UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT

ANNUAL REPORT FOR YEAR ENDING DECEMBER 31, 2020

Upper Trinity Groundwater Conservation District

2020 Annual Report

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General Manager’s Report 2020

Unfortunately, the predominate theme during 2020 was operating through COVID-19. Beginning in early April, the majority of District staff began to work from home, utilizing Zoom videoconferences to stay in touch. Despite the changes from the norm, staff managed to process a record number of new well applications, several Operating Permit applications, and hundreds of Historic Use Permit Applications.

The District also continued to invest in the development of resources to expand the knowledge, data, and science available which further ensures that decisions are based on the best available science. To that end, the District drilled five (5) water-level monitoring wells in 2020. Two wells were drilled in the Silverado on the Brazos subdivision in Southern Parker County, two wells were drilled on Mr. Don Smelley’s property in Western Parker County, and one well was drilled on the northeast side of Lake Nocona in Northern Montague County.

Finally, I am happy to report that the District met or exceeded each Management Plan objective, as set forth in our Management Plan, for 2020. Furthermore, an independent auditor has reported favorably in regard to the District’s financial position.

Below are a few highlights from 2020:

Staff:

- Kyle Russell was promoted to Assistant General Manager.
- Zane Bearden was hired in December of 2020 to fill a newly created Field Technician position.

Other Notable Accomplishments:

- Issued first permits – Operating Permits.
- Drilled five water-level monitoring wells.
- The District was awarded the 2020 Rain Catchers award by the TWDB for the rainwater harvesting project the District funded in coordination with the Parker County Livestock Improvement Association.

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 2020

- ✓ 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.

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

Doug Shaw
General Manager

Kyle Russell
Assistant General Manager

Ann Devenney
Office Manager

Blaine Hicks, P.G.
Staff Geologist

Jill Garcia
Education/PR Coordinator

Laina Furlong
Office Assistant

Jennifer Hachtel
Data Coordinator

Leisha Mazanec
Field Technician

Jacob Dove
Field Technician

Jay Love
Reporting Compliance Coordinator

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 15, 2019, the Board of Directors elected District Officers to serve two-year terms ending July 2021. 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 2020

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 344 more water well registrations in 2020 than in 2019 — Parker, Wise, and Montague counties each had more registrations than the previous year; Hood county had one less.

County	Exempt	Nonexempt	Existing	New	Total
Hood	84	6	4	86	90
Montague	136	0	10	126	136
Parker	880	43	74	849	923
Wise	437	10	29	418	447
Total:	1,537	59	117	1,479	1,596

Groundwater Production Report 2020

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 2020, Public Water Supply production accounted for approximately 94% 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	1,685,750,855	44.09%
Montague	118,922,406	3.11%
Parker	1,214,848,777	31.78%
Wise	574,512,821	15.03%
Total:	**3,594,034,859**	**94.01%**

Oil & Gas Production	Gallons Reported	Category Percentage
Hood	3,078,816	0.08%
Montague	1,207,090	0.03%
Parker	50,849,660	1.33%
Wise	93,357,856	2.44%
Total:	**148,493,422**	**3.88%**

Commercial/Business	Gallons Reported	Category Percentage
Hood	18,231,576	0.48%
Montague	1,599,400	0.04%
Parker	59,165,095	1.55%
Wise	1,660,993	0.04%
Total:	**80,657,064**	**2.11%**

2020 Grand Total:	**3,823,185,345**	

Permitted Groundwater Production Volumes 2020

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 did not begin issuing HUPs until 2021, however below you will find the pending volumes requested in HUP applications received prior to the end of 2020.

Total Approved and Pending Permits as of December 31, 2020

Public Water Supply	Operating Permits	Historic Use Permits (Pending)
Hood	0	2,262,205,650
Montague	0	138,114,200
Parker	47,542,000	1,506,817,410
Wise	33,386,000	676,569,494
Total:	**80,928,000**	**4,583,706,754**

Oil & Gas Production	Operating Permits	Historic Use Permits (Pending)
Hood	0	207,727,138
Montague	0	669,461,796
Parker	0	758,293,271
Wise	0	2,680,063,350
Total:	**0**	**4,315,545,555**

Commercial/Business	Operating Permits	Historic Use Permits (Pending)
Hood	0	379,112,484
Montague	0	9,600,000
Parker	0	377,240,717
Wise	0	47,196,503
Total:	**0**	**813,149,704**

Total Permits	**9,793,330,013**

Waste of Groundwater 2020

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 2020

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 2020, the District invoiced a total of $839,223 for nonexempt water use fees, however total nonexempt groundwater production would have actually totaled a value of $841,101. 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, a Public Water Supply well owner in Parker/Wise County reporting use but failed to pay fees, and over-reporting in both 2020 and 2019. Staff has provided a detailed explanation of these discrepancies as subtext to the table below.

In 2020, the total water use fees collected was slightly less than the $868,000 collected in 2019, 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	1,685,750,855	118,922,406	1,214,848,777	574,512,821	**3,594,034,859**
	Fees Collected	$370,848.65*	$26,161.17**	$266,570.80***	$125,229.65****	$788,810.27
Oil & Gas	GW Production	3,078,816	1,207,090	50,849,660	93,357,856	**148,493,422**
	Fees Collected	$677.34	$265.56	$11,186.93	$20,538.73	$32,668.55
Commercial/Business	GW Production	18,231,576	1,599,400	59,165,095	1,660,993	**80,657,064**
	Fees Collected	$4,010.95	$351.87	$13,016.32	$365.42	$17,744.55
Total	GW Production	**1,707,061,247**	**121,728,896**	**1,324,863,532**	**669,531,670**	**3,823,185,345**
	Fees Collected	**$375,537**	**$26,779**	**$290,774**	**$146,134**	**$839,223**

*Includes deduction of fees for 75,200 gallons of emergency water use for the City of Tolar.

**Includes deduction of fees for 8,000 gallons of emergency water use for the City of Saint Jo.

***Includes deduction of fees for 3,000,000 gallons emergency water use for the City of Aledo, 75,325 gallons of emergency water use for the City of Willow Park, 4,600 gallons of emergency water use for the Town of Annetta, 1,279,161 gallons of production for Patterson Water Supply that was pumped in 2020 but invoiced in 2021, 40,000 gallons of prodcution for Springs event center that was pumped in 2020 but invoiced in 2019, and inclusion of fees for 1,235,790 gallons of production for the City of Cresson that was over-reported in 2020.

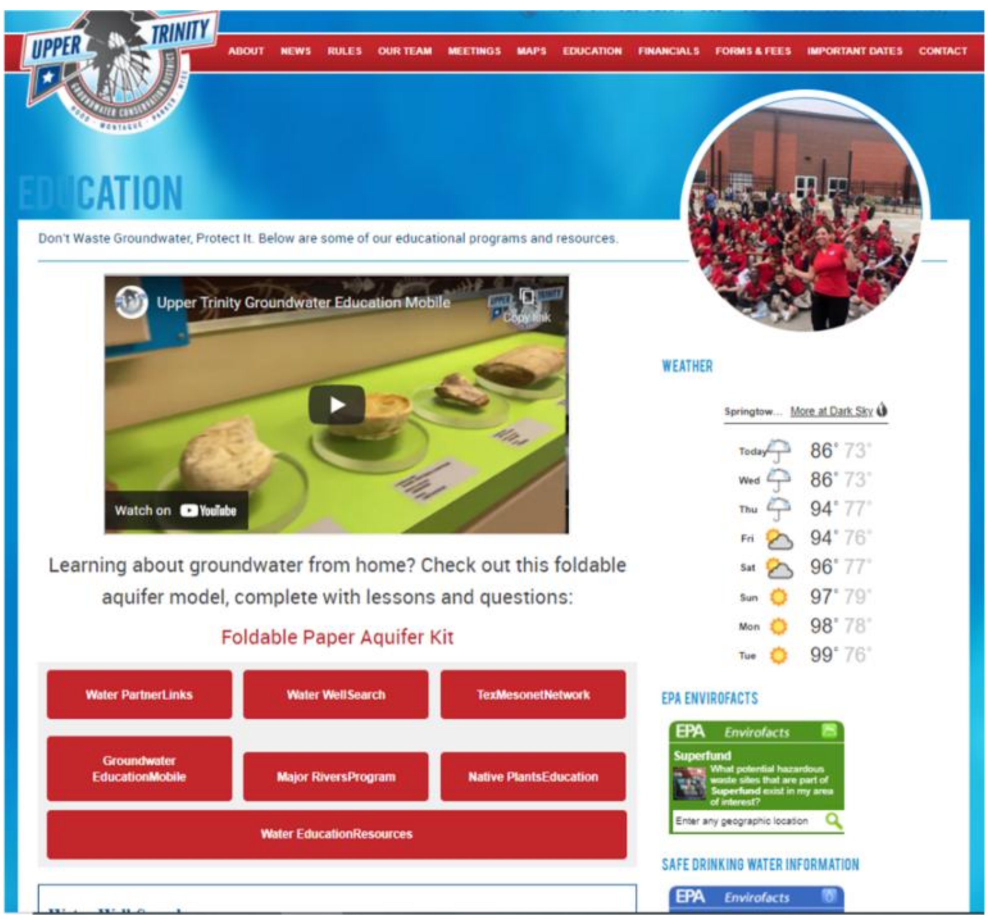
****Includes deduction of fees for 71,560 gallons of emergency water use for Slidell WSC, 200,000 gallons of emergency water use for Bolivar, and 5,015,570 gallons of production for Patterson Water Supply that was pumped in 2020 but invoiced in 2021.

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 2020, 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 2020

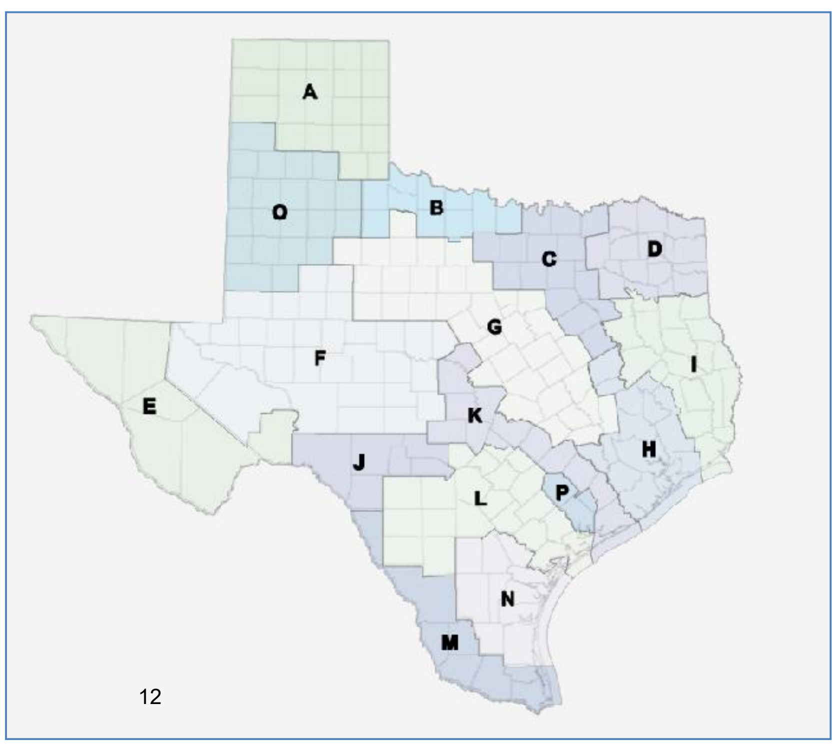
C.1 Objective - Each year the District will participate in the regional water planning process by attending at least one of the Region B, C or G Regional Water Planning Group Meetings to encourage the development of surface water supplies to meet the needs of water user groups within the District.

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.

Date	Event	Location	Representative
1/22/20	RWPG-B	Wichita Falls, TX	Tracy Mesler & Doug Shaw
2/10/20	RWPG-C	Arlington, TX	Doug Shaw
2/12/2020	RWPG-G	Waco, TX	Doug Shaw
8/12/2020	RWPG-G	Video conference	Doug Shaw
9/2/20	RWPG-B	Teleconference	Tracy Mesler & Doug Shaw
9/9/2020	RWPG-G	Video conference	Doug Shaw
9/21/20	RWPG-C	Video conference	Doug Shaw
10/28/2020	RWPG-G	Video conference	Doug Shaw

Regional Water Planning Group Map



Injection Well Applications 2020

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.2 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 2020

Operator	Registration No.	Location	Date District Received	Well Site Protested	Resolution/Notes
Legacy Exploration, LLC I	53423	Jack County, 17 miles Northwest of Jacksboro	12/22/2020	no	
Xplore Operating LLC	53345	Clay County, 1 mile East of Petrolia	11/30/2020	no	
Xplore Operating LLC	53296	Clay County, 1 mile East of Petrolia	11/5/2020	no	
Stamper Operating Co. Inc.	53281	Jack County, 12 miles Northwest of Jacksboro	11/3/2020	no	
Antle Operating, Inc.	53247	Palo Pinto County, 3 miles North of Graford	10/21/2020	no	
Feiderhoff Production Company	53223	Cooke County, 1.5 miles West of Gainesville	10/12/2020	no	
Tettleton, Steven B.	53151	Montague County, 4 miles Northwest of Saint Jo	9/23/2020	no	
Daylight Petroleum LLC	53119	Cooke County, 1.5 miles North of Sivells Bend	9/15/2020	no	
JRCO of Muenster LLC	53093	Cooke County, 6 miles North of Muenster	9/1/2020	no	
Scout Energy Management LLC	53089	Montague County, 6.5 miles Northwest of Bowie	9/1/2020	yes	withdrawn
Scout Energy Management LLC	53088	Montague County, 2 miles Southwest of Fruitland	9/1/2020	yes	withdrawn
Scout Energy Management LLC	53087	Montague County, 1.4 miles Northeast of New Harp	9/1/2020	yes	withdrawn
Sage Natural Resources LLC	52999	Hood County, 4.7 miles North of Cresson	8/6/2020	yes	withdrawn
WFW Production Company, INC.	52802	Cooke County, 2.5 miles North of Muenster	6/9/2020	No	
Bridwell Oil Co.	52790	Clay County, 9 miles Southwest of Jolly	6/3/2020	No	
Oakridge Oil and Gas, LP	52759	Jack County, 5 miles Southeast of Jacksboro	5/20/2020	No	
Robuck Petroleum, LLC	52751	Jack County, 8 miles Southwest of Jacksboro	5/18/2020	No	
Oakridge Oil and Gas, LP	52657	Jack County, 7 miles Southeast of Jacksboro	4/17/2020	No	
JF Trust	52600	Clay County, 6 miles West Northwest of Joy	4/7/2020	No	
Grayson Petroleum Company	52593	Montague County, 2 miles east of Nocona	4/6/2020	Being Reviewed	
Triple G Well Service, Inc.	52510	Cooke County, 11 miles South of Muenster	3/16/2020	no	
Xplore Operating LLC	52492	Jack County, 10 miles Northwest of Jacksboro	3/10/2020	no	

Drought Conditions 2020

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

January 2020

Texas Water Development Board

RAINFALL

Rainfall observations from the National Oceanic and Atmospheric Administration – National Weather Service (NOAA-NWS) indicate that during the month of January portions of the High Plains, south and west Trans Pecos, western portions of the Southern climate division and patches of the Edwards Plateau climate divisions received little to no rainfall [yellow, orange and red shading, Figure 1(a)]. The central and eastern parts of the state including eastern Low Rolling Plains, eastern Edwards Plateau, the majority of the North Central, South Central, Upper Coast, and East Texas climate divisions received high amounts of rainfall [light and dark blue shading, Figure 1(a)], reaching 10.33 inches in eastern portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for January was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in the south and west Trans Pecos, the majority of the High Plains, Southern, Lower Valley, and South Central divisions, as well as the southeast North Central, southwest East Texas, and the north, west, and eastern borders of the Upper Coast. The northern High Plains, northeast corner of the Trans Pecos, the majority of the Low Rolling Plains, Edwards Plateau, north and east portions of East Texas, southern Upper Coast, and north and west North Central received above average rainfall [green and blue shading, Figure 1(b)], with an area in the northern North Central climate division receiving 4-6 times the average rainfall in January [purple shading, Figure 1(b)]

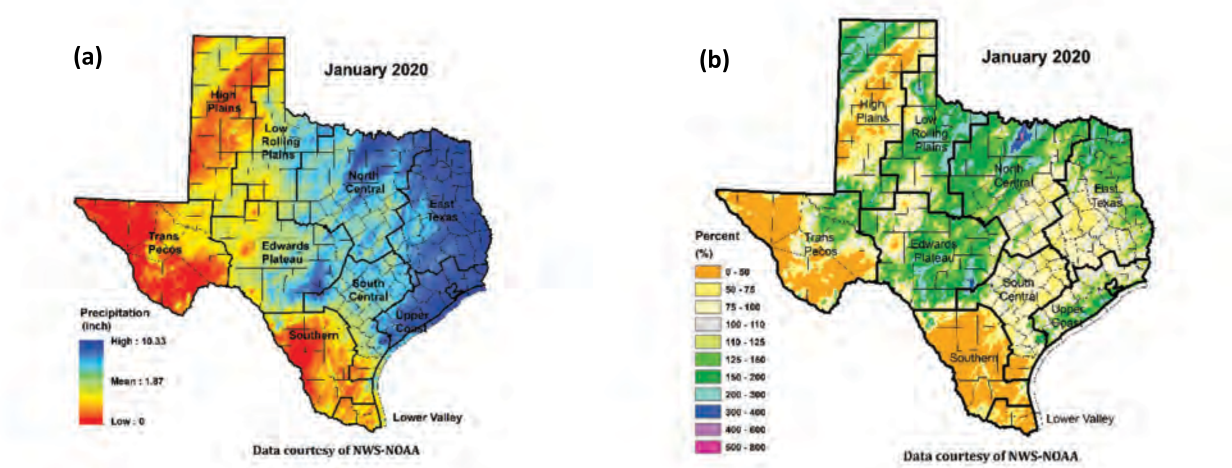


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of January 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 26.18 million acre-feet or 81 percent of total conservation storage capacity (Figure 2). This is approximately 0.601 million acre-feet more than a month ago and approximately 1.96 million acre-feet less than the end of January 2019.

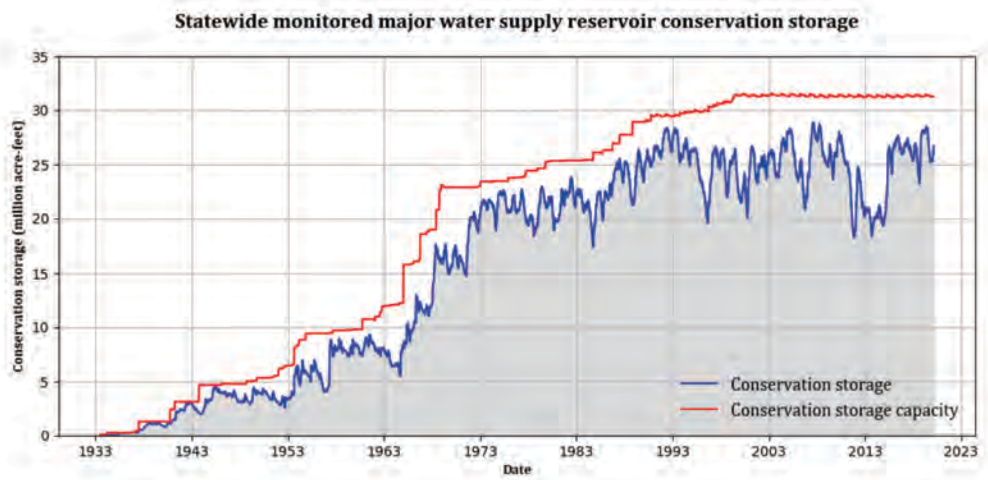


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 25 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 35 were at or above 90 percent full. Seven reservoirs [E.V. Spence (27 percent full), Greenbelt (20 percent full), J.B. Thomas (24 percent full), Mackenzie (11 percent full), O. C. Fisher (9 percent full), Palo Duro Reservoir (5 percent full), and White River (18 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 30 percent full.

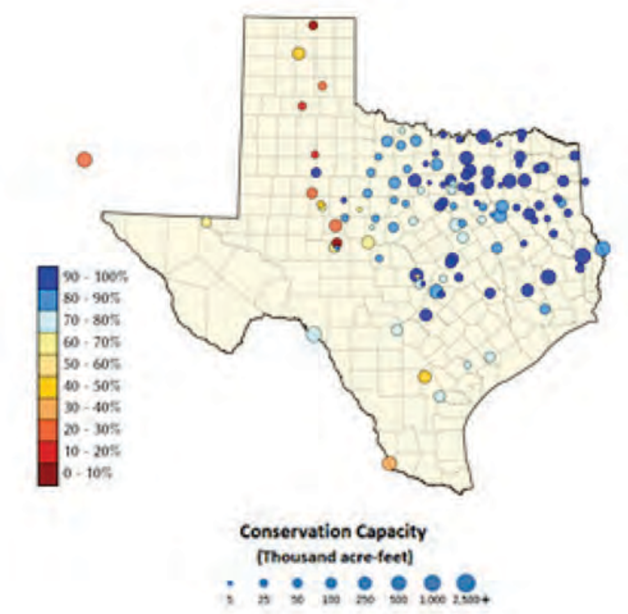


Figure 3: Reservoir conservation storage at end-January expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the North Central (92.2 percent full), South Central (85.4 percent full), East Texas (93.8 percent full), and Upper Coast (80.5 percent full) climate divisions (Figure 4). Conservation storage in the Low Rolling Plains (66.4 percent full) and Edwards Plateau (69.2 percent full) climate divisions was abnormally low (Figure 4). The High Plains (35 percent full), Southern (39.4 percent full), and Trans Pecos (35.1 percent full) climate divisions had severely low conservation storage.

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

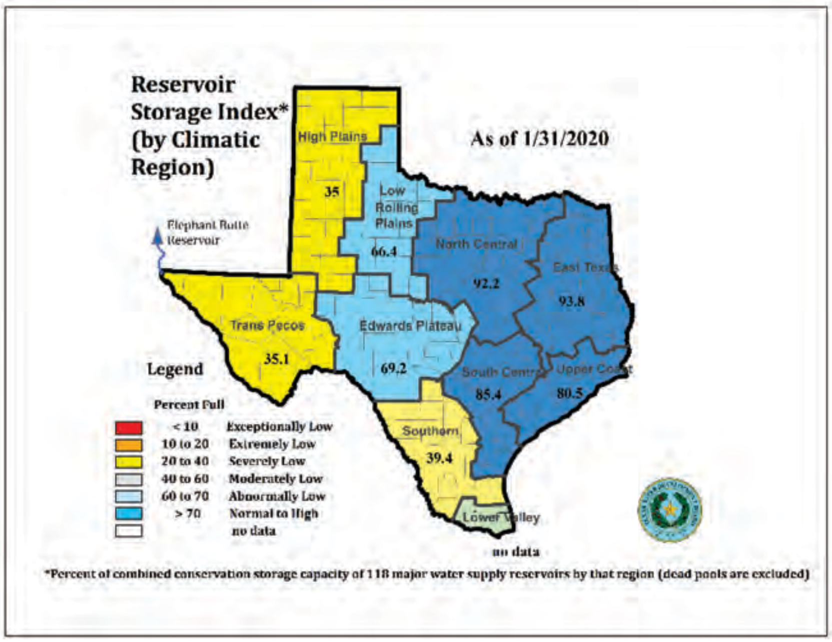


Figure 4: Reservoir Storage Index* by climate division at 1/31/2020

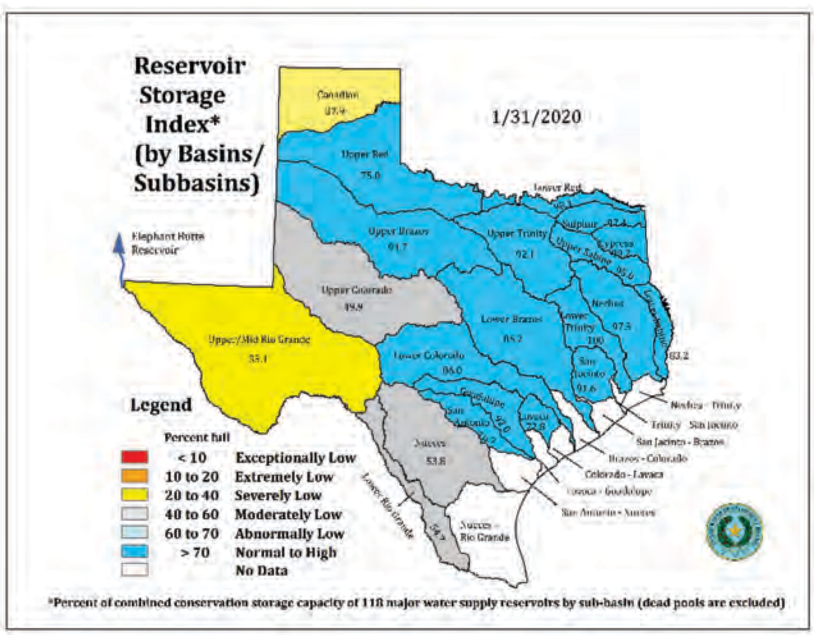


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 1/31/2020

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

Texas Water Conditions Report

February 2020

Texas Water Development Board

RAINFALL

Rainfall observations from the National Oceanic and Atmospheric Administration – National Weather Service (NOAA-NWS) indicate that during the month of February the majority of the High Plains, Trans Pecos, Southern, and Lower Valley climate divisions, as well as the western Low Rolling Plains, southern portion of the Edwards Plateau, southwest Upper Coast, and southern South Central climate divisions received little to no rainfall [yellow, orange and red shading, Figure 1(a)]. Some areas of the High Plains and Trans Pecos, south and east Low Rolling Plains, north and east Edwards Plateau, north South Central, northeast Upper Coast, and small portions of north and south Southern climate divisions received high amounts of rainfall [light and dark blue shading, Figure 1(a)], reaching 14.68 inches in eastern portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for February was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in the central and south Trans Pecos, portions of the High Plains, northern Low Rolling Plains, small areas of the North Central, the majority of the Southern, Upper Coast, and South Central climate divisions, along with southern portions of the Edwards Plateau and East Texas. The northwest and northeast portions of the Trans Pecos, central and scattered areas stretching northeasterly in the High Plains, central and south Low Rolling Plains, west, south, and east North Central, central and north East Texas, northwest and small areas of northeast Edwards Plateau, very small portions in north and south Southern, and small scattered areas of north and west South Central climate divisions received above average rainfall [green and blue shading, Figure 1(b)].

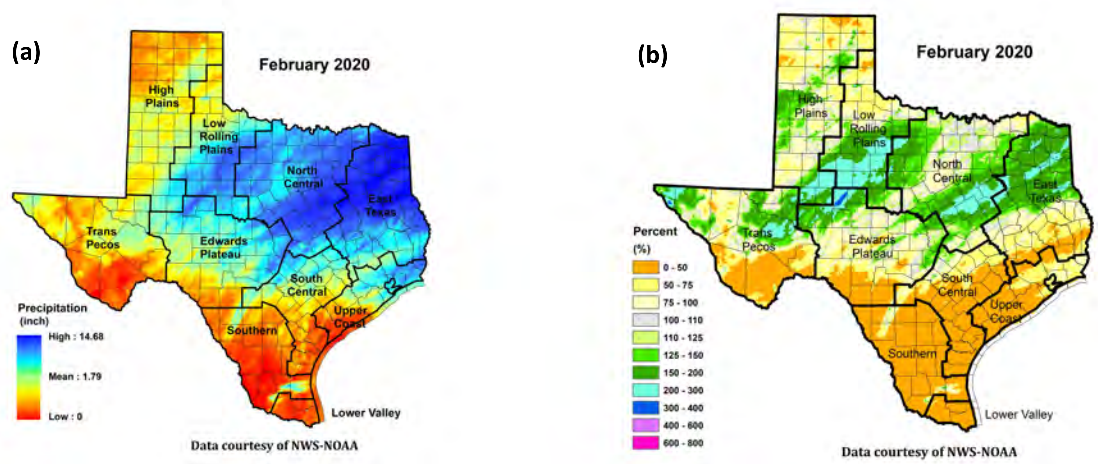


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of February 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 27.019 million acre-feet or 84 percent of total conservation storage capacity (Figure 2). This is approximately 0.975 million acre-feet more than a month ago and approximately 0.952 million acre-feet less than the end of February 2019.

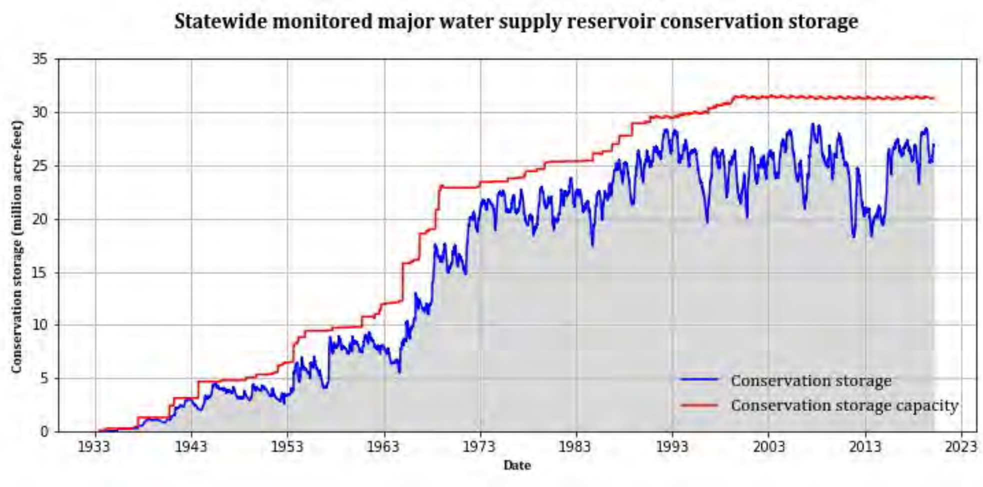


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 44 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 30 were at or above 90 percent full. Seven reservoirs [E.V. Spence (27 percent full), Greenbelt (20 percent full), J.B. Thomas (24 percent full), Mackenzie (11 percent full), O. C. Fisher (9 percent full), Palo Duro Reservoir (5 percent full), and White River (18 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 31 percent full.

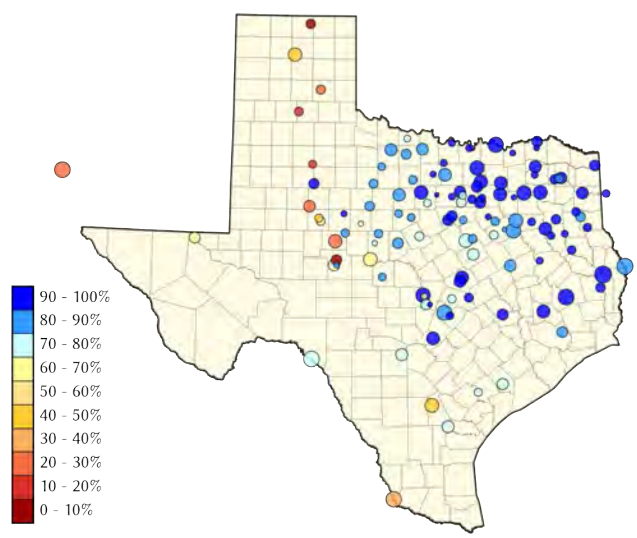


Figure 3: Reservoir conservation storage at end-February expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the North Central (96.2 percent full), South Central (84.8 percent full), East Texas (98.8 percent full), and Upper Coast (82.4 percent full) climate divisions (Figure 4). Conservation storage in the Low Rolling Plains (68.1 percent full) and Edwards Plateau (68 percent full) climate divisions was abnormally low (Figure 4). The High Plains (35 percent full), Southern (38.7 percent full), and Trans Pecos (36.7 percent full) climate divisions had severely low conservation storage.

Combined conservation storage by river basin or sub-basin showed that the upper and Lower Red, Upper and Lower Brazos, Lower Colorado, Guadalupe, San Antonio, Upper and Lower Trinity, San Jacinto, Neches, Upper and Lower Sabine, Sulphur, and Cypress was normal to high (>70 percent full). In the Lavaca basin the storage was abnormally low and the Canadian and Upper/Mid Rio Grande conservation storage was severely low (20-40 percent full, Figure 5).

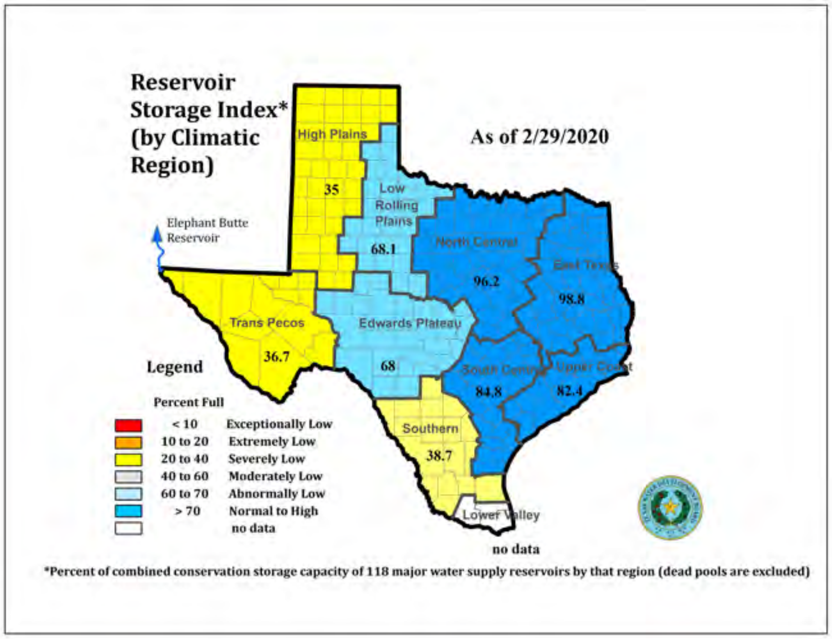


Figure 4: Reservoir Storage Index* by climate division at 2/29/2020

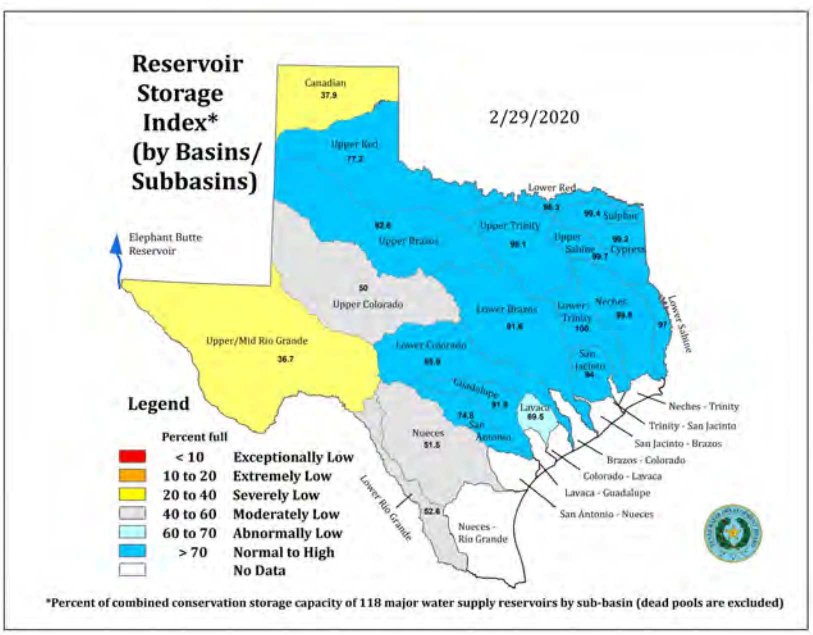


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 2/29/2020

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

Texas Water Conditions Report

March 2020

Texas Water Development Board

RAINFALL

Rainfall observations from the National Oceanic and Atmospheric Administration – National Weather Service (NOAA-NWS) indicate that during the month of March the majority of the Trans Pecos, the Lower Valley, Upper Coast, Southern, and the High Plains (particularly the northern portions), the western and southeast Edwards Plateau, small scattered portions of East Texas, eastern, western and to a greater extent in the southern South Central, and areas in the northern Low Rolling Plains received little to no rainfall [yellow, orange and red shading, Figure 1(a)]. Some scattered areas of the southern High Plains, small areas of northwest and northeast Trans Pecos, the north, northeast, and central Edwards Plateau, scattered areas of the north with higher concentrations in the central and southern portions of the Low Rolling Plains, the majority of the North Central and East Texas climate divisions, areas in central and northeast South Central, and isolated areas in central, west, and northeast Southern climate division received high amounts of rainfall [light and dark blue shading, Figure 1(a)], reaching 12.71 inches in northeast portions of the state[dark blue shading, Figure 1(a)].

Monthly rainfall for March was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in portions of the northern High Plains, parts of central and southeast Trans Pecos, west and southeast Edward Plateau, the majority of the Southern and Lower Valley, a substantial amount of the South Central climate division with the southern portions being drier, the Upper Coast, scattered portions of southern North Central, the southern portion of East Texas, and small areas in the northern Low Rolling Plains.

The majority of the High Plains, Low Rolling Plains, North Central, patchy areas across the Southern and South Central, a small portion of northwest Lower Valley,the majority of East Texas and Edwards Plateau climate divisions received above average rainfall [green and blue shading, Figure 1(b)]. Additionally, a small area of the Edwards Plateau and significant portions of the Trans Pecos received four to eight times the average amount of rainfall.

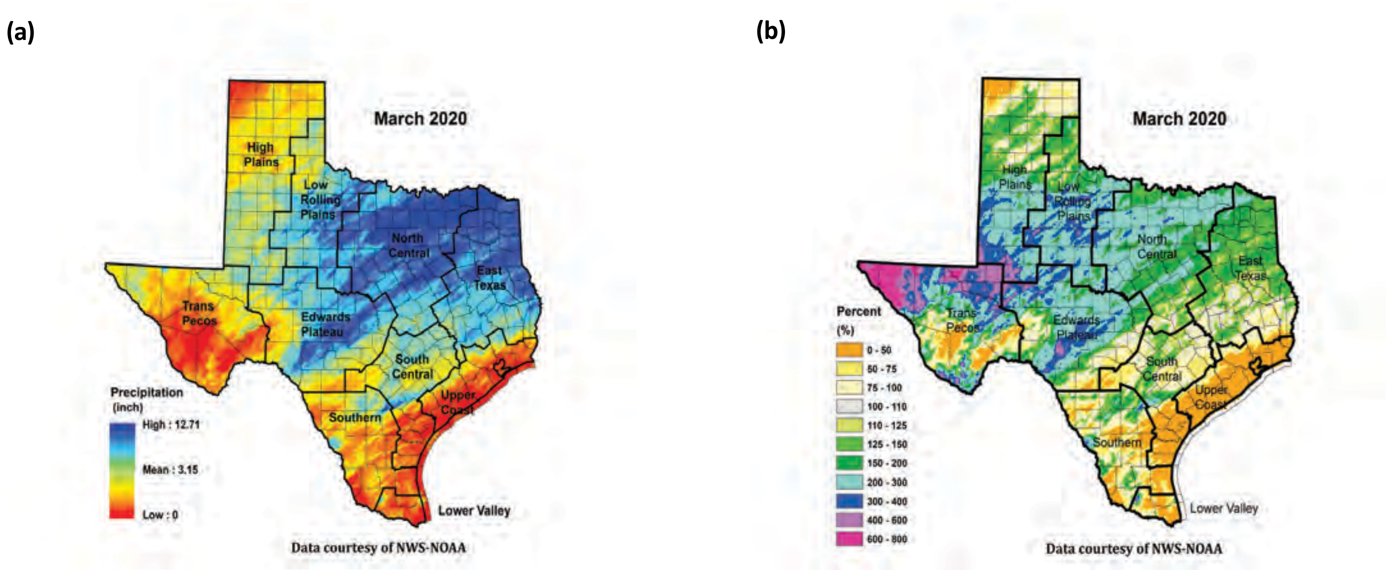


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of March 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 27.5 million acre-feet or 86 percent of total conservation storage capacity (Figure 2). This is approximately 0.467 million acre-feet more than a month ago and approximately 0.486 million acre-feet less than the end of March 2019.

