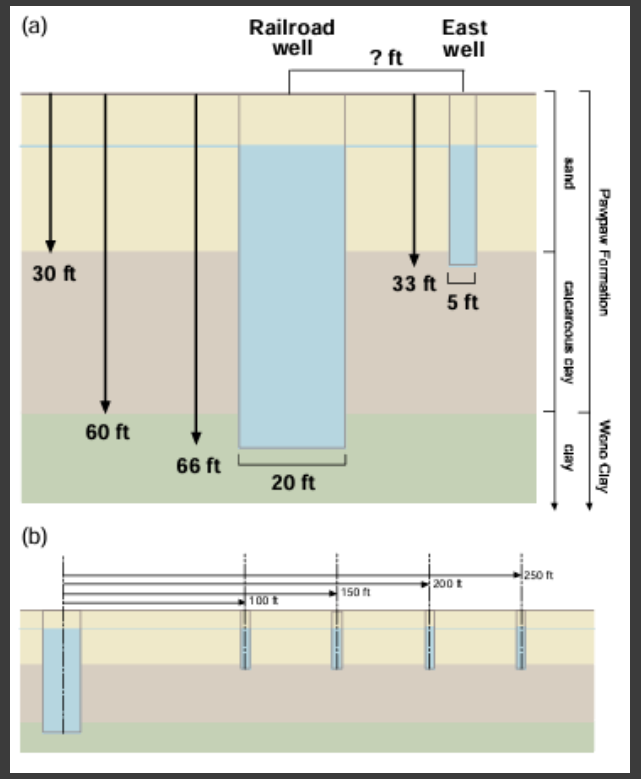
Water & the Courts

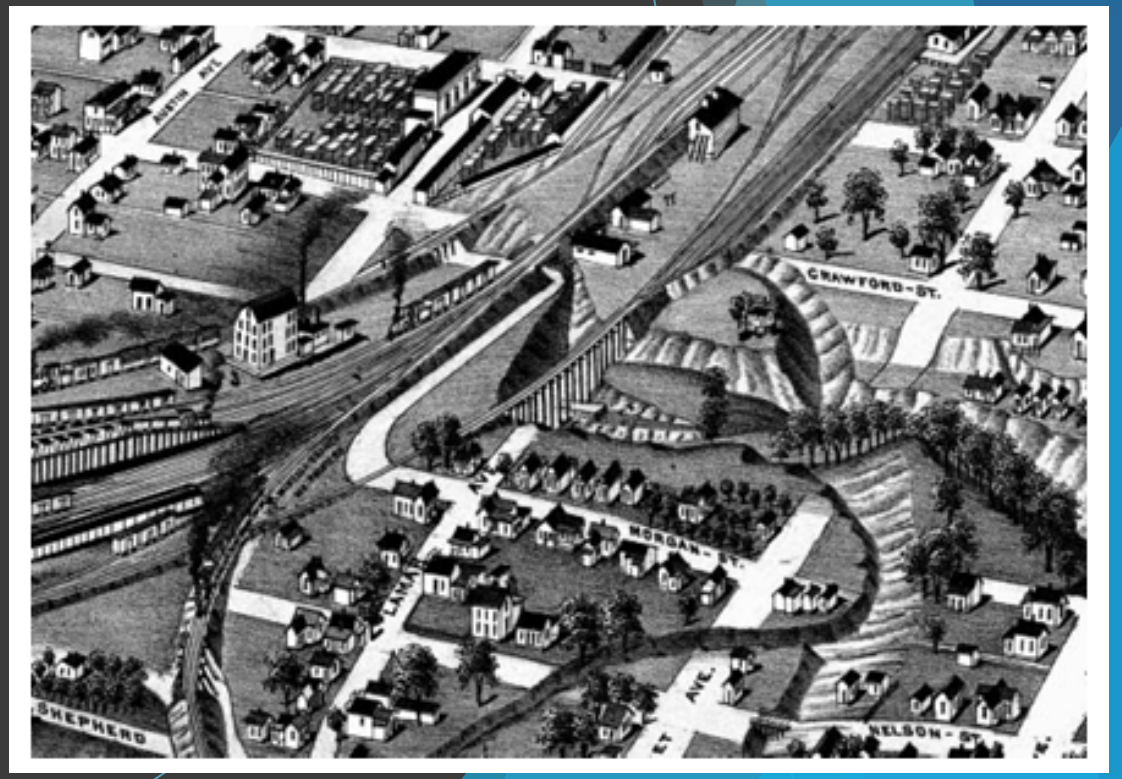
- Texas courts divide water into unrelated legal classes with different rules of law governing the ownership and use of each class:
  - **Groundwater** – governed by the rule of capture, which grants the landowners the right to capture the water beneath their property.
  - **Surface Water** – owned by the state of Texas and can be used by a landowner only with permission from the State (with some exceptions).

Groundwater History: H.T.C. Ry Co. V. East (1904)

"Because the existence, origin, movement, and course of such waters, and the causes which govern and direct their movements, are so secret, occult, and concealed that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty, and would, therefore, be practically impossible."







Trinity Aquifer
Desired Future Conditions

"The desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint planning process."

TLDR: How groundwater districts decide what they want their aquifers to look like in the future.
What level of water loss is considered acceptable?

Values are designated by cooperative efforts between GCD's sharing aquifers.

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
May 09, 2024

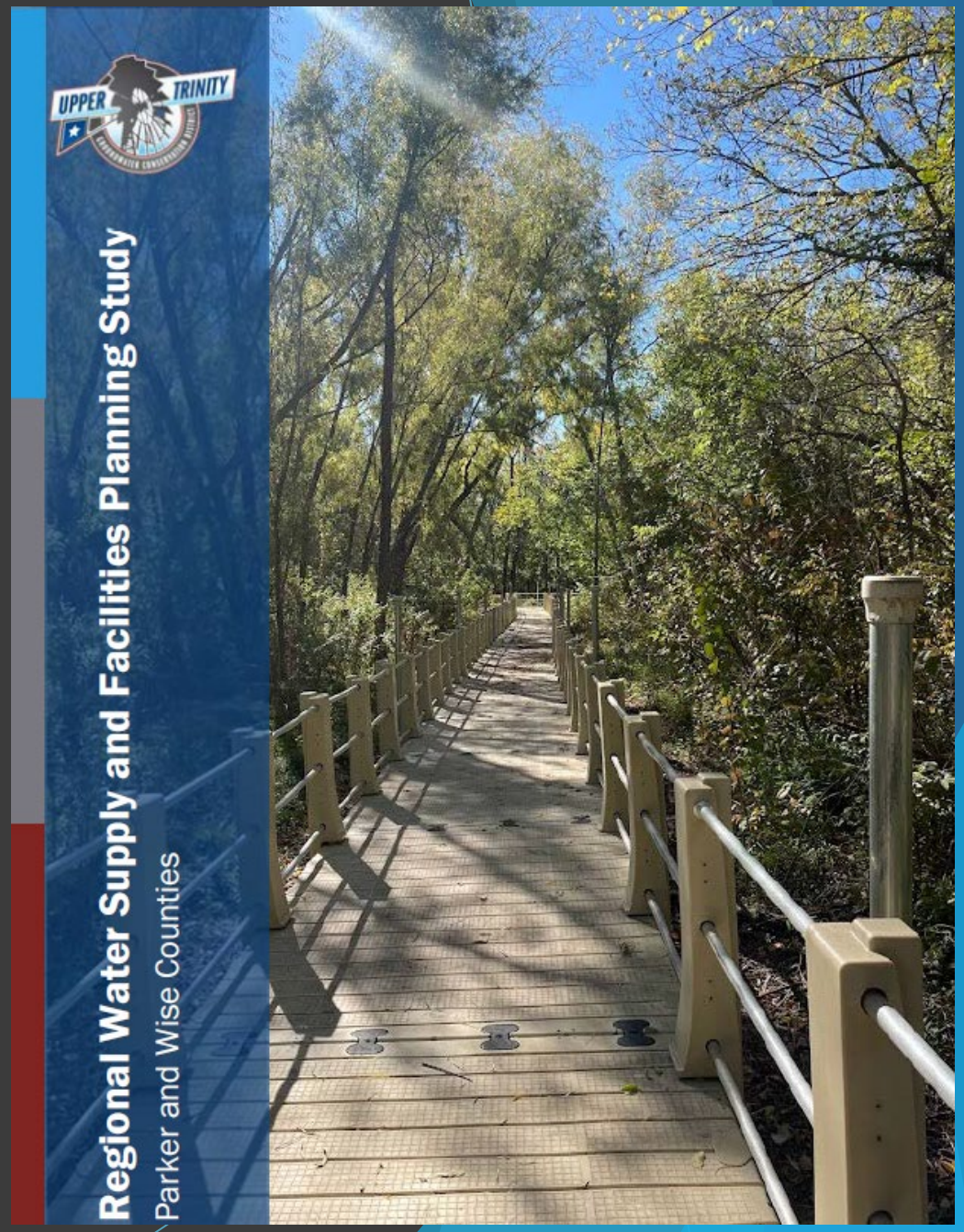
		Outcrop					Subcrop				
	County	Antlers	Paluxy	Glen Rose	Twin Mountains	Cross Timbers	Antlers	Paluxy	Glen Rose	Twin Mountains	Cross Timbers
Desired Future Conditions	**Montague**	-40	-	-	-	-	-	-	-	-	-
	Wise	-60	-	-	-	-	-154	-	-	-	-
	Parker	-42	-6	-20	-7	-	-	-2	-50	-68	-
	Hood	-	-	-9	-13	-	-	-	-39	-72	-
1-Year Water Level Change	**Montague**	-1.3	-	-	-	1.1	-	-	-	-	-20.8
	Wise	-0.6	-	-	-	28.3	-8.6	-	-	-	-
	Parker	-3.9	-3.8	-1.6	-4.9	0.4	-	-	-	-1.1	-
	Hood	-	-	1.6	0.4	-	-	-	-	0.3	-
5-Year Water Level Change	**Montague**	-0.1	-	-	-	1.6	-	-	-	-	-19.4
	Wise	-2.7	-	-	-	-	-4.0	-	-	-	-
	Parker	1.9	-6.0	-7.7	-1.9	3.1	-	-	-	-1.5	-
	Hood	-	-	5.6	-0.8	-	-	-	-	2.5	-
Cumulative Water Level Change (2010 to Present)	**Montague**	3.1	-	-	-	16.1	-	-	-	-	-8.3
	Wise	-1.1	-	-	-	33.6	3.0	-	-	-	-
	Parker	-4.3	-12.4	-2.4	-4.6	4.3	-	-	-	-8.7	-
	Hood	-	-	8.3	-1.0	-	-	-	-	6.3	-
DFCs vs Cumulative Change	**Montague**	43.1	-	-	-	-	-	-	-	-	-
	Wise	58.9	-	-	-	-	157.0	-	-	-	-
	Parker	37.7	-6.4	17.6	2.4	-	-	-	-	59.4	-
	Hood	-	-	17.3	12.0	-	-	-	-	78.3	-

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Water Planning Study

Freese & Nichols - 2023

- Study commissioned by UTGCD on behalf of Parker and Wise Counties to assess water availability for future development.
- Public utilities within Parker and Wise polled to assess growth potential.
- Results made available to county leadership following study conclusion.
- Recommendations made by firm staff include transition to surface water sources for large development, utilization of rainwater harvesting technologies, and investing in conservation education of residents.
- Full study available at uppertrinitygcd.com.



