UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT

ANNUAL REPORT FOR YEAR ENDING DECEMBER 31, 2022

General Manager’s Report 2022

2022 proved to be the busiest year since the creation of the District. Staff processed approximately 2,300 new well registrations – 60% of which were in Parker County. Additionally, the District received the most Permit requests to date.

2022 also saw the completion of the second large rainwater harvesting project – the Wise County Fairgrounds, which led to the Board adopting Resolution 22-002 Establishing and Ongoing Rainwater Harvesting Grant Program, and began accepting applications in the fall. The District was also voted “Wise County Large Business of the Year”.

Finally, I am happy to report that the District met or exceeded each Management Plan objective, as set forth in our Management Plan, for 2022. Furthermore, an independent auditor has reported favorably in regard to the District’s financial position.

Below are a few highlights from 2020:

Staff/Board:

- Natalie Nava, Dawson Lowe, and Sara Scoggins joined the District staff as Field Technicians.
- Board Vice President Richard English (Hood Co.) announced his resignation in late 2022.

Other Notable Accomplishments:

- Adopted DFCs.
- Completed the paving of the District Parking lot.
- Adopted annual Rainwater Harvesting Grant Program.

District staff is pleased to submit the remainder of this report, to the Board, to highlight the fulfillment of our objectives.

Doug Shaw
General Manager

Brief History 2022

✓ In 2006, based on data from the Texas Water Development Board (TWDB) and the Texas Commission on Environmental Quality (TCEQ), the counties of Montague, Wise, Parker, and Hood were included in the designation of the North Texas Priority Groundwater Management Area (PGMA).

✓ In 2007, the 80th Texas Legislature created the Upper Trinity Groundwater Conservation District (UTGCD).

✓ In November 2007, over 78 percent of voting residents within the District's four counties approved creation of the groundwater conservation district.

✓ On November 30, 2009, the Board of Directors of the UTGCD revised and adopted the Temporary Rules for Water Wells; they allow the District to enforce spacing regulations between wells and minimum distance from property boundaries for water wells drilled after January 1, 2009.

✓ In 2017, UTGCD purchased property in Springtown, Parker County to build a new District office and education center, and in 2018 the District moved into the new facility.

✓ On October 15, 2018, the Board of Directors adopted a revised District Management Plan. Its Objectives and Performance Standards are discussed on the following pages.

✓ On August 19, 2019, UTGCD adopted updated Rules for Water Wells in Hood, Montague, Parker, and Wise Counties, Texas, which now include permitting requirements for nonexempt water wells.

✓ In 2020, the District awarded grant funding, for the first time, for a large rainwater collection project in Parker Co. The District was awarded the Rain Catcher Award by the Texas Water Development Board.

✓ On June 15, 2020, the Board of Directors adopted a revised District Management Plan. Its Objectives and Performance Standards are discussed on the following pages.

✓ In the fall of 2022, the District adopted an ongoing annual Rainwater Harvesting Grant Program.

Mission Statement

The Mission of the Upper Trinity Groundwater Conservation District is to develop rules to provide protection to existing wells, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, ensure that the residents of Montague, Wise, Parker, and Hood Counties maintain local control over their groundwater, respect and protect the property rights of landowners in groundwater, and operate the District in a fair and equitable manner for all residents of the District.

District Staff 2022

Doug Shaw
General Manager

Kyle Russell
Assistant G.M.

Ann Devenney
Office Manager

Blaine Hicks, P.G.
Staff Geologist

Jill Garcia, P.G.
Outreach, Education, Grants

Laina Furlong
Office Admin

Jacob Dove
GIS Analyst/Property Management Coord.

Jennifer Hachtel
Data Coordinator

Jay Love
Reporting Compliance Coord.

Leisha Mazanec
Field Supervisor

Sara Scoggins
Field Technician

Natalie Nava
Field Technician

Dawson Lowe
Field Technician

Board of Directors

The Board of Directors of the Upper Trinity Groundwater Conservation District is composed of two members, per county, appointed by their county's Commissioners' Court. In a Regular Board Meeting on July 19, 2021, the Board of Directors elected District Officers to serve two-year terms ending July 2023. In September 2022, Director English submitted his Letter of Resignation to the Board; the position remains vacant. The appointments are as follows:

Tracy Mesler – President	Montague County
Richard English – Vice President	Hood County
Tim Watts – Secretary/Treasurer	Parker County
Jarrod Reynolds – Assistant Secretary	Hood County
Mike Berkley – Assistant Secretary	Montague County
Shannon Nave – Assistant Secretary	Parker County
Donald Majka – Assistant Secretary	Wise County
Brent Wilson – Assistant Secretary	Wise County

Board of Directors

The District's Management Plan sets forth a methodology for tracking the District's progress in achieving management goals. The Plan requires the District to prepare an Annual Report to the District's Board of Directors, which must contain an update on the District's performance in regard to achieving management goals and objectives. This report is intended to satisfy the annual reporting requirements of the District's Management Plan. After adoption by the Board of Directors, the Annual Report is made available to the public.

Well Registrations 2022

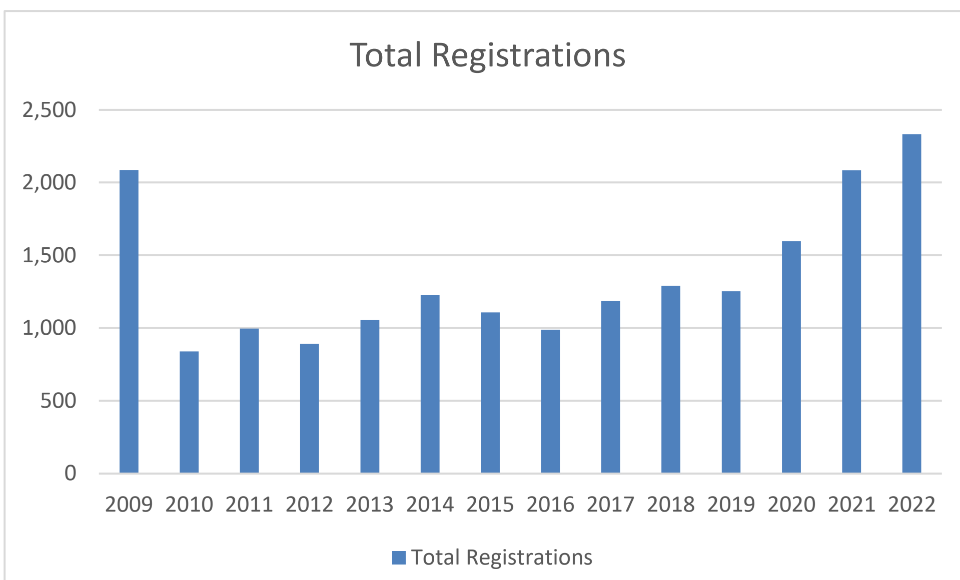
A1. Objective - Each year the District will require registration of all new wells within the District.

A.1 Performance Standard - Annual reporting of well registration statistics will be included in the Annual Report provided to the Board of Directors.

The District Rules for Water Wells require any water well drilled on or after January 1, 2009, to be registered with the District; additionally, owners of any exempt well drilled prior to 2009 may voluntarily register their well(s) with the District. Furthermore, the District requires all operational nonexempt wells are registered and the monthly volume of groundwater produced from those wells be reported to the District. The District received 248 more water well registrations in 2022 than in 2021 — Hood, Parker, Wise, and Montague counties each had more registrations than the previous year.

County	Exempt	Nonexempt	Existing	New	Total
Hood	173	2	11	164	175
Montague	229	2	13	218	231
Parker	1356	17	45	1,328	1,373
Wise	540	13	30	523	553
Total:	2,298	34	99	2,233	2,332

Year	Total Registrations
2009	2,086
2010	839
2011	996
2012	892
2013	1,054
2014	1,226
2015	1,107
2016	988
2017	1,187
2018	1,290
2019	1,252
2020	1,596
2021	2,084
2022	2,332



Groundwater Production Report 2022

A.2 Objective - Each year the District will monitor annual production from all non-exempt wells within the District.

A.2 Performance Standard - The District will require installation of meters on all non-exempt wells and reporting of production to the District. The annual production of groundwater from non-exempt wells will be included in the Annual Report provided to the Board of Directors.

The District has adopted rules requiring metering, reporting and fee payment for all wells determined to be subject to those requirements (nonexempt wells). Owners/Operators of these nonexempt wells must report groundwater production semi-annually and pay water usage fees, set annually by the Board.

In 2022, Public Water Supply production accounted for approximately 81% of total groundwater extracted from nonexempt water wells within the District. The table below shows total groundwater production for each of the three categories of use (Public Water Supply, Oil and Gas, and Commercial/Business) in each of the four counties that comprise the District .

Public Water Supply	Gallons Reported	Category Percentage
Hood	1,504,240,186	33.62%
Montague	117,301,867	2.62%
Parker	1,281,856,545	28.65%
Wise	701,306,897	15.67%
Total:	**3,604,705,495**	**80.56%**

Oil & Gas Production	Gallons Reported	Category Percentage
Hood	0	0.00%
Montague	4,953,230	0.11%
Parker	9,568,120	0.21%
Wise	470,420,654	10.51%
Total:	**484,942,004**	**10.84%**

Commercial/Business	Gallons Reported	Category Percentage
Hood	114,319,569	2.56%
Montague	2,024,900	0.05%
Parker	251,844,531	5.63%
Wise	16,464,628	0.37%
Total:	**384,653,628**	**8.60%**

2022 Grand Total:	**4,474,301,127**	

Permitted Groundwater Production Volumes 2021

A.3 Objective - Each year the District will monitor permitted groundwater production volumes.

A.3 Performance Standard - Annual permitted volume of groundwater will be included in the Annual Report provided to the Board of Directors.

In 2019, the District's Board of Directors adopted rules implementing a permitting process related to wells determined to be subject to those requirements (nonexempt wells); two types of permits were included – Operating Permits (OP) and Historic Use Permits (HUP). OPs apply to all new nonexempt wells drilled after December 31, 2019, and wells drilled, or for which administratively complete applications were received, prior to that date are eligible for HUPs.

The District began issuing OPs in 2020, and the original deadline to submit an application for a HUP was December 31, 2020 (this was extended to June 30, 2021, due to COVID). The District's Board of Directors began issuing HUPs in 2021. Below you will find the authorized and pending volumes requested in HUP applications received prior to the end of 2022.

Total Approved and Pending Permits as of December 31, 2022

Public Water Supply	Operating Permits	Historic Use Permits (Including Authorized and Pending)
Hood	0	2,757,226,590
Montague	0	208,625,300
Parker	93,872,332	1,581,535,500
Wise	67,462,363	796,149,650
Total:	**161,334,695**	**5,343,537,040**

Oil & Gas Production	Operating Permits	Historic Use Permits (Including Authorized and Pending)
Hood	0	250,724,978
Montague	3,612,370	876,452,246
Parker	0	919,934,981
Wise	76,208,919	2,917,177,065
Total:	**79,821,289**	**4,964,289,270**

Commercial/Business	Operating Permits	Historic Use Permits (Including Authorized and Pending)
Hood	15,528,283	493,194,980
Montague	30,000,000	5,100,000
Parker	31,558,080	487,991,558
Wise	32,550,000	177,643,943
Total:	**109,636,363**	**1,163,930,481**

Total Permits	**11,822,549,138**

Waste of Groundwater 2022

B.1 Objective - Annual evaluation of the rules to determine if any amendments are recommended to decrease waste of groundwater within the District.
B.1 Performance Standard - Annual discussion of the evaluation of the rules and a reporting of whether any of the District rules require amendment to prevent waste of groundwater to be included in the Annual Report provided to the Board of Directors.

In August of 2019, the District's Board of Directors adopted District Rules which include the following definition related to the waste of groundwater:

(59) "Waste" means one or more of the following:

(a) withdrawal of groundwater from a groundwater reservoir at a rate and in an amount that causes or threatens to cause an intrusion into the reservoir of groundwater unsuitable for agriculture, gardening, domestic, stock raising, or other beneficial purposes;

(b) the flowing or producing of water from the groundwater reservoir by artificial means if the groundwater produced is not used for a beneficial purpose;

(c) the escape of groundwater from a groundwater reservoir to any other reservoir or geologic strata that does not contain groundwater;

(d) pollution or harmful alteration of groundwater in a groundwater reservoir by saltwater or by other deleterious matter admitted from another stratum or from the surface of the ground;

(e) willfully or negligently causing, suffering, or allowing groundwater to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or other order issued by the Texas Commission on Environmental Quality under Chapter 26 of the Texas Water Code;

(f) groundwater pumped for irrigation that escapes as irrigation tailwater onto land other than that of the owner of the well unless permission has been granted by the occupant of the land receiving the discharge;

(g) for groundwater produced from an artesian well, "waste" has the meaning assigned by Section 11.205, Texas Water Code;

(h) operating a deteriorated well; or

(i) producing groundwater in violation of any District rule governing the withdrawal of groundwater through production limits on wells, managed depletion, or both.

Furthermore, District staff continues to monitor and evaluate the activities of well owners within the District and enforce the District's rules to promote conservation and prevent waste of groundwater. Usually, once an issue is brought to the owner's attention, the matter is corrected immediately. However, District staff will continue to evaluate whether amendments to the District's rules are necessary to decrease waste of groundwater.

Water Use Fees 2022

B.2 Objective - The District will encourage the elimination and reduction of groundwater waste through the collection of a water-use fee for non-exempt production wells within the District.

B.2 Performance Standard - Annual reporting of the total fees paid and total groundwater used by non-exempt wells will be included in the Annual Report provided to the Board of Directors.

UTGCD's Board of Directors set the fee for groundwater usage at a rate of .22 cents per thousand gallons ($.22/1,000 gallons) for all commercial, municipal, and industrial users within the District that are not exempt from the metering, monitoring, reporting or payment requirements as set forth in the temporary rules adopted by the District.

In 2022, the District invoiced a total of $984,307 for nonexempt water use fees, however total nonexempt groundwater production would have actually totaled a value of $984,346. The difference between the total amount invoiced and the total value of the total reported groundwater production is due to issues such as reported emergency use being exempt from fee payment and issues of both over and under reporting in both 2021 by multiple entities. Staff has provided a detailed explanation of these discrepancies as subtext to the table below.

In 2021, the total water use fees collected was slightly higher than the $949,000 collected in 2021, however this value is well within the range of what has been collected since 2015. Prior to 2015, the annual water use fees paid to the District was significantly higher due to O&G production in the area; the peak year was in 2011 when the District collected over $1.5 million in annual water use fees.

Use Category		Hood	Montague	Parker	Wise	Total
Public Water Supply	GW Production	1,504,240,186	117,301,867	1,281,856,545	701,306,897	**3,604,705,495**
	Fees Collected	$330,921.84*	$25,799.59**	$281,114.21***	$154,276.85****	$792,112.49
Oil & Gas	GW Production	0	4,953,230	9,568,120	470,420,654	**484,942,004**
	Fees Collected	$0.00	$1,089.71	$2,067.59*****	$103,492.54	$106,649.84
Commercial/ Business	GW Production	114,319,569	2,024,900	251,844,531	16,464,628	**384,653,628**
	Fees Collected	$25,563.36******	$445.48	$55,913.44*******	$3,622.22	$85,544.50
Total	GW Production	**1,618,559,755**	**124,279,997**	**1,543,269,196**	**1,188,192,179**	**4,474,301,127**
	Fees Collected	**$356,485.20**	**$27,334.78**	**$339,095.24**	**$261,391.61**	**$984,306.83**

* Includes deduction of fees for 50,000 gallons of emergency water use for Cresson MUD #2.

** Includes deduction of fees for 31,000 gallons of emergency water use for the City of Saint Jo.

*** Includes deduction of fees for 3,000,000 gallons of emergency water use for the City of Aledo, deduction of fees for 37,141 gallons of emergency water use for the City of Willow Park, a deduction of fees for 1,010,097 gallons for Palo Duro Service Company for additional 2022 production that was corrected and invoiced in 2023, and deduction of 17,463 gallons for West Park Properties for additonal production for 2022 that was invoiced and corrected in 2023.

**** Includes deduction of fees for 48,500 gallons of emergency water use for Slidell WSC.

*****Includes deduction of fees for 170,000 gallons for Bedrock Production for a corretion to add to their 2022 production that was corrected and invoiced in 2023.

******Includes addition of fees for 1,877,508 gallons of production for Camp El Tesoro that was produced prior to but invoiced in 2022 as part of a violation.

*******Includes deduction of fees for 257,860 gallons for Brown Southgate Glen Texas for additional 2022 production that was received and invoiced in 2023, addition of fees for 519,269 gallons for Greywalls LLC DBA Split Rail Golf and Clubfor over reported production in 2022, addition of fees for 385 gallons for Guy Hamilton for production prior to 2022 that was received and invoiced in 2022 as part of a violation, addition of fees for 409,000 gallons for Rhonda Odom for production prior to 2022 that was received and invoiced in 2022 as part of a violation, addition of fees for 108,000 gallons for Sky Family Investments for production prior to 2022 that was recieved and invoiced in 2022 as part of a violation, addition of fees for 1,534,000 gallons for St. Clare Health Care, LLC for production prior to 2022 that was received and invoiced in 2022 as part of a violation, and a deduction of fees for 5,800 gallons of emergency water use for the Town of Annetta.

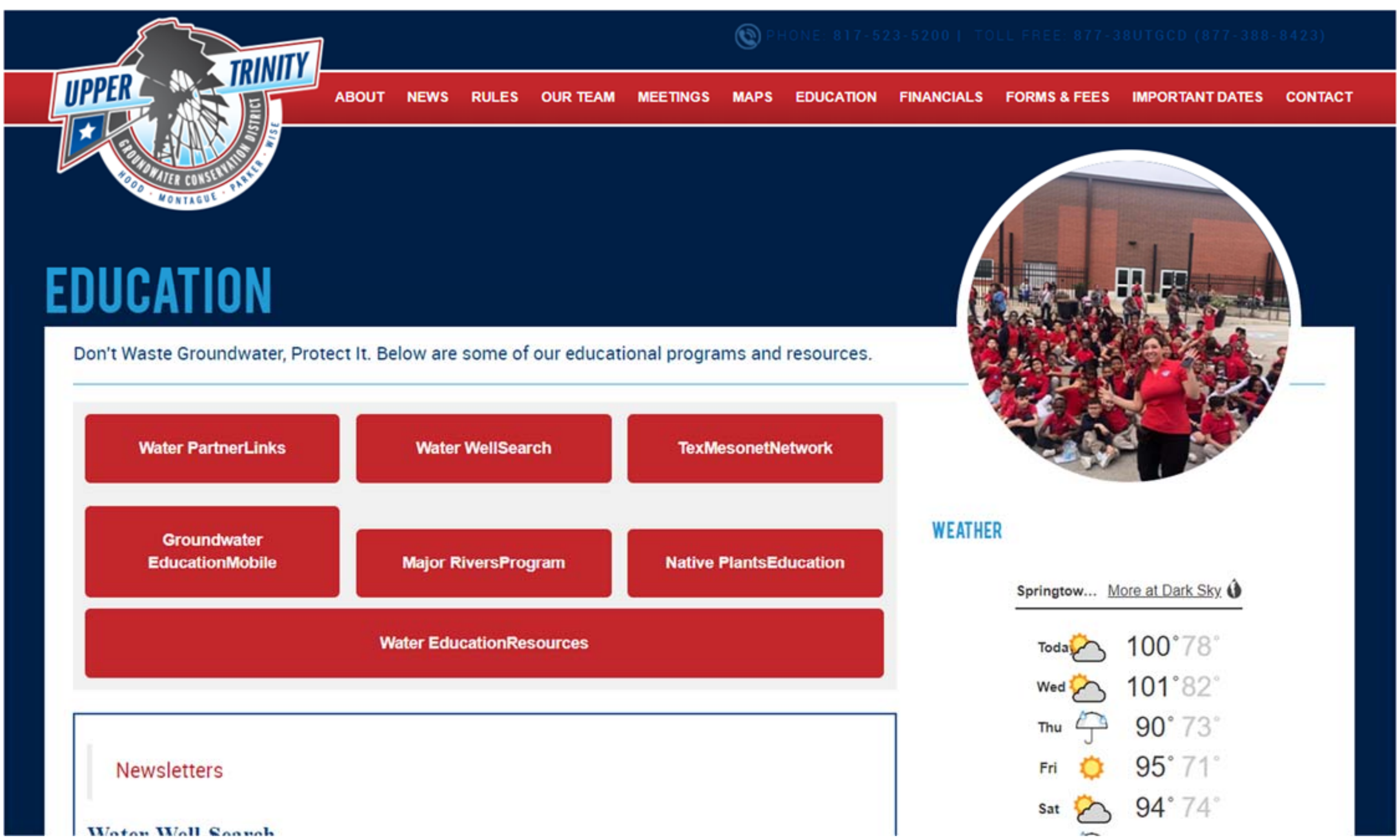
Online Access 2022

B.3 Objective - Each year, the District will provide information to the public on eliminating and reducing wasteful practices in the use of groundwater by including information on groundwater waste reduction on the District's website.

B.3 Performance Standard - Each year, a copy of the information provided on the groundwater waste reduction page of the District's website will be included in the District's Annual Report to be given to the District's Board of Directors.

The Upper Trinity Groundwater Conservation District's website provides information about eliminating waste on the "Education" page, which can be found at http://uppertrinitygcd.com/education/. The website is promoted through the District's news releases, advertising, social media, and brochures.

Additionally, local educators and event coordinators can schedule a free on-site visit of the Groundwater Education Mobile (GEM) through the "Education" page. In 2022, over 4,000 elementary school, middle school, and high school students and over 200 adults were able to tour the District's education trailer, both virtually and in-person. Students are encouraged to engage in critical thinking about our most precious resource. In addition to touring the exhibits, staff participated in many STEM-based learning activities that included customized lesson plans with hydrogeology curriculum, content development seminars with Region 11, water pollution simulations, and water conservation principles. UTGCD makes the GEM available to North Texas schools and entities interested in water conservation and aquifer resources



https://uppertrinitygcd.com/education/

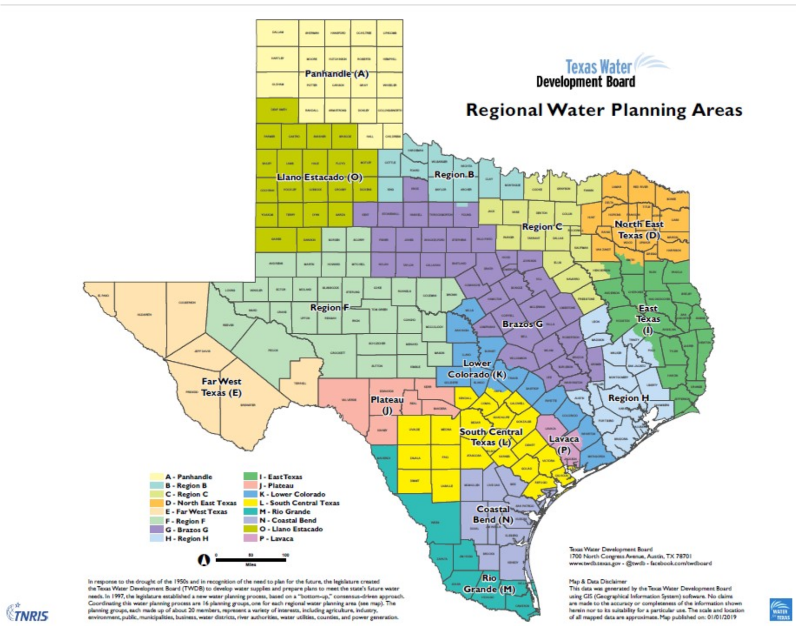
Regional Water Planning Participation 2022

C.1 Objective - Each year the District will participate in the regional water planning process by attending at least one of the Region B, C or G Regional Water Planning Group Meetings to encourage the development of surface water supplies to meet the needs of water user groups within the District.

C.1 Performance Standard - The attendance of a District representative at any Regional Water Planning Group meeting will be noted in the Annual Report provided to the Board of Directors.

Throughout the year, the District's staff attended various water-planning meetings. Staff and Board members also participated in meetings and/or conferences concerning public outreach or other groundwater issues. A record of attendance at regional water planning meetings by District Representatives follows.

Region B Water Planning Group		
5/4/2022	Wichita Falls, TX	Tracy Mesler and Doug Shaw
11/16/2022	Wichita Falls, TX	Tracy Mesler and Doug Shaw
Region C Water Planning Group		
5/23/2022	Arlington, TX	Doug Shaw
11/7/2022	Arlington, TX	Doug Shaw
Region G Water Planning Group		
3/23/2022	Waco, TX	Doug Shaw
7/13/2022	Waco, TX	Doug Shaw
11/2/2022	Waco, TX	Doug Shaw



Injection Well Applications 2022

D.1 Objective - Ongoing monitoring and review of all applications submitted to the Railroad Commission of Texas to inject fluid into a reservoir productive of oil or gas within the boundaries of the District and all counties immediately adjacent to the District.
D.1 Performance Standard - Regular updates to the District's Board of Directors concerning injection well applications received and reviewed and inclusion of summary of all applications received and reviewed by the District in the Annual Report provided to the Board of Directors.

Injection Well Applications
Received by the District in 2022

Operator	Registration No.	Location	Date District Received	Well Site Protested	Resolution/Notes
BKV Dcarbon Venture, LLC.	55813	Wise, 4.6 miles Southwest of Bridgeport	11/15/2022	yes	issues have been resolved and protest withdrawn
Oakridge Oil and Gas, LP	55813	Jack, 5 miles North of Jacksboro	11/14/2022	yes	
Scout Energy Management LLC	55795	Montague, 5.5 miles Southwest of Forestburg	11/5/2022	yes	
BKV North Texas, LLC	55661	Parker, 5.1 miles Northwest of Azle	10/13/2022	yes	
Hadley Oil Company	55615	Montague, 11 miles North of Nocona	10/6/2022	no	
Pelty Drilling Co. Inc.	55557	Clay, 5.5 miles South of Jolly	9/20/2022	no	
Cobra Oil & Gas Corporation	55492	Clay, 2 miles east of Deer Creek	9/6/2022	no	
Peba Oil & Gas, Inc.	55451	Montague, 14 miles north of Nocona	8/22/2022	no	
Muirfield Exploration, Ltdd.	55406	Clay, 3 miles east of Petrolia	8/8/2022	no	
WFW Production Company, INC.	55364	Cooke, 5 miles north of Muenster	7/22/2022	no	
WFW Production Company, INC.	55357	Cooke, 5 miles north of Muenster	7/22/2022	no	
Massie Oil Company	55344	Clay, 3 miles south of Petrolia	7/22/2022	no	
BKV Barnett, LLC	55286	Wise, 4.6 miles southwest of Bridgeport	7/22/2022	yes	applicant has provided the requested infomration - protest withdrawn
Oakridge Oil and Gas, LP	55260	Jack, 11 miles southeast of Jacksboro	6/23/2022	no	
HWH Production, LLC	55235	Cooke, 1.7 miles north of Muenster	6/17/2022	no	
Miller, Glenn J.	55201	Cooke, 3 miles south of Muenster	6/3/2022	no	
J.R. and Adam Seitz, LTD	55129	Cooke, 2 miles southeast of Woodbine	5/16/2022	no	
T&S Oil & Gas LLC	55119	Palo Pinto, 1.5 miles North of Gordon	5/16/2022	no	
LR Operating Co.	55058	Palo Pinto, 1 mile South of Graford	5/2/2022	no	

Injection Well Applications
Received by the District in 2022 - continued

Operator	Registration No.	Location	Date District Received	Well Site Protested	Resolution/Notes
Xplore Operating LLC	55016	Jack County, 10 miles Northwest of Jacksboro	4/26/2022	no	
Atmos Pipeline	54916	Clay County, 8 miles southeast of Henrietta	4/5/2022	no	
Diversified Production LLC	54843	Tarrant County, 3 miles southeast of Haslet	3/16/2022	no	
EOG SPG Holdings, Inc.	54836	Montague County, 9.4 miles southeast of Montague	3/16/2022	yes	applicant agreed to changes - rescinded protest
Daylight Petroleum LLC	54810	Cooke County, 1.5 miles northwest of Sivells Bend	3/7/2022	no	
WFW Production Company, INC.	54784	Cooke County, 7.5 miles south of Muenster	3/1/2022	no	
Ross, Dwight M. DRLG. CO., INC.	54765	Montague County, 6.7 miles north of St. Jo	2/26/2022	no	
Worsham-Steed Gas Storage, LLC	54756	Jack County, 3 miles northeast of Perrin	2/23/2022	no	
Reed Production Inc.	54649	Cooke County, 3 miles Southeast of Gainesville	1/26/2022	no	
Peba Oil & Gas, Inc.	54637	Montague County, 10 miles North of Nocona	1/24/2022	no	
WFW Production Company, INC.	54623	Cooke County, 5 miles South of Muenster	1/20/2022	no	
Bend Pet Oleum Co.	54606	Cooke County, 12 miles Southeast of Gainesville	1/14/2022	no	

Drought Conditions 2022

E.1 Objective - Monthly review of drought conditions within the District using the Texas Water Development Board's Monthly Drought Conditions Presentation available at: http://www.twdb.texas.gov/surfacewater/conditions/report/index.asp

E.1 Performance Standard - An annual review of drought conditions within the District will be included in the Annual Report provided to the Board of Directors and on the District website.

The National Drought Mitigation Center defines drought as "a deficiency of precipitation over an extended period of time (usually a season or more) resulting in a water shortage." (Source: https://drought.unl.edu/Education/DroughtBasics.aspx). The District reviews the Texas Water Conditions Report published by the Texas Water Development Board every month.

Beginning on the next page, you will find the TWDB's monthly Texas Water Conditions Report (TWCR).

Texas Water Conditions Report

O. C. Fisher, Samuel Sutton, San Angelo Standard-Times

January 2022

Water News:

There has been an uptick in the extent of Texas drought conditions, which now covers 96.79% of Texas with the extreme drought category (D3) expanding to cover ~22% of the land area. To learn more, read TWDB's Drought Outlook Blog: https://waterdatafortexas.org/drought/drought-outlook

RAINFALL

This month very little to no rain [yellow, orange, and red shading, Figure 1(a)] fell over most of the state, while southeastern portions of Texas received above average rainfall, reaching 13.99 inches in some areas [dark blue shading, Figure 1(a)]. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in southern North Central, eastern South Central, southeastern Southern, eastern Lower Valley, southern East Texas, and the Upper Coast climate divisions.

Monthly rainfall for January was below average, compared to historical data from 1991–2020, for most of the state [yellow and orange shading, Figure 1(b)]. Average rainfall [green shading, Figure 1(b)] was seen in southern North Central, northern and eastern South Central, southeastern Southern, Lower Valley, southern East Texas, and the Upper Coast climate divisions. Above average rainfall [light blue shading, Figure 1(b)] was seen in the southern East Texas, Upper Coast, southeastern Southern, and eastern Lower Valley climate divisions.

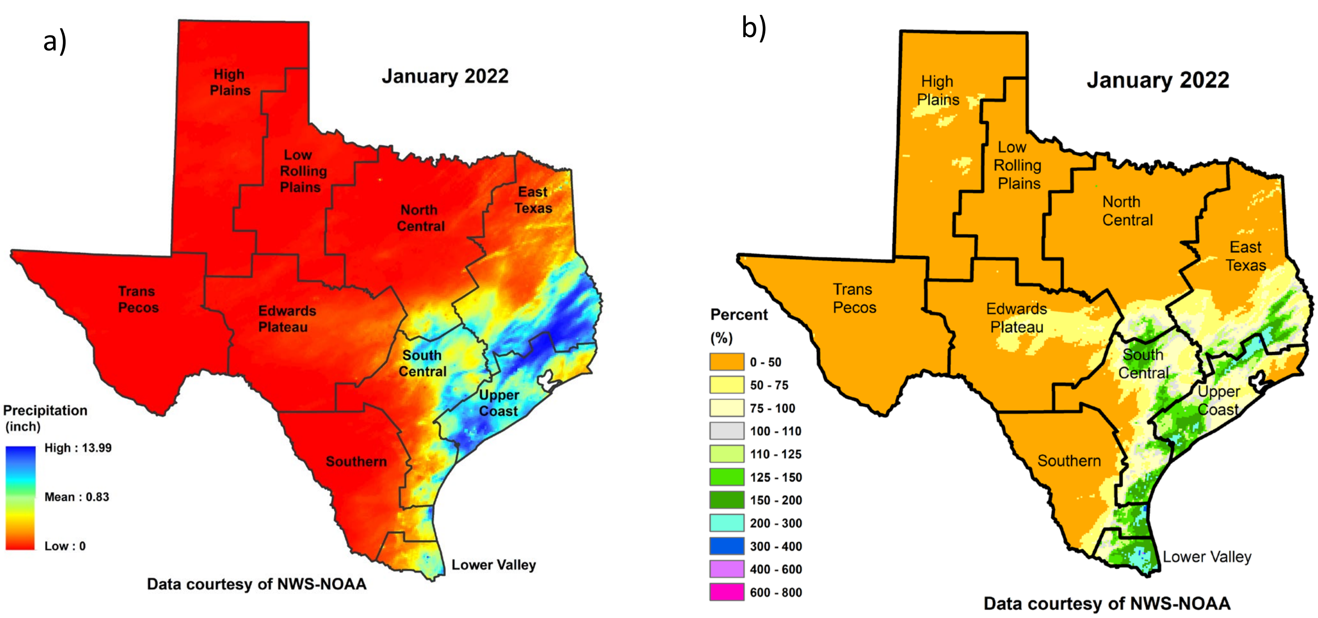


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of January 2022, total conservation storage* in 122 of the state's major water supply reservoirs was 24.5 million acre-feet or 76 percent of total conservation storage capacity (Figure 2). This is approximately 0.20 million-acre-feet less than a month ago and approximately 1.3 million acre-feet less than at the end of January 2021.

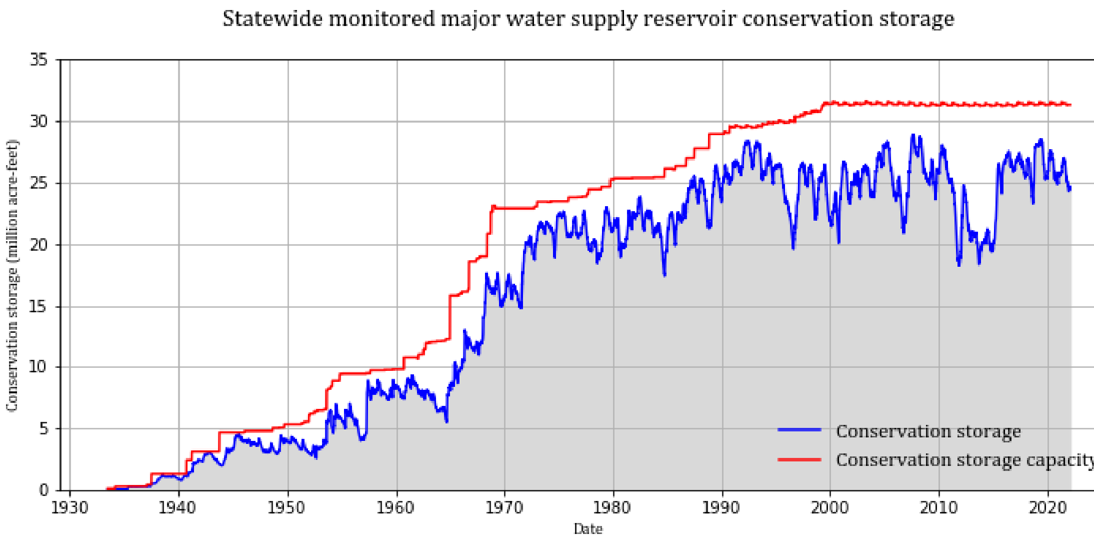


Figure 2: Statewide reservoir conservation storage

Out of 122 reservoirs in the state, 13 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 41 were at or above 90 percent full. Eight reservoirs remained below 30 percent full: E.V. Spence (24 percent full), Greenbelt (16 percent full), Mackenzie (8 percent full), O. C. Fisher (6 percent full), Palo Duro Reservoir (1 percent full), Falcon (23 percent full), Medina Lake (25 percent full), and White River (19 percent full). Elephant Butte Reservoir (located in New Mexico) was 10 percent full.

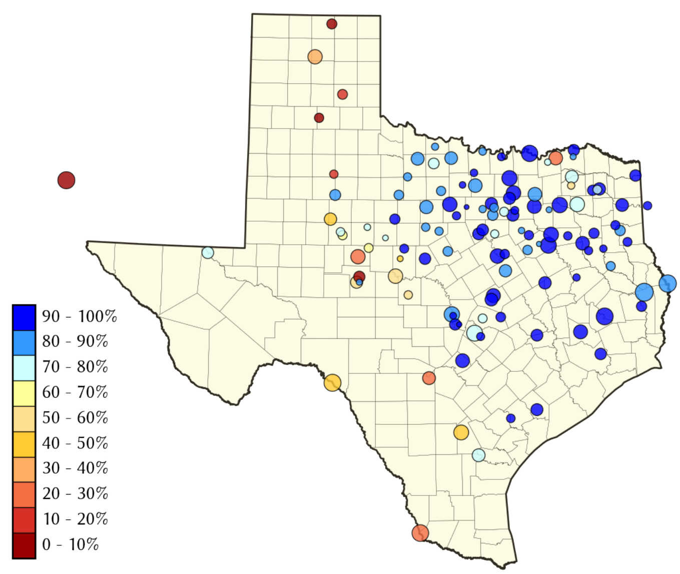


Figure 3: Reservoir conservation storage at end-January expressed as percent full (%)

*Storage is based on end of the month data in 122 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.

Total regionally combined conservation storage was at or above normal (storage ≥70 percent full) in East Texas (89.7 percent full), North Central (90.5 percent full), South Central (72.5 percent full), and Upper Coast (96.5 percent full) climate divisions (Figure 4). The conservation storage for the Low Rolling Plains (69.3 percent full) climate division was abnormally low (Figure 4). The Edwards Plateau climate division had moderately low conservation storage (54.8 percent full, Figure 4). The High Plains (28.4 percent full) and Southern (33.8 percent full) climate divisions had severely low conservation storage, and the Trans Pecos climate division (19.6 percent full) had extremely low conservation storage (Figure 4).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 5) in the Upper and Lower Red, Sulphur, Cypress, Neches, Upper and Lower Sabine, Upper and Lower Trinity, Upper and Lower Brazos, San Jacinto, Lower Colorado, Guadalupe, and Lavaca river basins. The Upper Colorado and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 5), and the San Antonio and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 5). The Upper/Mid Rio Grande river basin had extremely low conservation storage (10–20 percent full, Figure 5).

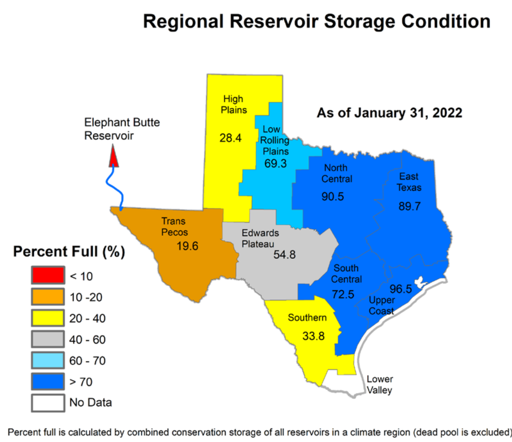


Figure 4: Reservoir Storage Index* by climate division at 1/31/2022

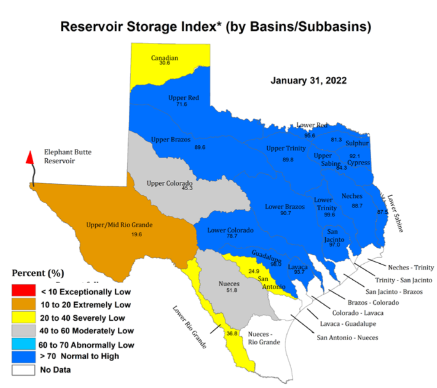


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 1/31/2022

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

February 2022

Water News:

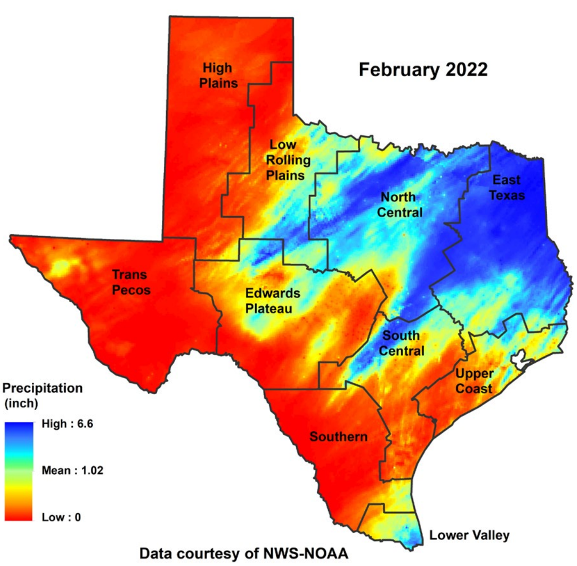
- The goal of the Statewide Synthesis of Environmental Flow Studies (published here: https://www.twdb.texas.gov/publications/reports/contracted_reports/index.asp) was to evaluate: the applicability of each environmental flow study for meeting the goals of defining a sound ecological environment, the expected variability in ecosystem indicators of a sound ecological environment, the potential need for refining adopted flow standards, and strategies to provide for environmental flows in five basin-bay systems.
- The name Bois d’Arc Lake has been officially recognized by the U.S. Board of Geographic Names of the U.S. Department of the Interior and is the first major reservoir to be built in Texas in over 30 years. https://waterdatafortexas.org/reservoirs/individual/bois-darc

RAINFALL

This month very little to no rain [yellow, orange, and red shading, Figure 1(a)] fell over the High Plains, western Low Rolling Plains, Trans Pecos, much of the Edwards Plateau, southwestern North Central, much of South Central, Southern, western Lower Valley, and much of the Upper Coast climate divisions. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in eastern Low Rolling Plains, northern Edwards Plateau, northern South Central, much of the North Central, eastern Upper Coast, and East Texas climate divisions. Above average rainfall [dark blue shading, Figure 1(a)] reaching 6.6 inches in the northeastern parts of the state.

Monthly rainfall for February was below average, compared to historical data from 1991–2020, for most of the state [yellow and orange shading, Figure 1(b)]. Average rainfall [green shading, Figure 1(b)] was seen in northwestern and southern North Central, areas of northern and southern Low Rolling Plains, northern East Texas, western Trans Pecos, northwestern South Central, and southeastern Lower Valley climate divisions. Above average rainfall [light blue shading, Figure 1(b)] was seen in the western Trans Pecos climate division.

a)



b)

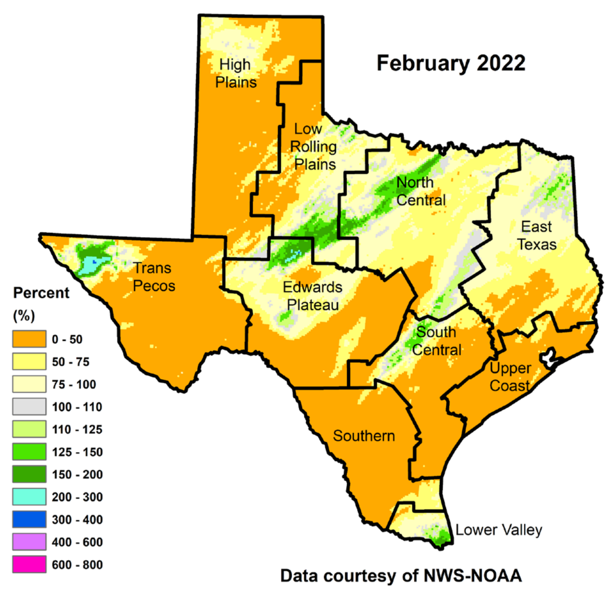


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of February 2022, total conservation storage* in 123 of the state's major water supply reservoirs was 24.6 million acre-feet or 77 percent of total conservation storage capacity (Figure 2). This is approximately 0.12 million-acre-feet more than a month ago and approximately 1.04 million acre-feet less than at the end of February 2021.

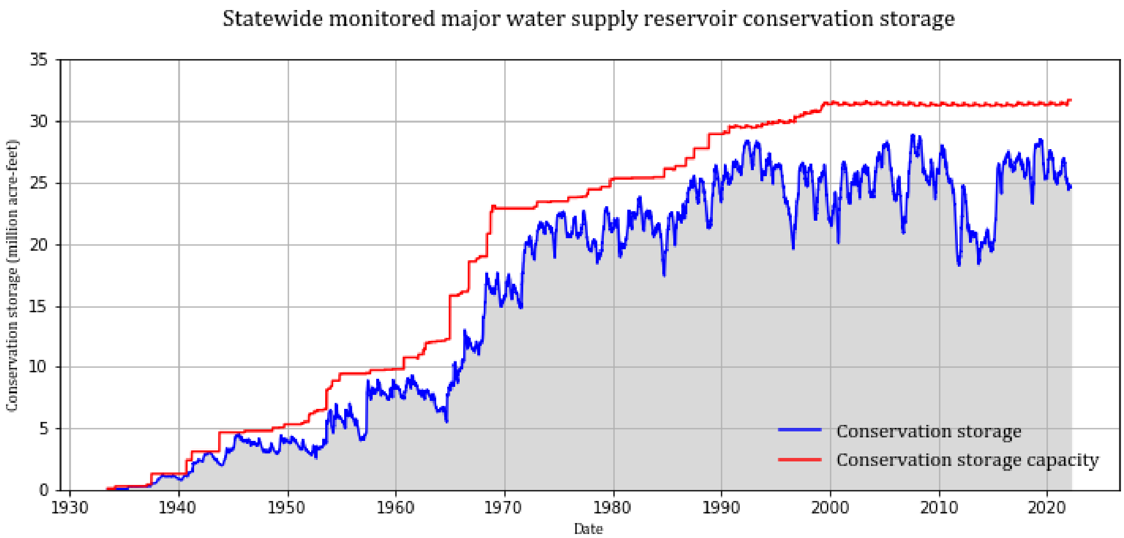


Figure 2: Statewide reservoir conservation storage

Out of 123 reservoirs in the state, 14 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 43 were at or above 90 percent full. Nine reservoirs remained below 30 percent full: Bois d'Arc (23 percent full), E.V. Spence (24 percent full), Greenbelt (16 percent full), Mackenzie (8 percent full), O. C. Fisher (6 percent full), Palo Duro Reservoir (1 percent full), Falcon (23 percent full), Medina Lake (25 percent full), and White River (18 percent full). Elephant Butte Reservoir (located in New Mexico) was 11 percent full.

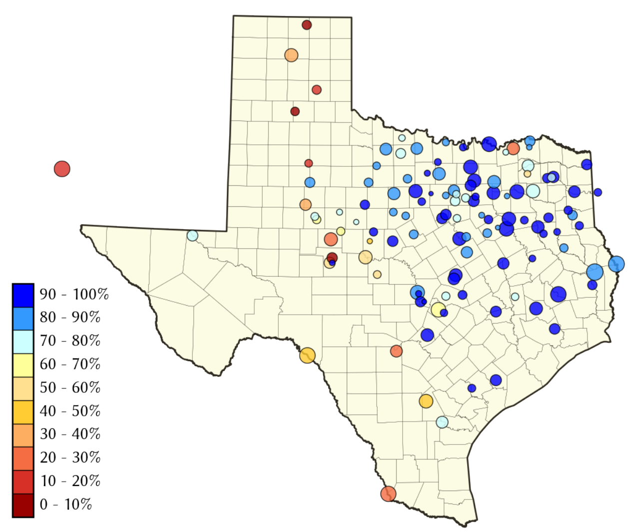


Figure 3: Reservoir conservation storage at end-February expressed as percent full (%)

*Storage is based on end of the month data in 123 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.

Total regionally combined conservation storage was at or above normal (storage ≥70 percent full) in East Texas (90.8 percent full), North Central (90.9 percent full), South Central (72.1 percent full), and the Upper Coast (99.0 percent full) climate divisions (Figure 4). Conservation storage for the Low Rolling Plains (68.7 percent full) climate division was abnormally low (Figure 4). The Edwards Plateau climate division had moderately low conservation storage (54.6 percent full, Figure 4). The High Plains (28.1 percent full), Southern (33.4 percent full), and the Trans Pecos (20.5 percent full) climate divisions had severely low conservation storage (Figure 4).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 5) in the Upper and Lower Red, Upper and Lower Trinity, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Brazos, San Jacinto, Neches, Lower Colorado, Lavaca, and Guadalupe river basins. The Upper Colorado and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 5), and the San Antonio, Upper/Mid Rio Grande, Lower Rio Grande, and Canadian river basins had severely low conservation storage (20–40 percent full, Figure 5).

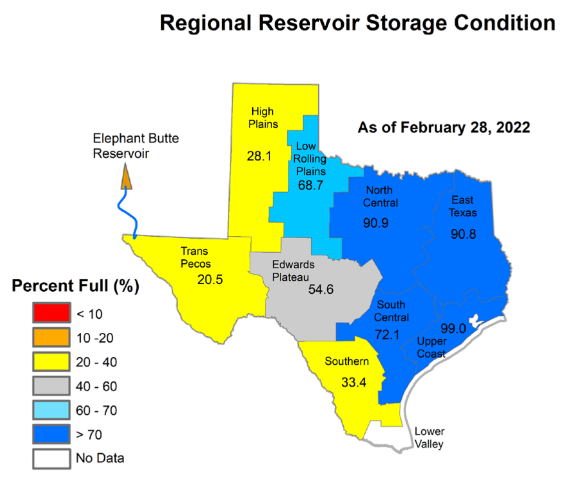


Figure 4: Reservoir Storage Index* by climate division at 2/28/2022

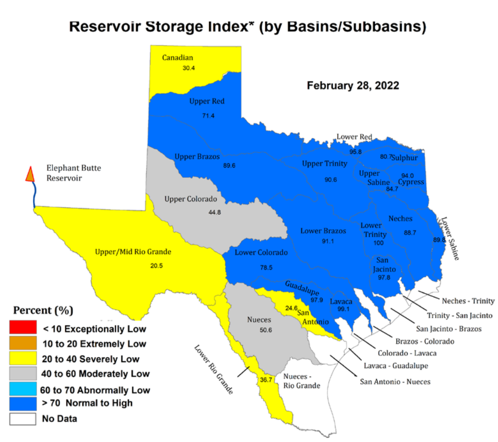


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 2/28/2022

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

Sunset on Lake Travis

March 2022

Water News:

- Every ten years state agencies undergo a review by the Texas Legislature that assesses the effectiveness and performance of a program or agency. The 2022–23 TWDB Sunset Staff Report has been posted: https://www.sunset.texas.gov/reviews-and-reports/agencies/texas-water-development-board

- Lake evaporation datasets were updated on 03/08/2022 adding 2021 data to our Water Data for Texas site. https://www.waterdatafortexas.org/lake-evaporation-rainfall

RAINFALL

This was a very dry month for most of the state. Very little to no rain [yellow, orange, and red shading, Figure 1(a)] fell over the High Plains, Low Rolling Plains, Trans Pecos, the Edwards Plateau, much of North Central, South Central, Southern, Lower Valley, and the southern and western Upper Coast climate divisions. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in northeastern High Plains, northwestern Low Rolling Plains, eastern North Central, northeastern South Central, East Texas, and the northern and eastern portions of the Upper Coast climate divisions. Rainfall accumulations reached 11.2 inches in the eastern portions of the state [dark blue shading, Figure 1(a)] .

About two thirds of the state received 0 to 50 percent of normal rainfall in March (orange shading, Figure 1(b)]. That is just under half of what is typically expected compared to historical data from 1991–2020. Average rainfall [green shading, Figure 1(b)] was seen in northeastern High Plains, northwestern Low Rolling Plains, northwestern Trans Pecos, portions of eastern North Central, northeastern South Central, and much of East Texas climate divisions. The East Texas climate division received 200–300 percent of normal rainfall [light blue shading, Figure 1(b)].

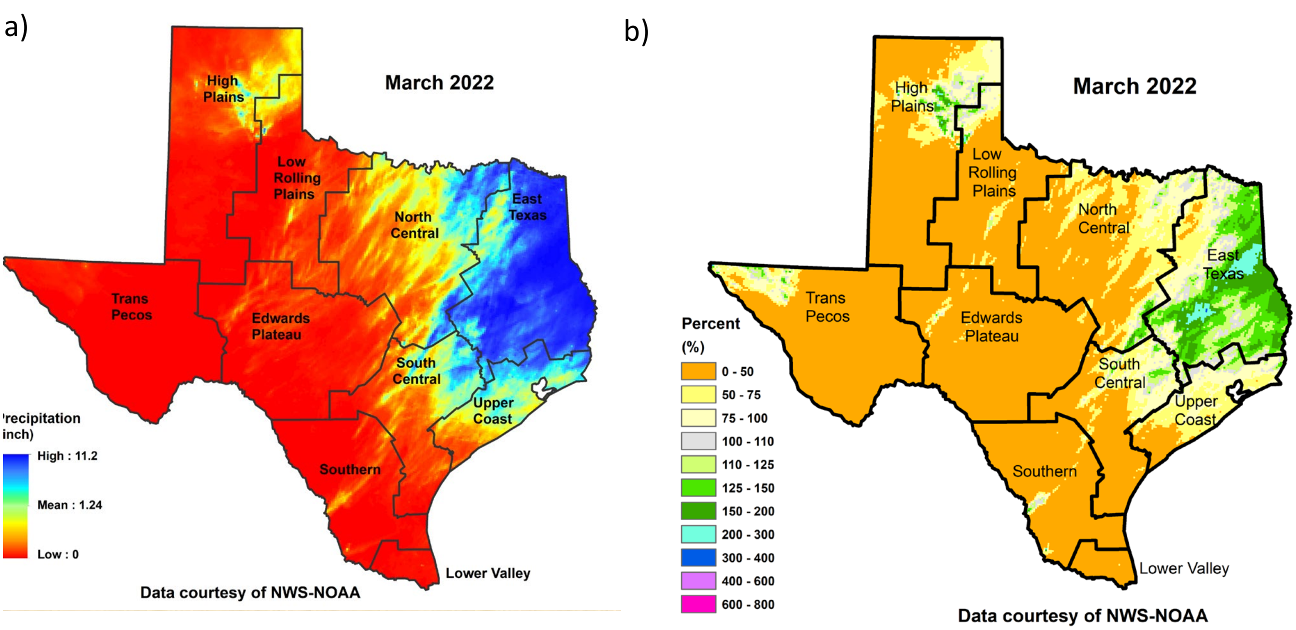


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of March 2022, total conservation storage* in 123 of the state's major water supply reservoirs was 24.9 million acre-feet or 77 percent of total conservation storage capacity (Figure 2). This is approximately 0.20 million-acre-feet more than a month ago and approximately 0.93 million acre-feet less than at the end of March 2021.

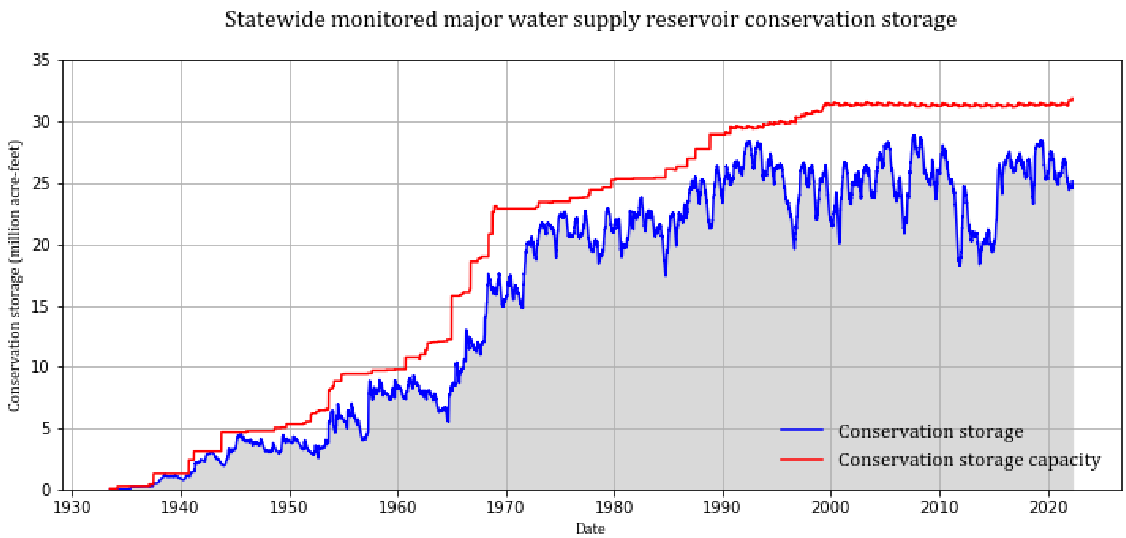


Figure 2: Statewide reservoir conservation storage

Out of 123 reservoirs in the state, 21 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 40 were at or above 90 percent full. Nine reservoirs remained below 30 percent full: Bois d'Arc (28 percent full), E.V. Spence (24 percent full), Falcon (21 percent full), Greenbelt (16 percent full), Mackenzie (7 percent full), Medina Lake (22 percent full), O. C. Fisher (6 percent full), Palo Duro Reservoir (1 percent full), and White River (17 percent full). Elephant Butte Reservoir (located in New Mexico) was 12 percent full.