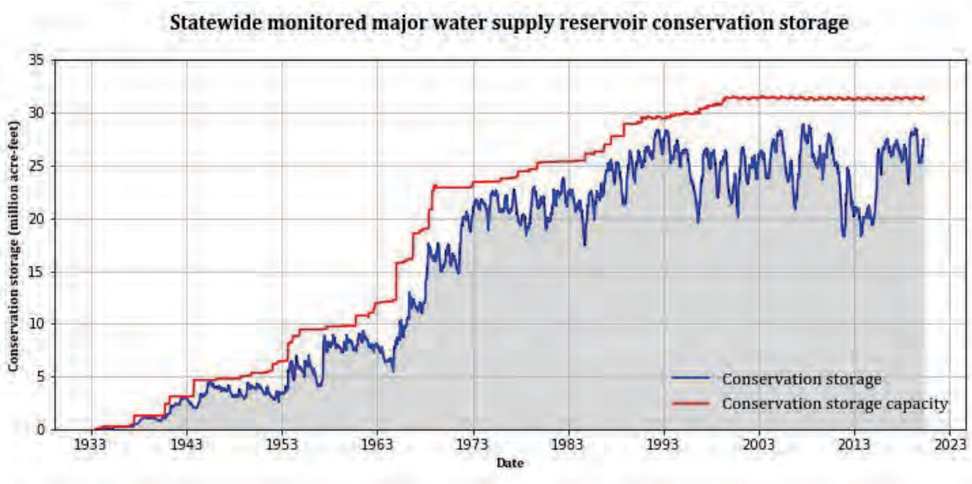


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 71 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 23 were at or above 90 percent full. Seven reservoirs [E.V. Spence (27 percent full), Greenbelt (21 percent full), J.B. Thomas (25 percent full), Mackenzie (11 percent full), O. C. Fisher (9 percent full), Palo Duro Reservoir (4 percent full), and White River (21 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 29 percent full.

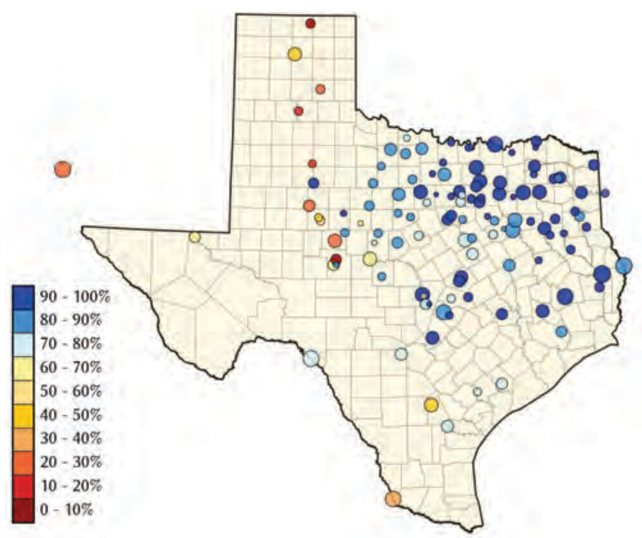


Figure 3: Reservoir conservation storage at end-March expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the Low Rolling Plains (74.3 percent full), North Central (99.6 percent full), South Central (87 percent full), East Texas (99.8 percent full), and Upper Coast (81.2 percent full) climate divisions (Figure 4). Conservation storage in the and Edwards Plateau (68.1 percent full) climate divisions was abnormally low (Figure 4). The High Plains (35.4 percent full), Southern (36.8 percent full), and Trans Pecos (34.5 percent full) climate divisions had severely low conservation storage (Figure 4).

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

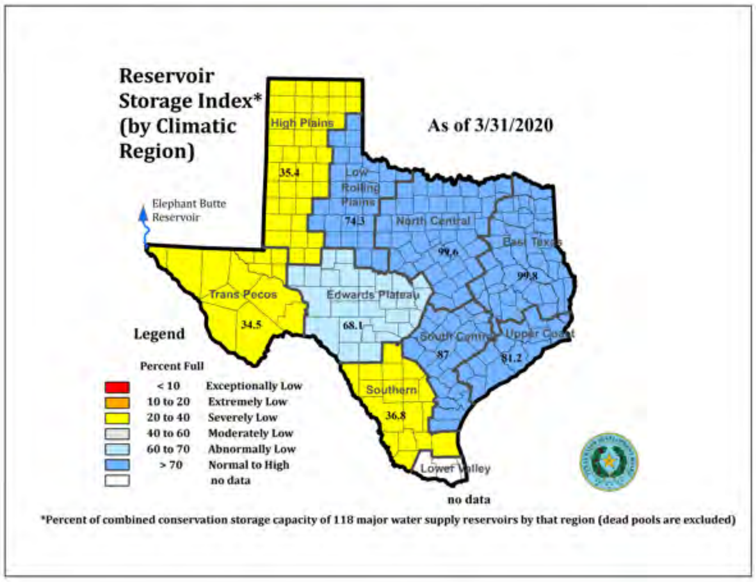


Figure 4: Reservoir Storage Index* by climate division at 3/31/2020

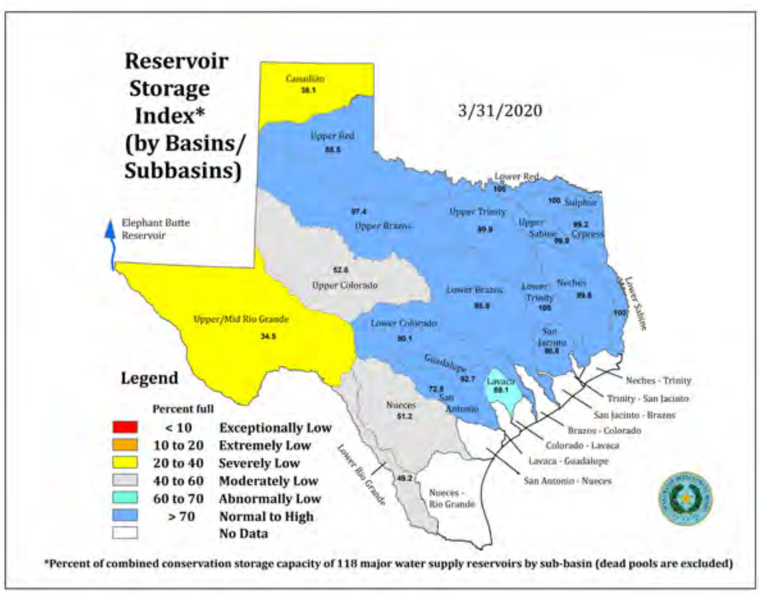


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 3/31/2020

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

Texas Water Conditions Report

April 2020

Texas Water Development Board

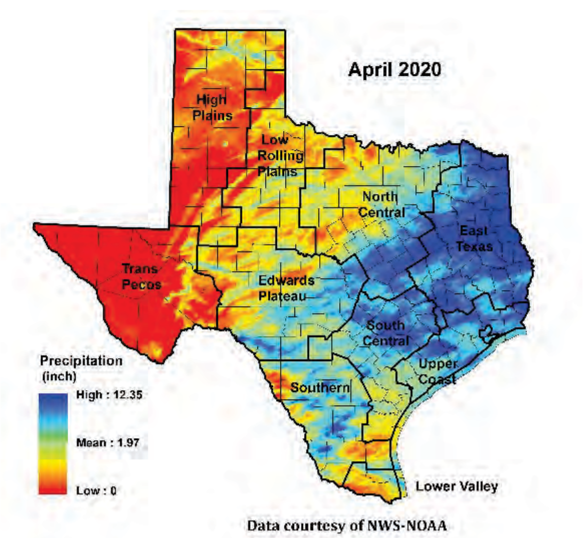
RAINFALL

Little to no rain fell over the majority of the High Plains, Trans Pecos, Low Rolling Plains, and Lower Valley the north western portions of the North Central and Edwards Plateau, the western and southern portions of the Southern, and southern South Central climate divisions during the month of April [yellow, orange and red shading, Figure 1(a)]. Some rainfall [light blue shading, Figure 1(a)] was recorded over scattered areas of the northern High Plains, central Low Rolling Plains, scattered areas across northern and more concentrated in the southern portions of the North Central, scattered areas across central and southern Edwards Plateau, and northern Lower Valley climate divisions. High amounts of rainfall were recorded in northern South Central, and the majority of the Upper Coast and East Texas climate divisions with rainfall reaching 12.35 inches in the eastern portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for April was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in much of the state, including the majority of the High Plains, Trans Pecos, Low Rolling Plains, Edwards Plateau, North Central, and Lower Valley climate divisions.

Above average rainfall fell in small areas of eastern Trans Pecos, northern and southern High Plains, scattered across the Edwards Plateau with higher amounts in the southern portions of the North Central, northern portions of South Central, northern and central Southern, northern Lower Valley, portions of the Upper Coast and the majority of East Texas climate divisions [green and blue shading, Figure 1(b)]. Additionally, 4 to 6 times the average amount of rainfall fell over a very small patch in southern Edwards Plateau and Southern climate divisions.

(a)



(b)

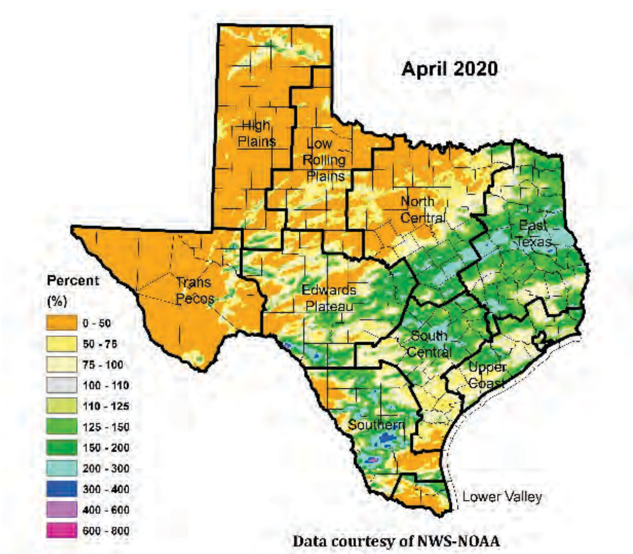


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of April 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 27.6 million acre-feet or 85 percent of total conservation storage capacity (Figure 2). This is approximately .083 million acre-feet less than a month ago and approximately 0.73 million acre-feet less than the end of April 2019.

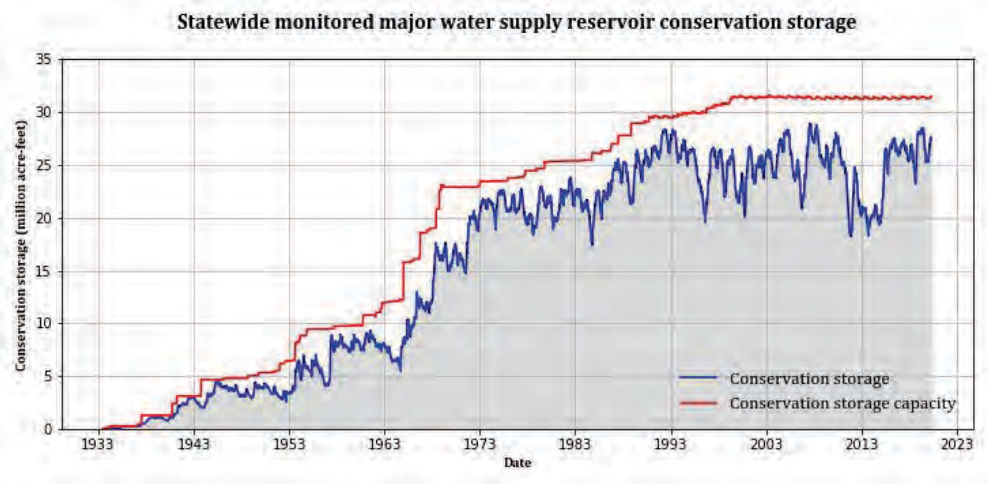


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 63 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 26 were at or above 90 percent full. Eight reservoirs [E.V. Spence (27 percent full), Falcon (27 percent full), Greenbelt (20 percent full), J.B. Thomas (24 percent full), Mackenzie (11 percent full), O. C. Fisher (9 percent full), Palo Duro Reservoir (4 percent full), and White River (20 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 26 percent full.

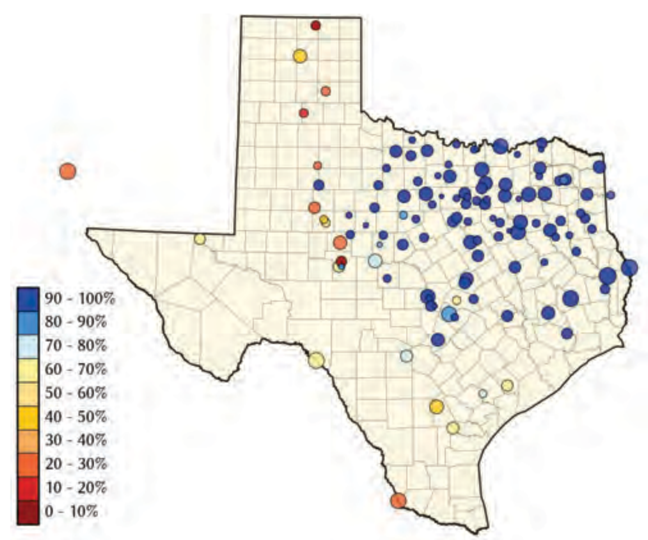


Figure 3: Reservoir conservation storage at end-April expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the Low Rolling Plains (73.9 percent full), North Central (99.1 percent full), South Central (87.4 percent full), East Texas (99.7 percent full), and Upper Coast (87.1 percent full) climate divisions (Figure 4). Conservation storage in the and Edwards Plateau (67.6 percent full) climate divisions was abnormally low (Figure 4). The High Plains (35 percent full), Southern (35.8 percent full), and Trans Pecos (32.1 percent full) climate divisions had severely low conservation storage (Figure 4).

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

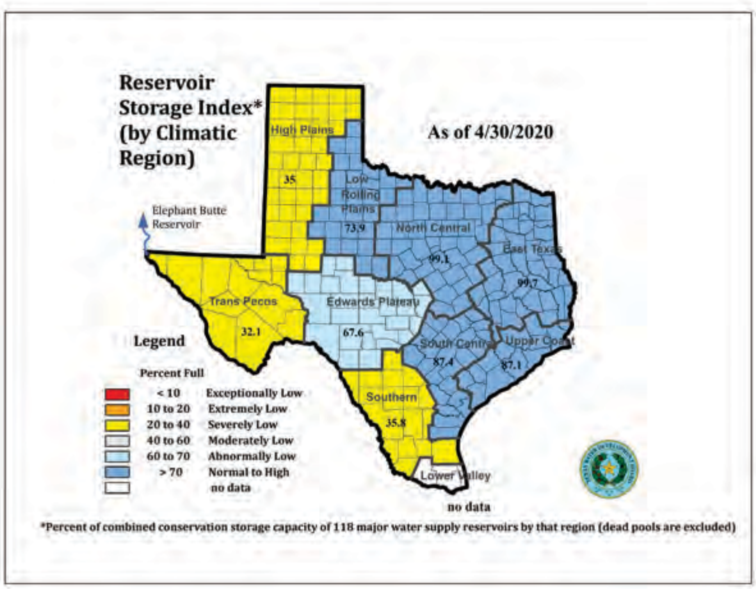


Figure 4: Reservoir Storage Index* by climate division at 4/30/2020

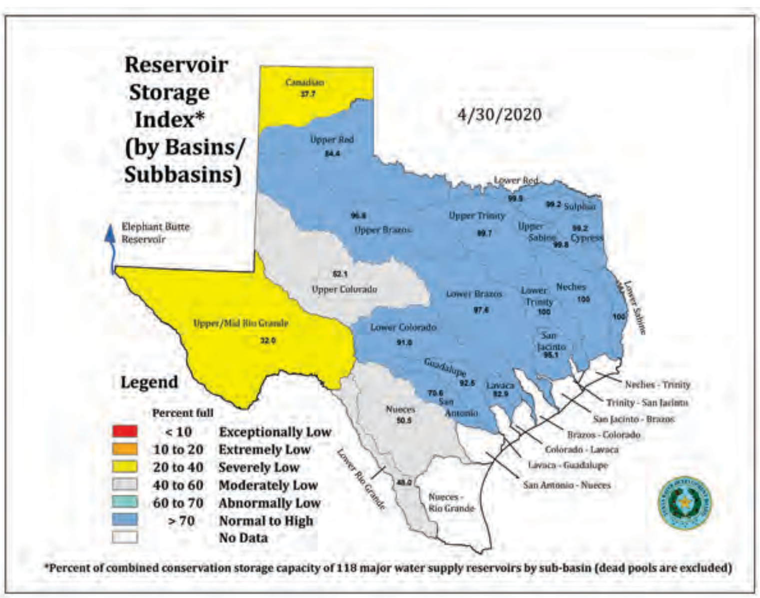


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 4/30/2020
*Reservoir Storage Index is defined as the percent full of conservation storage capacity.

Texas Water Conditions Report

May 2020

Texas Water Development Board

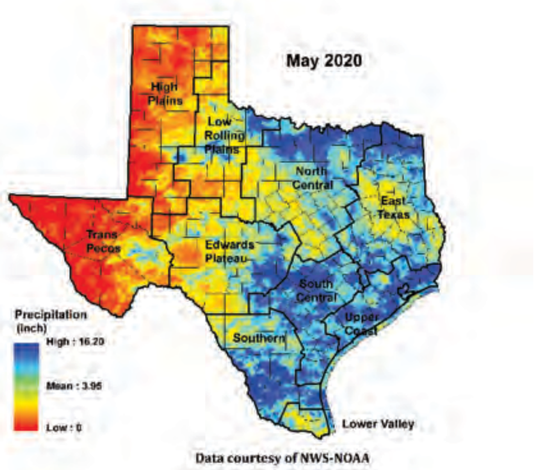
RAINFALL

Little to no rain fell over the majority of the High Plains, Trans Pecos, Low Rolling Plains, Edwards Plateau and the Lower Valley, portions of southwestern North Central, north and west Southern, and central East Texas climate divisions [yellow, orange and red shading, Figure 1(a)]. Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded over scattered areas of northern central and eastern Edwards Plateau, north central Low Rolling Plains, northern, central, eastern and southern portions of North Central, northeastern and western areas of the Lower Valley, small portions of eastern Trans Pecos, a small patch of southeastern High Plains, northern and southern East Texas, and the majority of the Southern, South Central, and Upper Coast climate divisions, reaching 16.20 inches in portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for May was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in much of the state, including the majority of the High Plains and Trans Pecos, northern and southern Low Rolling Plains, southern, central and northwestern Edwards Plateau, central and southwestern North Central, central East Texas, northeastern South Central, central Lower Valley, scattered across portions of northwestern Southern and parts of the Upper Coast climate divisions.

Above average rainfall fell in small scattered areas in northwestern, northeastern and more so in eastern Trans Pecos, southeastern portions of High Plains, northwestern, southwestern, central and east Edwards Plateau, central, western, and northeastern Low Rolling Plains, scattered in northern, and eastern areas of the North Central climate division, northern, western, eastern, and southern borders of the Lower Valley, northern and southern East Texas, the majority of the Upper Coast and Southern climate divisions [green and blue shading, Figure 1(b)]. Additionally, parts of the Trans Pecos received 3–6 times the average amount of rainfall and parts of the Southern climate division received 3–8 times the average amount of rainfall.

(a)



(b)

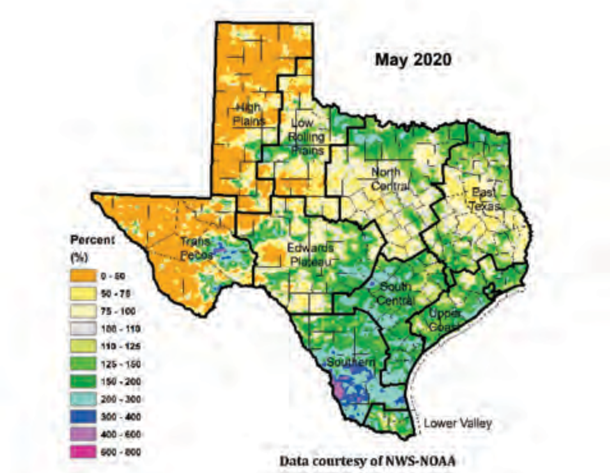


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of May 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 27.5 million acre-feet or 85 percent of total conservation storage capacity (Figure 2). This is approximately 0.057 million acre-feet less than a month ago and approximately 1.08 million acre-feet less than the end of May 2019.

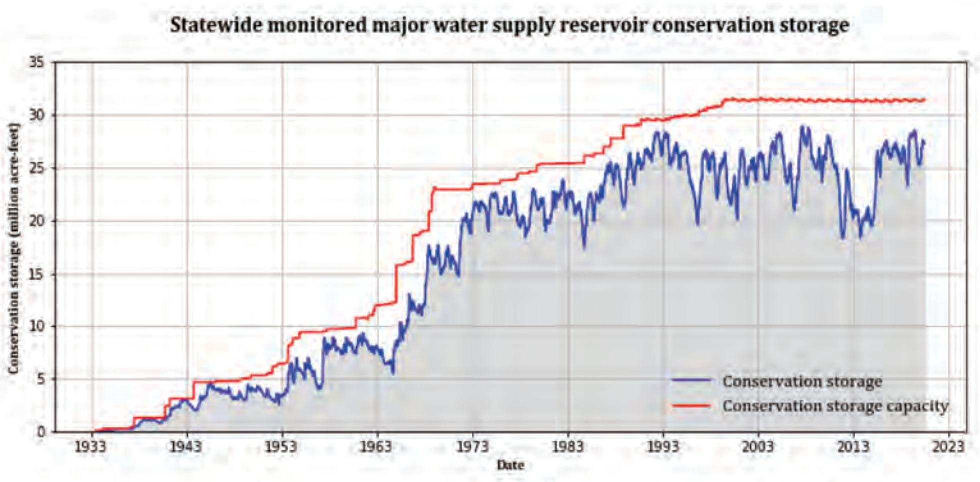


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 65 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 24 were at or above 90 percent full. Seven reservoirs [E.V. Spence (26 percent full), Greenbelt (20 percent full), J.B. Thomas (23 percent full), Mackenzie (11 percent full), O. C. Fisher (9 percent full), Palo Duro Reservoir (3 percent full), and White River (20 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 21 percent full.

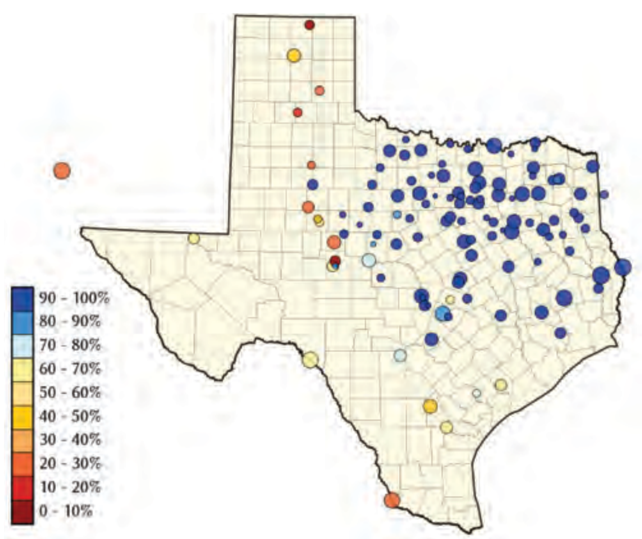


Figure 3: Reservoir conservation storage at end-May expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the Low Rolling Plains (73.5 percent full), North Central (99.3 percent full), South Central (87.4 percent full), East Texas (99.6 percent full), and Upper Coast (96.3 percent full) climate divisions (Figure 4). Conservation storage in the Edwards Plateau (64.9 percent full) climate division was abnormally low (Figure 4). The High Plains (34.2 percent full), Southern (38.9 percent full), and Trans Pecos (26.9 percent full) climate divisions had severely low conservation storage (Figure 4).

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

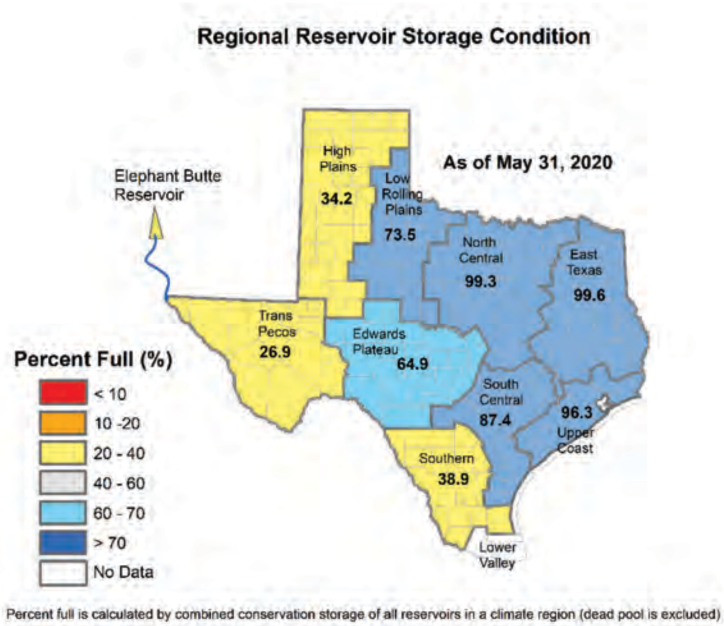


Figure 4: Reservoir Storage Index* by climate division at 5/31/2020

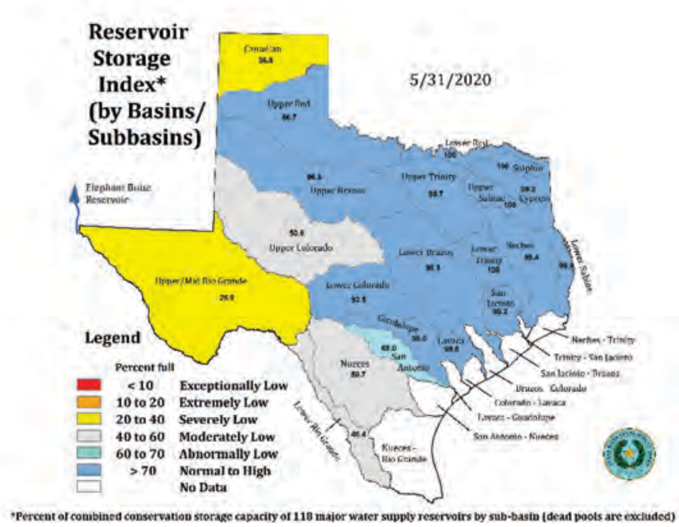


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 5/31/2020

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

Texas Water Conditions Report

June 2020

Texas Water Development Board

RAINFALL

Little to no rain fell over the majority of the Trans Pecos, High Plains, Low Rolling Plains, Edwards Plateau, Southern, southern, northeastern, and portions of western North Central, western and northeastern East Texas and northern portions of the South Central climate divisions [yellow, orange and red shading, Figure 1(a)].

Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded over portions of northeastern and southeastern High Plains, southeastern Trans Pecos, scattered areas of northern, eastern and southwestern Low Rolling Plains, eastern and scattered portions of western Southern, southern and portions of northern South Central, the majority of northern North Central, East Texas, Lower Valley, and the Upper Coast climate divisions, reaching 13.89 inches in portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for June was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in much of the state, including the majority of the Trans Pecos, High Plains, Low Rolling Plains, North Central, Edwards Plateau, Southern, South Central, East Texas and Upper Coast climate divisions.

Above average rainfall fell in portions of the northern and eastern Trans Pecos, northern High Plains, southern Low Rolling Plains, northern North Central, southern East Texas, central Upper Coast, southern and central South Central, southeastern Southern, and the majority of the Lower Valley climate divisions [green and blue shading, Figure 1(b)]. Additionally, small portions of southern Texas received 3–4 times the average amount of rainfall.

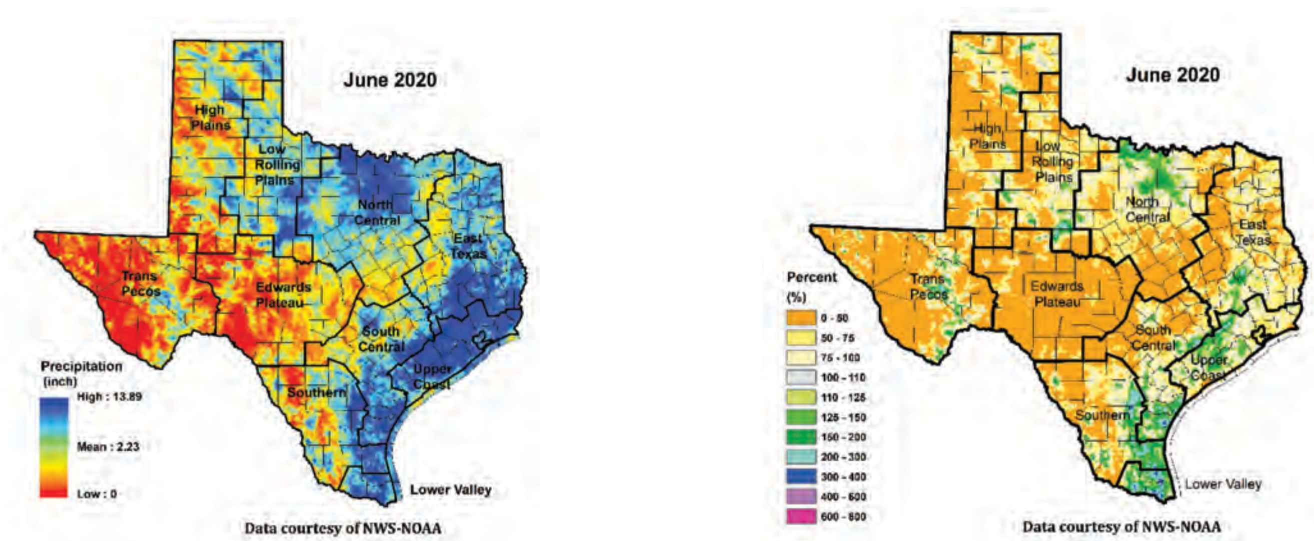


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of June 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 26.99 million acre-feet or 84 percent of total conservation storage capacity (Figure 2). This is approximately 0.56 million acre-feet less than a month ago and approximately 1.56 million acre-feet less than the end of June 2019.

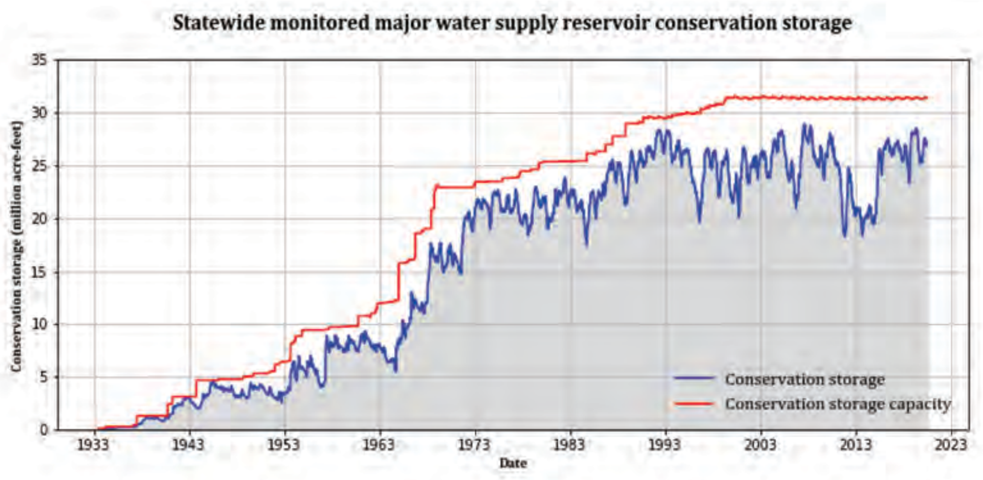


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 43 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 44 were at or above 90 percent full. Eight reservoirs [E.V. Spence (25 percent full), Greenbelt (20 percent full), J.B. Thomas (22 percent full), Mackenzie (10 percent full), O. C. Fisher (8 percent full), Palo Duro Reservoir (3 percent full), and White River (18 percent full), Falcon Reservoir (29 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 15 percent full.

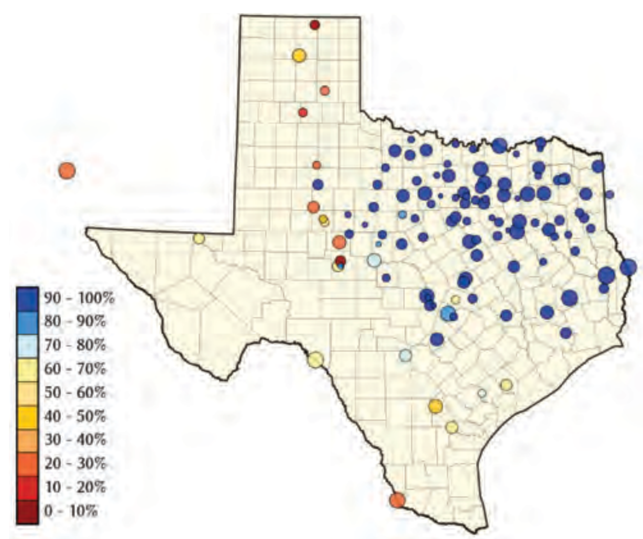


Figure 3: Reservoir conservation storage at end-June expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the Lower Rolling Plains (72.8 percent full), North Central (98.9 percent full), East Texas (97.6 percent full), South Central (83.9), and Upper Coast (95.7 percent full) climate divisions (Figure 4). Conservation storage in the Edwards Plateau (64.1 percent full) was abnormally low (Figure 4). The High Plains (33.2 percent full), Southern (36.6 percent full) and the Trans Pecos (21 percent full) climate divisions had severely low conservation storage (Figure 4).

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

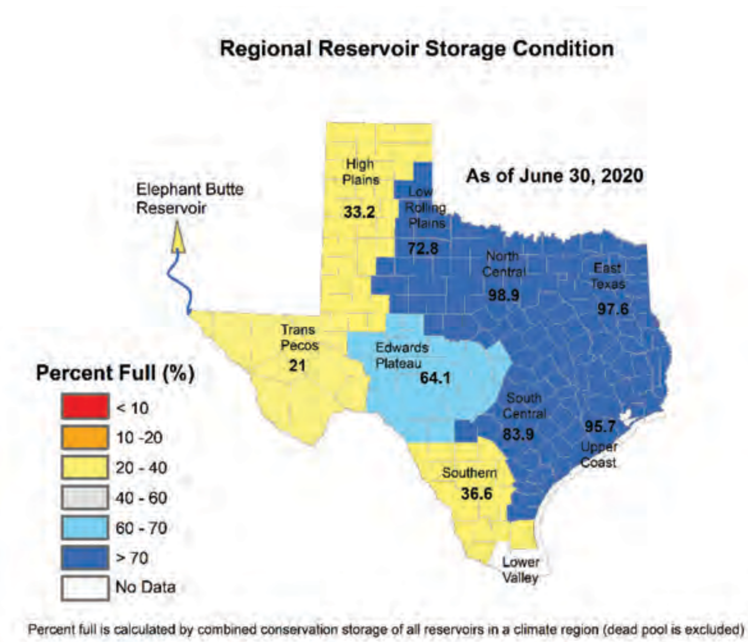


Figure 4: Reservoir Storage Index* by climate division at 6/30/2020

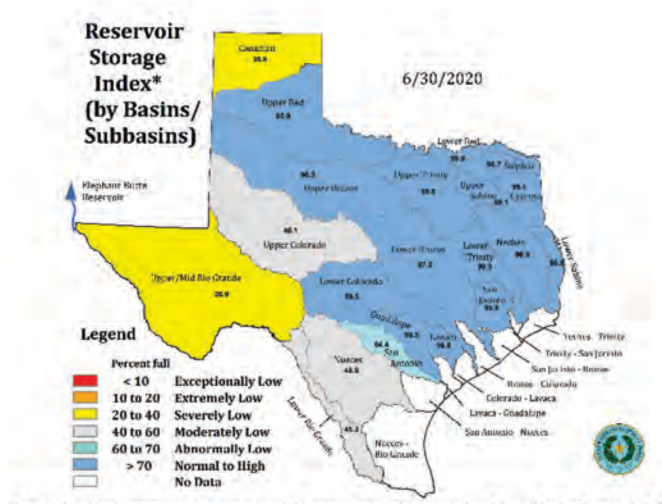


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 6/30/2020

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

Texas Water Conditions Report

July 2020

Texas Water Development Board

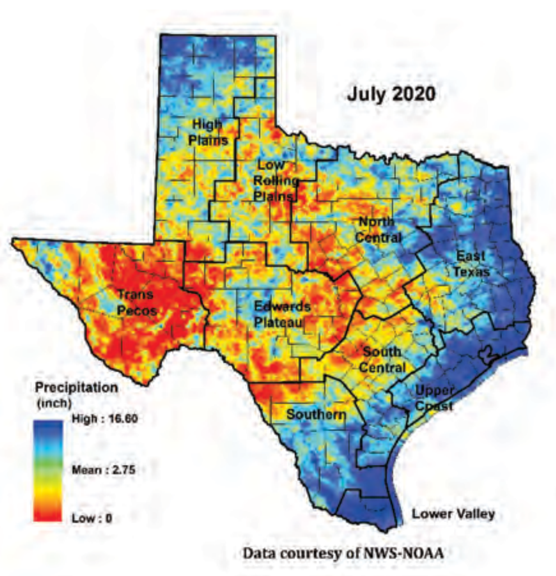
RAINFALL

Little to no rain fell over the majority of the Trans Pecos, Low Rolling Plains, Edwards Plateau, North Central, portions of southeastern High Plains, northern South Central, and northern regions of the Southern climate divisions [yellow, orange and red shading, Figure 1(a)].

Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded over northwestern and central, Trans Pecos, northern and southern High Plains, scattered areas throughout the Low Rolling Plains, central Edwards Plateau, northern, central and eastern North Central, southern and northeastern South Central, the majority of the Southern, Lower Valley, Upper Coast, and East Texas climate divisions, reaching 16.60 inches in portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for July was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in much of the state, including the majority of the Trans Pecos, High Plains, Low Rolling Plains, Edwards Plateau, North Central, South Central and parts of the Southern, Upper Coast, and East Texas climate divisions.

Above average rainfall fell in small areas in northwestern and southeastern Trans Pecos, Central Edwards, small scattered areas across the Low Rolling Plains, northern, as well as scattered across central and southern portions of the High Plains, parts of the northern and central North Central, eastern and central East Texas, southern and a small area in the northeastern South Central, the majority of the Upper Coast and Southern climate divisions [green and blue shading, Figure 1(b)]. Additionally, parts of southern and central Southern and the majority of the Lower Valley received 2–8 times the average amount of rainfall.



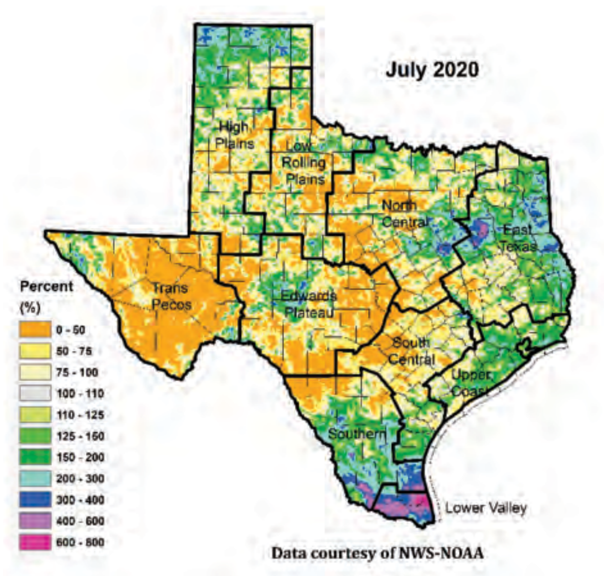


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of July 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 26.3 million acre-feet or 82 percent of total conservation storage capacity (Figure 2). This is approximately 0.663 million acre-feet less than a month ago and approximately 1.45 million acre-feet less than the end of July 2019.

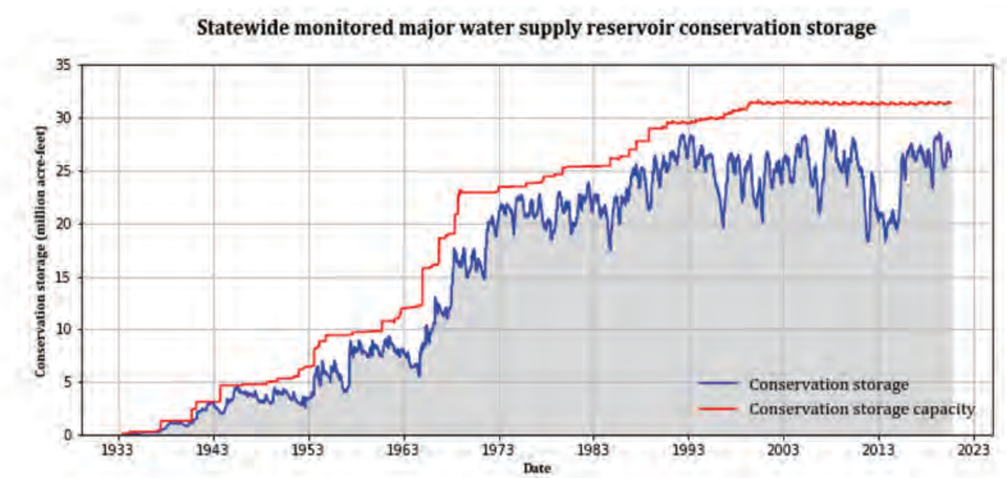


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 24 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 60 were at or above 90 percent full. Eight reservoirs [E.V. Spence (24 percent full), Greenbelt (19 percent full), J.B. Thomas (20 percent full), Mackenzie (10 percent full), O. C. Fisher (8 percent full), Palo Duro Reservoir (3 percent full), and White River (17 percent full), Falcon Reservoir (26 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 9 percent full.

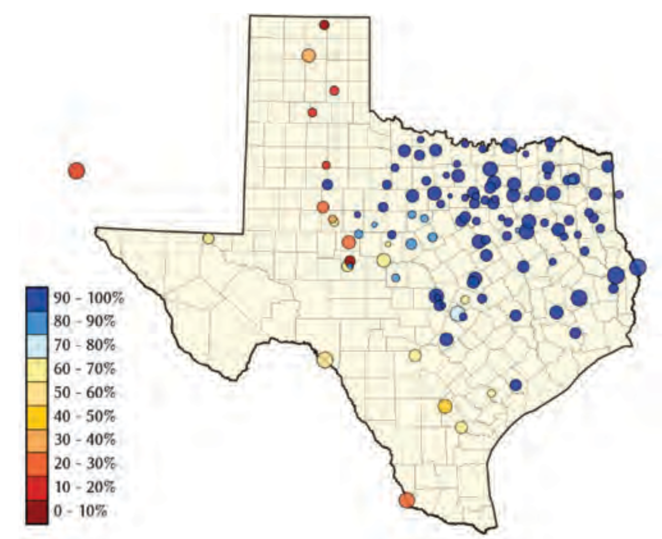


Figure 3: Reservoir conservation storage at end-July expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the North Central (96.9 percent full), East Texas (96.1 percent full), South Central (79.4), and Upper Coast (96.3 percent full) climate divisions (Figure 4). Conservation storage in the Edwards Plateau (62.3 percent full), and Low Rolling Plains (69.2 percent full) climate divisions was abnormally low (Figure 4). The High Plains (32.6 percent full), Southern (34.1 percent full) climate divisions had severely low and the Trans Pecos (15.5 percent full) climate division had extremely low conservation storage (Figure 4). Combined conservation storage by river basin or sub-basin showed that the Upper and Lower Red, Upper and Lower Trinity, Upper and Lower Sabine, Sulphur, Cypress, San Jacinto, Upper and Lower Brazos, Lower Colorado, Guadalupe, Lavaca, and Neches was normal to high (>70 percent full, Figure 5). The conservation storage in the Upper Colorado, Nueces, San Antonio, and Lower Rio Grande was moderately low (40–60 percent full). In the Canadian sub-basin storage was severely low (20–40 percent full). In the Upper/Mid Rio Grande the conservation storage was extremely low (10–20 percent full, Figure 5).

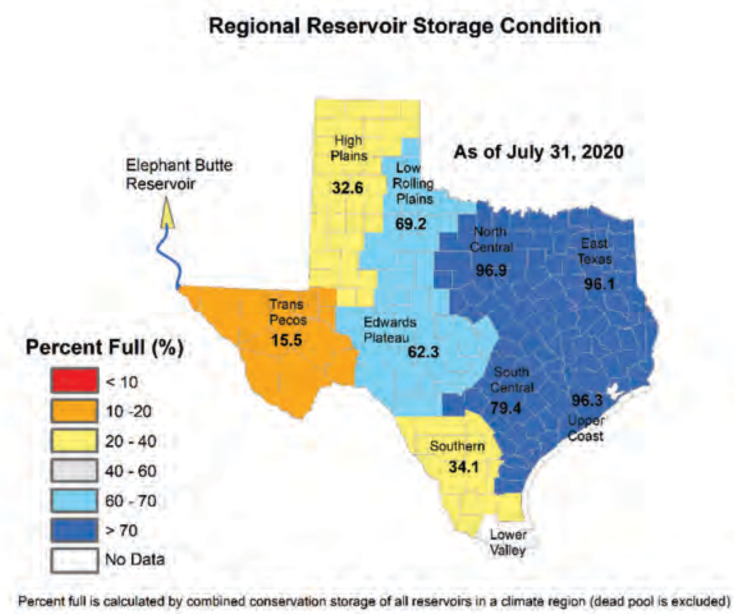


Figure 4: Reservoir Storage Index* by climate division at 7/31/2020

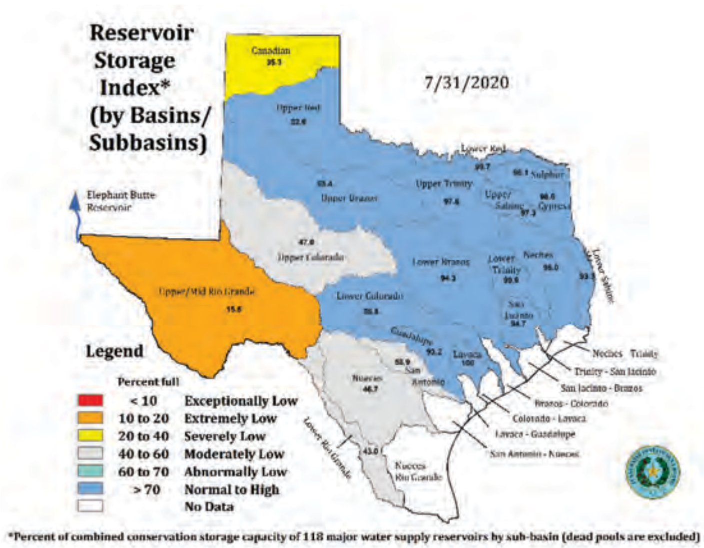


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 7/31/2020

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

Texas Water Conditions Report

August 2020

Texas Water Development Board

RAINFALL

Little to no rain fell over the majority of the Trans Pecos, Edwards Aquifer, Southern, North Central, southern and central High Plains, southern and central Low Rolling Plains, parts of northern, central and southern South Central, western Upper Coast, eastern Lower Valley and southeastern and central East Texas climate divisions [yellow, orange and red shading, Figure 1(a)].

Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded over northern and southwestern High Plains, northern and southwestern Low Rolling Plains, northern North Central, parts of northern, eastern, and southern Edwards Plateau, northern and southern South Central, southern and northeastern Southern, the majority of the Lower Valley, Upper Coast and East Texas climate divisions, reaching 16.09 inches in portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for August was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in much of the state, including the High Plains, Trans Pecos, Edwards Plateau, Low Rolling Plains, North Central, South Central, Southern, Lower Valley, Upper Coast and East Texas climate divisions.

Above average rainfall fell in small areas in the northern High Plains, north and central Low Rolling Plains, northern North Central, northern and eastern East Texas, eastern and western Upper Coast, western Lower Valley, southern and northeastern Southern, and eastern Edwards Plateau climate divisions [green and blue shading, Figure 1(b)]. Additionally, small portions of northern North Central and East Texas received 3–6 times the average amount of rainfall.

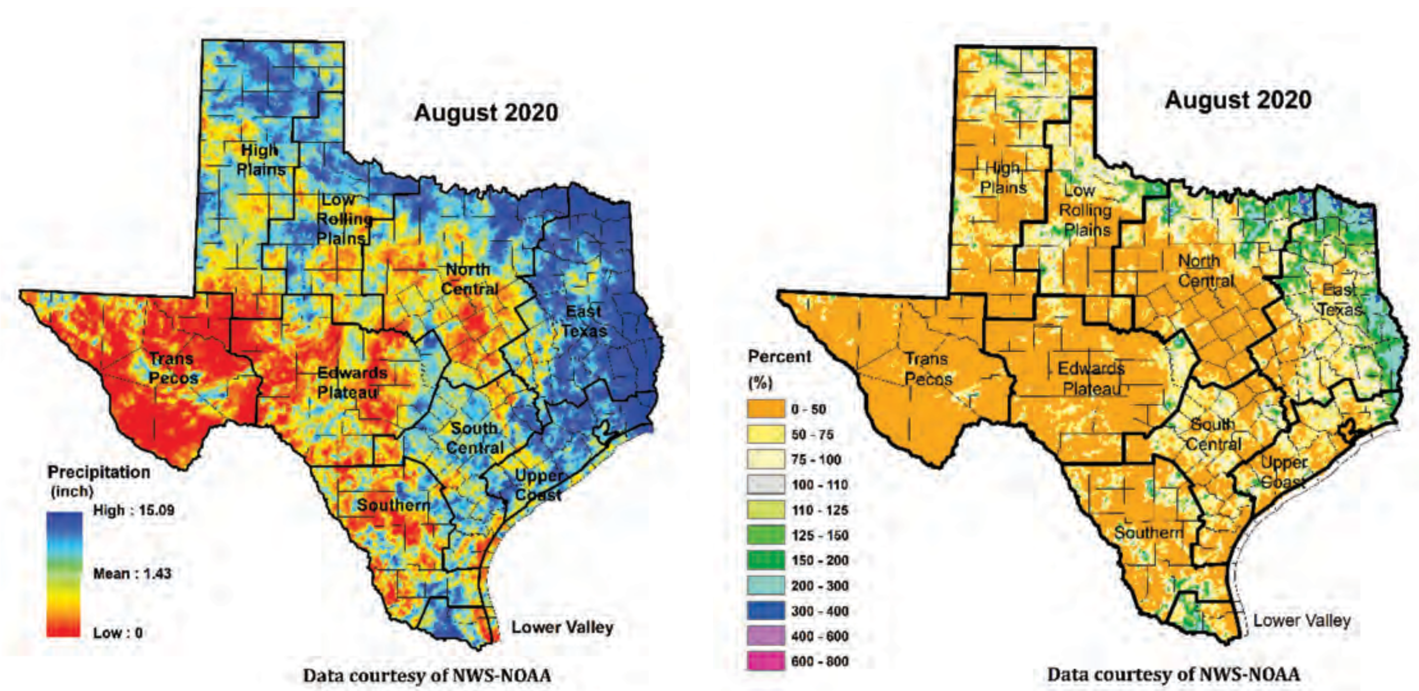


Figure 1: (a) Monthly accumulated rainfall, (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of August 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 25.31 million acre-feet or 78 percent of total conservation storage capacity (Figure 2). This is approximately 1.04 million acre-feet less than a month ago and approximately 1.37 million acre-feet less than the end of August 2019.

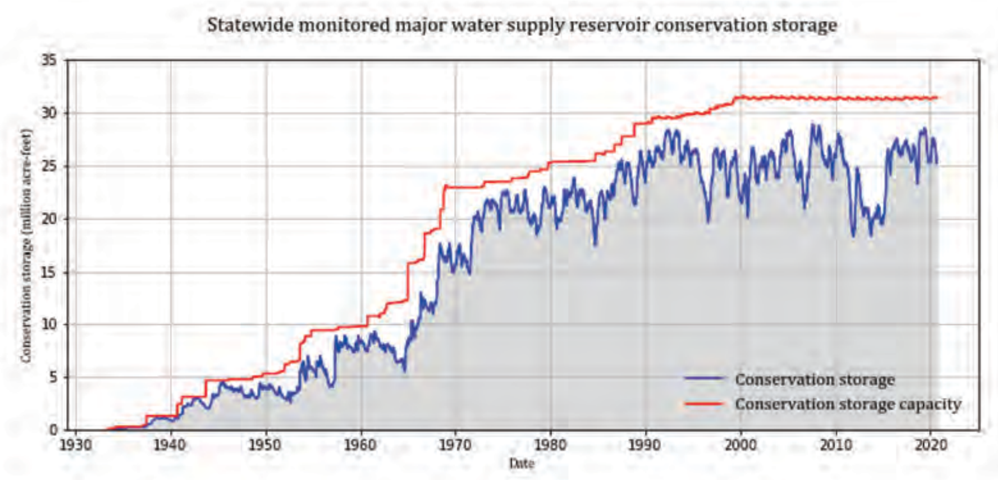


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 8 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 57 were at or above 90 percent full. Eight reservoirs [E.V. Spence (23 percent full), Greenbelt (18 percent full), J.B. Thomas (19 percent full), Mackenzie (10 percent full), O. C. Fisher (7 percent full), Palo Duro Reservoir (3 percent full), and White River (15 percent full), Falcon Reservoir (28 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 6 percent full.

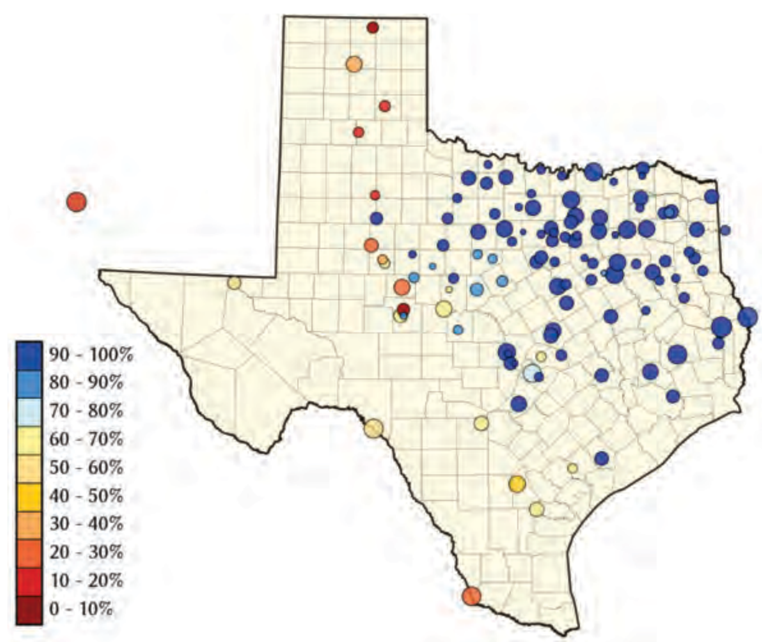


Figure 3: Reservoir conservation storage at end-August expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the North Central (92.6 percent full), East Texas (93.2 percent full), South Central (75.3), and Upper Coast (93.6 percent full) climate divisions (Figure 4). Conservation storage in the Edwards Plateau (60.2 percent full), and Low Rolling Plains (63.9 percent full) climate divisions was abnormally low (Figure 4). The High Plains (31.6 percent full), Southern (33.6 percent full) climate divisions had severely low and the Trans Pecos (12.2 percent full) climate division had extremely low conservation storage (Figure 4).

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

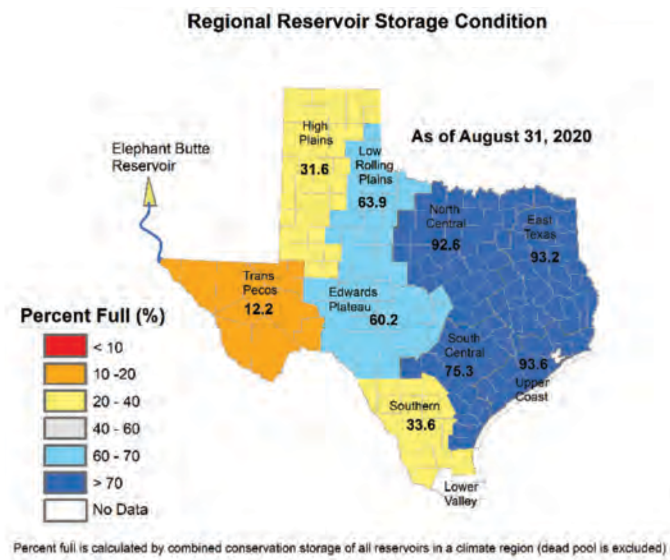


Figure 4: Reservoir Storage Index* by climate division at 8/31/2020

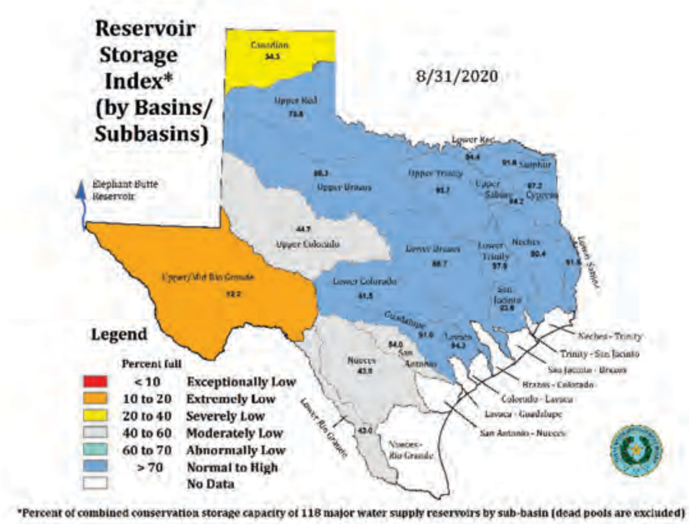


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 8/31/2020

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

Texas Water Conditions Report

September 2020

Texas Water Development Board

RAINFALL

Little to no rain fell over the majority of the High Plains, Trans Pecos, Low Rolling Plains, western and parts of central Edwards Plateau, portions of the Southern, northwestern and central South Central, portions of central and northern East Texas, parts of northern North Central, and northeastern and southwestern regions of the Upper Coast climate divisions [yellow, orange and red shading, Figure 1(a)].

Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded over portions of northcentral and eastern Edwards Plateau, eastern Low Rolling Plains, the majority of North Central, Upper Coast, East Texas, parts of northern and scattered portions of southern South Central, and scattered areas in the Southern climate divisions, reaching 20.42 inches in portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for September was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in the majority of the High Plains and Trans Pecos, portions of northwestern Low Rolling Plains, central eastern Edwards Plateau, northwestern and southern South Central, northern and southern Southern, southern Upper Coast, central East Texas, and a small area of northern North Central climate divisions.

Above average rainfall fell in the majority of the Edwards Plateau, North Central, East Texas, northern Upper Coast , portions of eastern Trans Pecos, southern and eastern Low Rolling Plains, northeastern and central Southern, northern South Central, and parts of the Lower Valley climate divisions [green and blue shading, Figure 1(b)]. Additionally, areas of the Low Rolling Plains, Edwards Plateau, North Central, Southern, South Central, Upper Coast and East Texas received 2–8 times the average amount of rainfall.

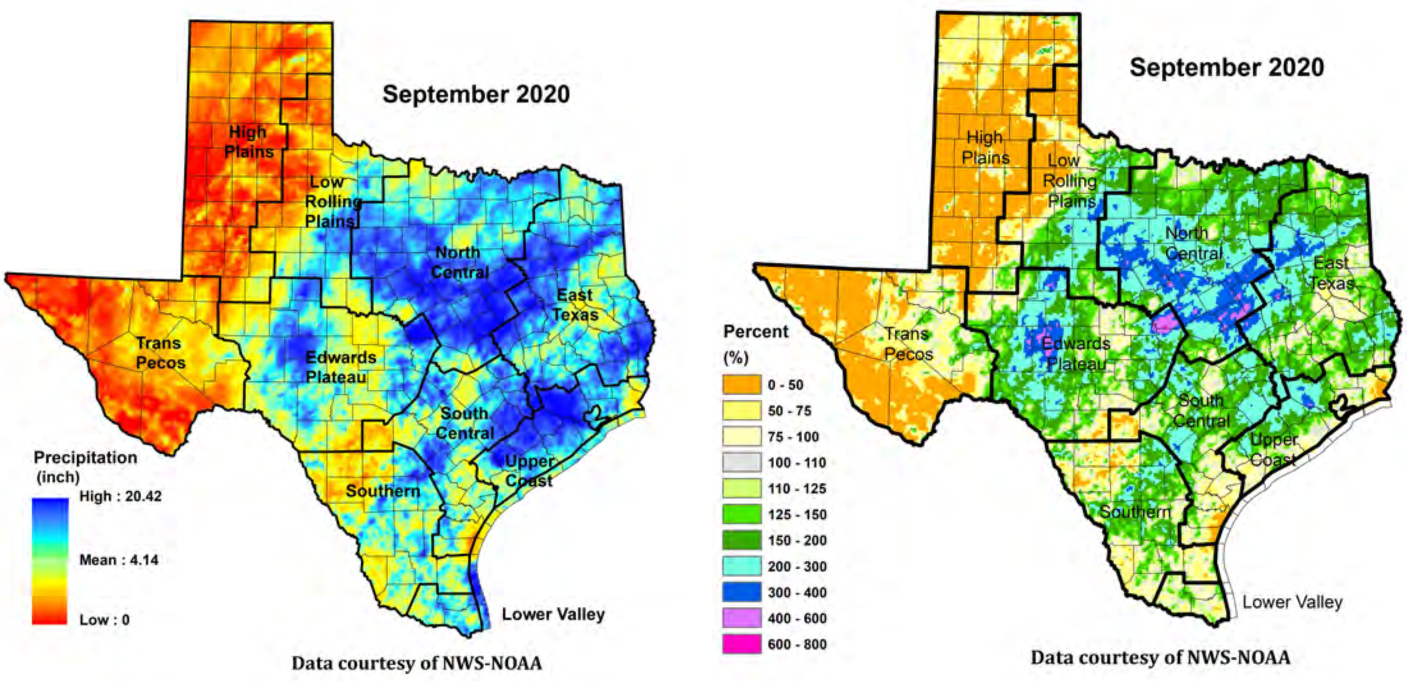


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of September 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 25.72 million acre-feet or 80 percent of total conservation storage capacity (Figure 2). This is approximately 0.42 million acre-feet more than a month ago and approximately 0.22 million acre-feet less than the end of September 2019.

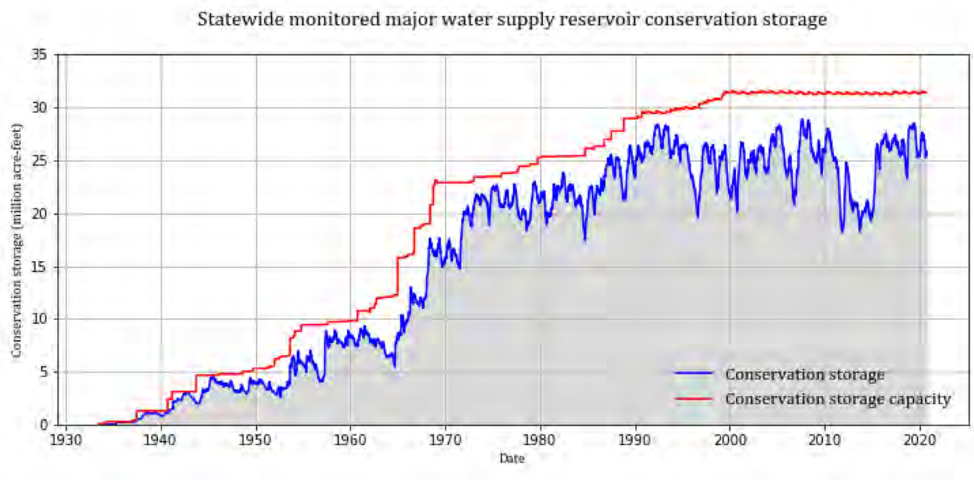


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 25 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 51 were at or above 90 percent full. Eight reservoirs [E.V. Spence (24 percent full), Falcon Reservoir (29 percent full), Greenbelt (18 percent full), J.B. Thomas (17 percent full), Mackenzie (9 percent full), O. C. Fisher (7 percent full), Palo Duro Reservoir (2 percent full), and White River (14 percent full) remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 4 percent full.

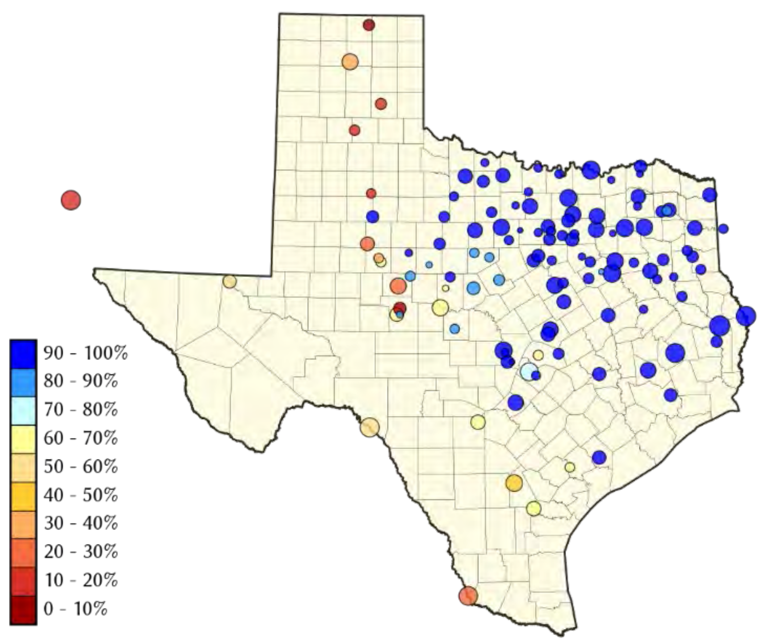


Figure 3: Reservoir conservation storage at end-September expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the North Central (96 percent full), East Texas (92.2 percent full), South Central (73.9), and Upper Coast (99.2 percent full) climate divisions (Figure 4). Conservation storage in the Edwards Plateau (62.6 percent full) and Low Rolling Plains (65.5) climate divisions was abnormally low (Figure 4). The High Plains (30.8 percent full), and Southern (34.3 percent full) climate divisions had severely low storage, and the Trans Pecos (10.8 percent full) climate division had extremely low conservation storage (Figure 4).

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

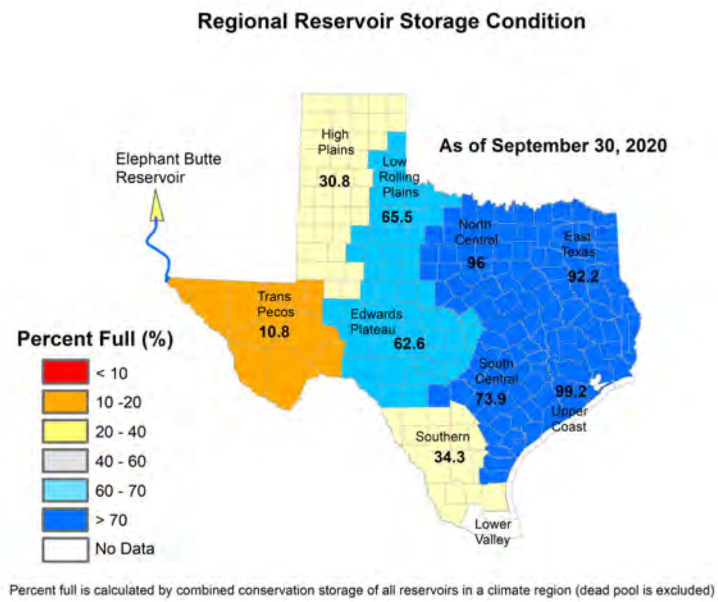


Figure 4: Reservoir Storage Index* by climate division at 9/30/2020

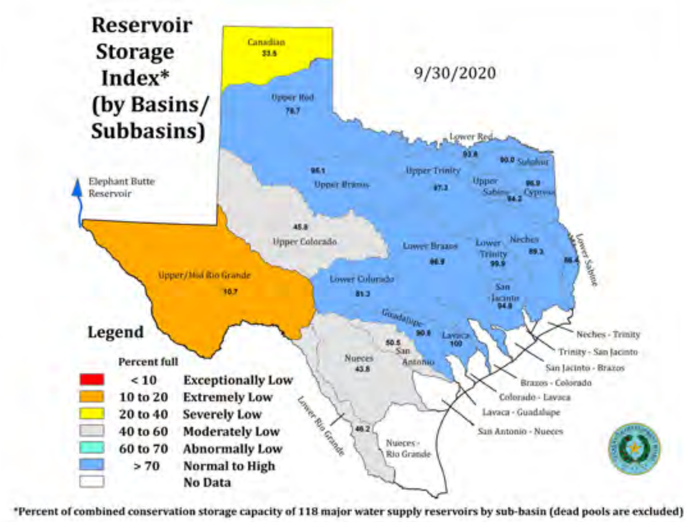


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 9/30/2020

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

Texas Water Conditions Report

October 2020

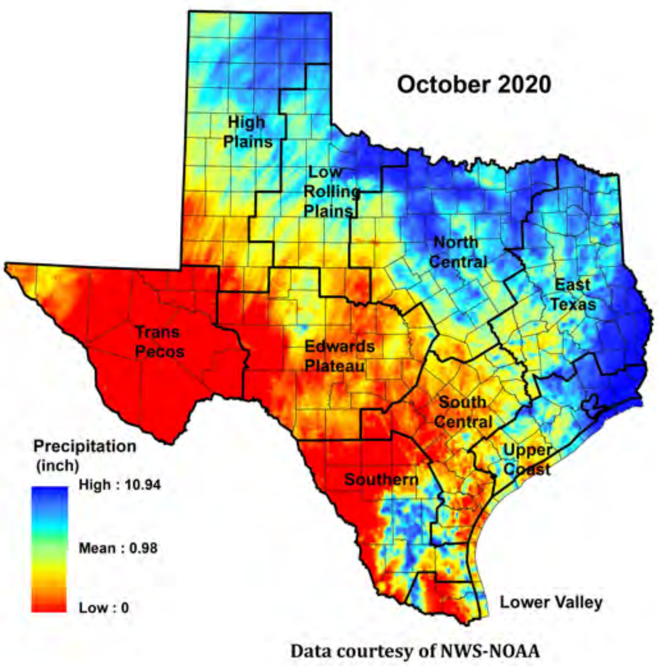
Texas Water Development Board

RAINFALL

Little to no rain fell over the majority of the Trans Pecos, Edwards Plateau, South Central, Lower Valley, northern and western Southern, southern High Plains, southern Low Rolling Plains, western Upper Coast, southwestern East Texas, and southern and western North Central climate divisions [yellow, orange and red shading, Figure 1(a)].

Some rainfall [light blue and dark blue shading, Figure 1(a)] was recorded over portions of northern High Plains, northern Low Rolling Plains, northern and central North Central, northern and eastern East Texas, eastern Upper Coast, southeastern Southern, and eastern and western Lower Valley climate divisions, reaching 10.94 inches in portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for October was below-average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, across the majority of Texas. Exceptions to this were in portions of northeastern High Plains, northeastern Low Rolling Plains, southeastern East Texas, and eastern Upper Coast climate divisions where above average rainfall occurred [green shading, Figure 1(b)].



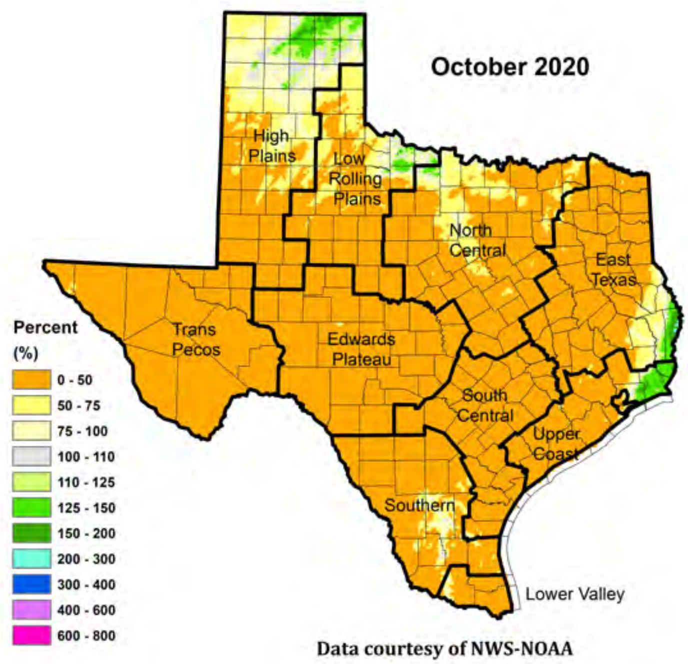


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of October 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 25.22 million acre-feet or 78 percent of total conservation storage capacity (Figure 2). This is approximately 0.5 million acre-feet less than a month ago and approximately 0.44 million acre-feet less than the end of October 2019.

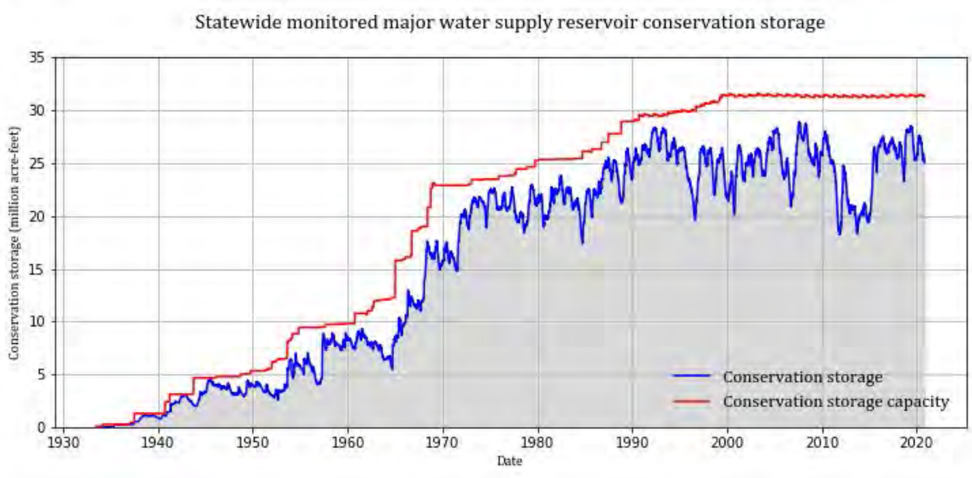


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 16 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 53 were at or above 90 percent full. Seven reservoirs [E.V. Spence (24 percent full), Greenbelt (17 percent full), J.B. Thomas (16 percent full), Mackenzie (9 percent full), O. C. Fisher (7 percent full), Palo Duro Reservoir (2 percent full), and White River (13 percent full) remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 4 percent full.