County Population/Demand Projections

FIGURE 8: PARKER COUNTY MUNICIPAL DEMAND PROJECTIONS

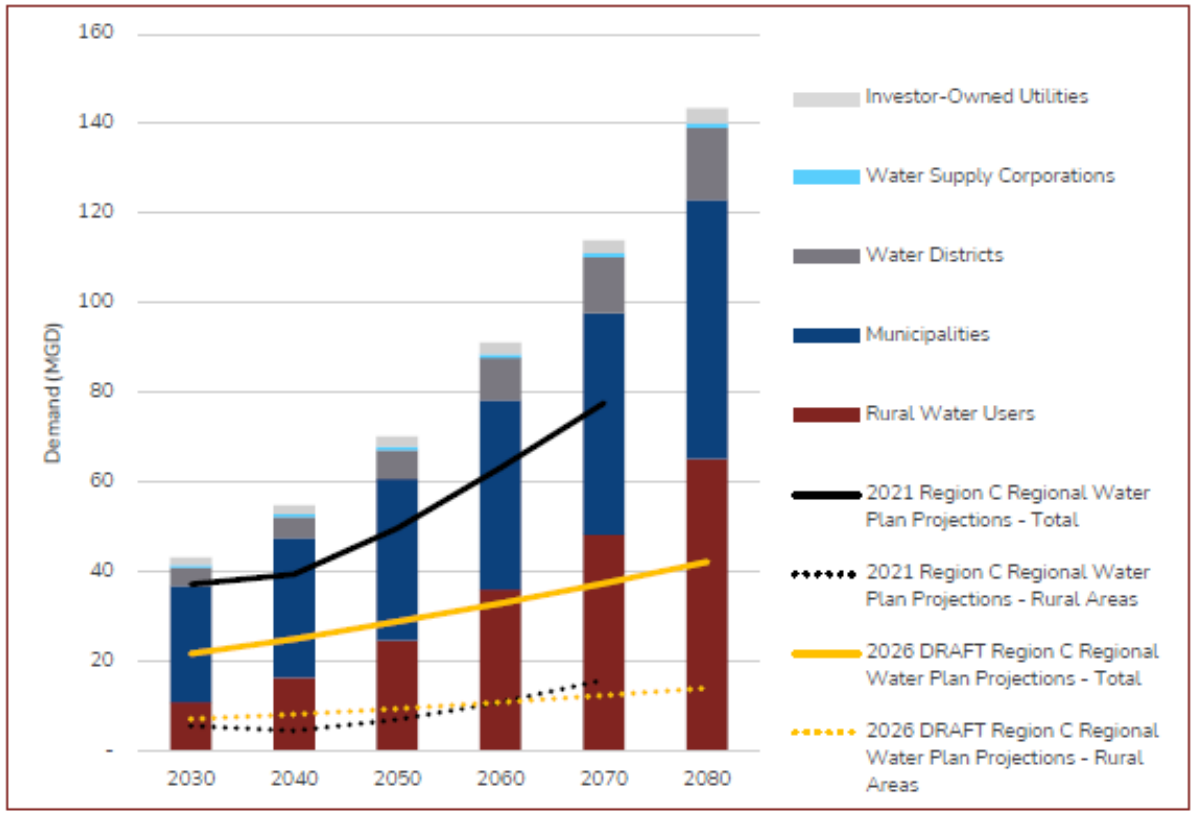
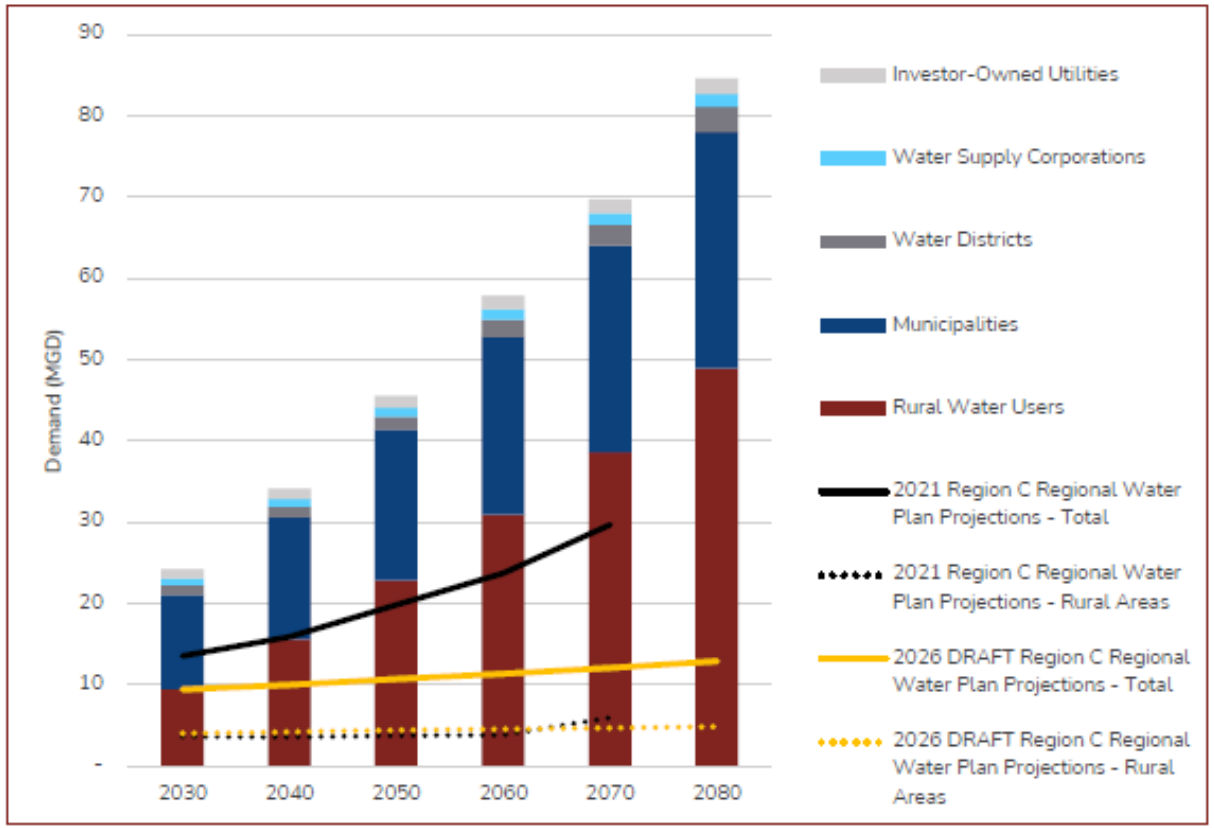


FIGURE 12: WISE COUNTY MUNICIPAL DEMAND PROJECTIONS



Municipal Demand versus M.A.G.

(Modeled Available Groundwater)

FIGURE 13: CURRENTLY CONNECTED SUPPLIES IN 2020 BASED ON STATE WATER PLAN DATA

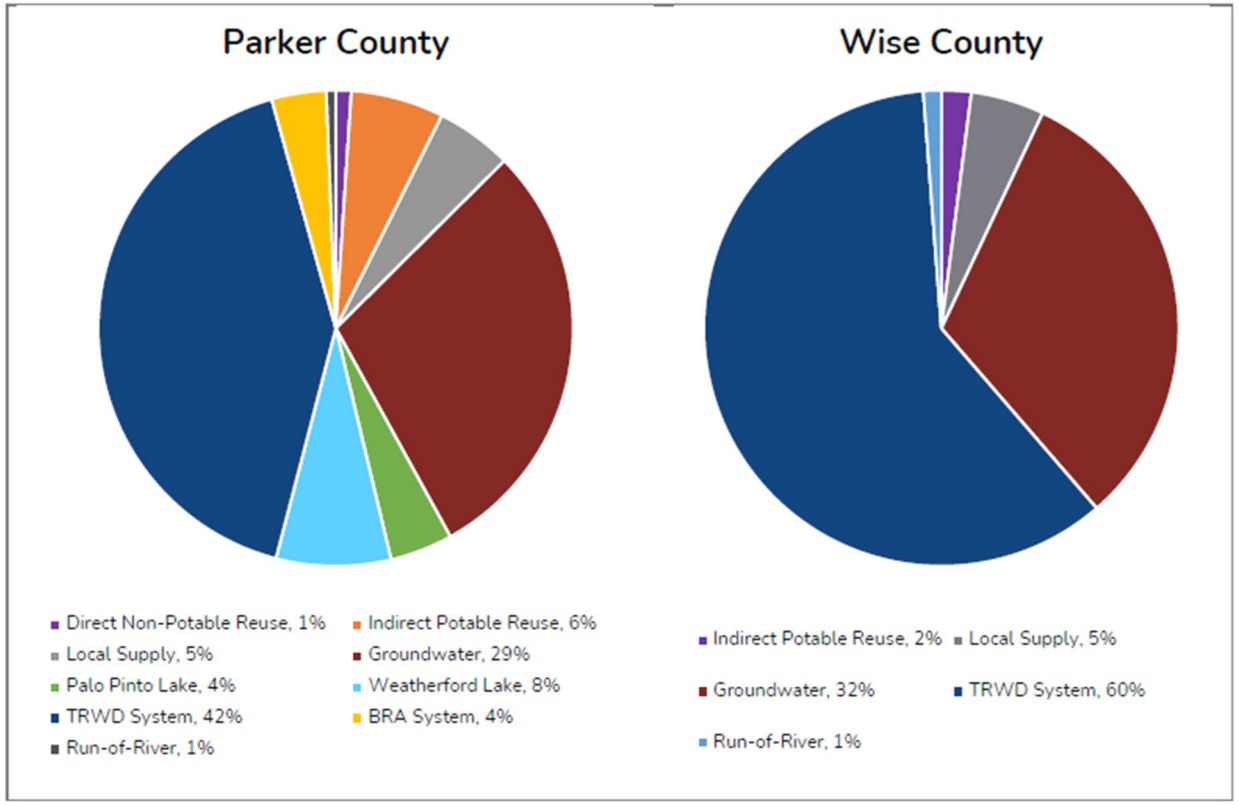
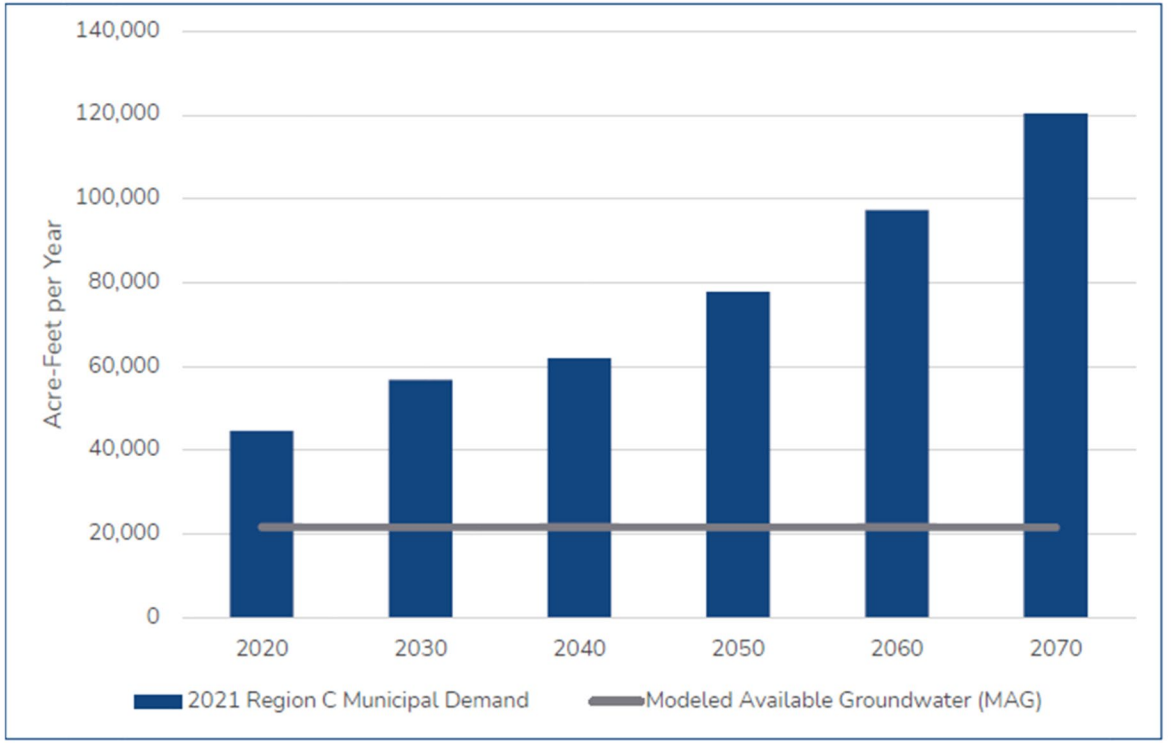