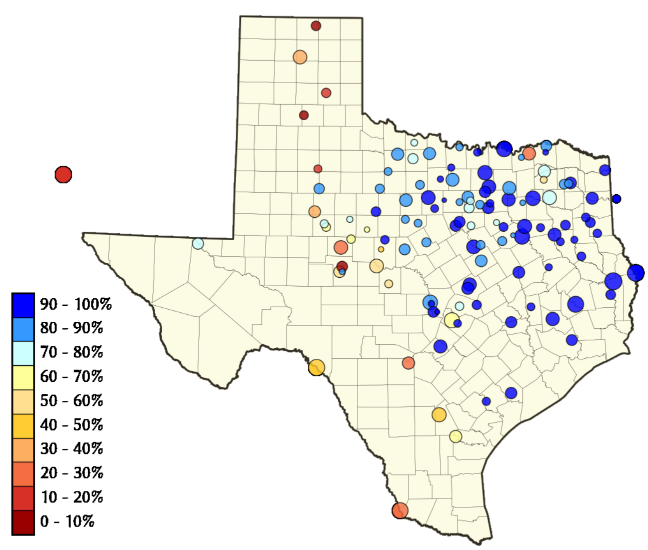


Figure 3: Reservoir conservation storage at end-March expressed as percent full (%)

*Storage is based on end of the month data in 123 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.

Total regionally combined conservation storage was at or above normal (storage ≥70 percent full) in East Texas (94.1 percent full), North Central (90.9 percent full), South Central (70.8 percent full), and the Upper Coast (99.6 percent full) climate divisions (Figure 4). Conservation storage for the Low Rolling Plains (67.5 percent full) climate division was abnormally low (Figure 4). The Edwards Plateau climate division had moderately low conservation storage (54.1 percent full, Figure 4). The High Plains (28.0 percent full), Southern (31.6 percent full), and the Trans Pecos (21.5 percent full) climate divisions had severely low conservation storage (Figure 4).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 5) in the Upper and Lower Red, Upper and Lower Trinity, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Brazos, San Jacinto, Neches, Lower Colorado, Lavaca, and Guadalupe river basins. The Upper Colorado and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 5), and the San Antonio, Upper/Mid Rio Grande, Lower Rio Grande, and Canadian river basins had severely low conservation storage (20–40 percent full, Figure 5).

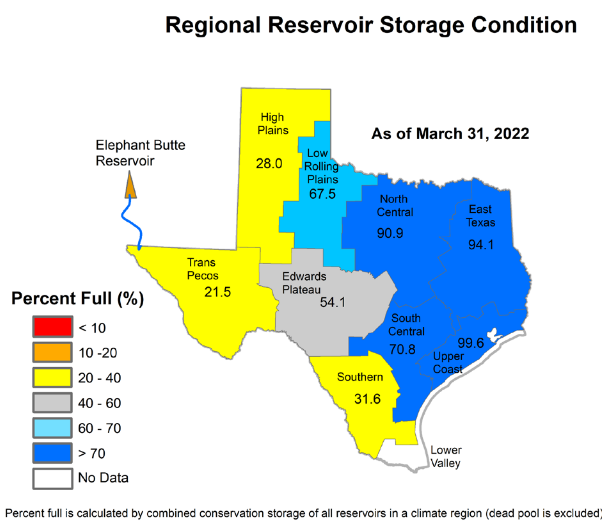


Figure 4: Reservoir Storage Index* by climate division at 3/31/2022

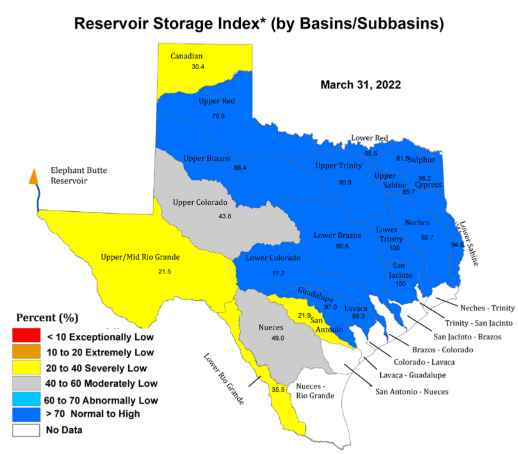
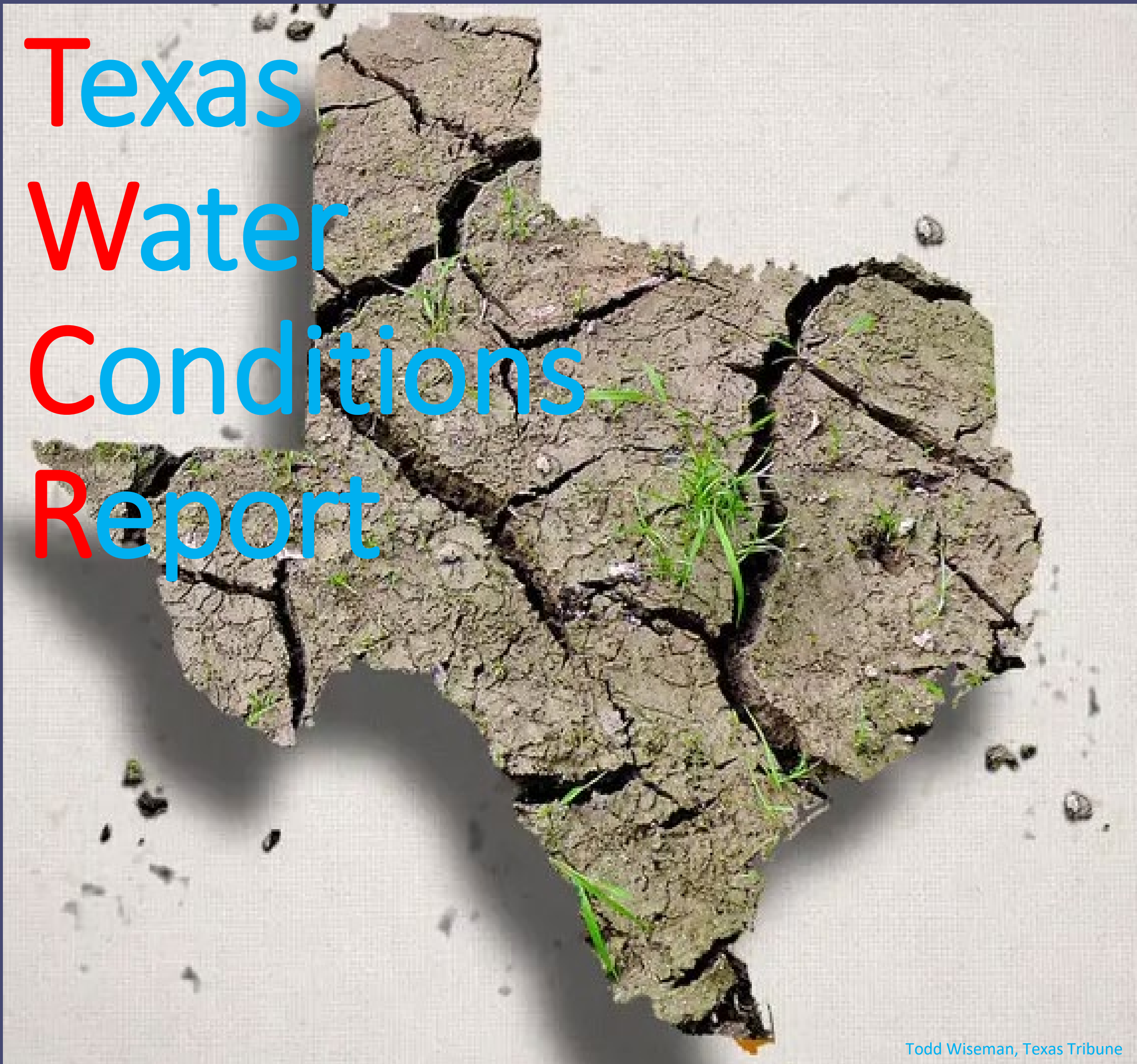


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 3/31/2022

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report



April 2022

Water News:

The Groundwater Advisory Unit of the Railroad Commission of Texas announced the identification of the Maverick Basin aquifer, which is located thousands of feet deep in the Glen Rose Formation and has been tentatively mapped in Maverick, Zavala, Dimmit, Kinney, and Uvalde counties. To learn more visit https://texaswaternewsroom.org/articles/ask_an_expert_a_newly_identified_aquifer_could_provide_water_supply_for_texas.html.

RAINFALL

This was a very dry month for several areas of the state. Very little to no rain [yellow, orange, and red shading, Figure 1(a)] fell over the High Plains, Low Rolling Plains, Trans Pecos, northern Edwards Plateau, southwestern North Central, portions of South Central, portions of Southern, Lower Valley, and the Upper Coast climate divisions. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in northern and a small area of southeastern High Plains, eastern Low Rolling Plains, North Central, northern South Central, Southern, East Texas, Lower Valley, and eastern portions of the Upper Coast climate divisions. Rainfall accumulations reached 8.58 inches in these portions of the state [dark blue shading, Figure 1(a)].

The High Plains, Low Rolling Plains, Trans Pecos, southwestern North Central, portions of the Edwards Plateau, South Central, southeastern East Texas, northern Southern, and the Upper Coast climate divisions received 0 to 50 percent of normal rainfall in April (orange shading, Figure 1(b)] compared to historical data from 1991–2020. Average rainfall [green shading, Figure 1(b)] was seen in the northern High Plains, eastern Low Rolling Plains, portions of the Trans Pecos, western and central Edwards Plateau, Southern, Lower Valley, northern North Central, northern South Central, and much of East Texas climate divisions. The northern Lower valley, northern High Plains, northern North Central, and East Texas climate divisions received 200–300 percent of normal rainfall [light blue shading, Figure 1(b)]. Eastern Trans Pecos, western Edwards Plateau, and Southern climate divisions received 200–600 percent of normal rainfall.

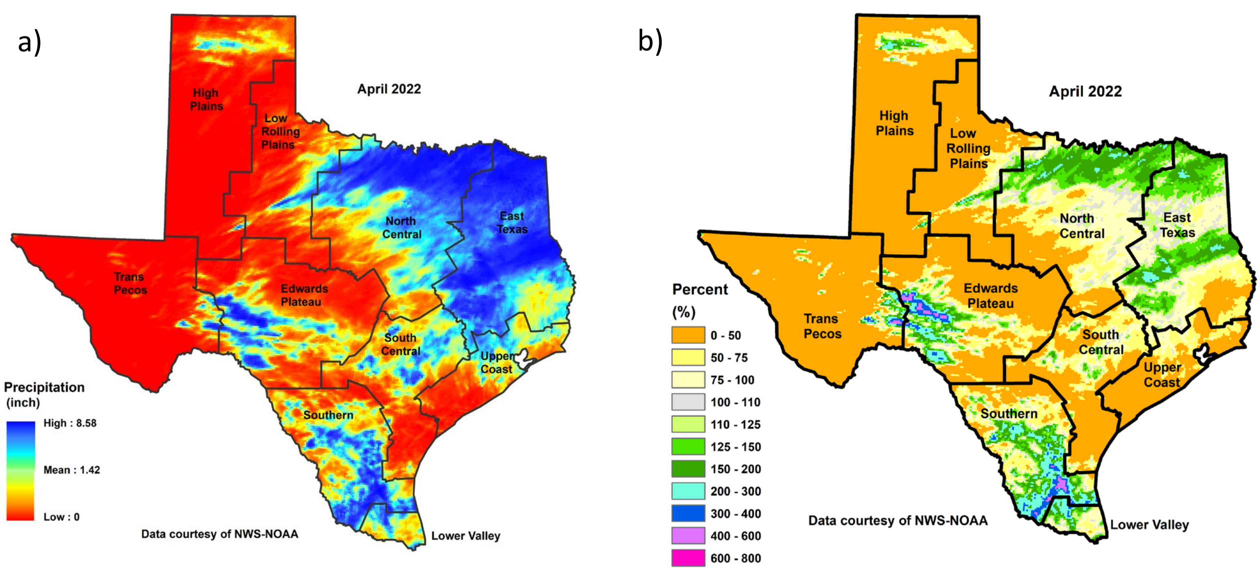


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of April 2022, total conservation storage* in 123 of the state's major water supply reservoirs was 25.3 million acre-feet or 77.3 percent of total conservation storage capacity (Figure 2). This is approximately 0.34 million-acre-feet more than a month ago and approximately 0.96 million acre-feet less than at the end of April 2021.

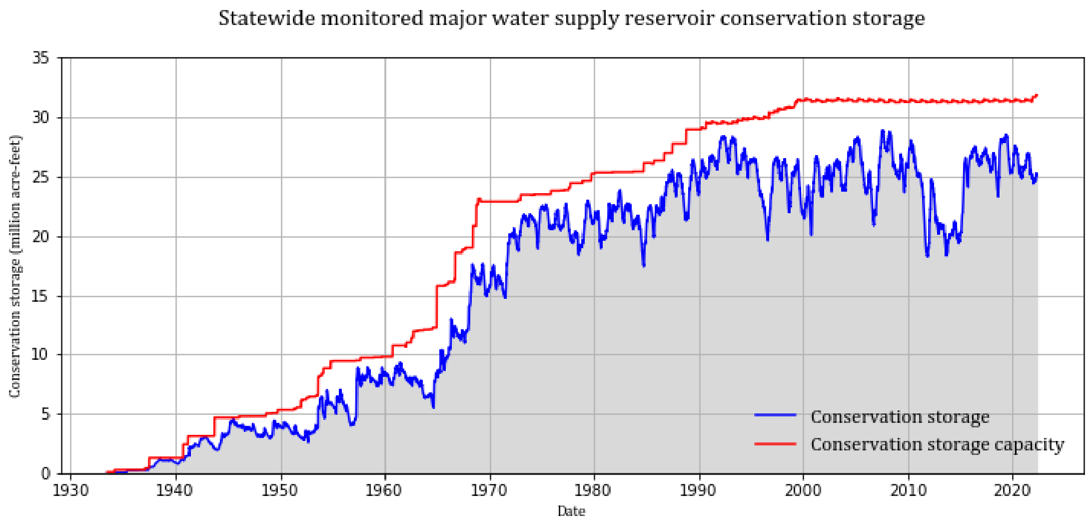


Figure 2: Statewide reservoir conservation storage

Out of 123 reservoirs in the state, 24 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 33 were at or above 90 percent full. Eight reservoirs remained below 30 percent full: E.V. Spence (23.1 percent full), Falcon (19.9 percent full), Greenbelt (15.5 percent full), Mackenzie (7.2 percent full), Medina Lake (19.1 percent full), O. C. Fisher (5.3 percent full), Palo Duro Reservoir (0.5 percent full), and White River (15.4 percent full). Elephant Butte Reservoir (located in New Mexico) was 13.0 percent full.

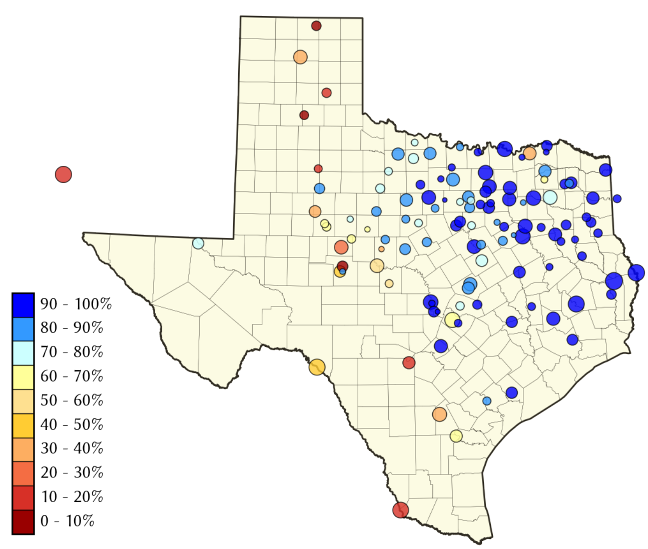


Figure 3: Reservoir conservation storage at end-April expressed as percent full (%)

*Storage is based on end of the month data in 123 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.

Total regionally combined conservation storage was at or above normal (storage ≥70 percent full) in East Texas (95.9 percent full), North Central (93.0 percent full), and the Upper Coast (96.0 percent full) climate divisions (Figure 4). Conservation storage for the Low Rolling Plains (67.5 percent full), and South Central (67.8 percent full) climate divisions were abnormally low (Figure 4). The Edwards Plateau climate division had moderately low conservation storage (51.3 percent full, Figure 4). The High Plains (27.5 percent full), Southern (29.9 percent full), and the Trans Pecos (21.8 percent full) climate divisions had severely low conservation storage (Figure 4).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 5) in the Lower Red, Upper and Lower Trinity, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Brazos, San Jacinto, Neches, Lower Colorado, Lavaca, and Guadalupe river basins. The Upper Red river basin had abnormally low conservation storage (60–70 percent full, Figure 5). The Upper Colorado and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 5). The Canadian, Upper/Mid Rio Grande, and Lower Rio Grande, had severely low conservation storage (20–40 percent full, Figure 5), and the San Antonio river basin had extremely low conservation storage (10–20 percent full, Figure 5).

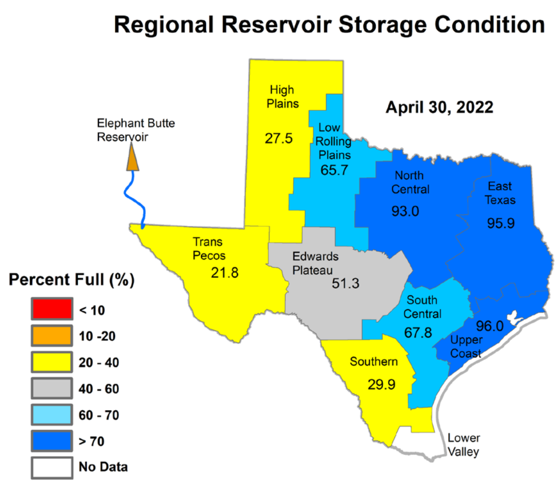


Figure 4: Reservoir Storage Index* by climate division at 4/30/2022

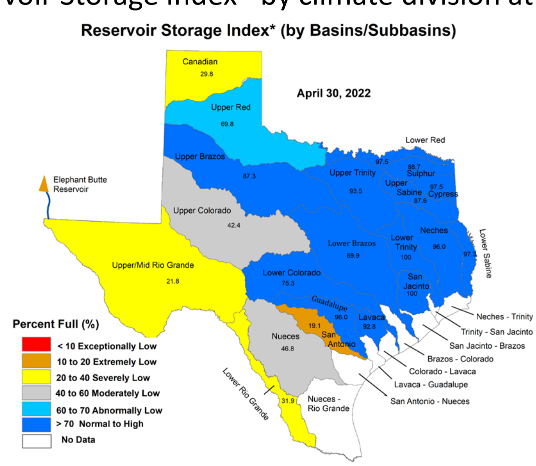
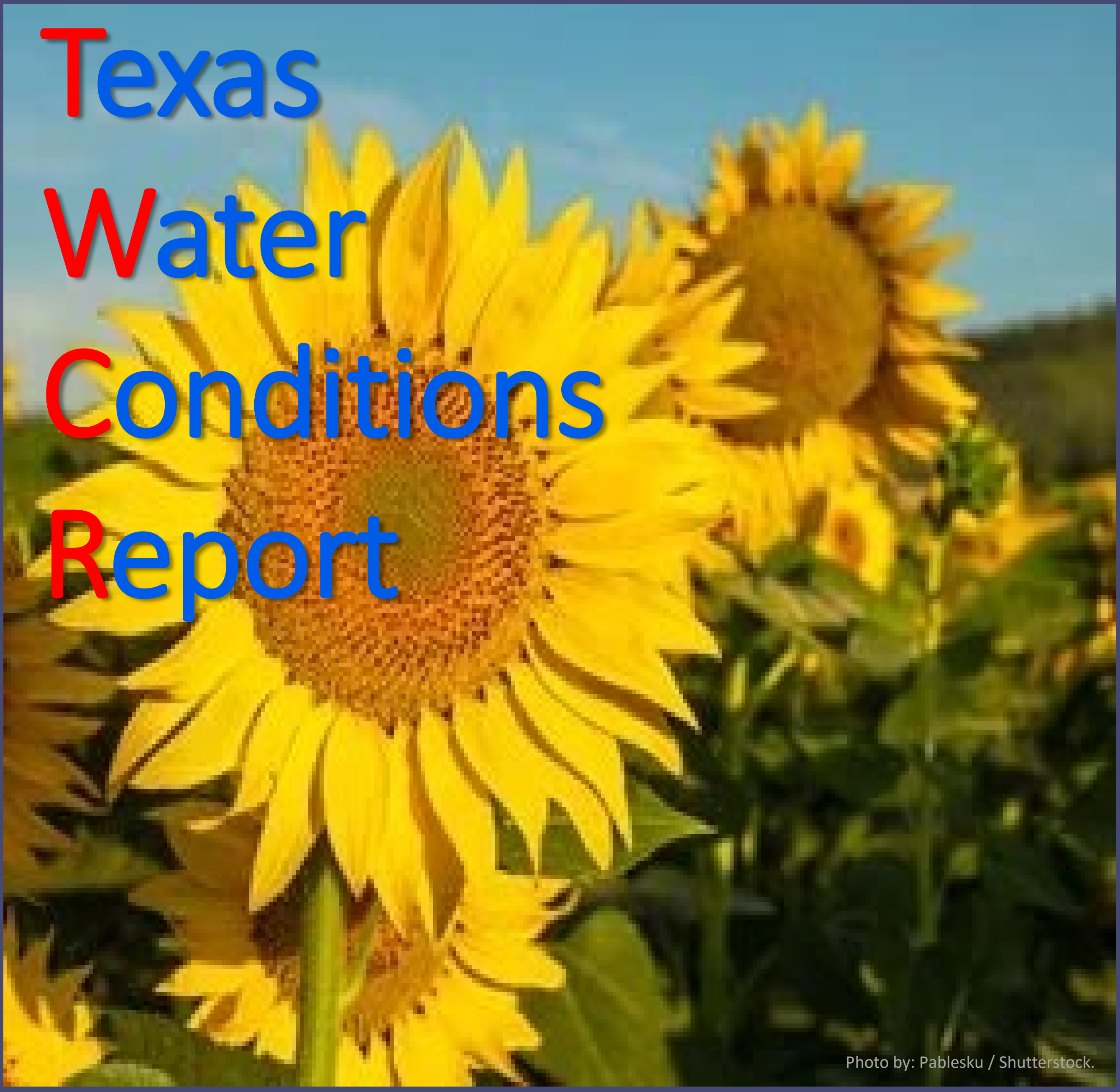


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 4/30/2022

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.



May 2022

Water News:

Schools, libraries, businesses, and utilities across Texas are implementing innovative rainwater harvesting methods to divert and store rainwater on a big scale.
To learn more about these projects and the Texas Rain Catcher Award visit:
https://texaswaternewsroom.org/articles/modern_rainwater_harvesting_efforts_evolve_beyond_backyard_barrels_to_large-scale_water_solutions.html

RAINFALL

Little to no rain [yellow, orange, and red shading, Figure 1(a)] fell over portions of the High Plains, southern Low Rolling Plains, Trans Pecos, portions of the Edwards Plateau, central and southern North Central, much of South Central, portions of Southern, south and western Upper Coast, and portions of western and northern East Texas climate divisions. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in central and northern High Plains, much of the Low Rolling Plains, eastern Trans Pecos, northeastern and southern Edwards Plateau, western and eastern Southern, Lower Valley, much of North Central, East Texas, and northeastern Upper Coast climate divisions. Rainfall accumulations reached 13.91 inches in portions of the state [dark blue shading, Figure 1(a)].

Areas of northern and southern High Plains, southern Low Rolling Plains, much of the Trans Pecos, much of the Edwards Plateau, South Central, northern and central Southern, portions of central North Central, western East Texas, and western Upper Coast received 0 to 50 percent of normal rainfall in May (orange shading, Figure 1(b)] compared to historical data from 1991–2020. Average rainfall [green shading, Figure 1(b)] was seen in central and northern High Plains, portions of the Low Rolling Plains, eastern Trans Pecos, northern and southwestern Edwards Plateau, areas of Southern, much of the Lower Valley, northern and southern North Central, southern South Central, and eastern East Texas climate divisions. The central High Plains, northern Low Rolling Plains, eastern Trans Pecos, western Southern, and portions of the Lower Valley climate divisions received 200–300 percent of normal rainfall [light blue shading, Figure 1(b)]. Western Lower Valley, and western and southern Southern climate divisions received 300–600 percent of normal rainfall [dark blue and purple shading, Figure 1(b)].

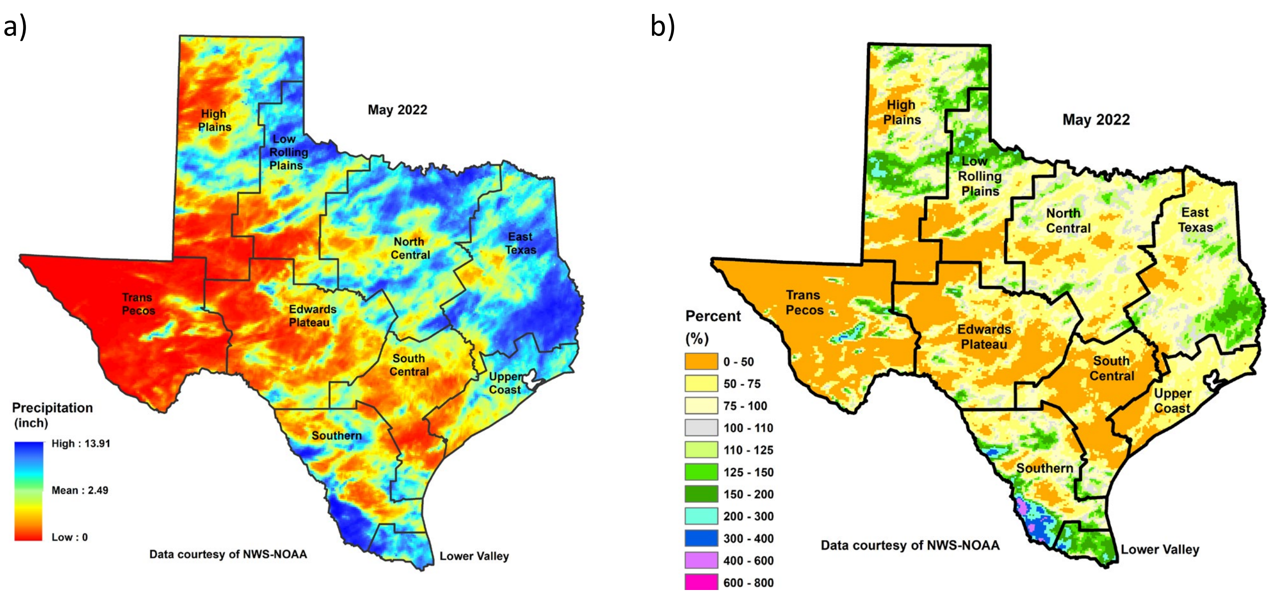


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of May 2022, total conservation storage* in 123 of the state's major water supply reservoirs was 25.1 million acre-feet or 76.7 percent of total conservation storage capacity (Figure 2). This is approximately 0.19 million-acre-feet less than a month ago and approximately 1.80 million acre-feet less than at the end of May 2021.

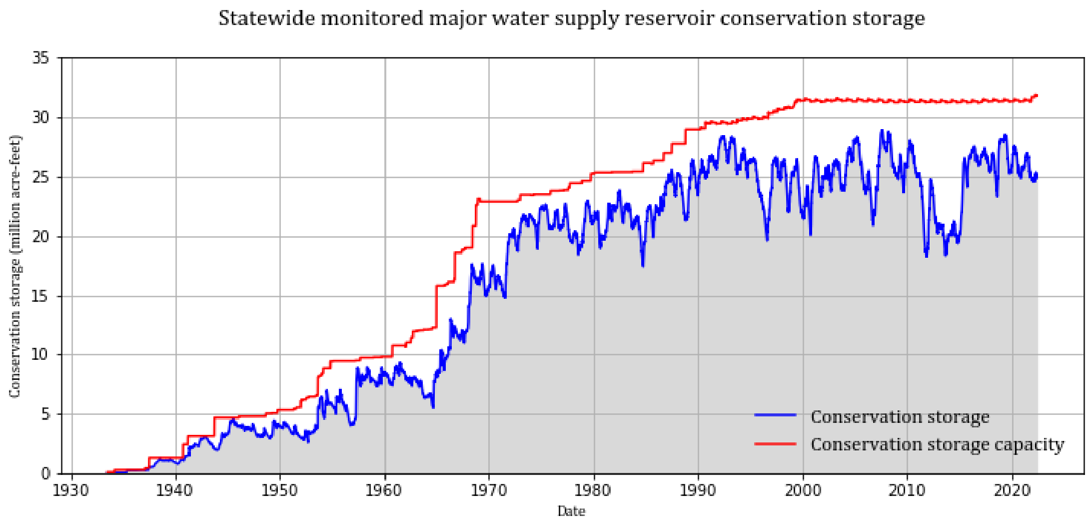


Figure 2: Statewide reservoir conservation storage

Out of 123 reservoirs in the state, 17 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 39 were at or above 90 percent full. Eight reservoirs remained below 30 percent full: E.V. Spence (22.4 percent full), Falcon (20.8 percent full), Greenbelt (15.3 percent full), Mackenzie (7.0 percent full), Medina Lake (16.5 percent full), O. C. Fisher (4.9 percent full), Palo Duro Reservoir (0.5 percent full), and White River (16.8 percent full). Elephant Butte Reservoir (located in New Mexico) was 12.9 percent full.

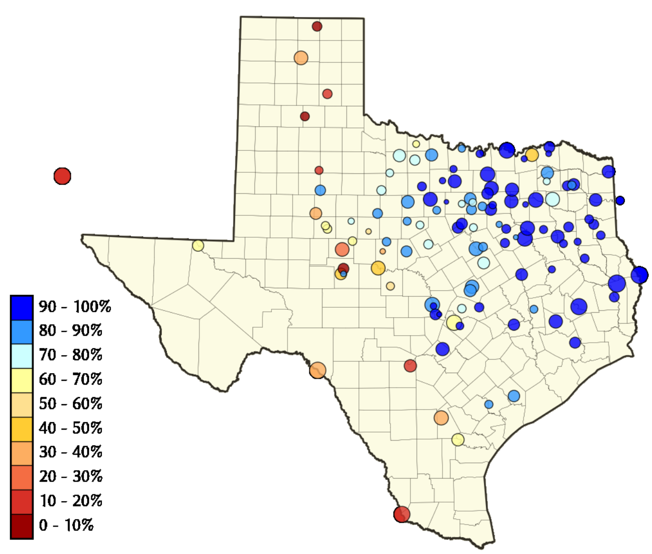


Figure 3: Reservoir conservation storage at end-May expressed as percent full (%)

*Storage is based on end of the month data in 123 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.

Total regionally combined conservation storage was at or above normal (storage ≥70 percent full) in East Texas (95.8 percent full), North Central (93.2 percent full), and the Upper Coast (92.9 percent full) climate divisions (Figure 4). Conservation storage for the Low Rolling Plains (62.0 percent full), and South Central (65.3 percent full) climate divisions were abnormally low (Figure 4). The Edwards Plateau climate division had moderately low conservation storage (48.3 percent full, Figure 4). The High Plains (26.8 percent full), Southern (29.5 percent full), and the Trans Pecos (21.3 percent full) climate divisions had severely low conservation storage (Figure 4).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 5) in the Lower Red, Sulphur, Cypress, Upper and Lower Brazos, Upper and Lower Trinity, Upper and Lower Sabine, Neches, San Jacinto, Lower Colorado, Guadalupe, and Lavaca river basins. The Upper Red river basin had abnormally low conservation storage (60–70 percent full, Figure 5). The Upper Colorado and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 5). The Canadian, Upper/Mid Rio Grande, and Lower Rio Grande, had severely low conservation storage (20–40 percent full, Figure 5), and the San Antonio river basin had extremely low conservation storage (10–20 percent full, Figure 5).

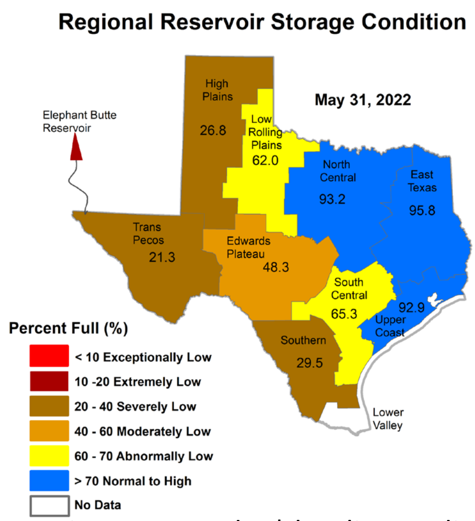


Figure 4: Reservoir Storage Index* by climate division at 5/31/2022

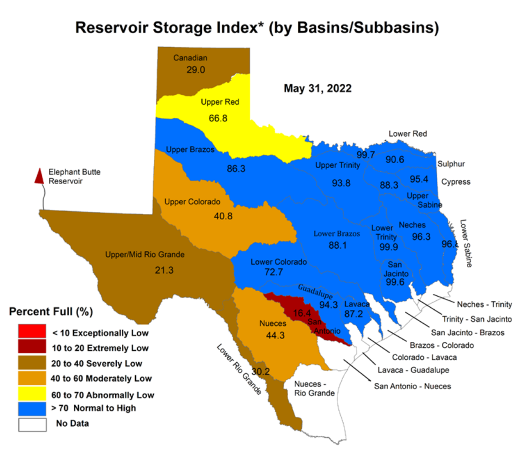


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 5/31/2022

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

Frio River in Concan. Photo taken in June, 2022. (Pilar Newberry)

June 2022

Water News:

According to the State Climatologist, the base flow conditions on the Frio River at Concan this spring and early summer are presently the worst on record, having gone to zero flow on June 20, 2022. In 2011, zero flow was not reached until July 12. In both the 1953 and 1956 droughts there were lower flows during the spring, but flow remained at a trickle in 1953 and only reached zero on August 5, 1956. Presumably much less groundwater use allowed water levels to remain more stable during those previous droughts.

See pages 3-5 of this report for a comparison of reservoir storage in 2011 and 2022.

RAINFALL

Little to no rain [yellow, orange, and red shading, Figure 1(a)] fell over most of the state this month. Rainfall accumulations ranged from 0 to 9.43 inches across the state. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in the northern and southern High Plains, northern and central Trans Pecos, areas of the Low Rolling Plains, northern and central Edwards Plateau, areas across North Central, northern and central South Central, small areas of northwestern, southern, and eastern Southern, northern and areas of central and southern East Texas, and the southern and western Upper Coast climate divisions.

Compared to historical data from 1991–2020, 0 to 50 percent of normal rainfall (orange shading, Figure 1(b)) was received in June across most of the state. Average rainfall [green shading, Figure 1(b)] was seen in in portions of northern and southern High Plains, portions of northern and central Low Rolling Plains, small areas of western and northeastern Edwards Plateau, western and northeastern North Central, northern East Texas, western Upper Coast, central South Central, southern and eastern Southern, and northern and central Trans Pacos climate divisions. In fact, the Trans Pecos received 200–600 percent of normal rainfall [light blue, dark blue, purple shading, Figure 1(b)] in the northern and central portions of the climate division.

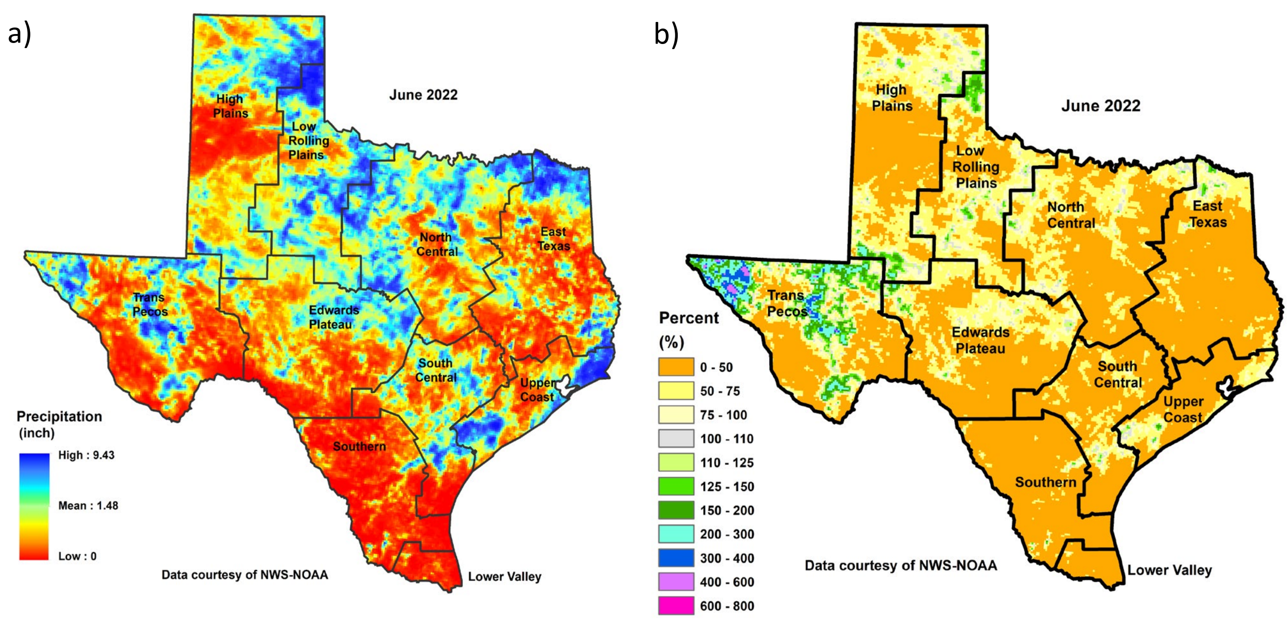


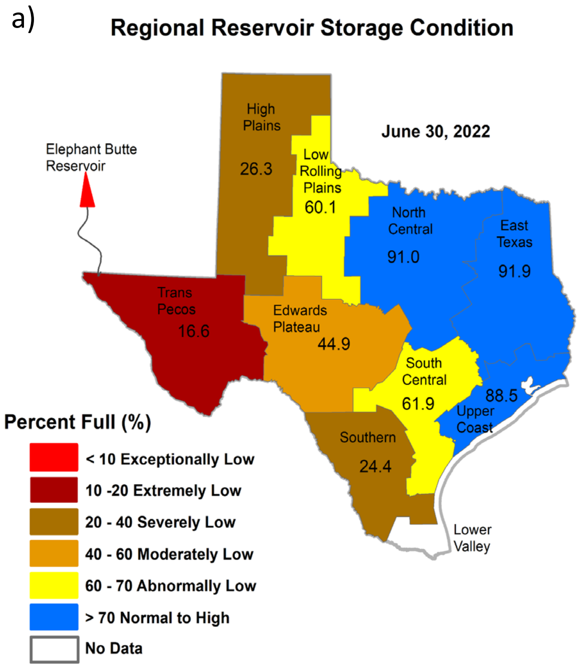
Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

In June of 2022, the total regionally combined conservation storage was at or above normal (storage ≥70 percent full) in East Texas (91.9 percent full), North Central (91.0 percent full), and the Upper Coast (88.5 percent full) climate divisions (Figure 2(a)). Conservation storage for the Low Rolling Plains (60.1 percent full), and South Central (61.9 percent full) climate divisions were abnormally low (Figure 4(a)). The Edwards Plateau climate division had moderately low conservation storage (44.9 percent full, Figure 2(a)). The High Plains (26.3 percent full) and Southern (24.4 percent full) climate divisions had severely low conservation storage (Figure 2(a)). The Trans Pecos (16.6 percent full) climate division had extremely low conservation storage (Figure 2(a)).

Comparing June 2022 to June 2011, the current drought is impacting water supply storage in different areas of the state. Conservation storage was lower in 2011 than 2022 in the High Plains (-23.2 percent difference), Low Rolling Plains (-14.2 percent difference), Trans Pecos (-1.5 percent difference), North Central (-7 percent difference), South Central (-0.8 percent difference), and the Upper Coast (-20 percent difference) (Figure 2(b)).

The biggest difference in storage between June 2022 and June 2011 is evident in the Southern, Low Rolling Plains, and Upper Coast climate divisions. In June 2022, the conservation storage in the Edwards Plateau was 15 percent lower than in 2011, and 47.1 percent lower in the Southern climate division, going from normal-to-high reservoir storage in 2011 (Figure 2(b)) to severely low reservoir storage in 2022 (Figure 2(a)).

a)



b)

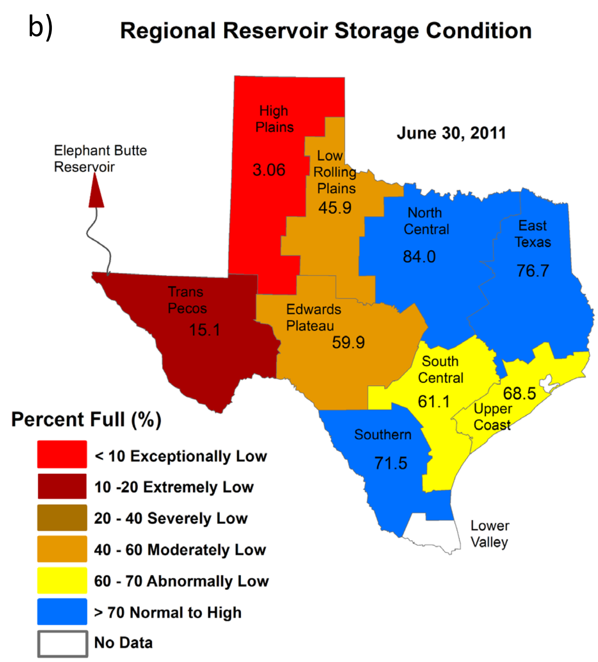


Figure 2: Reservoir Storage Index* by climate division a) 6/30/2022, and b) 6/30/2011

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 3(a)) in the Lower Red, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Trinity, Upper and Lower Brazos, Neches, San Jacinto, Guadalupe, and Lavaca river basins. The Upper Red and Lower Colorado river basins had abnormally low conservation storage (60–70 percent full, Figure 3(a)). The Nueces river basin had moderately low conservation storage (40–60 percent full, Figure 3(a)). The Canadian, Upper Colorado, and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 3(a)), and the San Antonio and Upper/Mid Rio Grande river basins had extremely low conservation storage (10–20 percent full, Figure 3(a)).

Compared to June 2011, June 2022 reservoir storage was higher in the Canadian, Upper and Lower Red, Upper and Lower Brazos, Upper and Lower Trinity, Sulphur, Cypress, Upper and Lower Sabine, Neches, San Jacinto, Lavaca, Upper and Lower Colorado, and Upper/Mid Rio Grande river basins (blue shading, Figure 3(b)). Differences ranged from 1.1 percent to 27.1 percent.

In 2022, reservoir storage was lower in the Guadalupe, San Antonio, Nueces, and Lower Rio Grande river basins, ranging from 7.9 percent to 58 percent lower (tan shading, Figure 3(b)).

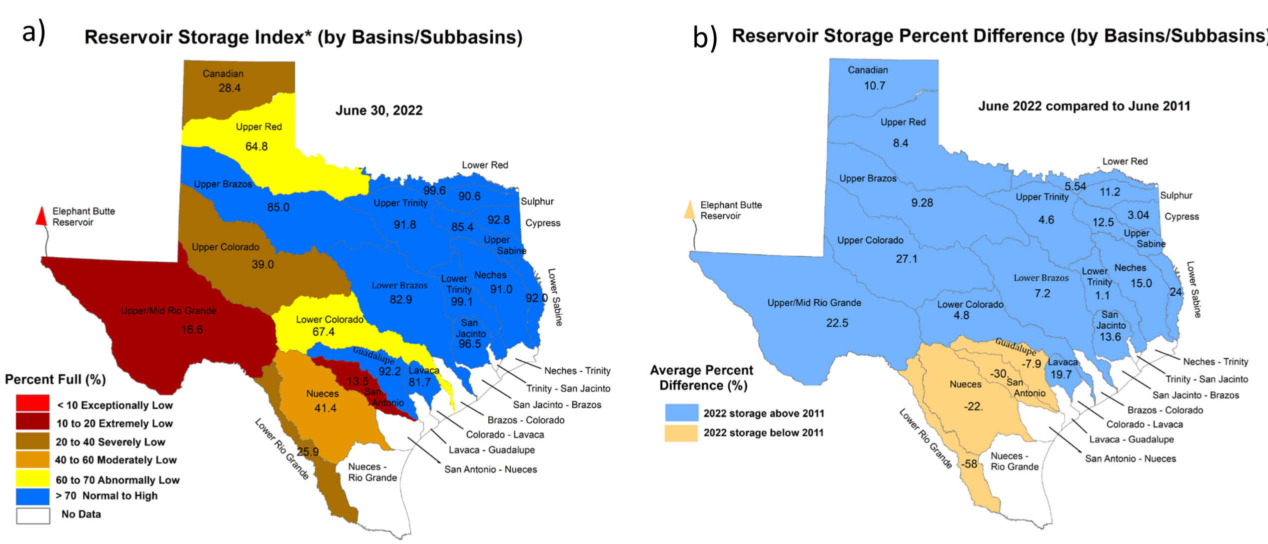


Figure 3: Reservoir Storage Index* by river basin/sub-basin a) 6/30/2022, and b) average percent difference in reservoir storage in 2022 compared to 2011.

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

RESERVOIR STORAGE

June 2022 began with water supply storage more than two percent lower than normal for the time of year. By the end of June, it fell to about ten percent lower than normal.
In 2011, water supply began the year closer to normal, but fell farther and faster than in 2022. By the end of June, storage was about one and a half percent less than this year (Figure 4(a), (https://texaswaternewsroomorg/videos/water_and_weather_for_june_2022.html).

At the end of June 2022, total conservation storage in 123 of the state's major water supply reservoirs was 24.0 million acre-feet or 73.6 percent of total conservation storage capacity (Figure 4(b)). This is approximately 0.11 million-acre-feet less than a month ago and approximately 3.0 million acre-feet less than at the end of June 2021 (Figure 4(b)). In the coming months, additional storage declines are expected. Since 2011, the Bois d'Arc reservoir was built adding 367,609-acre feet to the storage capacity.

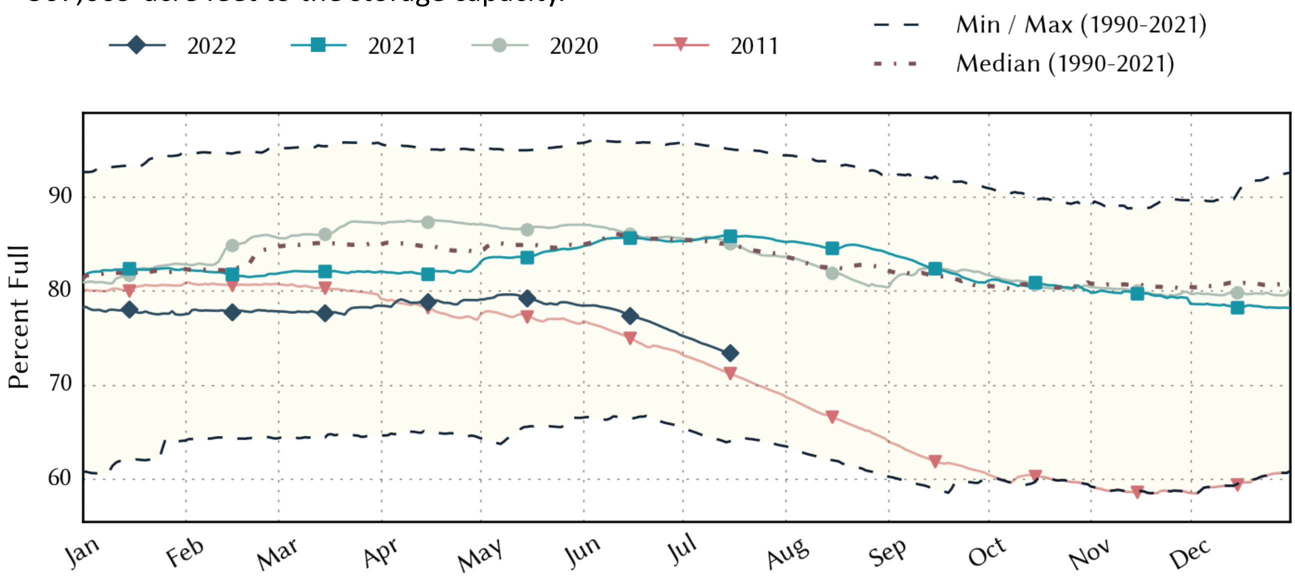


Figure 4(a): Statewide conservation storage comparison of 2020, 2021, 2022, and 2011.

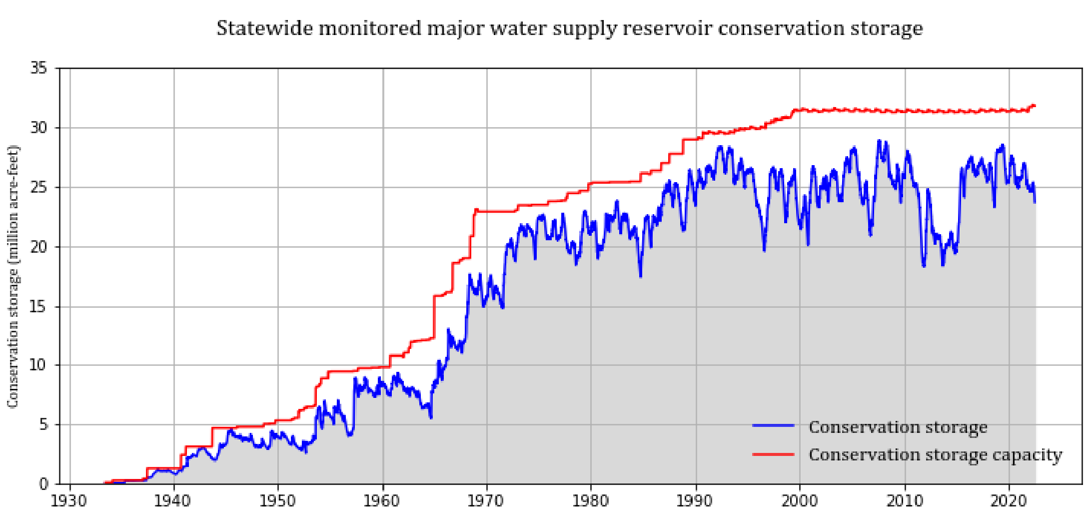
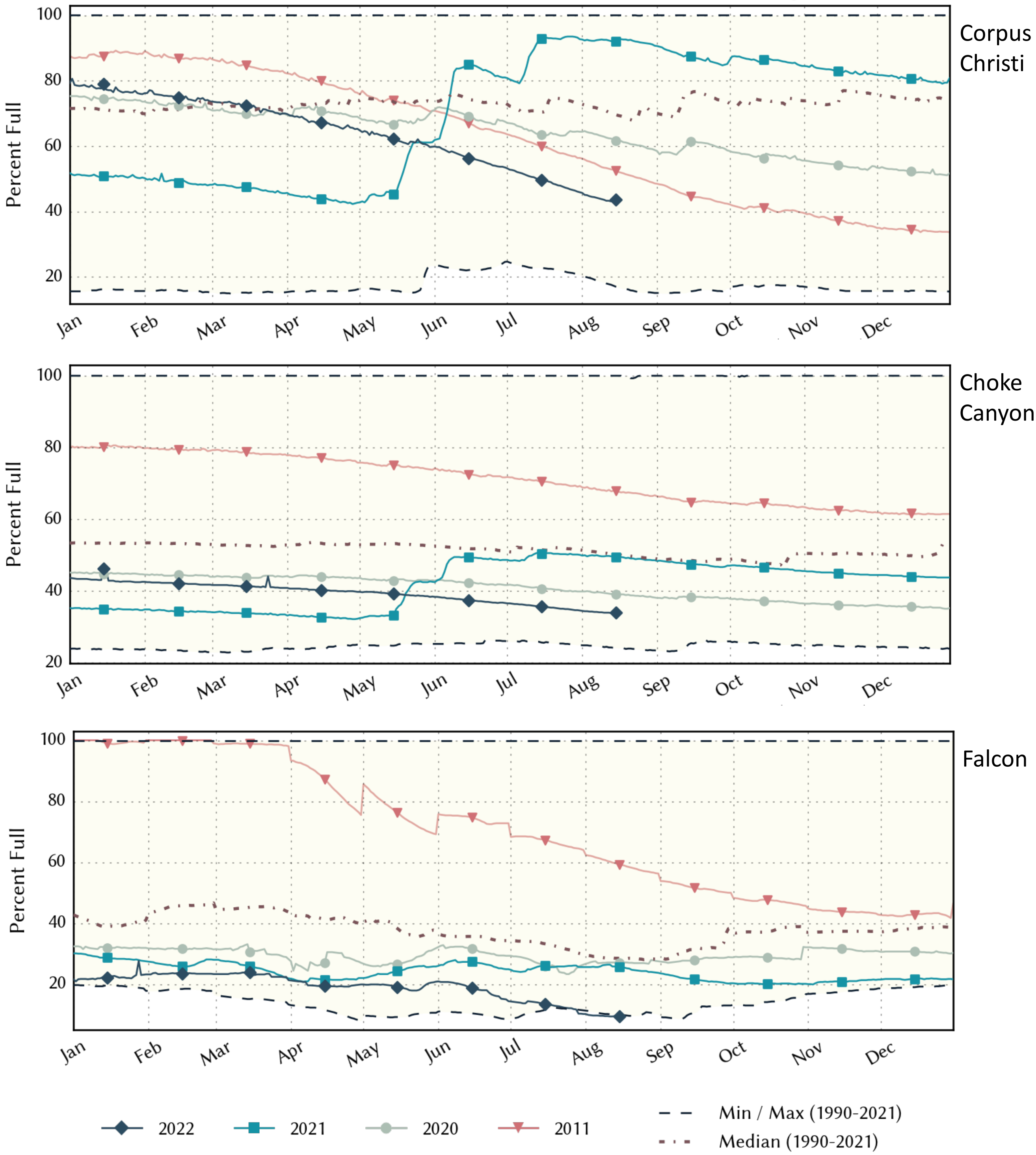


Figure 4(b) : Statewide reservoir conservation storage

Texas Water Conditions Report



July 2022 Water News:

Statewide reservoir storage in July was at 71% of conservation storage capacity, which is 13% lower than what is expected this time of year. Reservoirs in the Southern climate division have been particularly affected (July conservation storage pictured above from top to bottom Corpus Christi 45.7%, Choke Canyon 34.6%, Falcon 10.2% full).

Please visit https://waterdatafortexas.org/reservoirs/climate/south for more details.

RAINFALL

Rainfall accumulations ranged from 0 to 12.31 inches across the state. Little to no rain [yellow, orange, and red shading, Figure 1(a)] fell over most of the state this month. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in the northern High Plains, northern and central Trans Pecos, central Edwards Plateau, areas of northern North Central, northwestern Southern, southern South Central, the Upper Coast, and East Texas climate divisions.