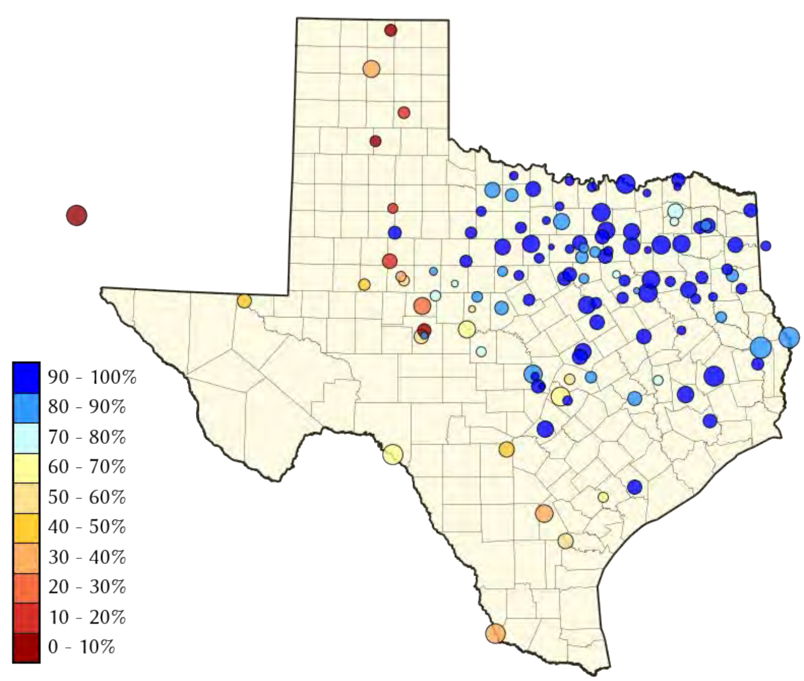


Figure 3: Reservoir conservation storage at end-October expressed as percent full (%)

*Storage is based on end of the month data in 118 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, blue shading, Figure 4) in the North Central (94.1 percent full), East Texas (90.7 percent full), South Central (71.9), and Upper Coast (95.9 percent full) climate divisions. Conservation storage in the Edwards Plateau (63.4 percent full) and Low Rolling Plains (64.8) climate divisions was abnormally low (light blue shading, Figure 4). The High Plains (29.9 percent full), and Southern (35.8 percent full) climate divisions had severely low storage (yellow shading, Figure 4), and the Trans Pecos (10.7 percent full) climate division had extremely low conservation storage (orange shading, Figure 4).

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

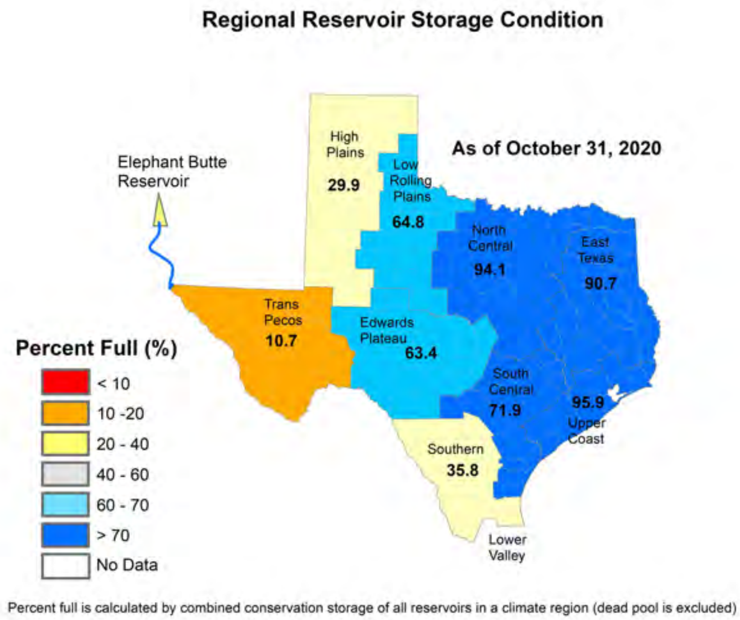


Figure 4: Reservoir Storage Index* by climate division at 10/31/2020

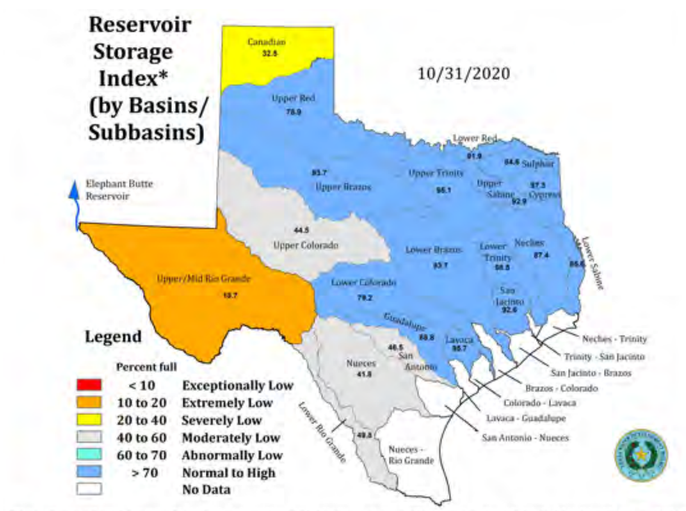


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 10/31/2020

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

Texas Water Conditions Report

November 2020

Texas Water Development Board

RAINFALL

Little to no rain [yellow, orange, and red shading, Figure 1(a)], fell over the Trans Pecos, the majority of the High Plains, Edwards Plateau, Low Rolling Plains, Lower Valley, southern portions of the Southern, portions of North Central, and northern East Texas climate divisions .

Some rainfall [light blue and dark blue shading, Figure 1(a)], was recorded over portions of the northeastern Low Rolling Plains, northern and central North Central, portions of northeastern and southern East Texas, areas of southern Edwards Plateau, northern Southern, the majority of the South Central, and Upper Coast climate divisions, reaching 8.63 inches in southeastern portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for November was below average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, across the majority of Texas. Exceptions to this were in portions of the southern Edwards Plateau, central and southern South Central, and northern and western Upper Coast climate divisions, where above average rainfall occurred [green shading, Figure 1(b)].

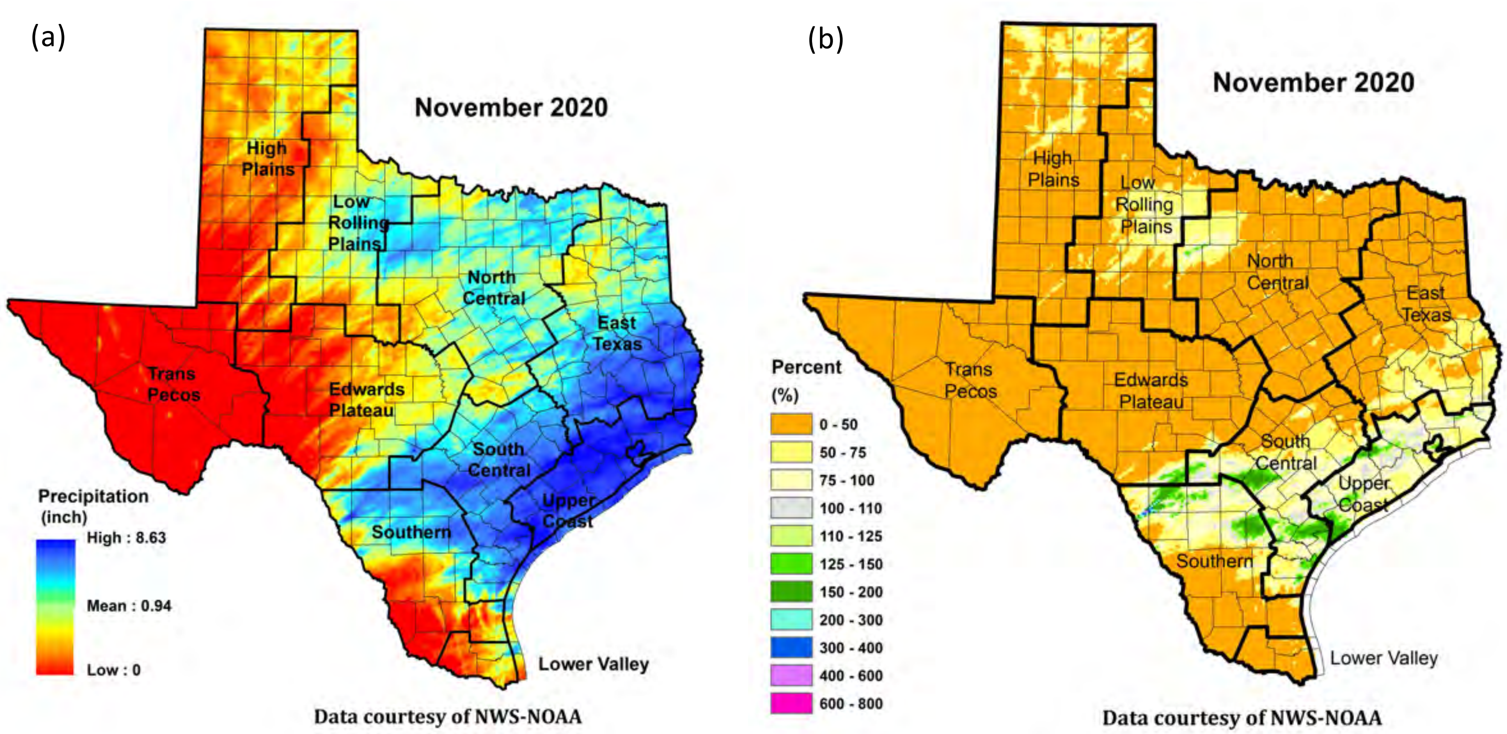


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of November 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 25.06 million acre-feet or 78 percent of total conservation storage capacity (Figure 2). This is approximately 0.14 million acre-feet less than a month ago and approximately 0.53 million acre-feet less than the end of November 2019.

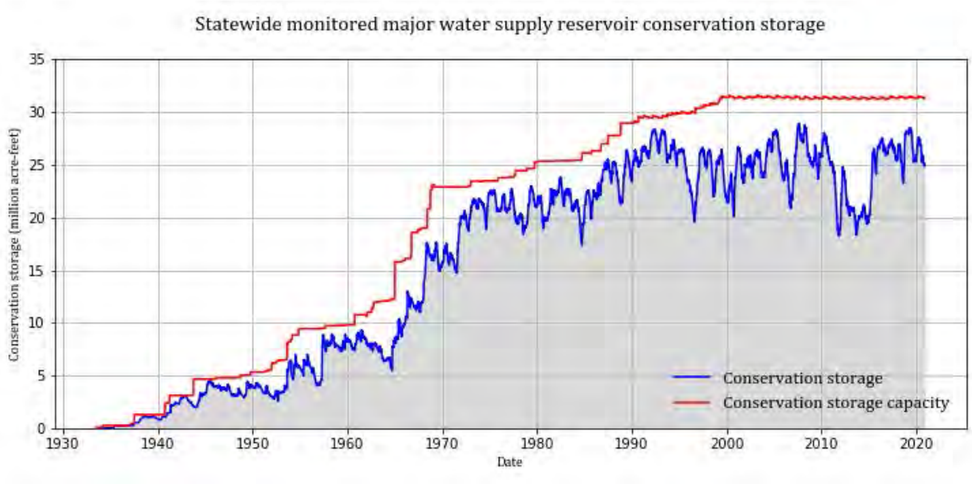


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 15 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 49 were at or above 90 percent full. Seven reservoirs [E.V. Spence (23.0 percent full), Greenbelt (16.8 percent full), J.B. Thomas (15.1 percent full), Mackenzie (9.1 percent full), O. C. Fisher (6.4 percent full), Palo Duro Reservoir (1.8 percent full), and White River (12.3 percent full) remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 5.1 percent full.

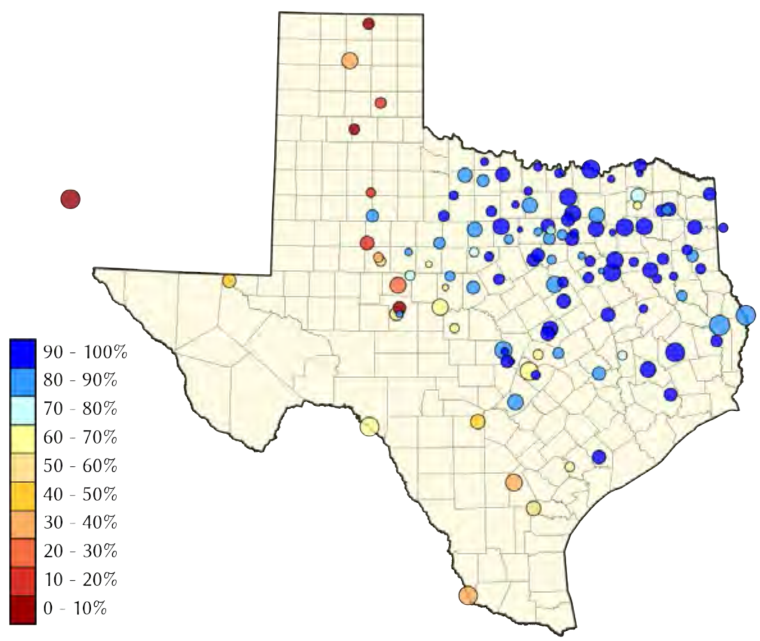


Figure 3: Reservoir conservation storage at end-November expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the North Central (94.1 percent full), East Texas (90.7 percent full), South Central (71.9), and Upper Coast (95.9 percent full) climate divisions (Figure 4). Conservation storage in the Edwards Plateau (63.4 percent full) and Low Rolling Plains (64.8) climate divisions was abnormally low (Figure 4). The High Plains (29.9 percent full), and Southern (35.8 percent full) climate divisions had severely low storage, and the Trans Pecos (11.3 percent full) climate division had extremely low conservation storage (Figure 4).

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

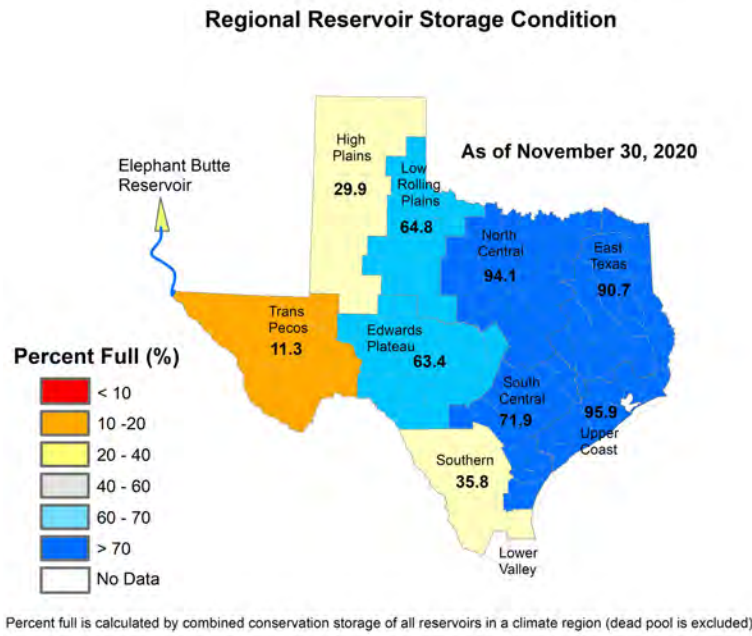


Figure 4: Reservoir Storage Index* by climate division at 11/30/2020

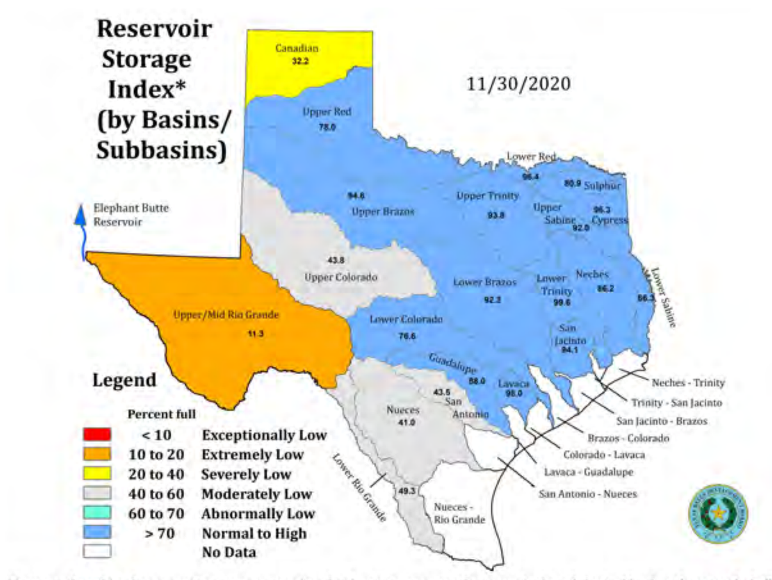


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 11/30/2020

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

Texas Water Conditions Report

December 2020

Texas Water Development Board

RAINFALL

Little to no rain [yellow, orange, and red shading, Figure 1(a)], fell over much of the Trans Pecos, High Plains, Low Rolling Plains, Southern, Lower Valley, portions of central and eastern Edwards Plateau, central and southwestern South Central, and areas of central and western North Central climate divisions .

Some rainfall [light blue and dark blue shading, Figure 1(a)], was recorded over portions of the northeastern and southern Low Rolling Plains, eastern Trans Pecos, northwestern, central, and eastern Edwards Plateau, an area of northwestern Southern, southeastern Lower Valley, northern and southeastern South Central, the majority of North Central, East Texas, and Upper Coast climate divisions, reaching 14.91 inches in eastern portions of the state [dark blue shading, Figure 1(a)].

Monthly rainfall for December was below average [yellow and orange shading, Figure 1(b)], compared to historical data from 1981–2010, in much of the High Plains, northwestern Trans Pecos, central and northern Low Rolling Plains, portions of central North Central, parts of eastern Edwards Plateau, the majority of South Central , Southern, and Lower Valley climate divisions. Above average rainfall [green and light blue shading, Figure 1(b)] occurred in portions of the northern and southern High Plains, northeastern and southern Low Rolling Plains, southeastern Trans Pecos, the majority of Edwards Plateau, northwestern Southern, eastern and western North Central, northern and southern South Central, the majority of East Texas, and the Upper Coast climate divisions. Areas of eastern Trans Pecos, northwestern Edwards Plateau, the southern High Plains, and northwestern Southern climate divisions received 3 to 6 times the average rainfall for December (dark blue and purple, Figure 1 (b).

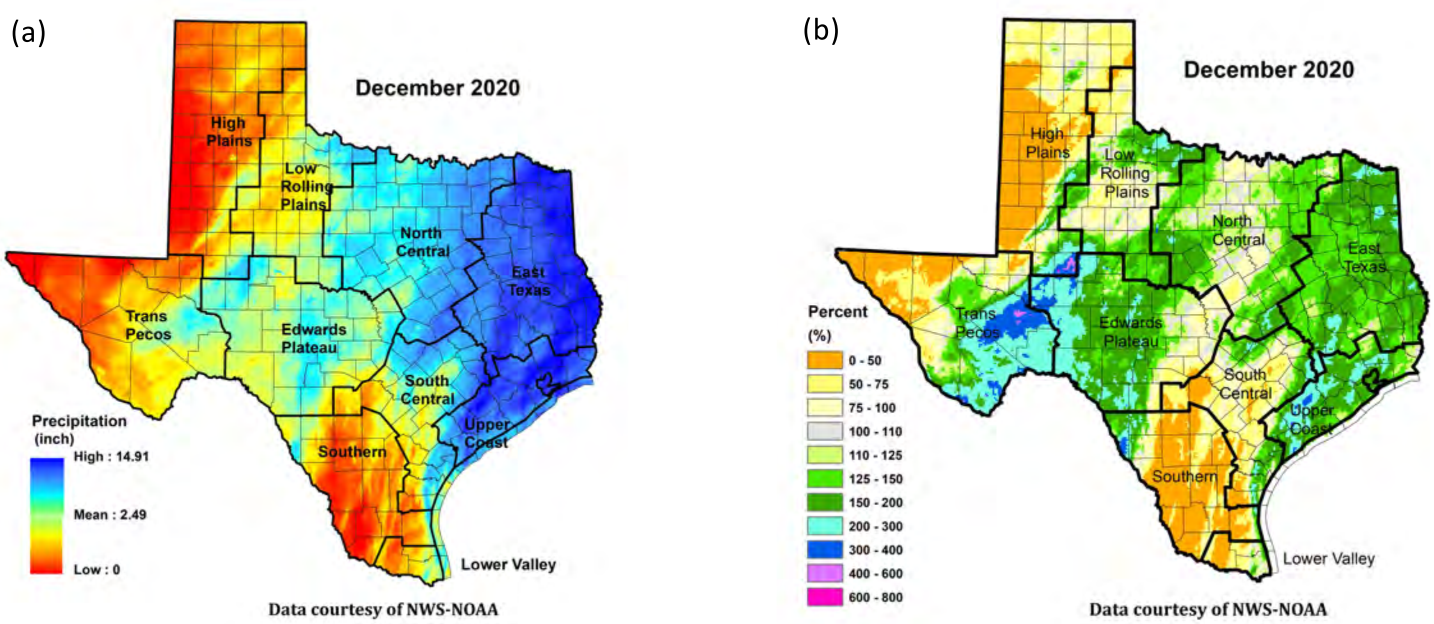


Figure 1: (a) Monthly accumulated rainfall and (b) Percent of normal rainfall

RESERVOIR STORAGE

At the end of December 2020, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 25.17 million acre-feet or 78.2 percent of total conservation storage capacity (Figure 2). This is approximately 0.10 million acre-feet more than a month ago and approximately 0.42 million acre-feet less than at the end of December 2019.

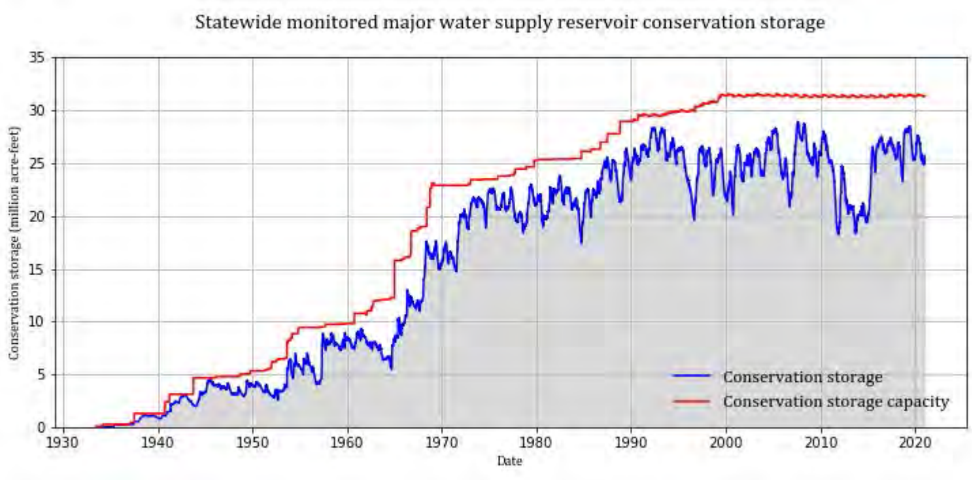


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 20 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 41 were at or above 90 percent full. Seven reservoirs [E.V. Spence (22.5 percent full), Greenbelt (16.4 percent full), J.B. Thomas (14.1 percent full), Mackenzie (9.0 percent full), O. C. Fisher (6.3 percent full), Palo Duro Reservoir (1.7 percent full), and White River (12.1 percent full) remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 6.4 percent full.

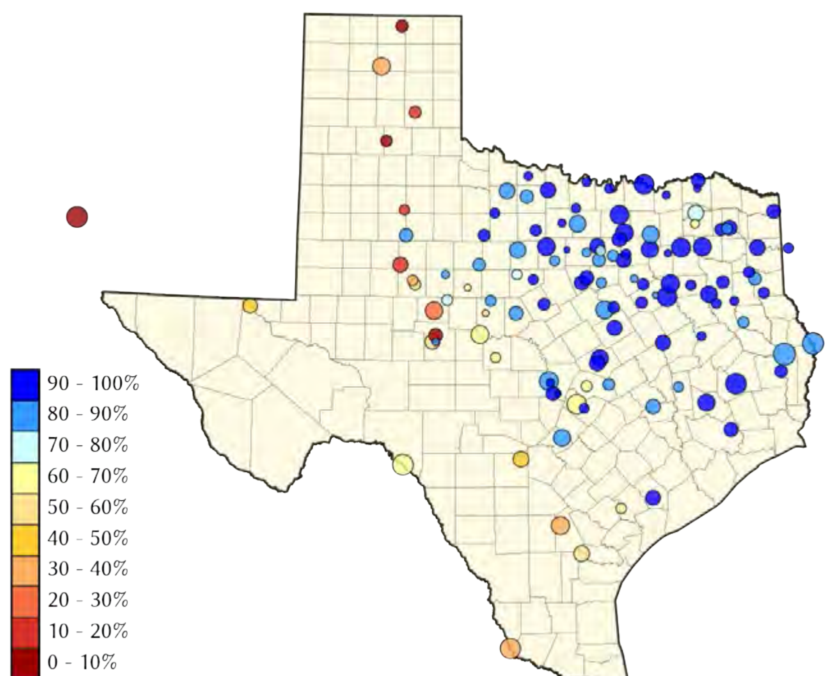


Figure 3: Reservoir conservation storage at end-December expressed as percent full (%)

*Storage is based on end of the month data in 118 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 the North Central (93.4 percent full), East Texas (91.3 percent full), and Upper Coast (99.1 percent full) climate divisions (Figure 4). Conservation storage in the Edwards Plateau (61.6 percent full), Low Rolling Plains (63.1), and South Central (69.6 percent full) climate divisions was abnormally low (Figure 4). The High Plains (29.3 percent full), and Southern (33.9 percent full) climate divisions had severely low storage, and the Trans Pecos (12.6 percent full) climate division had extremely low conservation storage (Figure 4).

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

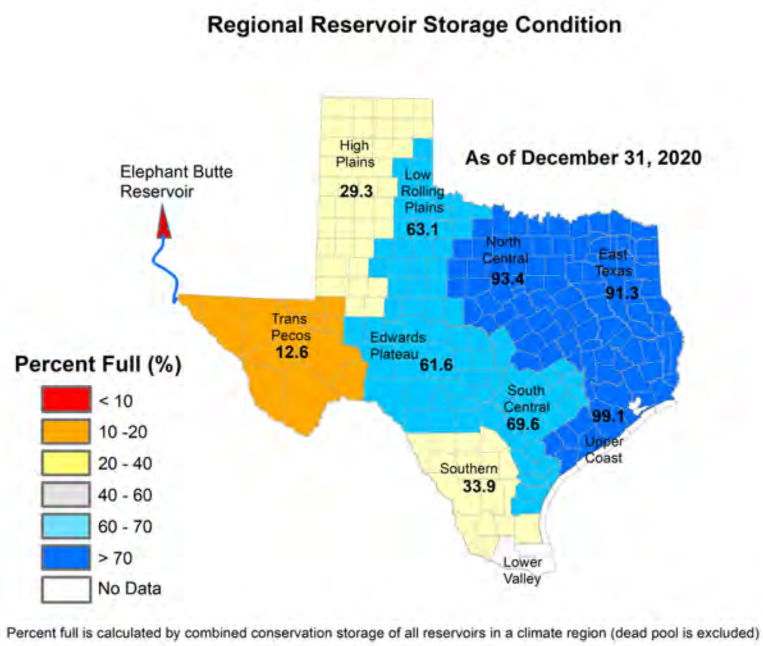


Figure 4: Reservoir Storage Index* by climate division at 12/31/2020

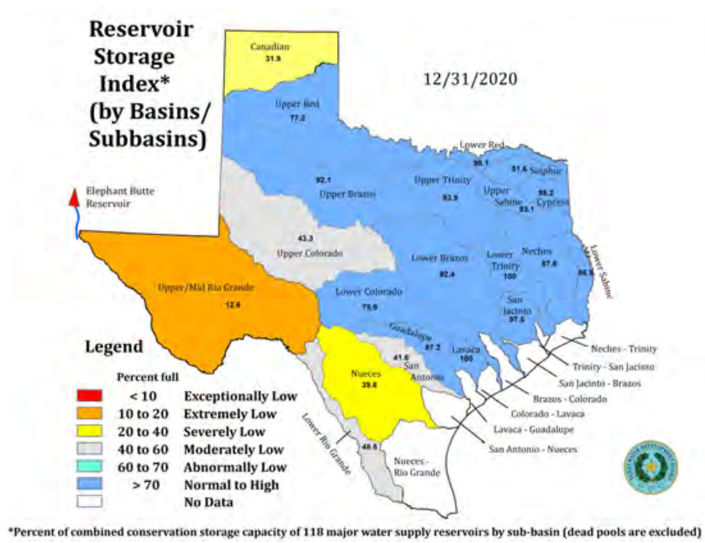


Figure 5: Reservoir Storage Index* by river basin/sub-basin at 12/31/2020

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

Making Headlines 2020

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 2020.

F.1:

- Water conservation article submitted to all newspapers in the District and published by the Weatherford Democrat on July 8, 2020.

F.2:

- Rainwater harvesting article submitted to several newspapers and published by the Weatherford Democrat on July 17, 2020.
- Rainwater harvesting article submitted to all newspapers in the District and published by the Springtown Epigraph on October 22, 2020.

F.3:

- District Newsletter provided to all non-exempt well owners and others that have signed up for the District's mailing list:
    - Spring 2020 Newsletter, distributed March 9, 2020
    - Community Resources and Updates During COVID-19, distributed April 17, 2020
    - Summer 2020 Newsletter, distributed July 2, 2020
    - Fall 2020 Newsletter, distributed October 2, 2020

https://www.weatherforddemocrat.com/news/local_news/utgcd-offers-water-conservation-tips-for-the-summer/article_a38e2a63-65e7-536a-b43f-f16c24c3e3ea.html

UTGCD offers water conservation tips for the summer

Special to the Democrat
Jul 8, 2020

Conserving water during Texas summers may seem daunting, but there are plenty of options to conserve and stay cool at the same time! Many of these practices can be performed at your home, or office location. Less water consumption equates to lower utility bills, and here are some conservation tips from the Upper Trinity Groundwater Conservation District to help you save money.

1. Try reducing lawn irrigation or revising your watering schedule. Many varieties, such as Bermuda or St. Augustine grass, require significant watering in the summer months. Remember, the grass can be brown and still be healthy and thriving! Many water groups advise watering schedules, do your best to reduce your amount of water used on your lawn. Utilizing a watering timer or making the switch to drip irrigation vastly reduces your water consumption, while keeping plants hydrated.

2. Only use water for outdoor cleaning when necessary. Many homeowners view water hoses as the ultimate cleaning tool for large concrete surfaces or driveways. While it may be easy to hose down stone surfaces, a more conservative approach is sweeping the debris instead! The extra grass and lawn clippings that are swept up can also be utilized in a mulch pile, which will also help keep your lawn healthy. You'll save tens of gallons of water, and reduce the likelihood of injury on slick surfaces.

3. Are you using water for summer activities like a pool or slip-n-slide and throwing that water out? We recommend saving any of that excess water for your plants and garden afterwards! The average kiddie pool usually houses between 50 - 200 gallons of water, so once the kids or dogs are done playing, put that water to use. If the water is not chlorinated, it can be used on any outdoor plants or lawn grass safely.

4. Icy drinks during the summer are excellent for a cool break, but where does that ice end up? If you find yourself with extra ice or water from a cooler or drink, consider placing them in your small plants or indoor garden. The ice will melt slowly and allow your plant to be watered for an extended

period of time. If you're worried about the temperature of the ice negatively affecting delicate plants, we recommend putting the ice in the soil next to the plant, to allow it to melt slowly.

For more information, visit uppertrinitygcd.com.

https://www.weatherforddemocrat.com/news/local_news/pclia-awarded-50k-grant-to-harvest-rainwater/article_e9cdbb8d-424c-5789-9c77-fcc3c13c8e72.html

EDITOR'S PICK TOPICAL

PCLIA awarded $50K grant to harvest rainwater

By Autumn Owens news1@weatherforddemocrat.com
Jul 17, 2020

A $50,000 grant recently allowed the Parker County Livestock Improvement Association to construct a rainwater harvesting collection.

“The PCLIA is both honored and grateful to have worked with the [Upper Trinity Groundwater Conservation District] and received this grant to benefit our community, our county and our organization,” PCLIA Secretary Annette Sledge said.

The UTGCD awarded the grant to the PCLIA so the collection could be built on the Parker County Sheriff’s Posse grounds.

“Because of its size and the number of people that visit annually, the PCLIA’s new facility at the sheriff’s posse rodeo grounds was a perfect opportunity to showcase how rainwater can be captured and used for many purposes,” UTGCD Manager Doug Shaw said. “This is increasingly important with the growth in Parker County, especially with so many of the new homes depending on groundwater as their source of water.”

With more than 60 events taking place at the grounds annually and an estimated 35,000 visitors, the PCLIA wanted to ensure all contestants and their animals had continued access to clean, potable water, according to a release from the UTGCD. In 2019, the livestock improvement association installed a meter on the existing water well, which dips into the Trinity Aquifer, and found that about 50,000 gallons of water was used during the Parker County Youth Livestock Show. Because of the amount of water used, the PCLIA was going to have to purchase a second water well.

“Rainwater captured off barns can be stored and used to water livestock in areas where other water resources may not be available or to prevent the need to drill a water well,” Shaw said. “In more urban environments, rainwater can be used to offset the outdoor water demand. For homeowners that depend on private wells, this helps to conserve groundwater and for those that purchase water from a public water system, this could result in lower monthly bills.”

Just before this summer’s livestock show, the harvesting collection project was completed.

“The rainfall in late May and early June filled the tank, and was used exclusively during our show,” Sledge said. “We were able to utilize the harvested water for all our water needs during the entire week.

Specifically, Sledge said the rainwater harvesting collection helped with washing and watering animals as well as the arena during the youth livestock show.

“Pioneers from the past previously harvested water and our generation has neglected harvesting this precious resource. This water harvest system is set up for the PCLIA to capture 65,000 gallons of water with 4 inches of rain,” Sledge said. “This allows us to utilize rainwater for our wash racks, water animals, watering the arena and other needs without taking precious water resources from our groundwater through the well. It is an incredible educational tool and benefits both us and our community, showing that we can save our water resources by harvesting rainwater. The local fire department will also have access to utilizing the harvested water in the unfortunate incident of local fires.”

Shaw said members of the PCLIA first approached the district late last year with the idea for the project.

“Working with the PCLIA has been a great experience, and being able to be part of such a forward-thinking project has been a real highlight this year,” Shaw said. “Based on the results the district hopes to be able to fund similar projects in our other three counties in the years to come.”

Sledge said the PCLIA hopes this project will inspire others to jump on board.

“We would like to give a special thanks to PCLIA President Melton Harms and PCLIA member and Parker County commissioner Larry Walden for their research and help negotiating with the UTGCD to secure this grant. We are also grateful to the Parker County Sheriff’s Posse for partnering with us on the project. We are very appreciative of this opportunity to be stewards of our land and preserve our natural resources to benefit our organization and those around us," Sledge said. "We hope this water harvest example will encourage other companies and individuals to harvest their own rainwater to preserve our natural water resources."

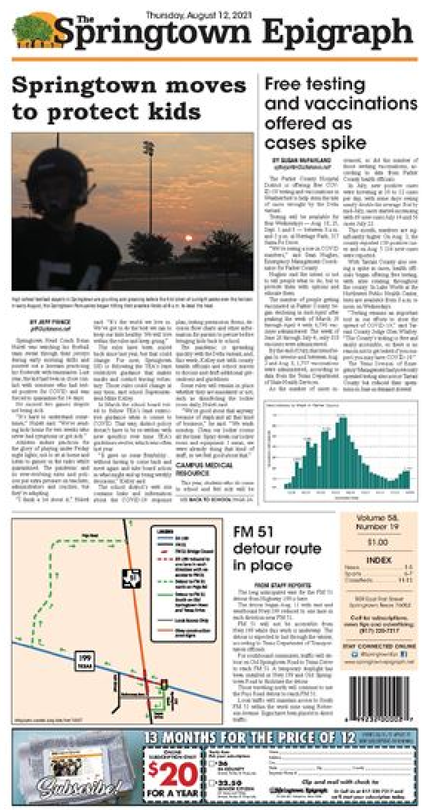
TRENDING VIDEO

Autumn Owens

The Springtown Epigraph

Rain chains: conservation with flair

Thursday, October 22, 2020


The Springtown Epigraph
Thursday, August 12, 2021

Springtown moves to protect kids

Free testing and vaccinations offered as cases spike

FM 51 detour route in place

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Click here to read Springtown Epigraph

Throughout North Texas, rainwater harvesting takes all shapes and sizes.

Oftentimes, residential dwellings may not have access to an entire roof for rain catchment. When this occurs, heavy runoff culminates at corners of the structure, and usually causes damage to soil and vegetation below. This is a perfect location for a rain chain.

Rain chains function as an alternative to downspouts, allowing rainwater to pass along decorative baubles and cups down to a cistern below.

This means a downspout can accentuate your outdoor area, while conserving rainwater.

How long should your rain chain be? Approximately 8.5 feet works for most American singlestory buildings. Materials for rain chains range from wood to metal, but popular recent models feature copper that develops a beautiful hue from chemical weathering as time goes on.

Depending on the materials the rain chain is constructed of , trace amounts of excess metals may leach into your collected water, including copper and aluminum. However, metals avoid the risk of algae or bacterial growth within your system, whereas wooden structures are prone to this type of growth if not properly treated prior to installation.

Upper Trinity Ground Water Conservation District always recommends treating harvested water to avoid injury and infection. Whether you are planning for your spring garden this fall or looking to create a tranquil space on your porch, consider rainwater harvesting.

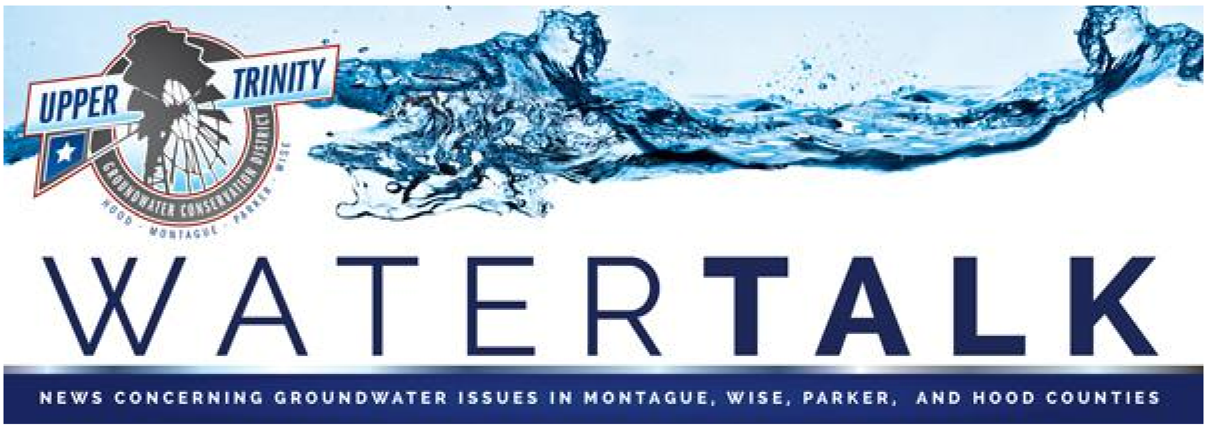
For more information and recommendations on rainwater harvesting, contact UTGCD Education and PR Coordinator, Jill Garcia, at jill@uppertrinitygcd.com.