FIGURE 3: MUNICIPAL DEMAND VERSUS MODELED AVAILABLE GROUNDWATER



Anticipated Parker and Wise County Water Needs

FIGURE 16: PARKER COUNTY NEEDS SUMMARY

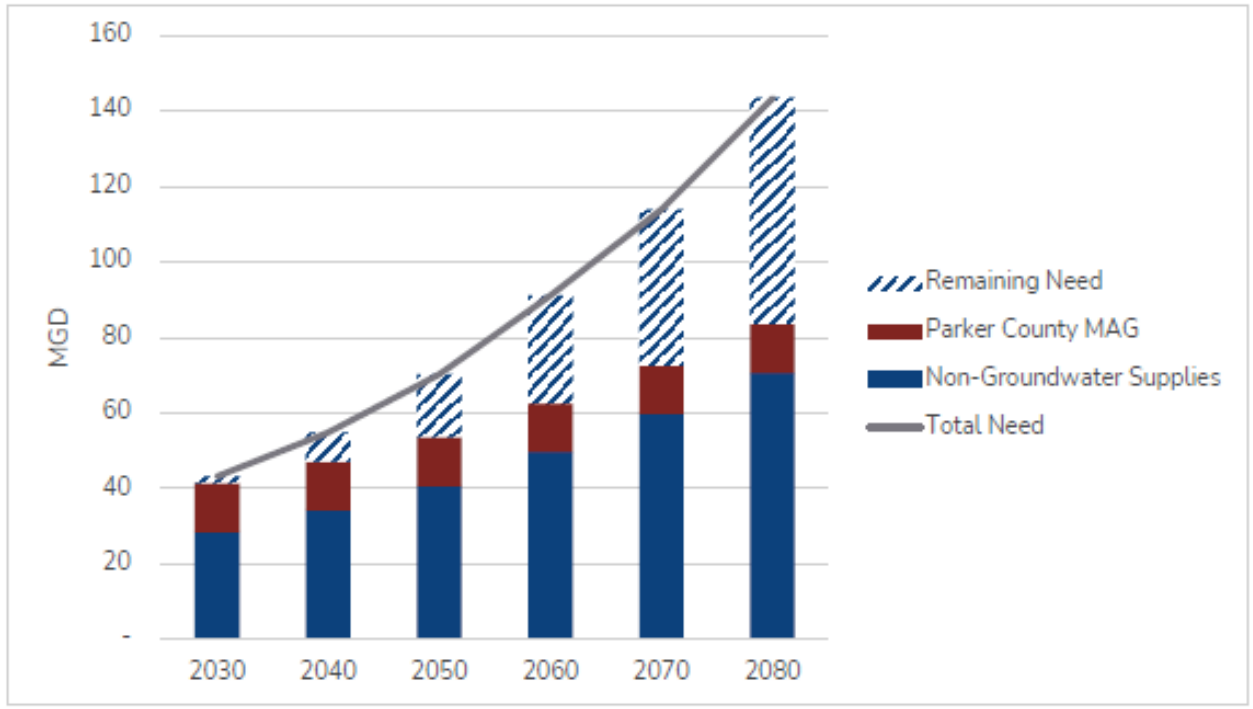


TABLE 12: PARKER COUNTY NEEDS SUMMARY (MGD)

	2030	2040	2050	2060	2070	2080
Total Demand	43	55	70	91	114	143
Non-Groundwater Supplies	*27*	*33*	*39*	*48*	*58*	*68*
Groundwater Supplies	*13*	*13*	*13*	*13*	*13*	*13*
REMAINING NEED	***3***	***9***	***18***	***30***	***43***	***62***

FIGURE 17: WISE COUNTY NEEDS SUMMARY

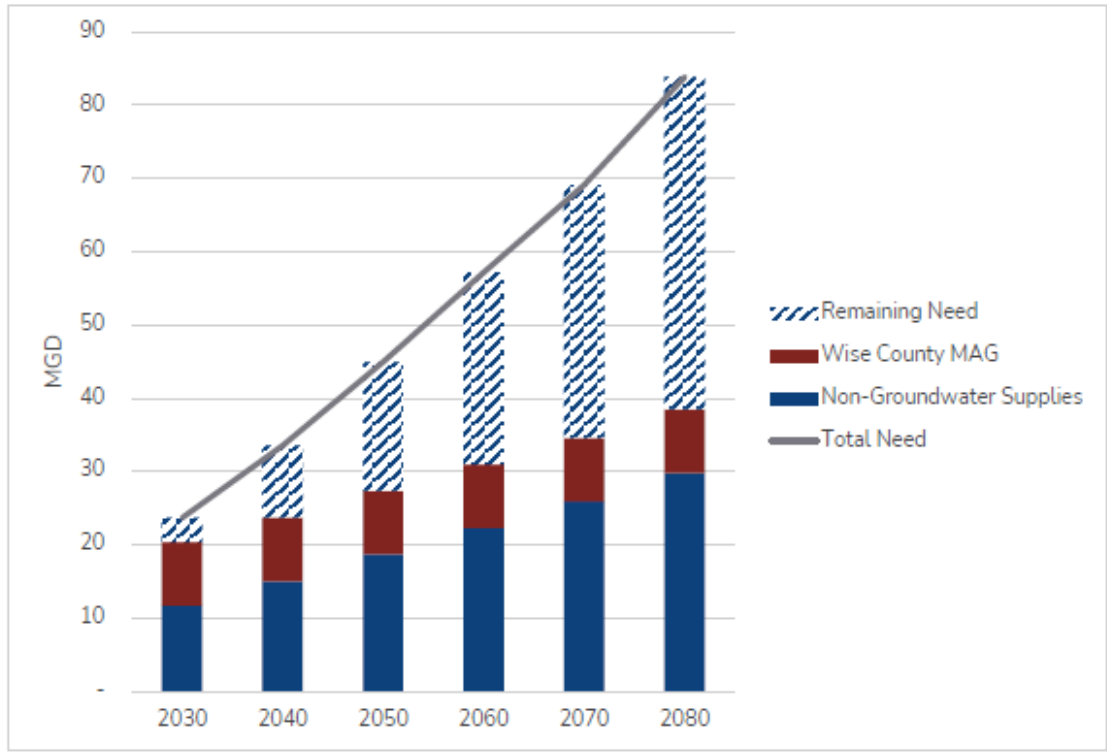
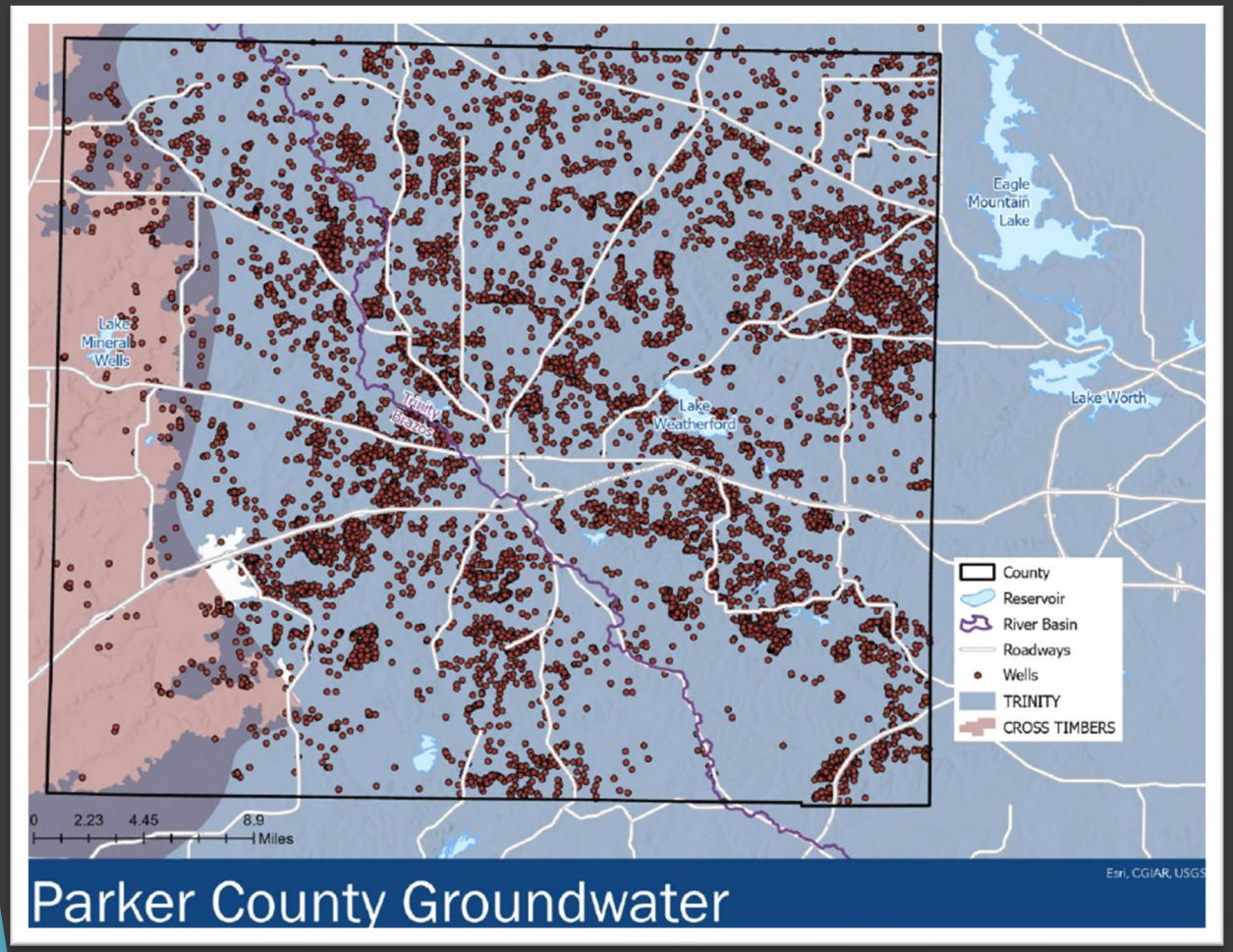
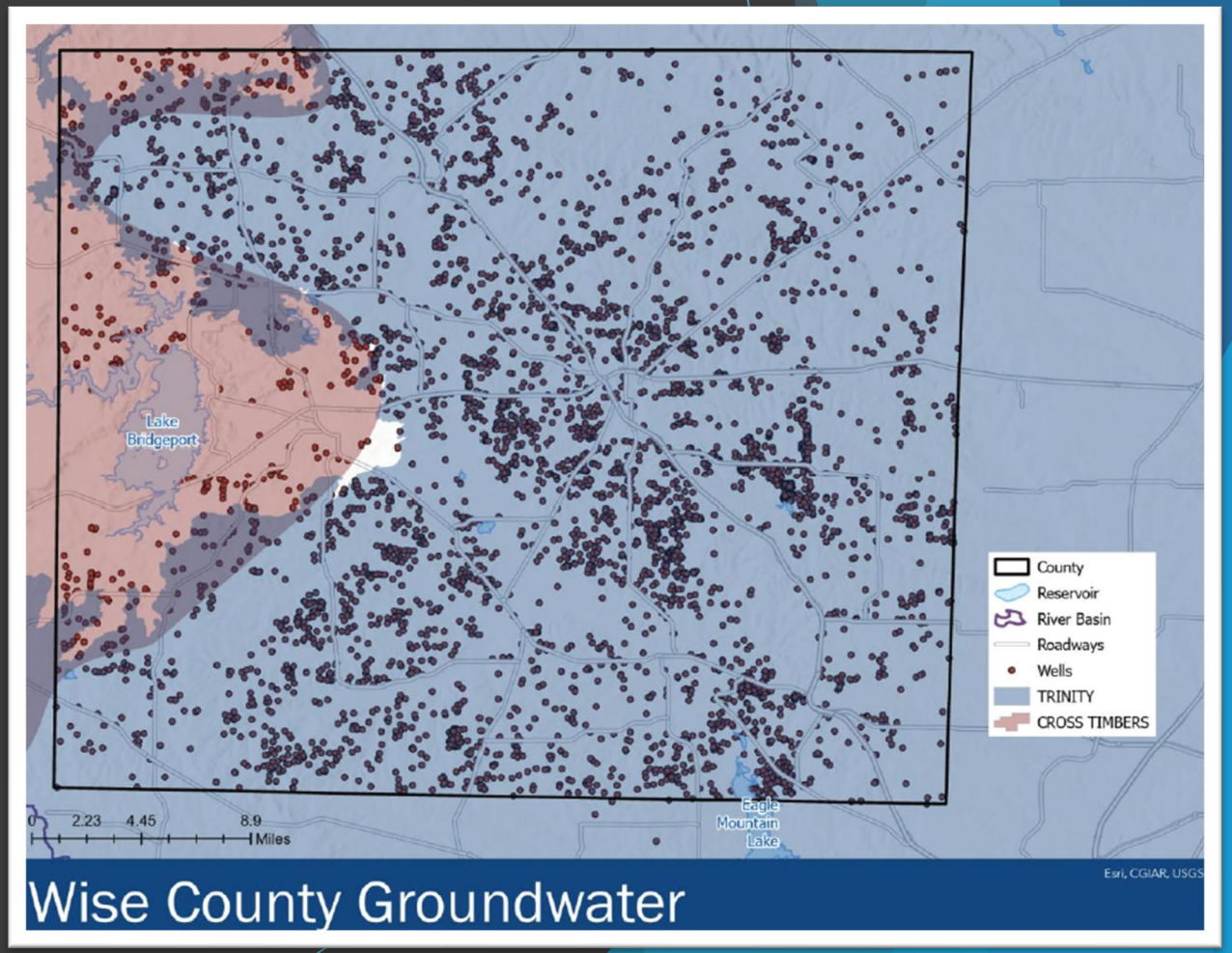