Compared to historical data from 1991–2020, much of the state received 0 to 50 percent of normal rainfall (orange shading, Figure 1(b)) in July. Slightly above average rainfall [green shading, Figure 1(b)] was seen in portions of the northern High Plains, Trans Pecos, northern Low Rolling Plains, eastern North Central, Edwards Plateau, northwestern Southern, portions of the Lower Valley, East Texas, and the Upper Coast climate divisions. Areas of central and northern Trans Pecos, northern High Plains, central East Texas, and northwestern Southern climate divisions received 200–400 percent of normal rainfall [light blue, dark blue shading, Figure 1(b)]. A portion of far West Texas and northwestern Southern climate division received 400–600 percent of normal rainfall [(light pink shading, circled in red, Figure 1 (b)]

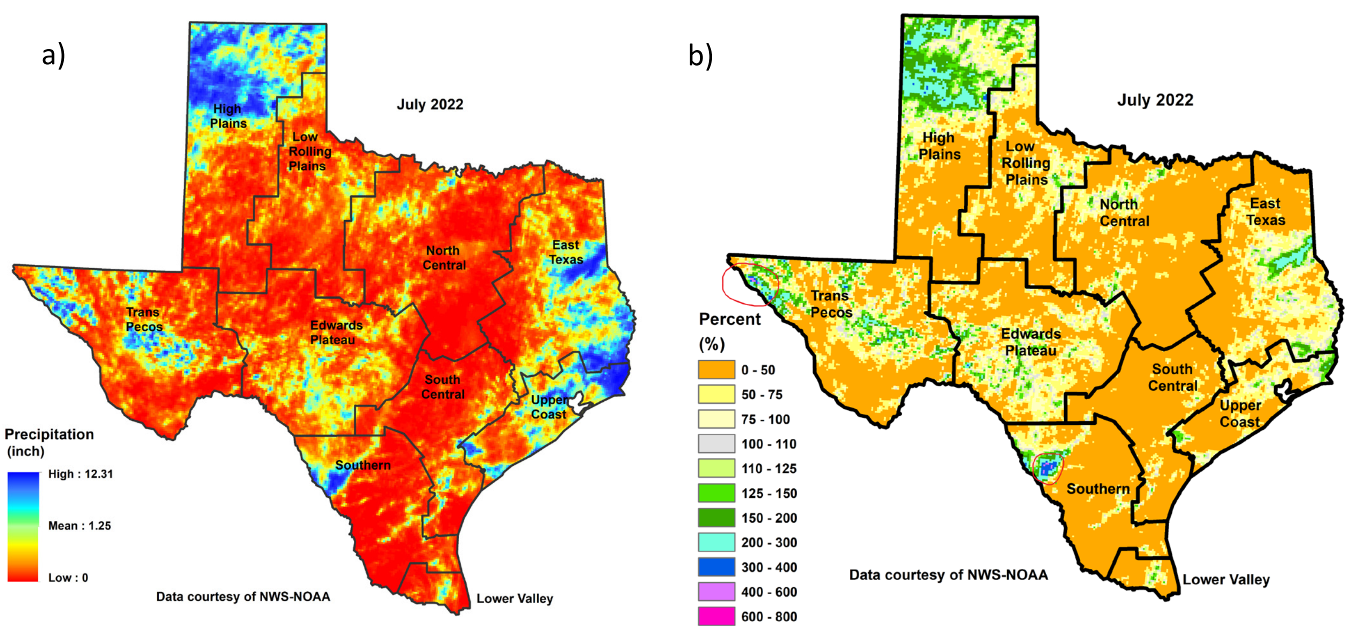


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

99.2% of the state was in drought leading into August, with 83.2% of the state in the extreme to exceptional drought categories (D3 & D4- red and dark red shading in Figure 2 & Table 1).

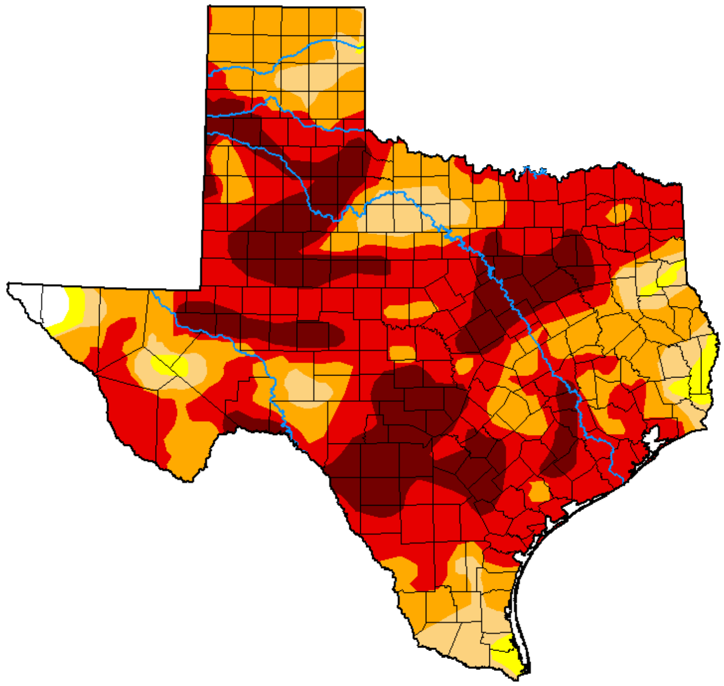


Figure 2. The extent of drought in Texas according to the U.S. Drought Monitor map as of August 2.

Category	Historically observed impacts
D3	Soil has large cracks; soil moisture is very low; dust and sandstorms occur
	Row and forage crops fail to germinate; decreased yields for irrigated crops and very large yield reduction for dryland crops are reported
	Need for supplemental feed, nutrients, protein, and water for livestock increases; herds are sold
	Increased risk of large wildfires is noted
	Many sectors experience financial burden
	Severe fish, plant, and wildlife loss reported
	Water sanitation is a concern; reservoir levels drop significantly; surface water is nearly dry; river flow is very low; salinity increases in bays and estuaries
D4	Exceptional and widespread crop loss is reported; rangeland is dead; producers are not planting fields
	Culling continues; producers wean calves early and liquidate herds due to importation of hay and water expenses
	Seafood, forestry, tourism, and agriculture sectors report significant financial loss
	Extreme sensitivity to fire danger; firework restrictions are implemented
	Widespread tree mortality is reported; most wildlife species' health and population are suffering
	Devastating algae blooms occur; water quality is very poor
	Exceptional water shortages are noted across surface water sources; water table is declining
	Boat ramps are closed; obstacles are exposed in water bodies; water levels are at or near historic lows

Table 1. Description of D3 (extreme) & D4 (exceptional) drought categories and associated impacts.

RESERVOIR STORAGE

In July of 2022, the total regionally combined conservation storage dropped an average of 4% statewide compared to the previous month. East Texas (86.5 percent full), North Central (85.9 percent full), and the Upper Coast (84.5 percent full) climate divisions were at or above normal (storage ≥70 percent full) in Figure 3(a). Conservation storage for the Low Rolling Plains (55.3 percent full), and South Central (57.9 percent full) climate divisions went from abnormally low to the moderately low conservation storage category (Figure 3(a)). The Edwards Plateau climate division remained in the moderately low conservation storage category (41.1 percent full, Figure 3(a)). The High Plains (25.4 percent full) and Southern (20.4 percent full) climate divisions had severely low conservation storage (Figure 3(a)). The Trans Pecos (13.1 percent full) climate division had extremely low conservation storage (Figure 3(a)).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 3(b)) in the Lower Red, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Trinity, Upper and Lower Brazos, Neches, San Jacinto, Guadalupe, and Lavaca river basins. The Lower Colorado river basin had abnormally low conservation storage (60–70 percent full, Figure 3 (b)). The Upper Red river basin had moderately low conservation storage (40–60 percent full, Figure 3(b)). The Canadian, Upper Colorado, Nueces, and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 3(b)), and the San Antonio and Upper/Mid Rio Grande river basins had extremely low conservation storage (10–20 percent full, Figure 3(b)).

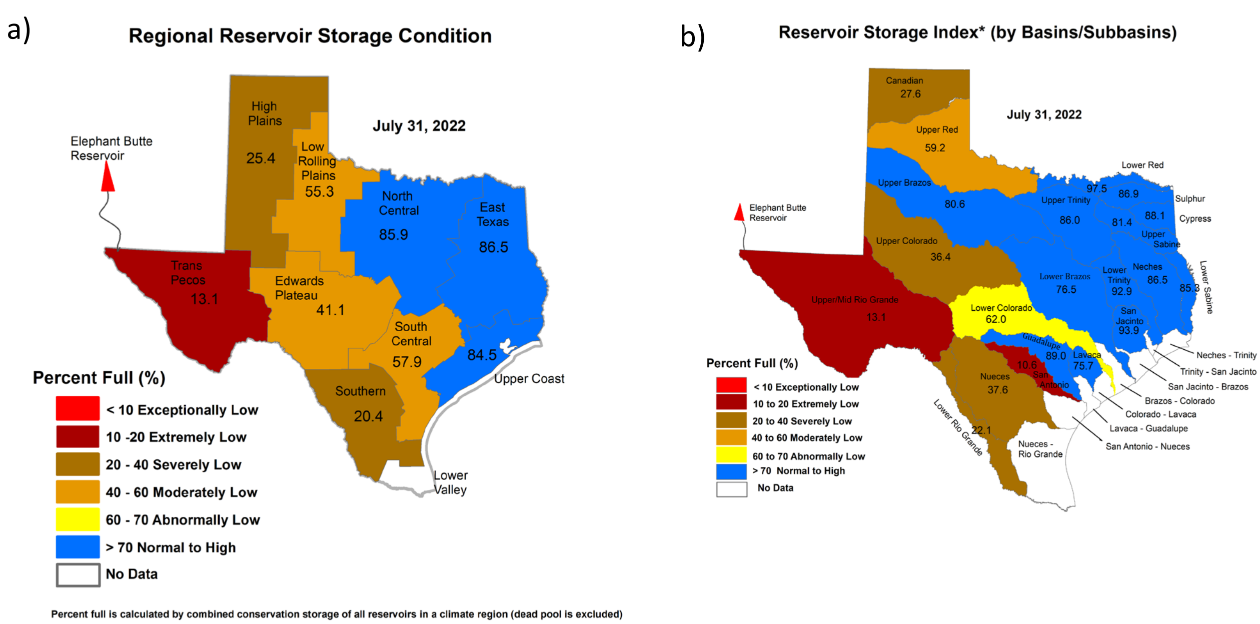


Figure 3: (a) Reservoir Storage Index* by climate, and (b) Reservoir Storage Index* by river basin/sub-basin

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

Hamilton Pool, Planetware.com

August 2022

Water News:

The rain that was received at the end of August contributed to some improvements across the state, but reservoirs were still showing the impacts of drought. See page 3 for more details.

RAINFALL

Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded across the state in all climate divisions, with accumulations reaching 18.82 inches.

Little to no rain [yellow, orange, and red shading, Figure 1(a)] was seen in the northern and southern High Plains, areas of the Low Rolling Plains, Trans Pecos, Edwards Plateau, North Central, northern South Central, western Southern, portions of the Lower Valley, and central and northern East Texas this month.

Compared to historical data from 1991–2020, much of the state received above average rainfall [green shading, Figure 1(b)]. Areas of central and southern High Plains, Low Rolling Plains, Trans Pecos, Edwards Plateau, Southern, South Central, North Central, East Texas, and the Upper Coast climate divisions received 200–400 percent of normal rainfall [light blue, dark blue shading, Figure 1(b)]. Portions of Trans Pecos, southern and eastern Edwards Plateau, eastern North Central, northern East Texas, central Upper Coast, southern South Central, northern Lower Valley, and much of the Southern climate divisions received 400–800 percent of normal rainfall [(light pink and dark pink shading, Figure 1 (b)].

Below normal rainfall [(yellow and orange shading, Figure 1(b)] was recorded in areas of the northern and portions of the southern High Plains, southwestern Trans Pecos, northern Edwards Plateau, parts of northern South Central, North Central, and the southern end of the Lower Valley climate divisions.

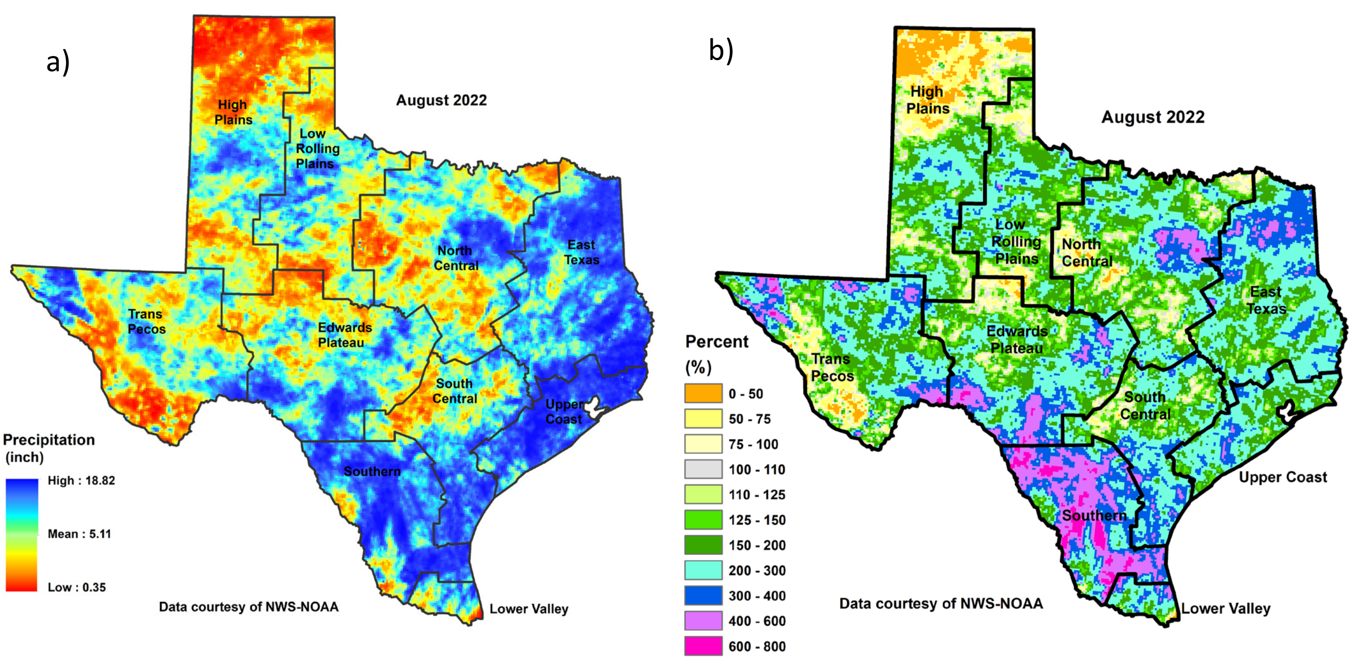
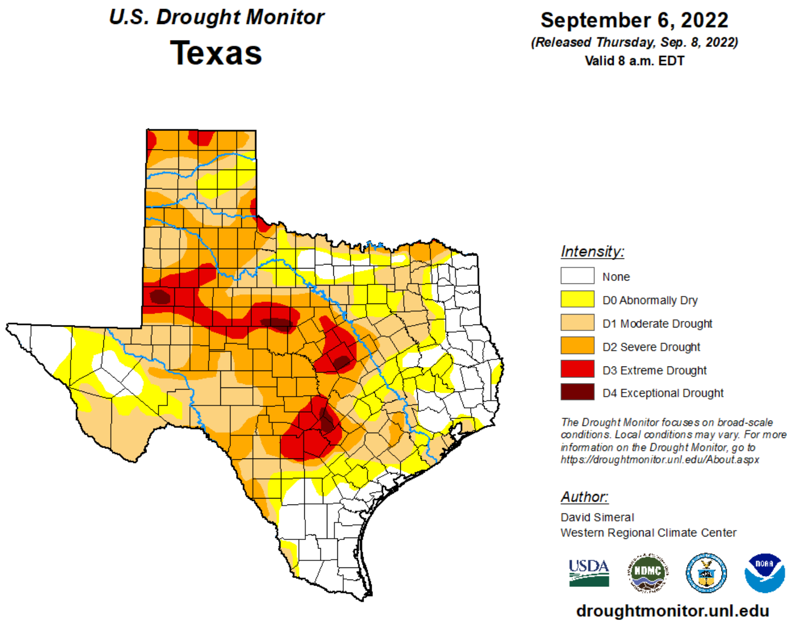


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

DROUGHT

79.4% of the state was in drought leading into September, that is an improvement of 19.8% from August 2 (**Figure 2**).



Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
2022-09-06	20.57	79.43	62.32	33.57	9.26	0.90

Figure 2. The extent of drought in Texas according to the U.S. Drought Monitor map as of Sept 6, 2022.

RESERVOIR STORAGE

The much-needed rain that was received at the end of August contributed to some improvements across the state, but reservoirs were still showing the impacts of drought. Out of 119 monitored reservoirs in the state, 7 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 23 were at or above 90 percent full. Eight reservoirs remained below 30 percent full: E.V. Spence (19.7 percent full), O. C. Fisher (3.7 percent full), J.B. Thomas (28.0 percent full), Falcon (12.2 percent full), Greenbelt (13.6 percent full), Mackenzie (6.6 percent full, Medina Lake (8.0 percent full), Palo Duro Reservoir (0.5 percent full), and the White River Lake (13.8 percent full). Elephant Butte Reservoir (New Mexico) was 4.8 percent full (**Figure 3**).

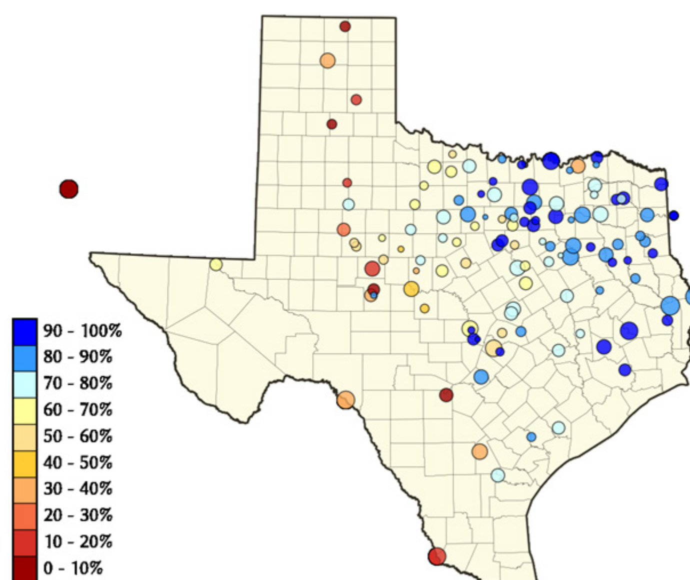


Figure 3. Reservoir conservation storage at end-August expressed as percent full (%)

Reservoir conservation storage by climate division was at or above normal (storage ≥70 percent full) in Figure 4(a)) for East Texas (87.7 percent full), North Central (84.3 percent full), and the Upper Coast (86.7 percent full) climate divisions. Conservation storage for the Low Rolling Plains (53.7 percent full), Edwards Plateau (41.9 percent full), and South Central (54.6 percent full) climate divisions was moderately low (Figure 4(a)). The High Plains (26.5 percent full) and Southern (24.8 percent full) climate divisions had severely low conservation storage (Figure 4(a)). The Trans Pecos (13.6 percent full) climate division had extremely low conservation storage (Figure 4(a)).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 4(b)) in the Lower Red, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Trinity, Upper and Lower Brazos, Neches, San Jacinto, Guadalupe, and Lavaca river basins. The Lower Colorado, Upper Red and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 4(b)). The Canadian, Upper Colorado, and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 4(b)). The Upper/Mid Rio Grande river basin had extremely low conservation storage (10–20 percent full, Figure 4(b)) and the San Antonio river basin had exceptionally low conservation storage (< 10 percent full, Figure 4(b)).

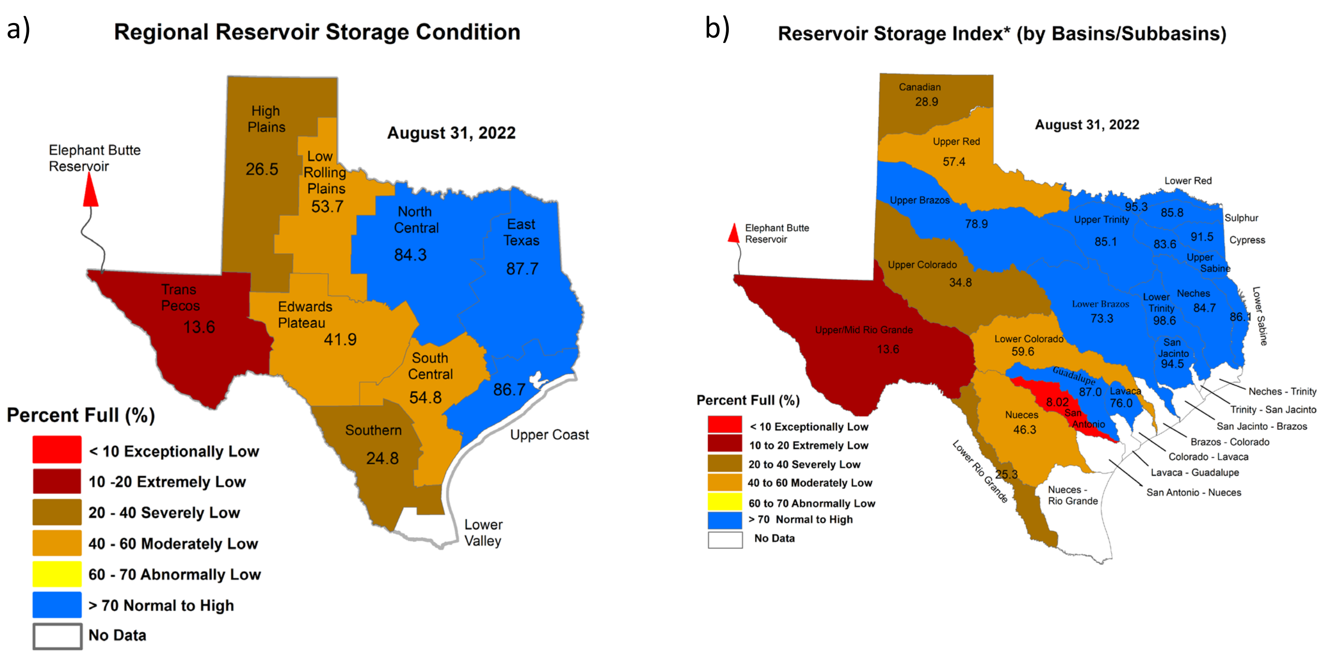
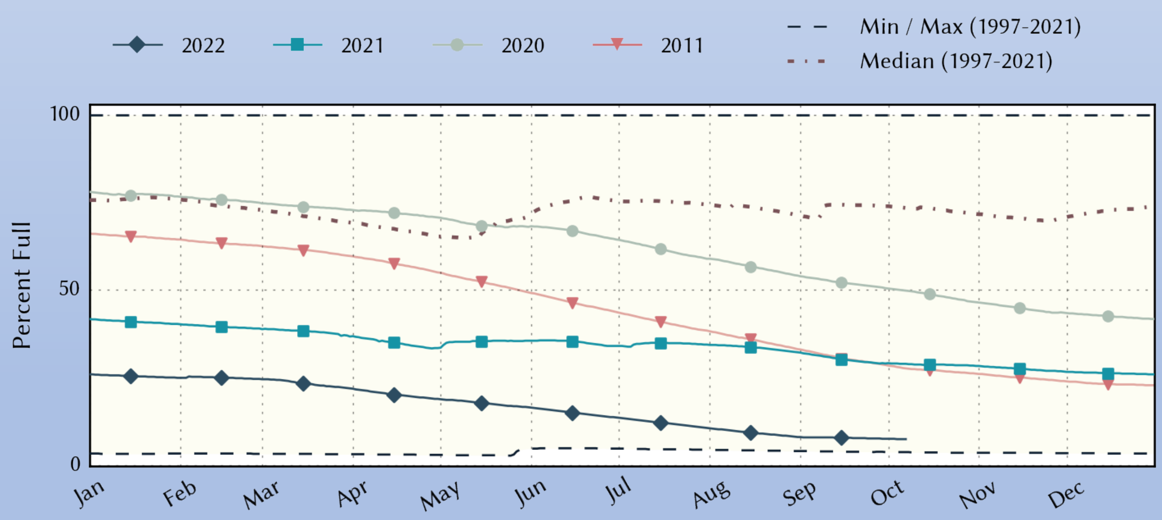


Figure 4: (a) Reservoir Storage Index* by climate, and (b) Reservoir Storage Index* by basin/sub-basin.

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

September 2022



Water News:

Pictured above, Medina Lake, located in the San Antonio River Basin, reached a conservation storage of 7.5% in September. That is just 5.1% more than the observed minimum conservation storage record for this reservoir, which occurred in May 2014. For more storage conservation data for Medina Lake and 118 other monitored reservoirs, visit https://www.waterdatafortexas.org/reservoirs/statewide.

RAINFALL

Little to no rain [yellow, orange, and red shading, Figure 1(a)] was seen across most of the state this month. However, some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded in the Trans Pecos, southwestern Edwards Plateau, central North Central, scattered areas across East Texas, southern South Central, Southern, Lower Valley, and the Upper Coast climate divisions, with accumulations reaching 17.5 inches.

Compared to historical data from 1991–2020, much of the state received below average rainfall [yellow and orange shading, Figure 1(b)]. Areas of the Trans Pecos, Edwards Plateau, central North Central, areas of East Texas, southern South Central, Southern, and Lower Valley climate divisions received 125–200 percent of normal rainfall [light green, dark green shading, Figure 1(b)]. 200–400 percent of normal rainfall [light blue, dark blue shading, Figure 1(b)] was seen in the Trans Pecos, Edwards Plateau, and Southern climate divisions. Northwestern Trans Pecos, and southwestern Southern climate divisions received 400–600 percent of normal rainfall [(light pink shading, circled in red, Figure 1 (b)].

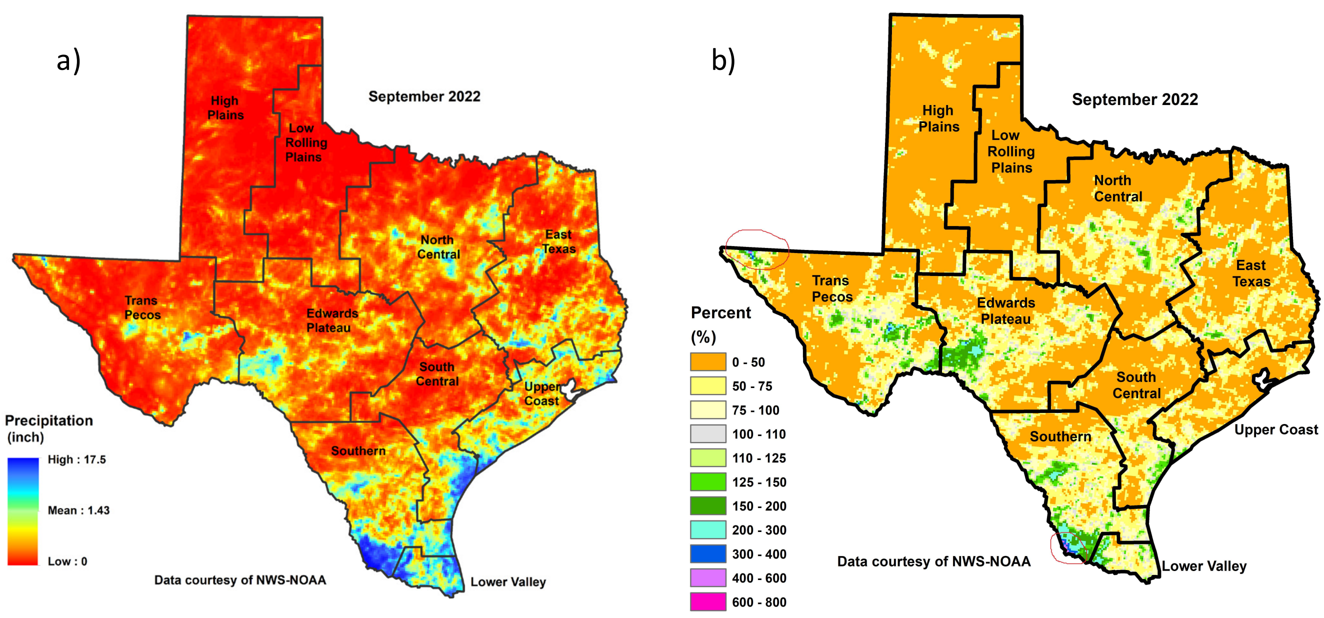
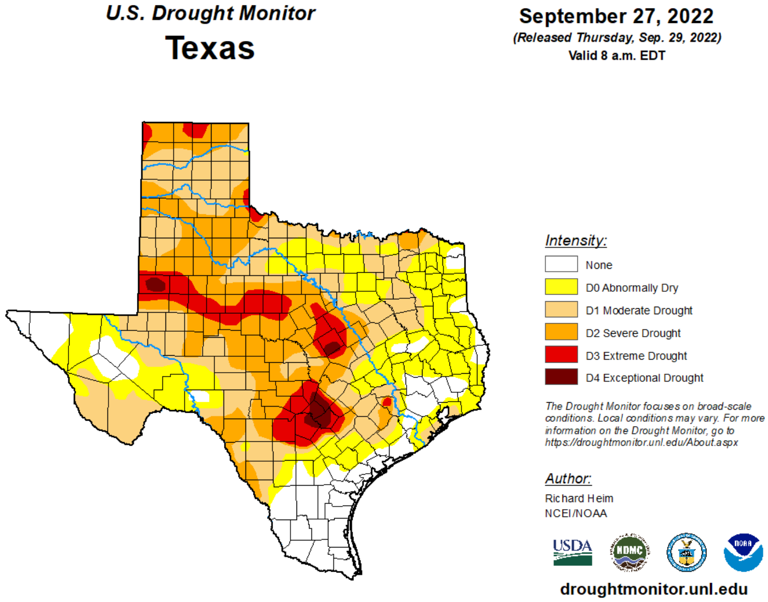


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

DROUGHT

The August rains allowed for a brief relief from drier conditions. Leading into October, 85% of the state was in the D0 (abnormally dry) through D4 (exceptional drought) categories (**Figure 2**). That is an increase of nearly 6% from September 6.



Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
2022-09-27	14.96	85.04	61.36	31.61	8.82	1.06

Figure 2. The percentage of drought in Texas according to the U.S. Drought Monitor map as of September 27, 2022.

RESERVOIR STORAGE

Out of 119 reservoirs in the state, 4 reservoirs held 100 percent conservation storage capacity (Figure 3). Additionally, 18 reservoirs were at or above 90 percent full. Nine reservoirs remained below 30 percent full: E.V. Spence (19.2 percent full), O. C. Fisher (3.4 percent full), J.B. Thomas (27.1 percent full), Falcon (16.1 percent full), Greenbelt (12.7 percent full), Mackenzie (6.4 percent full, Medina Lake (7.5 percent full), Palo Duro Reservoir (0.5 percent full), and the White River Lake (15.5 percent full). Elephant Butte Reservoir (New Mexico) was 5.5 percent full (Figure 3).

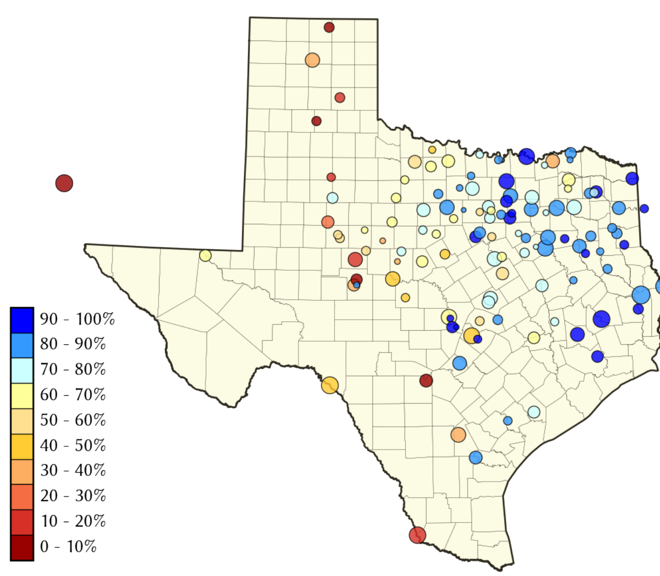
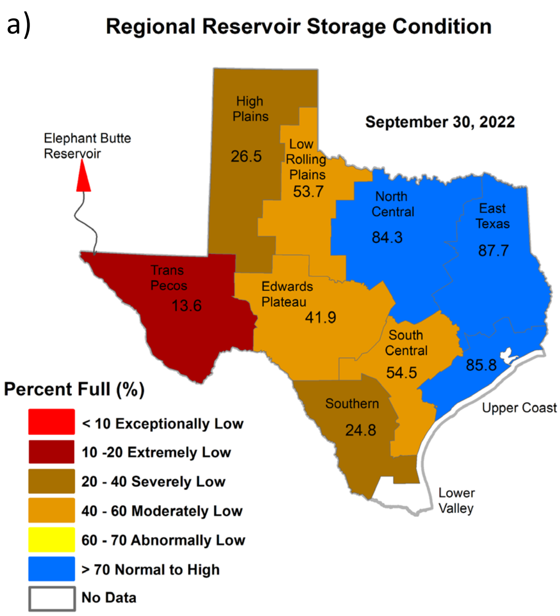


Figure 3. Reservoir conservation storage at end-September expressed as percent full (%)

Reservoir conservation storage by climate division was at or above normal [storage ≥70 percent full, Figure 4(a)] for East Texas (87.7 percent full), North Central (84.3 percent full), and the Upper Coast (85.8 percent full) climate divisions. Conservation storage was moderately low (Figure 4(a)) for the Low Rolling Plains (53.7 percent full), Edwards Plateau (41.9 percent full), and South Central (54.5 percent full) climate divisions. The High Plains (26.5 percent full) and Southern (24.8 percent full) climate divisions had severely low conservation storage (Figure 4(a)). The Trans Pecos (13.6 percent full) climate division had extremely low conservation storage (Figure 4(a)).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 4(b)) in the Lower Red, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Trinity, Upper and Lower Brazos, Neches, San Jacinto, Guadalupe, and Lavaca river basins. The Lower Colorado, Upper Red and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 4(b)). The Canadian, Upper Colorado, and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 4(b)). The Upper/Mid Rio Grande river basin had extremely low conservation storage (10–20 percent full, Figure 4(b)) and the San Antonio river basin had exceptionally low conservation storage (< 10 percent full, Figure 4(b)).

a)



b)

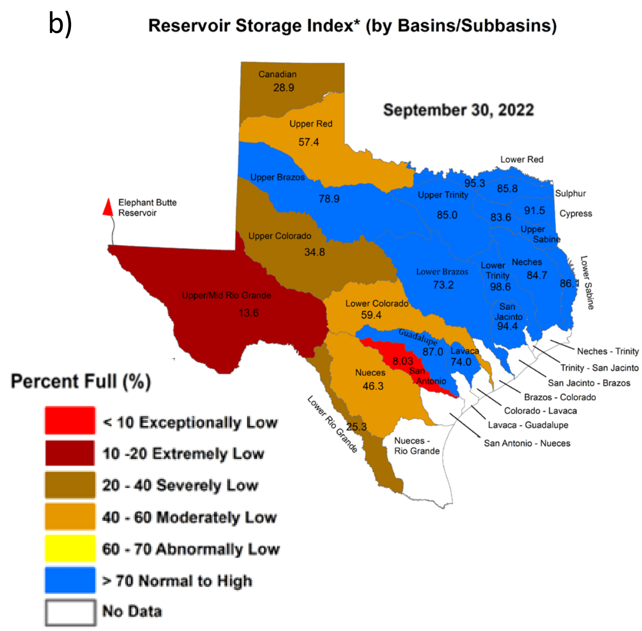
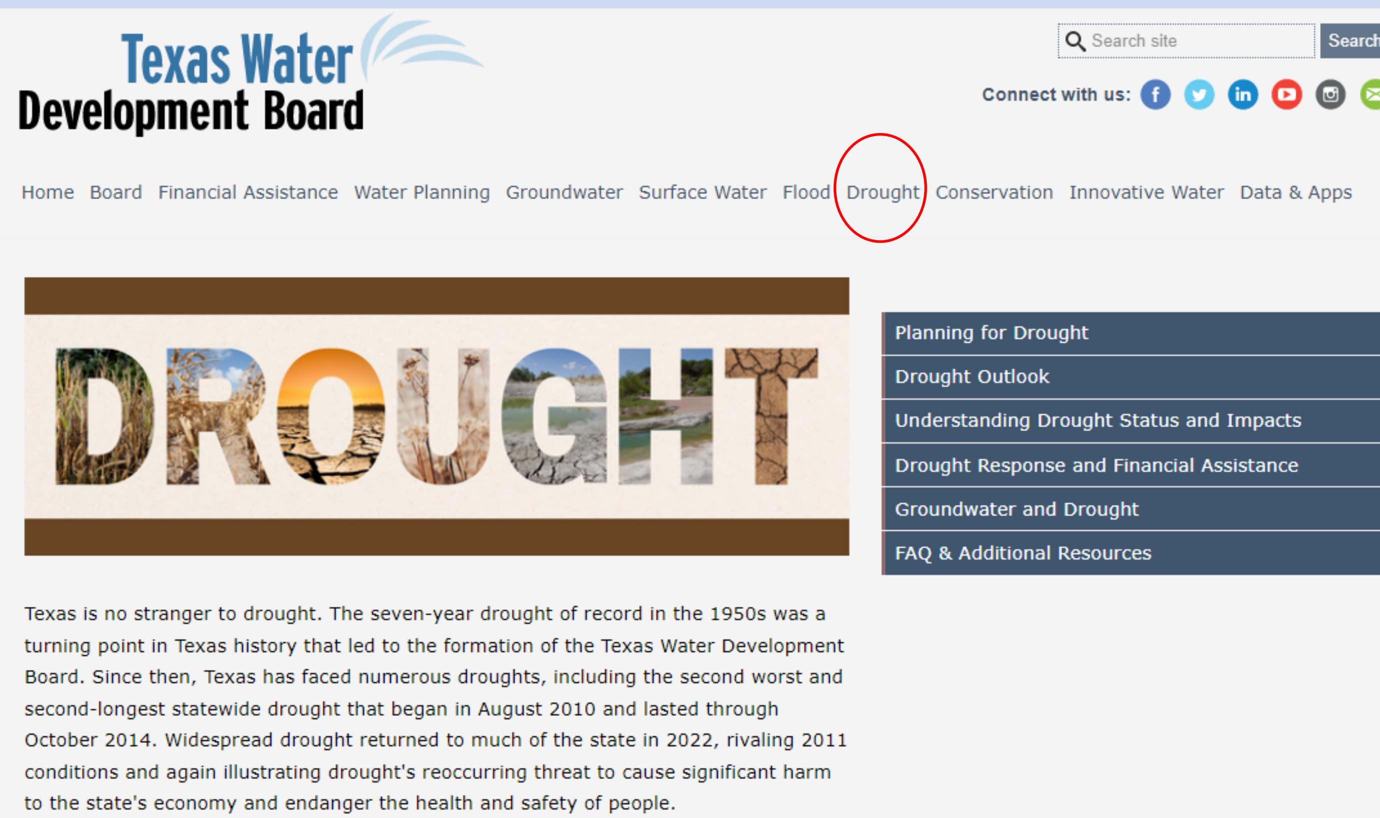


Figure 4: (a) Reservoir Storage Index* by climate division, and (b) Reservoir Storage Index* by basin/sub-basin.

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

October 2022



Water News:

The Texas Water Development Board has a new drought tab. For drought information, data, and resources visit http://www.twdb.texas.gov/drought/index.asp.

RAINFALL

Some rainfall [light blue and dark blue shading, Figure 1(a)] was seen across most of the state this month, with accumulations reaching 9.3 inches. Little to no rain [yellow, orange, and red shading, Figure 1(a)] was seen in areas of the High Plains, Trans Pecos, eastern Edwards Plateau, Southern, South Central, Lower Valley, southern North Central, portions of the Upper Coast, and southern East Texas.

Compared to historical data from 1991–2020, much of the state received below average rainfall [yellow and orange shading, Figure 1(b)]. Areas of the High Plains, Low Rolling Plains, Trans Pecos, western Edwards Plateau, northern North Central, northern East Texas, and southern and central Southern climate divisions received 125–200 percent of normal rainfall [light green, dark green shading, Figure 1(b)]. 200–400 percent of normal rainfall [light blue, dark blue shading, Figure 1(b)] was seen in the Trans Pecos, western Edwards Plateau, southern High Plains, southern Low Rolling Plains, and southwestern Southern climate divisions. Northwestern and eastern Trans Pecos, and southern High Plains climate divisions received 400–600 percent of normal rainfall [(light pink shading, Figure 1 (b)]. In a small area in the northwestern corner of the Trans Pecos 600-800 percent of normal rainfall [(dark pink shading, red circle, Figure 1 (c)] was seen.

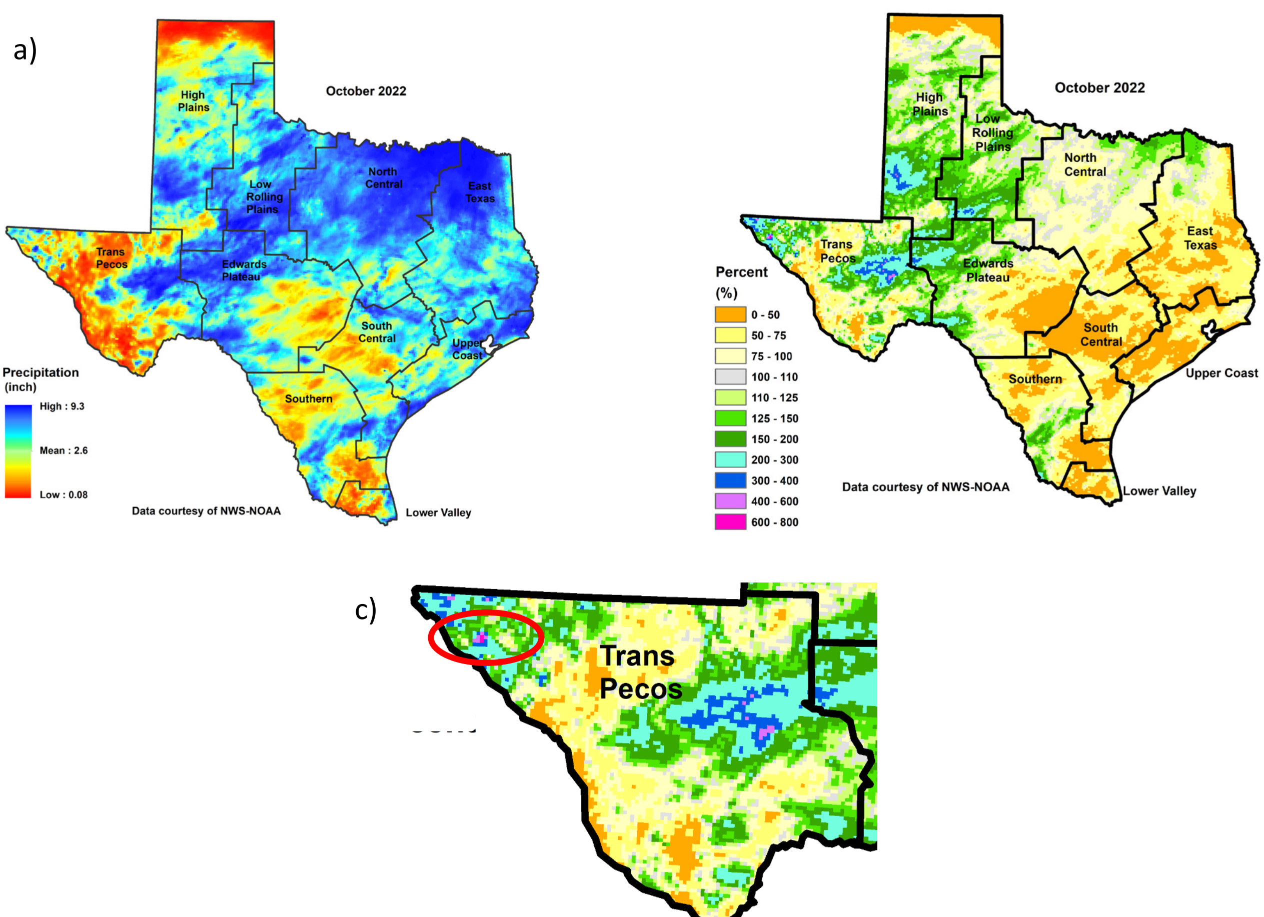
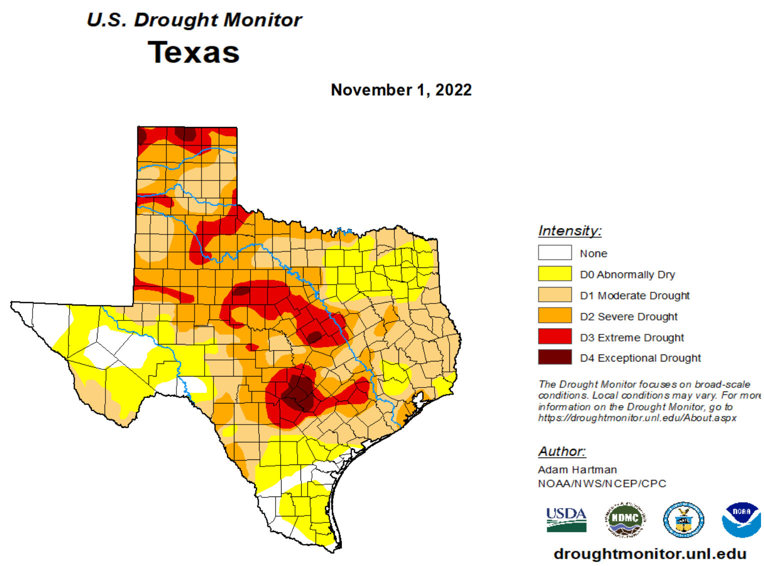


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall, and (c) Areas of 600-800 percent of normal rainfall (dark pink shading-circled in red)

DROUGHT

On the first of November, 91.9% of the state was in the D0 (abnormally dry) through D4 (exceptional drought) categories (**Figure 2**). That is an increase of more than 5% from the end of September.



Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
2022-11-01	8.10	91.90	69.56	40.13	13.43	1.73

Figure 2. The percentage of drought in Texas according to the U.S. Drought Monitor map as of November 1, 2022.

RESERVOIR STORAGE

Out of 119 reservoirs in the state, five reservoirs held 100 percent conservation storage capacity (Figure 3). Additionally, 13 reservoirs were at or above 90 percent full. Ten reservoirs remained below 30 percent full: E.V. Spence (19.0 percent full), O. C. Fisher (3.3 percent full), J.B. Thomas (26.0 percent full), Falcon (14.7 percent full), Greenbelt (12.4 percent full), Mackenzie (6.3 percent full, Medina Lake (7.0 percent full), Palo Duro Reservoir (0.4 percent full), Twin Buttes (29.3 percent full), and the White River Lake (15.2 percent full). Elephant Butte Reservoir (New Mexico) was 7.1 percent full (Figure 3).

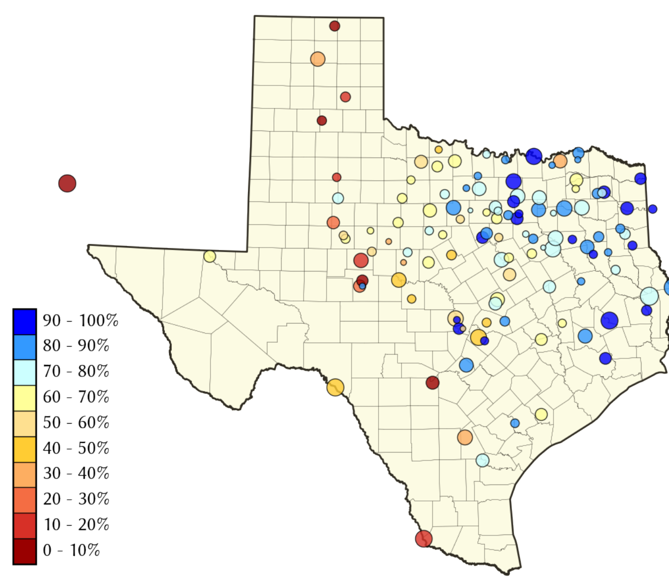


Figure 3. Reservoir conservation storage at end-October expressed as percent full (%)

Reservoir conservation storage by climate division was at or above normal [storage ≥70 percent full, Figure 4(a)] for East Texas (83.1 percent full), North Central (80.1 percent full), and the Upper Coast (82.8 percent full) climate divisions. Conservation storage was moderately low (Figure 4(a)) for the Low Rolling Plains (50.1 percent full), Edwards Plateau (45.1 percent full), and South Central (50.6 percent full) climate divisions. The High Plains (25.8 percent full) and Southern (26.3 percent full) climate divisions had severely low conservation storage (Figure 4(a)). The Trans Pecos (15.1 percent full) climate division had extremely low conservation storage (Figure 4(a)).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 4(b)) in the Lower Red, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Trinity, Upper Brazos, Neches, San Jacinto, and Guadalupe river basins. The Lower Brazos and Lavaca river basins had abnormally low conservation storage. The Lower Colorado, Upper Red, and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 4(b)). The Canadian, Upper Colorado, and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 4(b)). The Upper/Mid Rio Grande river basin had extremely low conservation storage (10–20 percent full, Figure 4(b)) and the San Antonio river basin had exceptionally low conservation storage (< 10 percent full, Figure 4(b)).

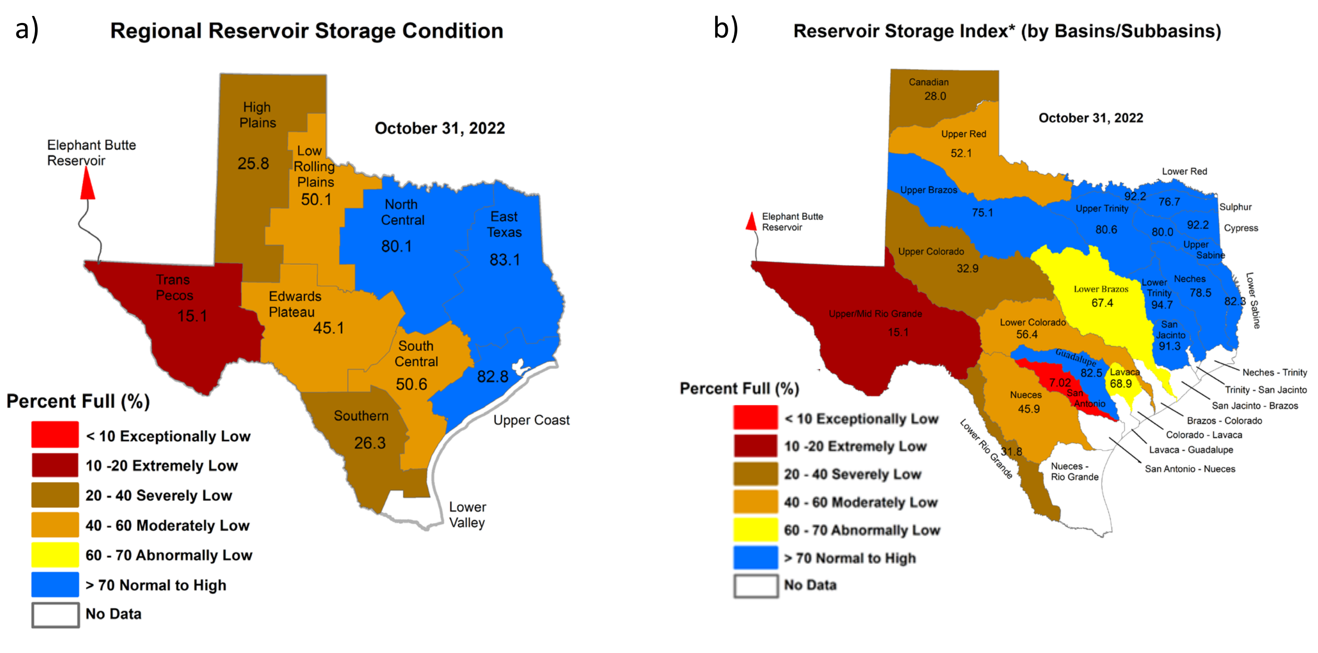
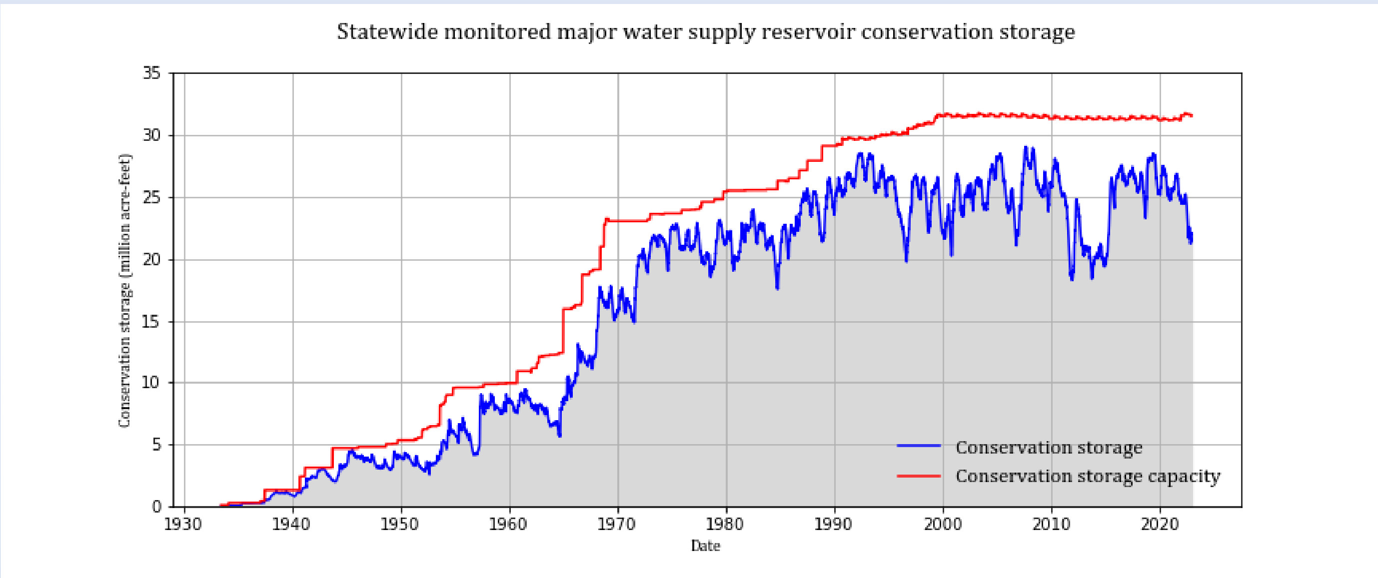


Figure 4: (a) Reservoir Storage Index* by climate division, and (b) Reservoir Storage Index* by basin/sub-basin.

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

November 2022



Water News:

Statewide conservation storage of monitored water supply reservoirs increased from last month in 64 reservoirs (53.8 % of reservoirs), decreased in 9 reservoirs (7.6% of reservoirs), and remained the same in 45 reservoirs (37.8% of reservoirs). For daily updates on reservoir storage across the state visit, https://waterdatafortexas.org/reservoirs/statewide.

RAINFALL

Little to no rain [yellow, orange, and red shading, Figure 1(a)] fell in the High Plains, much of the Low Rolling Plains, Trans Pecos, southern and western Edwards Plateau, much of the Southern, northwestern and areas of southern South Central, northwestern Lower Valley, and northwestern North Central climate conditions. Some rainfall [light blue and dark blue shading, Figure 1(a)] was seen in northeastern Edwards Plateau, central and eastern North Central, much of South Central, Upper Coast, and East Texas, with accumulations reaching 14.08 inches.