Category: News

Doug Shaw

From: Upper Trinity GCD <jill@uppertrinitygcd.com>
Sent: Monday, March 9, 2020 2:20 PM
To: Doug Shaw
Subject: Spring 2020 Newsletter

Spring 2020 Newsletter [View this email in your browser]



latest **news**

Parker County Rainwater Harvesting Project

With grant funds provided by the Upper Trinity GCD (UTGCD), the Parker County Livestock Improvement Association (PCLIA) will be installing a massive rainwater harvesting system on their newly constructed barn at the Parker County Sherriff's Posse Rodeo Grounds. The idea for the project was first brought to the District in late 2019 by PLCIA President Melton Harms and Parker Co. Commissioner Larry Walden.

The goal of the system is to provide water, both potable and non-potable, to replace the water provided to the rodeo grounds from an aging water well. In recent years, the PLCIA installed a meter on the existing well and found that they

events

April:

10th- Good Friday (Office Closed)

20th- Board Meeting
5pm, District Office, Springtown, TX

May:

25th- Memorial Day (Office

used 50,000 gallons of water during the county stock show – primarily for washing animals. The existing well has had trouble keeping up with demand, and rather than drill a new well, which was the original plan, Harms and Walden brought forth the idea of collecting rainwater, which will help conserve groundwater as well as provide a tremendous educational opportunity.

The project includes installing infrastructure to collect rainfall from the existing downspouts on the new building, 65,000-gallon storage tank, filtration and UV sanitation for potable use, pressurized 1" line for final connection and fire hose connection. By including the fire hose connection, local fire departments will be able to take advantage of the system to fill trucks during times when the water is not needed at facility.

To complete the project, the PLCIA has selected Rain Ranchers, from Boyd, TX, as the contractor to design and install the system. Working together for 20 years, Rain Ranchers' father/daughter team Jenn and Kenn Davis have previously completed systems for the District's Springtown offices.

With the project slated to begin construction in the Spring of 2020, the public can expect to see the system operational 2-3 weeks after breaking ground, just in time for spring and summer showing events.

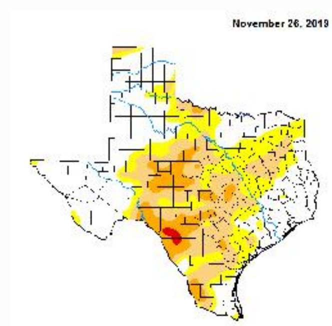
As part of the project, the PLCIA and Sherriff's Posse have agreed to allow the UTGCD to install educational signage and material at the site, highlighting the advantages of rainwater harvesting and water conservation to the thousands of visitors that visit the property annually. District staff aim to encourage groups within the District to reach out regarding future rainwater projects, as many fairgrounds and arenas feature optimal roofing structures for capture and utilization of precipitation.

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

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

*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.*

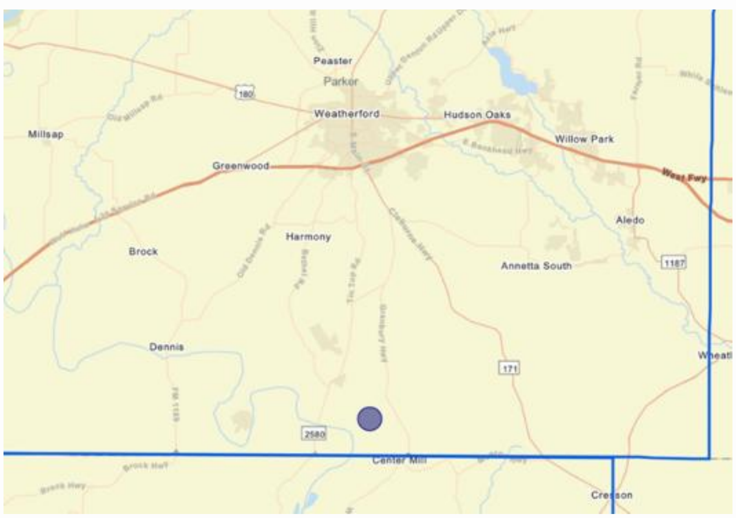
drought **status**



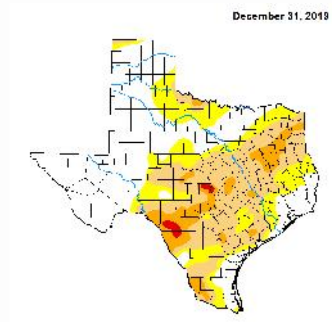
November 26th, 2019

Parker County Monitoring Well Easement Update

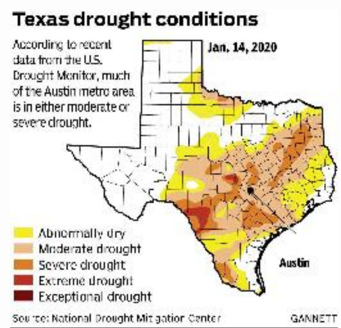
The UTGCD, in coordination with the Silverado on the Brazos HOA (Parker County), has recently completed the drilling of two monitoring wells within the subdivision. After the borehole was completed, the District was able to complete geophysical logs at both sites (gamma and dual induction) to accurately identify the upper and lower boundaries of the aquifer. Pressure transducers will be installed in both wells to record water level every minute to gain a better understanding of both short and long-term trends. (Below is a map showing the location of the subdivision).



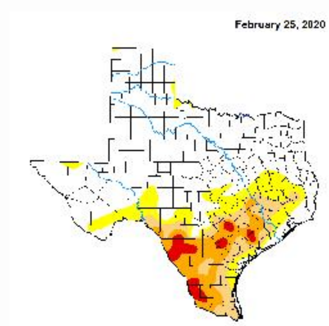
Similarly, the Oak Shores HOA (Montague Co.) has deeded a lot within the subdivision to the District for the purpose of drilling a test hole/monitoring well. Work on this project is expected to begin in late March/early April. (Below is a map showing the location of the subdivision).



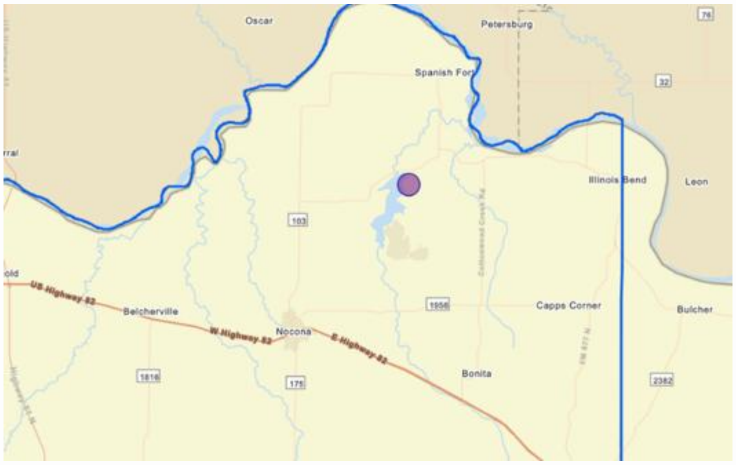
December 31st, 2019



January 14th, 2020



February 25th, 2020



This project will further assist the District with attaining quality water level data and information to help better manage groundwater resources within the District and to improve groundwater conceptual and flow modeling. These types of projects would not be possible without the interest and cooperation of local citizens.

Upper Trinity Summer Internship Program

UTGCD will continue its college level internship program through the summer of 2020. Undergraduate and graduate students are provided the opportunity to work alongside permit coordinators, compliance officers, and field technicians involved in North Texas groundwater. Past intern projects involved database management and well data analysis. Former intern, Jay Love, had this to say about the program,

"My experience with internship program here can be expressed as a great opportunity to apply what I have learned to the local community. The various duties during my internship provided me with an insight into the need for water conservation, while building knowledge and skills that are valuable for multiple different disciplines."

Interested applicants should send their applications, along with full college transcripts, to General Manager Doug Shaw by April 30th. Potential candidates will be contacted through

District Staff

Doug Shaw,
General Manager

Kyle Russell,
Assistant General Manager

Ann Devenney,
Office Manager

Jennifer Hachtel,
Data Support

Laina Furlong,
Office Assistant

Jill Garcia,
Education & PR Coordinator

Leisha Mazanec,
Field Technician

Jacob Dove,
Field Technician

Jay Love,
Reporting Compliance Coordinator

Blaine Hicks,
Staff Geologist

the District office. Consider a rewarding summer career in Texas groundwater this 2020!

DON'T FORGET!

It's is important that well owners get their well water tested 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

Is your well registered? What about your neighbors? Friends and family? Registering your well is the most effective way to 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.

Spring Conservation Reminders

With spring just around the corner, staff has compiled a list of helpful water conservation and native plant tips for your home or business. Check these out and let us know if you have any to recommend!

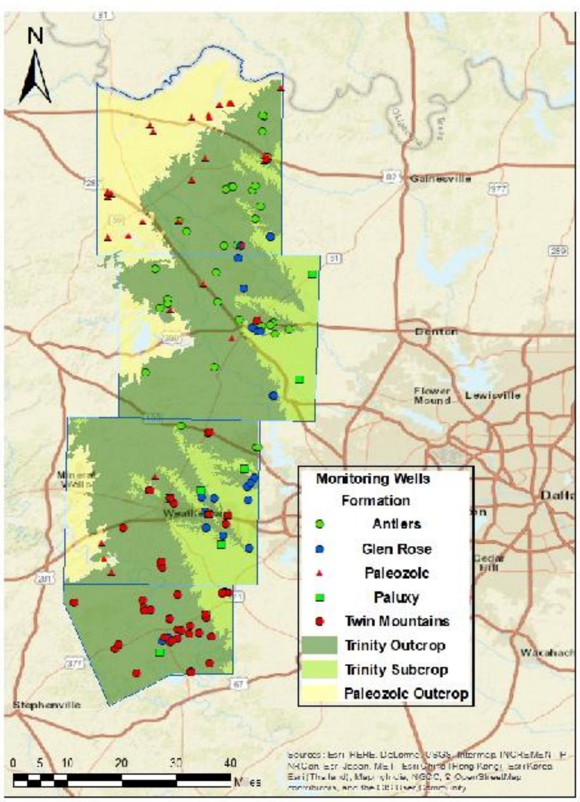
- The rainy season will be upon us soon, and UTGCD wants to remind you to maintenance your rainwater harvesting systems. Check barrels for cracks, gutters for leaf debris, and pipes for hygiene. This can ensure quality water for your garden or plants.

- Consider a succulent garden for your next green project. Most varieties require minimal amounts of water and sunlight, and propagating blooms only takes a few weeks.

Don't forget, March 8th - 14th is National Groundwater Awareness Week. Check back with UTGCD to see what events we have planned, and how you can get more involved with Texas water conservation efforts!

Monitoring Well Program

Are you a well owner interested in learning what the water level in your well is? Are you interested in how the water level changes over time? Consider joining our monitoring well program. Our field technicians visit quarterly to take measurements and help well owners understand more about the groundwater in their area. Check out the maps below or our maps page on our website to see where we currently have monitoring wells and fill out this form to apply. OR come by the office and let us show you our NEW Monitoring Wells!



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

Mobile Education Exhibit

The UTGCD is committed to enhancing public knowledge and awareness in regards to the groundwater resources in the District. Education and PR Coordinator, Jill Garcia, continues attending both community and school events, with the District's Mobile Education Exhibit or Aquifer Trailer. The Aquifer Trailer is designed to help the public visualize how an aquifer is formed, how it works, how a well is constructed and how it brings water to the surface, why groundwater conservation districts exist and how they were formed, as well as tips and tricks about water conservation and conservation practices regarding native plants and rainwater harvesting. We attend events to educate the public, to stay connected to the community, and to keep up to date on the current happenings in each county.

We are also pleased to announce the addition of new G.E.M. exhibits! In the coming months, look for rainwater harvesting, geological history, and watershed management activities to be featured in the trailer. Below are some of the events in which UTGCD staff have had the opportunity to teach children and adults about groundwater in North Texas:

- January
  - Goshen Creek Elementary- Springtown, TX
  - Arlington ISD Energy Commission - Arlington, TX
  - Dan Powell Intermediate School - Fort Worth, TX
  - Castleberry Elementary - River Oaks, TX
  - Poolville Elementary - Poolville, TX
  - Wise County STEAM Camp- Decatur, TX
- February
  - Granbury Middle School - Granbury, TX
  - Lucyle Collins Middle School - Lake Worth, TX
  - Johns Elementary - Arlington, TX
  - Acton Elementary - Acton, TX
  - Region 11 - Fort Worth, TX
  - Azle Elementary - Azle, TX
  - Tolar Middle School - Tolar, TX

We here at Upper Trinity GCD are doing our part to protect groundwater for the future and want to teach others to do the same! If you have any questions about the events attended or would like to schedule the Trailer for an event, please contact Jill Garcia at **jill@uppertrinitygcd.com** or call our office at **817-523-5200**.

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|

Doug Shaw

From: Upper Trinity GCD <jill@uppertrinitygcd.com>
Sent: Friday, April 17, 2020 10:43 AM
To: Doug Shaw
Subject: Community Resources & Updates during COVID-19

Upper Trinity Groundwater Conservation District

Community Resources & Updates during COVID-19

NRCS Urban & Rural Garden Grants

The USDA Natural Resources Conservation Service (NRCS) is accepting grant applications until May 29, 2020, to establish gardens, rainwater harvesting systems and high tunnels through Project G.R.E.E.N. (Growing Roots for Education, Environment and Nutrition) and through the Texas NRCS Urban and Rural Conservation Project. Grant funding will help establish gardens to grow healthy produce in areas of need and to educate urban and rural youth, organizations, and communities about the importance of conservation, agriculture and growing healthy fresh vegetables.

The Texas Urban and Rural Conservation Project will provide technical and financial assistance to eligible entities to establish or improve gardens for food production and pollinator habitat, including habitat for monarch butterflies, to install rainwater harvesting systems, and to establish high tunnels to extend the growing season for fruits and vegetables. These grants are available to entities other than schools. Project G.R.E.E.N. (Growing Roots for Education, Environment and Nutrition) grants are available only to independent, private, public and state controlled school districts, and private, public and state controlled institutions of higher education.

The grants have four components–community gardens, pollinator habitat, high tunnels and rainwater harvesting systems. Applicants can apply for one, two, three or all four components of the grant in one application.

Earth X Virtual Conference Activities

Earth X is still happening this spring in Dallas! Major events have transitioned to virtual tours, and zoom talks with some of the industry's leaders. Community events for students are held Thursday-Sunday. Check it out!

Friday, 4/17 - EarthxFilm Kick Off Virtual Film Festival

Wednesday 4/22 - Celebration of Earth Day’s 50th Anniversary

Thursday – Sunday 4/23-4/26 - Conferences, Summits, Youth Activities

Click here to get the up-to-date details on the calendar.

EPA Announces Grant Funding to Support Healthy School Environments

WASHINGTON (April 15, 2020) — The U.S. Environmental Protection Agency (EPA) is seeking grant applications through the Children's Healthy Learning Environments Grant Initiative from states, federally recognized tribes, universities, local governments, non-profits, and other groups to support children's environmental health in school and childcare settings. These grants advance children's environmental health by providing education, training, tools and capacity building.

"EPA knows it's critical to help schools and childcare settings understand how to reduce environmental exposures," **said EPA Administrator Andrew Wheeler.** "These Children's Health Protection grants will address improvements in schools and childcare settings that can advance awareness and change attitudes about environmental hazards for both children and adults. This is an important initiative that I fully support."

EPA anticipates awarding two grants of approximately $145,000 each for up to a two-year funding period. Grant applications should reflect multi-media and holistic approaches for reducing environmental exposures in schools and childcare settings through capacity building, trainings, and technical assistance. Proposals should also demonstrate a broad reach and collaborative problem-solving with appropriate partners.

In addition, EPA is working to customize comprehensive environmental health in schools materials for middle-school teachers, students, and parents. Through EPA's contract with Scholastic, EPA will reach more than 1.5 million middle school students and 50,000 teachers with a wide range of on-line tools.

Applications are due by June 1, 2020. Additional information is available on www.grants.gov, under Funding Opportunity Announcement EPA-OA-OCHP-20-01.

For more information, visit the Office of Children's Health Protection website: https://www.epa.gov/children/childrens-healthy-learning-environments-grant-initiative-rfa-june-2020.

Take Care of Texas
It's the only one we've got.
TakeCareOfTexas.org

Water Conservation during COVID-19

Water conservation may fall by the wayside during stressful times, when plastic water bottles can accrue as we stay safe in our homes. Take Care of Texas has some excellent resources for continuing water conservation during difficult times. Gardening and horticulture often bring peace in times of strife, so focus on your native plants and wildlife support. Check out their recommendations!

http://takecareoftexas.org/conservation-tips/conserve-our-water

Join us for our first virtual board meeting! Our agenda can be found at uppertrinitygcd.com.

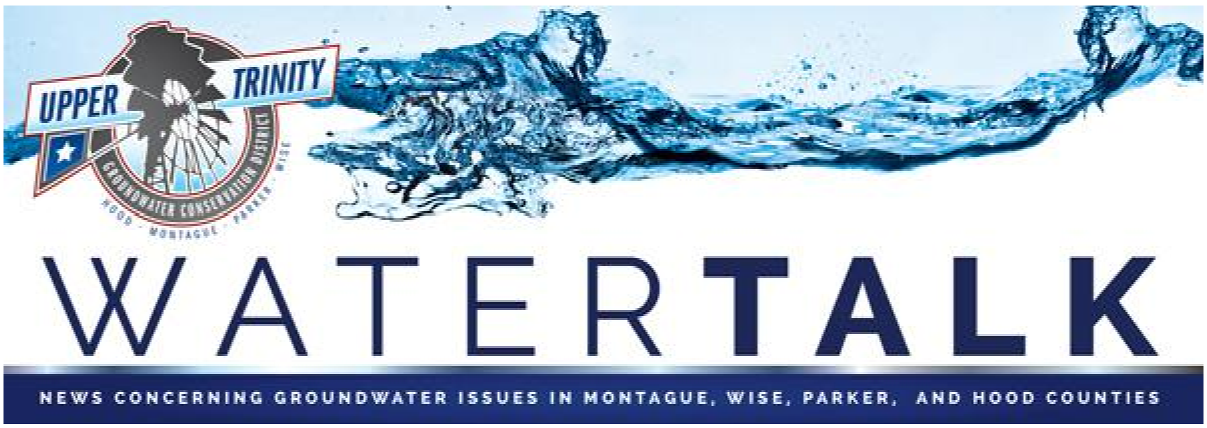
Do you have some awesome native plants that deserve recognition? Or a rainwater system you want to show off? Send us a picture of your business or home practicing water conservation and we'll feature you on our website, as well as send you a free gift! Send your pictures to jill@uppertrinitygcd.com to be featured.

During this difficult time, we are continuing to work for you in an online capacity, approving well applications and continuing water conservation outreach. If you're interested in hosting a ZOOM gardening class or virtual geology trip for your school or community group, contact our outreach coordinator, at jill@uppertrinitygcd.com.

Doug Shaw

From: Upper Trinity GCD <jill@uppertrinitygcd.com>
Sent: Thursday, July 2, 2020 10:49 AM
To: Doug Shaw
Subject: Upper Trinity GCD Summer 2020 Newsletter

Summer 2020 Newsletter View this email in your browser



latest news

Upper Trinity Provides Funding for PCLIA Rainwater Harvesting System

The Upper Trinity GCD recently awarded a $50,000 grant to the Parker County Livestock Improvement Association (PCLIA) to construct a rainwater harvesting collection on the newly constructed 30,000 square foot livestock arena.

events

July:

3rd- Day before Independence Day (Office Closed)

20th- Board Meeting
5pm, District Office, Springtown, TX

The system was first visualized by association members, who noted the fairgrounds, located at the Parker County Sherriff's Posse grounds in Weatherford, TX, faced a water supply challenge. With over 60 events at the grounds per year and an estimated 35,000 visitors annually, members wanted to ensure all contestants and their animals had continued access to clean, potable water. In 2019, the PCLIA installed a meter on their existing water well, completed into the Trinity Aquifer, and found that approximately 50,000 gallons of water was used during their largest annual event, the Parker County Youth Livestock Show. Because the existing water well had struggled to keep up with demand, the PCLIA required a second water well, which would pose significant costs to the group, as well as cause increased demand on the aquifer. Rain Ranchers and District staff worked together to complete the 65,000 gallon system before the 2020 summer began, ensuring rainwater harvesting commenced swiftly to benefit upcoming rodeo stock shows.

Water provided by the system function to replace/offset demand on the Trinity Aquifer at the project site and will primarily be used to provide water to livestock during stock shows and rodeos, both for consumption and washing. A potable system was installed to ensure the safety of anyone that may encounter water from the system. Furthermore, local fire departments will be able to utilize water in the tank to fill firetrucks. As there are no fire hydrants within several miles of the facility, this is a huge benefit to anyone that lives in the area, by reducing travel time to refill fire tankers. The project will also serve as an educational tool, as the District is currently developing educational signage to install near the tank and plans to hold rainwater harvesting events at the site in the future. For more information about the site, please reach out to the PCLIA or the District office.

August:

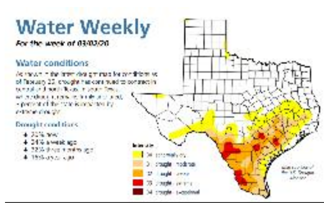
17th- Board Meeting
5pm, District Office, Springtown, TX

September:

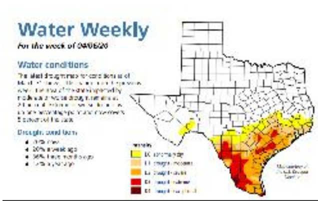
7th- Labor Day (Office Closed)
16th- Board Meeting
5pm, District Office, Springtown, TX

*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.*

drought **status**



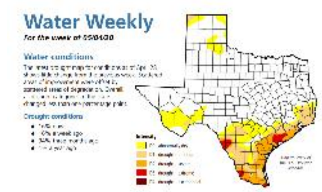
March 2nd, 2020



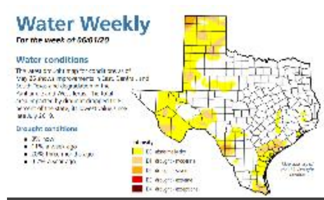
April 6th, 2020

Social Distancing Update

The District continues to maintain social distancing practices throughout our Springtown office. Staff have coordinated alternating work schedules for several weeks, and plan to continue for the foreseeable future. Although our offices are closed to the public, the District now provides contact-less water quality testing for qualified District residents! Simply pick up one of our sanitized water test kits at our Springtown offices, follow the instructions, and drop your sample back in the designated drop box. **Drillers and other parties may now drop off checks and applications with this service as well. Please call 817-523-5200 for more information or to reserve your drop off time.**



May 4th, 2020



June 1st, 2020

District Staff

Doug Shaw,
General Manager

Kyle Russell,
Assistant Manager

Ann Devenney,
Office Manager

Jennifer Hachtel,
Data Support

Laina Furlong,
Office Assistant

Blaine Hicks,
Staff Geologist

Montague Monitoring Well Completed

The District recently completed a new monitoring well project near Nocona, Texas. District staff will install a pressure transducer in the well, which allows for water levels to be recorded continuously. Staff Geologist Blaine Hicks assisted with surveying and logging of the Oak Shores well, and worked closely with the drilling company throughout the process. The cuttings pictured above were found at 560-570 feet below ground surface, and included clean, angular sand and chert components.

UTGCD Well 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 minimumtract 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.

Jacob Dove,
Field Technician

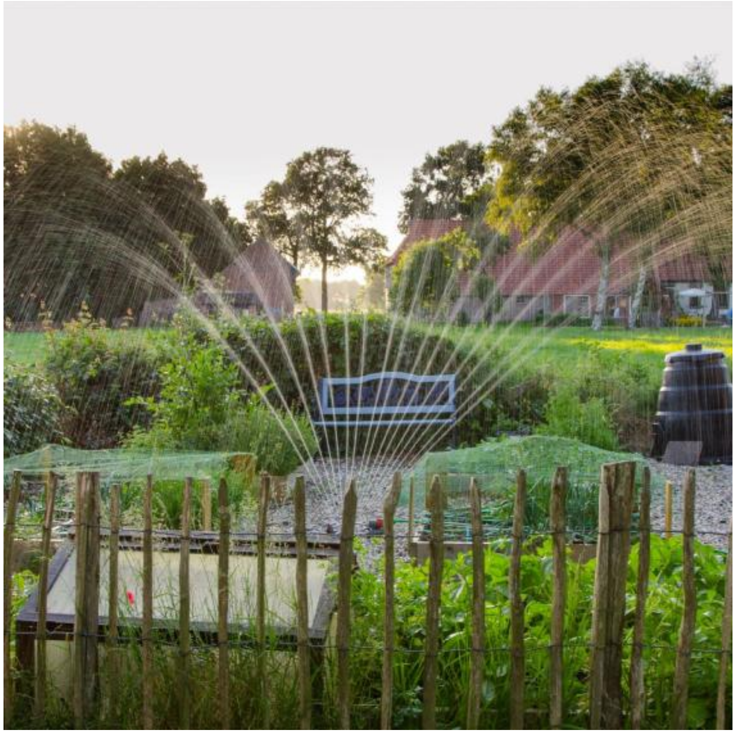
Leisha Manzanec,
Field Technician

Jill Garcia,
Education & PR Coordinator

Jay Love,
Reporting Compliance Coordinator

Are You a Realtor or Title Company Associate?

It's is important that well owners and new homeowners get their well water tested at least once a year. The District offers FREE water testing E. coli and coliform bacteria, as well as water well instructional classes for interested parties in the District. Educate your staff on water well transfers, water availability in the District, and conservation



Conservation Ideas for Summer 2020

Conserving water during Texas summers may seem daunting, but trust us at the District when we say there are plenty of options to conserve and stay cool at the same time! Many of these practices can be performed at your home, or office location. Less water consumption equates to lower utility bills, so try out our favorite conservation tips today!

1. Try reducing lawn irrigation or revising your watering schedule. Many varieties, such as Bermuda or St. Augustine grass, require significant watering in the summer months. Remember, the grass can be brown and still be healthy and thriving! Many water groups advise watering schedules, do your best to reduce your amount of water used on your lawn. Utilizing a watering timer or making the switch to drip irrigation vastly reduces your water consumption, while keeping plants hydrated.

2. Only use water for outdoor cleaning when necessary. Many homeowners view water hoses as the ultimate cleaning tool for large concrete surfaces or driveways. While it may be easy to hose down stone surfaces, a more conservative approach is sweeping the debris instead! The extra grass and lawn clippings that are swept up can also be utilized in a

recommendations. We also have a list of NELAP certified laboratories available if you are interested in more detailed testing. Call our office at **817-523-5200** for more information.

Protecting Your Rights

Is your well registered? What about your neighbors? Friends and family? Registering your well is the most effective way to 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.

mulch pile, which will also help keep your lawn healthy. You'll save tens of gallons of water, and reduce the likelihood of injury on slick surfaces.

3. Are you using water for summer activities like a pool or slip-n-slide and throwing that water out? We recommend saving any of that excess water for your plants and garden afterwards! The average kiddie pool usually houses between 50 - 200 gallons of water, so once the kids or dogs are done playing, put that water to use. If the water is not chlorinated, it can be used on any outdoor plants or lawn grass safely.

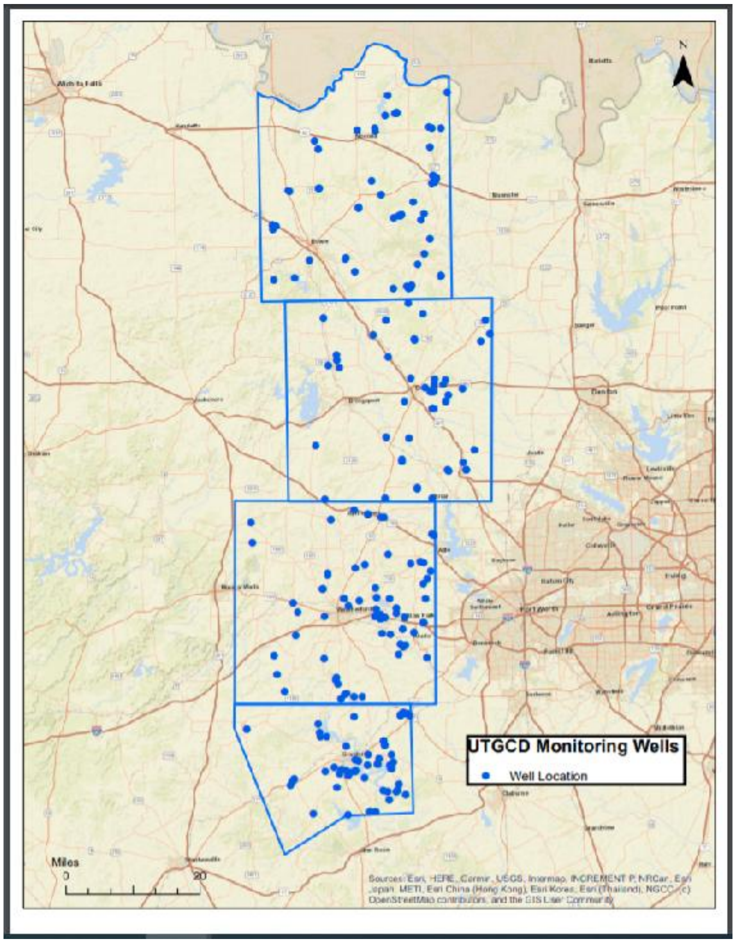
4. Icy drinks during the summer are excellent for a cool break, but where does that ice end up? If you find yourself with extra ice or water from a cooler or drink, consider placing them in your small plants or indoor garden. The ice will melt slowly and allow your plant to be watered for an extended period of time. If you're worried about the temperature of the ice negatively affecting delicate plants, we recommend putting the ice in the soil next to the plant, to allow it to melt slowly.

Monitoring Well Program

Are you a well owner interested in learning what the water level in your well is? Are you interested in how the water level changes over time? Consider joining our monitoring well program. Our field technicians visit quarterly to take measurements and help well owners understand more about the groundwater in their area. Check out the maps below or our maps page on our website to see where we currently have monitoring wells and fill out this form to apply. OR come by the office and let us show you our NEW Monitoring Wells!

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.



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 Update

View the number of well registrations in the Upper Trinity since January 1st, 2020. Check your county's aquifer health and remind yourself that groundwater conservation is everyone's responsibility!

Number of Wells Drilled January-June 2020					
	Hood	Parker	Wise	Montague	Totals
New	14	163	81	18	276
Existing	0	11	6	2	19
Non-Exempt	0	0	1	0	1
Exempt	14	174	86	20	294
County Totals	14	174	87	20	295

Board Meeting Updates

Over the past few months, the Upper Trinity GCD Board of Directors has continued to conduct business virtually, below are some highlights and decisions from the previous months.

March – Meeting cancelled

April – The District's Board adopted a resolution clarifying a few rules and deadlines regarding non-exempt wells. The resolution extended several deadlines for certain non-exempt wells and further clarified that wells used solely for certain emergency purposes are exempt from obtaining permits.

May – The District's Board of Directors approved Operating Permits for:

- Wise Water Corporation – Wise County
- Graford Holdings LLC – Parker County

June – The District's Board adopted a resolution to create an employee tuition assistance program to focus additional resources on staff training. The introduction of this new employee development program funds the completion of relevant advanced science degrees.

For more information and to listen to audio recordings of these meetings visit the Districts website: https://uppertrinitygcd.com/meetings/

Education & Outreach Updates

The UTGCD is committed to enhancing public knowledge and awareness in regards to the groundwater resources in the District, while focusing on safety during these difficult times. We conduct visits and online classes further education the public about groundwater.The Aquifer Trailer is designed to help the public visualize how an aquifer is formed, how it works, how a well is constructed and how it brings water to the surface, why groundwater conservation districts exist and how they were formed, as well as tips and tricks about water conservation and conservation practices regarding native plants and rainwater harvesting. We plan to keep attending events to educate the public, to stay connected to the community, and to keep up to date on the current happenings in each county.

The trailer will be at several events this summer, but staff will be asking visitors to please utilize hand sanitizer and masks prior to entering the GEM. Look for us at the following locations!
- East Parker County Library on July 18th @ 10:00 AM
- Bowie Library on July 21st @ 10:00 AM

We are also pleased to announce the addition of four new G.E.M. exhibits and virtual classes! This month, look for rainwater harvesting, geological history, and watershed management activities to be featured in the trailer. We at Upper Trinity GCD are doing our part to protect groundwater for the future and want to teach others to do the same! If you have any questions about the events attended or would like to schedule the Trailer for an event, please contact Jill Garcia at **jill@uppertrinitygcd.com** or call our office at **817-523-5200**.

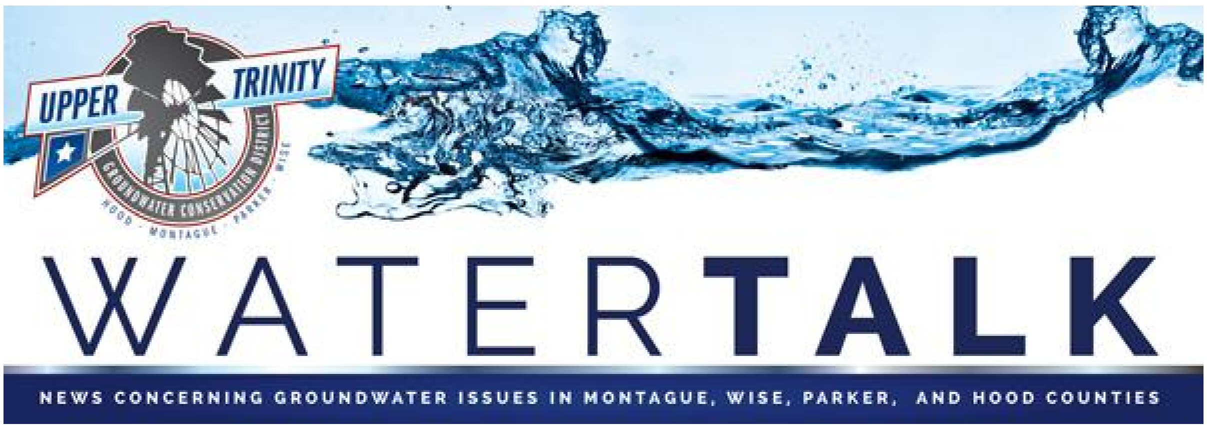
Keep up to date by following us on social media!

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

Doug Shaw

From: Upper Trinity GCD <jill@uppertrinitygcd.com>
Sent: Friday, October 2, 2020 1:51 PM
To: Doug Shaw
Subject: WaterTalk Fall Newsletter

Fall 2020 Newsletter View this email in your browser



latest news

Upper Trinity & PCLIA Celebrate TWDB Award

events

October:

12th- Columbus Day/Indigenous People's Day

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

November:

Earlier this year, the Upper Trinity GCD awarded a $50,000 grant to the Parker County Livestock Improvement Association (PCLIA) to install a rainwater harvesting collection system on the newly constructed 30,000 square foot livestock arena. The system has since been named as a recipient of the Texas Water Development Board's 2020 Rain Catcher of the Year Award. Competing against systems from all over the state, PCLIA's system is now regarded as an example for water conservation across Texas.

PCLIA and UTGCD hosted a joint socially distanced reception on September 30th at the Parker County Fairgrounds to celebrate the achievement. Local officials from Parker County, including Commissioner Larry Walden and Posse officers were in attendance. Thoughtful refreshments

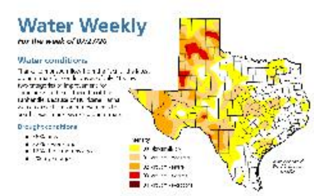
11th- Veteran's Day
16th- Board Meeting
5pm, District Office, Springtown, TX
26th & 27th- Thanksgiving

December:

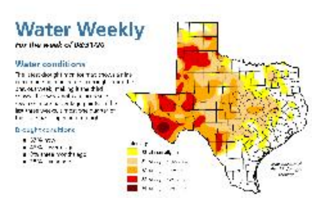
21st- Board Meeting
5pm, District Office, Springtown, TX
24th & 25th- Christmas

*Board Meetings are held at our District office at **1859 W Hwy 199, Springtown, TX at 5:00pm**. They are open to the public, free to attend, **and now available online through Zoom.***

drought status



July 27th, 2020



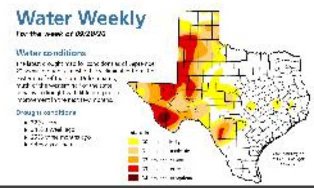
August 31st, 2020

were provided from the Bent Bucket Bakery in Lipan, Texas. The award was dedicated to Mr. Melton Harms of the PCLIA, who first brought the idea for the project to the UTGCD board in late 2019.

Other winners from the 2020 Rain Catcher Awards include a Wimberly ISD middle school campus, Texas Tech University, the Austin Central Library, and Anodamine Inc.

Have you read our 2019 annual report? It's available on our website, click below!

Annual Report 2019



September 28th, 2020

District Staff

Doug Shaw,
General Manager

Kyle Russell,
Assistant Manager

Ann Devenney,
Office Manager

Jennifer Hachtel,
Data Coordinator

Laina Furlong,
Office Assistant

Blaine Hicks,
Staff Geologist

Jacob Dove,
Field Technician

Leisha Manzanec,
Field Technician

Monitoring Well Program Update

Even though COVID-19 has caused delays in projects in some areas of Texas, the District is proud to announce two new monitoring wells currently in development for western Parker County. Construction of these wells will begin later this year and District staff plan to install transducers in both wells to increase the District's groundwater data recording. Are you interested in joining the monitoring well program? **Contact us at 817-523-5200 for more information.**

UTGCD Well 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 minimumtract 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.
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17.36 - 30 gpm		500 ft.	150 ft.
30 - 50 gpm	Minimum Tract Size is 2 Acres	1,000 ft.	250 ft.
50 - 80 gpm		1,750 ft	500 ft.
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>100 gpm		3,250 ft.	1,000 ft.

Jill Garcia,
Education & PR Coordinator

Jay Love,
Reporting Compliance Coordinator

Are You a Realtor or Title Company Associate?

It's is important that well owners and new homeowners get their well water tested at least once a year. The District offers FREE water testing for E. coli and coliform bacteria.

District staff also offers water well instructional classes for interested parties in the District. Educate your staff on water well transfers, water availability in the District, and conservation recommendations. We also have a list of NELAP certified laboratories available if you are

Conservation Corner:

Rain Chains - Harvesting with Flair

Throughout north Texas, rainwater harvesting takes all shapes and sizes. Your dream system may include stainless steel cisterns or wooden gutters, but there are practical options for any budget. As the climate shifts into the cooler months, September and October bring a chance for autumn storms. Oftentimes, residential dwellings may not have access to an entire roof for rain catchment. When this occurs, heavy runoff culminates at corners of the structure, and usually causes damage to soil and vegetation below. This is the perfect location for a rain chain.

interested in more detailed testing.
Call our office at **817-523-5200** for more information.

Protecting Your Rights

Is your well registered? What about your neighbors? Friends and family? Registering your well is the most effective way to protect your water well from encroachment of new wells!