TABLE 13: WISE COUNTY NEEDS SUMMARY (MGD)

	2030	2040	2050	2060	2070	2080
Total Demand	24	33	45	57	69	84
Non-Groundwater Supplies	*12*	*15*	*19*	*22*	*26*	*30*
Groundwater	*10*	*10*	*10*	*10*	*10*	*10*
REMAINING NEED	***2***	***8***	***16***	***25***	***33***	***44***

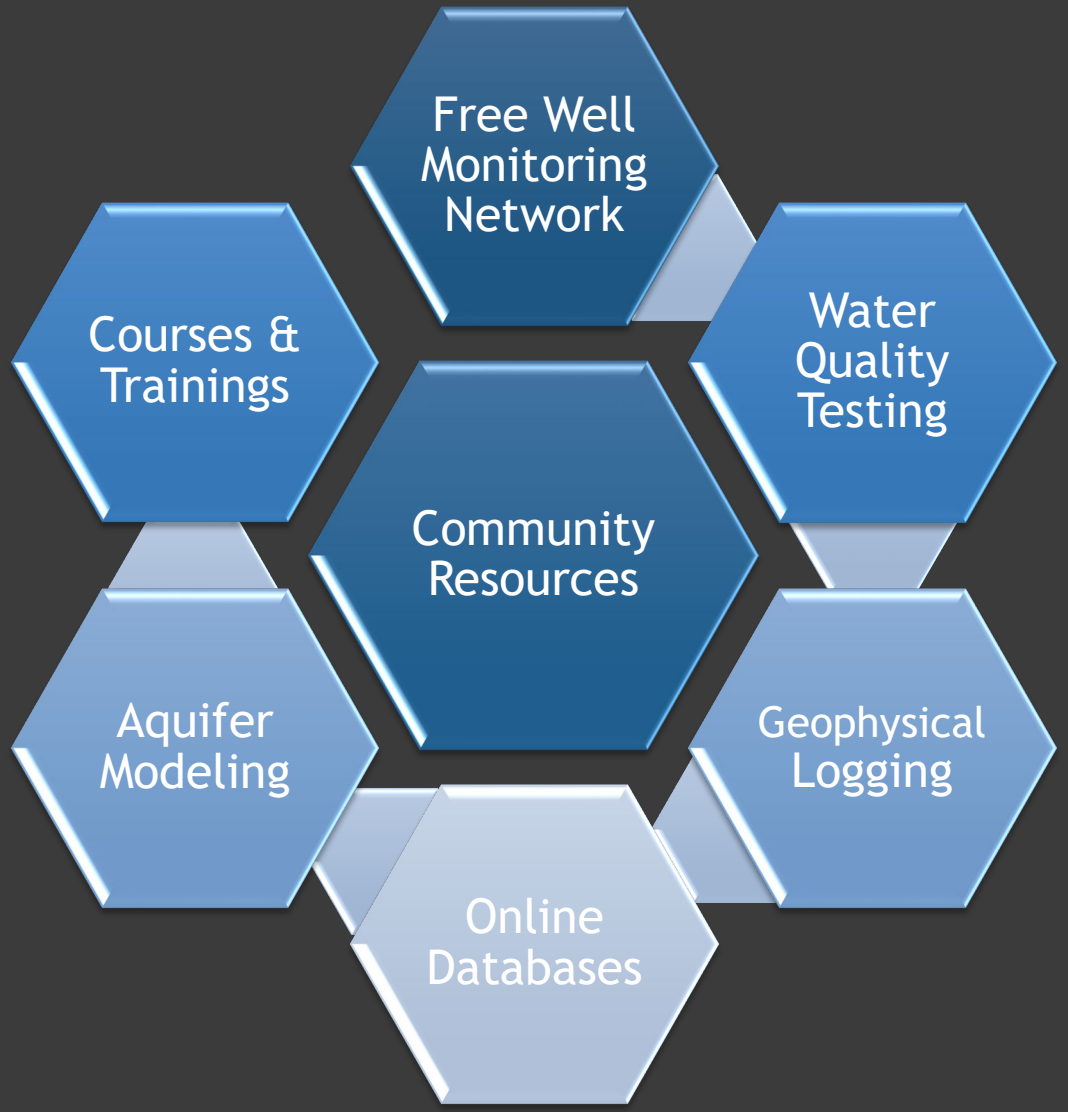


Parker County Groundwater

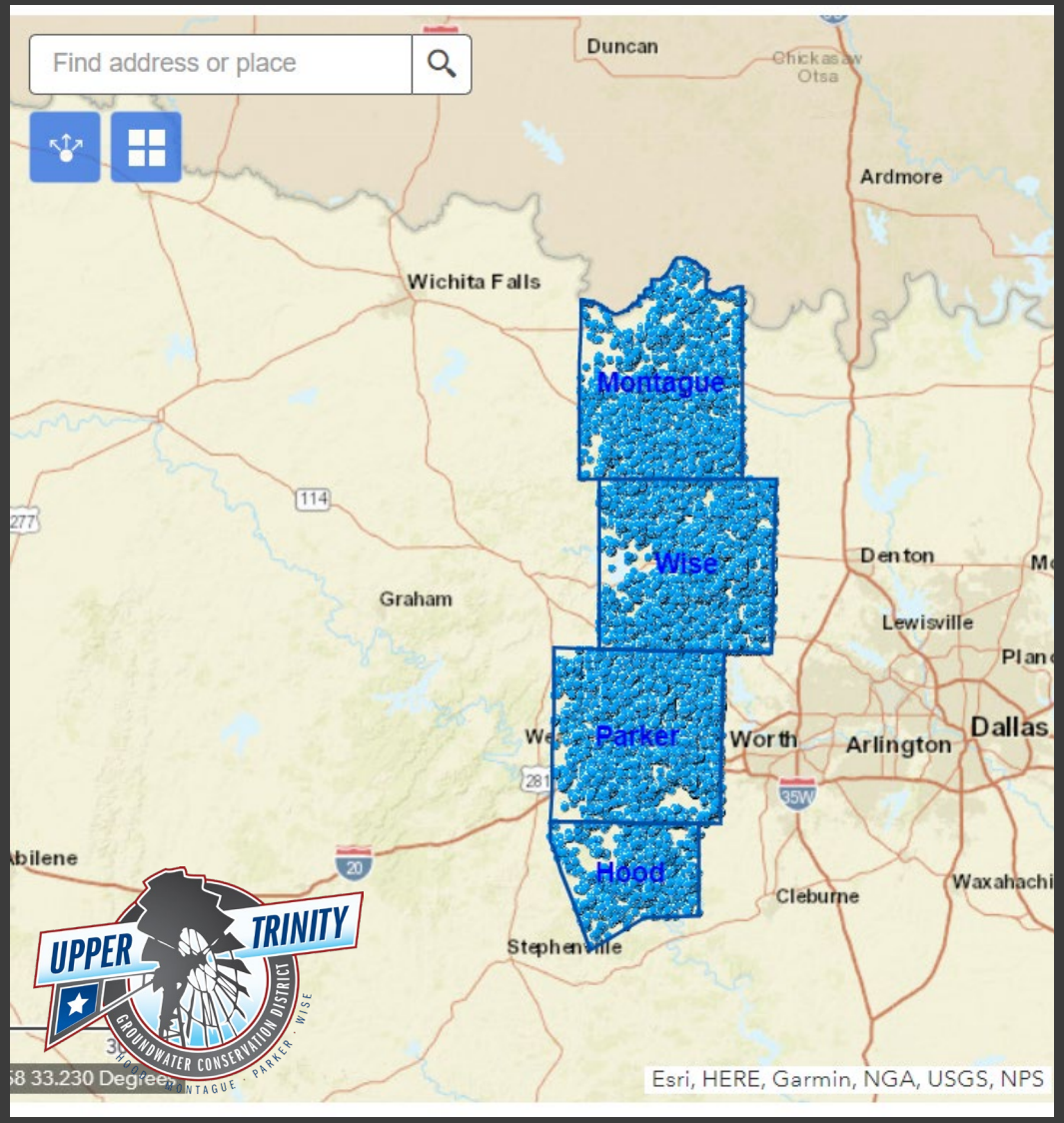


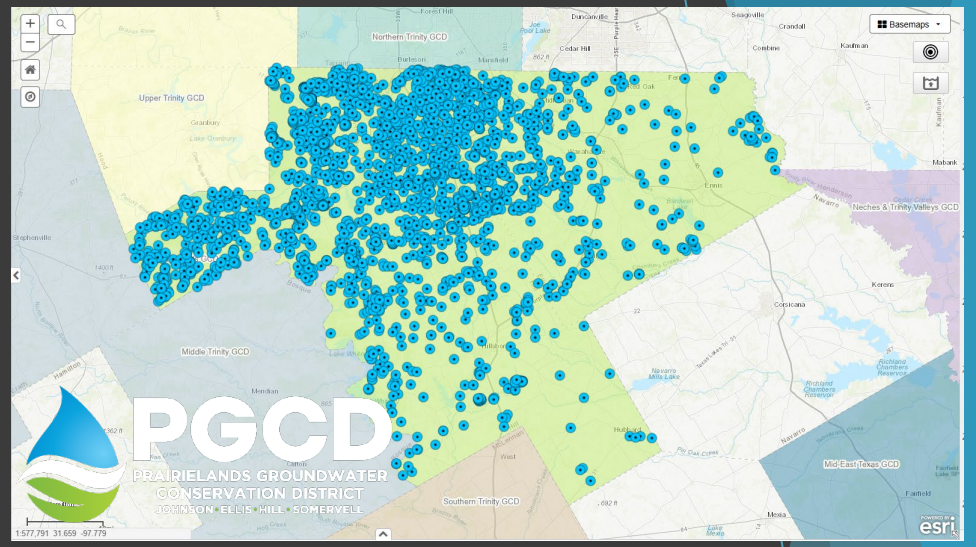
Wise County Groundwater

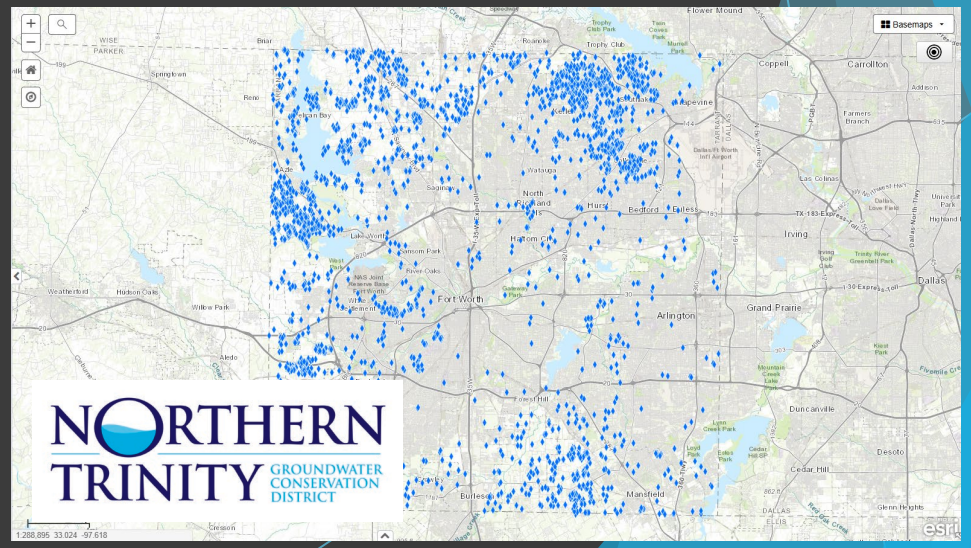
Connecting with your District

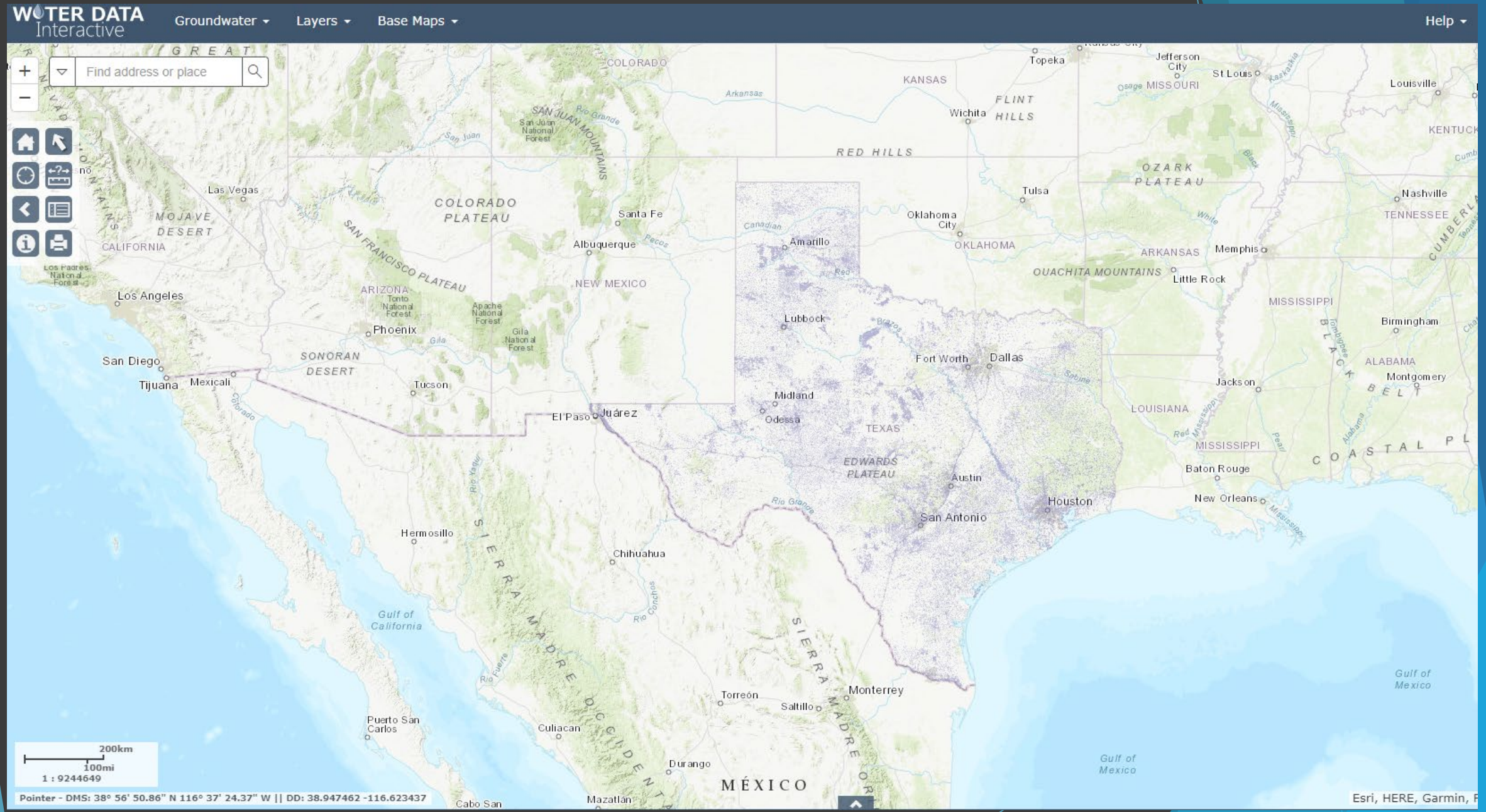


GCD Water Well Databases

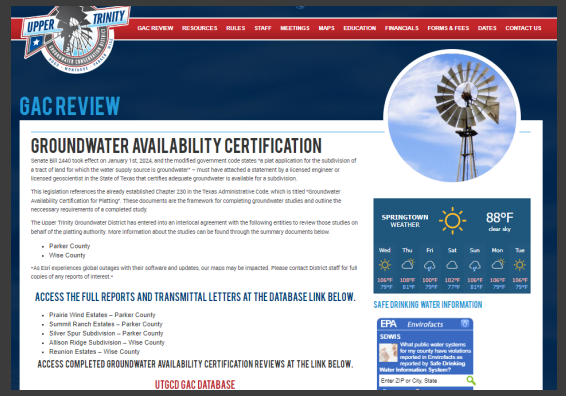







WATER DATA Interactive
Groundwater
Layers
Base Maps
Help
Find address or place
GREAT
COLORADO
KANSAS
Topeka
Jefferson City
St Louis
Louisville
Wichita
FLINT HILLS
RED HILLS
OZARK PLATEAU
Tulsa
Nashville
TENNESSEE
Las Vegas
MOJAVE DESERT
CALIFORNIA
COLORADO PLATEAU
Santa Fe
Albuquerque
Amarillo
Oklahoma City
OKLAHOMA
ARKANSAS
Memphis
Little Rock
OUACHITA MOUNTAINS
SAN FRANCISCO PLATEAU
ARIZONA
NEW MEXICO
Los Angeles
Phoenix
Lubbock
MISSISSIPPI
Birmingham
ALABAMA
Montgomery
San Diego
Tijuana
Mexicali
SONORAN DESERT
Tucson
Fort Worth
Dallas
Jackson
Midland
Odessa
El Paso
Juárez
TEXAS
LOUISIANA
EDWARDS PLATEAU
Austin
Houston
Baton Rouge
New Orleans
San Antonio
Hermosillo
Chihuahua
SIERRA MADRE OCCIDENTAL
SIERRA MADRE ORIENTAL
Gulf of California