Compared to historical data from 1991–2020, areas of the state that received below average rainfall [yellow and orange shading, Figure 1(b)] were the northern High Plains, northern Low Rolling Plains, western and southern Trans Pecos, portions of southern Edwards Plateau, northwestern North Central, portions of East Texas, and much of the Southern climate divisions. The southern High Plains, portions of the Low Rolling Plains, much of the North Central, northern and eastern East Texas, northern Trans Pecos, northern Edwards Plateau, much of the South Central and Upper Coast climate divisions received 125–200 percent of normal rainfall [light green, dark green shading, Figure 1(b)]. 200–300 percent of normal rainfall [light blue shading, Figure 1(b)] was seen in the northern Trans Pecos, northern Edwards Plateau, southern Low Rolling Plains, eastern North Central, small areas of northern and eastern East Texas, eastern Southern, southern South Central, the Lower Valley, and portions of the Upper Coast climate divisions. Northern Trans Pecos, northern Edwards Plateau, and the Lower Valley climate divisions received 300–600 percent of normal rainfall [(dark blue, and light pink shading, Figure 1 (b)].

a) b)

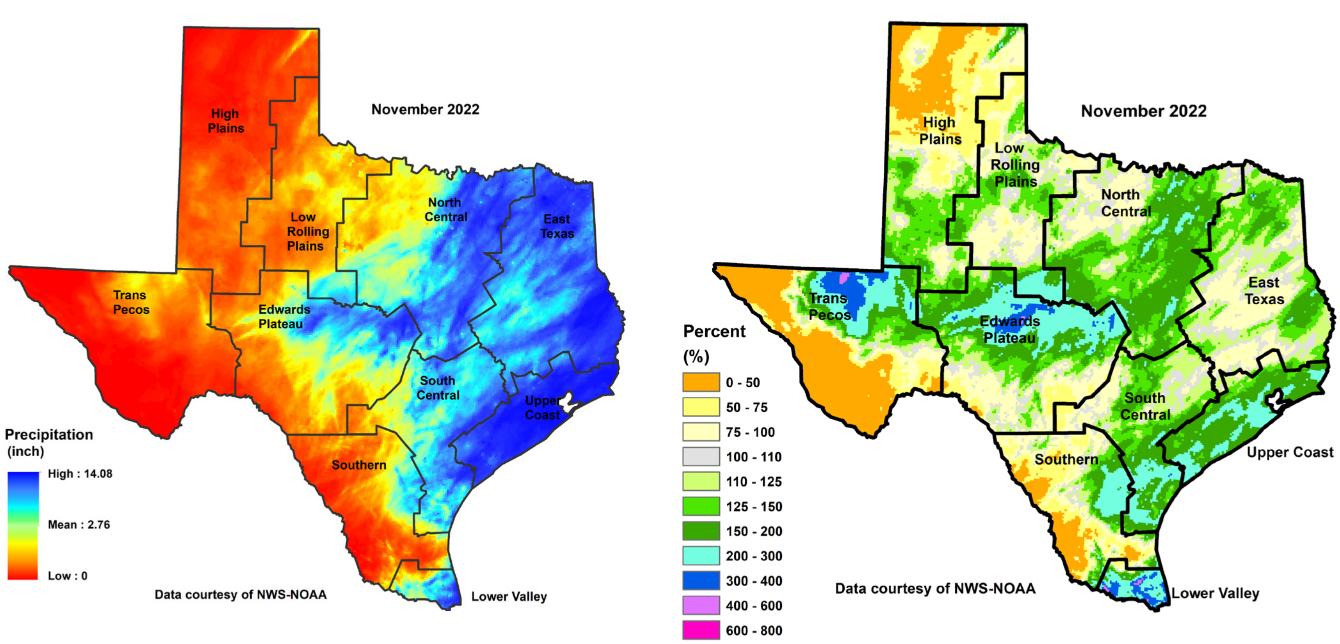
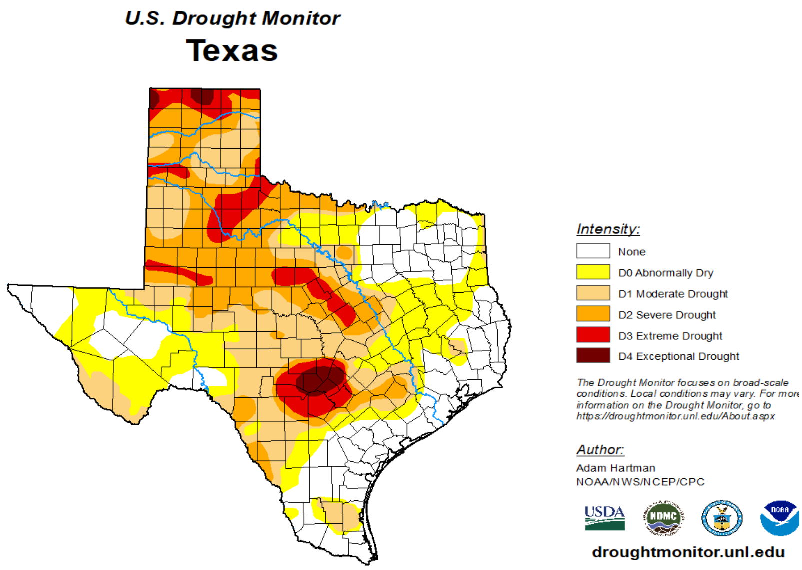


Figure 1: (a) Monthly accumulated rainfall, and (b) Percent of normal rainfall

DROUGHT

At the end of November, 74.14 % of the state was in the D0 (abnormally dry) through D4 (exceptional drought) categories (**Figure 2**). That is a decrease of 17.8% from the beginning of November.



Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
2022-11-29	25.86	74.14	51.97	29.26	9.23	1.39

Figure 2. The percentage of drought in Texas according to the U.S. Drought Monitor map as of November 29, 2022.

RESERVOIR STORAGE

Out of 119 reservoirs in the state, 11 reservoirs held 100 percent conservation storage capacity (Figure 3). Additionally, 23 reservoirs were at or above 90 percent full. Ten reservoirs remained below 30 percent full: E.V. Spence (18.8 percent full), O. C. Fisher (3.2 percent full), J.B. Thomas (25.1 percent full), Falcon (14.1 percent full), Greenbelt (12.0 percent full), Mackenzie (6.3 percent full, Medina Lake (6.7 percent full), Palo Duro Reservoir (0.5 percent full), Twin Buttes (29.0 percent full), and the White River Lake (14.5 percent full). Elephant Butte Reservoir (New Mexico) was 9.0 percent full (Figure 3).

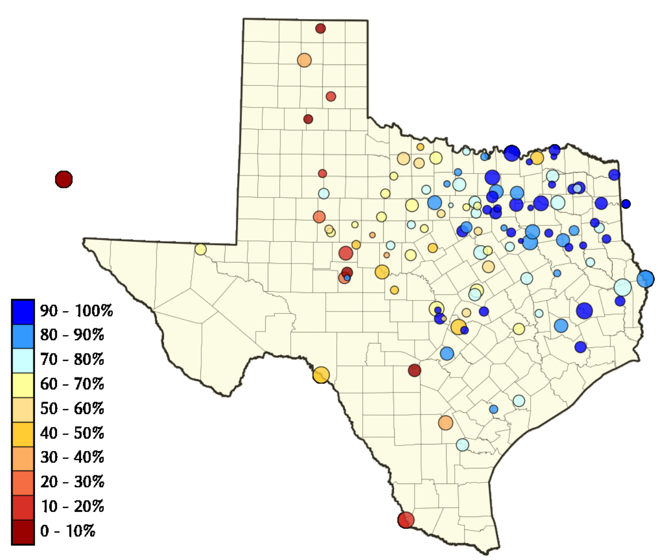


Figure 3. Reservoir conservation storage at end-November expressed as percent full (%)

Reservoir conservation storage by climate division was at or above normal [storage ≥70 percent full, Figure 4(a)] for East Texas (85.7 percent full), North Central (83.6 percent full), and the Upper Coast (86.5 percent full) climate divisions. Conservation storage was moderately low (Figure 4(a)) for the Low Rolling Plains (49.8 percent full), Edwards Plateau (44.9 percent full), and South Central (50.4 percent full) climate divisions. The High Plains (25.4 percent full) and Southern (25.6 percent full) climate divisions had severely low conservation storage (Figure 4(a)). The Trans Pecos (16.9 percent full) climate division had extremely low conservation storage (Figure 4(a)).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 4(b)) in the Lower Red, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Trinity, Upper Brazos, Neches, San Jacinto, and Guadalupe river basins. The Lower Brazos river basin had abnormally low conservation storage. The Lower Colorado, Upper Red, and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 4(b)). The Canadian, Upper Colorado, and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 4(b)). The Upper/Mid Rio Grande river basin had extremely low conservation storage (10–20 percent full, Figure 4(b)) and the San Antonio river basin had exceptionally low conservation storage (< 10 percent full, Figure 4(b)).

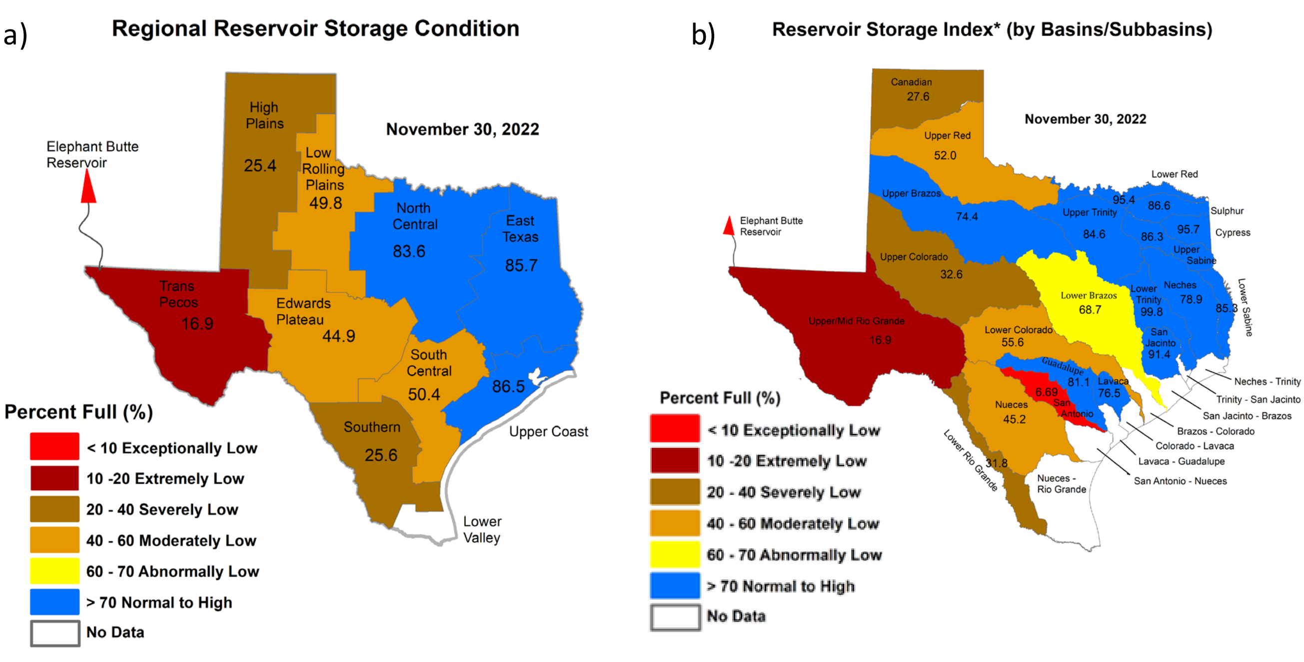
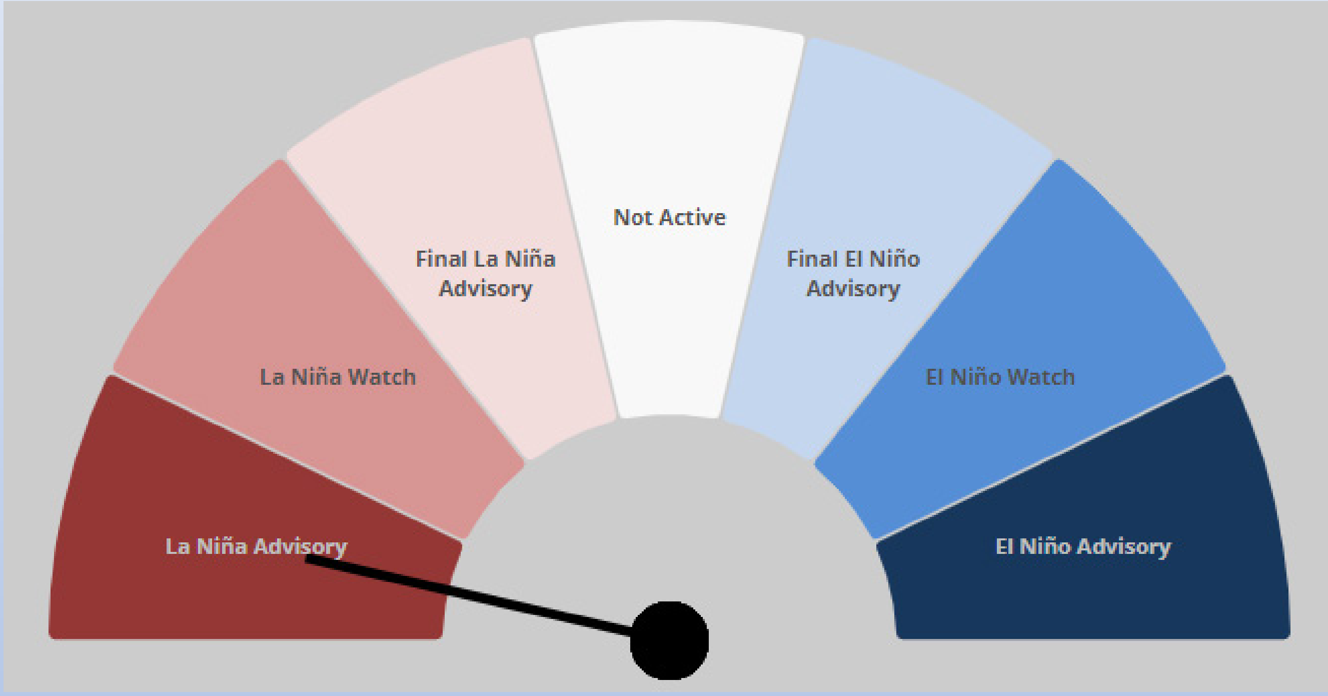


Figure 4: (a) Reservoir Storage Index* by climate division, and (b) Reservoir Storage Index* by basin/sub-basin.

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

December 2022



Water News:

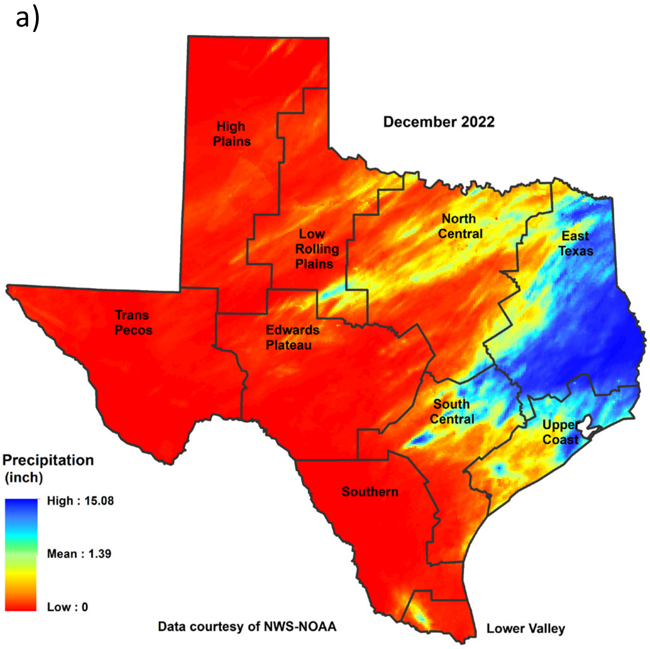
La Niña (warmer and drier than normal) conditions are expected to continue through the winter, with equal chances of La Niña and ENSO-neutral conditions occurring during January-March 2023. In February-April 2023, there is a 71% chance of returning to more neutral (ENSO-neutral) conditions. https://waterdatafortexas.org/drought/drought-outlook

RAINFALL

Little to no rain [yellow, orange, and red shading, Figure 1(a)] fell in the High Plains, much of the Low Rolling Plains, Trans Pecos, Edwards Plateau, Southern, northwestern and southern South Central, Lower Valley, much of the North Central, western Upper Coast, and western East Texas climate divisions. Some rainfall [light blue and dark blue shading, Figure 1(a)] was seen in southern Low Rolling Plains, areas of northern and southeastern North Central, northern South Central, eastern and areas of western Upper Coast, portions of western Lower Valley, and much of East Texas, with accumulations reaching 15.08 inches.

Compared to historical data from 1991–2020, much of the state received below average rainfall [yellow and orange shading, Figure 1(b)]. Small portions of the High Plains, areas of central and southern Low Rolling Plains, western North Central, northern Edwards Plateau, southern Southern, western Lower Valley, northern South Central, areas of the Upper Coast, and eastern and southern East Texas climate divisions received 125–200 percent of normal rainfall [light green, dark green shading, Figure 1(b)]. 200–300 percent of normal rainfall [light blue shading, Figure 1(b)] was seen in the northern High Plains, southern Low Rolling Plains, western North Central, northern South Central, southern East Texas, and western Lower Valley climate divisions. The Low Rolling Plains, northern Southern, and western Lower Valley climate divisions received 300–400 percent of normal rainfall [(dark blue shading, Figure 1 (b)].

a)



b)

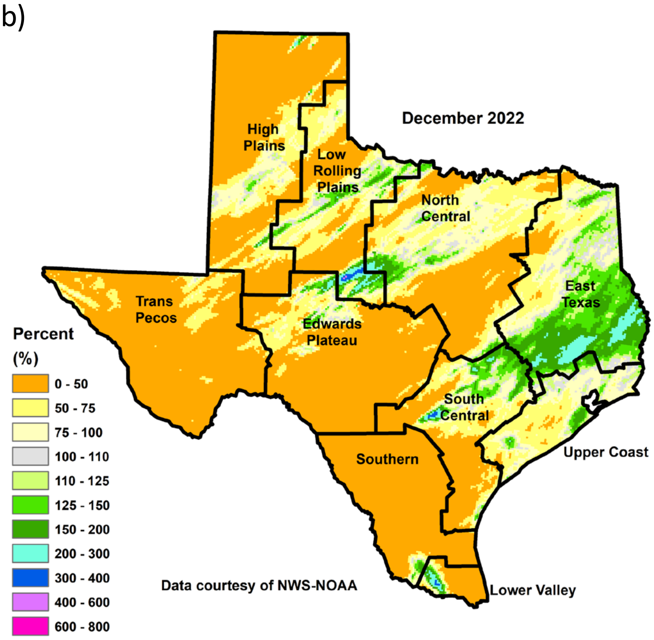
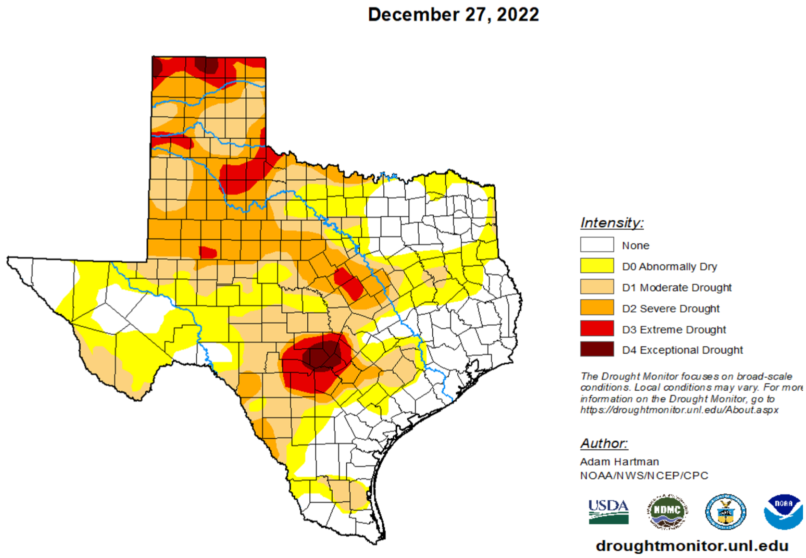


Figure 1: (a) Monthly accumulated rainfall, and (b) Percent of normal rainfall

DROUGHT

At the end of December, 72.43% of the state was in the D0 (abnormally dry) through D4 (exceptional drought) categories (**Figure 2**). That is a decrease of 1.71% from the end of November.



Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
2022-12-27	27.57	72.43	48.59	25.88	7.13	1.24

Figure 2. The percentage of drought in Texas according to the U.S. Drought Monitor map as of December 27, 2022.

RESERVOIR STORAGE

Out of 119 reservoirs in the state, 13 reservoirs held 100 percent conservation storage capacity (Figure 3). Additionally, 25 reservoirs were at or above 90 percent full. Ten reservoirs remained below 30 percent full: E.V. Spence (18.3 percent full), O. C. Fisher (3.2 percent full), J.B. Thomas (24.2 percent full), Falcon (14.7 percent full), Greenbelt (11.8 percent full), Mackenzie (6.2 percent full, Medina Lake (6.3 percent full), Palo Duro Reservoir (0.3 percent full), Twin Buttes (29.1 percent full), and the White River Lake (14.0 percent full). Elephant Butte Reservoir (New Mexico) was 11.4 percent full (Figure 3).

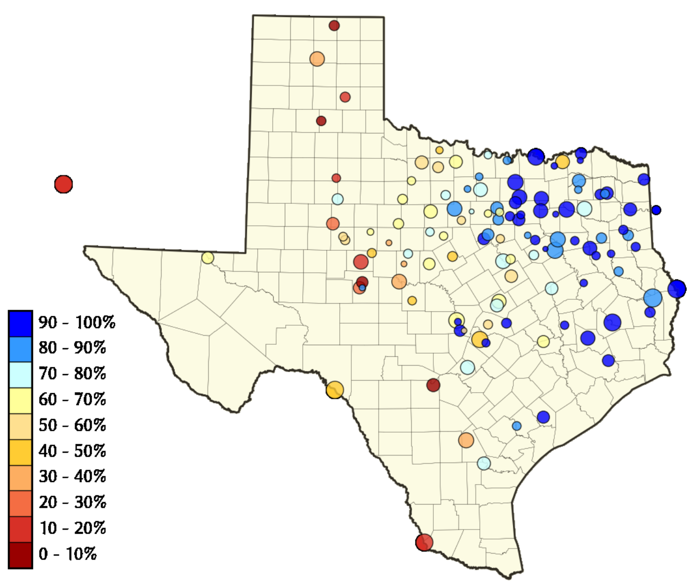


Figure 3. Reservoir conservation storage at end-December expressed as percent full (%)

Reservoir conservation storage by climate division was at or above normal [storage ≥70 percent full, Figure 4(a)] for East Texas (88.3 percent full), North Central (83.5 percent full), and the Upper Coast (95.1 percent full) climate divisions. Conservation storage was moderately low (Figure 4(a)) for the Low Rolling Plains (49.8 percent full), Edwards Plateau (45.0 percent full), and South Central (50.0 percent full) climate divisions. The High Plains (25.1 percent full) and Southern (25.5 percent full) climate divisions had severely low conservation storage (Figure 4(a)). The Trans Pecos (19.2 percent full) climate division had extremely low conservation storage (Figure 4(a)).

Combined conservation storage by river basin or sub-basin was normal to high (>70 percent full, Figure 4(b)) in the Lower Red, Sulphur, Cypress, Upper and Lower Sabine, Upper and Lower Trinity, Upper Brazos, Neches, San Jacinto, Lavaca, and Guadalupe river basins. The Lower Brazos river basin had abnormally low conservation storage. The Lower Colorado, Upper Red, and Nueces river basins had moderately low conservation storage (40–60 percent full, Figure 4(b)). The Canadian, Upper Colorado, and Lower Rio Grande river basins had severely low conservation storage (20–40 percent full, Figure 4(b)). The Upper/Mid Rio Grande river basin had extremely low conservation storage (10–20 percent full, Figure 4(b)) and the San Antonio river basin had exceptionally low or less than 10 percent of conservation storage (Figure 4 (b)).

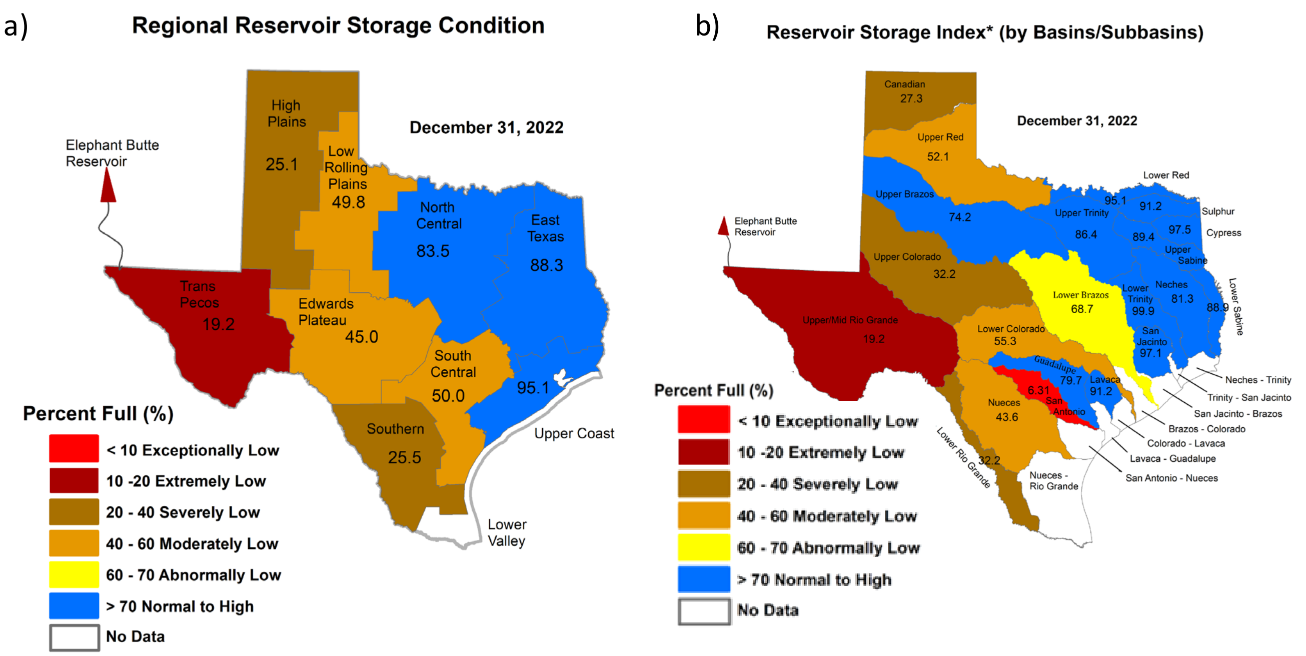


Figure 4: (a) Reservoir Storage Index* by climate division, and (b) Reservoir Storage Index* by basin/sub-basin.

*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Making Headlines 2022

F.1 Objective - The District will annually submit an article regarding water conservation for publication to at least one newspaper of general circulation in the District counties.

F.1 Performance Standard - Each year, a copy of the conservation article will be included in the District's Annual Report to be given to the District's Board of Directors.

F.2 Objective - The District will annually submit an article regarding rainwater harvesting for publication to at least one newspaper of general circulation in the District counties.

F.2 Performance Standard - Each year, a copy of the rainwater harvesting article will be included in the District's Annual Report to be given to the District's Board of Directors.

F.3 Objective - Each year, the District will include an informative flier on water conservation within at least one mail out to groundwater non-exempt water users distributed in the normal course of business for the District.

F.3 Performance Standard - Each year, a copy of the water conservation mail-out flyer will be included in the District's Annual Report to be given to the District's Board of Directors.

There are several newspapers in the District that routinely publish information provided by the District, including meeting notifications and conservation ideas. In addition, District staff routinely submits articles for publication and sends out updates and newsletters related to general updates on the District, water level monitoring, new well registrations, groundwater production, water conservation and rainwater harvesting. The following pages are examples of information released by the District to fulfill our management objectives in 2021.

F.1:

- Water conservation article submitted to all newspapers in the District and published by the Bowie News on August 03, 2022.

F.2:

- Rainwater harvesting article submitted to all newspapers in the District and published by Weatherford Democrat on November 15, 2022 and the Community News on December 21, 2022.

F.3:

- District Newsletter provided to all non-exempt well owners and others that have signed up for the District's mailing list:
    - Summer 2022 Newsletter, distributed June of 2022.
    - Winter 2022 Newsletter, distributed December of 2022.

NEWS

Drought conditions impacting well operations

Published **1 year ago** on **08/03/2022**
By **bowienews**

During this difficult time of heat and drought, the staff of the Upper Trinity Groundwater Conservation District has received numerous calls from residents whose wells have run dry or they are having difficulty producing.
Jill Garcia of the district said they have complied a list of resources and advice for landowners. Those with additional questions or in need of more information can call the office in Springtown at 817-525-5200 or visit the website at uppertrinitygcd.com.

While the district cannot restrict water volumes of private domestic wells, per our rules, below are ways to keep your well and property safe and maintained until late September when rain is expected.

Read the full list of tips in the mid-week Bowie News.

RELATED TOPICS:

https://www.weatherforddemocrat.com/news/local_news/rainwater-collection-grants-open-for-government-other-entities/article_e329c246-c121-537f-86ec-2d7a3e050513.html

Rainwater collection grants open for government, other entities

From staff reports
Nov 15, 2022

Cities, counties school districts and other entities in Parker and three other counties can apply for up to 100 percent grant funding to harvest rainwater off their structures, the Upper Trinity Groundwater Conservation District has announced.

Deadline to apply is Feb. 28, 2023.

"UTGCD encourages organizations within the district area to consider the addition of rainwater harvesting systems to structures and organizational buildings," an announcement from the district said. "Maintained systems significantly reduce groundwater usage, utility costs, erosion and the weathering of vegetative surfaces.”

Entities, including emergency services districts, in Hood, Wise and Montague counties also also are eligible for the grants.

Nonprofit organizations, volunteer fire departments and emergency services districts also are on the list of eligible entities.

Others eligible are private entities to which the public has access, special utility districts, municipal utility districts and other entities “that provide public service consistent with the purposes of or that otherwise benefit the district,” an announcement said.

The conservation district’s offer comes as drought continues in North Central Texas and across much of the Lone Star State.

The Texas Water Development Board’s Water Weekly email for Nov. 7 showed Parker County remaining in severe drought.

To apply for the conservation district funding, go to uppertrinitygcd.com and click first on, news, then on UTGCD Rainwater Harvesting Grant Hub.

“There is no cost to apply, and multiple systems may be granted with an application year,” the announcement says. “Up to 100 percent of funding is available to grantees, with multiple cost sharing options available as well.”

Trending Video

THE COMMUNITY NEWS
(/)
LOCAL NEWS FROM THE HEART OF EAST PARKER COUNTY

PARKER COUNTY

Rainwater harvesting grant program under way

Up to 100% funding is available

(https://gamma.creativecirclecdn.com/communitynews/original/20221221-075144-Web-Sheriffs-Posse-System.jpg)

A 65,000 gallon harvesting system located at the Sheriff's Posse grounds in Weatherford was awarded to Parker County.The project was completed in 2020 and was awarded the Texas Rain Catcher of the Year in the governmental category.

SPECIAL TO THE COMMUNITY NEWS

Posted Wednesday, December 21, 2022 7:52 am

Special to The Community News

The Upper Trinity Groundwater Conservation District has announced a new annual rainwater harvesting grant program for Montague, Wise, Parker, and Hood Counties.

UTGCD encourages organizations within the district area to consider the addition of rainwater harvesting systems to structures and organizational buildings.

Maintained systems significantly reduce groundwater usage, utility costs, erosion, and weathering of vegetative surfaces. The State of Texas publicly supports rainwater harvesting efforts while recognizing exemplary systems each year via the Texas Water Development Board.

There is no cost to apply to the program, and multiple systems may be granted within an application year. Up to 100% of funding is available to grantees, with multiple cost sharing options available as well.

The grant application period is open now and UTGCD will accept applications through Feb. 28, 2023.

To access application documents, video guides, and resources on rainwater harvesting, visit uppertrinitygcd.com (https://uppertrinitygcd.com/rainwater-harvesting-grants/).

Administratively complete applications will be graded via a numerical scoring rubric, available to applicants as part of program transparency.

Applicants will be able to track the status of their application via the district website. Organizations that fall into the below listed categories may apply. Interested parties can reach out to UTGCD to verify their eligibility.

Eligible entities and organizations include the following:

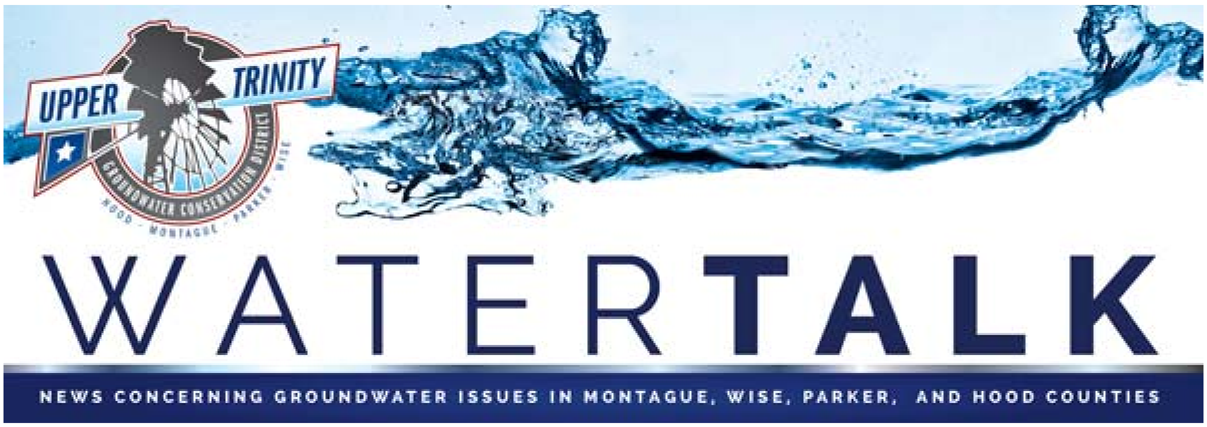
- Cities;
- Counties;
- Independent School Districts;
- Municipal Utility Districts;
- Special Utility Districts;
- Emergency Service Districts;
- Volunteer Fire Departments;
- Non-profit organizations;
- Other entities that provide public service consistent with the purposes of or that otherwise benefit the District;
- Other private entities to which the public has access.

For questions regarding the application process, application materials, and status updates, call Jill Garcia with the Upper Trinity GCD at 817-523-5200 or email jill@uppertrinitygcd.com.

Doug Shaw

From: Upper Trinity GCD <jill@uppertrinitygcd.com>
Sent: Thursday, June 2, 2022 9:48 AM
To: Doug Shaw
Subject: UTGCD WaterTalk Newsletter: Summer Edition 💧

Summer 2022 Newsletter   View this email in your browser



latest **news**

Ribbon Cutting/Grand Opening in Wise County

events

June:

20th- Juneteenth Day (Office Closed)

21st - Ribbon Cutting & Rainwater Seminar
6pm, Wise County Fairgrounds, Decatur, TX

23rd - Board Meeting
5pm, District Office, Springtown, TX

July:

4th- Fourth of July (Office Closed)

18th- Board Meeting
5pm, District Office, Springtown, TX

August:

15th- Board Meeting
5pm, District Office, Springtown, TX

September:

5th- Labor Day (Office Closed)

19th- Board Meeting
5pm, District Office, Springtown, TX

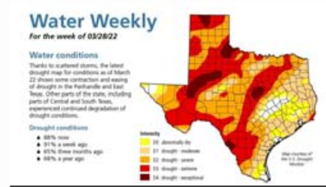
The rainwater collection project at the Wise County Fairgrounds, funded through a grant awarded by the District, has recently been completed, and we would like to welcome everyone to the Ribbon Cutting ceremony for the project on June 21st.

The project began in 2021 when the District awarded funds for the construction of the project, which will help to raise awareness related to capturing rainwater in order to help offset outdoor water demand, which can ultimately lead to the conservation of groundwater.

*Board Meetings are held at our District office at **1859 W Hwy 199, Springtown, TX at 5:00pm**.*

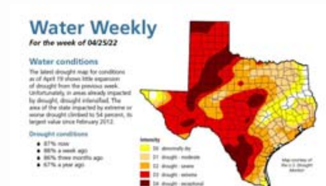
They are open to the public, and available virtually through Zoom. Check our meetings page on our website for login information.

drought **status**

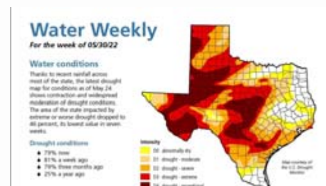


March 28th, 2022

The new system will hold up to 65,000 gallons of rainwater and is already being utilized by participants of events held at the grounds. County Judge J.D. Clark and Grounds manager Jimmy Counts worked closely with district staff to manage and oversee development and construction of the project. Educational signage will soon be installed alongside the system so fair-goers and visitors learn about the importance of rainwater harvesting and how to develop their own residential or commercial systems.



April 24th, 2022



May 30th, 2022

UTGCD Spacing Rules

Maximum Allowed Well Production	Minimum Tract Size	Spacing from Other Well Sites	Spacing from Property Line
The maximum amount of groundwater the well can actually produce as equipped in gallons per minute (gpm).	The minimum tract size that may be considered an appropriate site for a well.	The minimum distance, in feet, that a new well or proposed well site may be located from an existing registered or permitted well, existing unregistered well identified by the General Manager under Rule 4.3(b), or approved well site.	The minimum distance, in feet, that a new well or proposed well site may be located from the nearest property line of the tract of land on which it is to be located.
<17.36 gpm	Minimum Tract Size is 2 Acres	150 ft.	50 ft.
17.36 - 30 gpm		500 ft.	150 ft.
30 - 50 gpm		1,000 ft.	250 ft.
50 - 80 gpm		1,750 ft	500 ft.
80 – 100 gpm		2,500 ft.	750 ft.
>100 gpm		3,250 ft.	1,000 ft.

A copy of the District rules is always available at the District Office or at the website below.

District Staff

Doug Shaw,
General Manager

Kyle Russell,
Assistant General Manager

Ann Devenney,
Office Manager

Upper Trinity GCD Rules

District Staff Updates

The Upper Trinity welcomed several new employees to our Springtown offices during 2022, hiring additional field technicians to assist with incoming well applications. Below are some fun facts about our new hires.

Zane Bearden graduated from Tarleton State University with a degree in Agriculture Services and Development and is currently working on his master's in Agriculture Consumer Resources.

Jennifer Hachtel,
Data Coordinator

Laina Furlong,
Administrative Assistant

Leisha Manzanec,
Field Supervisor

Jacob Dove,
GIS Analyst

Blaine Hicks,
Staff Geologist

Jill Garcia,
Education & PR Coordinator

Zane Bearden,
Field Technician

Natalie Nava,
Field Technician

Dawson Lowe,
Field Technician

Water Quality Testing

The District offers free

When asked about his personal interests, Zane enjoys hunting for fossils (especially ammonites) and reading in his spare time. Zane's hometown is Sterling City, Texas, and his dream was to become an archeologist when he was younger. When asked where he would like to travel, Zane hopes to visit Zion National Park someday.

Natalie Nava graduated from the University of North Texas this past year with a bachelor's degree in Geography. When asked about her personal interests, Natalie hopes to travel to Rio De Janeiro, Brazil, and experience the local culture alongside the beaches and forests. When asked about her favorite food or candy, Natalie enjoys boba/bubble tea originally from Taiwan, while the avocado slush is her favorite flavor combination.

Dawson Lowe graduated from Tarleton State University this past year with a bachelor's degree in Agriculture. When asked about his hobbies and home life, Dawson enjoys spending time outdoors, including hunting and fishing in North Texas. Dawson also is the proud owner of a golden retriever named Goose, and a Blue Heeler named Cash. His currently resides is Stephenville, Texas.

water testing for E. coli and coliform bacteria. We also have a list of NELAP certified laboratories available for VA Loan testing and property closings.

Call **817-523-5200** for more information.

Realtor Education Courses

UTGCD offers free courses for realtors on groundwater and water wells in North Texas. Check our website for additional information or call 817-523-5200 to schedule a class today.

UTGCD staff is always happy to help residents of the District with any issues related to groundwater. Below is an image of District staff using a downhole camera to help identify what could be blocking a water well.

Monitoring Well Program Updates

The District's Board of Directors recently approved funding the drilling of a deep monitoring well in southwestern Parker County. The project is a partnership with Parker County SUD, as they are looking for additional water sources to address future growth. The goal of the project is to identify potential water sources from the Cross Timbers Aquifer, which may likely prove to be brackish or of a much lower quality than water from the Trinity Group.

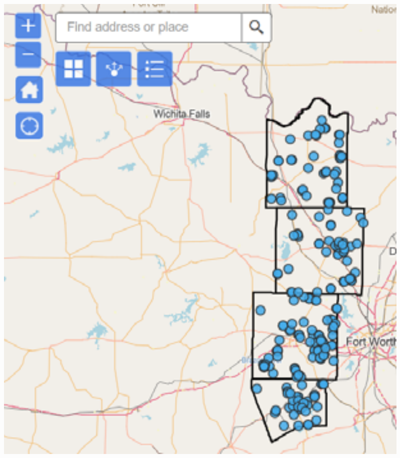
Because water from the Trinity group of aquifers is either scarce, or non-existent, within most of the boundaries of Parker County SUD, they depend mostly on water from the Brazos River. Due to the quality of the water from the Brazos, the SUD has invested tremendous funds in treatment facilities to treat that water to drinking water standards. Because of the existence of these treatment facilities, the SUD has identified that a source of brackish groundwater could also be treated by these facilities.

More to come as the project progresses, feel free to check in at District board meetings for additional updates.

The District has recently updated the Monitoring Well Map on our website. The map now contains up-to-date links to hydrographs showing historic and current water levels for all the wells in the program (water levels can also be downloaded).

Click below to access the maps!

District Monitoring & Registration Maps



Water well owners are invited to join the District's ongoing monitoring program. Those registered in the program receive quarterly updates on water level depth. The district well monitoring program currently has 221 well sites within our database and have added five sites in 2022.

Staff are continuously looking for interested landowners to assist with water data collection throughout the Upper Trinity Aquifer – please email blaine@uppertrinitygcd.com for more information regarding the program or visit our website at uppertrinitygcd.com.

Water Production Report Dates & Reminders

Water Production Report Dates			
Reporting Period	**Due Date**	**Usage Dates**	**Late Payment Penalties**
Semi- Annual 2	Janary 31	July 1 - December 31	30 days over due: the greater of $25.00 or 10% of the water use fees
Semi- Annual 1	July 31	January 1 - June 30	60+ days overdue: up to three times the amount of the water use fees

---

District Wells & Aquifer Health Update

Check out the number of well registrations in the Upper Trinity since January 1st, 2019. Below that are average water level trends in your county. Check your county's aquifer health and remind yourself that groundwater conservation is everyone's responsibility!

New Well Applications Received January - May 2022	
County	**# of Wells**
Hood	58
Montague	100
Parker	660
Wise	250

Education & Outreach Update

UTGCD is committed to enhancing public knowledge and awareness regarding groundwater resources in the Montague, Hood, Wise, and Parker counties. Staff regularly attend both community and school events to connect with citizens on subjects such as rainwater harvesting, native plant development, and sustainable community growth.

District staff have been visiting campuses both in person and virtually during the 2022 school year to help students review groundwater and water concepts for the upcoming STAAR examinations. Staff have also visited community events to teach district residents about native plants and topsoil health. If your group or campus is interested reserving a speaker from district staff or schedule a water trailer visit, contact our office or chat with us online at uppertrinitygcd.com.

Water Conservation Recommendations

UTGCD has our favorite conservation tips listed below for a hot Texas summer. Do you have your own conservation practices around your garden or property?

- The spring and early summer is a great time to evaluate irrigation infrastructure on your property or in your garden.
    - The timing of outdoor water use is very important – watering in the early morning or evening can prevent evaporative loss from the heat/sun.
    - Check your system - significant volumes of water can be wasted by broken or leaking equipment.
    - Consider a drip irrigation system for your garden or landscaping, in many typical irrigation systems.
- Leave your grass longer – longer grass helps to promote deeper root growth, which creates a more water efficient lawn.
- Mulch!

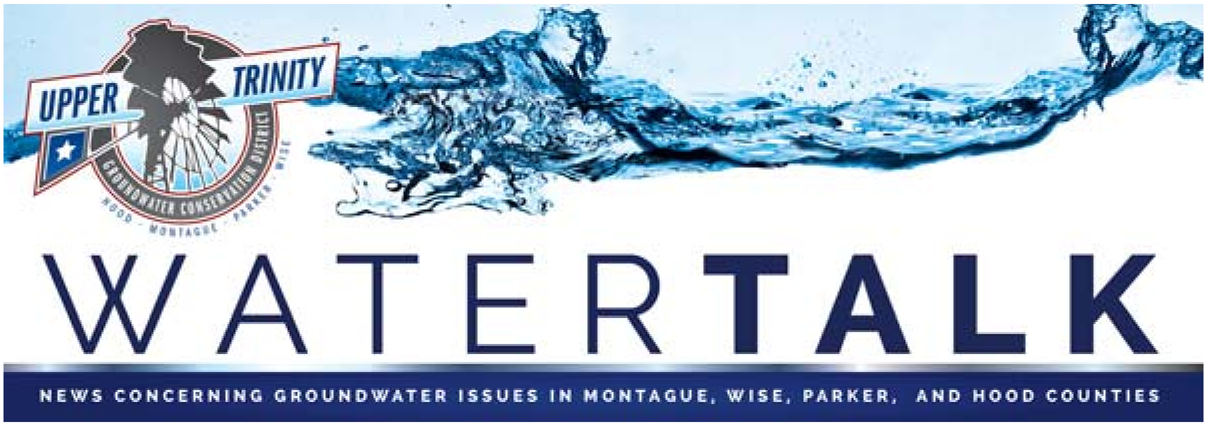
Thanks for reading - and keep up with all things UTGCD on our social media channels!

Our mailing address is:
|P.O. Box 1749 Springtown, TX 76082|
Our physical address is:
|1859 W. Hwy 199 Springtown, TX 76082|

Doug Shaw

From: Upper Trinity GCD <jill@uppertrinitygcd.com>
Sent: Monday, December 12, 2022 10:11 AM
To: Doug Shaw
Subject: Winter 2022 Newsletter

Winter 2022 Newsletter   View this email in your browser



latest **news**

Rainwater Harvesting Grants

events

December:

15th - Board Meeting
5pm, District Office, Springtown, TX
26th - Christmas (Observed)

January:

16th - Martin Luther King Day (Office Closed)
31st - Water Production Reports Due (Usage Jul. 1 -

The Upper Trinity Groundwater Conservation District is excited to announce a new annual rainwater harvesting grant program for eligible organizations in Montague, Wise, Parker, and Hood Counties.

UTGCD encourages entities within the district area to consider the addition of rainwater harvesting systems to structures and organizational buildings. Maintained systems significantly reduce groundwater usage, utility costs, erosion, and weathering of vegetative surfaces. The State of Texas publicly supports rainwater harvesting efforts while recognizing exemplary systems each year via the Texas Water Development Board. There is no cost to apply to the program, and funding may be awarded to multiple applicants within an application year. Up to 100% of funding is available to grantees, with multiple cost sharing options available as well. There is a requirement to submit, as part of the application package, a thorough plan and cost estimate for the proposed system. Sample plans/cost estimates are available, as examples, at uppertrinitygcd.com.

The grant application period opened on November 1st, 2022, and UTGCD will continue to accept applications through February 28th, 2023. To access application documents and resources on rainwater harvesting, visit uppertrinitygcd.com and navigate to the grant resource hub.

Eligible entities and organizations include the following:

- Cities

Dec. 31)

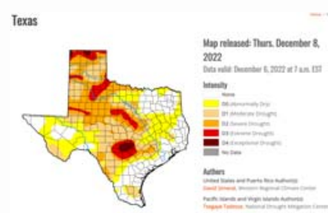
February:

20th - President's Day

Board Meetings are held at our District office at ***1859 W Hwy 199, Springtown, TX at 5:00pm****.*

They are open to the public and free to attend, and available virtually through Zoom. Check our meetings page on our website for login information.

drought **status**



Dec 8th, 2022

District Staff

Doug Shaw,
General Manager

Kyle Russell, G.I.T.
Assistant General

- Counties
- Independent School Districts
- Municipal Utility Districts, Special Utility Districts, etc.
- Emergency Service Districts
- Volunteer Fire Departments
- Non-profit organizations
- Other entities that provide public service consistent with the purposes of or that otherwise benefit the District.

For questions regarding the application process, application materials, and status updates, please contact Jill Garcia with the Upper Trinity GCD at 817-523-5200 or jill@uppertrinitygcd.com.

Water Supply Study Update

UTGCD recently commissioned an alternative water supply study, through the environmental engineering firm Freese and Nichols (FNI), to review water availability and possible long-term solutions for Parker and Wise Counties. FNI associates provided district Board Members with a progress update during the November meeting.

The study began with estimating population growth in the two counties through 2080. Currently, most people from both counties receive water from TRWD systems, however the second largest

Manager

Ann Devenney,
Office Manager

Jennifer Hachtel,
Data Coordinator

Laina Furlong,
Administrative Assistant

Leisha Manzanec,
Field Supervisor

Jacob Dove, G.I.T.
GIS Analyst

Jay Love, G.I.T.
Compliance Coordinator

Blaine Hicks, P.G.
Staff Geologist

Jill Garcia, P.G.
Education, Outreach, Grant Coordinator

Dawson Lowe,
Field Technician

Natalie Nava,
Field Technician

supply utilized, and much of the current growth, depend on groundwater. The projected total needs, in addition to supplies currently identified, for Parker and Wise in the year 2080 are 62 and 45 million gallons per day (MGD) respectively. The final task of the project is to identify strategies to meet the demands or collective strategies to offset future usage.

Several potentially feasible water management strategies have been identified, such as possible utilization of brackish groundwater, increased purchase of treated water from existing utility companies, the treatment of raw surface water from nearby reservoirs, along with ASR and precipitation collection technologies.

Additional updates will be made to UTGCD management as the report is finalized. Check back at uppertrinitygcd.com for report progress.

Sara Scoggins,
Field Technician

Water Quality Testing

Well owners should test their well water at least once a year. The District offers free water testing for E. coli and coliform bacteria. We also have a list of NELAP certified laboratories available if you are interested in other types of testing.

Call our office at **817-523-5200** for more information.

Protecting Your Rights

Registering your well is the most effective way to

UTGCD In Action

The district logging truck, complete with downhole camera and resistivity equipment, is available for registered district well owners. Staff recently assisted a landowner in Wise County to check the integrity of his well casing. Give our office a call for potential reservations.

protect your spacing rights.

Any well that was drilled prior to January 1st, 2009 was NOT automatically registered with the District. Registering your well allows the District to ensure that no new wells are drilled too close to yours, which could potentially have a negative impact on your water.

Registering your existing well is **FREE.**

Don't wait! Call our office at 817-523-5200 to find out more or head over to our website to fill out our Existing Well Application.

District Spacing Rules

Maximum Allowed Well Production	Minimum Tract Size	Spacing from Other Well Sites	Spacing from Property Line
The maximum amount of groundwater the well can actually produce as equipped in gallons per minute (gpm).	The minimum tract size that may be considered an appropriate site for a well.	The minimum distance, in feet, that a new well or proposed well site may be located from an existing registered or permitted well, existing unregistered well identified by the General Manager under Rule 4.3(b), or approved well site.	The minimum distance, in feet, that a new well or proposed well site may be located from the nearest property line of the tract of land on which it is to be located.
<17.36 gpm	Minimum Tract Size is 2 Acres	150 ft.	50 ft.
17.36 - 30 gpm		500 ft.	150 ft.
30 - 50 gpm		1,000 ft.	250 ft.
50 - 80 gpm		1,750 ft	500 ft.
80 – 100 gpm		2,500 ft.	750 ft.
>100 gpm		3,250 ft.	1,000 ft.

A copy of the District rules is always available at the District Office or at the website below: https://uppertrinitygcd.com/rules/.

District Staff Updates

UTGCD added new members to our Springtown office team in 2022, and are pleased to announce the arrival of Sara Scoggins, who will fill the role of field technician.

Sara was born in California where she earned a Bachelor of Science in Geology, followed by a Master of Science in Geological Sciences. During her thesis work she studied the East African Rift and spent time in a geochemistry research lab. Some fun facts about Sara are she has wanted to be a geologist since she was five years old, and in her spare time she practices freelance photography. Welcome to our team Sara!

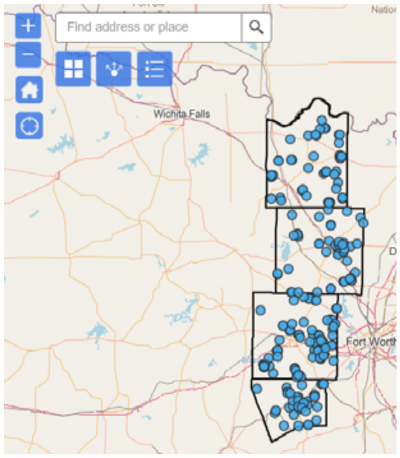
Director Richard English recently announced his resignation from the Upper Trinity Board of

Directors, effective October 20th, in order to take a position on the Brazos Regional Public Utility Agency Board of Directors. Director English was originally appointed to the District's Board of Directors in 2013 and served as the Board's Vice President since 2017.

Monitoring Well Program Updates

UTGCD continues to maintain our district wide monitoring network – and has added 51 new wells to the region in 2022. Water level data assists district staff in producing annual trend analysis reports of the health of various aquifer formations in North Texas.

To join the no-cost annual program, verify the registration status of your well, then click the link below to access the monitoring agreement. District staff visit sites four times a year - providing water level data to homeowners within our four counties. For additional questions and inquiries regarding the program, email the District geologist at blaine@uppertrinitygcd.com.



Water Production Report Dates & Reminders

Water Production Report Dates			
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Semi- Annual 1	July 31	January 1 - June 30	60+ days overdue: up to three times the amount of the water use fees

District Wells Update

View the number of well registrations within our four counties since January 1st, 2022. Below that are average water level trends in your county. Check your county's aquifer health and remind yourself that groundwater conservation is everyone's responsibility.

Number of Wells Drilled January - November 28, 2022					
	Hood	Parker	Wise	Montague	Totals
New	146	1230	476	192	2044
Existing	10	41	28	13	92
Non-Exempt	1	11	13	2	27
Exempt	155	1260	491	203	2109
County Totals	156	1271	504	205	2136

Education & Outreach Update

UTGCD is committed to enhancing public knowledge and awareness regarding groundwater resources in the Montague, Hood, Wise, and Parker counties. Staff regularly attend both community and school events to connect with citizens on subjects such as rainwater harvesting, native plant development, and sustainable community growth.

District staff hosted the first continuing education course for realtors and title agents at our Springtown office. Attendees participated in a four hour course that covered groundwater, wells and environmental management practices. Thank you to all who attended and look for more 2023 dates coming soon.

Save Money & Water this Winter

https://www.wcmessenger.com/articles/save-water-money-this-fall/

Texas finally welcomed fall temperatures and weather in the last few weeks, and with the change comes new opportunities for fall lawn maintenance and conservation.

UTGCD recommends the following ways to conserve natural resources and lower utility bills this autumn.

Now that the days are shortening, so is the sun's influence on outdoor plants and lawns. Bermuda, St. Augustine and Zoysia grasses need less watering and soaking episodes October through

February. Shortening your watering schedule will reduce monthly utility costs and increase the longevity of irrigation systems.

Now is the perfect time of year to inspect your irrigation system. Leaks can be costly if left unattended for weeks or months at a time, so consider investing in repair and maintenance of systems during the cooler weather.

As more leaves begin to appear on our community roads and sidewalks, remember to sweep and not soak. Brushing leaves to the curb or even on top of certain parts of your lawn, reduces water used to hose down driveways, and even acts as a moisture barrier for more sensitive grasses.

Letting grasses grow a little longer during this time of year keeps the plant's root systems healthy, as the length provides for more water capacity storage. So give your lawnmower a break, and keep your lawn healthy for the spring.

Are you designing a fall garden? Utilizing native and water conscious plants reduces maintenance time and resources, and Texas is home to a vast collection of beautiful and easy to manage grasses, perennial, and succulent varieties. Check out your local nursery or garden center for recommendations from seasoned experts.

Finally, consider installation of a rainwater harvesting system at your home or place of business. Even an inch of rainfall can generate hundreds of gallons, and ultraviolet filtration can provide potable water for a family or garden.

The Upper Trinity Groundwater Conservation District is proud to announce in October the beginning of an annual rainwater harvesting grant program for eligible groups, with the application period beginning in November. Consider a harvesting system and check your group's eligibility today.

All these tips and more will save money, time, and resources as the leaves begin to change and Texas finally receives autumn colors and temperatures.

Keep up to date by following us on social media!

Our mailing address is:
|P.O. Box 1749 Springtown, TX 76082|
Our physical address is:
|1859 W. Hwy 199 Springtown, TX 76082|

Groundwater Monitoring Program

G.1 Objective - Within 3 years of Groundwater Management Plan adoption develop a Groundwater Monitoring Program within the District.

G.1 Performance Standard - Upon development, attachment of the District Groundwater Monitoring Program to the District's Annual Report to be given to the District's Board of Directors.

G.2 Objective - Upon approval of the District Monitoring Program – conduct water level measurements at least annually on groundwater resources within the District.

G.2 Performance Standard - Annual evaluation of water-level trends and the adequacy of the monitoring network to monitor aquifer conditions within the District and comply with the aquifer resources desired future conditions. The evaluation will be included in the District's Annual Report to be given to the District's Board of Directors. The District may also take into consideration any measurements made by the TWDB groundwater measurement team.