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.

Rain chains function as an alternative to downspouts, allowing rainwater to pass along decorative baubles and cups down to a cistern below. This means a downspout can accentuate your outdoor area, while conserving rainwater. Their origins date back to 1,600 years ago, when the *sukiya* architectural style seen frequently in Japanese tea houses, first became prominent.

Kusari toi installation encourages vertical irrigation, while providing the pleasant aesthetic of running water. The 1998 Winter Olympics in Nagano, Japan, first showcased the hardware to millions of viewers all over the world. Since then, chains have remained a popular staple in garden and feed stores.

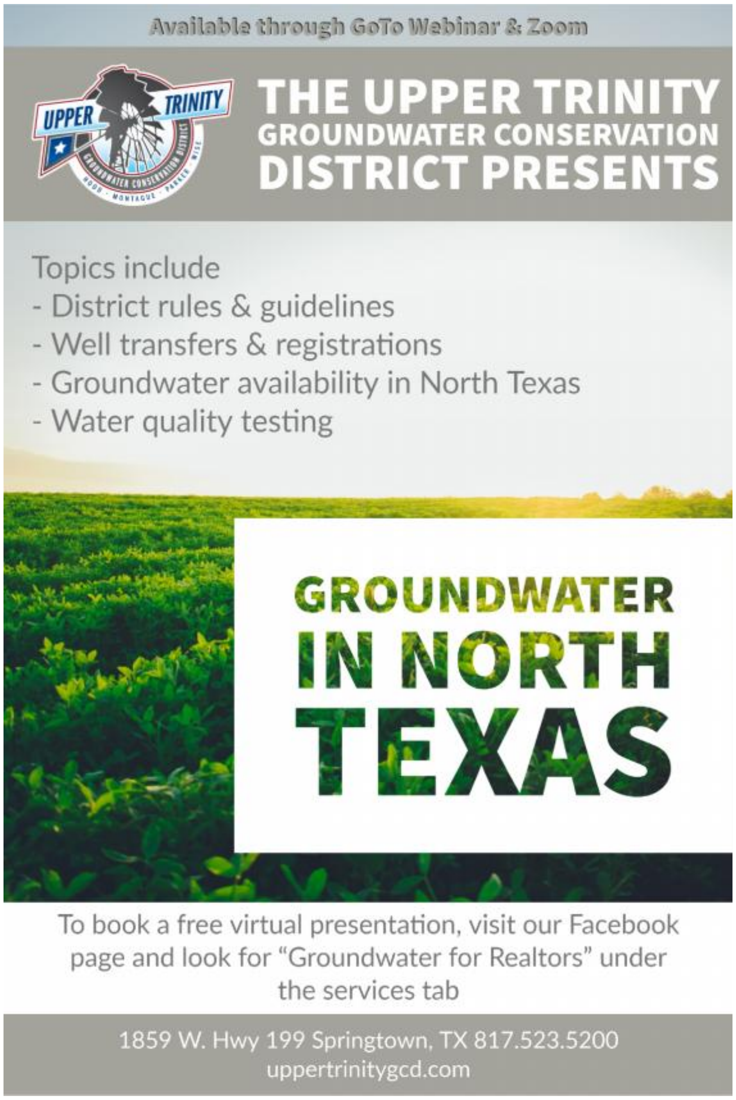
How long should your rain chain be? Approximately 8.5 feet works for most American single-story buildings. Materials for rain chains range from wood to metal, but popular recent models feature copper that develops a beautiful hue from chemical weathering as time goes on. Add an additional layer of conservation to your garden by placing native plants or potted varieties around the chain to utilize excess water. While some rain chains may function purely as decoration, we encourage those with lily & scallop design cups to conserve more water.

Depending on the materials the rain chain is constructed of, trace amounts of excess metals may leach into your collected water, including copper and aluminum. However, metals avoid the risk of algae or bacterial growth within your system, whereas wooden structures are prone to this type of growth if not properly treated prior to installation.

Regarding installation, A “V” or gutter hook easily attaches the chain inside of a gutter hole. Thoroughly cleaning your gutter system and harvesting cistern reduces the likelihood of algae and coliform growth, as well as nasty mosquito larvae (your amphibious garden visitors may be fans though).

UTGCD always recommends treating harvested water to avoid injury and infection. Whether you’re planning for your spring garden this fall or looking to create a tranquil space on your porch, consider rainwater harvesting.

Image permissions graciously provided by Monarch Abode, formerly Monarch Rain Chains.



Monitoring Well Program

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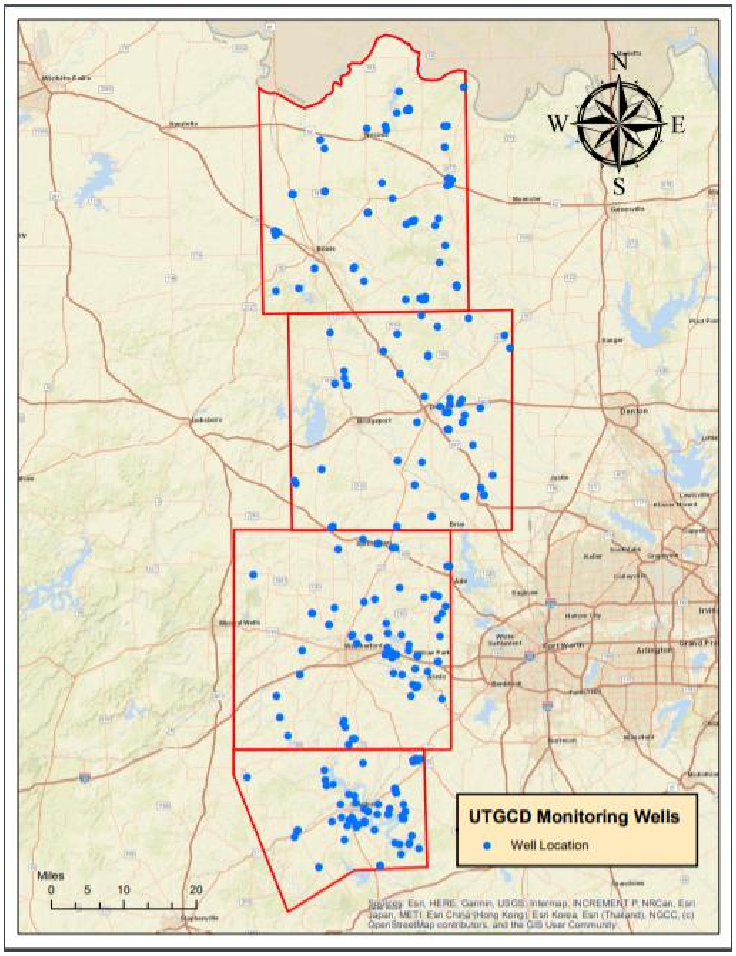

Water Production Report Dates & Reminders

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
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District Wells Update

View the number of well registrations in the Upper Trinity since January 1st, 2020. Check your county's aquifer health and remind yourself that groundwater conservation is everyone's responsibility!

Number of Wells Drilled January-September 2020					
	Hood	Parker	Wise	Montague	Totals
New	62	610	311	80	1063
Existing	2	37	25	8	72
Non-Exempt	4	7	9	0	20
Exempt	60	640	327	88	1115
County Totals	64	647	336	88	1135

Board Meeting Updates

Over the past few months, the Upper Trinity GCD Board of Directors has continued to conduct business virtually, below are some highlights and decisions from the previous months.

July– The District's Board of Directors approved Operating Permits for:

- Aqua Texas Inc. - Wise County

The District's 2019 Financial Report was presented by representatives from Boucher, Morgan, and Young, and was subsequently voted on and approved by the Board.

August– The District's Board of Directors approved Operating Permits for:

- North Texas Homestead Partners LLC – Parker County

The District Board also authorized General Manager Doug Shaw to proceed with a monitoring well project in Parker County.

September– The District's Board of Directors approved Operating Permits for (waiting for Ann verification):

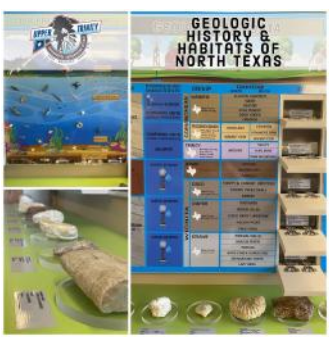
- Town of Annetta

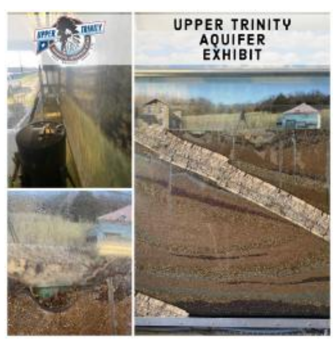
The District's board was presented with and approved the District's 2019 annual report.

For meeting recordings & past agendas click below.

District Meetings

Education & Outreach Updates





Education Video Archive

Have you seen our Youtube Channel? Check it out now for videos featuring your favorite exhibits! Bring the science of groundwater and conservation to your phone, tablet, or computer.

Looking for a live video? Want more information about the G.E.M.? contact the District at **jill@uppertrinitygcd.com** or call **817-523-5200**.

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 2020.

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 five 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. Additionally, a total of 23 new monitoring wells were added to the program in 2020. 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. 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	-18	-	-	-	-	-	-	-	-	-
	Wise	-34	-	-	-	-	-142	-	-	-	-
	Parker	-11	-5	-10	-1	-	-	-1	-28	-46	-
	Hood	-	-5	-7	-4	-	-	-	-28	-46	-
1-Year Water Level Change	Montague	-0.2	-	-	-	4.0	-	-	-	-	12.6
	Wise	0.6	-	-	-	5.3	0.2	-	-	-	-
	Parker	-0.6	-0.5	0.7	-1.5	-24.1	-	-	-	-2.2	-
	Hood	-	-3.1	-4.6	-0.2	-	-	-	-16.2	1.9	-
5-Year Water Level Change	Montague	3.6	-	-	-	9.0	-	-	-	-	1.7
	Wise	5.1	-	-	-	-	2.7	-	-	-	-
	Parker	4.8	-4.9	-0.2	-0.2	-25.9	-	-	-	-17.2	-
	Hood	-	7.5	-9.3	-4.5	-	-	-	-18.1	0.1	-
Cumulative Water Level Change (2010 to Present)	Montague	4.8	-	-	-	46.2	-	-	-	-	-9.0
	Wise	3.7	-	-	-	5.3	6.8	-	-	-	-
	Parker	-2.0	-7.2	1.7	-5.6	-22.1	-	-	-	-9.3	-
	Hood	-	4.9	-7.9	-2.6	-	-	-	-6.1	8.5	-
DFCs vs Cumulative Change	Montague	22.8	-	-	-	-	-	-	-	-	-
	Wise	37.7	-	-	-	-	148.8	-	-	-	-
	Parker	9.0	-2.2	11.7	-4.6	-	-	-	-	36.8	-
	Hood	-	9.9	-0.9	1.4	-	-	-	21.9	54.5	-

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

So, 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 2070.
- 1-year water level change represents the change in water levels from the 2019 “aquifer year” to the 2020 “aquifer year”.
- 5-year water level change represents the change in water levels from the 2015 “aquifer year” to the 2020 “aquifer year”
- Cumulative water level change (2010 to present) represents the change in water levels from the 2010 “aquifer year” to the 2020 “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 2070. 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 2018 exempt use estimates, staff took the TWDB estimate for 2015 and projection for 2020, and used a linear function to calculate estimated 2018 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 2018 utilizing data from the following sources:

- The Region B, C, and G 2011and 2016 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	6,355	1,613	6,278	5,452	**19,698**
Non-Exempt Use	5,239	374	4,066	2,055	**11,733**
Total	**11,594**	**1,987**	**10,344**	**7,507**	**31,431**

(1) AFY = acre-feet per year

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

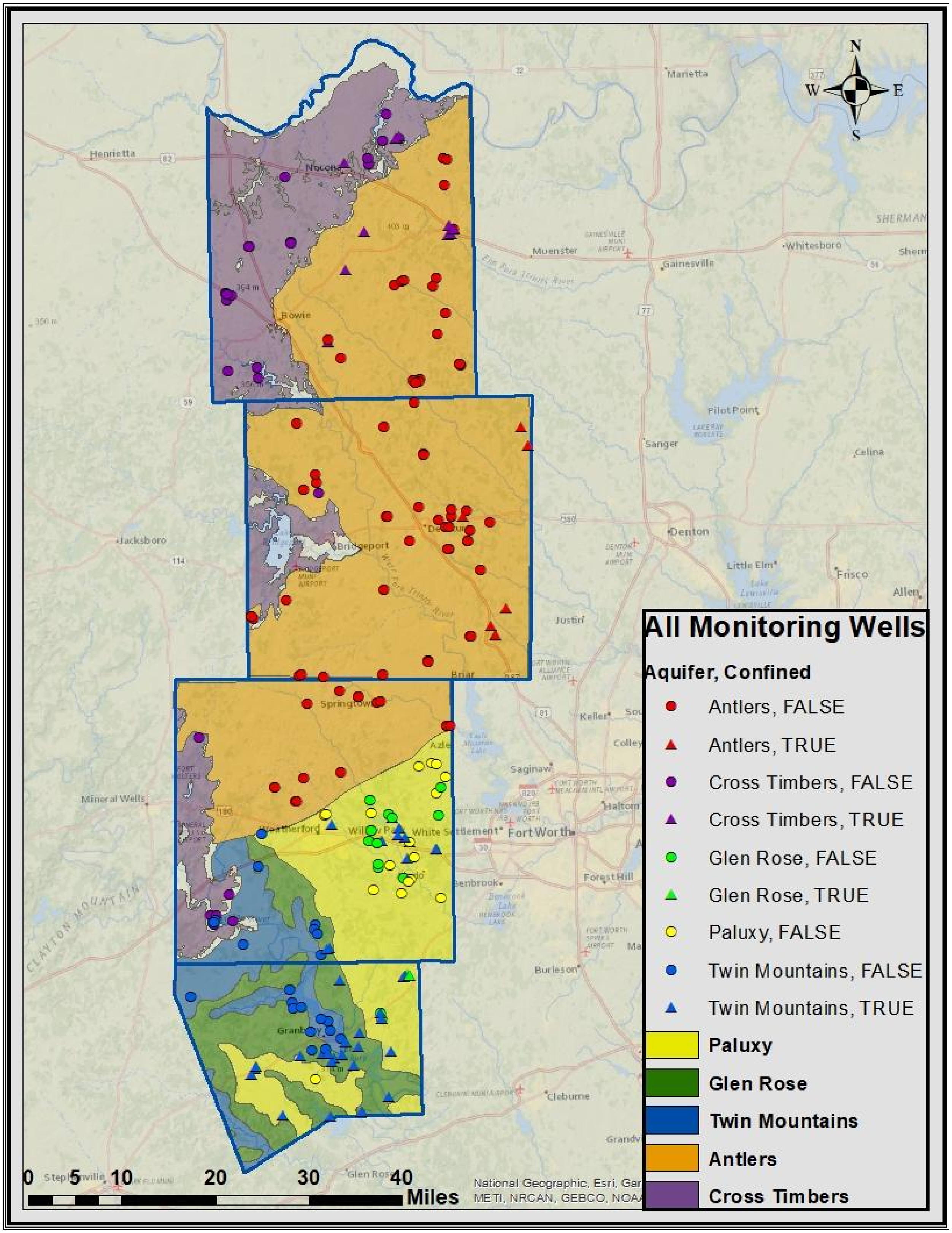
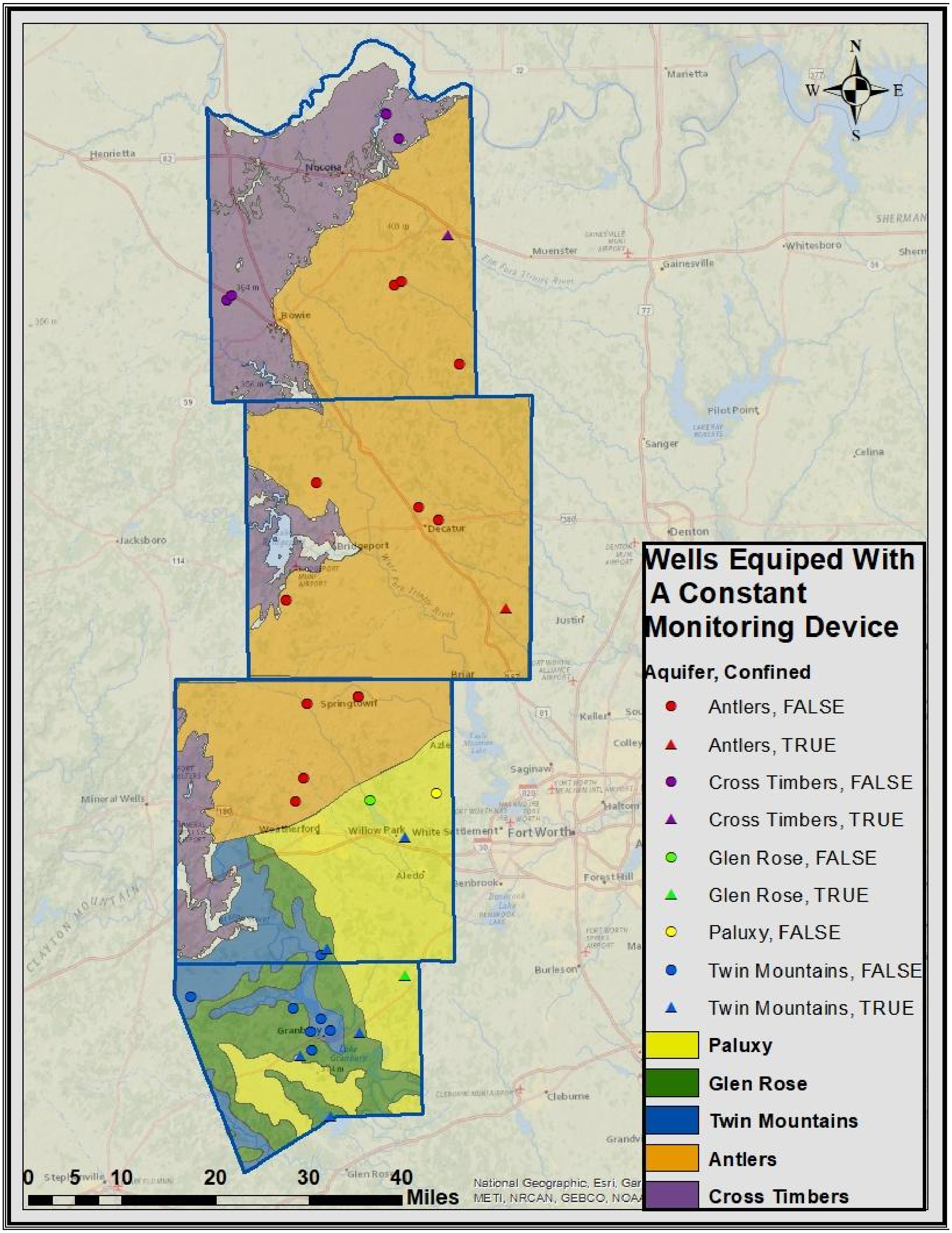


Figure B. Wells in the District's Monitoring Well Network Equipped with A Constant Monitoring Device



APPENDIX 1

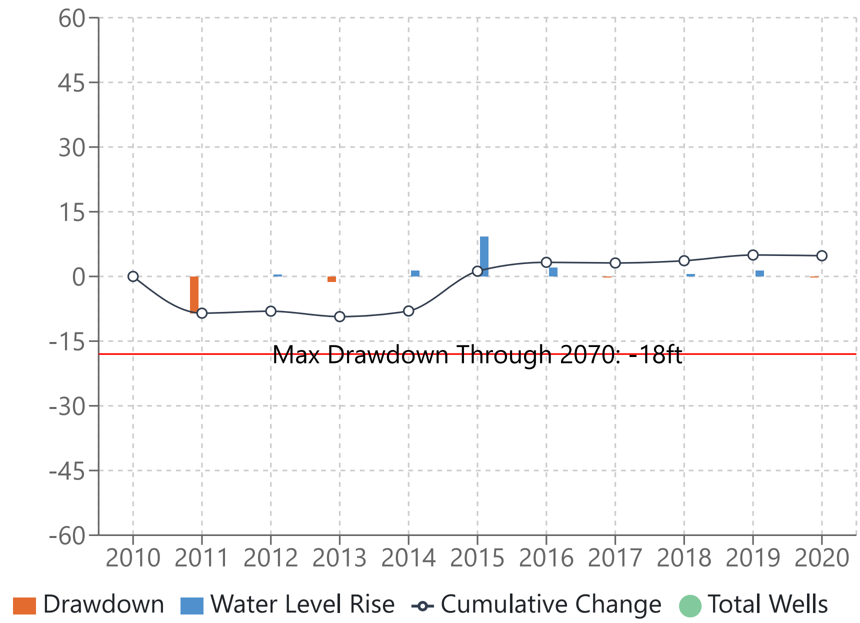
Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
August 05, 2021

		Outcrop					Subcrop				
	County	**Antlers**	**Paluxy**	**Glen Rose**	**Twin Mountains**	**Cross Timbers**	**Antlers**	**Paluxy**	**Glen Rose**	**Twin Mountains**	**Cross Timbers**
Desired Future Conditions	**Montague**	-18	-	-	-	-	-	-	-	-	-
	Wise	-34	-	-	-	-	-142	-	-	-	-
	Parker	-11	-5	-10	-1	-	-	-1	-28	-46	-
	Hood	-	-5	-7	-4	-	-	-	-28	-46	-
1-Year Water Level Change	**Montague**	-0.2	-	-	-	4.0	-	-	-	-	12.6
	Wise	0.6	-	-	-	5.3	0.2	-	-	-	-
	Parker	-0.6	-0.5	0.7	-1.5	-24.1	-	-	-	-2.2	-
	Hood	-	-3.1	-4.6	-0.2	-	-	-	-16.2	1.9	-
5-Year Water Level Change	**Montague**	3.6	-	-	-	9.0	-	-	-	-	1.7
	Wise	5.1	-	-	-	-	2.7	-	-	-	-
	Parker	4.8	-4.9	-0.2	-0.2	-25.9	-	-	-	-17.2	-
	Hood	-	7.5	-9.3	-4.5	-	-	-	-18.1	0.1	-
Cumulative Water Level Change (2010 to Present)	**Montague**	4.8	-	-	-	46.2	-	-	-	-	-9.0
	Wise	3.7	-	-	-	5.3	6.8	-	-	-	-
	Parker	-2.0	-7.2	1.7	-5.6	-22.1	-	-	-	-9.3	-
	Hood	-	4.9	-7.9	-2.6	-	-	-	-6.1	8.5	-
DFCs vs Cumulative Change	**Montague**	22.8	-	-	-	-	-	-	-	-	-
	Wise	37.7	-	-	-	-	148.8	-	-	-	-
	Parker	9.0	-2.2	11.7	-4.6	-	-	-	-	36.8	-
	Hood	-	9.9	-0.9	1.4	-	-	-	21.9	54.5	-

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
August 05, 2021

Montague County-Antlers-Outcrop

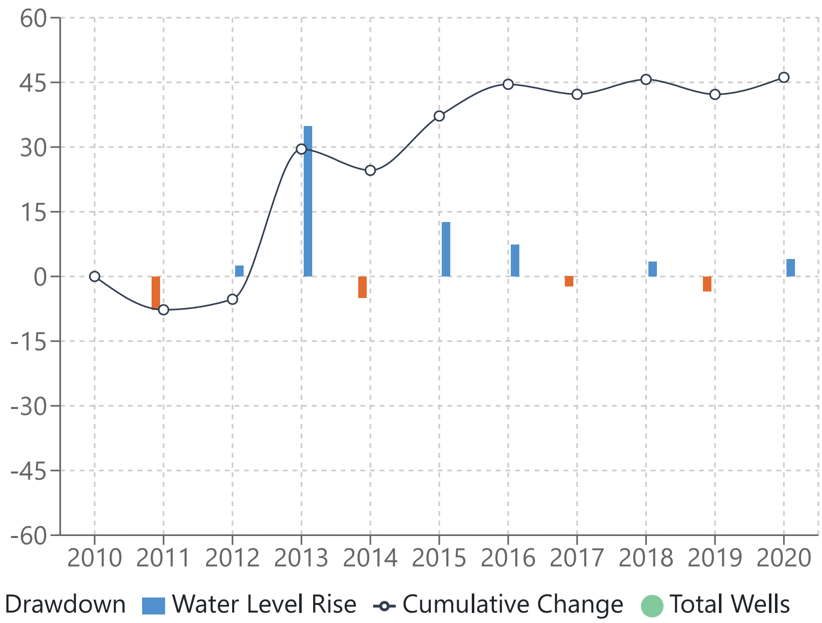


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-18	Not Applicable	Not Applicable
1-Year Water Level Change	-0.2	20	4062, 2898, 2097, 2897, 196, 2096, 200, 2899, 2813, 1495, 1410, 8882, 1500, 1501, 1497, 4402, 632, 4107, 9505, 8890
5-Year Water Level Change	3.6	22	2898, 2097, 2897, 196, 2096, 200, 4062, 3973, 2813, 1410, 8882, 1501, 1495, 1500, 304, 632, 8890, 4107, 2899, 1497, 4402, 9505
Cumulative Water Level Change (2010 to Present)	4.8	22	196, 2096, 200, 2097, 3973, 1495, 1501, 1500, 304, 1497, 8882, 632, 2898, 2897, 4062, 2813, 1410, 8890, 4107, 2899, 4402, 9505
DFCs vs Cumulative Change	22.8	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
August 05, 2021

Montague County-Cross Timbers-Outcrop

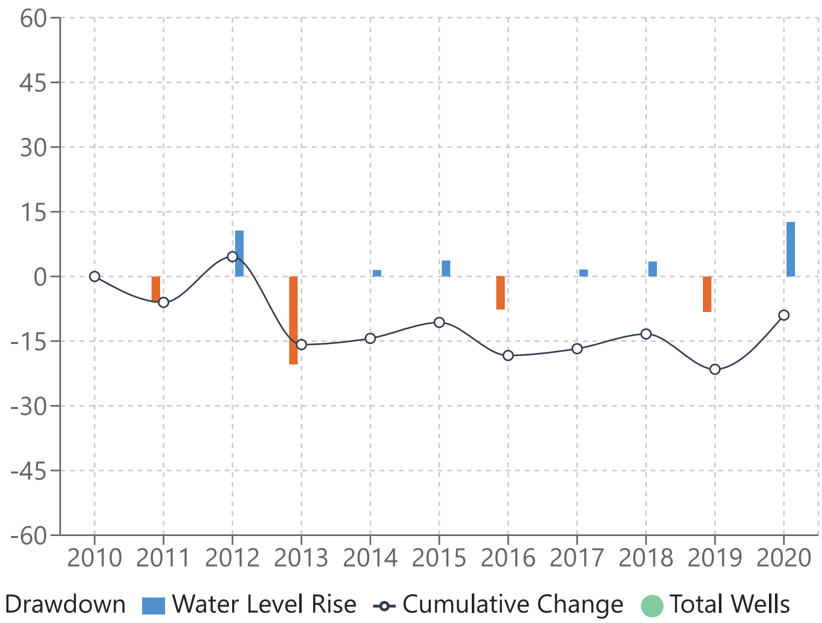


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	4.0	15	6433, 5199, 4202, 2196, 6604, 2608, 8866, 6605, 6208, 1016, 1015, 1295, 1298, 593, 8881
5-Year Water Level Change	9.0	17	6433, 5199, 4202, 6604, 2608, 6605, 592, 1295, 1298, 2196, 8866, 593, 8881, 9366, 6208, 1016, 1015
Cumulative Water Level Change (2010 to Present)	46.2	17	2608, 8866, 1295, 1298, 8881, 4202, 592, 6433, 5199, 6604, 6605, 2196, 593, 9366, 6208, 1016, 1015
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
August 05, 2021

Montague County-Cross Timbers-Subcrop

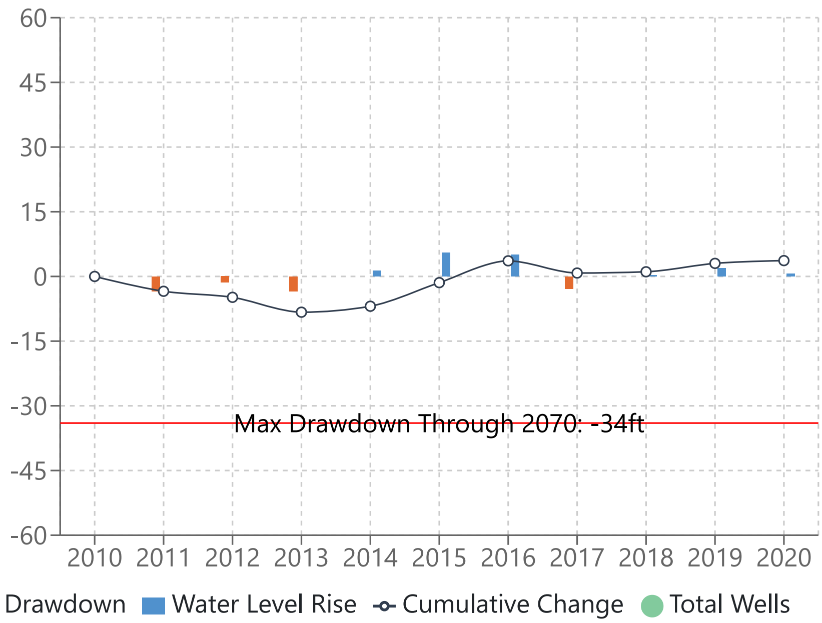


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	12.6	10	4401, 637, 636, 638, 633, 3970, 666, 2413, 1296, 2728
5-Year Water Level Change	1.7	14	634, 635, 638, 633, 666, 3970, 2427, 1297, 1296, 2413, 2728, 4401, 636, 637
Cumulative Water Level Change (2010 to Present)	-9.0	14	637, 634, 635, 638, 1297, 1296, 2413, 633, 636, 3970, 2427, 666, 2728, 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
August 05, 2021

Wise County-Antlers-Outcrop

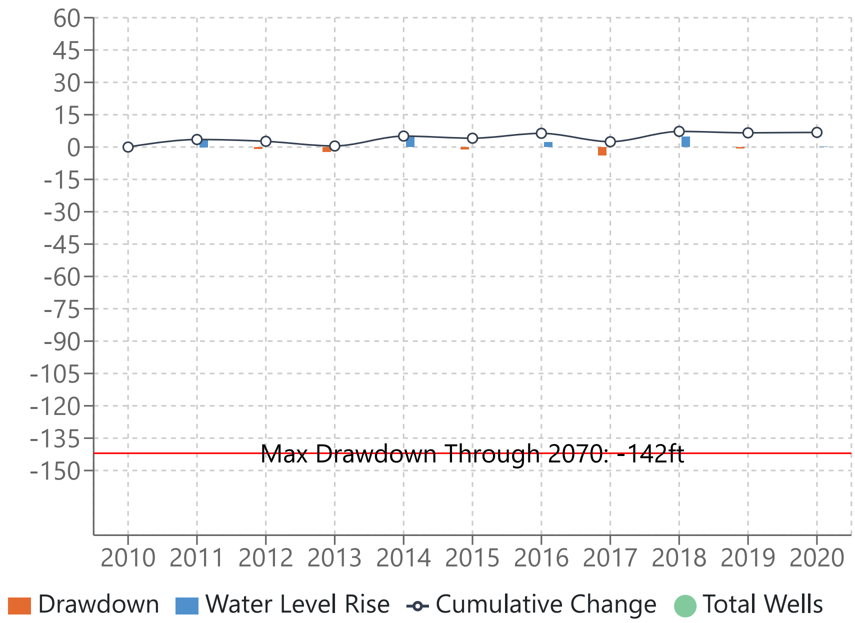


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-34	Not Applicable	Not Applicable
1-Year Water Level Change	0.6	24	1114, 7010, 1106, 8863, 1075, 1076, 4404, 4344, 1010, 11629, 3841, 8887, 13745, 9095, 1138, 3056, 1128, 10319, 1759, 10425, 10321, 3055, 1108, 8886
5-Year Water Level Change	5.1	33	7011, 7010, 8885, 2010, 1075, 1076, 4404, 8883, 1010, 3056, 3055, 1759, 8886, 1114, 3308, 1106, 8863, 4344, 3841, 1138, 1128, 1108, 1011, 10425, 11629, 11628, 10318, 10320, 8887, 13745, 9095, 10319, 10321
Cumulative Water Level Change (2010 to Present)	3.7	38	2531, 2010, 8863, 1075, 1076, 1010, 9429, 1011, 9428, 10187, 8887, 8886, 8885, 8883, 4404, 4405, 4344, 3056, 3055, 1759, 7011, 7010, 1114, 3308, 1106, 3841, 1138, 1128, 1108, 10425, 11629, 11628, 10318, 10320, 13745, 9095, 10319, 10321
DFCs vs Cumulative Change	37.7	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
August 05, 2021

Wise County-Antlers-Subcrop

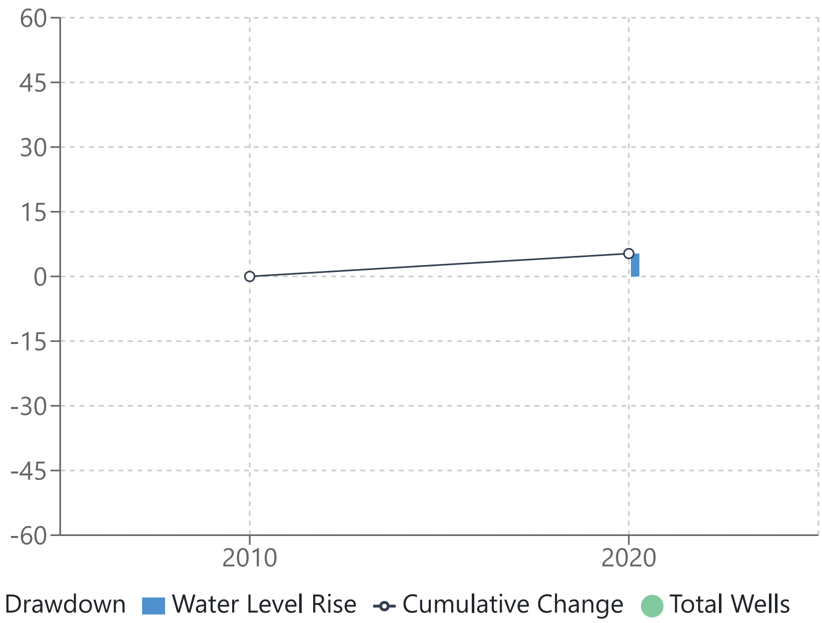


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-142	Not Applicable	Not Applicable
1-Year Water Level Change	0.2	4	8884, 11110, 8888, 1115
5-Year Water Level Change	2.7	4	8884, 8888, 1115, 11110
Cumulative Water Level Change (2010 to Present)	6.8	4	8884, 8888, 1115, 11110
DFCs vs Cumulative Change	148.8	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
August 05, 2021

Wise County-Cross Timbers-Outcrop

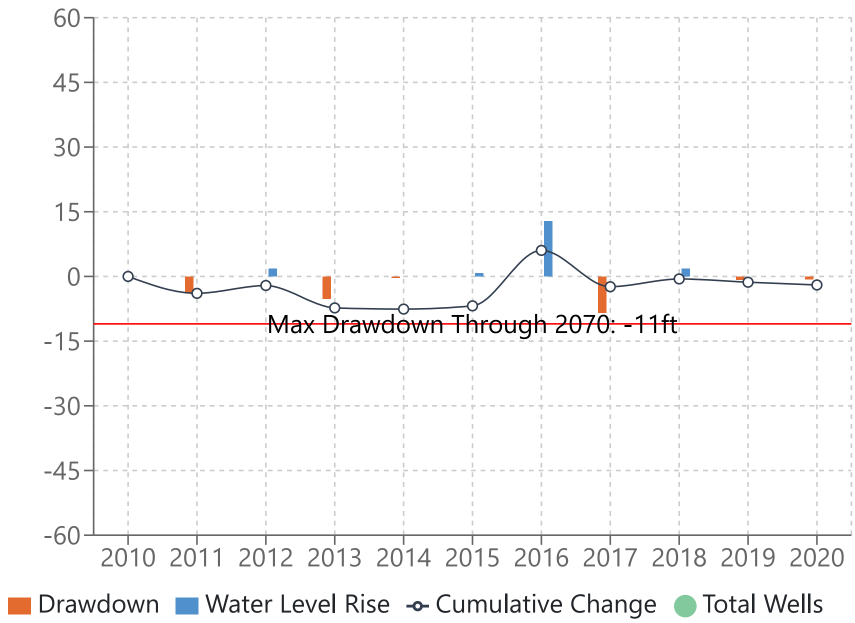


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	5.3	1	1325
5-Year Water Level Change		Not Avaliable	Not Avaliable
Cumulative Water Level Change (2010 to Present)	5.3	1	1325
DFCs vs Cumulative Change	Not 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
August 05, 2021

Parker County-Antlers-Outcrop

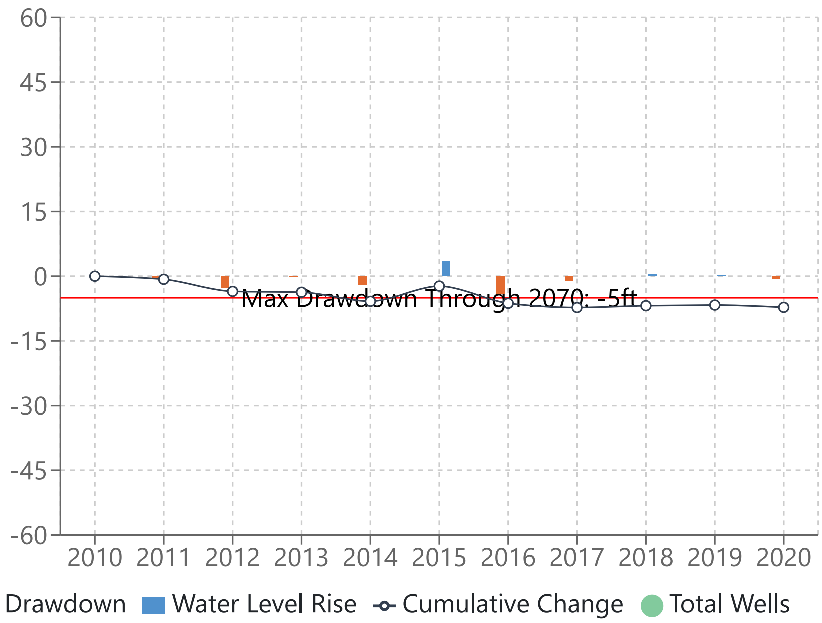


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-11	Not Applicable	Not Applicable
1-Year Water Level Change	-0.6	10	10885, 10884, 8864, 1809, 975, 565, 630, 2200, 12929, 8872
5-Year Water Level Change	4.8	12	1809, 985, 975, 996, 630, 8872, 2200, 8864, 10885, 10884, 565, 12929
Cumulative Water Level Change (2010 to Present)	-2.0	12	8864, 985, 975, 996, 8872, 1809, 630, 2200, 10885, 10884, 565, 12929
DFCs vs Cumulative Change	9.0	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
August 05, 2021