Monterrey
Torreón
Saltillo
Puerto San Carlos
Culiacan
Durango
MÉXICO
Mazatlán
Gulf of Mexico
200km
100mi
1 : 9244649
Pointer - DMS: 38° 56' 50.86" N 116° 37' 24.37" W || DD: 38.947462 -116.623437
Esri, HERE, Garmin,

Groundwater Availability Certifications (GACs)



- Enabling legislation Senate Bill 2440 from last legislative session.
- Certain subdivisions of land looking to utilize groundwater in certain areas must complete a study certifying groundwater is and will continue to be available.
- Contact GCDs for more information.
- **UTGCD reviewing studies for Parker, Montague, and Wise Counties currently.**
- ***13 reviews available online for viewing.***

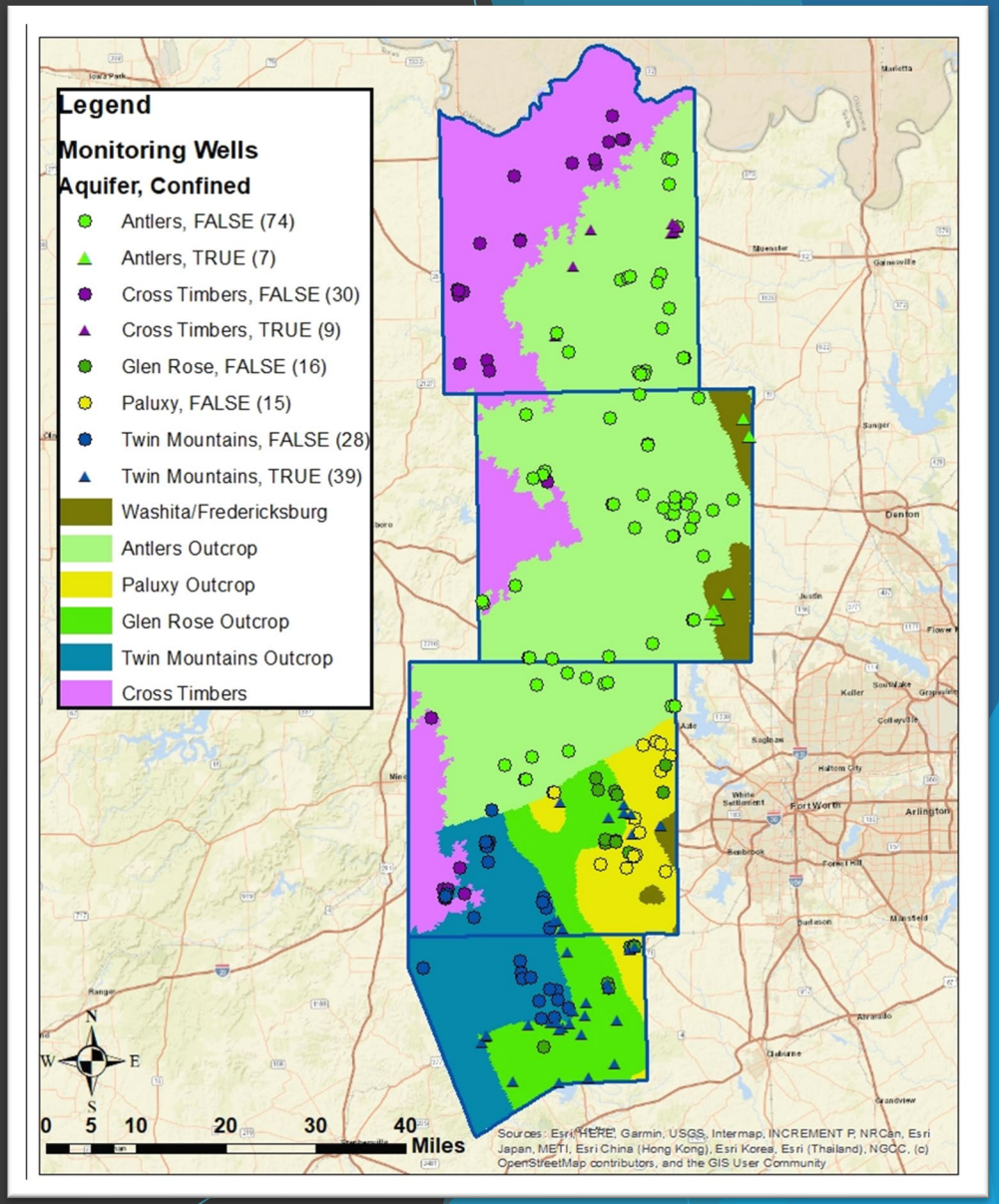
Groundwater Availability Certifications

- Require a licensed geologist or engineer to complete sign and seal.
- Pump Testing + Water Quality Testing + Well Modeling
- Chapter 230 of the Texas Administrative Code
- For governments, developers, and homeowners **outside** Parker, Wise, Montague, and Hood Counties looking for groundwater study contractors or have geoscientists review studies on their behalf:
  - **Contact our independent firm, Texan Geologic LLC.**
  - 3-geoscientist team completing and reviewing studies
  - Goal: to give back to the North Texas groundwater community ☺
  - Contact: Jill@texangeologic.com – 817.661.8438.
  - Texangeologic.com.