G.3 Objective - Monitor non-exempt pumping within the District for use in evaluating District compliance with aquifer desired future conditions.

G.3 Performance Standard - Annual reporting of groundwater used by nonexempt wells will be included in the Annual Report provided to the District's Board of Directors.

G.1 & G.2:

A brief history of the monitoring program is presented here followed by a description of activities conducted in 2022.

In 2010, the District developed and instituted a Groundwater Monitoring Program in compliance with Objective and Performance Standard F.1. Phase I of the program secured 108 monitor wells within the District where water levels are measured quarterly using the Steel Tape Method, the Air Line Method, and/or the Electrical Line Method in compliance with Objective F.2. District staff was trained by personnel from the Texas Water Development Board on correct procedures for measurement of water levels. Participating well owners volunteered their wells to allow District staff to take water-level measurements. The District actively pursued additional monitoring wells to improve our ability to monitor groundwater conditions, comply with GMA-8 requirements, and meet the mission of the District as a whole. All activities regarding the District Groundwater Monitoring Program were presented for review and consent to the District Board.

A review of the Phase I Monitor Well System of wells indicated that gaps existed in the monitoring well network both spatially and vertically within the Trinity Aquifer and the Paleozoic aquifers (Cross Timbers). In response, the District contracted with INTERA Inc. to augment the monitor well network in a Phase II process. In 2011, the consultant completed a draft report that documented the hydrogeologic framework for the aquifers within the District with emphasis on the Paleozoic aquifers and also developed the strategy for assessing the Phase I monitoring well network and selecting the Phase II wells to meet the performance objectives and mission of the District. The monitoring strategy was focused to develop the data required to evaluate aquifer conditions within the boundaries of the District relative to the Trinity Aquifer DFCs and for potential future Cross Timbers aquifers DFC. This report is included as Appendix 2.

Based upon the data analysis presented in the Phase II report, 65 wells of the original 108 Phase I wells were suggested for retention in the network. An additional 120 optimally located wells were targeted for inclusion in the monitoring network. During 2013, District Staff and INTERA focused on securing agreements with owners of the identified wells. However, the process of acquiring new wells at optimal locations proved more difficult than anticipated and, as a result, progress was slower than originally expected. As of the end of December 2013, 24 new wells had been added to the monitoring network as part of the Phase II efforts.

In 2015, District staff conducted an internal assessment of the program which resulted in several wells being removed from the program due to new owners electing not to participate in the monitoring program, changes in well configuration resulting in an inability to access the well, and well collapse. Many of the wells removed from the program had not been actively monitored for several years yet had been included in the trend analysis presented to the Board in previous annual reports. Figure A below shows all wells in which the District, at some point, has collected water level data.

In the spring of 2015, the District purchased and installed the first 14 pressure transducers, which have been recording daily water level readings since that time. A few of these transducers have been strategically relocated, and two had to be removed for a short period of time due to malfunctioning equipment, both cases have been resolved by sending the device back to the manufacturer for repair.

In the last few years, the District has installed pressure transducers in several other wells and equipped seven wells with well sounders. In 2018, the District also drilled two monitoring wells which are located at the District office site. Those wells are equipped with pressure transducers which take water level readings every 15 minutes and are connected to the TWDB's TexMesonet, data from those wells can be found at https://texmesonet.org. In 2020 the District drilled five monitoring wells, four in Parker County and one in Montague County. Each of these wells are equipped with pressure transducers. A total of 33 new monitoring wells were added to the program in 2022, making the total number of active monitoring wells now at 241. Locations and associated aquifers for all wells equipped with constant monitoring devices (transducers/sounders) can be seen in Figure B. District staff visits these locations to download data on a quarterly basis. In early 2023 the District drilled a Cross Timbers monitoring well in Parker County. This was an exploratory well that yielded less than 0.5 gallons per minute, was highly saline, contained volatiles, and had artesian pressure of unknown origins. As of now, the District plans to have the well plugged due to environmental concerns. Moving forward, it is likely in the best interest of the District to continue to identify the best candidate wells for transducers to bolster the monitoring program.

In the spring of 2018, the District had INTERA begin the development of a web based water level trend analysis/DFC tracking tool to be used to streamline the process of analyzing the District's water level data and to help minimize human error in that process. This tool was used to analyze the water level data collected from the wells in the District monitoring well program in order to provide insight into long-term water-level changes in the District.

Table 1 summarizes the average water-level changes obtained from the trend analysis, by county and aquifer (outcrop and subcrop). Appendix 1, attached to this report, includes a summary report for each aquifer/county/outcrop-subcrop split with greater detail, including the Well ID and the number of wells used in the analysis. The results in Table 1 represent water level changes over a defined time period for each of the defined aquifer units (outcrop and subcrop) in each of the 4 counties.

Table 1. Average Trend of Water-Level Changes since 2010.

		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**	-0.4	-	-	-	-1.5	-	-	-	-	-17.7
	Wise	-3.5	-	-	-	28.3	-2.5	-	-	-	-
	Parker	2.5	-2.1	-2.4	-0.9	-5.5	-	-	-	5.5	-
	Hood	-	-	1.7	0.7	-	-	-	-	1.0	-
5-Year Water Level Change	**Montague**	1.6	-	-	-	2.7	-	-	-	-	6.4
	Wise	-0.7	-	-	-	-	8.1	-	-	-	-
	Parker	1.7	-2.9	-2.2	11.4	-19.1	-	-	-	-5.7	-
	Hood	-	-	-4.1	-2.6	-	-	-	-	5.0	-
Cumulative Water Level Change (2010 to Present)	**Montague**	4.8	-	-	-	15.3	-	-	-	-	11.2
	Wise	0.6	-	-	-	33.6	8.4	-	-	-	-
	Parker	-2.2	-8.9	-0.8	-2.5	-18.7	-	-	-	-11.1	-
	Hood	-	-	6.7	-1.4	-	-	-	-	6.1	-
DFCs vs Cumulative Change	**Montague**	44.8	-	-	-	-	-	-	-	-	-
	Wise	60.6	-	-	-	-	162.4	-	-	-	-
	Parker	39.8	-2.9	19.2	4.5	-	-	-	-	56.9	-
	Hood	-	-	15.7	11.6	-	-	-	-	78.1	-

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

In the table above

- Desired Future Condition is the current adopted DFC for each of the defined formations. Remember the DFC requires no more than a certain level of water level decline (values in the table), from 2010 water levels, by 2080.
- 1-year water level change represents the change in water levels from the 2021 “aquifer year” to the 2022 “aquifer year”.
- 5-year water level change represents the change in water levels from the 2017 “aquifer year” to the 2022 “aquifer year”
- Cumulative water level change (2010 to present) represents the change in water levels from the 2010 “aquifer year” to the 2022 “aquifer year”.
- DFC vs. Cumulative change is simply a comparison of the cumulative water level change to the DFC

One of the key reasons the District monitors water levels is to track compliance with adopted desired future conditions (DFCs). The current DFCs are shown in Table 1 and describe water-level changes between 2010 and 2080. Since water level changes before water year 2010 do not apply to DFC compliance, they are removed from the analysis.

During collection of water levels, District staff note if the water level measurement was taken while the well is pumping or has recently been pumping. Water levels taken during pumping can be valuable for characterizing aquifer properties but are not appropriate for evaluating water level trends. These measurements are removed from this analysis, but they are maintained in the District's water level database.

Water levels in wells commonly fluctuate throughout a year, which can be due to changes in demands on the aquifer, changes in rainfall, or a combination of these and other factors. Typically, water levels are lower during summer months when demands are highest. The levels then recover between late fall and early spring when demands are lower. In order to ensure that water level measurements can be reasonably compared to each other, the data used in the analysis is limited to measurements taken between October and April. Each measurement is then assigned to a "water year" (WY). For example, water level measurements between October 2010 and April 2011 are assigned as WY 2010.

Although all wells in the District's monitoring program are measured multiple times per year, or continuously monitored with a transducer or other device, this analysis uses the shallowest measurement in each well in each water year (as defined above) to develop water level trends. This ensures that water levels compared across years are as analogous as possible.

The result of this process is a set of single water level measurements for each water year in each well. Where water level measurements are available for two consecutive water years, the water level change is calculated. For example, a calculated water level change for WY 2011 requires a water level measurement for the well in both WY 2010 and WY 2011.

District staff maintains aquifer assignments for each well in the monitoring program as well as whether the well represents outcrop/unconfined conditions or subcrop/confined conditions. Using these assignments, the average water level change associated with each DFC is calculated. Based on the current DFCs, the water level trends are divided by county, aquifer and outcrop/subcrop designation. One feature of this approach is that a different set of wells may be used to characterize water level changes for each year depending on availability of water level measurements. This allows for the District to make use of data from new wells added to the monitoring program or historical data for wells no longer monitored.

Currently, District staff continue to review all well registration applications to evaluate the potential for addition of that well to the monitoring well program. The District is incrementally expanding and improving the monitoring network to characterize groundwater conditions more effectively throughout the District. The District has also been actively working with landowners and developers in the District to acquire sites to drill monitoring well.

G.3:

In 2015, the District staff reviewed the best available information to develop estimated exempt groundwater use volumes by county. These estimates were presented to the District's Board of Directors in the 2015 Annual Report and were also provided to the Texas Water Development Board (TWDB). The TWDB then took those estimates and developed projections for exempt groundwater use for the years 2020, 2030, 2040, 2050, 2060 & 2070. In developing this data for the TWDB, District staff was asked to estimate exempt use for both the Trinity Aquifer group and the Paleozoic formations; only estimates for the Trinity Group were reported in the 2015 Annual Report.

For the 2022 exempt use estimates, staff took the TWDB estimate for 2015 and projection for 2020, and used a linear function to calculate estimated 2022 groundwater use by county. Also, it is noteworthy to mention that staff has included estimated exempt use from the Paleozoic formations in this report, as mentioned earlier only estimates from the Trinity Group were used in the 2015 report.

Non-exempt use was also estimated at the same time, this is largely based on metered volumes reported to the District by non-exempt well owners. Table 6 provides a best estimate of exempt and non-exempt groundwater use for the District in 2022 utilizing data from the following sources:

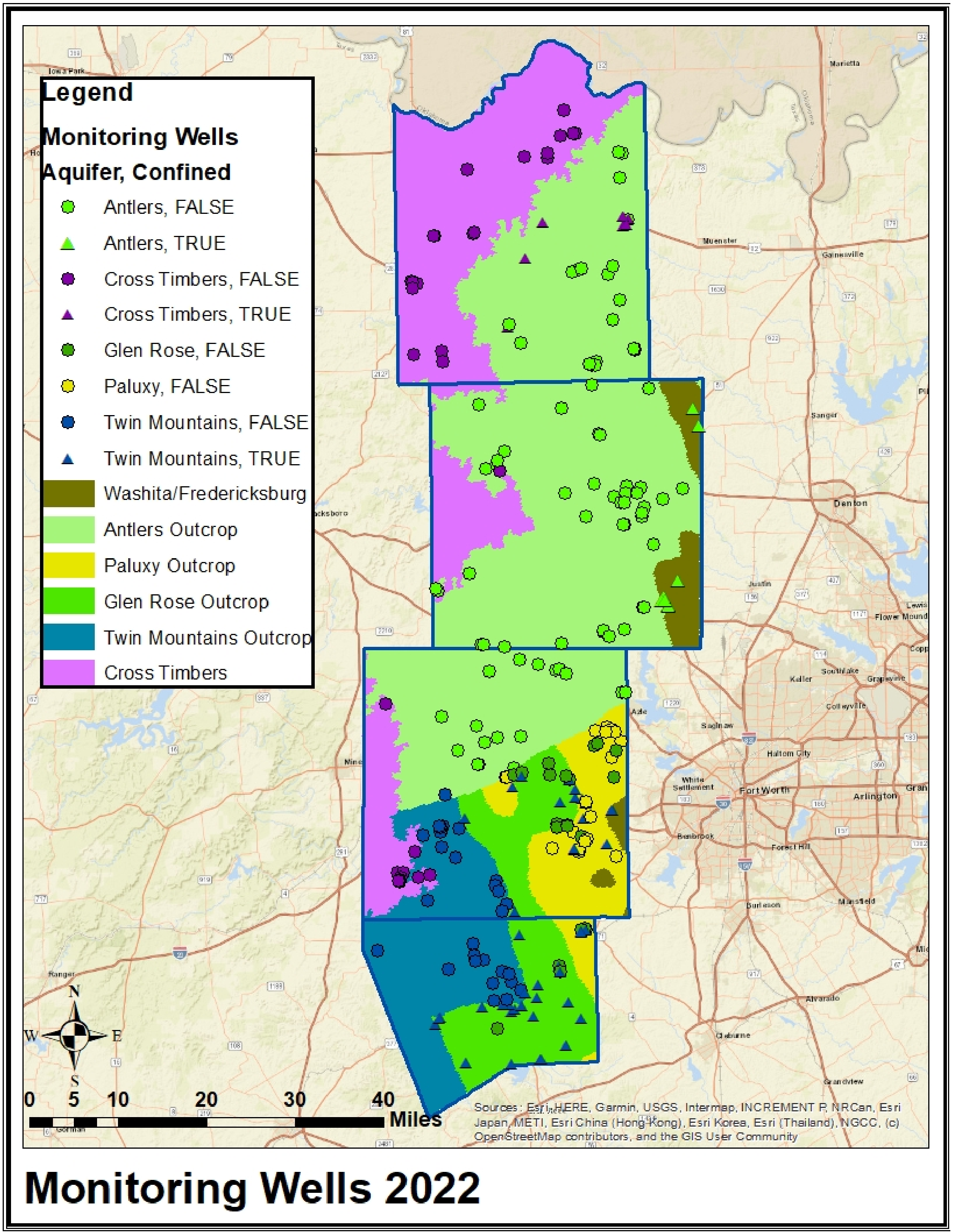
- The Region B, C, and G 2011, 2016, and 2021 Regional Water Plans;
- The report developed under contract to the TWDB titled "Total Projected Water Use in the Texas Mining and Oil and Gas Industry;
- Exempt pumping estimates from the TWDB
- Water Use Survey data from the TWDB
- Metered data reported to the District.

Table 2. Estimated Exempt and Non-exempt Groundwater Use for the District by County

Category	Groundwater Use (AFY)[1]				
	Hood	Montague	Parker	Wise	Total
Exempt Use	6,661	347	5,705	5,056	**17,769**
Non-Exempt Use	4,967	381	4,736	3,646	**13,731**
Total	**11,628**	**728**	**10,441**	**8,702**	**31,500**

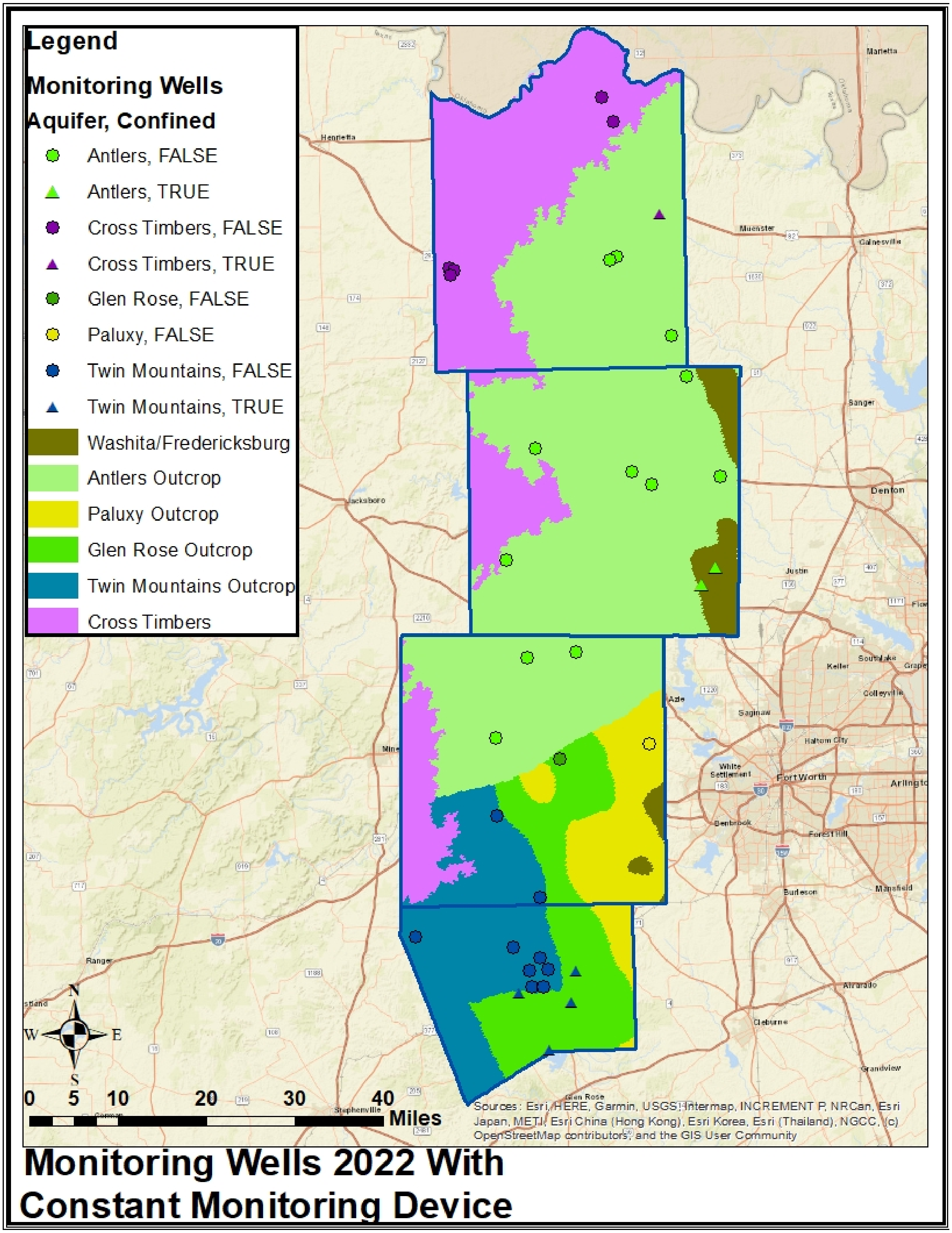
[1] AFY = acre-feet per year

Figure A. All wells in the District with Water Level Data



Monitoring Wells 2022

Figure B. **Wells in the District's Monitoring Well Network Equipped with A Constant Monitoring Device**



APPENDIX 1

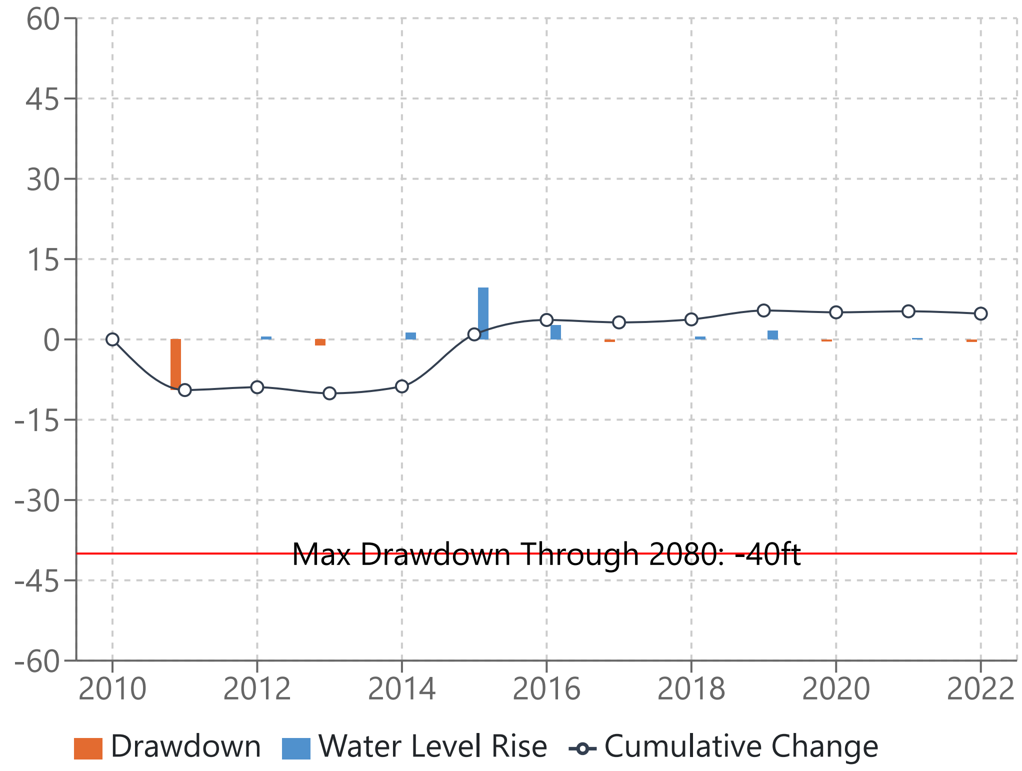
Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

	County	Outcrop Antlers	Outcrop Paluxy	Outcrop Glen Rose	Outcrop Twin Mountains	Outcrop Cross Timbers	Subcrop Antlers	Subcrop Paluxy	Subcrop Glen Rose	Subcrop Twin Mountains	Subcrop 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**	-0.4	-	-	-	-1.5	-	-	-	-	-17.7
	Wise	-3.5	-	-	-	28.3	-2.5	-	-	-	-
	Parker	2.5	-2.1	-2.4	-0.9	-5.5	-	-	-	5.5	-
	Hood	-	-	1.7	0.7	-	-	-	-	1.0	-
5-Year Water Level Change	**Montague**	1.6	-	-	-	2.7	-	-	-	-	6.4
	Wise	-0.7	-	-	-	-	8.1	-	-	-	-
	Parker	1.7	-2.9	-2.2	11.4	-19.1	-	-	-	-5.7	-
	Hood	-	-	-4.1	-2.6	-	-	-	-	5.0	-
Cumulative Water Level Change (2010 to Present)	**Montague**	4.8	-	-	-	15.3	-	-	-	-	11.2
	Wise	0.6	-	-	-	33.6	8.4	-	-	-	-
	Parker	-2.2	-8.9	-0.8	-2.5	-18.7	-	-	-	-11.1	-
	Hood	-	-	6.7	-1.4	-	-	-	-	6.1	-
DFCs vs Cumulative Change	**Montague**	44.8	-	-	-	-	-	-	-	-	-
	Wise	60.6	-	-	-	-	162.4	-	-	-	-
	Parker	39.8	-2.9	19.2	4.5	-	-	-	-	56.9	-
	Hood	-	-	15.7	11.6	-	-	-	-	78.1	-

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Montague County-Antlers-Outcrop

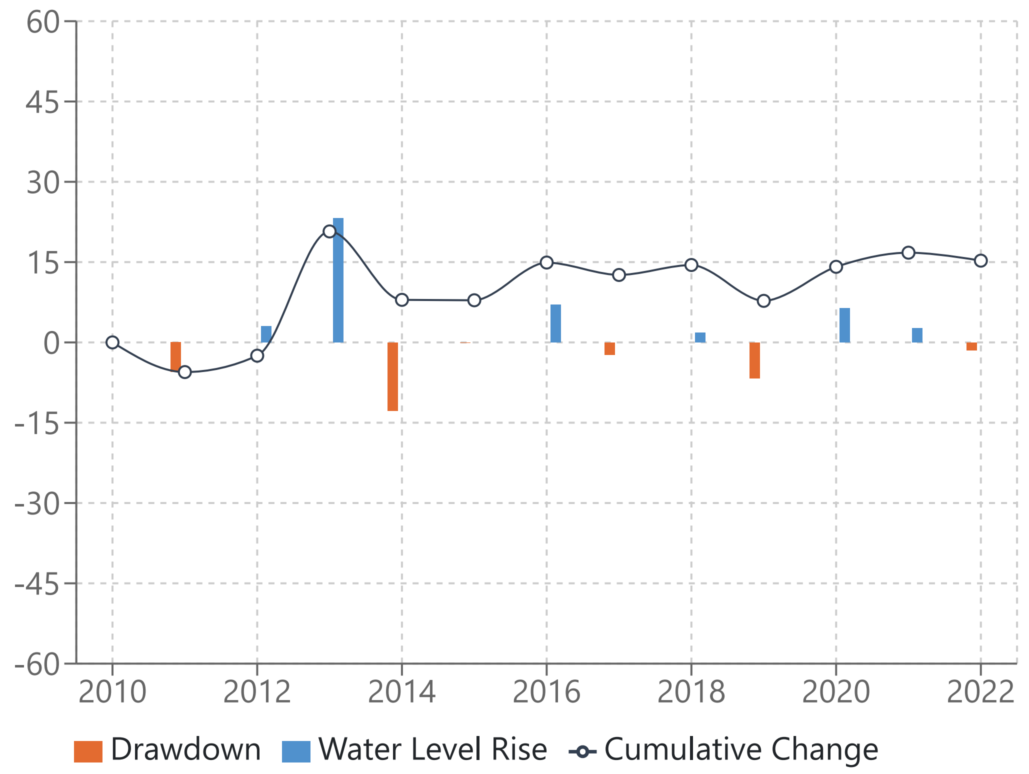


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-40	Not Applicable	Not Applicable
1-Year Water Level Change	-0.4	20	9505, 8890, 4107, 632, 4402, 1497, 1495, 1410, 8882, 1500, 304, 2813, 2899, 2898, 196, 2096, 200, 2097, 2897, 4062
5-Year Water Level Change	1.6	21	9505, 8890, 4107, 632, 4402, 1497, 1495, 1410, 8882, 1500, 1501, 304, 2813, 2899, 2898, 196, 2096, 200, 2097, 2897, 4062
Cumulative Water Level Change (2010 to Present)	4.8	21	1497, 1495, 1500, 1501, 304, 196, 2096, 200, 2097, 632, 8882, 8890, 1410, 2813, 2898, 2897, 4062, 4107, 9505, 4402, 2899
DFCs vs Cumulative Change	44.8	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Montague County-Cross Timbers-Outcrop

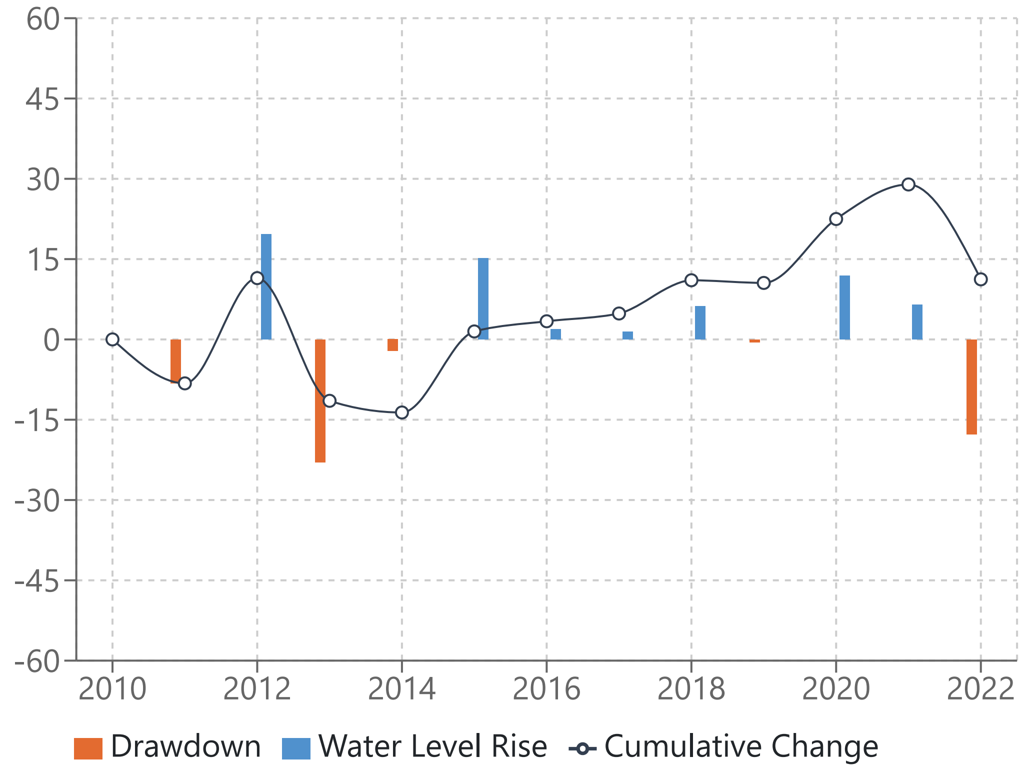


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	-1.5	20	13293, 8881, 2728, 592, 593, 1295, 1296, 2413, 1016, 1015, 6207, 6208, 8866, 2196, 6604, 2608, 6605, 5199, 6433, 14174
5-Year Water Level Change	2.7	21	8881, 2728, 1298, 592, 593, 1295, 1296, 8866, 2196, 6604, 2608, 6605, 5199, 6433, 1016, 1015, 6208, 2413, 13293, 14174, 6207
Cumulative Water Level Change (2010 to Present)	15.3	21	1298, 1295, 1296, 2413, 8866, 2608, 8881, 592, 2728, 6604, 6605, 5199, 6433, 593, 2196, 1016, 1015, 6208, 13293, 14174, 6207
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Montague County-Cross Timbers-Subcrop

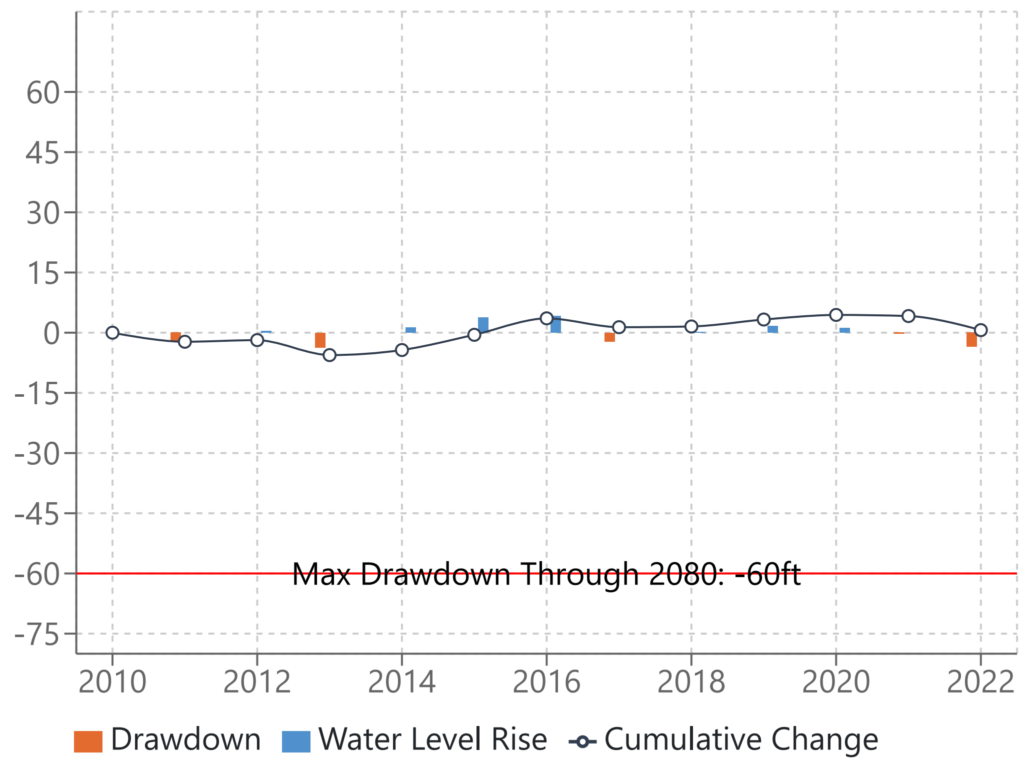


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	-17.7	7	3970, 666, 637, 638, 636, 633, 4401
5-Year Water Level Change	6.4	9	3970, 666, 637, 638, 636, 633, 635, 634, 4401
Cumulative Water Level Change (2010 to Present)	11.2	9	637, 638, 635, 634, 636, 633, 3970, 666, 4401
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Wise County-Antlers-Outcrop

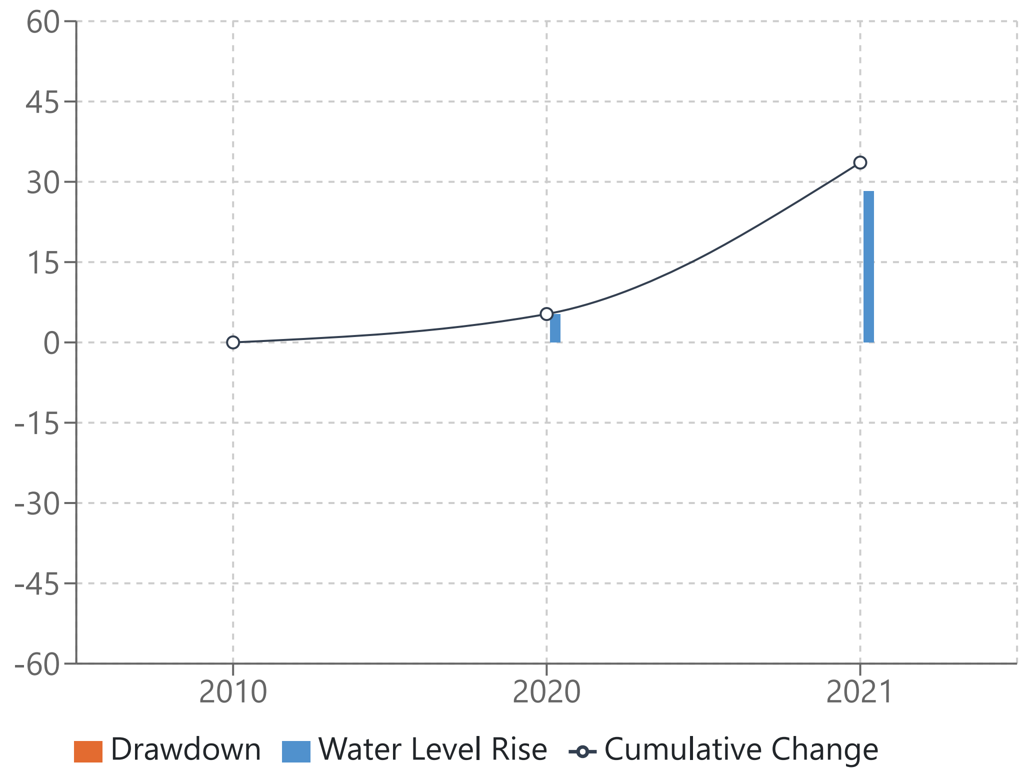


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-60	Not Applicable	Not Applicable
1-Year Water Level Change	-3.5	38	8883, 4344, 4404, 1830, 8863, 1075, 13061, 13062, 3308, 1106, 1114, 7010, 7011, 11238, 1102, 10320, 1108, 1115, 3055, 3056, 1128, 10319, 10321, 10425, 1759, 1138, 14157, 13001, 13000, 8887, 9095, 13745, 14348, 3841, 1010, 11628, 11629, 1011
5-Year Water Level Change	-0.7	40	8883, 4344, 4404, 8863, 1076, 1075, 3308, 1106, 1114, 7010, 7011, 1102, 1108, 1115, 3055, 3056, 1128, 1759, 1138, 8887, 3841, 1010, 10425, 1011, 10320, 10318, 11628, 11629, 10319, 10321, 9095, 13745, 13061, 13062, 14157, 13001, 13000, 14348, 1830, 11238
Cumulative Water Level Change (2010 to Present)	0.6	40	8863, 1076, 1075, 8887, 1010, 1011, 8883, 4344, 4404, 3055, 3056, 1759, 7010, 7011, 3308, 1106, 1114, 1102, 1108, 1115, 1128, 1138, 3841, 10425, 10320, 10318, 11628, 11629, 10319, 10321, 9095, 13745, 13061, 13062, 14157, 13001, 13000, 14348, 1830, 11238
DFCs vs Cumulative Change	60.6	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Wise County-Cross Timbers-Outcrop

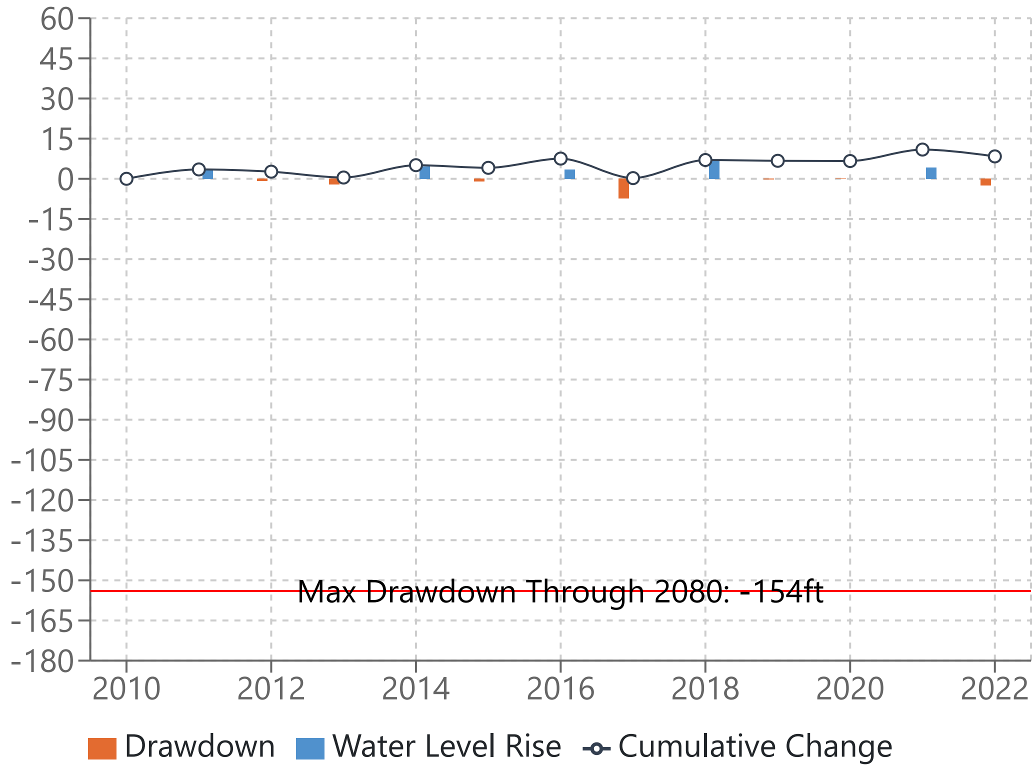


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	28.3	1	1325
5-Year Water Level Change		Not Avaliable	Not Avaliable
Cumulative Water Level Change (2010 to Present)	33.6	1	1325
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Wise County-Antlers-Subcrop

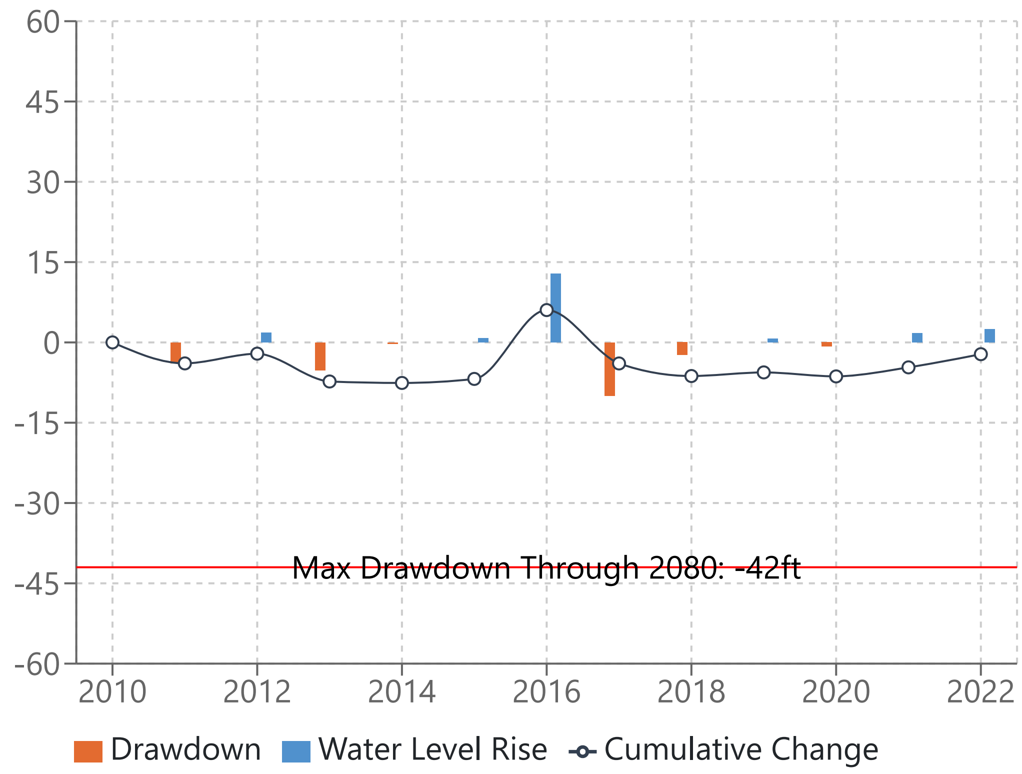


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-154	Not Applicable	Not Applicable
1-Year Water Level Change	-2.5	6	8884, 8888, 11290, 11110, 11164, 14118
5-Year Water Level Change	8.1	6	8884, 8888, 11110, 11290, 11164, 14118
Cumulative Water Level Change (2010 to Present)	8.4	6	8884, 8888, 11110, 11290, 11164, 14118
DFCs vs Cumulative Change	162.4	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Parker County-Antlers-Outcrop

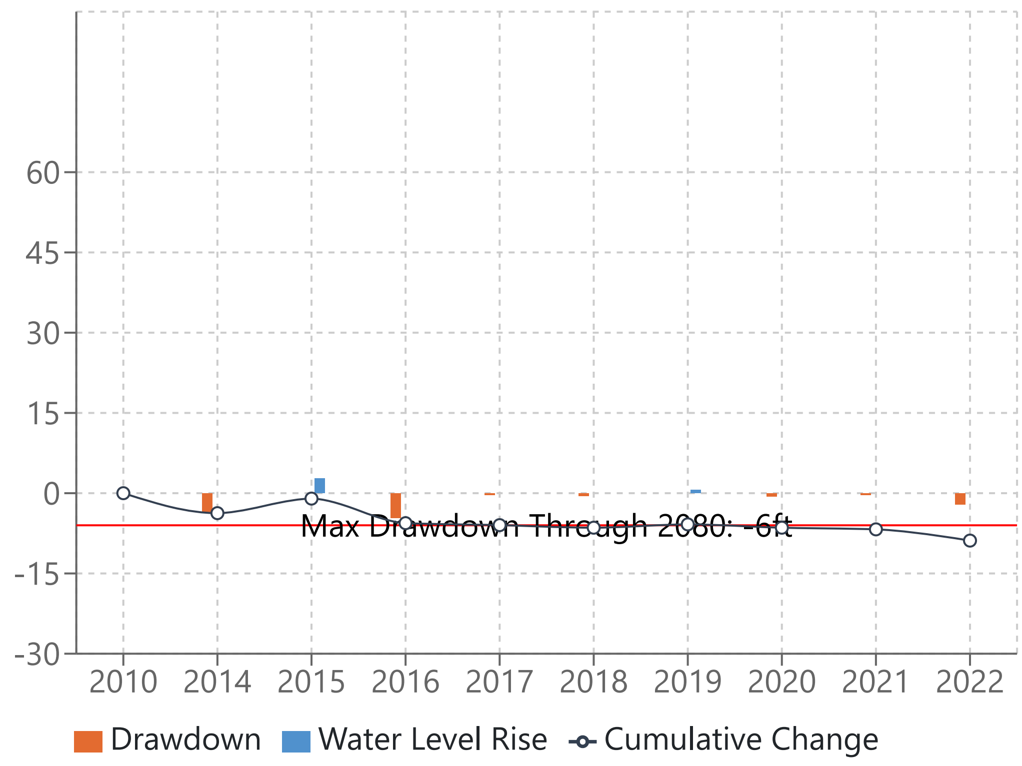


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-42	Not Applicable	Not Applicable
1-Year Water Level Change	2.5	13	12929, 8872, 8864, 10884, 10885, 1809, 630, 2200, 14135, 14134, 996, 975, 565
5-Year Water Level Change	1.7	14	8872, 8864, 1809, 630, 2200, 985, 996, 975, 10884, 10885, 565, 12929, 14135, 14134
Cumulative Water Level Change (2010 to Present)	-2.2	14	8872, 8864, 985, 996, 975, 1809, 630, 2200, 10884, 10885, 565, 12929, 14135, 14134
DFCs vs Cumulative Change	39.8	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Parker County-Paluxy-Outcrop

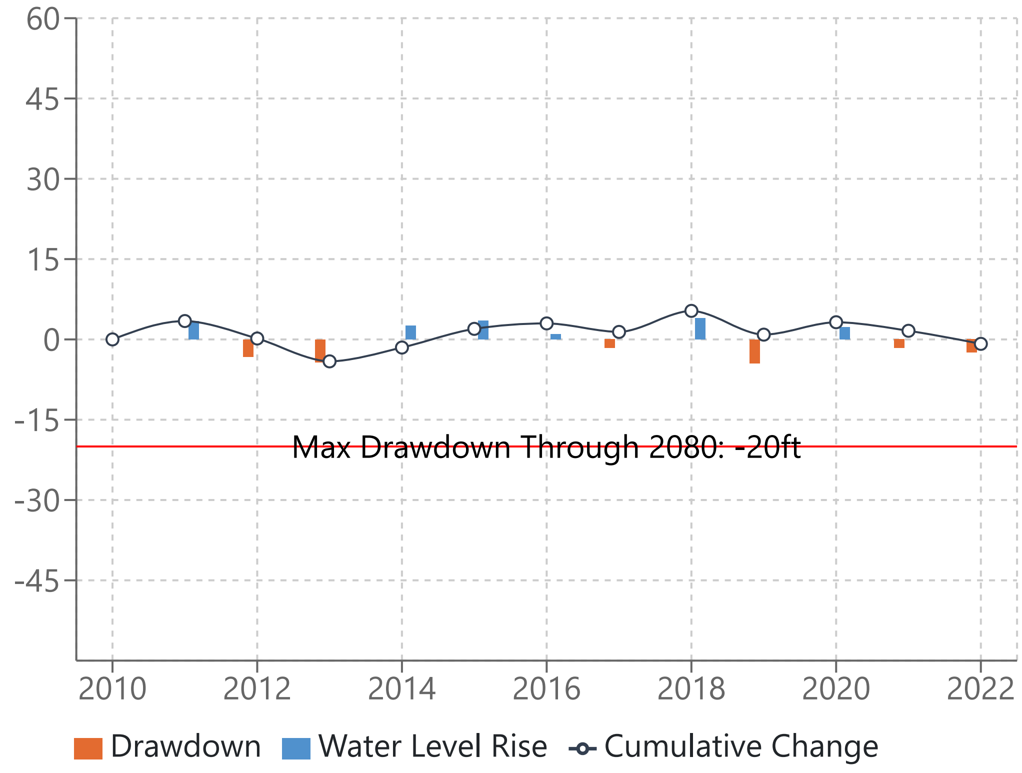


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-6	Not Applicable	Not Applicable
1-Year Water Level Change	-2.1	14	5212, 6638, 8718, 6178, 10740, 8568, 2596, 12075, 12144, 8459, 4993, 11483, 4365, 12994
5-Year Water Level Change	-2.9	15	5212, 6638, 8718, 6178, 8568, 2596, 1653, 4993, 4365, 10740, 12075, 12144, 11483, 8459, 12994
Cumulative Water Level Change (2010 to Present)	-8.9	15	4365, 5212, 6638, 1653, 6178, 4993, 8718, 8568, 2596, 10740, 12075, 12144, 11483, 8459, 12994
DFCs vs Cumulative Change	-2.9	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Parker County-Glen Rose-Outcrop

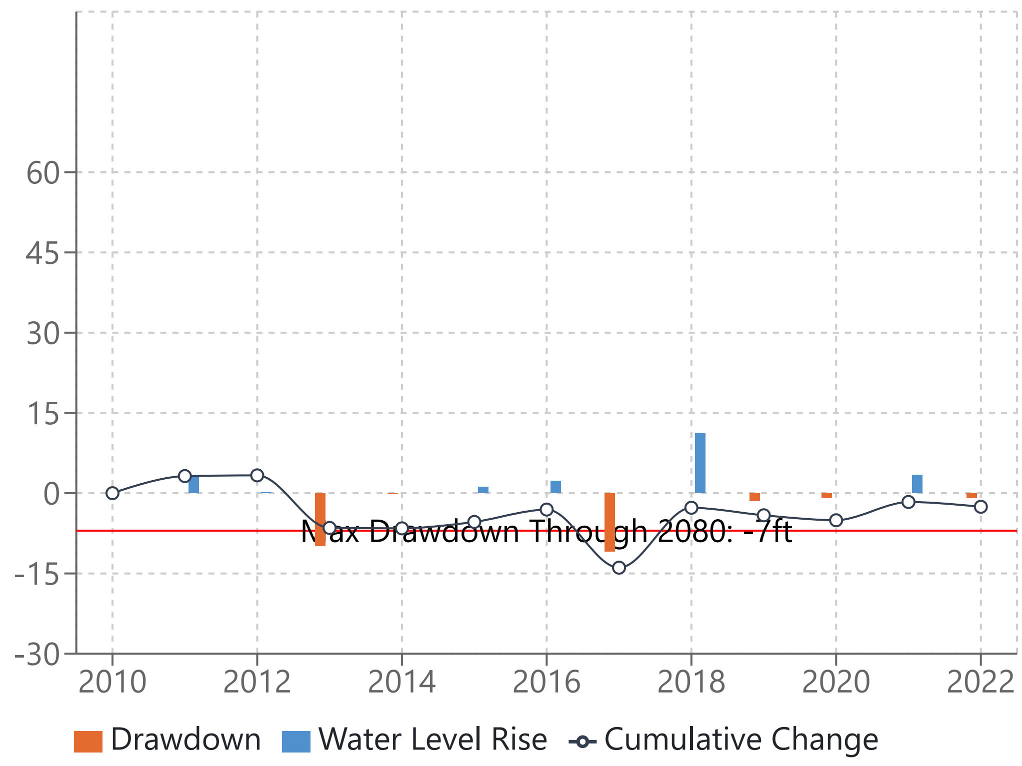


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-20	Not Applicable	Not Applicable
1-Year Water Level Change	-2.4	8	995, 8874, 8875, 8876, 8878, 8889, 9106, 11881
5-Year Water Level Change	-2.2	9	8873, 995, 8874, 8875, 8876, 8878, 8889, 9106, 11881
Cumulative Water Level Change (2010 to Present)	-0.8	9	8873, 995, 8874, 8875, 8876, 8878, 8889, 9106, 11881
DFCs vs Cumulative Change	19.2	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Parker County-Twin Mountains-Outcrop

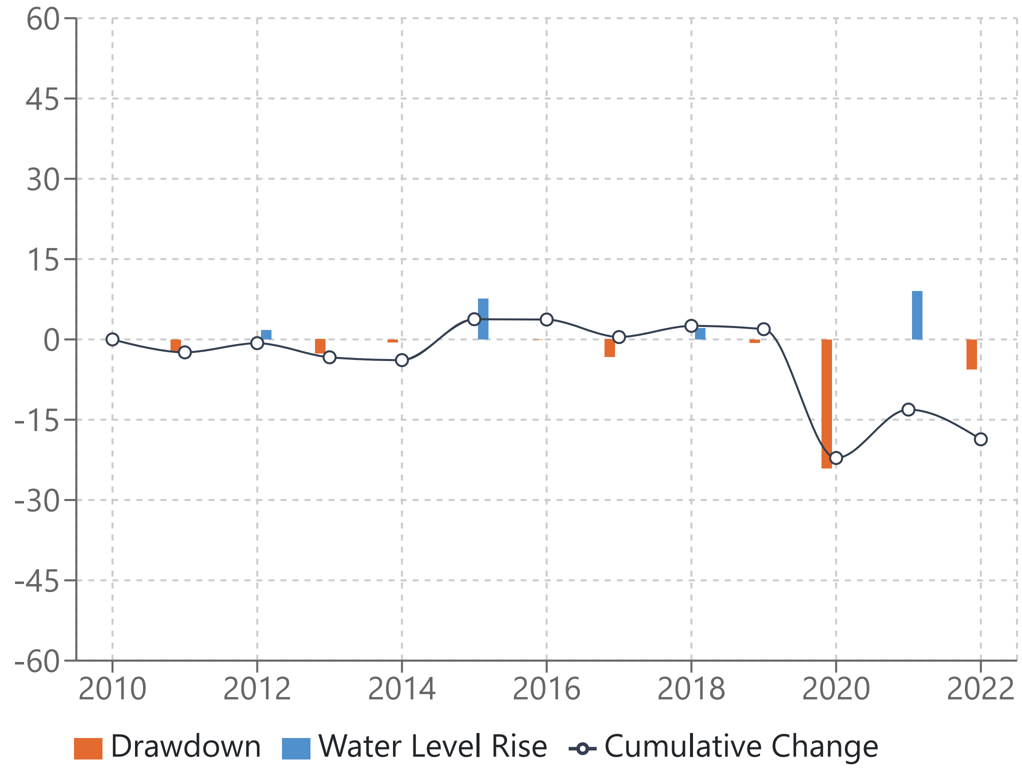


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-7	Not Applicable	Not Applicable
1-Year Water Level Change	-0.9	14	4911, 2484, 15588, 17061, 7800, 2376, 6851, 7408, 8880, 15284, 15283, 13295, 13294, 1774
5-Year Water Level Change	11.4	16	2484, 8880, 978, 979, 1774, 4911, 13295, 13294, 15283, 15588, 17061, 7800, 2376, 6851, 7408, 15284
Cumulative Water Level Change (2010 to Present)	-2.5	16	8880, 978, 979, 1774, 2484, 4911, 13295, 13294, 15283, 15588, 17061, 7800, 2376, 6851, 7408, 15284
DFCs vs Cumulative Change	4.5	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Parker County-Cross Timbers-Outcrop

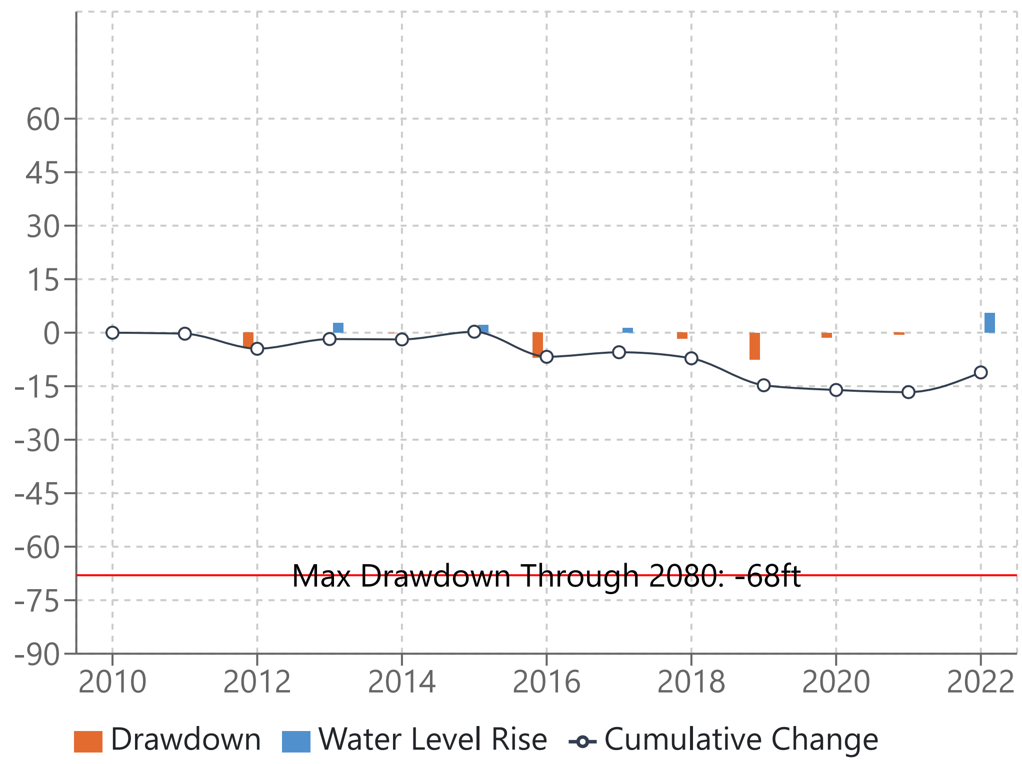


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	-5.5	9	12621, 4416, 8877, 12682, 517, 14615, 15285, 16153, 15282
5-Year Water Level Change	-19.1	9	4416, 8877, 12621, 12682, 517, 14615, 15285, 16153, 15282
Cumulative Water Level Change (2010 to Present)	-18.7	9	8877, 4416, 12621, 12682, 517, 14615, 15285, 16153, 15282
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Parker County-Twin Mountains-Subcrop