Parker County-Paluxy-Outcrop

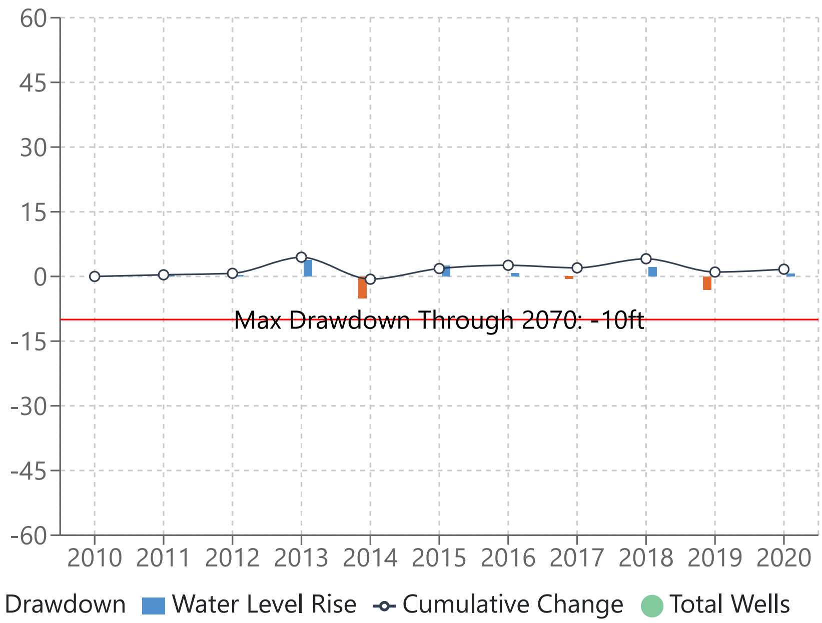


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-5	Not Applicable	Not Applicable
1-Year Water Level Change	-0.5	14	4365, 995, 2596, 8568, 8718, 6178, 10740, 5212, 6638, 11483, 1653, 12144, 4993, 12075
5-Year Water Level Change	-4.9	14	4365, 995, 5212, 6638, 1653, 6178, 4993, 2596, 8568, 8718, 10740, 11483, 12144, 12075
Cumulative Water Level Change (2010 to Present)	-7.2	14	995, 4365, 5212, 6638, 1653, 6178, 4993, 2596, 8568, 8718, 10740, 11483, 12144, 12075
DFCs vs Cumulative Change	-2.2	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
August 05, 2021

Parker County-Glen Rose-Outcrop

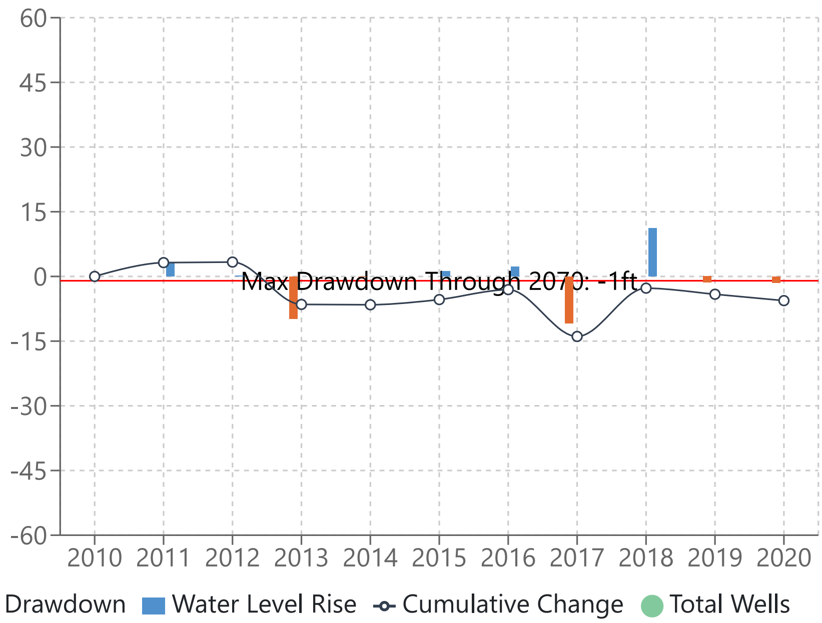


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-10	Not Applicable	Not Applicable
1-Year Water Level Change	0.7	7	8873, 8874, 8875, 8876, 1660, 8889, 8878
5-Year Water Level Change	-0.2	7	8874, 8876, 1660, 8875, 8878, 8889, 8873
Cumulative Water Level Change (2010 to Present)	1.7	9	8873, 8874, 8876, 905, 6338, 1660, 8875, 8878, 8889
DFCs vs Cumulative Change	11.7	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
August 05, 2021

Parker County-Twin Mountains-Outcrop

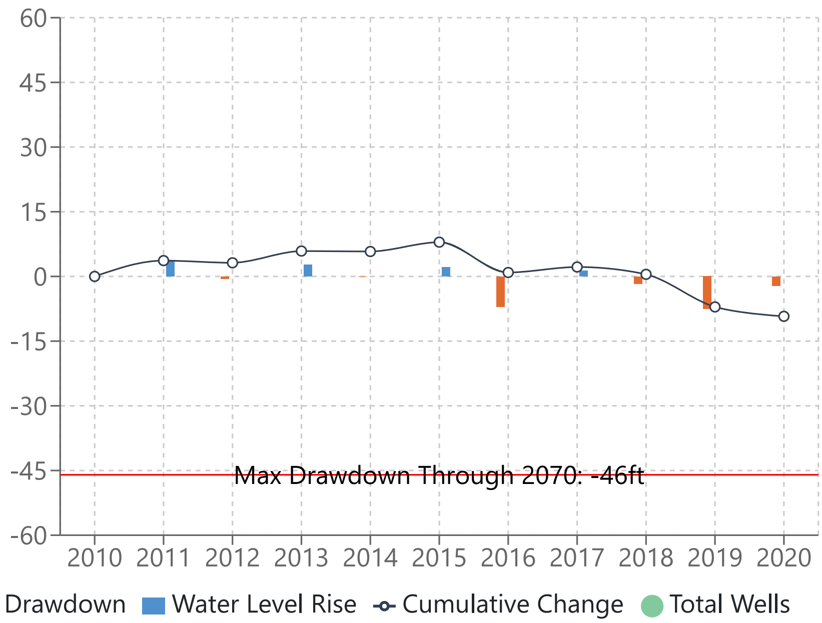


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-1	Not Applicable	Not Applicable
1-Year Water Level Change	-1.5	7	13295, 1774, 979, 978, 8880, 2484, 4911
5-Year Water Level Change	-0.2	7	1774, 978, 8880, 2484, 979, 4911, 13295
Cumulative Water Level Change (2010 to Present)	-5.6	7	1774, 979, 978, 8880, 2484, 4911, 13295
DFCs vs Cumulative Change	-4.6	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
August 05, 2021

Parker County-Twin Mountains-Subcrop

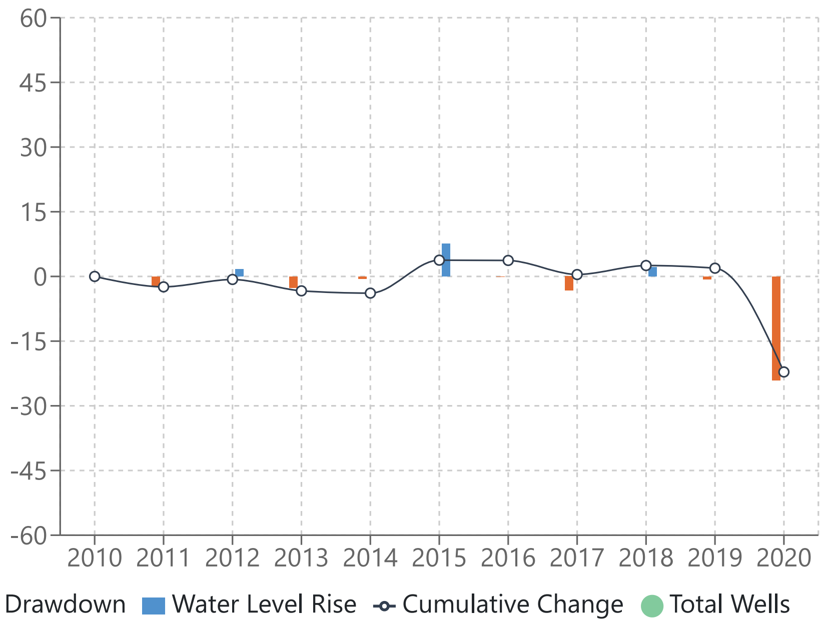


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-46	Not Applicable	Not Applicable
1-Year Water Level Change	-2.2	6	11323, 13294, 12241, 11386, 6534, 4142
5-Year Water Level Change	-17.2	9	6534, 4144, 4142, 8879, 11323, 10350, 12241, 13294, 11386
Cumulative Water Level Change (2010 to Present)	-9.3	10	6534, 1761, 8879, 4144, 4142, 11323, 10350, 12241, 13294, 11386
DFCs vs Cumulative Change	36.7	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
August 05, 2021

Parker County-Cross Timbers-Outcrop

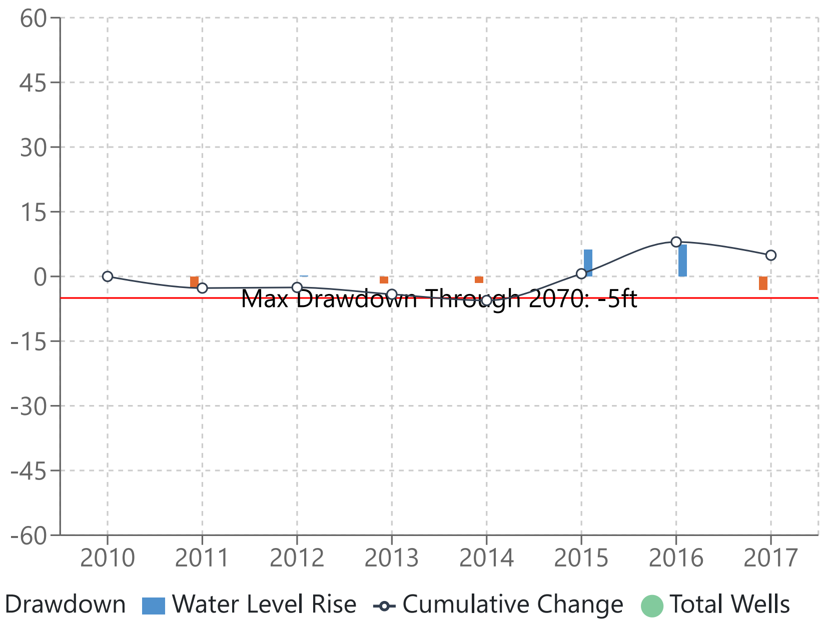


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	-24.1	3	4416, 8877, 12621
5-Year Water Level Change	-25.9	3	4416, 8877, 12621
Cumulative Water Level Change (2010 to Present)	-22.1	3	8877, 4416, 12621
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
August 05, 2021

Hood County-Paluxy-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-5	Not Applicable	Not Applicable
1-Year Water Level Change	-3.1	1	8870
5-Year Water Level Change	7.5	1	8870
Cumulative Water Level Change (2010 to Present)	4.9	1	8870
DFCs vs Cumulative Change	9.9	Not Applicable	Not Applicable

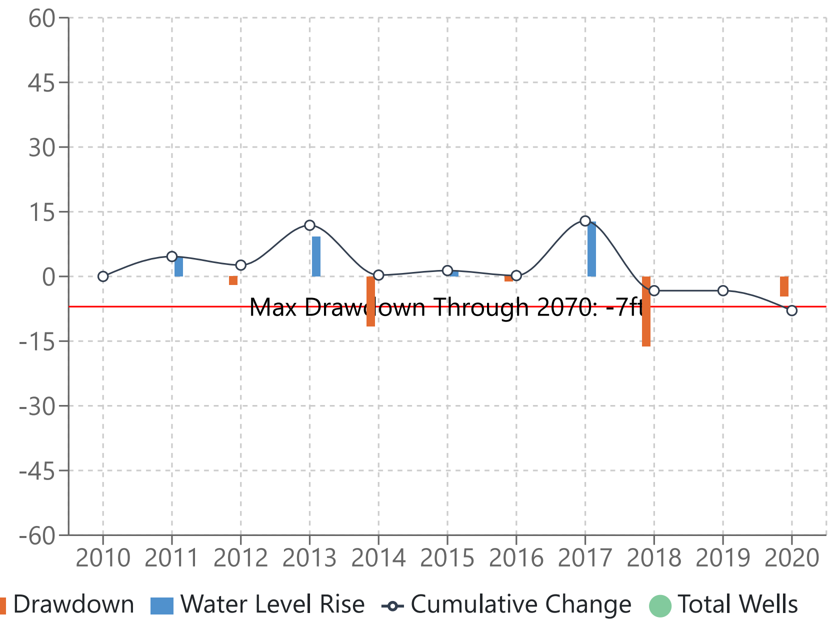
Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Summary of Desired Future Conditions and Water Level Trends

Upper Trinity Groundwater Conservation District

August 05, 2021

Hood County-Glen Rose-Outcrop

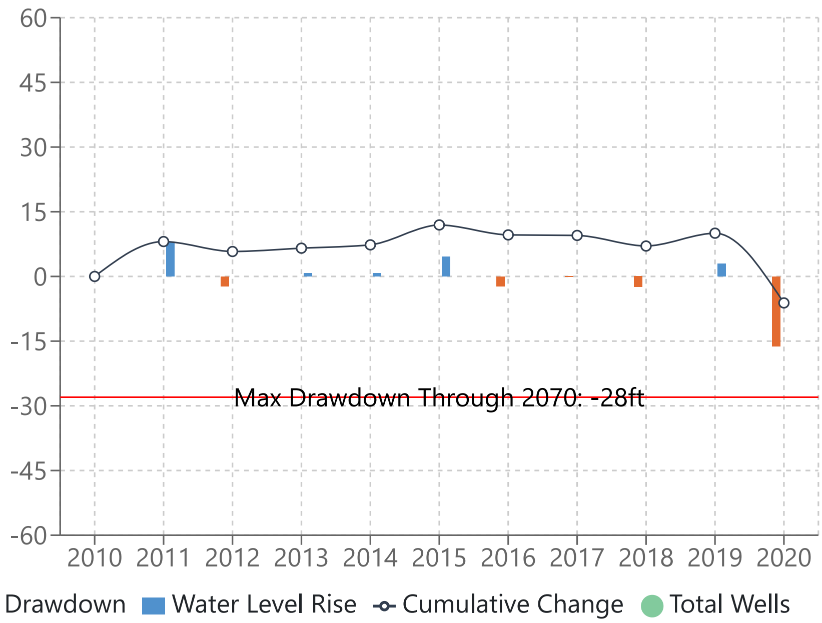


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-7	Not Applicable	Not Applicable
1-Year Water Level Change	-4.6	1	10
5-Year Water Level Change	-9.3	2	10, 3
Cumulative Water Level Change (2010 to Present)	-7.9	2	10, 3
DFCs vs Cumulative Change	-0.9	Not Applicable	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
August 05, 2021

Hood County-Glen Rose-Subcrop

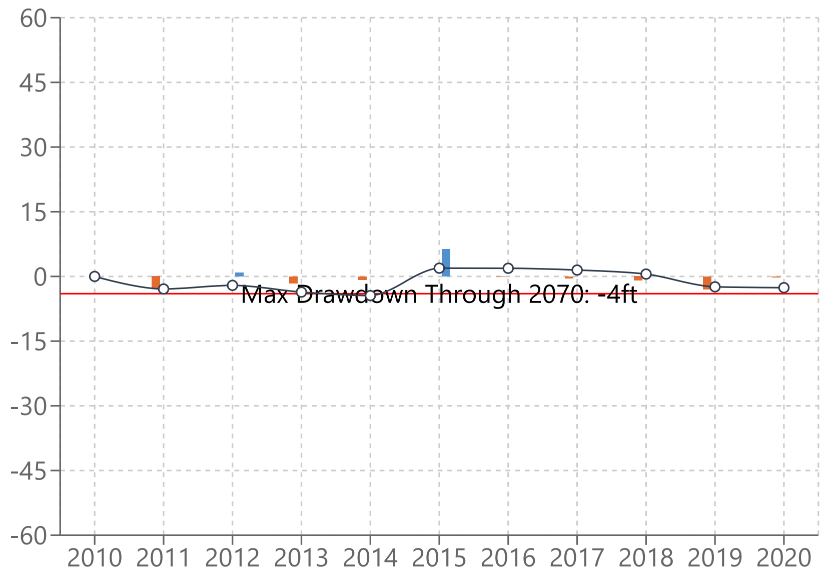


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-28	Not Applicable	Not Applicable
1-Year Water Level Change	-16.2	2	310, 311
5-Year Water Level Change	-18.1	3	311, 310, 312
Cumulative Water Level Change (2010 to Present)	-6.1	3	312, 311, 310
DFCs vs Cumulative Change	21.9	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
August 05, 2021

Hood County-Twin Mountains-Outcrop

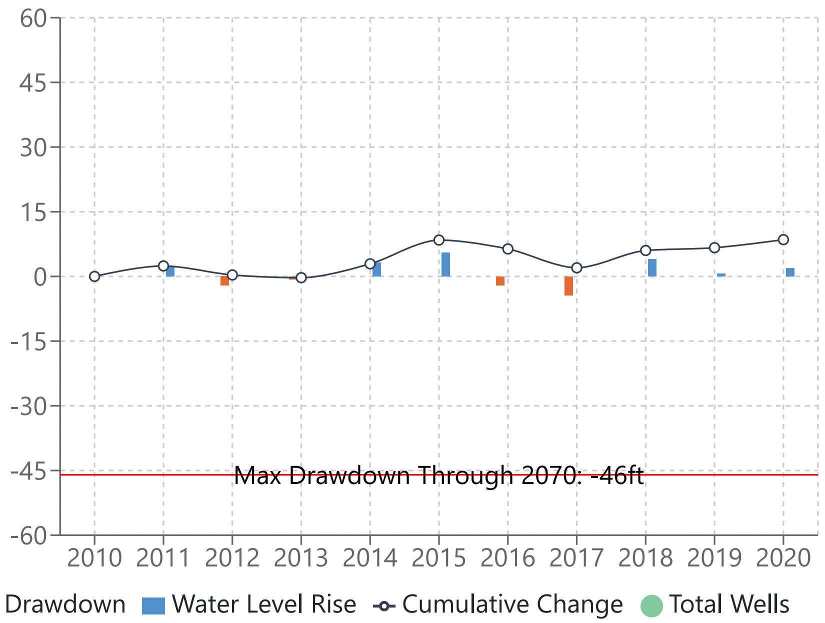


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-4	Not Applicable	Not Applicable
1-Year Water Level Change	-0.2	8	1009, 2181, 8867, 711, 990, 8869, 981, 8868
5-Year Water Level Change	-4.5	8	2181, 990, 981, 8869, 1009, 8867, 8868, 711
Cumulative Water Level Change (2010 to Present)	-2.6	8	1009, 990, 8867, 981, 8869, 8868, 2181, 711
DFCs vs Cumulative Change	1.4	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
August 05, 2021

Hood County-Twin Mountains-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-46	Not Applicable	Not Applicable
1-Year Water Level Change	1.9	12	581, 984, 738, 1002, 999, 8865, 2341, 17, 8891, 239, 243, 325
5-Year Water Level Change	0.1	23	581, 1006, 1002, 8865, 11, 4, 2341, 17, 243, 239, 240, 8871, 324, 325, 999, 993, 8891, 1001, 327, 322, 984, 7100, 738
Cumulative Water Level Change (2010 to Present)	8.5	23	1002, 8865, 11, 993, 4, 17, 243, 239, 240, 8871, 324, 327, 325, 322, 1001, 999, 581, 984, 2341, 1006, 8891, 7100, 738
DFCs vs Cumulative Change	54.5	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.

APPENDIX 2

Upper Trinity Groundwater Conservation District
Water Level Monitoring Program

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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.

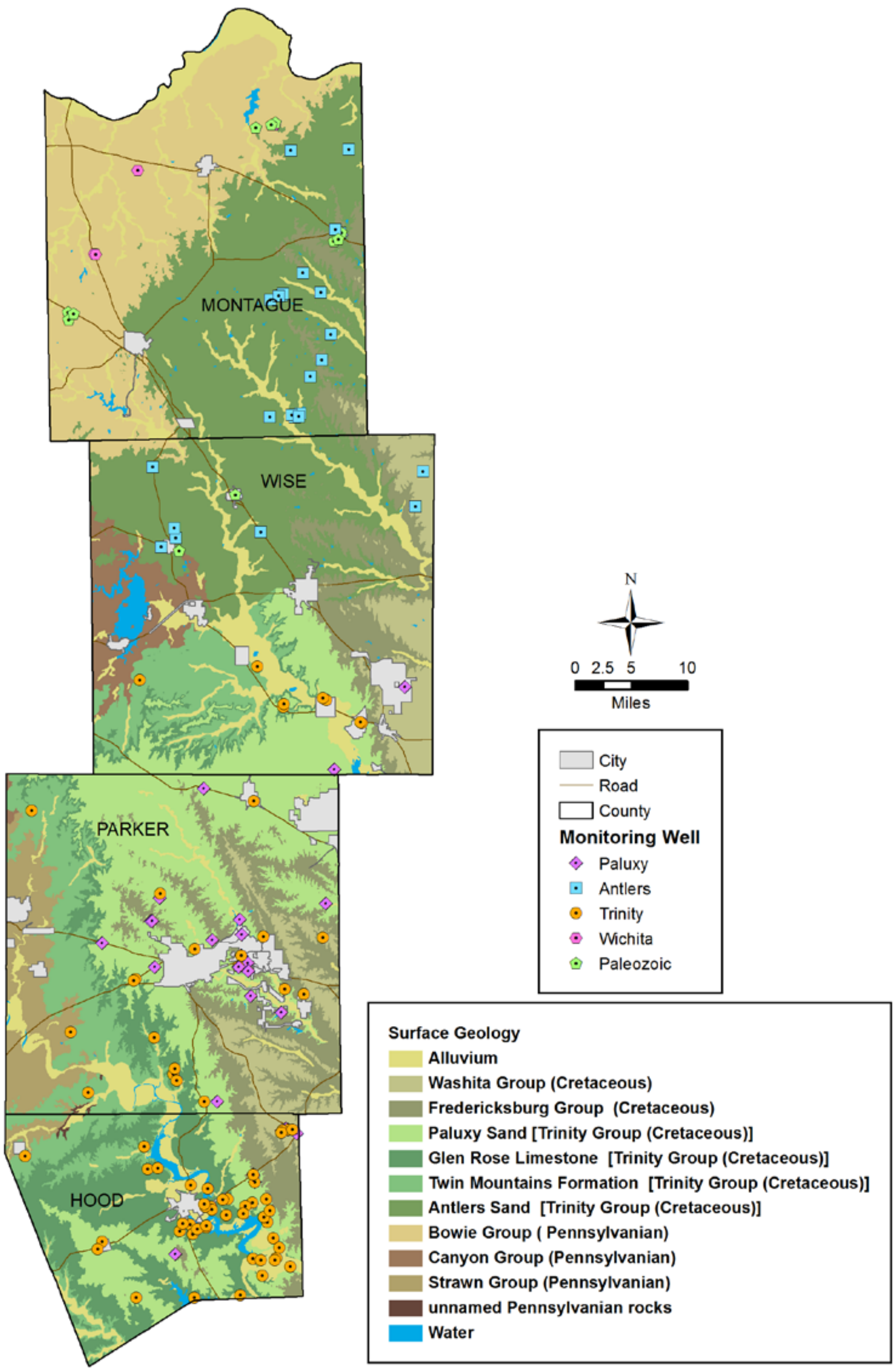

Figure 1. UTGCD Phase I Monitor Wells by Stratum and District Surface Geology.

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

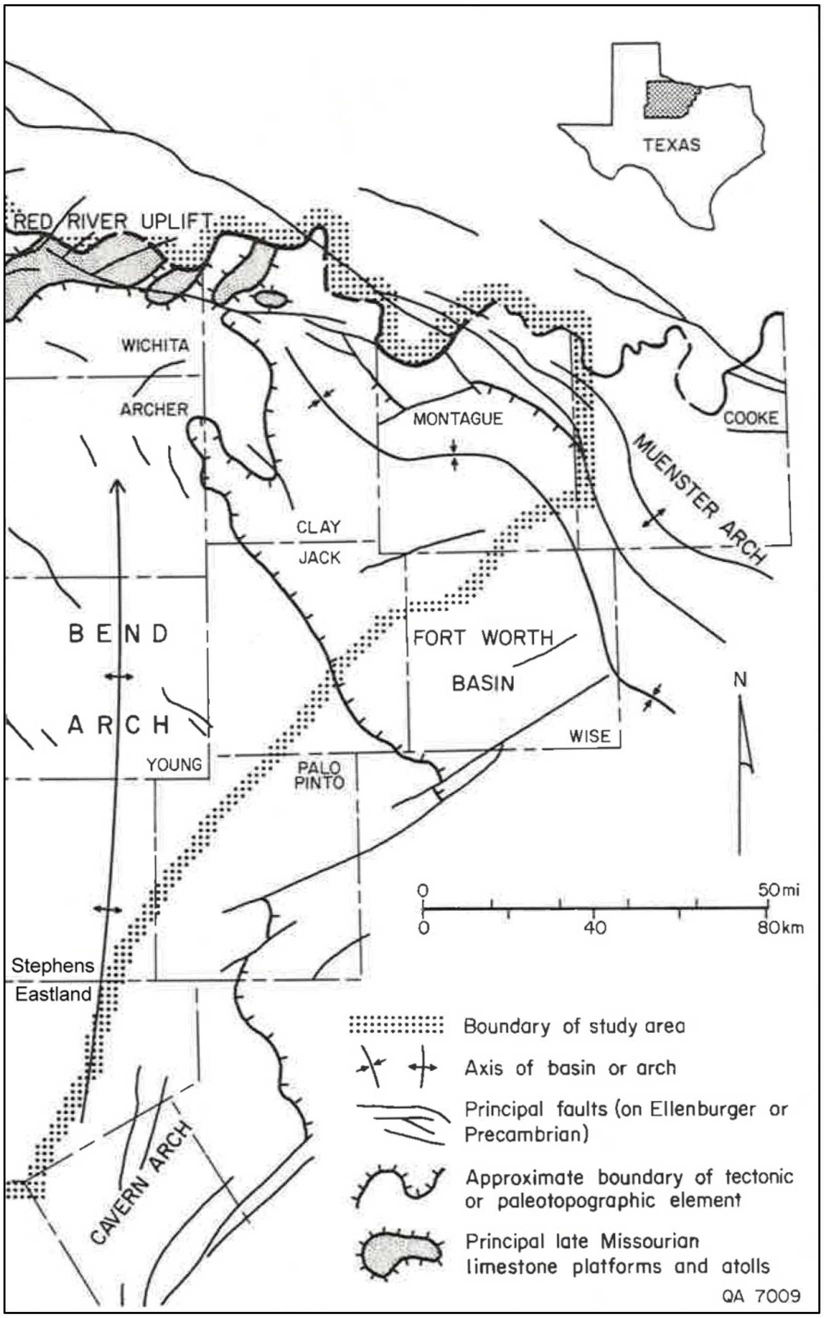

Figure 2. Principal Pre-Pennsylvanian structural features (after Brown et al. 1990)

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.

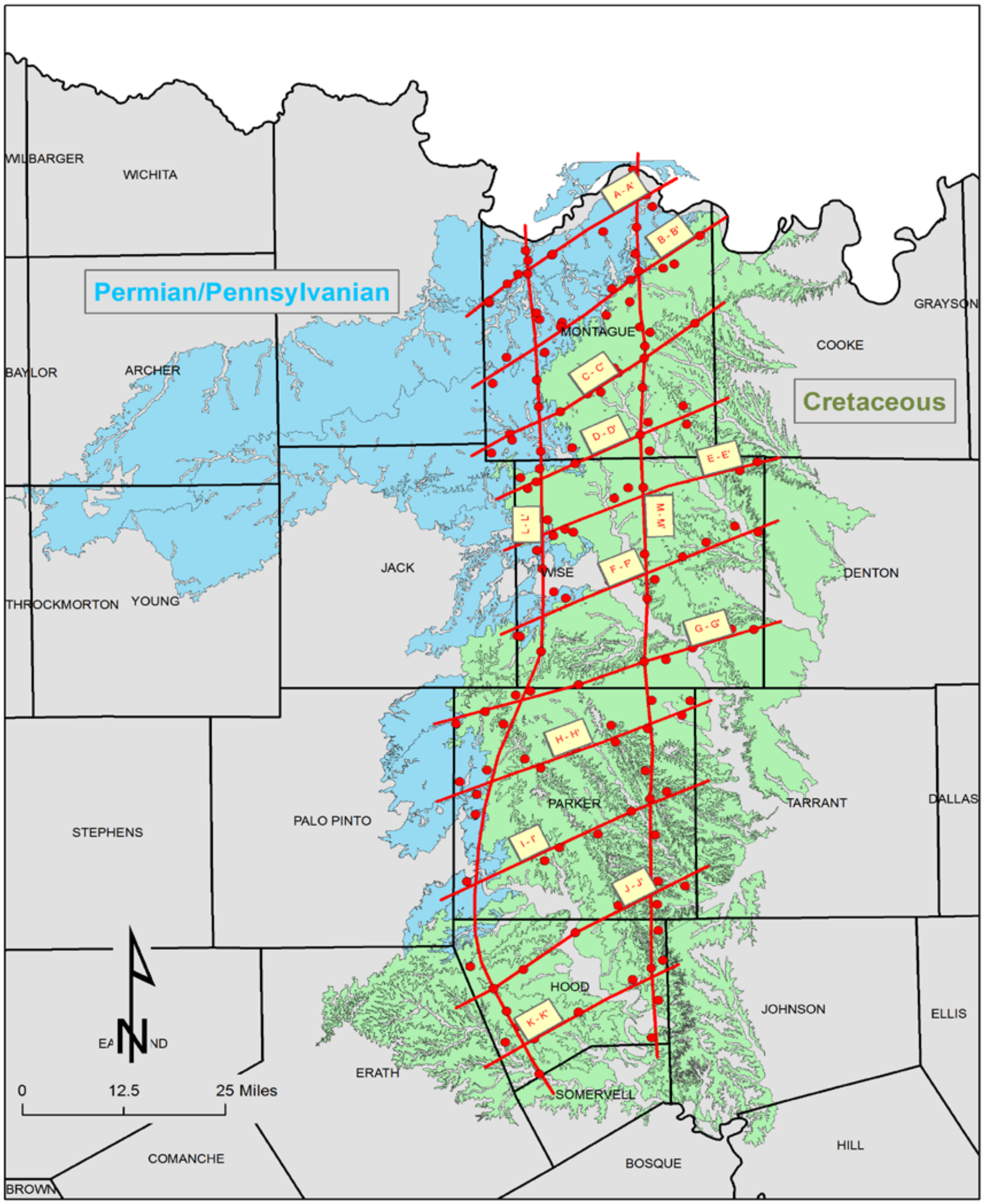

Figure 3. Cross-Section Base Map

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.

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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.

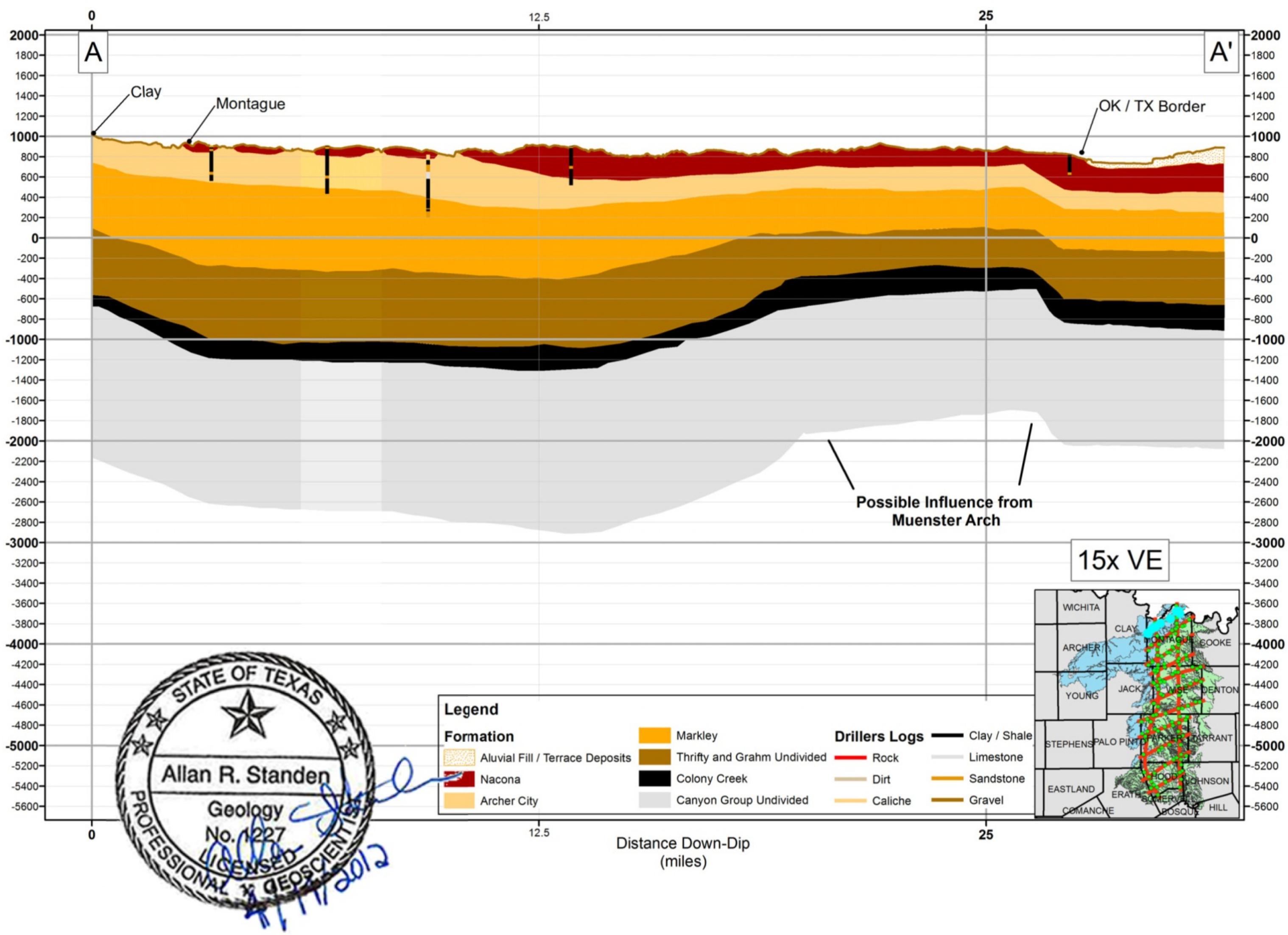

Figure 4. **Hydrogeologic Cross-Section A – A.**

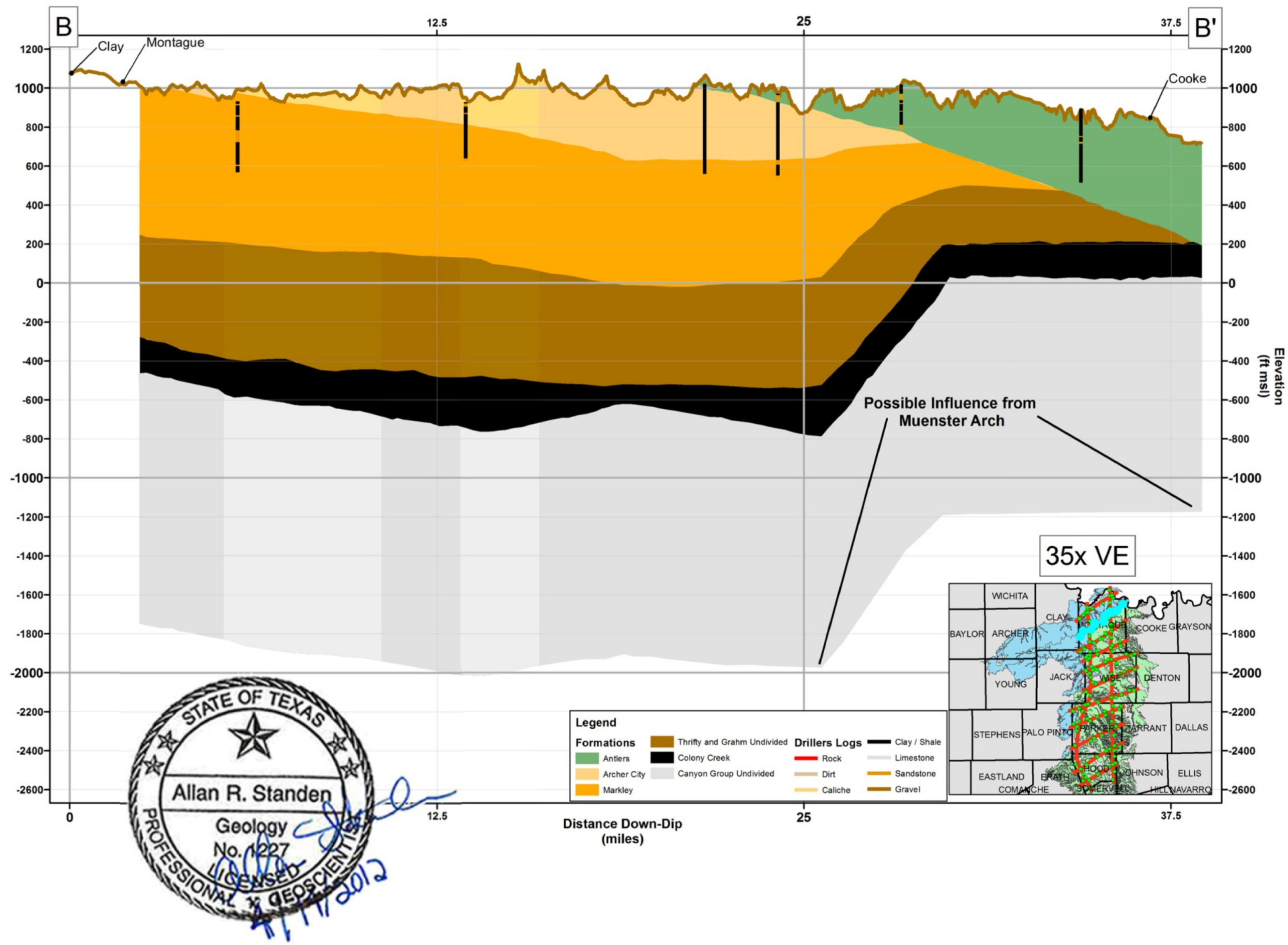

Figure 5. Hydrogeologic Cross-Section B – B.