TEXAN GEOLOGIC
GROUNDWATER STUDIES

Water Level Monitoring Program

- Several hundred wells in the program
- Free, no cost service
- Quarterly monitoring updates on well water levels
- Receive data to form trends on your local groundwater



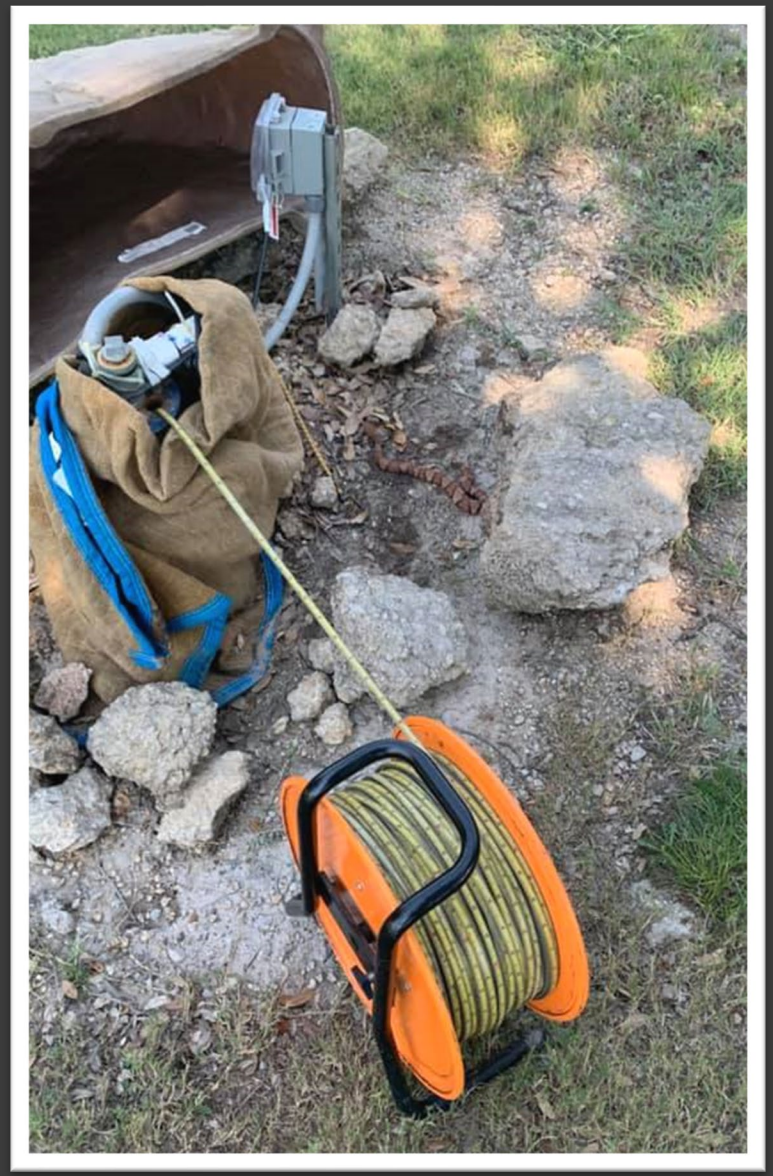
Rainwater Harvesting

Current Systems

- Parker County Sheriff's Posse Arena
- Wise County Fairgrounds
- Parker County Precinct 3 Equipment Site
- Central Community Fire Department
- City of Paradise, TX
- City of New Fairview, TX
- Slidell ISD Elementary Campus
- *Is your site next? Apply today!* ☺


UPPER TRINITY
CENTRAL


Rainwater Harvesting
How & Why
UPPER TRINITY
Rainwater harvesting is the collection and storage of precipitation for future use.
Harvesting rainwater can reduce the demand on fresh water supplies, such as local groundwater and help to conserve those resources for future generations.
The collection and utilization of rainwater can help lower utility bills, prevent erosion and assist with irrigation.
Rainfall Harvesting Calculator
Roof area (sq. ft.) x inches of rainfall x 0.623 = Rainfall Collected (gal.)
For this system:
Rainfall Collected (gal.) = 14,000 sq. ft. x 1 inch of rainfall x 0.623
Rainfall Collected (gal.) = 8,722 gallons for every inch of rain
1. Collection
2. Transport
3. Storage
4. Treatment
Learn more about creating your own rainwater harvesting system at uppertrinitygcd.com



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Speaker Introduction

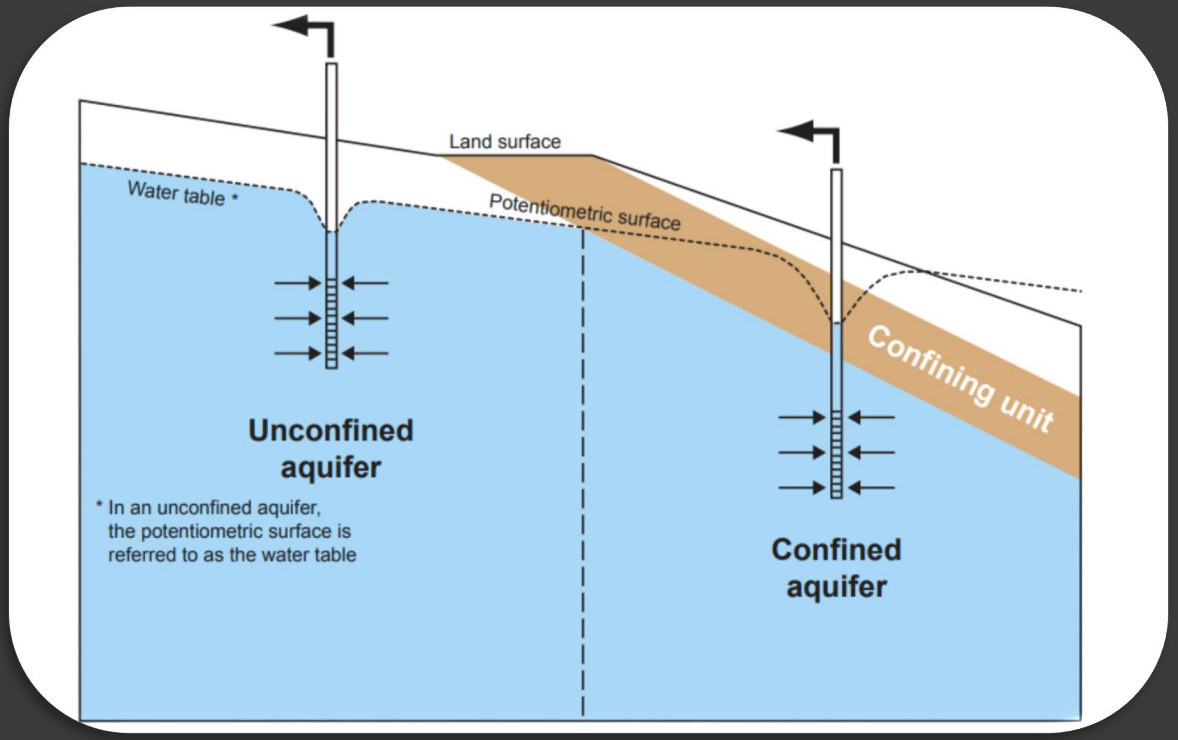
Corey Jones

General Manager, Northern Trinity Groundwater Conservation District

Groundwater Quality and the Impacts of Increased Development

Water's unique solvent properties enable it to dissolve various various chemicals. This characteristic allows water to carry carry dissolved contaminants from industrial, domestic, and and agricultural sources.

Introduction



What is Groundwater?

Groundwater is stored underground in aquifers. Groundwater Groundwater is vital for drinking water, agriculture, and healthy healthy ecosystems. It's a hidden resource that sustains our our lives.

Why Focus on Groundwater Quality?

Safe and healthy groundwater is essential for human health, health, environmental integrity, and long-term sustainability. sustainability. Protecting groundwater quality is a shared shared responsibility.

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Impacts of Increased Development

Urbanization

Increased paved surfaces reduce the natural recharge of groundwater, and runoff carries pollutants into aquifers.

Infrastructure

Aging or inadequate water or wastewater wastewater systems can lead to leaks and and contamination.

Industrial Expansion

Expansion increases the risk of spills and and leaching of hazardous substances, threatening groundwater resources.

Population Growth

Increased water demand places greater stress stress on aquifers and raises the risk of contamination.

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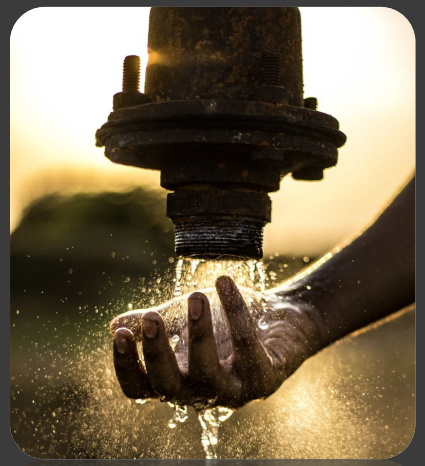
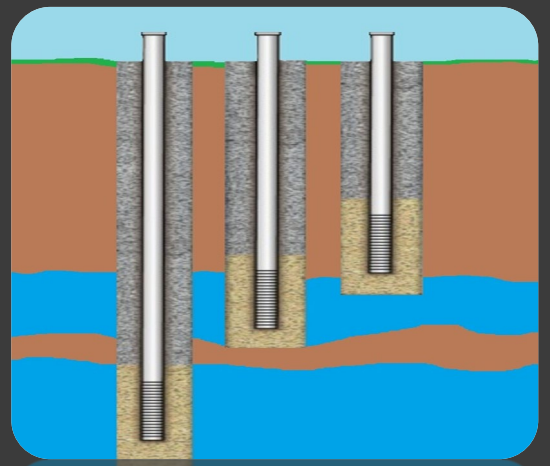
Effects of Groundwater Depletion



Decreased Well Yield

Wells produce less water as groundwater levels decline, reducing available water supply



Water wells drying up

Declining water levels can lead to wells drying up seasonally or permanently if the water level drops below a well's screened interval

Increased Pumping Costs

As the depth to water increases, the water must be lifted higher to reach the land surface

Ecosystem Impact

Reduced groundwater flow to surface water bodies affects streams and lakes

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Key Groundwater Quality Concerns

Contamination Sources

- Agricultural: Nitrates, pesticides, and herbicides.
- Industrial: Heavy metals and chemicals.
- Urban: Oils, leaking fuel tanks, PFAS and microplastics.
- Septic Systems: Pathogens and nutrients.
- Naturally occurring contaminants present in rocks and sediments.

Overextraction

Excessively withdrawing groundwater can lower water tables

Saline Water and Saltwater Intrusion

The migration of saline water can degrade water quality. Coastal areas are vulnerable to Saltwater intrusion caused by over-pumping

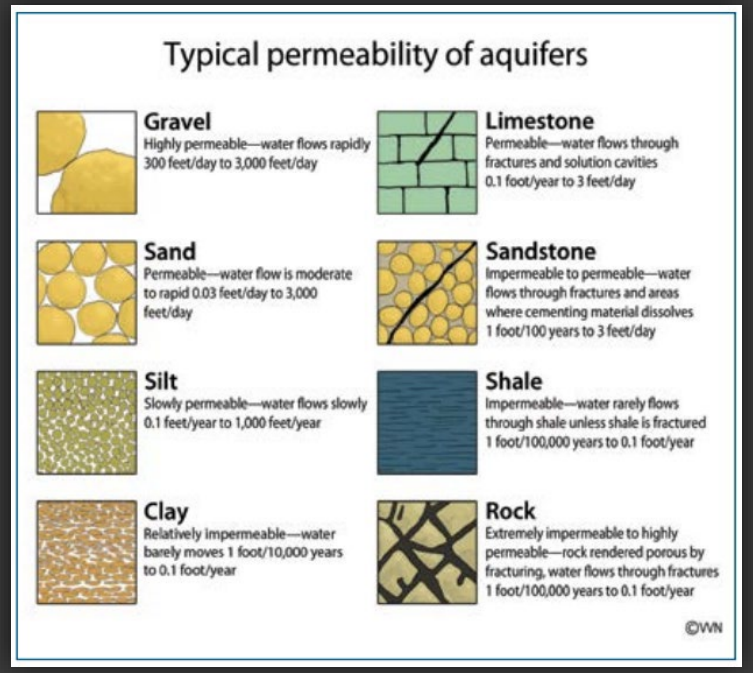
Natural Contaminants

Geological sources can introduce arsenic, Barium, fluoride, Iron, or radon into groundwater.