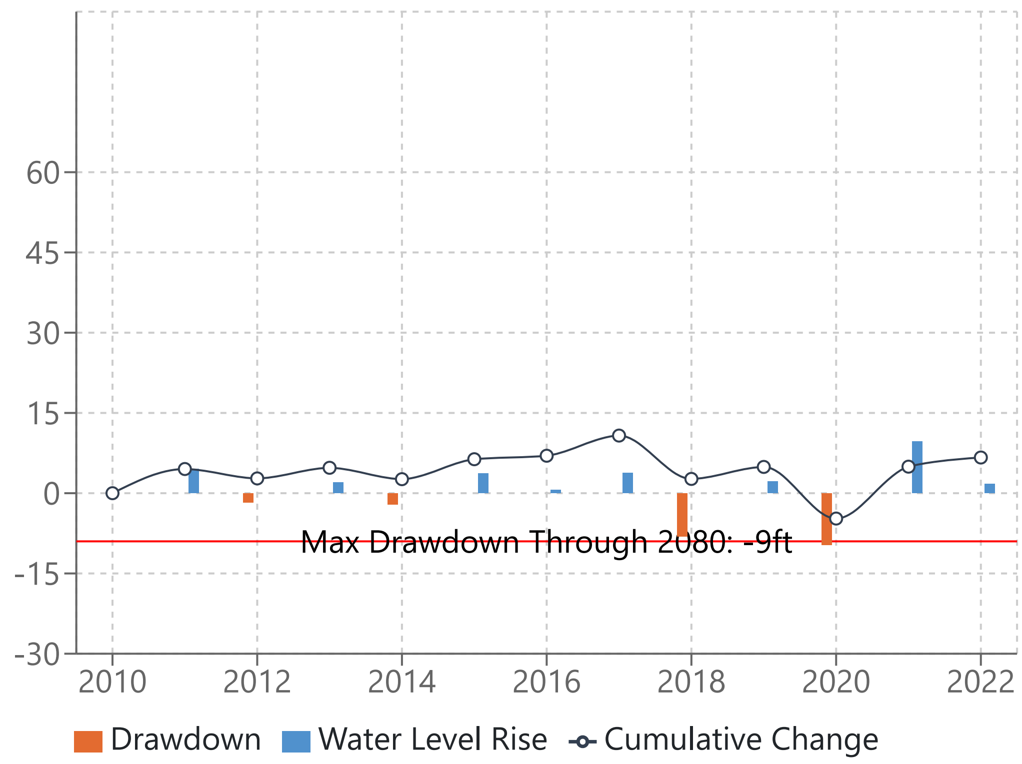


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-68	Not Applicable	Not Applicable
1-Year Water Level Change	5.5	10	6534, 11387, 11386, 8879, 4142, 11986, 12111, 10350, 12241, 11323
5-Year Water Level Change	-5.7	11	6534, 8879, 4144, 4142, 10350, 12241, 11323, 11386, 11387, 11986, 12111
Cumulative Water Level Change (2010 to Present)	-11.1	11	6534, 8879, 4144, 4142, 10350, 12241, 11323, 11386, 11387, 11986, 12111
DFCs vs Cumulative Change	56.9	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Hood County-Glen Rose-Outcrop

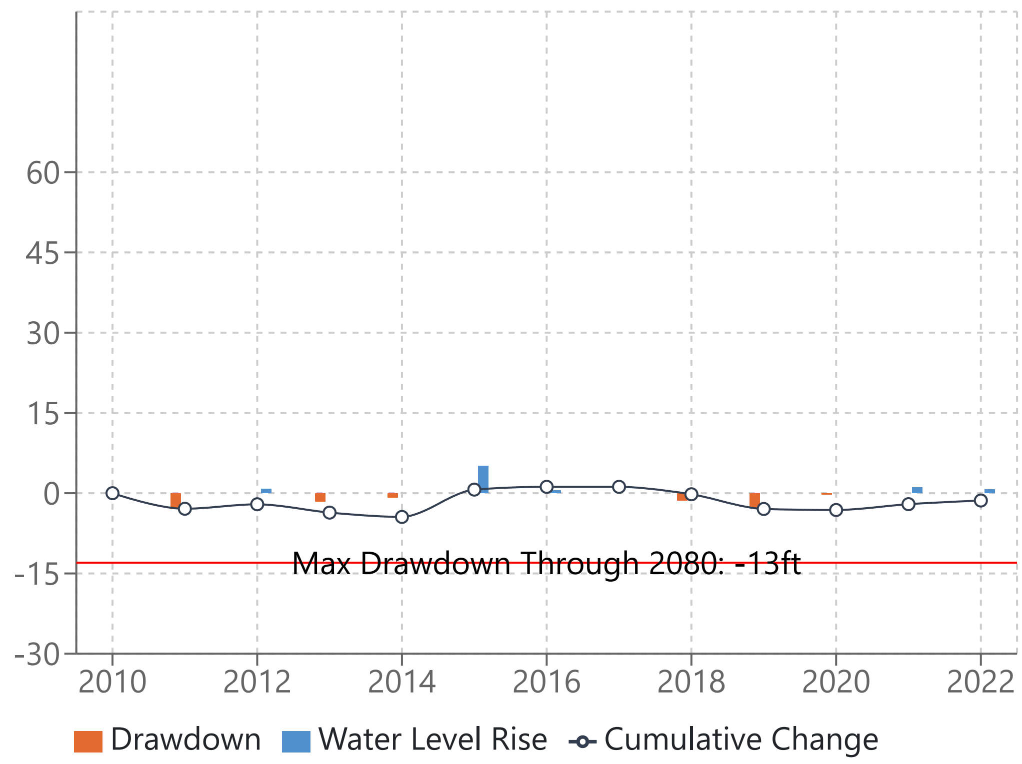


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-9	Not Applicable	Not Applicable
1-Year Water Level Change	1.7	5	311, 310, 8870, 10, 3
5-Year Water Level Change	-4.1	6	311, 312, 310, 8870, 10, 3
Cumulative Water Level Change (2010 to Present)	6.7	6	311, 312, 8870, 10, 310, 3
DFCs vs Cumulative Change	15.7	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Hood County-Twin Mountains-Outcrop

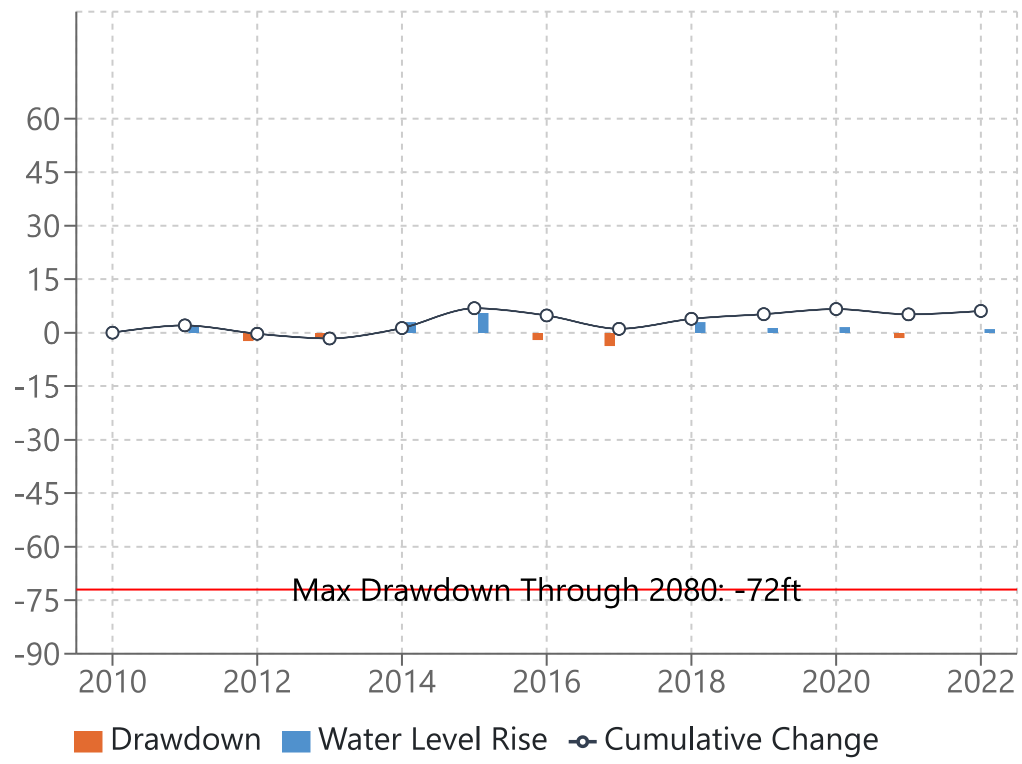


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-13	Not Applicable	Not Applicable
1-Year Water Level Change	0.7	11	8868, 1009, 8867, 1085, 705, 710, 701, 711, 8869, 2181, 990
5-Year Water Level Change	-2.6	12	8868, 1009, 8867, 8869, 2181, 990, 711, 981, 1085, 705, 710, 701
Cumulative Water Level Change (2010 to Present)	-1.4	12	8868, 1009, 8867, 8869, 981, 990, 2181, 711, 1085, 705, 710, 701
DFCs vs Cumulative Change	11.6	Not Applicable	Not Applicable

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

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 11, 2023

Hood County-Twin Mountains-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-72	Not Applicable	Not Applicable
1-Year Water Level Change	1.0	18	581, 324, 325, 322, 239, 243, 1002, 738, 999, 984, 8865, 11534, 4, 7100, 9438, 8871, 2341, 8891
5-Year Water Level Change	5.0	23	325, 322, 239, 243, 240, 1002, 999, 1001, 8865, 4, 11, 9438, 8871, 17, 2341, 8891, 984, 7100, 581, 1006, 738, 324, 11534
Cumulative Water Level Change (2010 to Present)	6.1	23	324, 325, 239, 243, 240, 1002, 8865, 4, 11, 9438, 8871, 17, 322, 999, 1001, 581, 984, 2341, 1006, 8891, 7100, 738, 11534
DFCs vs Cumulative Change	78.1	Not Applicable	Not Applicable

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

APPENDIX 2

Upper Trinity Groundwater Conservation District Water Level Monitoring Program

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List of Figures

1.0 Introduction

The District is undertaking the establishment of a monitor well network at key locations throughout the four counties to monitor water levels and aquifer conditions over time. The collection of District-scale hydrogeologic data such as water levels is key to the District's Mission and all resulting policies, management objectives and rules. Information from the well network will be assimilated along with groundwater production and use reports and estimates, well location and completion data, information on aquifer recharge rates and other hydrogeologic properties, and other information in a database that the District is continuing to develop to better understand and manage the groundwater resources of the area. Information gleaned from these efforts will be used by the District in the future establishment of desired future conditions (DFC) for the aquifers, in the monitoring of actual conditions of the aquifers, in the improvement of a future groundwater availability model (GAM), in making planning decisions, and in the development of permanent District rules that may include a permitting system for water wells.

The Upper Trinity Groundwater Conservation District (UTGCD) has completed Phase I of their Monitor Well Program. There are currently 108 wells identified by the UTGCD as monitor wells and the monitor well database contains a total of 146 wells. The District started quarterly monitoring of the Phase I monitoring network in the fourth quarter of 2010. **Figure 1** plots the wells in the UTGCD monitor well database along with the surface geology in the District. From a review of Figure 1 it can be seen that the distribution of wells both areally and by aquifer is not uniform across the District.

Building on the success of the Phase I monitor well network, the District recognized that the Phase I monitoring network and data collected to date must be evaluated in context to a monitoring strategy based upon meeting the management goals of the District. To this end, the District developed a set of goals for the Phase II monitoring plan which are listed below:

1. Analysis of all data collected to date including water levels and locations of the wells;
2. Expansion of the current monitoring program to collect data in locations not adequately represented in Phase I;
3. Determine appropriate layers of the District's aquifers that need study (including the Paleozoic);
4. Provide a model for the District's Board and staff to expand its monitoring program.

Based upon the stated objectives, INTERA developed a work scope for the performance of Phase II which is based upon a task structure comprised of five tasks. The five tasks are listed below:

- Task 1 – Development of a Hydrogeologic Framework for Management
- Task 2 – Development of a Monitoring Strategy
- Task 3 –Analysis of Phase I Monitor Wells and Collected Data
- Task 4 – Recommendations for Phase II Monitor Wells
- Task 5 – Phase II Monitor Well Survey and Initial Sampling

The task structure follows a sequential process by which the background data and the monitoring strategy (Tasks 1 and 2) are developed first. These are followed by Task 3 which is an assessment of the Phase I wells based upon the monitoring strategy laid out in Task 2. Based upon that analysis, the Phase I monitor well network will be augmented through the search for new monitor wells and potentially through the deletion of some Phase I wells considered of limited value. Finally, in Task 5 the new wells are brought into the network through a site visit, initial measurement and documentation.

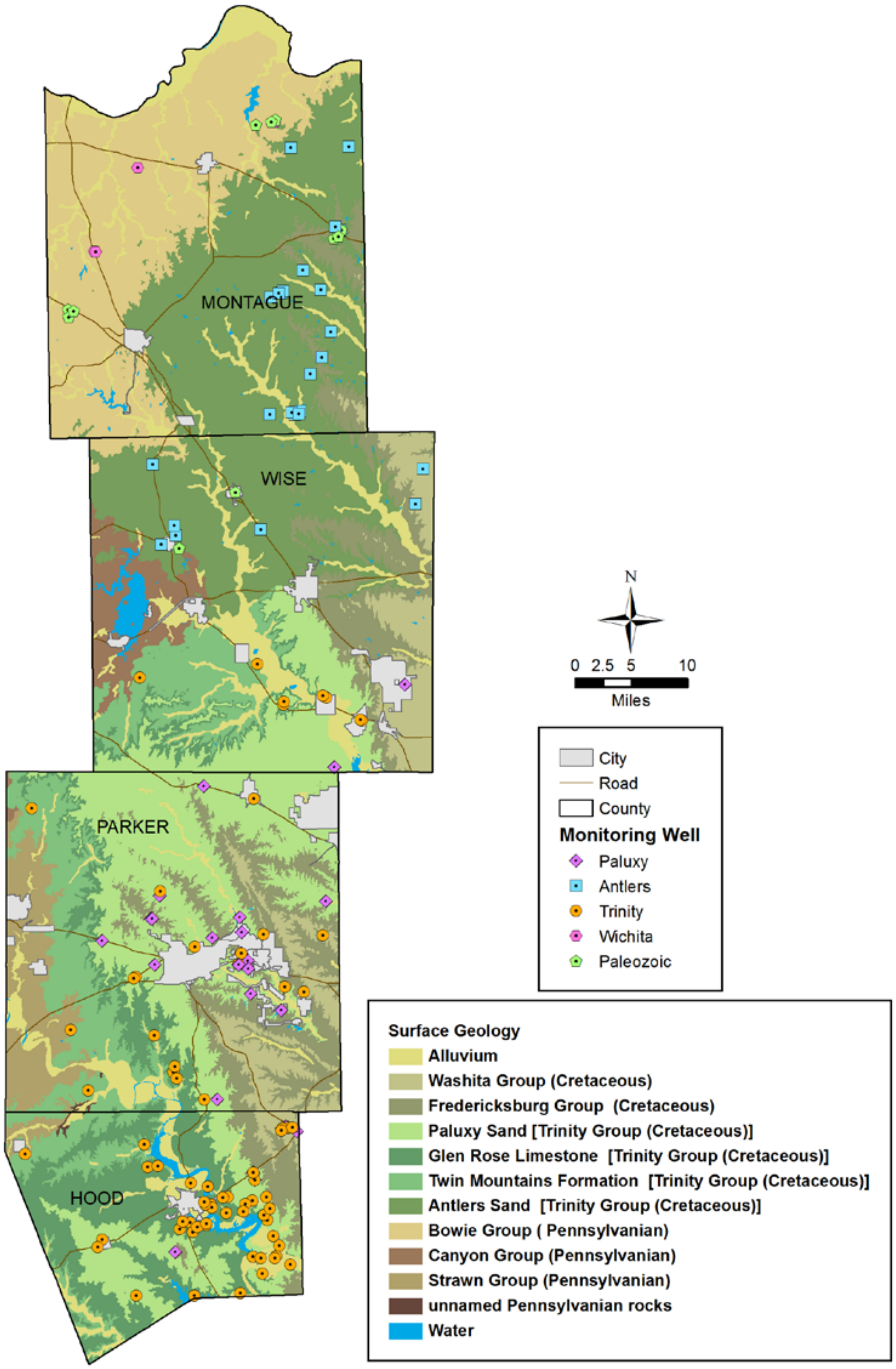


Figure 1. UTGCD Phase I Monitor Wells by Stratum and District Surface Geology.

This report is organized by chapters documenting each of the five tasks described above. This draft version of the report only documents efforts completed for Tasks 1 and 2. This document serves as the Task 1 and 2 milestone submittal. It has been delivered as an electronic file (pdf) and as a hard copy to promote comments from the Board and staff that can be used in the implementation of the remaining tasks.

2.0 Development of a Hydrogeologic Framework for Management

The objective of Task 1 is to develop an initial hydrogeologic framework for aquifer management within the District. Because the Paleozoics aquifer systems (Wichita, Bowie, Cisco and Canyon and Strawn Groups) are important in the District, this framework will include these aquifers as well as the Northern Trinity aquifer and associated formations as defined by the Texas Geologic Atlas Sherman and Dallas Sheets (McGowen et al., 1967; Barnes, 1972). The deliverable is a set of geologic cross-sections across the District. The geologic interpretations presented in this section are the product of Allan Standen (PG # 1227) in cooperation with INTERA personnel.

2.1 Overview of District Hydrogeology

Groundwater resources in the four counties making up the District include the Cretaceous-age Trinity Aquifer, several water-bearing units of Pennsylvanian- and Permian-age, referred to as the Paleozoic aquifers, and alluvial deposits (Figure 1). The Trinity Aquifer is recognized by the TWDB as a major aquifer in Texas. The Paleozoic aquifers are not recognized by the TWDB as either major or minor aquifers. No minor aquifers, as defined by the TWDB, are located in the District. The TWDB defines a major aquifer as one that supplies large quantities of water over large areas of the state and defines a minor aquifer as one that supplies relatively small quantities of water over large areas of the state or supplies large quantities of water over small areas of the state (Ashworth and Hopkins, 1995). A generalized stratigraphic section representative of the hydrogeology of the District is provided in **Table 1**. To properly design a monitoring network, one of the key components is an understanding of the hydrostratigraphic units which comprise the resource. This, in addition to an understanding of the groundwater use patterns by hydrostratigraphic unit (sub-aquifer), provides the data needed to make sure monitoring is occurring in the correct horizons. At this point, only the Trinity Aquifer has been considered in GMA-8 joint planning. However, the Paleozoic aquifer system which has not been included in the past must be for the next round of planning.

2.1.1 Geologic Setting

The oldest geologic units comprising aquifers in the District are the Paleozoic aquifers which are composed fluvial-deltaic and fluvial deposits originating from the Ouachita and Arbuckle mountains to the north and east of the District. These deposits were influenced by deep-seated structural features which influenced deposition through Cretaceous time. **Figure 2** shows the principal pre-Pennsylvanian structural features in the District and areas to the west. Important features for District aquifers are the Muenster Arch in Montague County which is an area of faulting and uplift and the Mineral Wells Fault Zone which is in south Wise County. These features have been shown to impact deposition through the Pennsylvanian and Permian and possibly into the Cretaceous (Trinity Aquifer).

The Paleozoic aquifers within the District were deposited on the eastern shelf of the Permian Basin. The Paleozoic aquifers are composed of a sequence of fluvial-deltaic deposits. The Paleozoic aquifers in the District are comprised from oldest to youngest of the Strawn, Canyon, Cisco, Bowie and Wichita Groups. The age of the Paleozoic aquifers at surface tends to get older as one moves north through the District to the south. The Strawn Group is primarily a fluvial-deltaic system comprised of several sandstone units inter-layered with shales.

Table 1. General Stratigraphy (Bené and others 2004; McGowen and others, 1967; 1972; Brown and others, 1972).

System	Hydrogeologic Characteristic	Group	Formation: North	Formation: South
	Water-Bearing		alluvial deposits	alluvial deposits
Cretaceous	Confining Units (locally productive)	Washita	Weno Denton Fort Worth Duck Creek Kiamichi	Weno Denton Fort Worth Duck Creek Kiamichi
Cretaceous	Confining Units (locally productive)	Fredericksburg	Goodland	Edwards
Cretaceous	Confining Units (locally productive)	Fredericksburg	Goodland	Comanche Peak
Cretaceous	Confining Units (locally productive)	Fredericksburg	Walnut Clay	Walnut Clay
Cretaceous	Aquifer	Trinity	Antlers	Paluxy
Cretaceous	Aquifer	Trinity	Antlers	Glen Rose
Cretaceous	Aquifer	Trinity	Antlers	Twin Mountains
Permian	Water-Bearing	Wichita	Nocona	Nocona
Permian	Water-Bearing	Bowie	Archer City Markley	Archer City Markley
Pennsylvanian	Water-Bearing	Cisco	Thrifty and Graham, undivided	Thrifty and Graham, undivided
Pennsylvanian	Water-Bearing	Canyon	Colony Creek Shale	Colony Creek Shale
Pennsylvanian	Water-Bearing	Canyon	Ranger	Ranger
Pennsylvanian	Water-Bearing	Canyon	Ventioner	Ventioner
Pennsylvanian	Water-Bearing	Canyon	Jasper Creek	Jasper Creek
Pennsylvanian	Water-Bearing	Canyon	Chico Ridge Limestone	Chico Ridge Limestone
Pennsylvanian	Water-Bearing	Canyon	Willow Point	Willow Point
Pennsylvanian	Water-Bearing	Strawn	Mineral Wells	Mineral Wells
Pennsylvanian	Water-Bearing	Strawn	Brazos River	Brazos River
Pennsylvanian	Water-Bearing	Strawn	Mingus	Mingus
Pennsylvanian	Water-Bearing	Strawn	Buck Creek Sandstone	Buck Creek Sandstone
Pennsylvanian	Water-Bearing	Strawn	Grindstone Creek	Grindstone Creek
Pennsylvanian	Water-Bearing	Strawn	Lazy Bend	Lazy Bend

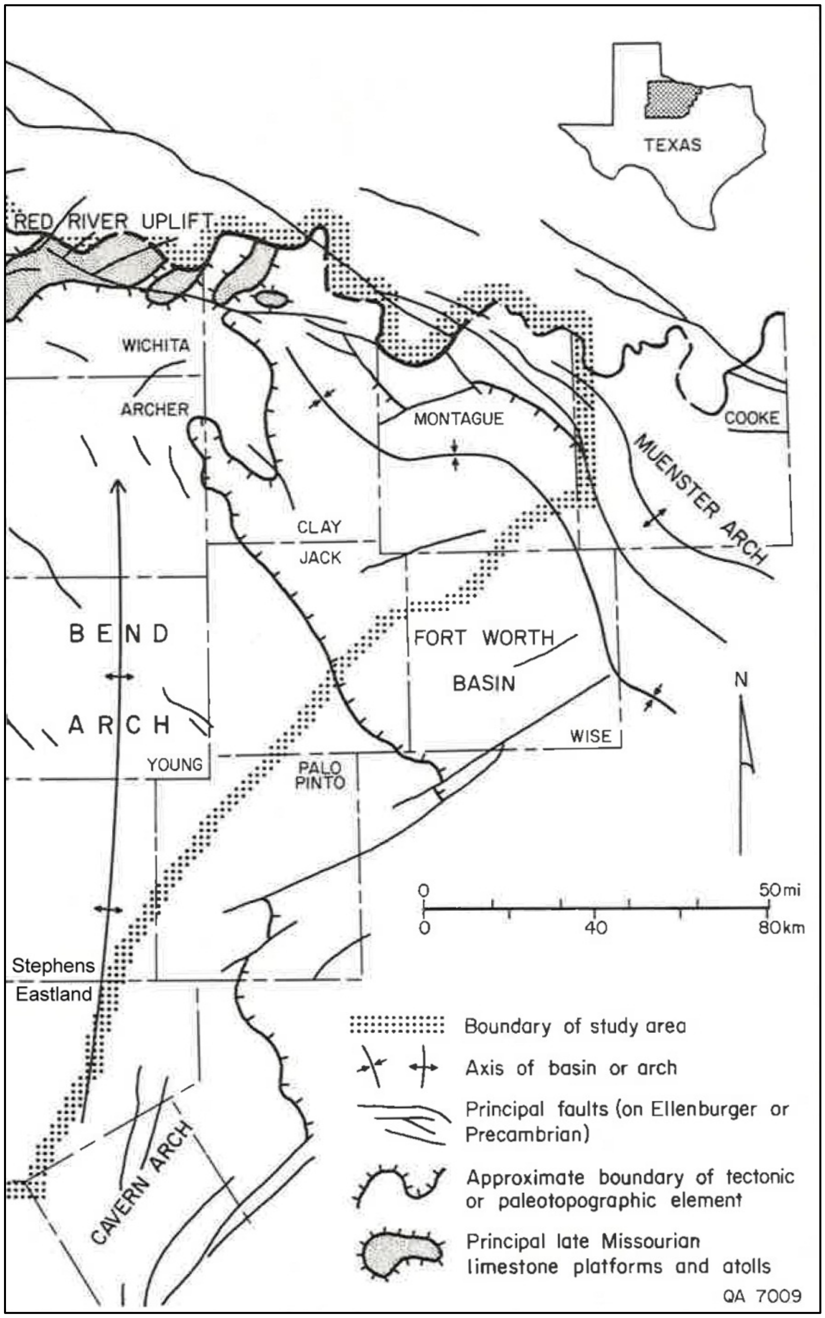


Figure 2. Principal Pre-Pennsylvanian structural features (after Brown et al. 1990)

The Canyon Group is a fluvial-deltaic system composed of sandstones and shales but which also has limestones reflecting a lower energy depositional environment. The Cisco Group is composed of fluvial-deltaic and marine deposits. The Cisco has many sandstone units that are poorly mapped because they are intermittent but has extensive limestone units (Brown et al., 1990). The Bowie Group represents a continental depositional facies and is typically composed of more coarse grained sediments than the underlying Cisco. The Wichita Group (Nocona Formation) is also a continental deposit and is composed of highly heterogeneous deposits of sand, gravel and shale. The Cretaceous Trinity Group unconformably overlies the Paleozoic aquifers system in the District, meaning that a period of erosion occurred after deposition of the Paleozoic aquifers and before the deposition of the Trinity aquifer. The Paleozoic aquifers generally dip in a westerly direction while the Cretaceous Trinity Group dips to the east-southeast. The Trinity Group was deposited from a sediment source feeding from the west and north into the East Texas Basin. Each of these aquifers will be discussed below.

2.1.1 Trinity Aquifer

The Trinity Aquifer, shown in Figure 1, is defined by the TWDB as a major aquifer composed of several individual aquifers contained within the Trinity Group. In the District, the Trinity Aquifer consists of the aquifers of the Paluxy Sand, the Glen Rose Formation, the Twin Mountains Formation, and the Antlers Formation. The Antlers Formation is the coalescence of the Paluxy and Twin Mountains formations north of the line where the Glen Rose Formation thins to extinction. This occurs approximately in central Wise County (Figure 1). The Cretaceous-age Fredericksburg and Washita Groups are generally considered confining units and they overlie the downdip portion of the Trinity Aquifer in the easternmost areas of the District.

The Paluxy Sand consists of sand, silt, and clay, with sand dominating. The sand and silts in the aquifer are primarily fine-grained, well sorted, and poorly cemented (Bené and others, 2004). Coarse-grained sand is found in the lower sections grading up to fine-grained sand with shale and clay in the upper section (Nordstrom, 1982). In general, natural groundwater flow in the Paluxy Sand is east to southeast (Langley, 1999). Wells completed into the Paluxy Sand typically yield small to moderate quantities of water that is fresh to slightly saline (Nordstrom, 1982). Where the Glen Rose Formation is absent, the Paluxy Sand is equivalent to the upper sands of the Antlers Formation (Baker and others, 1990).

The Glen Rose Formation consists primarily of limestone with some shale, sandy-shale, and anhydrite. In general, the aquifer yields small quantities of water in localized areas (Baker and others, 1990). Groundwater flow in the Glen Rose Formation is generally to the east and southeast.

The Twin Mountains Formation consists predominantly of medium- to coarse-grained sand, silty clay, and conglomerates. A massive sand is found in the lower portion of the formation while less sand is found in the upper portion of the aquifer due to increased interbedding of shale and clay (Nordstrom, 1982). In general, wells are primarily completed into the lower part of the aquifer. Where the Glen Rose Formation is absent, the Twin Mountains Formation is equivalent to the lower sands of the Antlers Formation (Baker and others, 1990). Typically, wells completed into the Twin Mountains Formation yield fresh and slightly saline water in moderate to large quantities (Nordstrom, 1982). Groundwater flow in this formation is generally to the east and southeast.

Typically, the Antlers Formation consists of a basal conglomerate and sand overlain by poorly consolidated sand interbedded with discontinuous clay layers (Nordstrom, 1982). Considerably more clay is found in the middle portion of the formation than in the upper and lower portions. Limestone is also found in the middle portion near the updip limit of the Glen Rose Formation. Generally, groundwater flow in the Antlers Formation is to the east and southeast. Well yield in the Antlers Formation is similar to that in the Twin Mountains Formation with downdip wells generally more productive than those in the outcrop areas.

2.1.2 Paleozoic Aquifers

Several Pennsylvanian- and Permian-age formations in the District are capable of producing usable quantities of groundwater. These formations are referred to collectively as the Paleozoic aquifers (see Figure 1). Literature regarding these formations is very limited and, therefore, information regarding their hydrologic characteristics is also limited. The Paleozoic aquifers are a significant source of groundwater in northern and western portions of Montague County, west-central Wise County, and western Parker County where the Trinity Aquifer is absent. Based on information in the TWDB groundwater database as of November 2009, the percentage of wells in the District completed into the Paleozoic aquifers is 78.2, 14.8, 5.4, and 0.0 percent for Montague, Wise, Parker, and Hood counties, respectively.

From youngest to oldest, the formations of the Wichita, Bowie, Cisco, Canyon, and Strawn groups make up the Paleozoic aquifers. The Wichita Group consists of the Nocona Formation (mudstone with sandstone and siltstone in thin lenticular beds throughout). The Bowie Group is composed of the Archer City Formation (predominantly mudstone with thin siltstone beds and sandstone) and the Markley Formation (mudstone with local thin beds of sandstone in upper portion and mudstone and shale with some coal and limestone below). The Cisco is comprised of the undivided Thrifty and Graham formations (predominantly mudstone and shale with thin sandstone beds and some sandstone sheets locally and two limestone members).

The underlying Canyon Group is comprised of the Colony Creek Shale (shale with some siltstone, local thin to medium beds of sandstone, and limestone lentils), the Ranger Limestone (predominantly limestone with local thin shale beds), the Ventioner Formation (shale and mudstone with numerous sandy and silty lenses and thin to medium beds), the Jasper Creek Formation (upper portion predominantly shale with thin siltstone beds throughout and isolated massive sandstone lenses and lower portion shale with thin limestone lentils and local thin and lenticular thick sandstone beds), the Chico Ridge Limestone (predominantly limestone with local shale beds), the Willow Point Formation (shale and claystone locally silty and sandy with local thin beds of sandstone and several limestone beds in lower portion and a single coal bed), and the Palo Pinto Formation (predominantly limestone and marl with some sandstone and shale and found west of the District). Sandstone lenses found in the Canyon Group are locally important to the occurrence of groundwater though are hard to map (Bayha, 1967).

The Strawn Group consists of the Mineral Wells Formation (shale containing local sandstone beds and a few limestone beds), the Brazos River Formation (sandstone with local lenses of conglomerate and mudstone), the Mingus Formation (sandy shale with one thin coal seam and some limestone beds), the Buck Creek Sandstone (sandstone), the Grindstone Creek Formation (shale, in part sandy, with local thin coal beds and sandstone lentils and limestone beds with some shale), and the Lazy Bend Formation (shale, in part sandy or silty, with local coal beds and limestone beds). While the Paleozoic aquifers are described as having many formations based upon outcrop, correlation of sandstone units in particular is very problematic in the subsurface.

The Paleozoic aquifers are the primary source of water in Montague County (Bayha, 1967) as indicated by the high percentage of wells completed into these aquifers in the county. Bayha (1967) indicates that groundwater is difficult to trace in these aquifers due to the complex depositional sequence.

2.1.2 Alluvial Deposits

Some alluvial deposits of Pleistocene to Recent age are capable of producing water in the District, especially along the Red River in Montague County and the Brazos River in Parker County. The majority of these sediments are stream deposits but some are of windblown origin. The alluvial deposits, consisting of sand, gravel, silt, and clay, yield small to large quantities of fresh water. Based on information in the TWDB groundwater database as of November 2009, the percentage of wells in the District completed into alluvial deposits is 10.0, 0.4, 3.0, and 0.1 percent for Montague, Wise, Parker, and Hood counties, respectively.

2.2 Approach for Development of the Hydrogeologic Sections

The construction of Paleozoic and Cretaceous formation cross-sections for the District required integration of subsurface information from numerous data sources and types. Available state agency published references (Texas Water Development Board (TWDB) and Bureau of Economic Geology (BEG)) were reviewed to identify and capture useful descriptions of stratigraphic marker beds and/or stratigraphic picks. The Sherman, Dallas and Abilene Geologic Atlas of Texas (GAT) sheets provided the geospatial distribution of the surface formation outcrops to connect with the top and base of subsurface picks.

The Paleozoic geologic surface outcrops are youngest in northern Montague County (Permian) and get progressively older (Pennsylvanian, Strawn) moving south into Parker County. Paleozoic rocks generally dip to the northwest-west at about 80 to 100 feet per mile. Over 1,000 scout tickets and cable tool driller's reports were screened to select wells with good location and Paleozoic (Permian and Pennsylvanian) formation top and base picks. A total of 40 locations with Paleozoic formation picks were selected for the created cross-sections. The number and geographic distribution of scout tickets and cable tool driller's reports decreased dramatically from Montague County south towards Hood County. Paleozoic formation top picks (Bowie Group, Gunsight Limestone, Canyon Group picks included the Home Creek, Ranger and Palo Pinto limestones and Strawn Group pick included the Caddo formation) were derived from the scout ticket and cable tool driller's reports which were compared with Paleozoic formation picks from BEG Report of Investigations 197, by Brown et. al., 1990. Formation picks from these two sources were compatible and in agreement.

The deeper Paleozoic picks for the Ranger, Palo Pinto and the Caddo formations are not illustrated in the constructed cross-sections because they were below the zone of interest for groundwater resources (upper 1,000 feet). However, these Paleozoic picks were used to construct subsurface formation surfaces. The geospatial subsurface thickness variations and extents of these Paleozoic formations are poorly known within the study area. Cross-section Paleozoic thicknesses in areas without data used outcrop thicknesses from the respective GAT sheets as a default.

Over 8,000 wells from the TWDB WIID website (groundwater database and submitted driller's reports) were screened by well depth (deepest) and the quality of the driller's reports lithologic description. A total of 102 driller's reports were selected to construct the cross-sections. Four Cretaceous formation top surfaces were mapped; the Paluxy Sand, Glen Rose Limestone, Twin Mountain Formation and the Antlers Sand. Cretaceous rocks generally dip to the east-southeast at about 40 to 60 feet per mile. A literature review of available older publications (Hendricks, 1957, Scott and Armstrong, 1932, Scott, 1930 and Stramel, 1951) as well as more recent publications (Baker, et. al., 1990, Duffin and Beynon, 1992, Harden, et al., 2004, Langley, 1999, McGowen et al, 1991 and Nordstrom, 1982) suggested that the Hensell and Hosston (aquifer units in the Travis Peak Formation) were not mappable geologic units within the study area. The older publications and the GAT sheet explanation provided detailed lithologic descriptions based on outcrops which were useful in the identification of formation tops and bases from the driller's report descriptions. The Hensell and Hosston were not positively identified within any of the 102 driller's reports which is consistent with the published geological reports in the area.

Brown, 1990 text and figures (1 and 6) provided general, structural subsurface guidance for the surface construction of the Paleozoic formations. A total of thirteen cross-sections (A - A' through M - M') were constructed for the District (see **Figure 3** for locations). The Paleozoic (Permian and Pennsylvanian Formations) interpretations in these cross-sections are based on very limited subsurface well data and should not be used or considered to replace or supersede more detailed regional structural studies. This study was intended to assist the District in understanding the stratigraphic framework and the designing of a water level monitoring system of their groundwater resources.

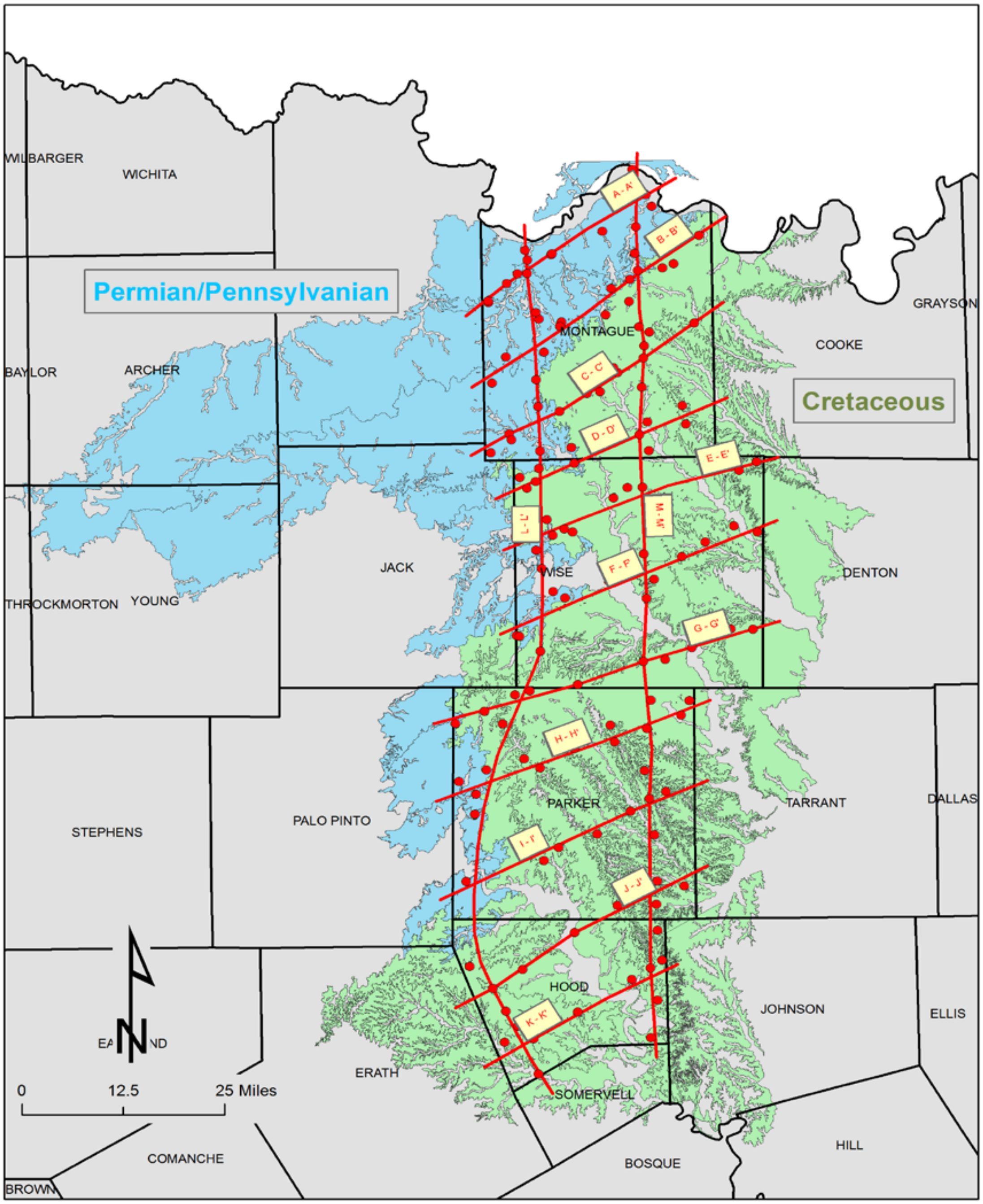


Figure 3. Cross-Section Base Map

2.3 Subsurface Data Sources and Reference Material Reviewed

Multiple subsurface data sources were investigated and used to construct the cross-sections for the UTGCD.

- The Bureau of Economic Geology (BEG) has a large collection of subsurface data including geophysical logs (1940's to present), scout tickets (1950's to 1990's) and cable tool driller's reports (1910 to 1960's).
- BEG publication, Brown et al, 1990, provided detailed information for the shallow Paleozoics in Montague County.
- UTGCD well data provided on CD.
- TWDB website (WIID) Texas Department of Licensing and Regulations (TDLR) submitted driller's reports (2001 to 2011) and groundwater well database driller's reports (1940s to present).
- University of Texas, Austin Thesis and Dissertations
- Texas Water Development Board (TWDB) publications

In addition to the subsurface data sources used to develop the correlations, many publications were reviewed for relevant information to help in the cross-section development and to understand the basic geology of the Trinity Aquifer and the Paleozoic Aquifers. The primary references reviewed include the following:

Baker, B., Duffin, G., Flores, R., and Lynch, T., 1990, Evaluation of Water Resources in Part of North-Central Texas, Report 318, Texas Water Development Board, 67 p

Bayha, D. C., 1967, Occurrence and Quality of Ground Water in Montague County Texas, Texas Water Development Board, Report 58, 102 p.

Barnes, V. E., 1988, Dallas Sheet, Geologic Atlas of Texas, 1:250,000, Bureau of Economic Geology

Brown, Jr., L. F., Goodson, J. L., Goodson, Harwood, P., and Barnes, V. E. Barnes, 2001, Abilene Sheet, Geologic Atlas of Texas, 1:250,000, Bureau of Economic Geology.

Brown, L. F., Solis-Iriarte, R. F. and Johns, D. A., 1990, Regional Depositional Systems Tracts, Paleogeography and Sequence Stratigraphy, Upper Pennsylvanian and Lower Permian Strata, North and West Central Texas, Report of Investigations No. 197, Texas Bureau of Economic Geology, 27 plates, 116 p.

Bullard, F. M. and Cuyler, R. H., 1930, A Preliminary Report on the Geology of Montague County, Texas, Bureau of Economic Geology, Part 1, pages 57 – 76.

Duffin, G. L. and Beynon, B. E., 1992, Evaluation of Water Resources in parts of the Rolling Prairies of North-Central Texas, Report 337, Texas Water Development Board, 93 p.

Harden, R. W. & Associates, Freese & Nichols Inc., HDR Engineering Inc., LBG-Guyton Associates, USGS, and Yelderman, J. Jr., 2004, Northern Trinity / Woodbine Aquifer Groundwater Availability Model, prepared for Texas Water Development Board, 391 p.

Hendricks, L., 1957, Geology of Parker County, Bureau of Economic Geology, Publication Number 5724, 67 p.

Langley, L., 1999, Updated Evaluation of Water Resources in Part of North-Central Texas, Report 349, Texas Water Development Board, 72 p.

McGowen, J. H., Hentz, T. F., Owen, D. E., Pieper, M. K., Shelby, C. A. and Barnes, V. E., 1991, Sherman Sheet, Geologic Atlas of Texas, 1:250,000, Bureau of Economic Geology

Nordstrom, P. L., 1982, Occurrence, Availability and Chemical Water Quality of Ground Water in the Cretaceous Aquifers of North Central Texas, Volumes 1 and 2, Report 269, Texas Water Development Board.

Scott, G. and Armstrong, J. M., 1932, The Geology of Wise County, The University of Texas, Bulletin 3224, pages 5 – 73.

2.4 Review of the Hydrogeologic Framework as Defined by Cross-Sections

Each of the thirteen cross-sections is depicted in Figures 4 through 16 and each will briefly be discussed below.

A – A′ (Figure 4) - Cross-section has a southwestern to northeastern strike which parallels the outcrops of the Permian Archer City and Nocona formations. These Paleozoic formations possibly have been deformed by the Muenster Arch in the northeastern half of this cross-section.

B – B’, (Figure 5) - Cross-section has a southwestern to northeastern strike which parallels the outcrops of the Permian Archer City and the Bowie Group Markley formations and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation. The Paleozoic formations possibly have been deformed by the Muenster Arch in the northeastern half of this cross-section.

C – C’, (Figure 6) - Cross-section has a southwestern to northeastern strike which parallels the outcrops of the Bowie Group Markley Formation and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation.

D – D’, (Figure 7) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Bowie Group Markley and Thrifty and Graham formation and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation.

E – E’, (Figure 8) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Canyon Group undivided (Ventioner Formation) and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation.

F – F’, (Figure 9) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Canyon Group undivided (Jasper Creek Formation) and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation transitioning into the Twin Mountain Formation. This cross-section is just north of the Mineral Wells – Newark East Fault system.

G – G’, (Figure 10) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Strawn Group Mineral Wells Formation and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation. This cross-section is in very close proximity and parallels the Mineral Wells – Newark East Fault system.

H – H’, (Figure 11) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Strawn Group Mineral Wells and Brazos River formations and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation.

I – I’, (Figure 12) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Strawn Group Grindstone Creek and Lazy Bend formations and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation.

J – J’, (Figure 13) - Cross-section has a southwestern to northeastern strike and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation

K – K’, (Figure 14) - Cross-section has a southwestern to northeastern strike and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation.

L – L’, (Figure 15) - Cross-section has a north to south strike on the western side of the District. The Paleozoic formations (Permian and Pennsylvanian) seem to form a basin in this region of the District with the Paleozoic Formations becoming shallower to the south.

M – M’, (Figure 16) - Cross-section has a north to south strike on the eastern side of the District. This section also shows a potential sub-basin in the Paleozoic formations (Permian and Pennsylvanian) with the formations becoming shallower to the south. General locations of the Muenster Arch and Mineral Wells – Newark East Fault system are noted in the cross-section.

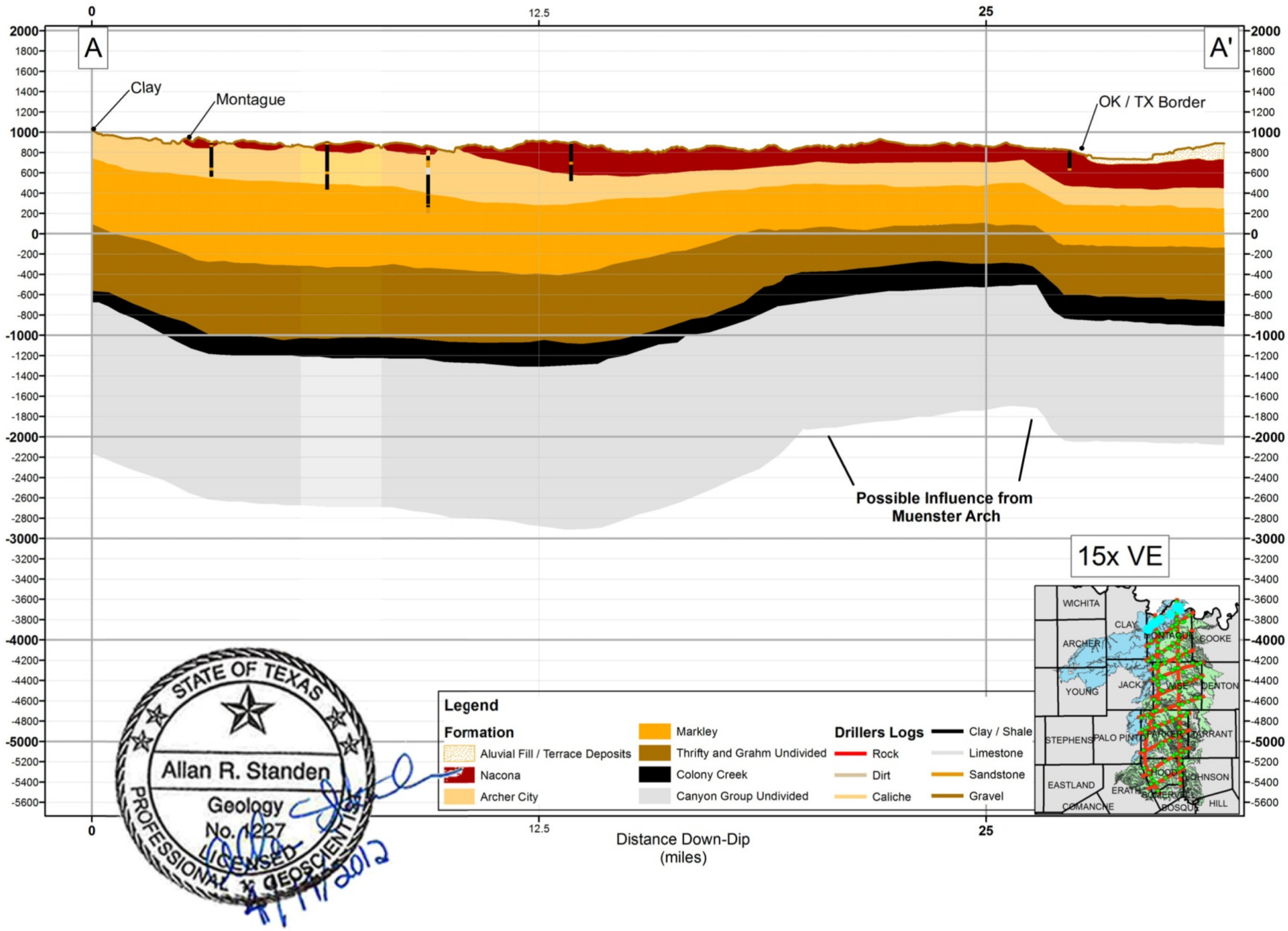


Figure 4. **Hydrogeologic Cross-Section A – A.**

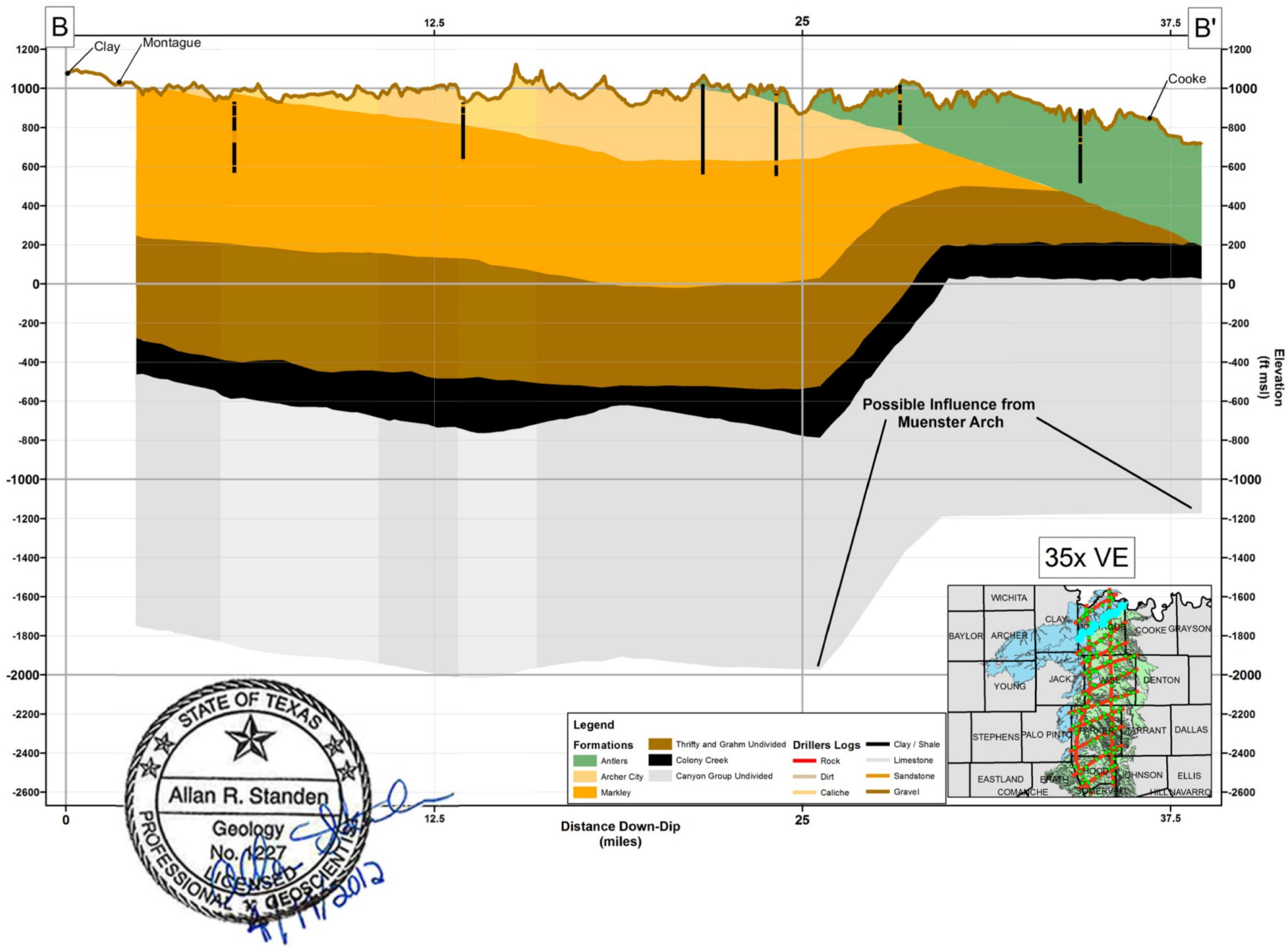


Figure 5. Hydrogeologic Cross-Section B – B.