Land Subsidence

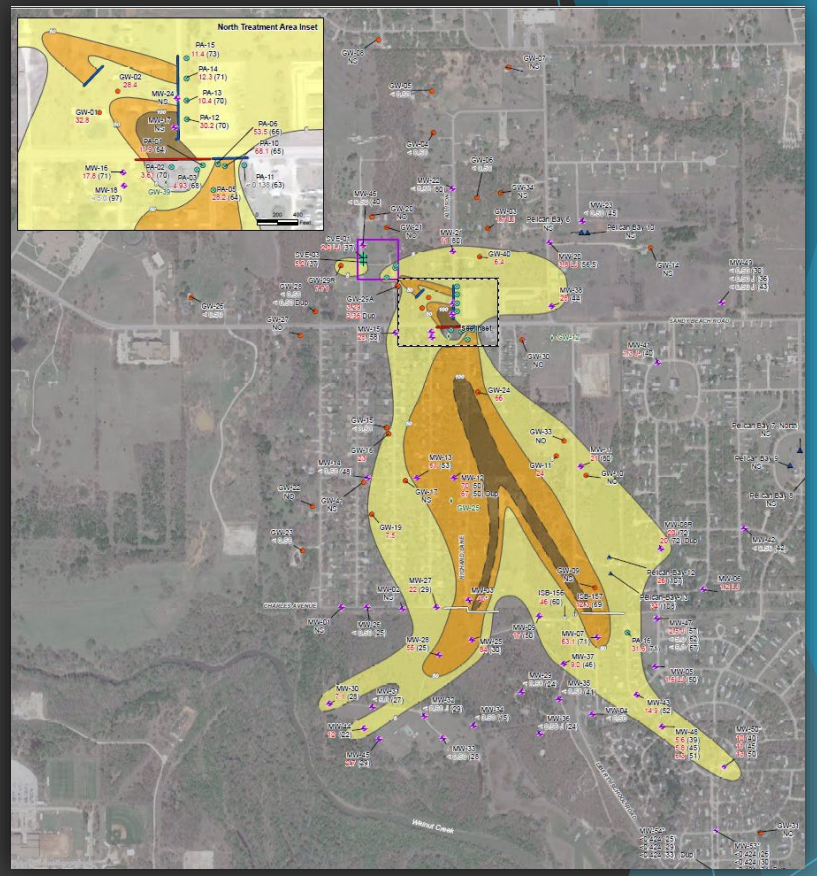
The Earth's surface can settle or sink, often as a result of groundwater withdrawal that leads to compaction. Over time, this depletion of aquifers can permanently reduce their water storage capacity

Contamination Sources



Natural Contaminants

Result from geological formations, soil composition, and natural radionuclide presence in groundwater. These elements naturally occur in rock layers and soil.



Human-Induced Contaminants

Arise from industrial activities, agricultural runoff, improper waste waste disposal, and urbanization. These contamination sources directly directly result from human activities and development.

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Emerging Contaminants

Pharmaceuticals

Hormones and antibiotics

Microplastics and Nanoplastics

From plastic breakdown and waste

PFAS

From industrial processes, wastewater treatment plants, plants, firefighting foam

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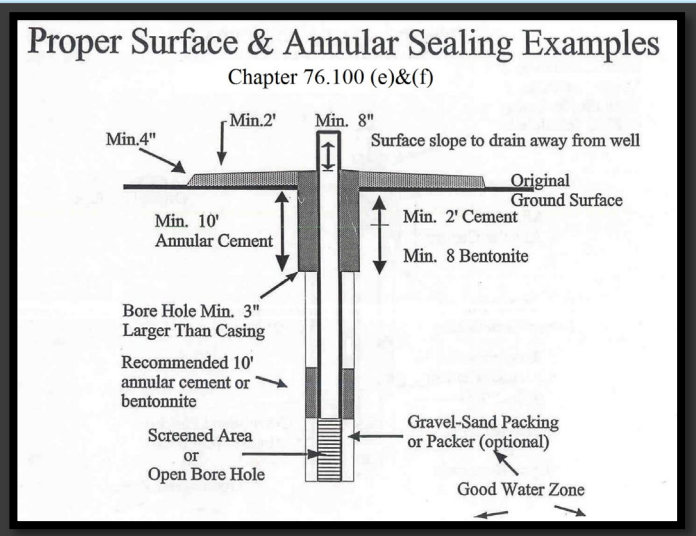
Preventing Contamination

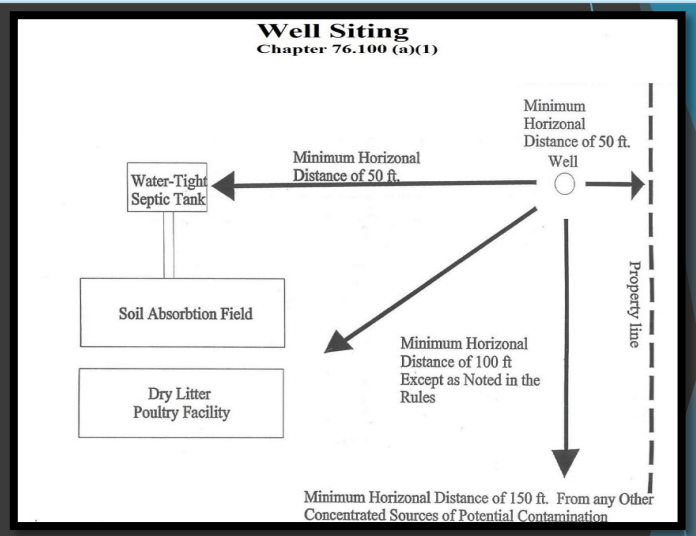
Well Construction

Properly construct and seal wells. Regularly test water quality.



Well Siting

Adhere to setback requirements from contamination sources.

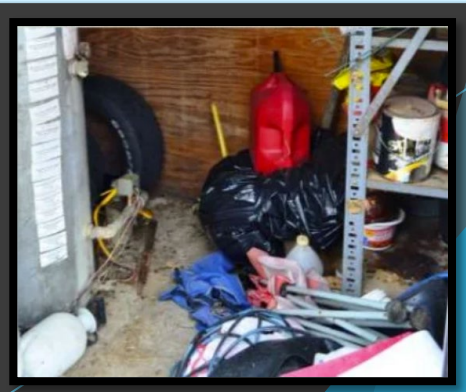


Proper Disposal

Safely dispose of chemicals, oil, and hazardous waste.

Chemical Storage

Keep area around well free of potential contaminants.



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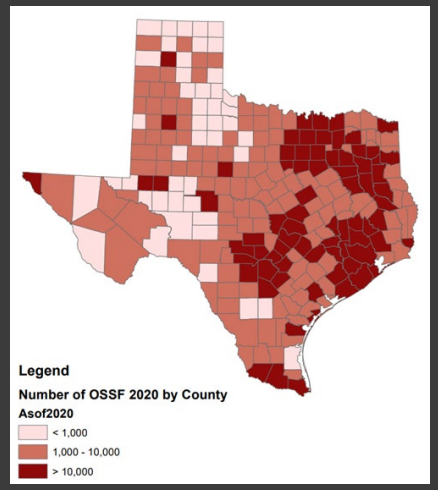
On-Site Sewage Facilities (OSSFs)



Widespread Usage

One in five Texas homes relies on OSSFs for OSSFs for wastewater treatment

Treatment Systems

Include both conventional septic tanks and and aerobic treatment systems. Poor design design or inadequate maintenance can lead lead to groundwater contamination.

Environmental Impact

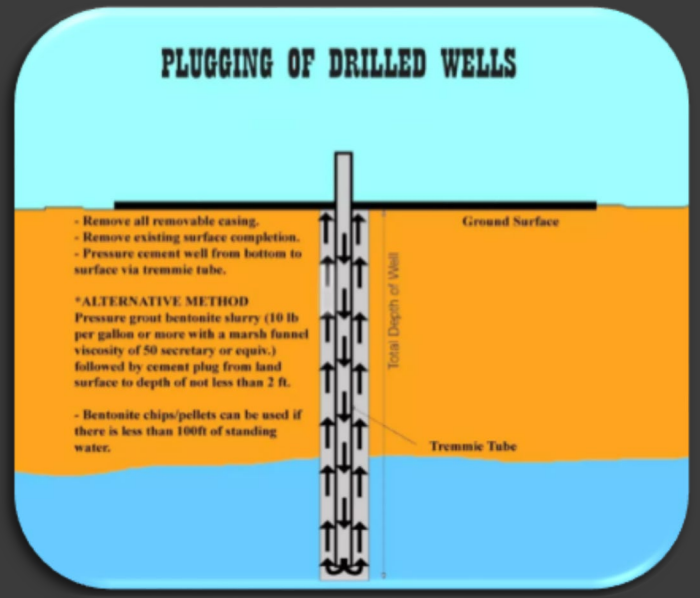
Maintenance is crucial - improperly maintained systems can lead to groundwater groundwater contamination

NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT

Abandoned and Deteriorated Wells

Abandoned or deteriorated wells pose a significant risk to groundwater quality, human health, and the environment.

- An abandoned well is a well that is not in use.
- A deteriorated well is a well that, because of its condition, will cause or is likely to cause pollution of any water in this state, including groundwater.



Plugging Abandoned Wells

Comply with Texas Administrative Code 76.104. Use pressure cementing or bentonite grout.

Capping Non-Deteriorated Wells

Use a cover designed to prevent surface pollutants from entering the well.

NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT

Speaker Introduction

Kaylin Garcia

Public Relations & Education Director, Prairielands Groundwater Conservation District

Groundwater Supply and Protection

Kaylin Garcia
Public Relations & Education Director
Prairielands Groundwater Conservation District

PGCD

Supply Concerns

- Priority Groundwater Management Area Designation
- Woodbine and Trinity Aquifers
- What is a PGMA
- PGMA Purpose
- PGMA Impact