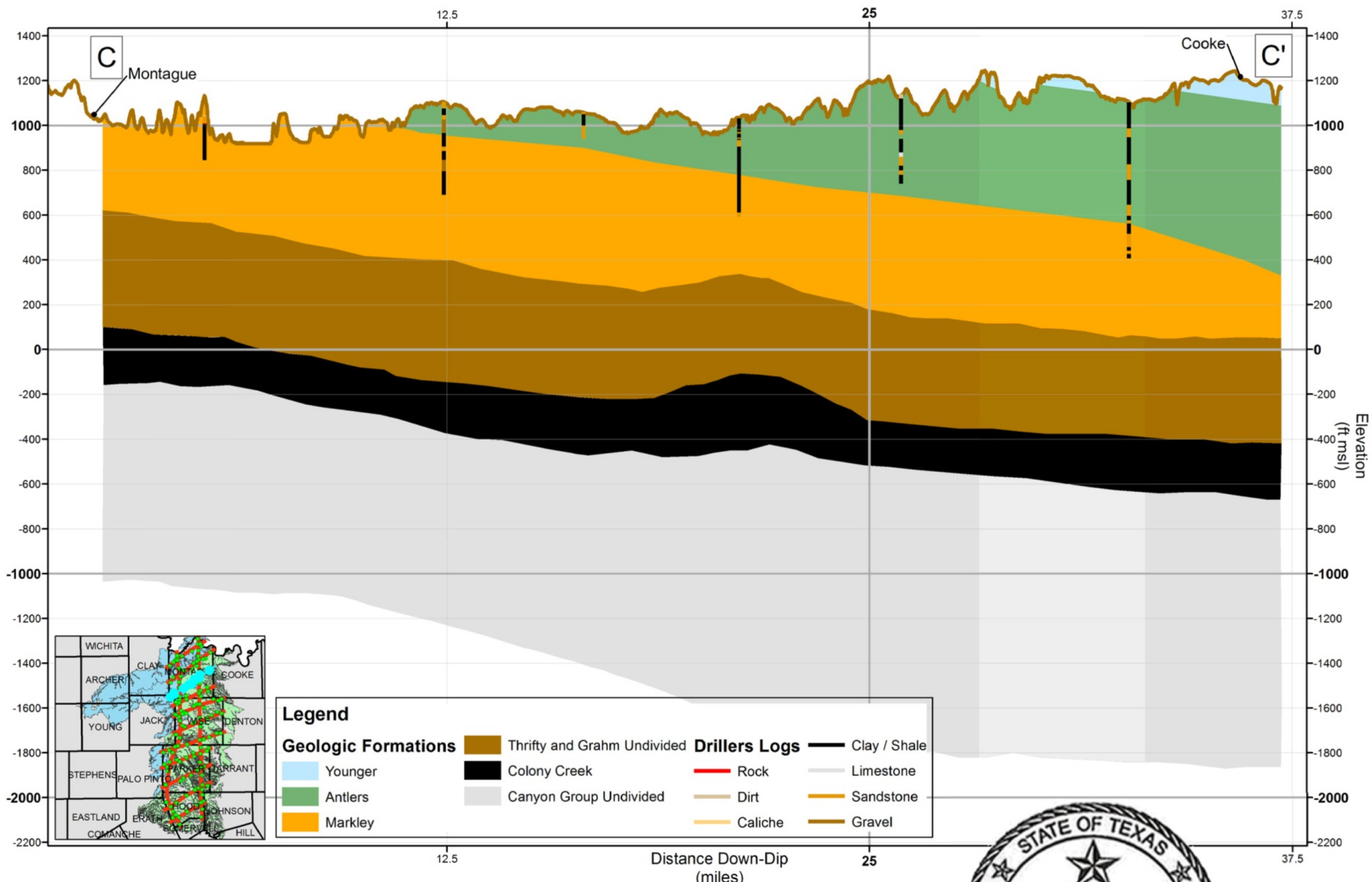
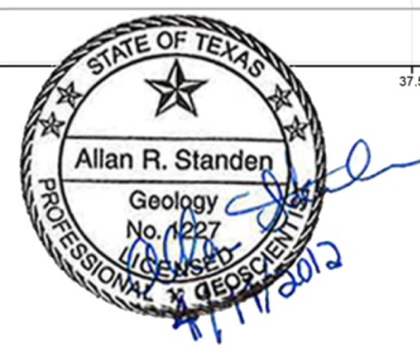


Figure 6. **Hydrogeologic Cross-Section C – C.**



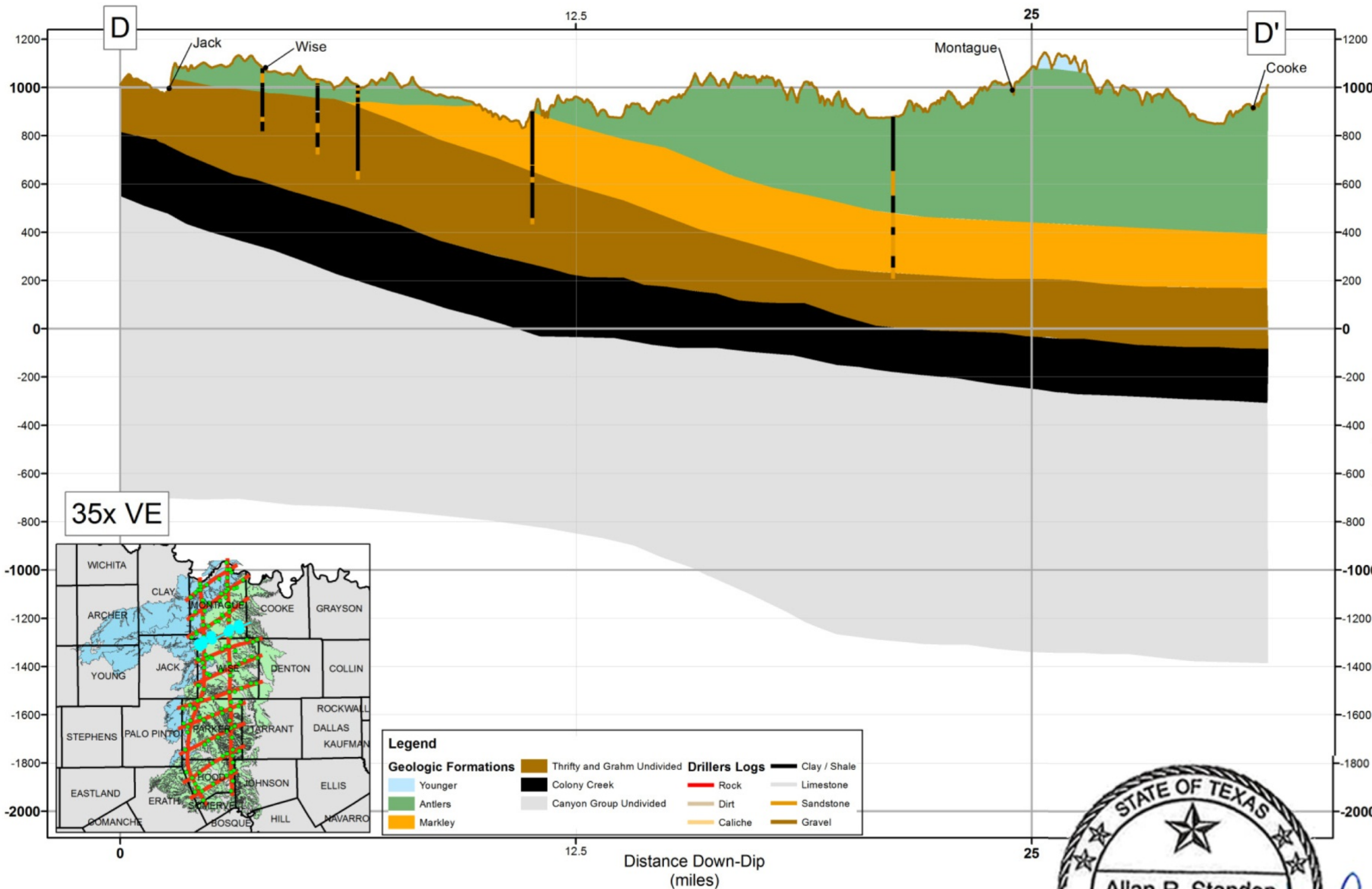


Figure 7. **Hydrogeologic Cross-Section D – D.**

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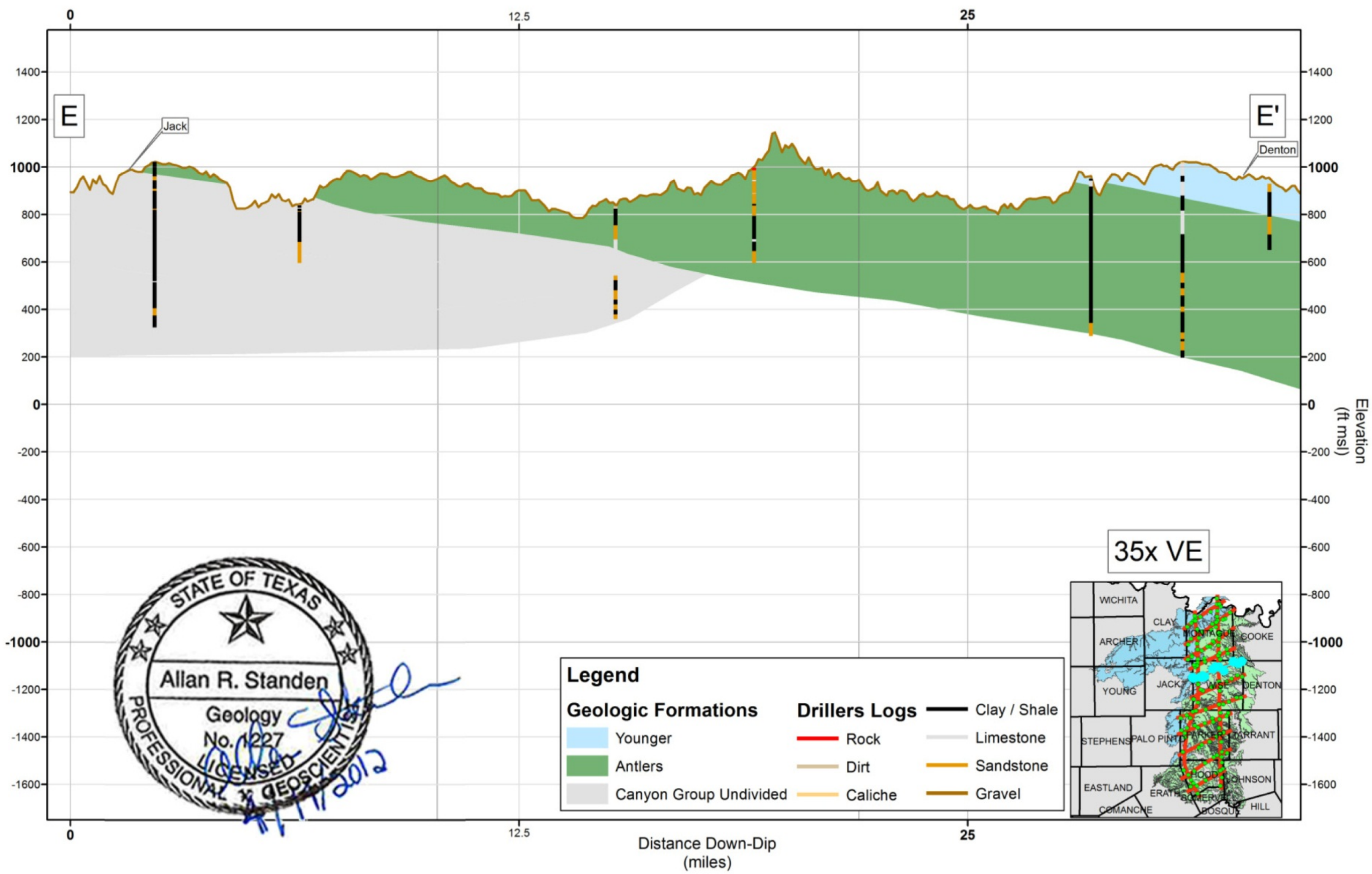


Figure 8. Hydrogeologic Cross-Section E – E.

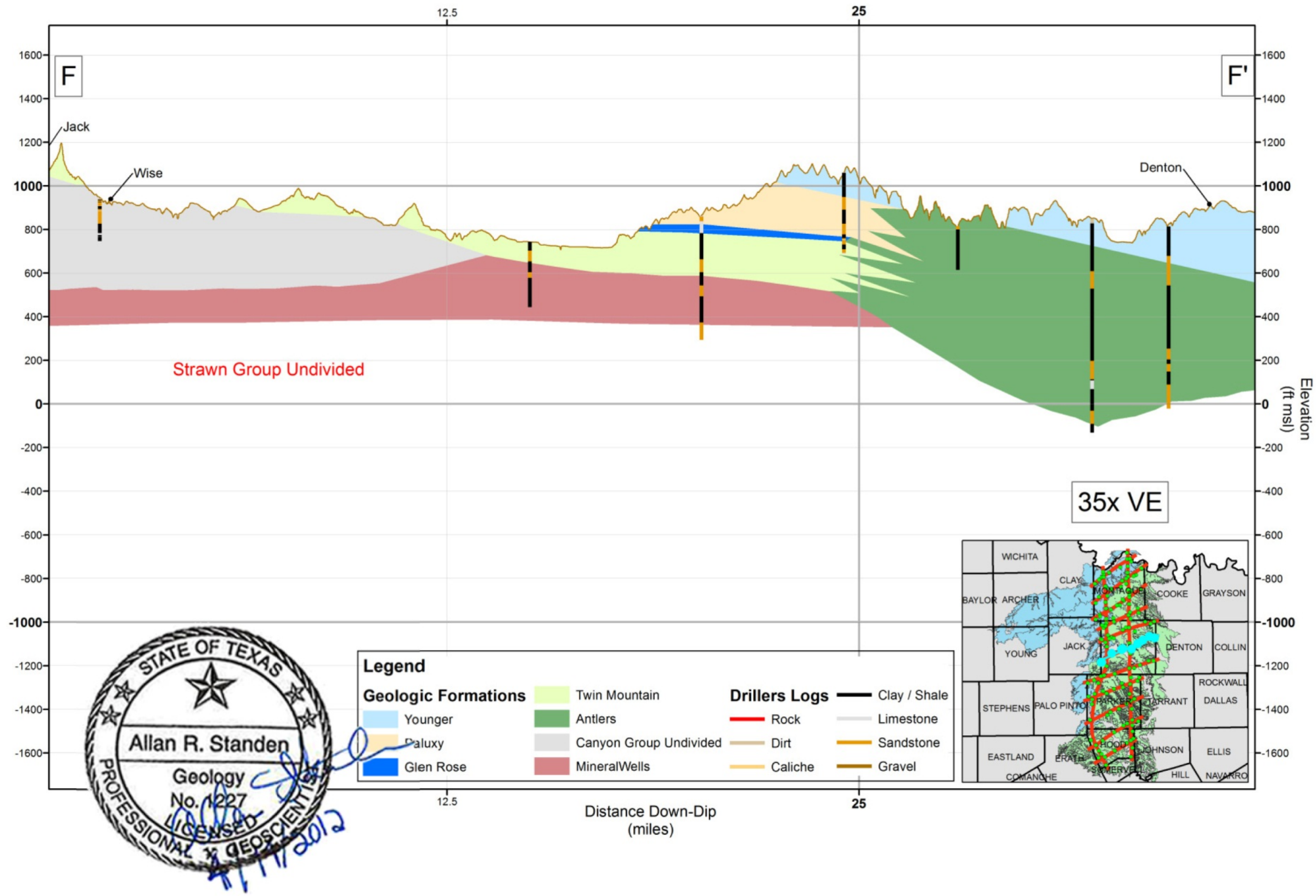


Figure 9. **Hydrogeologic Cross-Section F – F.**

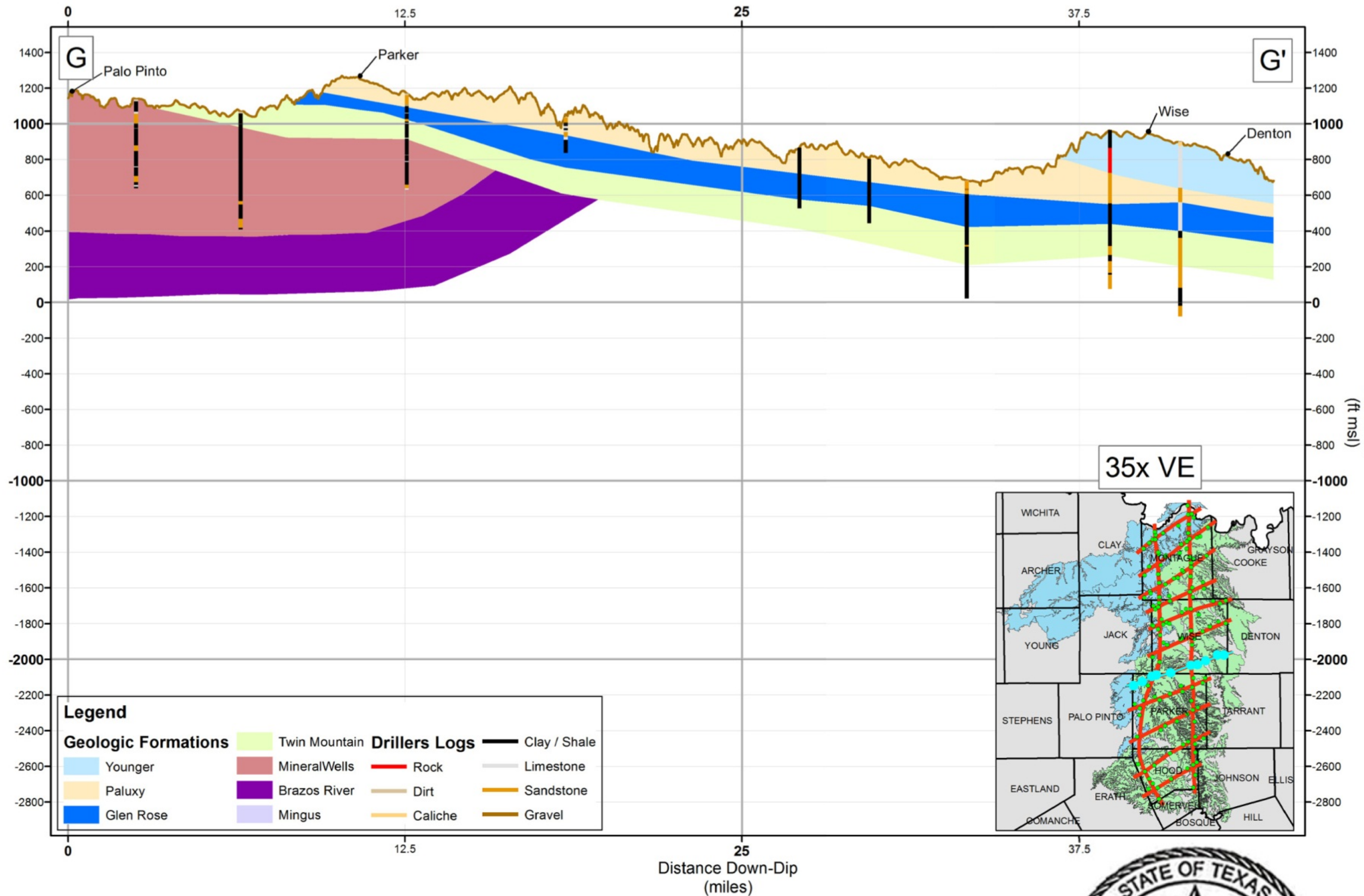
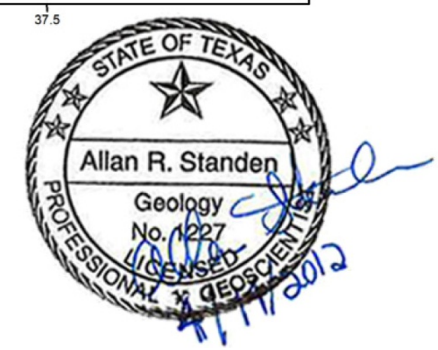


Figure 10. Hydrogeologic Cross-Section G – G.



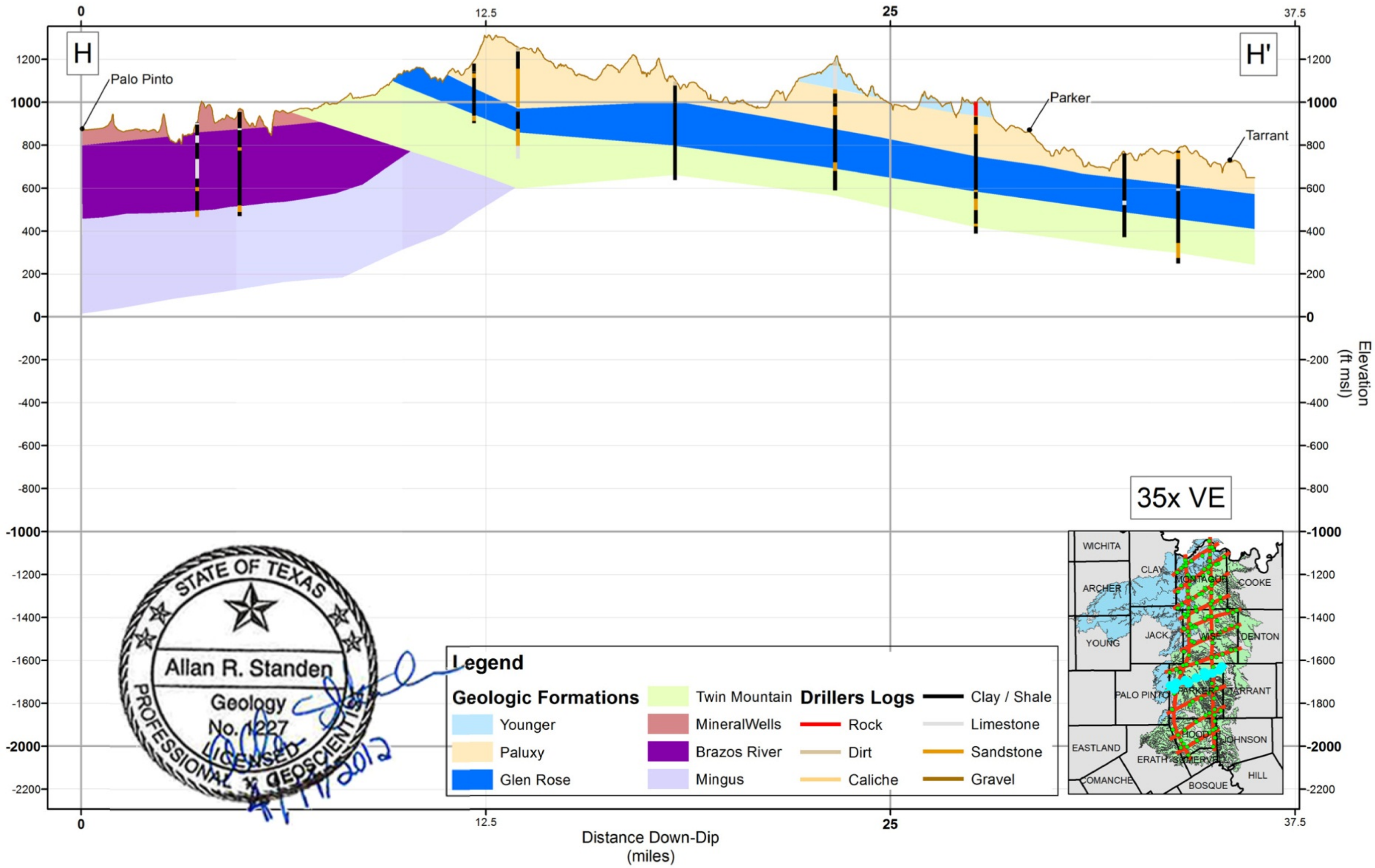


Figure 11. Hydrogeologic Cross-Section H – H.

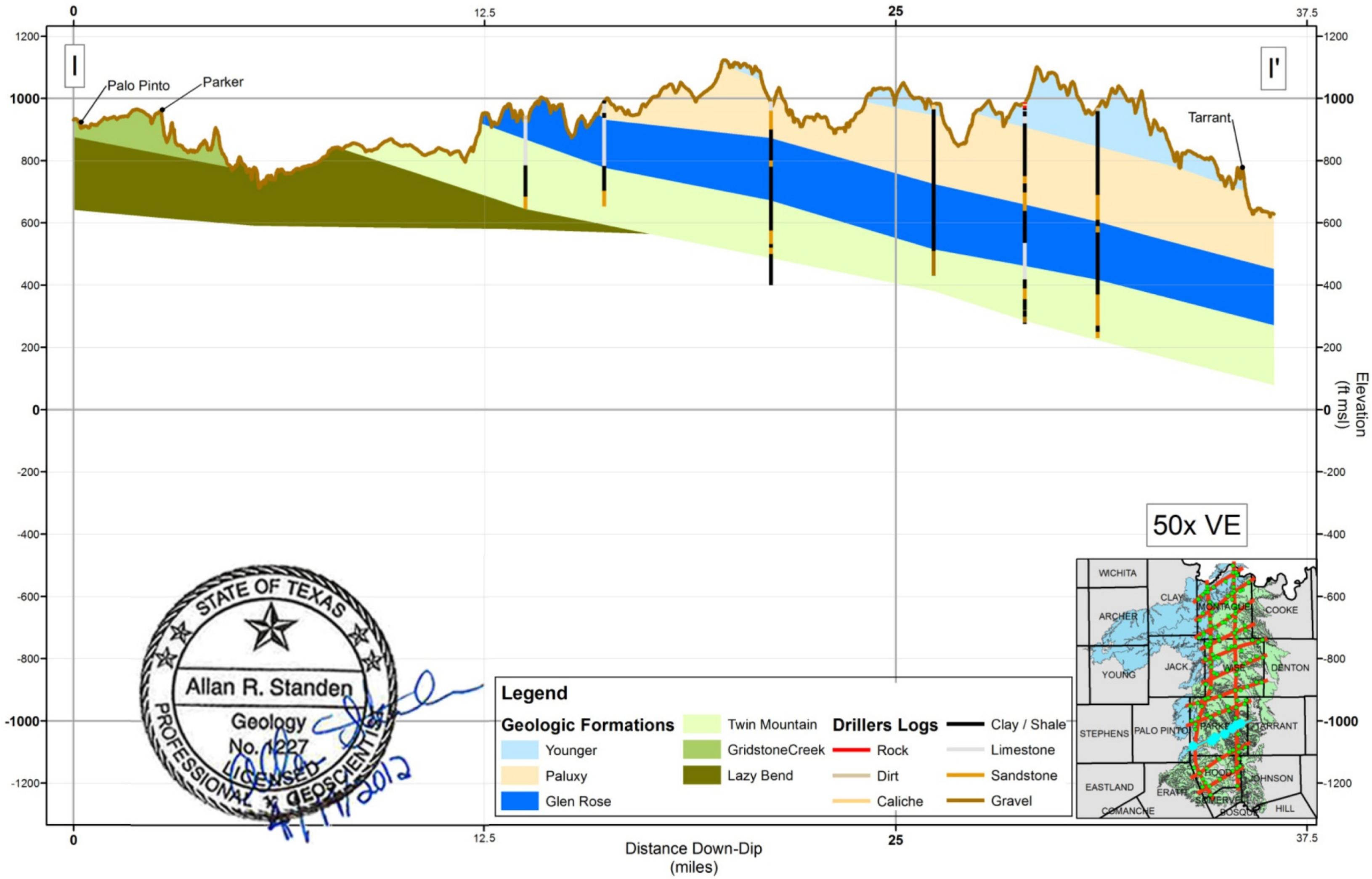


Figure 12. Hydrogeologic Cross-Section I – I.

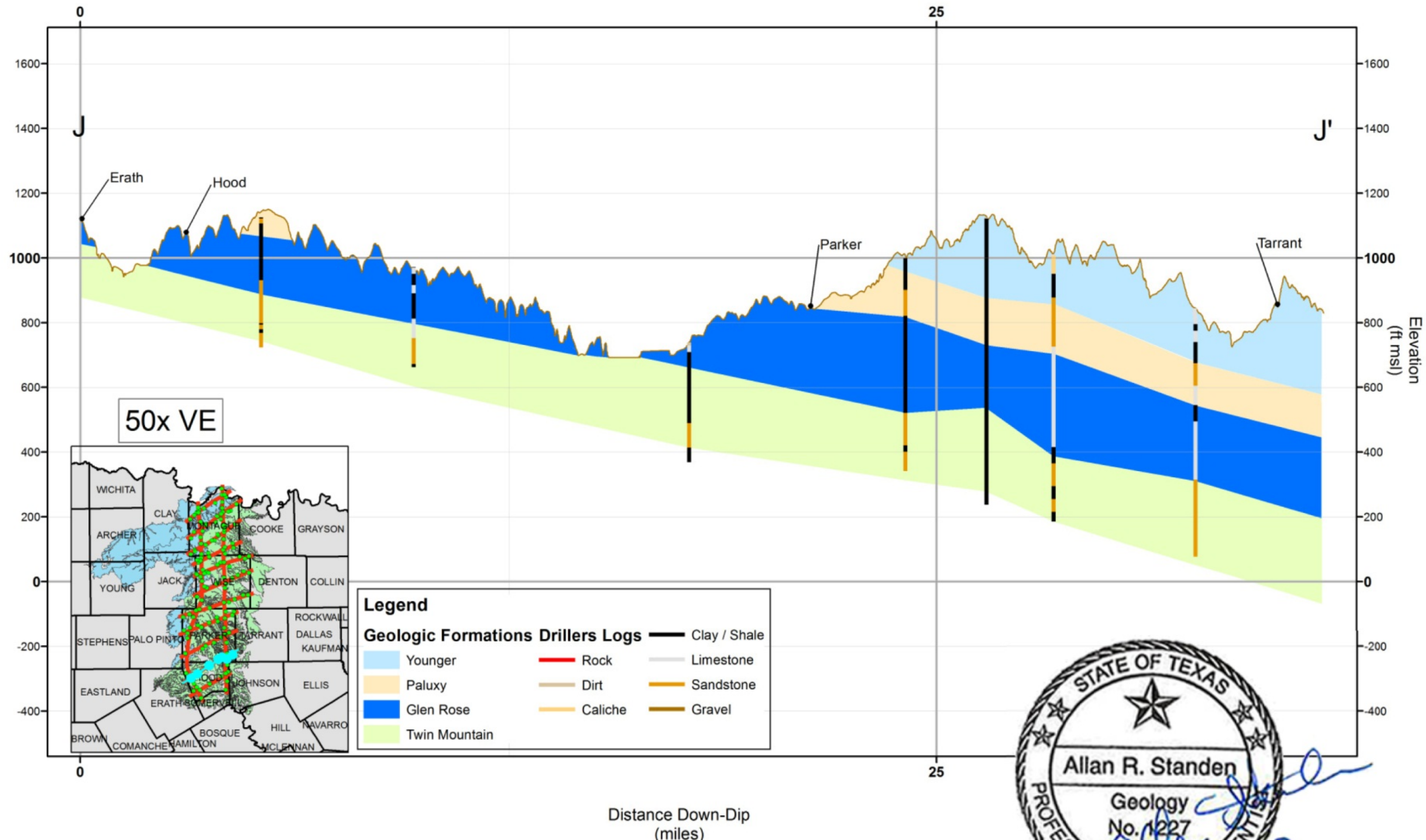


Figure 13. Hydrogeologic Cross-Section J – J.

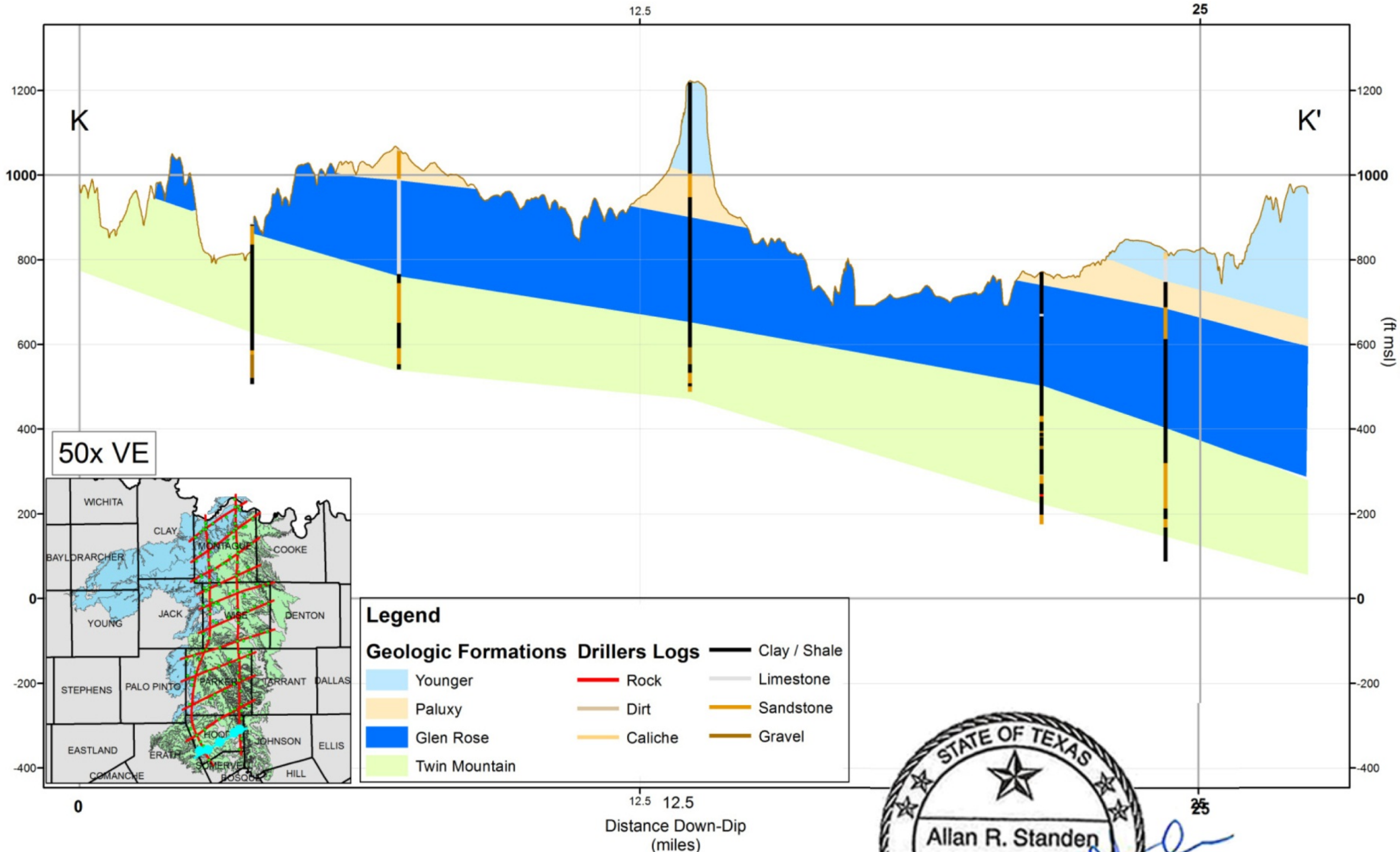


Figure 14. Hydrogeologic Cross-Section K – K.

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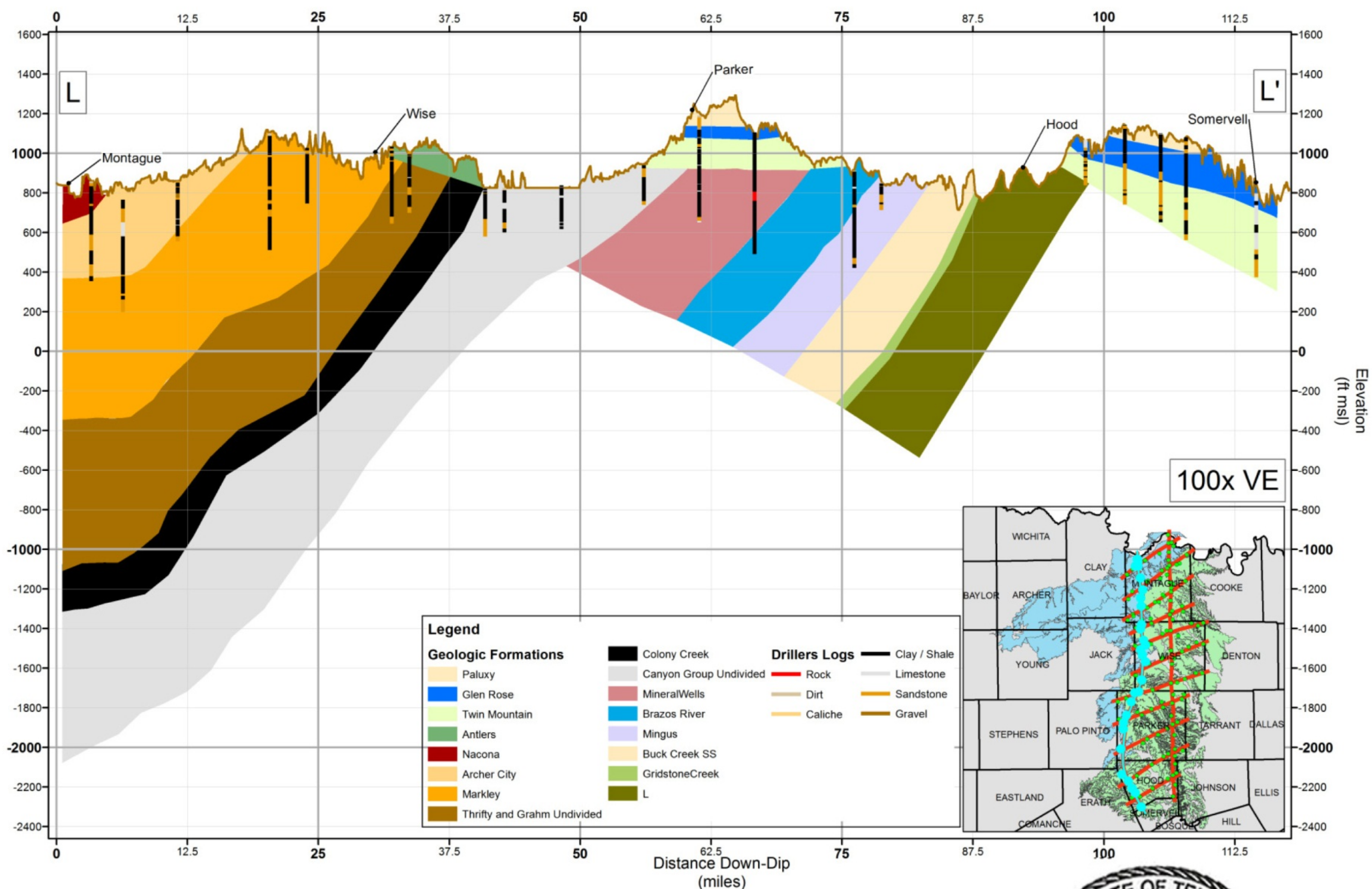
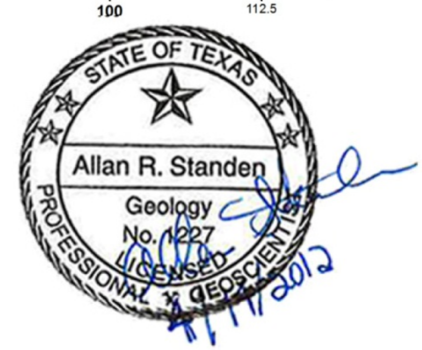


Figure 15. **Hydrogeologic Cross-Section L – L.**



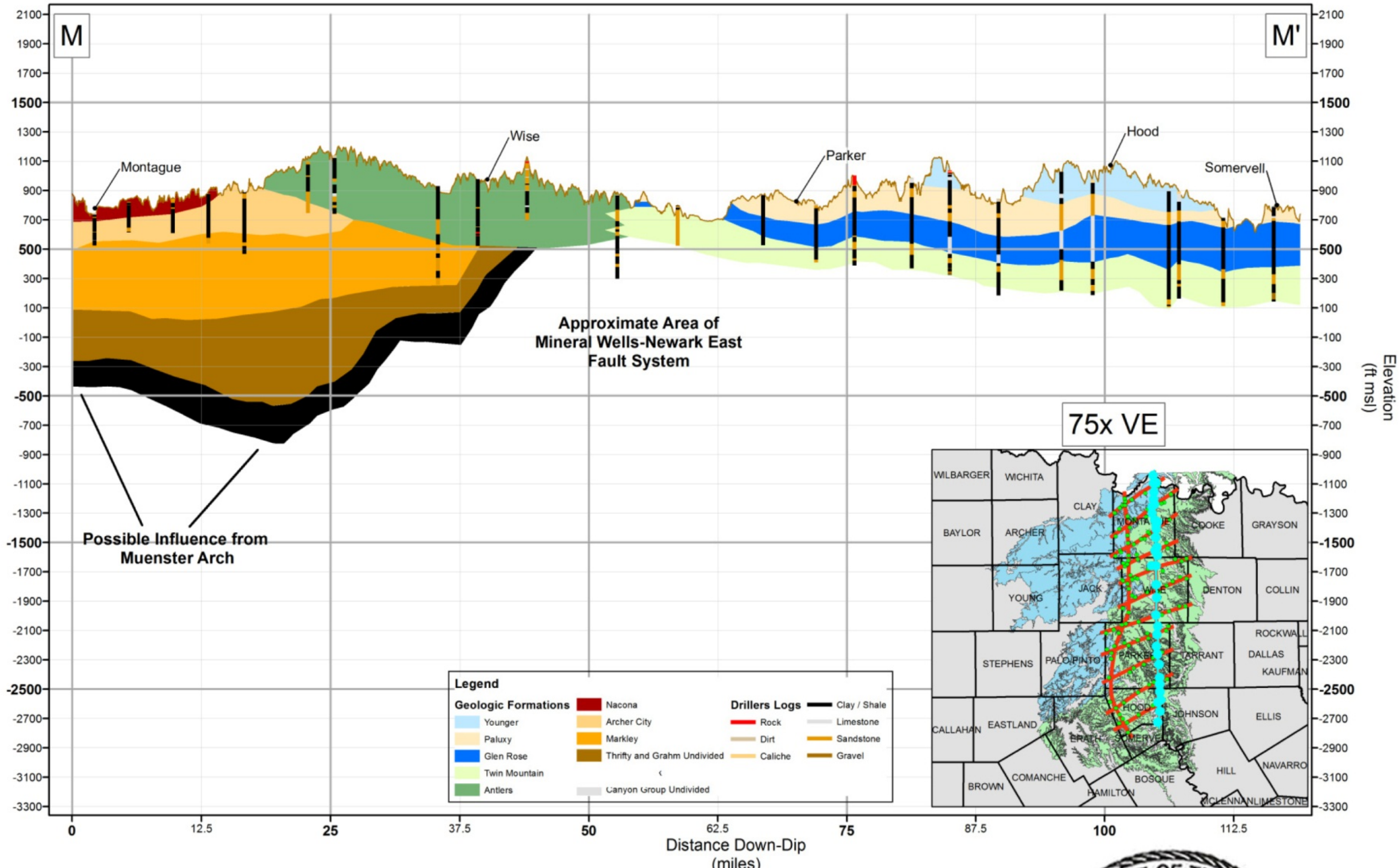


Figure 16. Hydrogeologic Cross-Section M – M.

3.0 Development of the UTGCD Monitoring Strategy

The purpose of Task 2 is to document a monitoring strategy for the District that defines the objectives and goals of the monitoring network, provides a context for evaluating Phase I monitor wells, and helps guide the expansion of the monitoring network in Phase II. The process of developing the monitoring strategy has been divided into three primary activities:

- Refine monitoring plan objectives and goals;
- Define monitoring constraints, if they exist; and
- Develop the strategy for expansion of the monitor well network and program

These activities are documented in this section.

3.1 Monitoring Plan Objectives and Goals

There are many objectives that can be defined for a monitoring program, derived from several separate but overlapping requirements of a District. In our review of the potential monitoring requirements, it was determined that monitoring objectives could be derived from several sources including:

- Chapter 36 (The Water Code) of the Texas Administrative Code;
- Current and future District rules;
- Groundwater Management Plan; and
- Fundamental hydrogeologic characterization of aquifer conditions.

A review of the requirements that precipitate monitoring will be followed by a list of potential monitoring objectives.

3.1.1 Chapter 36 of the Texas Administrative Code

At a fundamental level, all monitoring requirements are derived from the statute defining the Groundwater Conservation Districts (TAC 36).

TAC 36.101 – Rulemaking Authority - Under TAC 36.101 the District has the authority to develop rules. The District is still in the early stages of its development of a comprehensive system to manage the groundwater resources located within its boundaries. The District is acutely aware that the path it ultimately pursues for the permitting and regulation of water wells may have a significant impact on the manner in which water is provided to support human, animal, and plant life, land development, public water supplies, commercial and industrial operations, agriculture, and other economic growth in the District. The District Board takes its responsibilities very seriously with regard to these decisions and the impacts they may have on the property rights of the citizens of the District, and desires to undertake its approach to the development of a permitting and regulatory system in a careful, measured, and deliberate manner. In that regard, the District is determined to accumulate as much data and information as is practicable on the groundwater resources located within its boundaries before developing permanent rules and regulations that would impose permitting or groundwater production regulations on water wells.

The District began its initial studies and analysis of the aquifers and groundwater use patterns in early 2008 in an attempt to both catch up with then-ongoing discussions regarding the development of desired future conditions of the aquifers by the existing groundwater conservation districts in GMA-8, and to develop some baseline information on which decisions could be made for the development of temporary rules governing water wells. In August 2008, the District adopted its first set of temporary rules, which pioneer the District's information-gathering initiative. The District recognizes that the collection of District-scale hydrogeologic information such as groundwater levels, stratigraphy and hydraulic properties is critical to making sound policy and rules. As a result, both the Phase I and Phase II Monitoring Programs are being developed to support these fundamental requirements of the District.

TAC.36.1071 – Management Plan - The 75th Texas Legislature established a comprehensive regional and statewide water planning process in 1997. A critical component of that far-reaching overhaul of the Texas' water planning process included a requirement that each groundwater conservation district develop a management plan that defines the water needs and supply within each district and defines the goals the district will use to manage the groundwater in order to meet the stated needs or demonstrate that the needs exceed available groundwater supplies. Information from each district's management plan is incorporated into the regional and state water plans. The management plan is also used as the basis for the development of the district's permitting and groundwater management rules. A key component of the management plan is the establishment of a set of performance standards and management objectives which the District will use to demonstrate that they are achieving management goals set forth in the plan.

TAC.36.108 – Joint Planning in Management Area - This statute requires joint planning among districts located within the same Groundwater Management Area ("GMA"). Among other activities conducted pursuant to this joint planning process, the districts within each GMA must establish desired future conditions for all relevant aquifers located in whole or in part within the GMA. The desired future conditions established through this process are then submitted to the Texas Water Development Board ("TWDB"), which is required to provide each district with estimates concerning the amount of groundwater that can be produced from each relevant aquifer annually within each county located in the GMA in order to achieve the desired future conditions established for each aquifer. This quantified annual water budget for each aquifer is known as the "Modeled Available Groundwater" or "MAG" amount. Chapter 36 requires that technical information, such as the desired future conditions of the relevant aquifers within a district's jurisdiction and the amount of managed available groundwater from such aquifers, be included in the district's management plan. In addition, it is a requirement of the District to be able to demonstrate that they are achieving the DFC which can only be done through a monitoring program.

Other key aspects of this statute that are relevant to monitoring include the ability for a District to consider aquifer conditions and how they may vary geographically across a District. Statute TAC.36.108.D-1(1) states that districts can set DFCs differently in each aquifer, subdivision of an aquifer or geologic strata. This allows the District to adopt dissimilar regulatory approaches for wells completed in separate aquifers or in different geographic regions of the District, in order to address critical areas or to otherwise tailor regulations that are more suitable for a particular aquifer or area. For example, groundwater management strategies employed for the outcrop of the aquifer may differ from those utilized in subcrop areas. This regulatory flexibility may be appropriate to a District but requires hydrogeologic data including monitoring data to define these portions of the aquifer that may warrant such treatment.

3.1.2 Current or Future District Rules

In August 2008, the District adopted its first set of temporary rules, which pioneer the District's information-gathering initiative. Among other things, the rules require most large wells to be registered with the District, have meters installed to record the amount of groundwater produced, and submit records of the amounts produced to the District. Large well owners are also required to submit fee payments to the District based upon the amount of groundwater produced.

In addition, all new wells are required to be registered with the District and comply with the minimum well spacing requirements of the District. The minimum well spacing requirements were developed by the District to try to limit the off-property impacts of new wells to existing registered wells and adjoining landowners. They include minimum tract size requirements, spacing requirements from the property line on the tract where the well is drilled, and spacing requirements from registered wells in existence at the time the new well is proposed. The spacing distances were developed through hydrogeologic modeling of the varying sizes of the cones of depression of various well capacities, and such distances naturally increase with increases in well capacities. The District's spacing requirements should go a long way toward limiting well interference problems between new wells and between new and existing wells.

The District's monitoring network can be assimilated with groundwater production and use reports and estimates, well location and completion data, information on aquifer recharge rates and other hydrogeologic properties, and other information, in a database that the District is developing to enable it to better understand and manage the groundwater resources of the area. Information gleaned from these efforts will be used by the District in the future in the establishment of desired future conditions for the aquifers, in the monitoring of actual conditions of the aquifers and calibration of modeled conditions, in making planning decisions, and in the development of permanent District rules. These rules may include a permitting system for water wells and the potential for managing the District aquifers in a series of management zones recognizing the potential variability within the aquifers and their use.

3.1.3 Groundwater Management Plan

The Groundwater Management Plan provides several policy statements or management goals and performance standards that relate to the District Monitoring Plan. Specifically, the District's Mission statement states that the District will manage groundwater in a fair and equitable manner such that availability and accessibility of groundwater will remain for future generations. In addition the statement explicitly provides a desire to protect the quality of the groundwater in the recharge zone of the aquifer. This mission statement implies an understanding of the conditions of the aquifer (both water levels and water quality) that can only be accomplished through a deliberate monitoring program.

In the goals, management objective and performance standards section of the Management Plan the District sets specific goals and objectives specific to monitoring to comply with 31TAC(a)(1)(H) ((Implementing TWC §36.1071(a)(8)). These are reproduced below.

F.1 Objective - Within 3 years of Groundwater Management Plan adoption develop a Groundwater Monitoring Program within the District.

F.1 Performance Standard - Upon development, attachment of the District Groundwater Monitoring Program to the District's Annual Report to be given to the District's Board of Directors.

F.2 Objective - Upon approval of the District Monitoring Program – conduct water level measurements at least annually on groundwater resources within the District.

F.2 Performance Standard - Annual evaluation of water-level trends and the adequacy of the monitoring network to monitor aquifer conditions within the District and comply with the aquifer resources desired future conditions. The evaluation will be included in the District's Annual Report to be given to the District's Board of Directors. (See Table 5, in the main document)

F.3 Objective - Monitor non-exempt pumping within the District for use in evaluating District compliance with aquifer desired future conditions.

F.3 Performance Standard - Annual reporting of groundwater used by non-exempt wells will be included in the Annual Report provided to the District's Board of Directors. (See Table 2in the main document)

3.1.4 Fundamental Hydrogeologic Characterization of Aquifer Conditions

In addition to the requirements of monitoring described above, the management of groundwater implies groundwater monitoring and the collection of hydrogeologic data to characterize groundwater conditions. These generally support all of the implied or explicit objectives or requirements for monitoring and basic data collection defined in the preceding three sections. The objectives which may be classified as supporting hydrogeologic characterization include:

- Characterize current baseline groundwater levels in aquifers within the District;
- Characterize trends in aquifer levels in the District;
- Characterize hydraulic gradients within the District, i.e.:
  - Horizontal within aquifers
  - Vertical between aquifers
- Identify aquifers or aquifer zones that may respond distinctively to development and thus may be candidates for different management rules, e.g.:
  - Shallow versus deep (unconfined versus confined)
- Characterize aquifer response to pumping;
- Quantify available groundwater in the District;
- Identify areas susceptible to drought or significant drawdown from increased pumping during drought;
- Monitor aquifer water quality and trends in water quality, e.g.:
  - Isotopic fingerprinting of methane and other higher hydrocarbons (C_2-C_6) in areas of intense fracing operations
  - Characterization of brackish resources in the District
- Identify zones prone to surface contamination;
- Estimate recharge;
- Estimate groundwater and surface water interaction.

3.1.5 Summary of Monitoring Goals and Objectives

From the review of potential monitoring objectives and requirements provided in the sections above, one can conclude that there are many reasons for monitoring, many of which overlap. All of these monitoring objectives are worthy of consideration and relevant to the management of groundwater resources. While all identified objectives may be considered given the general mission statement for the District, it makes sense to prioritize the most important objectives above those that are not required through rule, statute or Management Plan requirements.

We consider the following monitoring objectives to be most important because they are either implicitly or explicitly required based upon the Districts rules or Management Plan.

- Establish current baseline groundwater levels in aquifers within the district;
- Establish trends in aquifer levels in the District;
- Define unique aquifer areas that could be established as separate groundwater management areas and therefore be handled differently in future rules, e.g.:
  - Shallow versus deep
  - Aquitards versus Aquifers
  - Paleozoic aquifer system versus the Trinity aquifer
- Provide adequate information to define future DFCs both in the Trinity and the Paleozoic Aquifers;

  - Better inform what is sustainable pumping
  - To be used to develop a better groundwater availability model
- Provide a means for definition of Desired Future Conditions within the district and a method for compliance demonstration.

There are several other monitoring requirements that are likely important to the District but may be of lower priority. These could include:

- Establish water quality within the District and trends in water quality;
- Determine areas prone to water quality degradation;
- Determine areas prone to drought to perhaps assist in drought planning;
- Provide a basis for drought management planning and drought impacts on groundwater conditions; and
- Define the base of freshwater in the District as well as the extent of brackish resources;
- Monitor the base of useable water as defined by the Railroad Commission, especially in areas of high density oil and gas exploration and production;
- Develop some isotope signature data in the deep aquifers in areas of high density oil and gas exploration and production;
- Monitor recharge in the shallow unconfined aquifer systems;
- Monitor aquifer levels at the borders of the District to define potential impacts from pumping outside of the District.

3.2 Monitoring Constraints

There are several constraints that one may consider applicable to the expansion of an existing monitoring network. These may include:

- Staff resources available to monitor network (number of wells);
- Costs associated with monitoring (number of wells);
- Current DFC and inherent assumptions and
- New versus existing wells.

Each of the more important constraints to our analysis will be described in the following sections.

3.2.1 Number of Wells

There exists a physical limit as to the number of wells that District staff can visit in a quarter and measure water level while still performing their other duties. This constraint has been brought up with the Board and the General Manager and at this time it is the District's opinion that they could double the number of wells in the current network. For purposes of this analysis, we are assuming that another 80 wells could be brought into the network in addition to those currently in the network. This number could change as we go through the analysis phase of this study. It is also assumed that the resources required to manage the larger network are available to current District staff.

3.2.2 Cost Constraints

It will be assumed that costs associated with the addition of 80 monitor wells will be acceptable from a District perspective. In addition, we will assume that each existing well will require an equal resource commitment for sampling.

3.2.3 Desired Future Condition and Basis

The current Northern Trinity Aquifer DFC is based upon the Northern Trinity GAM (Bené and others, 2004). In the GAM, the Trinity Aquifer is divided into four model layers generally representing the dominant hydrostratigraphy of the Trinity Aquifer in Central and North-Central

Texas; the Upper Trinity (Paluxy and Glen Rose aquifers), the Middle Trinity (Hensell aquifer) and the Lower Trinity (Hosston aquifer). The GAM models the Paluxy aquifer as model layer 3, the Glen Rose aquifer as model layer 4, the Hensell aquifer as model layer 5, and the Hosston aquifer as model layer 7. Model layer 6 represents the Pearsall/Cow Creek/Hammett members of the Travis Peak Formation, which are conceptualized as a confining unit. The relationship between these model layers and the hydrostratigraphy in the District is illustrated in **Table 2**. Table 2 shows that the GAM layering is inconsistent with the District hydrostratigraphy and this discrepancy becomes worse as one moves into the Antlers Formation in the Northern parts of the District. The Hensell and Hosston aquifers are generally not defined in the District but are combined as the Travis Peak Formation. As one moves north of the middle of Wise County, the Glen Rose (model layer 4) also becomes unidentifiable as a distinct unit and is generally lumped with the Antlers Formation. In regions of the District north of Decatur, the entire Trinity Aquifer sequence is generally mapped as the Antlers Formation.

Because the GAM was used as a means of defining desired future conditions as well as estimating the modeled available groundwater, the following discussion of the DFC uses terms of hydrostratigraphic nomenclature and model layers consistent with the GAM.

Table 2. Relationship Between District Trinity Aquifer Hydrostratigraphy and the Current Northern Trinity Aquifer GAM.

District Geology		GAM Model	
Montague and northern Wise counties	**Hood, Parker, southern Wise counties**	**Model Stratigraphy**	**Model Layer**
Antlers Formation	Paluxy Sand	Paluxy aquifer	3
	Glen Rose Formation	Glen Rose aquifer	4
	Twin Mountains Formation	Hensell aquifer	5
		Pearsall/Cow Creek/Hammett/ Sligo confining unit	6
		Hosston aquifer	7

The desired future conditions were specified based upon average drawdown from the year 2000 through the year 2050 on a county and aquifer (model layer) basis. **Table 3** defines the desired future conditions for the four counties comprising the District for the Northern Trinity Aquifer. For example, for the Hosston aquifer in Hood County, the specified management goal (desired future condition) is defined "from estimated year 2000 conditions, the average drawdown of the Hosston Aquifer should not exceed approximately 56 feet after 50 years" (Wade, 2009). All of the desired future conditions are specified in Wade (2009) in a similar format. These are summarized in **Table 3**.

Table 3. Desired Future Conditions and Managed Available Groundwater for the Northern Trinity Aquifer in the District.

County	Trinity Sub-Aquifer	Desired Future Condition(1)	Managed Available Groundwater (2) (AFY)
Hood	Paluxy	1	942
	Glen Rose	2	4
	Hensell	16	3,595
	Hosston	56	6,604
Hood County Total		NA	11,145
Parker	Paluxy	5	9,800
	Glen Rose	6	192
	Hensell	16	1,441
	Hosston	40	3,815
Parker County Total		NA	15,248
Wise	Paluxy	4	2,559
	Glen Rose	14	5
	Hensell	23	1,480
	Hosston	53	5,238
Wise County Total		NA	9,282
Montague	Paluxy	0	505
	Glen Rose	1	-
	Hensell	3	362
	Hosston	12	1,807
Montague County		NA	2,674
District Total		**NA**	**38,349**

OUTDATED

(1) Average drawdown in feet after 50 years from the year 2000
(2) from GAM Run 08-84mag (Wade, 2009)

From a monitoring network perspective, any aquifer DFC is very important in that it defines a constraint on how the monitoring network should be configured. The District Management Plan has explicit performance standards for evaluating the District monitoring program with respect to its adequacy to comply with the DFC. As a result, the monitoring network must be evaluated against the DFC. The current Trinity Aquifer DFC and MAG are couched in terms of GAM model layers that do not necessarily correlate to the District hydrogeology. However, the model layering must be used as a basis for evaluating and further developing the District monitoring network. We will also review the monitoring network using the hydrogeologic framework defined in Section 2.0.

GMA-8 did not propose a DFC for the Paleozoic aquifers systems in the District during Round 1 of the Joint-Planning Process. As a result, there is no equivalent DFC to be used to constrain the monitoring network. For the Paleozoic aquifers we will use the hydrogeologic framework defined in Section 2.0.

Finally, it has been documented by the District that the current Northern Trinity GAM has limitations to its use. As a result, four Districts within GMA-8 agreed to make revisions to the GAM over the course of the last 2 years. GAMs provide useful tools for supporting monitor well network development activities. The current Northern Trinity GAM is not ideal for these purposes for the UTGCD. However, we will try to use the GAM to the degree possible to understand the development of a monitor well network that can defensibly be used to evaluate aquifer conditions as they relate to the DFC.

3.2.4 New Versus Existing Wells

We are assuming that due to cost considerations, the Phase II wells will overwhelmingly consist of existing wells. It may be that once the analysis of the current network and the availability of existing wells are known, drilling a new well may be recommended to the District. However, new wells will only be recommended after the analysis has determined the need.

3.3 Monitoring Strategy

The monitoring strategy is meant to define the strategic concepts or framework that will guide the evaluation and augmentation of the Phase I monitoring network. While the summary in Section 3.1.5 shows that the individual objectives of a monitoring program can be numerous and varied, they all fall within a fundamental requirement: to be able to monitor the aquifer resources within the District at a scale commensurate with the management objectives or the future management objectives.

The current most important management objective stated for the District is the DFC Statement adopted by GMA-8 and instituted into the District Management Plan (Section 3.2.3 above). We will develop a strategy that keeps the DFC in center focus while also looking at other important aspects of District hydrogeology such as trends in water levels, current pumping distribution, shallow versus deep well screens and the hydrogeologic framework defined in Section 2.0.

The Paleozoic Aquifers do not currently have a DFC developed. The strategy that is developed for the Paleozoic aquifers will be informed by the development of the Trinity Aquifer monitoring strategy, with variation for the unique hydrogeology of the Paleozoic aquifers.

3.3.1 Trinity Aquifer Monitoring Strategy

Our strategy for the assessment of the current Phase I Trinity Aquifer monitoring network will also be used to guide the augmentation of the network in Phase II. The process will be sequential, as outlined in the following.

Step 1 – Establish Full Set of Potential Monitor Wells:

The first step will require two data sets. One is the existing Phase I monitor well network and data. The second will be a database with the available completion (screen location) information for all other potential wells. A potential well must have adequate location, elevation and completion information available, that any water level measurement can be accurately referenced to a common vertical datum, and definitely assigned to a particular aquifer or section of aquifer. It will also be important that the monitor well has a history of water level measurements. Because the DFC is based upon drawdown since the year 2000, it would be best if the time series starts by the year 2000, or can be reliably extrapolated back to that time.

In addition to these attributes, there are other practical considerations that can only be assessed once site visits have begun.

Step 2 – Develop DFC Zones:

The second step will be to divide the Trinity Aquifer within the District into 20 zones based upon the current DFC (termed DFC Zones). These zones are defined by the combination of Northern Trinity Aquifer GAM layer (based on the model grid discretization) and county. An initial assessment of the Phase I wells will be performed to determine whether a monitor well currently exists in each DFC Zone. If this is not the case, we try to find a candidate well for those "empty" zones.

Step 3 – Investigation of Monitor Well Location Based Upon DFC Methods:

Step 3 is an empirical study of the required or optimal number of monitor wells that may be required in a given DFC Zone to reproduce the DFC as calculated from the GAM. The TWDB calculated the DFC using the GAM by averaging drawdown calculated at each GAM model cell for a given model layer and county (DFC Zone) from the year 2000 to 2050. The GAM model grid is a one square mile grid. The District cannot support a monitoring program that would monitor every square mile of the District (3,208 square miles times four model layers equals 12,832 monitor wells). Therefore, the question that has to be addressed is how many monitor wells are required to provide good agreement with the model average methods used by GMA-8.

To test the number of required wells, we will simulate the performance of a hypothetical monitoring network using the existing DFC run. We will start by ensuring that each DFC Zone has at least one monitor well, from the Phase I wells and potential new monitor wells. At these well locations, we will extract the simulated head from the DFC run. These point "measurements" of head represent the simulated monitoring network. We will then estimate average drawdown in each DFC Zone based on these heads. The average will be calculated by interpolating the point "measurements" onto a one square mile grid, then taking the arithmetic mean of the grid values for each DFC Zone.

The DFC Zone drawdown averages estimated from the simulated monitoring network will be compared to the actual DFC run drawdown averages by DFC Zone. We expect there will be a difference between the two values, since the monitoring network has a limited head coverage compared to the GAM.

In a next iteration, we increase the number of monitor wells in those zones with the greatest difference between the estimate from the hypothetical monitoring network and the GAM. The new wells will be located based on an equal area, space filling approach or potentially by adding monitor points at locations where we have identified potential monitor wells. We will consider both options. This increase in well coverage will improve the performance of the monitor well network in those zones. Thus with each iteration, the hypothetical monitoring network will provide an average drawdown estimate that is closer to the DFC.

By this analysis, we hope to gain insight into the number (and potentially the strategy for location) of monitor wells that will adequately track the DFC. The best case we can expect out of this analysis approach is an optimal number of monitor wells in each DFC Zone.

An enhancement to the above analysis would be to look at the improvement (i.e., decrease in monitoring points) that may occur if we account for pumping in our monitor well selection process, instead of the initial space-filling approach. This would require calculation of a pumping density function (acre-feet per year per square-mile) that will be used to guide the location of additional monitor wells. Theoretically, this approach should improve our ability to reproduce the DFC with a smaller number of monitor points.

At the end of Step 3, we hope to have insight into the number of monitor wells it takes to satisfactorily reproduce the DFC average drawdown for each DFC Zone. We will also gain insight into the proposed approach for locating new wells based on pumping density.

Step 4 – Consideration of Water Level Trends:

In Step 4 we will use an analysis of water level trends to provide additional information for locating monitor wells. A monitor well program should be able to track large scale water level declines as a result of large pumping centers as well as regions of the aquifer that appear stable. Our objective is to characterize the trends in water levels at a scale much smaller than a county but not directly affected by pumping (i.e. not in a pumping well or directly adjacent to one).

We will use the data from the Phase I monitor wells in addition to any other available time series data to develop trends. We will focus our analysis on the time period from 2000 to present as this is the drawdown baseline used in the GMA-8 DFC calculations. We will look at two alternatives for this analysis. First, we will see if we have adequate time series data to investigate trends in each DFC Zone. Second, we will look at the dataset more globally and see if the data is defining areas of stable versus decreasing water level trends.

Step 5 - Initial Monitor Well Location Based Previous Analyses:

By this point in the analysis we will have developed some insight into:

- the number of wells needed to satisfactorily reproduce the DFC calculations;
- the influence of pumping on developing a better monitoring network; and
- trends in water levels across the District.

Based on this knowledge, we are ready to evaluate the Phase I wells and start identifying potential Phase II wells.

The first requirement will be the development of a District pumping dataset based upon the District's metered data and the District's best estimate of groundwater use. We will attempt to locate pumping as closely as possible to point locations. Once this is developed, we will use the actual District pumping data to develop a pumping density function for the District. We will then use the DFC Zones, the pumping data and the water level trend data to evaluate Phase I wells and to identify potential Phase II monitor wells.

Step 6 –Screen Monitor Well Locations Based on Updated Hydrogeology:

Because much of the focus at this point has been on the GAM model layering which is based on hydrostratigraphy that is not well matched to District conditions, the next step in the strategy is to compare the draft monitoring network to the hydrogeology developed as part of this scope of work (see Section 2). We will intersect all monitor well screens with the new hydrogeologic framework and make sure that these intervals are being adequately monitored.

Step 7 –Screen Monitor Well Locations Considering Shallow versus Deep:

Finally, we will review the draft monitoring network in terms of how well it does at monitoring aquifer conditions across the District in both shallow (unconfined to semi-confined) and deep (confined) portions of the aquifer system. We will also develop a registered well density coverage and assess whether the overall monitoring network does a good job of mimicking the density of groundwater use as it can be defined from registered wells.

3.3.2 Paleozoic Aquifer Monitoring Strategy

Our strategy for the Paleozoic Aquifers will be similar to that proposed for the Northern Trinity Aquifer with the exception that we will not be defining DFC Zones. Below each step will be discussed in terms of the Paleozoic Aquifers. We will develop similar zones based upon the hydrogeologic framework for assessment of the current Phase I Trinity Aquifer monitoring network. These zones will also be used to guide the augmentation of the network in Phase II. The process will be sequential.

Step 1 – Establish Universe of Potential Monitor Wells:

The same strategy and process used for the Trinity aquifer will be used for the Paleozoic aquifers (see Section 3.3.1, Step 1).

Step 2 – Develop Hydrostratigraphic-County Zones:

The second step will be to divide the Paleozoic aquifers into unique Hydrostratigraphic-County zones. Initially we will define five unique hydrostratigraphic units (Wichita, Bowie, Cisco, Canyon and Strawn) and four counties making 20 maximum combinations. In reality, there are fewer because each hydrostratigraphic unit does not reside in every county. An initial assessment of the Phase I wells will determine whether a monitor well is located in each of the Hydrostratigraphic-County zones. If this is not the case, we try to identify a potential well in each.

Step 3 – Investigation of Monitor Well Location Based Upon DFC Methods:

Step 3 cannot be performed for the Paleozoic aquifers because they have neither a DFC nor a GAM.

Step 4 – Consideration of Water Level Trends:

In Step 4 we will use an analysis of water level trends to provide additional information for locating monitor wells. In a monitor well program you want to be able to monitor large scale water level declines as a result of large pumping centers as well as monitor regions of the aquifer that appear stable. Our objective is to characterize the trends in water levels at a scale much smaller than a county but not directly affected by pumping (ie., not in a pumping well or directly adjacent to one).

We will use the data from the Phase I monitor wells in addition to any other available time series data to develop trends. We will look at two alternatives for this analysis. First, we will see if we have adequate time series data to investigate trends in each Hydrostratigrahic-County zone. Secondly, we will look at the dataset more globally and see how the data is defining areas of stable versus decreasing water level trends.

Step 5 - Initial Monitor Well Location Based Previous Analyses:

We will use the insight gained from Step 3 in the Trinity aquifer analysis along with the trend analysis data to evaluate the Phase I wells and to start identifying potential Phase II wells.

The first step of this analysis will be the development of a District pumping dataset based upon the District's metered data and the District's best estimate of groundwater use. We will attempt to locate pumping as closely as possible to point locations. Once this is developed, we will use the actual District pumping data to develop a pumping density function for the District. Once we have that we will use the Hydrotsratigraphic-County zones, the pumping data and the water level trend data to identify Phase I redundant wells and to identify potential Phase II monitor wells. In addition to the District database, we currently have the last 10 years of driller's reports for wells identified as being drilled for oil and gas exploration. We can also get the last 10 years of oil and gas well locations from the Railroad Commission for approximately $200. This data can help us see where oil and gas water use is most likely.

Step 6 –Screen Monitor Well Locations Based on Updated Hydrogeology:

Because we are using the hydrostratigrahic framework to develop the network, this step is unnecessary.

Step 7 –Screen Monitor Well Locations Based Upon Shallow versus Deep Screens:

Finally, we will review the draft monitoring network in terms of how well it does at monitoring aquifer conditions across the District in both shallow (unconfined to semi confined) and deep (confined) portions of the aquifer system. We will also develop a registered-well density coverage to assess whether the overall monitoring network does a good job of mimicking the density of groundwater use as it can be defined from registered wells.

References

Bayha, D.C., 1967, Occurrence and Quality of Ground Water in Montague County, Texas: Texas Water Development Board, Report 58.

Bené, J., Harden, B., O'Rourke, D., Donnelly, A., and Yelderman, J., 2004, Northern Trinity/Woodbine Groundwater Availability Model: Contractor Report to the Texas Water Development Board by R.W. Harden and Associates.

Broadhurst, W. L., and Follett, C. R., 1944, Ground-water Resources in the Vicinity of Nocona, Montague County, Texas: Texas Board Water Engineers, 17 p.

Brown, Jr., L.F., Goodson, J.L., Harwood, P., and Barnes, V.E., 1972, Geologic Atlas of Texas, Abilene Sheet, Scale: 1:250,000, Frederick Byron Plummer Memorial Edition: The University of Texas at Austin, Bureau of Economic Geology.

McGowen, J.H., Hentz, T.F., Owen, D.E., Pieper, M.K., Shelby, C.A., and Barnes, V.E., 1967, Geologic Atlas of Texas, Sherman Sheet, Scale: 1:250,000, Walter Scott Adkins Memorial Edition: The University of Texas at Austin, Bureau of Economic Geology.

McGowen, J.H., Proctor, Jr., C.V., Haenggi, W.T., Reaser, D.F., and Barnes, V.E., 1972, Geologic Atlas of Texas, Dallas Sheet, Scale: 1:250,000, Gayle Scott Memorial Edition: The University of Texas at Austin, Bureau of Economic Geology.

Wade, S.C., 2009, GAM Run 08-84mag: Texas Water Development Board, http://www.twdb.state.tx.us/gam/GAMruns/GR08-84mag.pdf.

APPENDIX 3

Upper Trinity Groundwater Conservation District

ANNUAL FINANCIAL REPORT

FOR THE YEAR ENDED DECEMBER 31, 2022

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Annual Financial Report
For the Year Ended December 31, 2022

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INDEPENDENT AUDITORS' REPORT

Board of Directors and General Manager
Upper Trinity Groundwater Conservation District
Springtown, Texas

Opinions

We have audited the accompanying financial statements of the governmental activities and each major fund of the Upper Trinity Groundwater Conservation District (the District) as of and for the year ended December 31, 2022, and the related notes to the financial statements, which collectively comprise the District's basic financial statements as listed in the table of contents.

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the governmental activities and each major fund of the District as of December 31, 2022, and the respective changes in financial position for the year end ended in accordance with accounting principles generally accepted in the United States of America.

Basis for Opinions

We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of the District and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audit. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America, and for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the District's ability to continue as a going concern for twelve months beyond the financial statement date, including any currently known information that may raise substantial doubt shortly thereafter.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinions. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with generally accepted auditing standards will always detect a material misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the financial statements.

In performing an audit in accordance with generally accepted auditing standards, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the District's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about the District's ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control-related matters that we identified during the audit.

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis, budgetary comparison information, schedule of change in Net Pension Liability and Related Ratios, Schedule of Contributions, and Notes to Required Supplementary Information (the Supplementary Information) be presented to supplement the basic financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the basic financial statements. The information has been subjected to the auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the Supplementary Information is fairly stated, in all material respects, in relation to the basic financial statements as a whole.

Boucher, Morgan & Young

Granbury, Texas
June 29, 2023

MANAGEMENT’S DISCUSSION AND ANALYSIS

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
MANAGEMENT’S DISCUSSION AND ANALYSIS

As management of the Upper Trinity Groundwater Conservation District, we offer readers of the District’s financial statement this narrative overview and analysis of the financial activities of the District for the fiscal year ended December 31, 2022. The District has implemented Governmental Accounting Standards Board Statement 34 – Basic Financial Statements and Management’s Discussion and Analysis for State and Local Governments.

Financial Highlights:

The assets and deferred outflows of the Upper Trinity Groundwater Conservation District exceeded its liabilities and deferred inflows at the close of the most recent fiscal year by $7,884,682.

The District’s total net position increased by $786,198 during the fiscal year.

Overview of Financial Statements:

This discussion and analysis is intended to serve as an introduction to the District’s basic financial statements. The District’s basic financial statements are comprised of three components: 1) government-wide financial statements, 2) fund financial statements, and 3) notes to the financial statements. This report also contains other supplementary information in addition to the basic financial statements themselves.

Government-wide financial statements – The government-wide financial statements are designed to provide readers with a broad overview of the District’s finances, in a manner similar to a private-sector business.

The Statement of Net Position presents information on all of the District’s assets and liabilities, with the difference between two reported as net position. Over time, increases or decreases in net position may serve as a useful indicator of whether the financial position of the District is improving or deteriorating.

The Statement of Activities presents information showing how the District’s net position changed during the fiscal year. All changes in net position are reported when the underlying event giving rise to change occurs, regardless of the timing of related cash flow. Thus, revenues and expenses are reported in this statement for some items that will only result in cash flows in the future fiscal periods.

Both of the government-wide financial statements distinguish functions of the District that are principally supported by charges and fees. The governmental activity of the District is to develop and enforce rules to provide protection to existing wells, to prevent waste and promote groundwater conservation.

Fund financial statements – A fund is a grouping of related accounts that is used to maintain control over resources that have been segregated for specific activities or objectives. The District, like other state and local governments, uses fund accounting to ensure and demonstrate compliance with finance-related legal requirements. The funds of the District consist solely of the one governmental fund.

Governmental Funds – Governmental funds are used to account for essentially the same functions reported as governmental activities in the government-wide financial statements. However, unlike the government-wide financial statements, governmental fund financial statements focus on near-term inflows and outflows of spendable resources, as well as on balances of spendable resources available at the end of the fiscal year. Such information may be useful in evaluating a government's near-term financing requirements.

Because the focus of governmental funds is narrower than that of the government-wide financial statements, it is useful to compare the information presented for governmental funds with similar information presented for governmental activities in the government-wide financial statements. By doing so, readers may better understand the long-term impact of a government's near-term financing decisions. Both the governmental fund balance sheet and the governmental fund statement of revenues, expenditures and changes in fund balance provide a reconciliation to facilitate this comparison between governmental funds and governmental activities.

> At the close of the current fiscal year, the District's governmental fund reported ending fund balance of $5,493,144 compared to the $5,094,576 in the prior year.

Notes to the Financial Statements – The notes provide additional information that is essential to a full understanding of the data provided in the government-wide and fund financial statements. The notes to the financial statements can be found on pages 19-32 of this report.

Governmental-Wide Financial Analysis

As noted earlier, net position may serve, over time, as a useful indicator of a government's financial position. In the case of Upper Trinity Groundwater Conservation District, assets and deferred outflows exceeded liabilities and deferred inflows by $7,884,682 as of December 31, 2022.

The largest portion of the District's net position is Unrestricted, while the remaining balance reflects its investment in capital assets.

Upper Trinity Groundwater Conservation District's Net position:

	Governmental Activities 2021	Governmental Activities 2022
Current assets	$ 5,264,847	$ 5,656,746
Capital assets	1,927,472	2,292,746
Net pension asset	37,013	65,704
Total assets	7,229,332	8,015,196
Deferred outflows	78,011	100,265
Total assets and deferred outflows	7,307,343	8,115,461
Current liabilities	170,271	163,602
Total liabilities	170,271	163,602
Deferred inflows	10,122	67,177
Total deferred inflows	10,122	67,177
Net position:		
Net investment in capital assets	1,927,472	2,292,746
Unrestricted	5,171,012	5,591,936
Total Net Position	$ 7,098,484	$ 7,884,682

As of December 31, 2022, the District is able to report positive balances in both categories of net position.

Analysis of the District's Operations – The following table provides a summary of the District's operations for the year ended December 31, 2022. Governmental-type activities increased the District's net position by $786,198.

Upper Trinity Groundwater Conservation District's Changes in Net position

	Governmental Activities 2021	Governmental Activities 2022
Revenues:		
Program Revenues:		
Water usage fees	$ 949,328	$ 984,307
New well registration fees	1,204,600	1,344,600
Other program revenue	76,831	35,280
Total program revenues	2,230,759	2,364,187
General Revenues:		
Miscellaneous revenue	11,326	13,333
Gain on disposal of capital assets	11,000	20,000
Net Investment earnings	23,401	22,765
Total revenues	2,276,486	2,420,285
Expenses:		
Groundwater conservation	1,373,440	1,656,443
Total expenses	1,373,440	1,656,443
Change in net position	903,046	786,198
Net position - beginning of year	6,195,438	7,098,484
Net position - end of year	$ 7,098,484	$ 7,884,682

Financial Analysis of the Government's Funds

The net position increased in 2022 by $786,198 compared to a $903,046 increase in 2021. Increased new well registrations caused an increase in program revenue of $140,000. Expenses increased from the previous year by $283,003.

Capital Assets

The Upper Trinity Groundwater Conservation District's investment in capital assets as of December 31, 2022, amounts to $2,292,746 (net of accumulated depreciation). This investment in capital assets includes land, buildings, vehicles, furniture, equipment, and software.

Capital Assets at Year-End Net of Accumulated Depreciation

	Governmental - Type Activities 2021	Governmental - Type Activities 2022
Land	$ 267,834	$ 267,834
Building and improvements	949,994	1,301,415
Vehicles	165,050	222,376
Furniture and equipment	379,345	363,950
Software	165,249	137,171
Total	$ 1,927,472	$ 2,292,746

Depreciation expense on all assets amounted to $156,813 for the year.

Economic Factors for Next Year

The original budget for the 2023 fiscal year shows projected revenues of $2,014,000 and expenditures of $1,861,900.

On November 17, 2022 the Board of Directors of UTGCD passed and adopted Resolution 22-007 Allocation of Funds for the District. They designated "Committed Funds" for Operating Reserve Fund and Legal Reserve and Litigation Fund. They also designated "Assigned Funds" for Monitoring Well Drilling Fund, Facilities/Building Fund, Rainwater Harvesting Grant Program Fund, GAM Development Fund, Special Study Fund, and Technology Development Fund.

The Board believes it is very prudent to recognize the litigious nature of the process of DFC adoptions and issues related to rules which contain permit limitations on non-exempt water wells. In addition, the revenues from water usage could decline if certain situations occur. Therefore, the Board deems it wise to accumulate sufficient funds to cover operations and unexpected expenses should they lose any major fee payers.

The District's immediate and long-term financial goals are to fund necessary water conservation and monitoring programs with program revenues and to safeguard the cash on hand for future needs.

Political issues affecting the District include potential groundwater ownership legislative issues, definition of "brackish" water, and discussions of the authority of groundwater conservation districts.

There could be a continued decrease in groundwater used for oil and gas exploration or production if companies continue to move out of the Barnett Shale or if they increase their use of alternative water sources. Also, production of groundwater by public water systems could decrease if they increase conservation efforts or increase their supply of surface water.

Request for Information

This financial report is designed to provide our citizens, customers, investors and creditors with a general overview of the District's finances. If you have questions about this report or need any additional information, contact Upper Trinity Groundwater Conservation District in care of Doug Shaw, General Manager, 1859 W Hwy 199, P.O. Box 1749, Springtown, Texas 76082.

BASIC FINANCIAL STATEMENTS

UPPER TRINITY GROUNDWATER CONSERVATION
STATEMENT OF NET POSITION
DECEMBER 31, 2022

		Governmental Activities
ASSETS:		
Current assets:		
Cash and cash equivalents	$	1,304,499
Certificates of deposit		3,812,889
Receivables, net of allowance		512,032
Prepaid expenses		16,983
Deposits		1,610
Undeposited funds		8,733
Total current assets		5,656,746
Non-current assets:		
Capital assets:		
Nondepreciable		267,834
Depreciable, net		2,024,912
Net pension asset		65,704
Total assets		8,015,196
DEFERRED OUTFLOWS:		
Deferred retirement contributions		58,005
Deferred assumption/input changes		42,260
Total deferred outflows		100,265
Total assets and deferred outflows	$	8,115,461
LIABILITIES:		
Current liabilities:		
Accounts and credit card payables	$	23,851
Payroll liabilities		45,111
Driller deposits		94,640
Total liabilities		163,602
DEFERRED INFLOWS:		
Deferred investment experience		63,960
Deferred actual vs. assumption		3,217
Total deferred inflows		67,177
NET POSITION		
Net investment in capital assets		2,292,746
Unrestricted		5,591,936
Total net position	$	7,884,682

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
STATEMENT OF ACTIVITIES
FOR THE YEAR ENDED DECEMBER 31, 2022

		Program Revenues	Net (Expense) Revenue and Changes in Net Position — Primary Government
	Expenses	Charges for Services	Governmental Activities
Primary Government			
Governmental Activities			
General government	$ 1,634,087	$ 2,364,187	$ 730,100
Total governmental	1,634,087	2,364,187	730,100
General revenues			
Miscellaneous revenue			13,333
Gain on disposal of capital assets			20,000
Investment earnings			22,765
Total general revenues			56,098
Change in net position			786,198
Net position - beginning			7,098,484
Net position - ending			$ 7,884,682

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
BALANCE SHEET - GOVERNMENTAL FUND
DECEMBER 31, 2022

	General Fund
ASSETS	
Cash and cash equivalents	$ 1,304,499
Certificates of deposit	3,812,889
Accounts receivable, net of allowance	512,032
Prepaid expenses	16,983
Security deposits	1,610
Undeposited funds	8,733
Total assets	$ 5,656,746
LIABILITIES	
Accounts and credit cards payable	$ 23,851
Payroll liabilities	45,111
Driller deposits	94,640
Total liabilities	163,602
FUND BALANCE	
Nonspendable	16,983
Committed	1,250,000
Assigned	1,750,000
Unassigned	2,476,161
Total fund balance	5,493,144
Total liabilities and fund balance	$ 5,656,746

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
RECONCILIATION OF THE GOVERNMENTAL FUND BALANCE SHEET
TO THE STATEMENT OF NET POSITION
DECEMBER 31, 2022

Total Fund Balance - Governmental Fund		$ 5,493,144
Capital assets used in governmental activities are not financial resources and therefore are not reported in governmental funds balance sheet.		2,292,746
The statement of net position includes the District's proportionate share of the TCDRS net pension liability (asset) as well as certain pension related transactions accounted for as Deferred Inflows and Outflows of resources.		
Net pension asset (liability)	65,704	
Deferred retirement contributions	58,005	
Deferred investment experience	(63,960)	
Deferred actual vs. assumption	(3,217)	
Deferred assumption/input changes	42,260	98,792
Net Position of Governmental Activities		$ 7,884,682

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
STATEMENT OF REVENUES, EXPENDITURES,
AND CHANGES IN FUND BALANCE - GOVERNMENTAL FUND
FOR THE YEAR ENDED DECEMBER 31, 2022

	General Fund
Revenues:	
Exception fees	$ 4,671
Penalties assessed	17,709
Forfeited deposits	3,700
New well registration fees	1,344,600
Permit application fees	9,200
Semi-annual program income	984,307
Total program revenue	2,364,187
Investment earnings	22,765
Other sources	13,333
Total revenues	2,400,285
Expenditures:	
General government	1,499,630
Capital outlay	502,087
Total expenditures	2,001,717
Net change in fund balance	398,568
Fund balance - beginning of year	5,094,576
Fund balance - end of year	$ 5,493,144

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
RECONCILIATION OF THE GOVERNMENTAL FUNDS STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE TO THE STATEMENT OF ACTIVITIES
DECEMBER 31, 2022

Total Net Change in Fund Balance - Governmental Fund	$	398,568
Current year capital outlays are expenditures in the fund financial statements, but they should be shown as increases in capital assets in the government-wide financial statements. The net effect of removing the 2022 capital outlays is to increase net position.		502,087
Depreciation is not recognized as an expense in governmental funds since it does not require the use of current financial resources. The net effect of the current year's depreciation is to decrease net position.		(156,813)
Net pension liabilities as well as the related deferred inflows and outflows of resources generated from those assets are not payable from current resources and therefore, are not reported in the governmental funds. These balances increased (decreased) by this amount.		22,356
Governmental funds expend only the amount of cash paid for capital assets as capital outlay. However, in the statement of activities, the amount received as trade-in value for a capital asset would be recorded as a gain(loss) on disposal and would be offset by the remaining net book value of the disposed asset, if any.		20,000
Change in Net Position of Governmental Activities	$	786,198

The accompanying notes are an integral part of the financial statements.

NOTES TO FINANCIAL STATEMENTS

1. Organization

The Upper Trinity Groundwater Conservation District (the "District") is a political subdivision of the State of Texas created under the authority of Article XVI, Section 59, Texas Constitution, and operating pursuant to the provisions of the Texas Water Code, Chapter 36, and Senate Bill 1983, Acts of the 80th Legislature, Regular Session, 2007. The creation of the District was confirmed in an election by the citizens of Montague, Wise, Parker and Hood counties, Texas, on November 6, 2007.

The mission of the Upper Trinity Groundwater Conservation District is to develop rules to provide protection to existing wells, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, ensure that the residents of Montague, Wise, Parker, and Hood counties maintain local control over their groundwater, respect and protect the property rights of landowners in groundwater, and operate the District in a fair and equitable manner for all residents of the District.

2. Summary of Significant Accounting Policies

Generally Accepted Accounting Principles – Upper Trinity Groundwater Conservation District prepares its financial statements in accordance with accounting principles generally accepted in the United States of America, in conformity with authoritative pronouncements of the Governmental Accounting Standards Board (GASB).

A. Basis of Presentation – Government – Wide Statements

The government-wide financial statements (the statement of net position and the statement of activities) report information on all the activities of the District. There are only governmental activities, which normally are supported by taxes and governmental revenues, and are reported separately from business-type activities, which rely to a significant extent on fees and charges for support. The District has no business-type activities.

The statement of activities demonstrates the degree to which the direct expenses of a given program are offset by program revenues. Direct expenses are those that are clearly identifiable with a specific program. Program revenues include charges to customers or applicants who purchase, use, or directly benefit from goods, services, meeting the operational or capital requirements of a particular program. Taxes and other items not properly included among program revenues are reported instead as general revenues.

2. Summary of Significant Accounting Policies (continued)

B. Measurement focus, Basis of Accounting and Basis of Presentation

The government-wide statements are reported using the economic resources measurement focus and the accrual basis of accounting. Revenues are recorded when earned and expenses are recorded when a liability is incurred, regardless of the timing of related cash flow.

Governmental fund financial statements are reported using the current financial resources measurement focus and the modified accrual basis of accounting. Under the modified accrual basis of accounting, revenues are recognized as soon as they are measurable and available. Revenues are considered to be available when they are collectible within the current period or soon enough thereafter to pay the liabilities of the current period. Water usage fees for each six month period are due and payable one month after the period ends. The District recognizes all fees pertaining to the calendar year as revenues for that year.

Expenditures are generally recorded when the related fund liability is incurred.

The accounts of the District are organized and operated on the basis of funds. A fund is an independent fiscal and accounting entity with self-balancing set accounts. Fund accounting segregates funds according to their purpose and is used to aid management in demonstrating compliance with finance-related legal and contractual provisions. The minimum number of funds is maintained consistent with legal and managerial requirements.

The District reports the following major governmental fund: The *general fund* is the government's primary operating fund. It accounts for all financial resources of the general government, except those required to be accounted for in another fund.

There are no proprietary funds of the District generating significant operating revenues, such as charges for services, resulting from exchange transactions associated with the principal activity of the fund.

C. Cash and Cash Equivalents

For purposes of the statements of cash flows, the District considers highly liquid investments with a maturity of three months or less to be cash equivalent.

D. Receivables

Gross accounts receivable of $526,397 are presented in the Balance Sheet and Statement of Net Position net of an allowance for doubtful accounts in the amount of $13,378.

2. Summary of Significant Accounting Policies (continued)

E. Capital Assets, Depreciation, and Amortization

The District's capital assets with useful lives of more than one year stated as historical cost and comprehensively reported in the government-wide financial statements. The District generally capitalizes individual assets with an initial cost of $1,500 or more, or a grouping of like-kind assets with a total cost of $5,000 or more. Capital assets are depreciated using the straight-line method. When capital assets are disposed, the cost and applicable accumulated depreciation are removed from the respective accounts, and the resulting gain or loss is recorded in operations.

Estimated useful lives, in years, for depreciable assets are as follows:

Vehicles	5- 10 years
Furniture and equipment	5-50 years
Software	3-10 years
Building and improvements	30 years

Maintenance and repairs which do not materially improve or extend the lives of the respective assets are charged to expense as incurred.

F. Pensions

For purposes of measuring the net pension liability (asset), deferred outflows of resources and deferred inflows of resources related to pensions, and pension expense, information about the Fiduciary Net Position of the Texas County and District Retirement System (TCDRS) and additions to/deductions from TCDRS' Fiduciary Net Position have been determined on the same basis as they are reported by TCDRS. For this purpose, plan contributions are recognized in the period that compensation is reported for the employee, which is when contributions are legally due. Benefit payments and refunds are recognized when due and payable in accordance with the benefit terms. Investments are reported at fair value.

2. Summary of Significant Accounting Policies (continued)

G. Budget

The District is legally required to adopt a budget and has done so in order to better manage its resources.

1. The budget is adopted on a basis consistent with accounting principles generally accepted in the United States of America (GAAP). Annual appropriated budgets are adopted for the general fund. All annual appropriations lapse at fiscal year-end. The final amended expenditures budget for the general fund for the year ended December 31, 2022 totaled $2,270,500. The general fund revenues budgeted for the year were $1,896,200 which were less than the budgeted expenditures, resulting in a deficit budget for the year.

2. The Board of Directors may approve budget amendments during the year. The Board approved budget amendments through the year as required.

3. Formal budgetary integration is employed as a management control device during the year for the general fund.

H. Net Position and Fund Balance

Net position represents the difference between assets and liabilities. The net investment in capital assets component of net position consists of capital assets, net of accumulated depreciation, reduced by the outstanding balances of any borrowing used for the acquisition, construction or improvement of those assets, and adding back unspent proceeds. Net position is reported as restricted when there are limitations imposed on its use either through the enabling legislation adopted by the District or through external restrictions imposed by creditors, grantors, or laws and/or regulations of other governments.

Fund Balance Classification - The governmental fund financial statements present fund balances based on classifications that comprise a hierarchy that is based primarily on the extent to which the District is bound to honor constraints on the specific purpose for which amounts in the respective governmental funds can be spent. The classifications used in the governmental fund financial statements are as follows:

Nonspendable - Resources which cannot be spent because they are either a) not in spendable form or; b) legally or contractually required to be maintained intact.

2. Summary of Significant Accounting Policies (continued)

Restricted – Resources with constraints placed on the use of resources are either a) externally imposed by creditors (such as through debt covenants), grantors, contributors, or laws or regulations of other governments; or b) imposed by law through constitutional provisions or enabling legislation.

Committed – Resources which are subject to limitations the government imposes upon itself at its highest level of decision making (resolution), and that remain binding unless removed in the same manner.

Assigned - Resources neither restricted nor committed for which a government has a stated intended use as established by the Board of Directors, or an official to which to the Board of Directors has delegated the authority to assign amounts for specific purposes.

Unassigned – Resources which cannot be properly classified in one of the other four categories. The General fund is the only fund that reports a positive unassigned fund.

I. Estimates

The preparation of financial statements in conformity with accounting principles generally accept in the United States of America required management to make estimates and assumptions that affect the amounts reported in the financial statements. Actual results may differ from those estimates.

J. Implementation of New Accounting Standards

In 2022, the District implemented GASB Statement No. 87, *Leases*. The objective of this Statement is to better meet the needs of financial statement users by improving accounting and financial reporting for leases by governments. This Statement increases the usefulness of governments' financial statements by requiring recognition of certain leased assets and liabilities for leases that previously were classified as operating leases and recognized as inflows of resources or outflows of resources based on the payment provisions of the contract. It establishes a single model for lease accounting based on the foundational principle that leases are financings of the right to use an underlying asset. Under this Statement, a lessee is required to recognize a lease liability and an intangible right-to-use lease asset, and a lessor is required to recognize a lease receivable and a deferred inflow of resources, thereby enhancing the relevance and consistency of information about government' leasing activities

The District did not have any lease agreements that met the criteria of GASB Statement No. 87, Leases, for fiscal year 2022.

3. Deposits and Investments with Financial Institutions

At year end, the book balance of the District's checking account and certificates of deposit was $5,117,388 which was all unrestricted. The bank balance of $5,170,429 which was partially covered with federal depository insurance ($4,309,992) and pledged collateral ($857,203) while the remaining $3,234 was not collateralized. The District believes it is not exposed to any significant credit risk on its cash and certificates of deposit balance.

At the end of the period the District had no deposits which were exposed to significant custodial credit risk. Custodial credit risk is the risk that in the event of a bank failure, the government's deposits may not be returned to it. The District's funds are required to be deposited and invested under the terms of the depository contract.

The State Public Funds Investments Act authorizes the government to invest in obligations of the U.S. Treasury, obligations of states, agencies, counties, cities and other political subdivisions, secured certificates of deposit, repurchase agreements, bankers' acceptances, commercial paper, mutual funds, guaranteed investment contracts and investment pools. During the year ended December 31, 2022, the District did not own any types of securities other than those permitted by statute.

4. Risk Management

The District is exposed to various risks of loss related to torts; theft of, damage to and destruction of assets; errors and omissions; injuries to employees; natural disasters; and the litigious nature of the political environment in which it operates. The District is covered through third-party insurance policies, and risk is also mitigated by the protections afforded it through the Texas Water Code, Chapter 36, Sections 36.066, 36.251 and 36.253.

5. Changes in Capital Assets

Capital assets consist of the following:

	Balance 12/31/2021	Additions	Retirements/ Adjustments	Balance 12/31/2022
Governmental activities:				
Non-depreciable assets:				
Land	$ 267,834	$ -	$ -	$ 267,834
Total non-depreciable assets	267,834	-	-	267,834
Capital assets being depreciated:				
Building and improvements	1,078,858	388,462	-	1,467,320
Vehicles	369,616	114,737	(24,159)	460,194
Furniture and equipment	489,059	18,888	-	507,947
Software	315,374	-	-	315,374
Total capital assets being depreciated	2,252,907	522,087	(24,159)	2,750,835
Less accumulated depreciation:				
Building and improvements	(128,864)	(37,041)	-	(165,905)
Vehicles	(204,566)	(57,411)	24,159	(237,818)
Furniture and equipment	(109,714)	(34,283)	-	(143,997)
Software	(150,125)	(28,078)	-	(178,203)
Total accumulated depreciation	(593,269)	(156,813)	24,159	(725,923)
Total capital assets being depreciated, net	1,659,638	365,274	-	2,024,912
Governmental activities capital assets, net	$ 1,927,472	$ 365,274	$ -	$ 2,292,746

Depreciation expense charged to the general government operations was $156,813.

6. Compensated Absences

It is the District's policy that employees will not receive payment for unused sick pay benefits upon separation from service. Therefore, no liability is reported for unpaid accumulated sick leave.

However, unused vacation and comp time earned is accrued as of December 31 and is payable upon separation from service. As of December 31, 2022, the District's liability for unpaid vacation and comp time was $20,637.

7. Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect certain reported amounts and disclosures. Accordingly, actual results could differ from those estimates.

8. Fund Balance Classifications

The Board passed a resolution during 2022 in order to commit a total of $1,250,000 for a legal reserve and litigation fund.

The Board has assigned the 2022 fund balance for the following purposes:

Monitoring well drilling fund	$650,000
Rainwater harvesting grant fund	250,000
Facilities and building fund	250,000
Groundwater availability model development fund	250,000
Special study fund	100,000
Technology development fund	250,000

9. Retirement Plan

Plan Description

The District provides retirement benefits for all of its full-time and part-time employees through a nontraditional defined benefit plan in the state-wide Texas County and District Retirement System (TCDRS). The Board of Trustees of TCDRS is responsible for the administration of the state-wide agent multiple-employer public employee retirement. TCDRS in the aggregate issues an annual comprehensive financial report (ACFR) on a calendar year basis. The ACFR is available upon written request from the TCDRS Board of Trustees at P.O. Box 2034, Austin, TX 78768-2034.

Benefits Provided

The plan provisions are adopted by the governing body of the employer, within the options available in the Texas state statutes governing TCDRS (TCDRS Act). Members can retire at age 60 and above with 5 or more years of service, with 30 years of service regardless of age, or when the sum of their age and years of service equals 75 or more, when vested. Members are vested after 5 years of service but must leave their accumulated contributions in the plan to receive any employer-financed benefit. Members who withdraw their personal contributions in a lump sum are not entitled to any amounts contributed by their employer.

Benefit amounts are determined by the sum of the employee's contributions to the plan, with interest, and employer-financed monetary credits. The level of these monetary credits is adopted by the governing body of the employer within the actuarial constraints improved by the TCDRS Act so that the resulting benefits can expect to be adequately financed by the employer's commitment to contribute. At retirement, death or disability, the benefit is calculated by converting the sum of the employee's accumulated contributions and the employer-financed monetary credits to a monthly annuity using annuity purchase rates prescribed by the TCDRS Act. There are no automatic post-employment benefit changes, including automatic COLAs.

At the December 31, 2021 valuation and measurement date, the following employees were covered by the benefit terms:

Inactive employees or beneficiaries currently receiving benefits	2
Inactive employees entitled to but not yet receiving benefits	7
Active employees	12
	21

9. Retirement Plan (continued)

Contributions

The District has elected the annually determined contribution rate (Variable Rate) plan provision of the TCDRS Act. The plan is funded by monthly contributions from both employee members and the employer based on the covered payroll of employee members. Under the TCDRS Act, the contribution rate of the employer is actuarially determined annually.

The District contributed using the actuarially required contribution rate of 8.22% for the calendar year ending 2022. The deposit rate payable by the employee members for calendar year 2022 is the rate of 5% as adopted by the governing body of the employer. The employee and employer deposit rates may be changed by the governing body of the District within the options available in the TCDRS Act.

Net Pension Liability

The District's Net Pension Liability (NPL) for the year ended December 31, 2022, was measured as of December 31, 2021, and the Total Pension Liability (TPL) used to calculate the Net Pension Liability was determined by an actuarial valuation as of that date.

Actuarial Assumptions:

The Total Pension Liability in the December 31, 2021 actuarial valuation was determined using the following actuarial assumptions:

Inflation	2.50% per year
Overall payroll growth	4.70% per year
Investment rate of return	7.50%, net of pension plan investment expense, including inflation

The annual salary increase rates assumed for individual members vary by length of service and by entry-age group. The annual rates consist of a general wage inflation component of 3.00% (made up of 2.50% inflation and .50% productivity increase assumptions) and a merit, promotion and longevity component that on average approximates 1.7% per year for a career employee.

Mortality rates for depositing members as well as service retirees, beneficiaries and non-depositing members were based on 135% of the Pub-2010 General Employees Amount-Weighted Mortality Table for males and 120% of the Pub-2010 General Employees Amount-Weighted Mortality Table for females as appropriate, projected with 100% of the MP-2021 Ultimate scale after 2010. Disabled retirees were based on 160% of the Pub-2010 General Disabled Retirees Amount-Weighted Mortality Table for males and 125% of the Pub-2010 General Disabled Retirees Amount-Weighted Mortality Table for females as appropriate, projected with 100% of the MP-2021 Ultimate scale after 2010

9. Retirement Plan (continued)

Net Pension Liability (continued)

The demographic assumptions were developed from an actuarial experience investigation of TCDRS over the years 2017-2020 and were adopted by the TCDRS Board of Trustees in December of 2021. All economic assumptions were adopted by the TCDRS Board of Trustees in March of 2021. These assumptions, except where required to be different by GASB 68, are used to determine the total pension liability as of December 31, 2021. The assumptions are reviewed annually for continued compliance with the relevant actuarial standards of practice.

The long-term expected rate of return of 7.60% is determined by adding expected inflation to expected long-term real returns, and reflecting expected volatility and correlation. The capital market assumptions and information shown below are provided by TCDRS' investment consultant, Cliffwater LLC. The numbers shown are based on January 2022 information for a 10-year time horizon and are re-assessed at a minimum of every four years, and is set based on a long-term time horizon. Best estimates of geometric real rates of return (net of inflation, assumed at 2.60%) for each major asset class included in the target asset allocation (per Cliffwater's 2022 capital market assumptions) were adopted at the March 2022 TCDRS board meeting and are summarized below:

Asset Class	Benchmark	Target Allocation	Geometric Real Rate of Return (Expected minus inflation)
U.S. Equities	Dow Jones U.S. Total Stock Market Index	11.50%	3.80%
Global Equities	MSCI World (net) Index	2.50%	4.10%
Int'l Equities - Developed Markets	MSCI World Ex USA (net)	5.00%	3.80%
Int'l Equities - Emerging Markets	MSCI Emerging Markets (net) Index	6.00%	4.30%
Investment-Grade Bonds	Bloomberg Barclays U.S. Aggregate Bond Index	3.00%	-0.85%
Strategic Credit	FTSE High-Yield Cash-Pay Capped Index	9.00%	1.77%
Direct Lending	S&P/LSTA Leveraged Loan Index	16.00%	6.25%
Distressed Debt	Cambridge Associates Distressed Securities Index	4.00%	4.50%
REIT Equities	67% FTSE NAREIT All Equity REITs Index + 33% S&P Global REIT (net) Index	2.00%	3.10%
Master Limited Partnerships	Alerian MLP Index	2.00%	3.85%
Private Real Estate Partnerships	Cambridge Associates Real Estate Index	6.00%	5.10%
Private Equity	Cambridge Associates Global Private Equity & Venture Capital Index	25.00%	6.80%
Hedge Funds	Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index	6.00%	1.55%
Cash Equivalents	90-Day U.S. Treasury	2.00%	-1.05%
Total		100.00%	

9. Retirement Plan (continued)

Net Pension Liability (continued)

Discount Rate

The discount rate used to measure the Total Pension Liability was 7.6%. Using the alternative method, the projected fiduciary net position is determined to be sufficient compared to projected benefit payments based on the funding requirements under the District's funding policy and the legal requirements under the TCDRS Act.

1. TCDRS has a funding policy where the unfunded actuarial accrued liability (UAAL) shall be amortized as a level percent of pay over 20-year closed layered periods.
2. Under the TCDRS Act, the District is legally required to make the contribution specified in the funding policy.
3. The District assets are projected to exceed its accrued liabilities in 20 years or less. When this point is reached, the District is still required to contribute at least the normal cost.
4. Any increased cost due to the adoption of a COLA is required to be funded over a period of 15 years, if applicable.

Since the projected fiduciary net position is projected to be sufficient to pay projected benefit payments in all future years, the discount rate for purposes of calculating the total pension liability and the net pension liability of the District is equal to the long-term assumed rate of return on investments.

	Increase (Decrease)		
	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability/(Asset) (a) - (b)
Balance at 12/31/2020	$ 452,185	$ 460,732	$ (8,547)
Changes for the year:			
Service cost	78,518	-	78,518
Interest on total pension liability	40,206	-	40,206
Effect of plan changes	-	-	-
Effect of economic/demographic gains or losses	(2,335)	-	(2,335)
Effect of assumptions changes or inputs	8,698	-	8,698
Refund of contributions	-	-	-
Benefit payments	(3,447)	(3,447)	-
Administrative expenses	-	(346)	346
Member contributions	-	31,811	(31,811)
Net investment income	-	109,023	(109,023)
Employer contributions	-	39,700	(39,700)
Other	-	2,056	(2,056)
Net changes	$ 121,640	$ 178,797	$ (57,157)
Balance at 12/31/2021	**$ 573,825**	**$ 639,529**	**$ (65,704)**

9. Retirement Plan (continued)

Net Pension Liability (continued)

Sensitivity of the net pension liability to changes in the discount rate

The following presents the net pension liability of the District, calculated using the discount rate of 7.6%, as well as what the District's net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (6.6%) or 1-percentage point higher (8.6%) than the current rate:

	1% Decrease in Discount Rate (6.6%)	Current Discount Rate (7.6%)	1% Increase in Discount Rate (8.6%)
Total pension liability	$ 701,776	$ 573,825	$ 472,459
Fiduciary net position	639,529	639,529	639,529
Net pension liability (asset)	$ 62,247	$ (65,704)	$ (167,070)

Pension Plan Fiduciary Net Position

Detailed information about the pension plan's Fiduciary Net Position is available in a separately-issued TCDRS comprehensive annual financial report. The most recent report may be obtained on the internet at www.tcdrs.org.

Pension Expense and Deferred Outflows of Resources and Deferred Inflows of Resources Related to Pensions

For the fiscal year ended December 31, 2022, the District recognized pension expense of $35,375.

As of December 31, 2022, the District reported deferred outflows of resources and deferred inflows of resources related to pensions from the following sources:

	Deferred Inflows of Resources	Deferred Outflows of Resources
Differences between expected and actual experience	$ 23,989	$ 20,772
Changes of assumptions	-	42,260
Net difference between projected and actual earnings	63,960	-
Contributions subsequent to the measurement date	N/A	58,005
Total	$ 87,949	$ 121,037

9. Retirement Plan (continued)

Net Pension Liability (continued)

$58,005 reported as deferred outflows of resources related to pensions resulting from contributions subsequent to the measurement date will be recognized as a reduction of the net pension liability for the year ending December 31, 2023. Other amounts reported as deferred outflows and inflows of resources related to pensions will be recognized in pension expense as follows:

Valuation year ended December 31:		
2022	$	(10,440)
2023		(15,074)
2024		(11,097)
2025		(9,925)
2026		4,356
Thereafter		17,263

REQUIRED SUPPLEMENTARY INFORMATION

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
STATEMENT OF REVENUES, EXPENDITURES AND
CHANGES IN FUND BALANCE - BUDGET AND ACTUAL
GENERAL FUND
FOR THE YEAR ENDED DECEMBER 31, 2022

	GAAP Basis			Variance
	Budgeted Amounts			Positive
	Original	Final	Actual	(Negative)
Revenues:				
Exception fees	$ 5,000	$ 5,000	$ 4,671	$ (329)
Export fees	500	500	-	(500)
Penalties assessed	5,000	5,000	17,709	12,709
Forfeited deposits	3,000	3,000	3,700	700
New well registration fees	950,000	950,000	1,344,600	394,600
Permit application fees	5,000	5,000	9,200	4,200
Semi-annual program income	875,000	875,000	984,307	109,307
Total program revenue	1,843,500	1,843,500	2,364,187	520,687
Investment earnings	45,000	45,000	22,765	(22,235)
Other sources	7,700	7,700	13,333	5,633
Total revenues	1,896,200	1,896,200	2,400,285	504,085
Expenditures:				
General government	1,747,900	1,756,900	1,499,630	257,270
Capital outlay	147,600	513,600	502,087	11,513
Total Expenditures	1,895,500	2,270,500	2,001,717	268,783
Excess (Deficiency) of Revenues Over (Under) Expenditures	700	(374,300)	398,568	772,868
Fund balance - beginning of year	5,094,576	5,094,576	5,094,576	-
Fund balance - end of year	$ 5,095,276	$ 4,720,276	$ 5,493,144	$ 772,868

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
SCHEDULE OF CHANGE IN NET PENSION LIABILITY
AND RELATED RATIOS
Last 10 Measurement Years (will ultimately be displayed)

Total Pension Liability	**2021**	**2020**	**2019**
Service Cost	$ 78,518	$ 61,653	$ 54,635
Interest on total pension liability	40,206	31,131	25,387
Effect of plan changes	-	-	-
Effect of assumption changes or inputs	8,698	40,015	-
Effect of economic/demographic (gains) or losses	(2,335)	683	(10,528)
Benefit payments/refunds of contributions	(3,447)	(7,811)	(3,447)
Net Change in Total Pension Liability	121,640	125,671	66,047
Total Pension Liability, beginning	452,185	326,514	260,467
Total Pension Liability, ending (a)	$ 573,825	$ 452,185	$ 326,514
Fiduciary Net Position			
Employer contributions	$ 39,700	$ 36,959	$ 31,573
Member contributions	31,811	28,965	24,822
Investment income net of investment expenses	109,023	37,674	43,539
Benefit payments/refunds of contributions	(3,447)	(7,811)	(3,447)
Administrative expenses	(346)	(337)	(277)
Other	2,056	1,755	1,863
Net Change in Fiduciary Net Position	178,797	97,205	98,073
Fiduciary Net Position, beginning	460,732	363,527	265,454
Fiduciary Net Position, ending (b)	$ 639,529	$ 460,732	$ 363,527
Net Pension Liability (Asset), ending = (a) - (b)	$ (65,704)	$ (8,547)	$ (37,013)
Fiduciary net position as a % of total pension liability	111.45%	101.89%	111.34%
Pensionable covered payroll	$ 636,212	$ 579,299	$ 496,432
Net pension liability as a % of covered payroll	-10.33%	-1.48%	-7.46%

Note: This schedule is presented to illustrate the requirement to show information for 10 years. However, recalculations of prior years are not required, and if prior years are not reported in accordance with the standards of GASB 67/68, they should not be shown here. Therefore, we have shown only years for which the new GASB statements have been implemented.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
SCHEDULE OF CHANGE IN NET PENSION LIABILITY
AND RELATED RATIOS - continued
Last 10 Measurement Years (will ultimately be displayed)

2018	2017	2016	2015	2014
$ 48,441	$ 44,816	$ 42,402	$ 19,962	$ 21,024
19,544	14,109	10,705	6,204	4,158
-	-	-	(3,620)	-
-	119	-	1,886	-
1,244	8,751	(25,799)	26,243	3,650
(3,138)	(5,458)	(13,040)	(2,766)	-
66,091	62,337	14,268	47,909	28,832
194,376	132,039	117,771	69,862	41,030
$ 260,467	$ 194,376	$ 132,039	$ 117,771	$ 69,862
$ 29,233	$ 26,740	$ 28,501	$ 13,860	$ 11,178
23,845	21,088	19,959	17,724	14,747
(3,498)	22,875	7,967	(1,459)	3,400
(3,138)	(5,458)	(13,040)	(2,766)	-
(213)	(145)	(86)	(67)	(49)
1,510	567	4,417	246	(3)
47,739	65,667	47,718	27,538	29,273
217,715	152,048	104,330	76,792	47,519
$ 265,454	$ 217,715	$ 152,048	$ 104,330	$ 76,792
$ (4,987)	$ (23,339)	$ (20,009)	$ 13,441	$ (6,930)
101.91%	112.01%	115.15%	88.59%	109.92%
$ 476,893	$ 421,761	$ 399,176	$ 354,472	$ 294,939
-1.05%	-5.53%	-5.01%	3.79%	-2.35%

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
SCHEDULE OF EMPLOYER CONTRIBUTIONS
Last 10 Fiscal Years (will ultimately be displayed)

Year Ending December 31	Actuarially Determined Contribution	Actual Employer Contribution	Contribution Deficiency (Excess)	Pensionable Covered Payroll	Actual Contribution as a % of Covered Payroll
2014	11,178	11,178	-	294,939	3.8%
2015	13,860	13,860	-	354,472	3.9%
2016	28,501	28,501	-	399,176	7.1%
2017	26,740	26,740	-	421,761	6.3%
2018	29,233	29,233	-	476,893	6.1%
2019	31,573	31,573	-	496,432	6.4%
2020	36,959	36,959	-	579,299	6.4%
2021	39,700	39,700	-	636,212	6.2%
2022	58,005	58,005	-	749,129	7.7%

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Notes to Required Supplementary Information
December 31, 2022

Budget

Annual operating budget is adopted on a basis consistent with generally accepted accounting principles for a governmental fund. The budget lapses at fiscal year-end.

The Board of Directors follows these procedures in establishing budgetary data reflected in the financial statements:

a. Prior to the beginning of the fiscal year, a proposed budget is submitted by the Finance Committee to the Board for approval.
b. During the year, the Board may amend the budget.
c. Budgetary control is maintained at the line item level, subject to adjustments permitted as described above.

Retirement Schedules

Valuation Date

Actuarially determined contribution rates are calculated as of December 31, two years prior to the end of the fiscal year in which contributions are reported.

Methods and Assumptions Used to Determine Contribution Rates

Actuarial Cost Method	Entry Age
Amortization Method	Level percentage of payroll, closed
Remaining Amortization Period	19.6 years (based on contribution rate calculated in 12/31/2021 valuation)
Asset Valuation Method	5-year smoothed market
Inflation	2.50%
Salary Increases	Varies by age and service. 4.7% average over career including inflation
Investment Rate of Return	7.50%, net of administrative and investment expenses, including inflation
Retirement Age	Members who are eligible for service retirement are assumed to commence receiving benefit payments based on age. The average age at service retirement for recent retirees is 61.
Mortality	135% of the Pub-2010 General Retirees Table for males and 120% of the Pub-2010 General Retirees Table for females, both projected with 100% of the MP-2021 Ultimate scale after 2010.
Changes in Assumptions and Methods Reflected in the Schedule of Employer Contributions	2015: New inflation, mortality and other assumptions were reflected 2017: New mortality assumptions were reflected 2019: New inflation, mortality and other assumptions were reflected
Changes in Plan Provisions Reflected in the Schedule of Employer Contributions	2015: No changes in plan provisions were reflected in the Schedule. 2016: Employer contributions reflect that the current service matching rate was increased to 200%. 2017: New Annuity Purchase Rates were reflected for benefits earned after 2017. 2018: No changes in plan provisions were reflected in the Schedule. 2019: No changes in plan provisions were reflected in the Schedule. 2020: No changes in plan provisions were reflected in the Schedule. 2021: No changes in plan provisions were reflected in the Schedule.