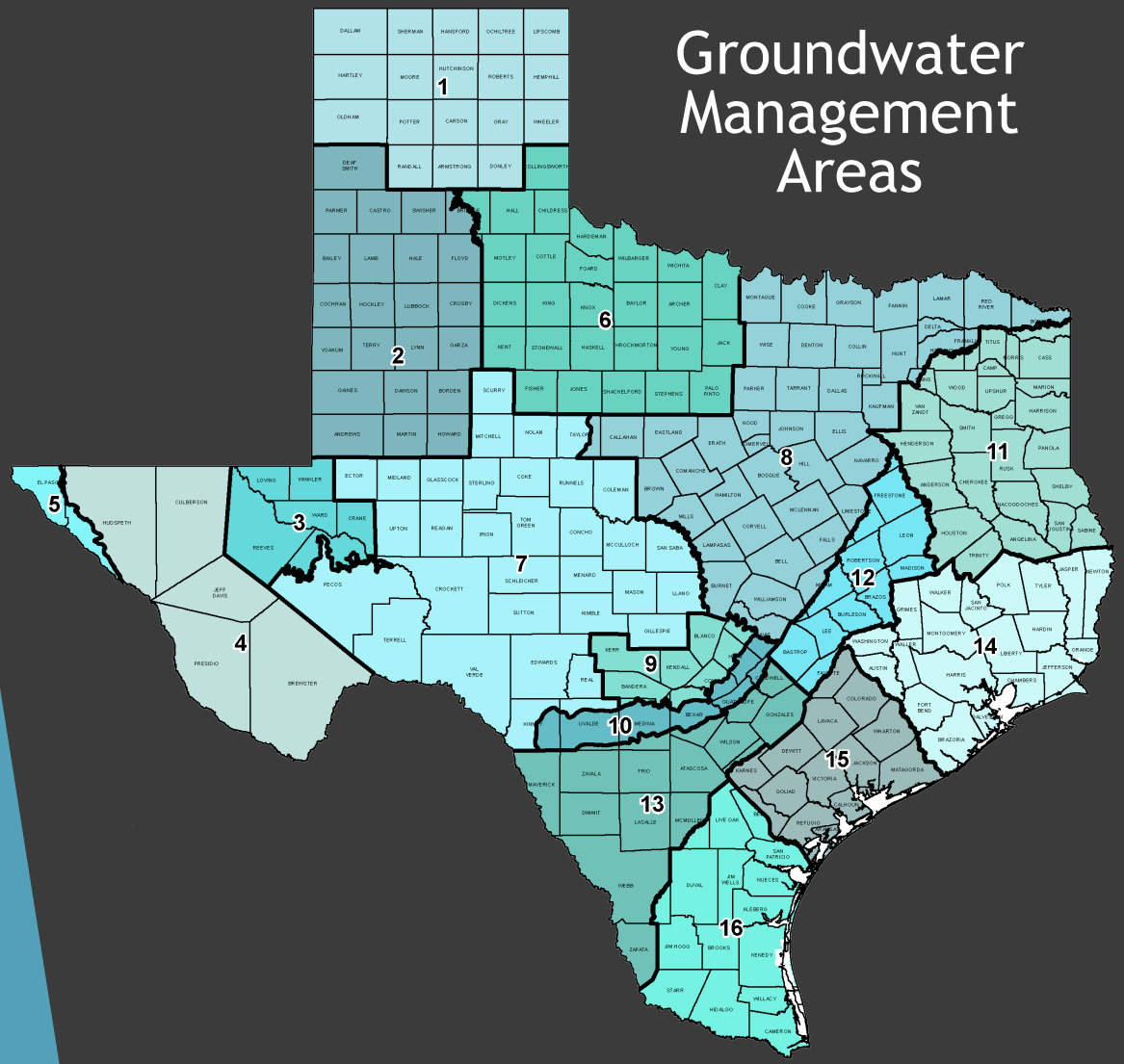
PGCD

GCDs Addressing Supply Concerns

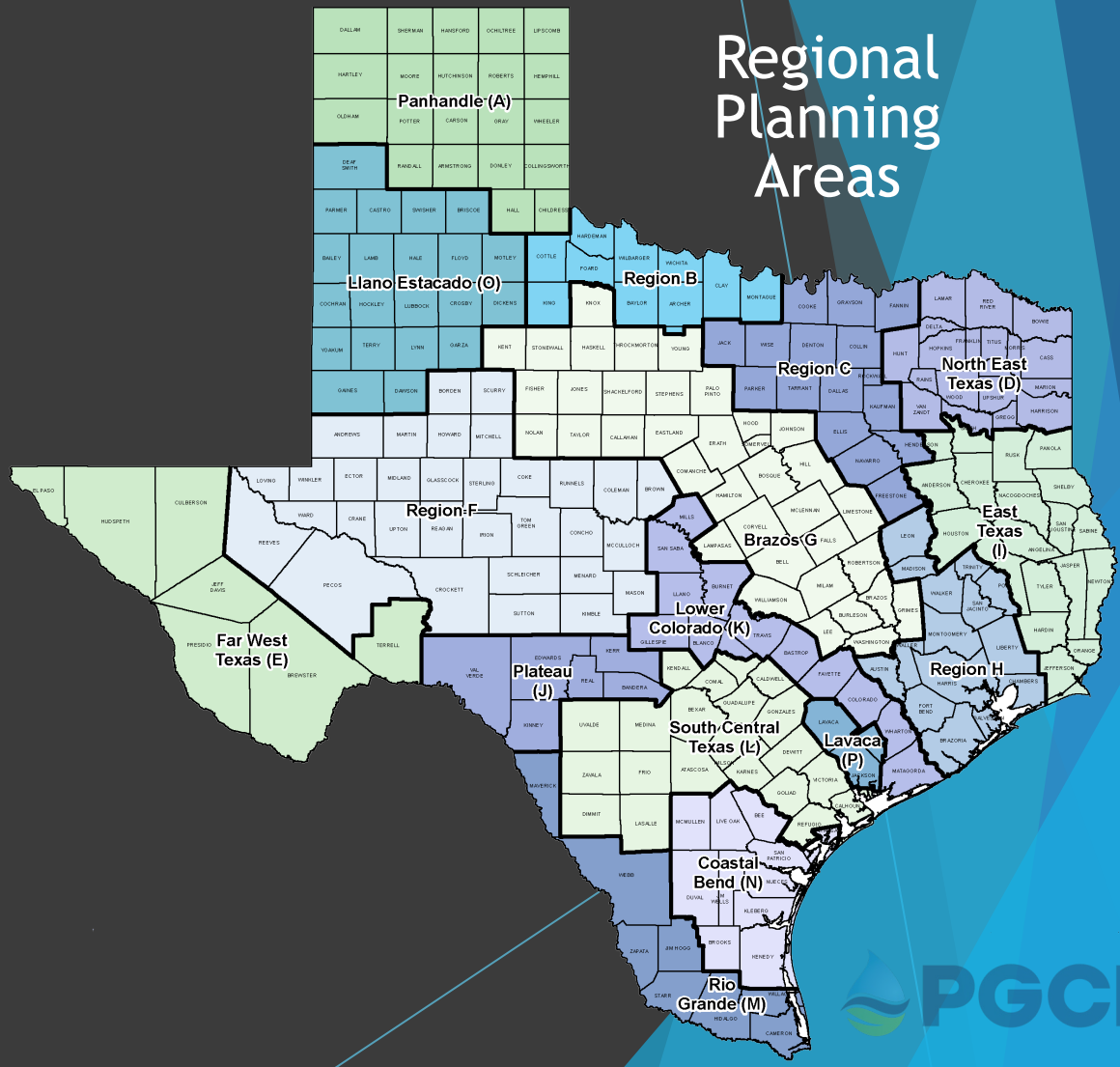
- Rules & Regulation
- Permitting & Registration
- Well Monitoring Programs Programs
- Coordinate with Regional & & State Agencies

Statewide Water Planning

Groundwater Management Areas



Regional Planning Areas



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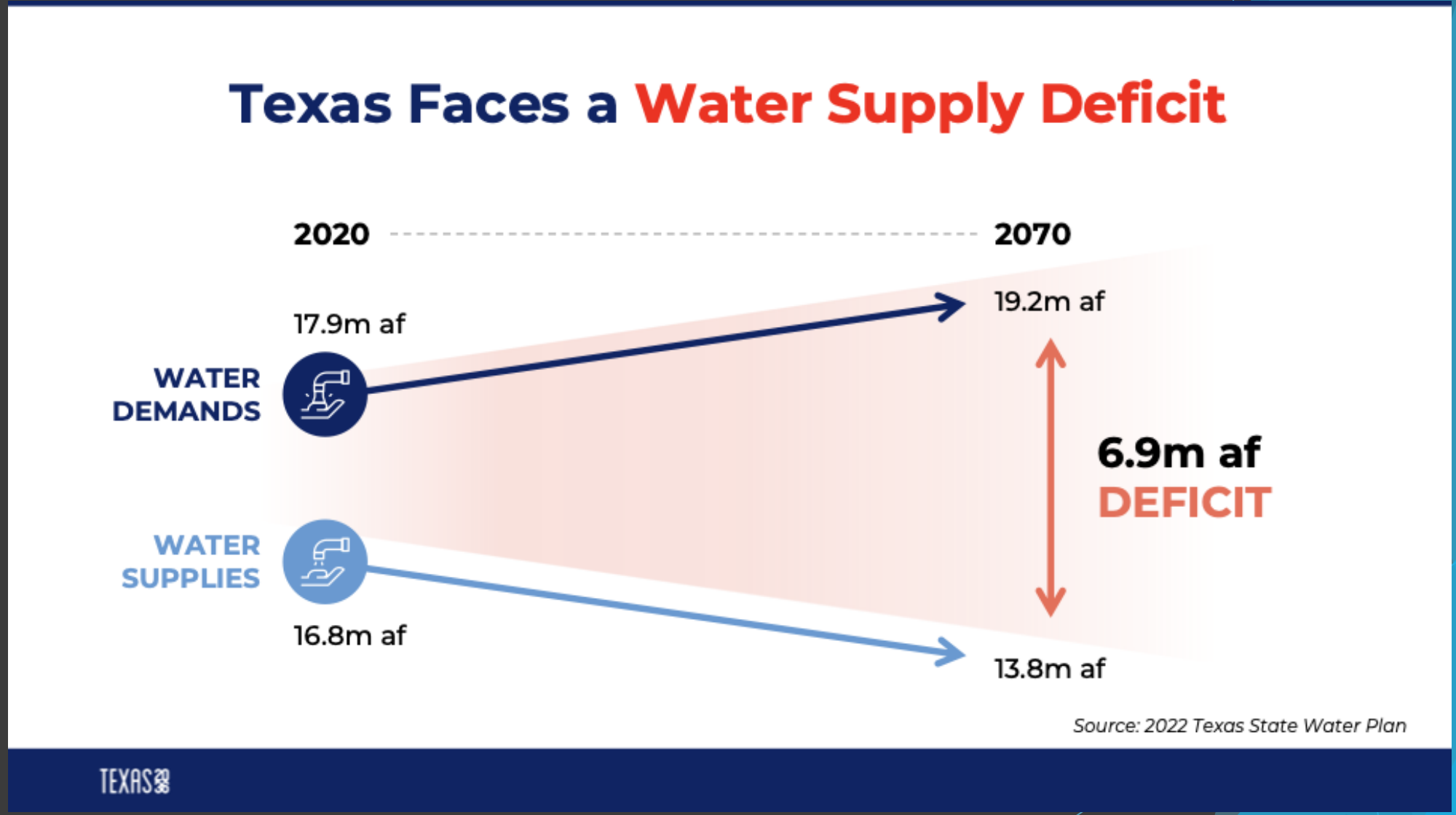
Water Demands



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Legislation Supporting Groundwater

- Senate Bill 2440
  - Groundwater Availability Certifications
- Proposition 6: Texas Water Fund
  - Promote Water Conservation
  - Support Sufficient water Supply During a Drought
  - Help Local Communities and Texas Economy

PGCD

Rainwater Harvesting Programs

- Workshops
- Rebate Programs
- Grant Programs
- Demonstrations

https://uppertrinitygcd.com/rainwater-harvesting-grants/

https://www.prairielandsgcd.org/education/rainwater-harvesting/

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Community Involvement

- Presentation to community members
  - Realtor Groups
  - Community Organizations
- Working closely with local leaders
  - Platting Authorities
  - Municipalities
  - Commission Courts

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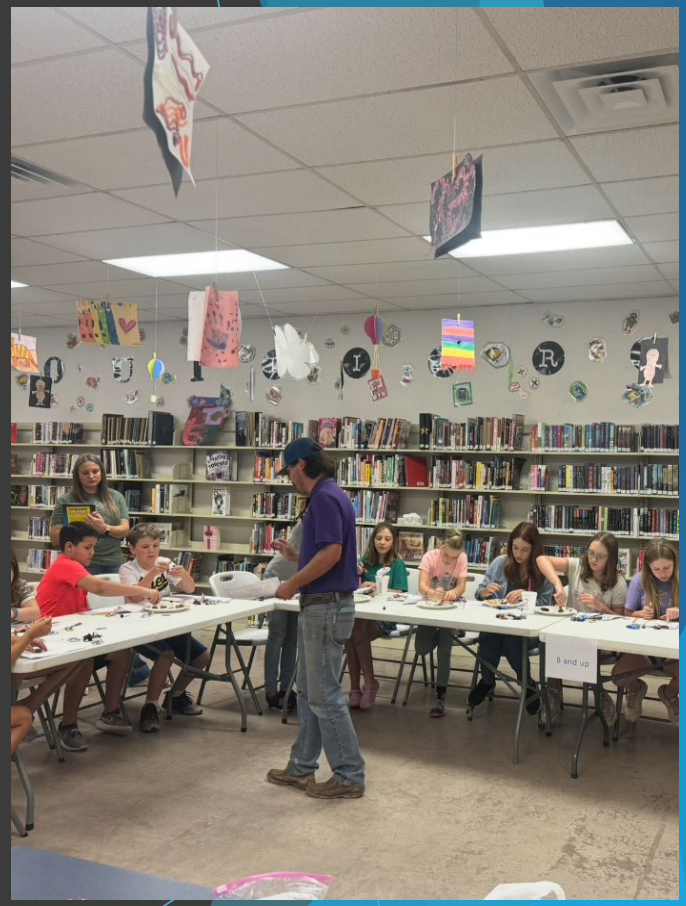
Education Programs

- Water Education Trailer
  - Mobile Classroom
  - Hands on Experience
- Schools and fairs across the Districts
- Prepares the next generation to make informed decisions about water use and policy



Questions?

Northern Trinity GCD

Prairielands GCD

Upper Trinity GCD

Thank you!

PGCD

Questions?

Webinar Feedback

- Please provide your feedback on today's webinar in this brief survey. Thank you!

Provide Webinar Feedback Here

Water for North Texas Online Library

- Resources related to today's topic and other water-related subjects can be found on the Water for North Texas Online Library

Wrap-Up

- If you have submitted an RSVP for this webinar, you will receive an email with the presentation slides and a link to the recording.
- All webinar slides and recordings are posted on NCTCOG's website under the green banner, "Webinars" here:
  https://www.nctcog.org/envir/natural-resources/water-resources
- If you did not RSVP and would like these webinar materials, please email aknox@nctcog.org.

North Central Texas Council of Governments

Thank you for attending!

NCTCOG Webinar
February 12, 2025

Alyssa Knox, NCTCOG
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North Central Texas Council of Governments Environment & Development

www.nctcog.org/WaterResources

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EPA United States Environmental Protection Agency

Texas Commission on Environmental Quality