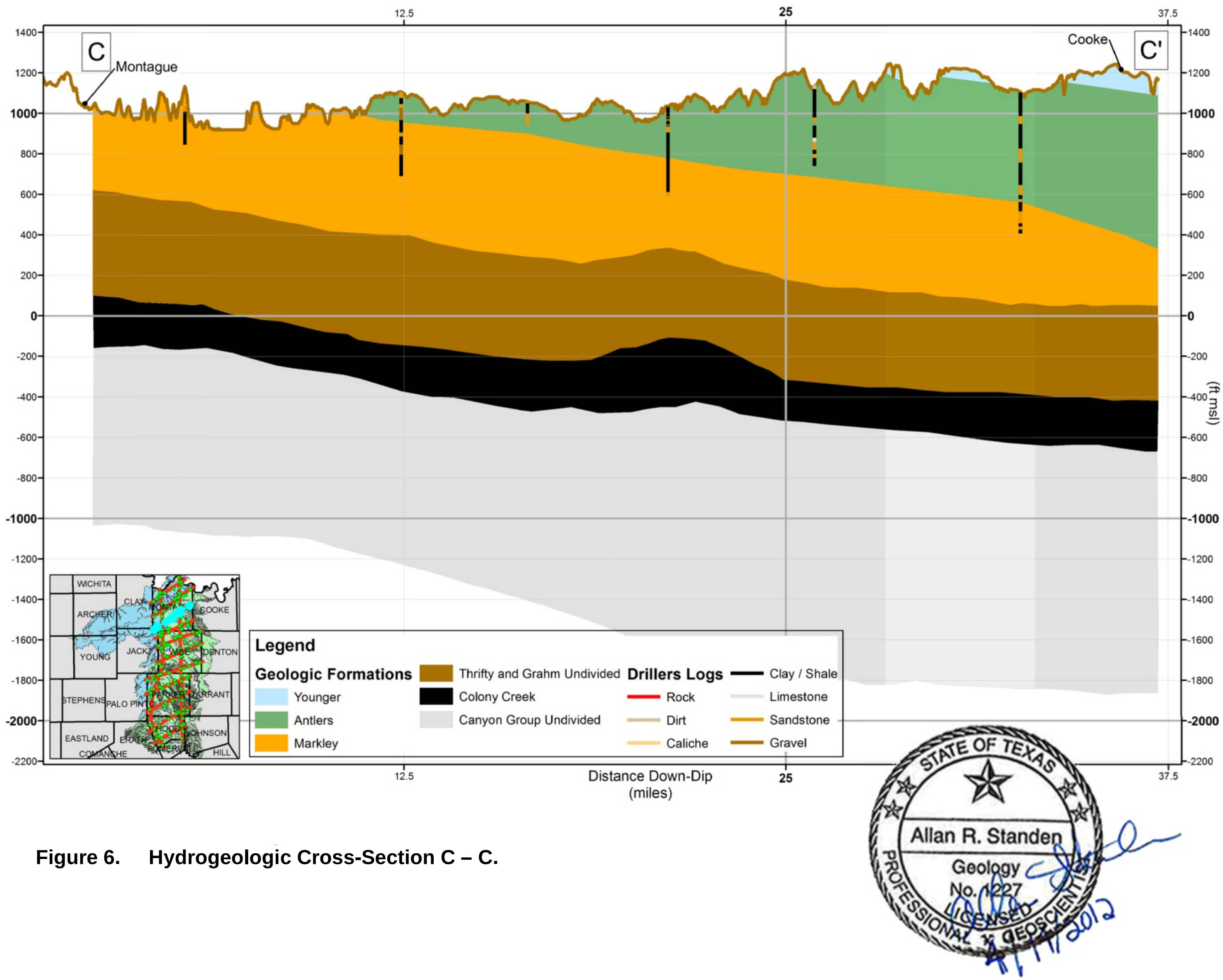

Figure 6. **Hydrogeologic Cross-Section C – C.**

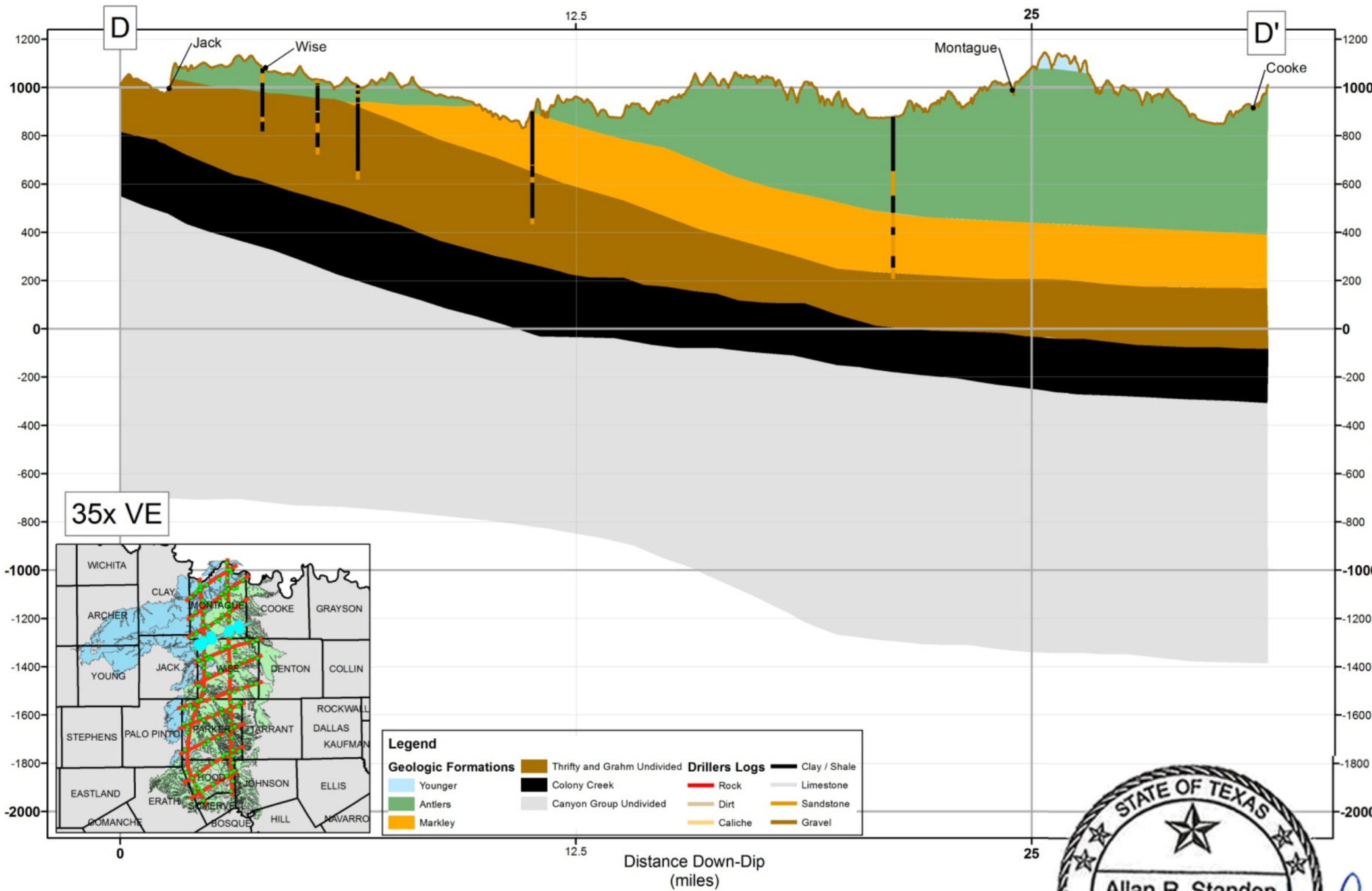

Figure 7. **Hydrogeologic Cross-Section D – D.**

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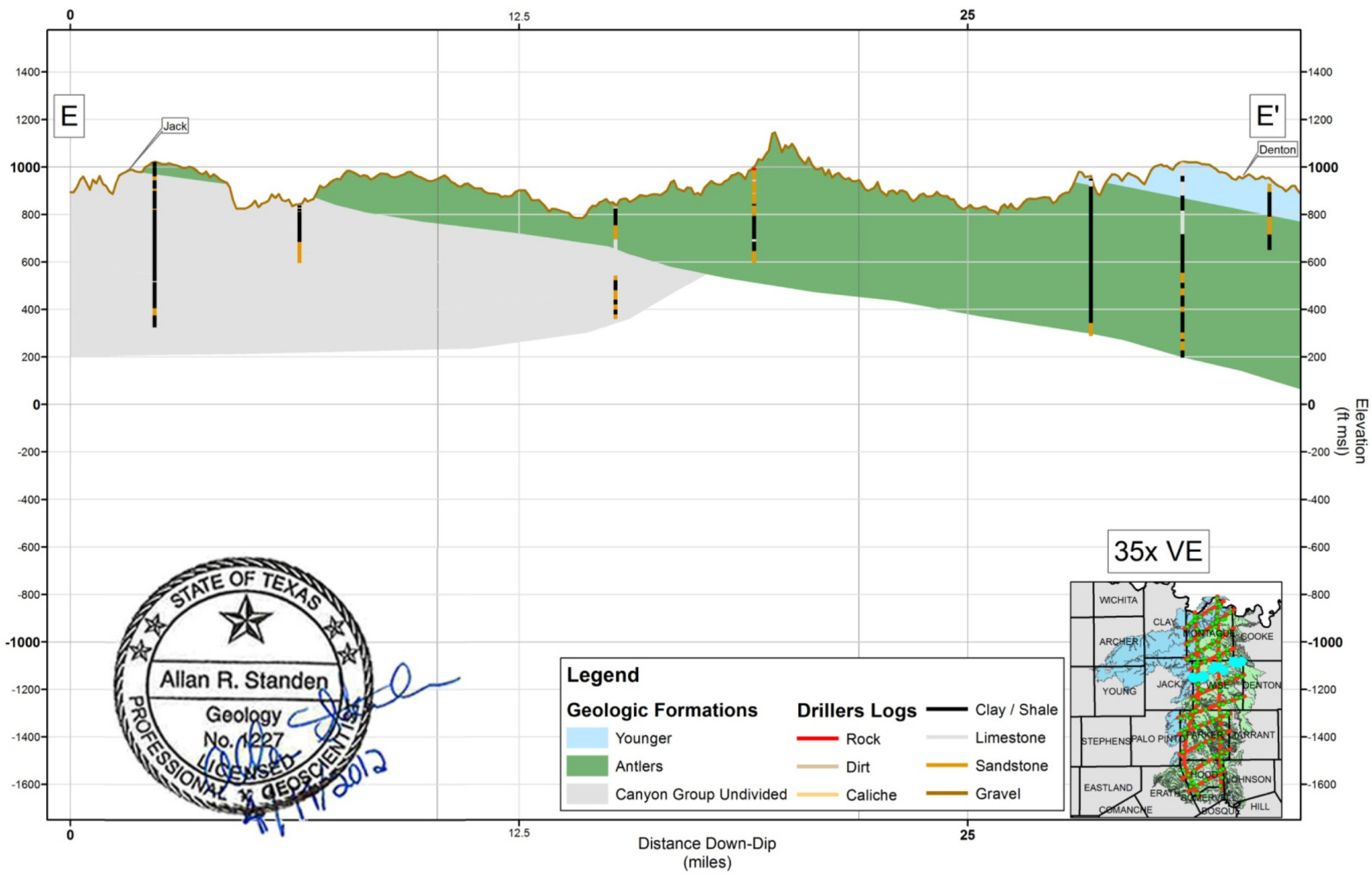

Figure 8. Hydrogeologic Cross-Section E – E.

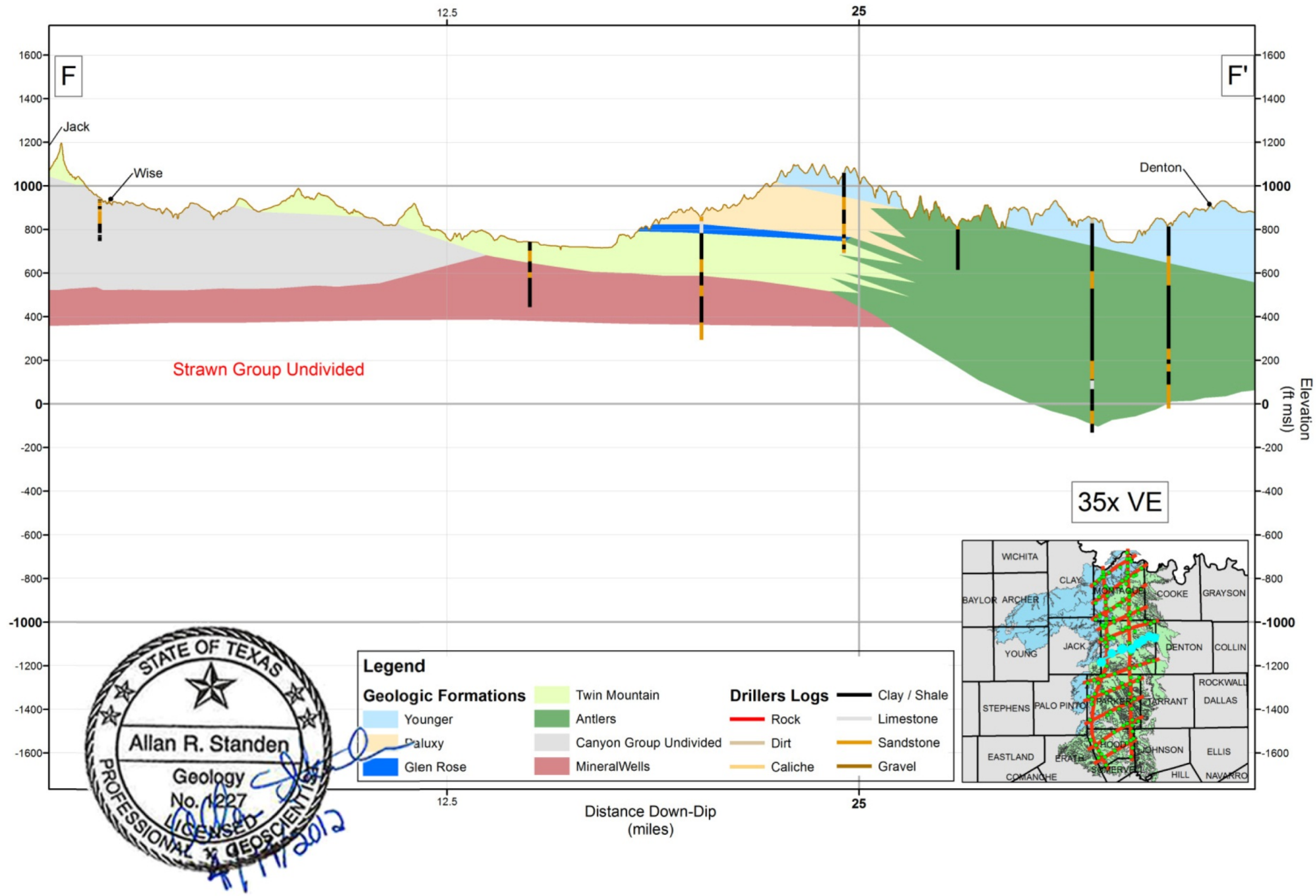

Figure 9. Hydrogeologic Cross-Section F – F.

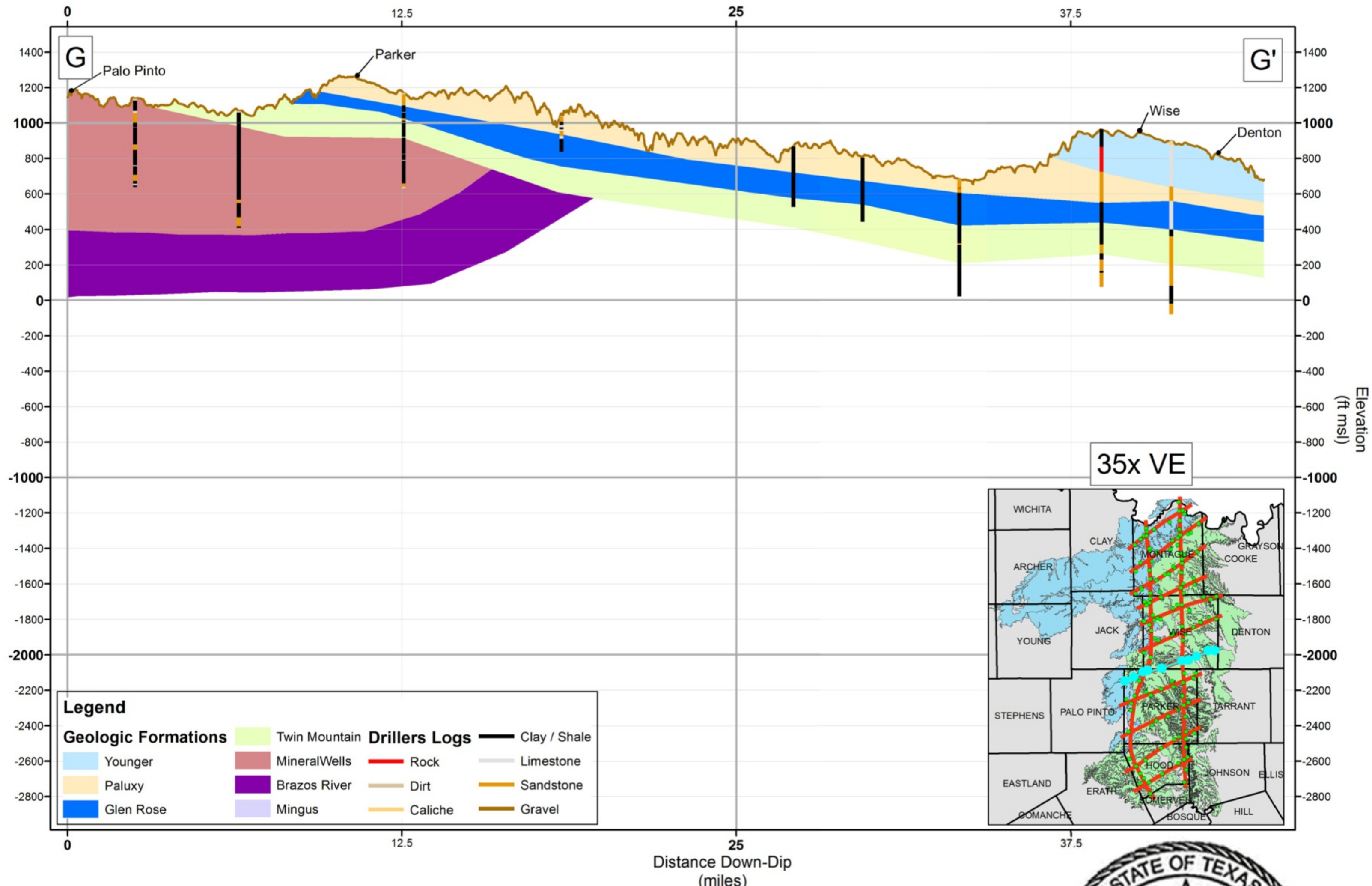

Figure 10. **Hydrogeologic Cross-Section G – G.**

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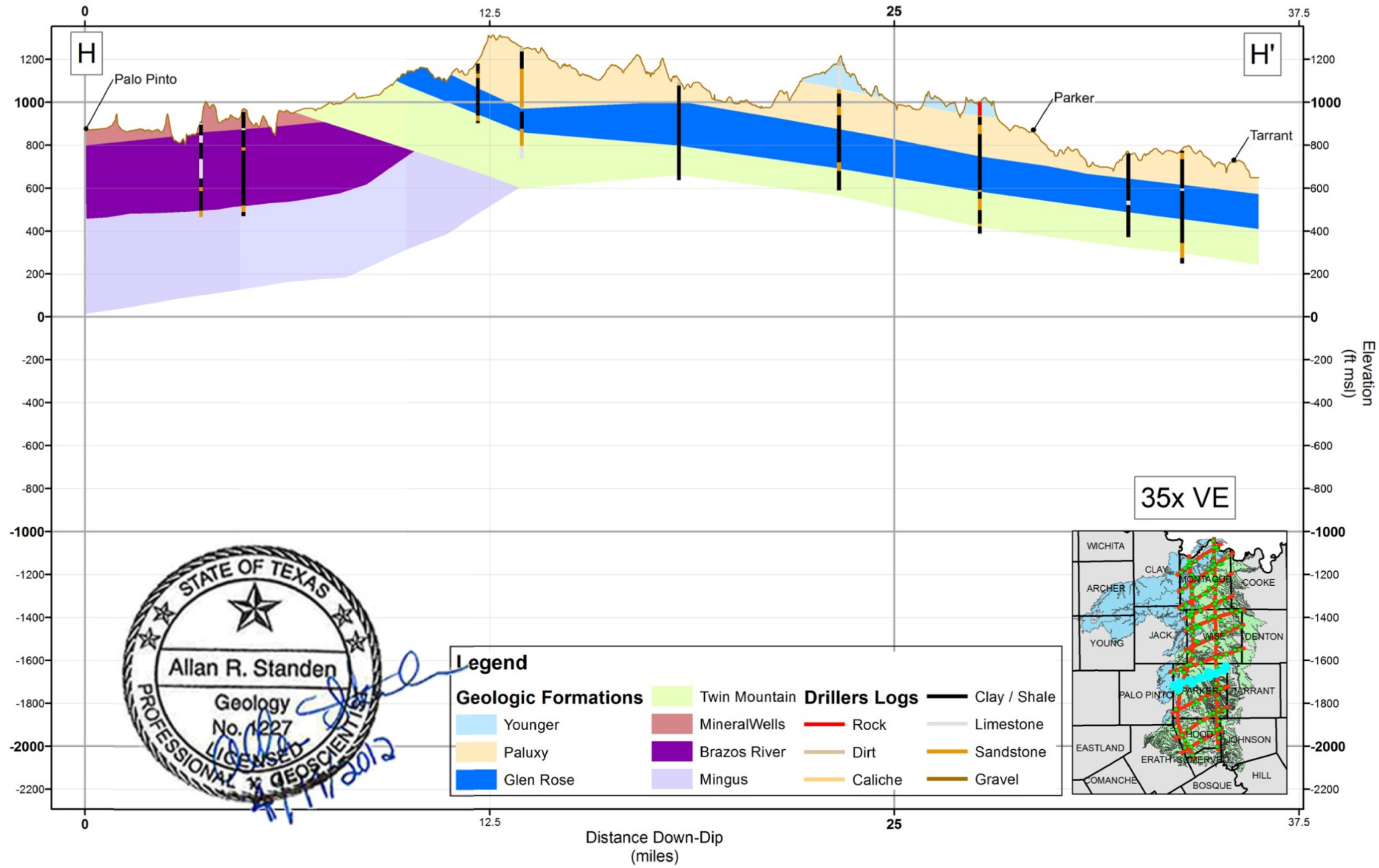

Figure 11. Hydrogeologic Cross-Section H – H.

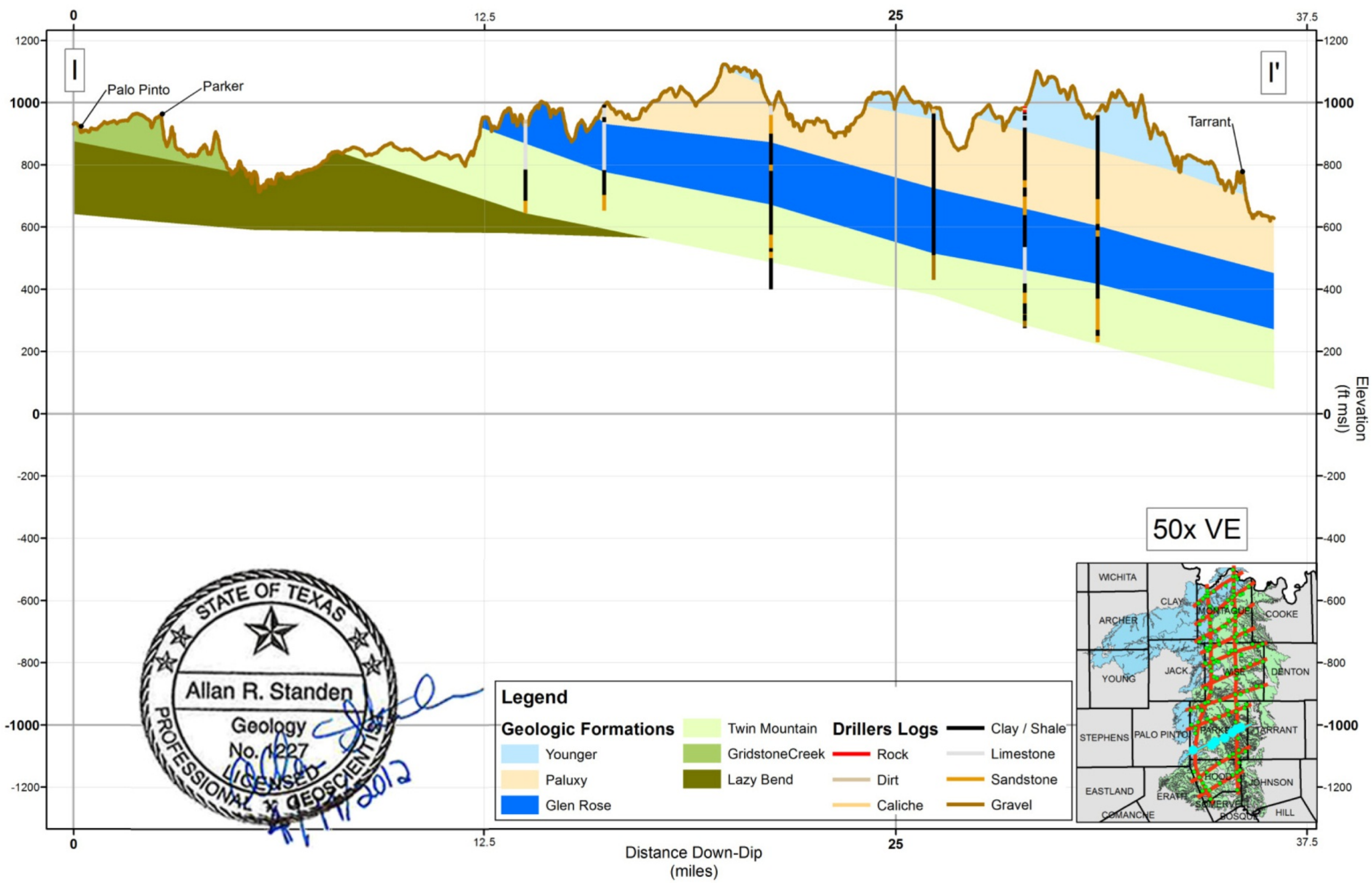

Figure 12. Hydrogeologic Cross-Section I – I.

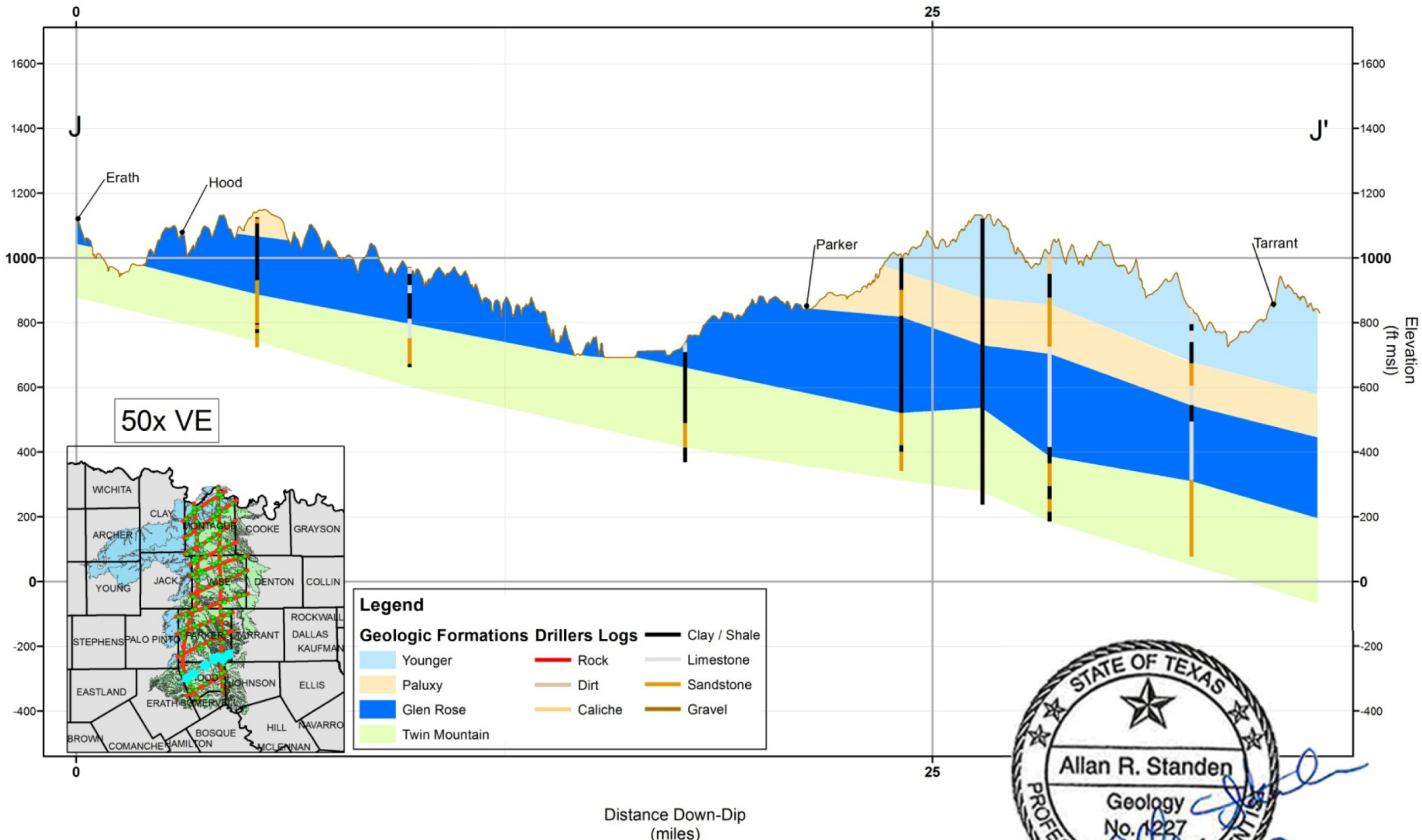

Figure 13. **Hydrogeologic Cross-Section J – J.**

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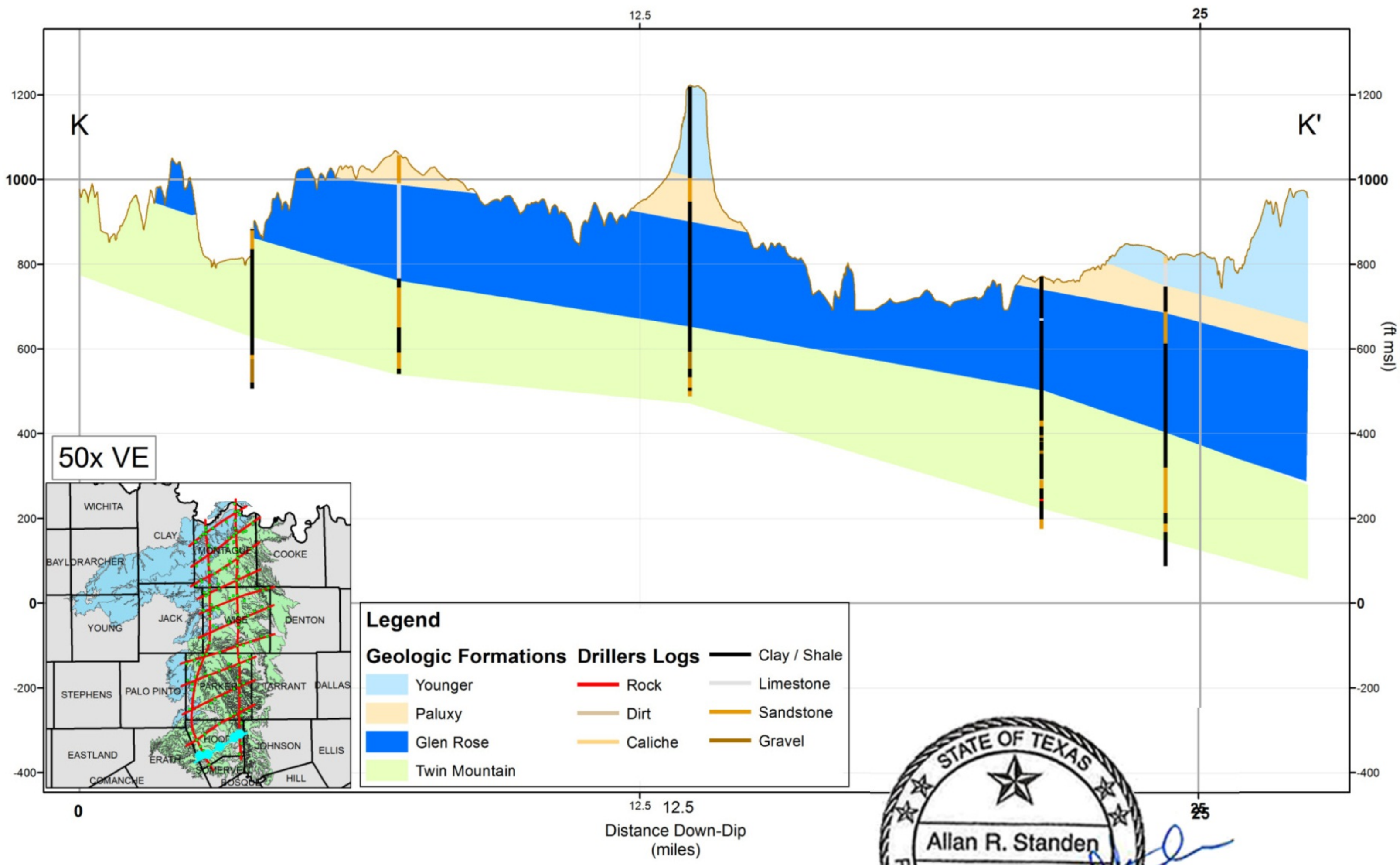

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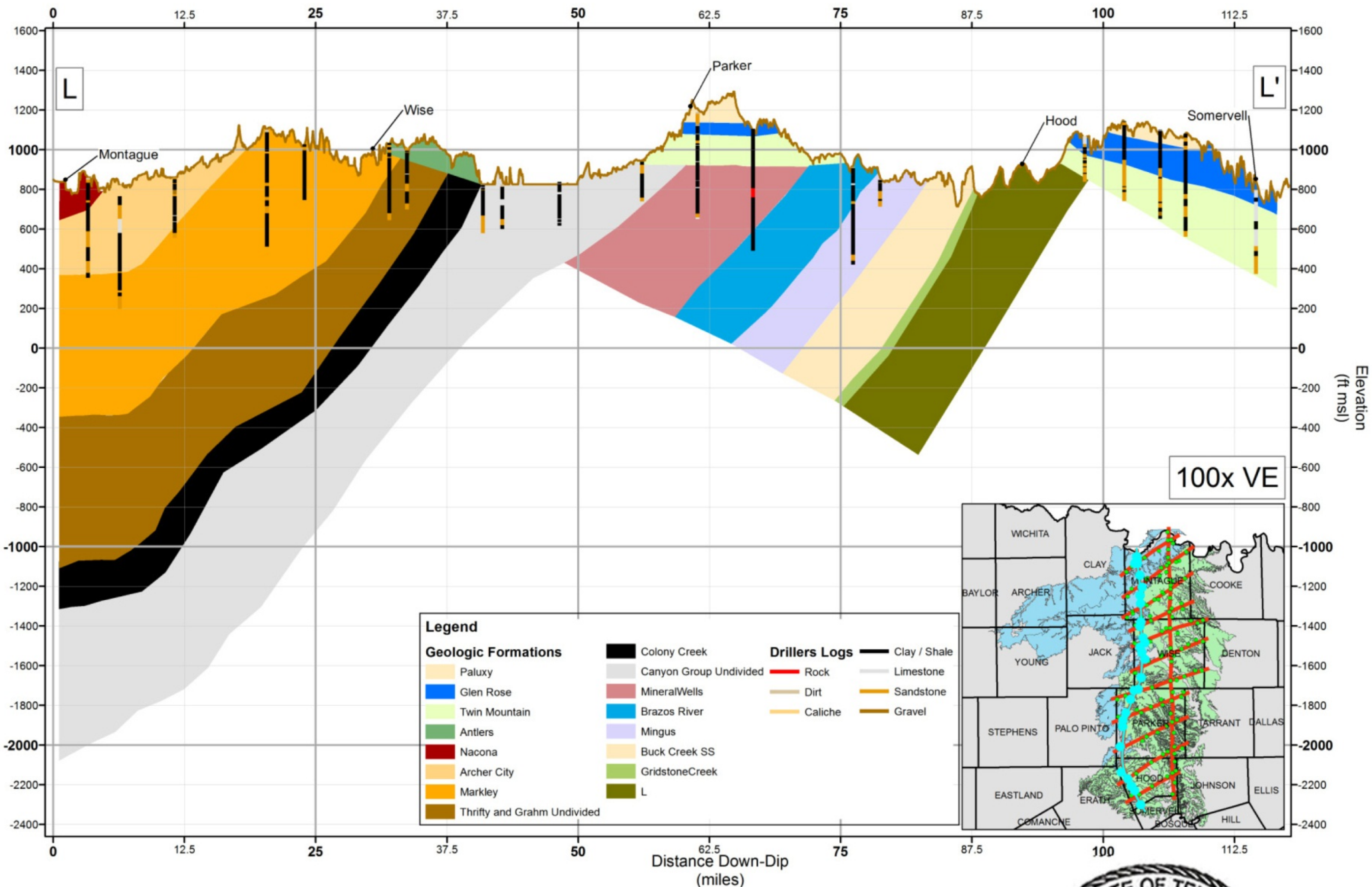
Figure 14. Hydrogeologic Cross-Section K – K.



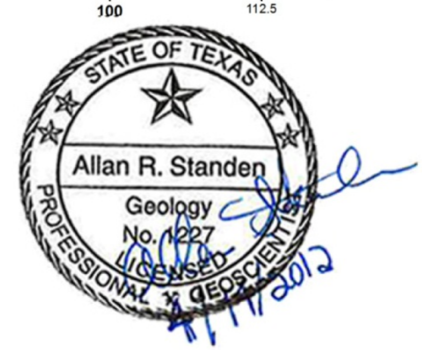


Figure 15. **Hydrogeologic Cross-Section L – L.**

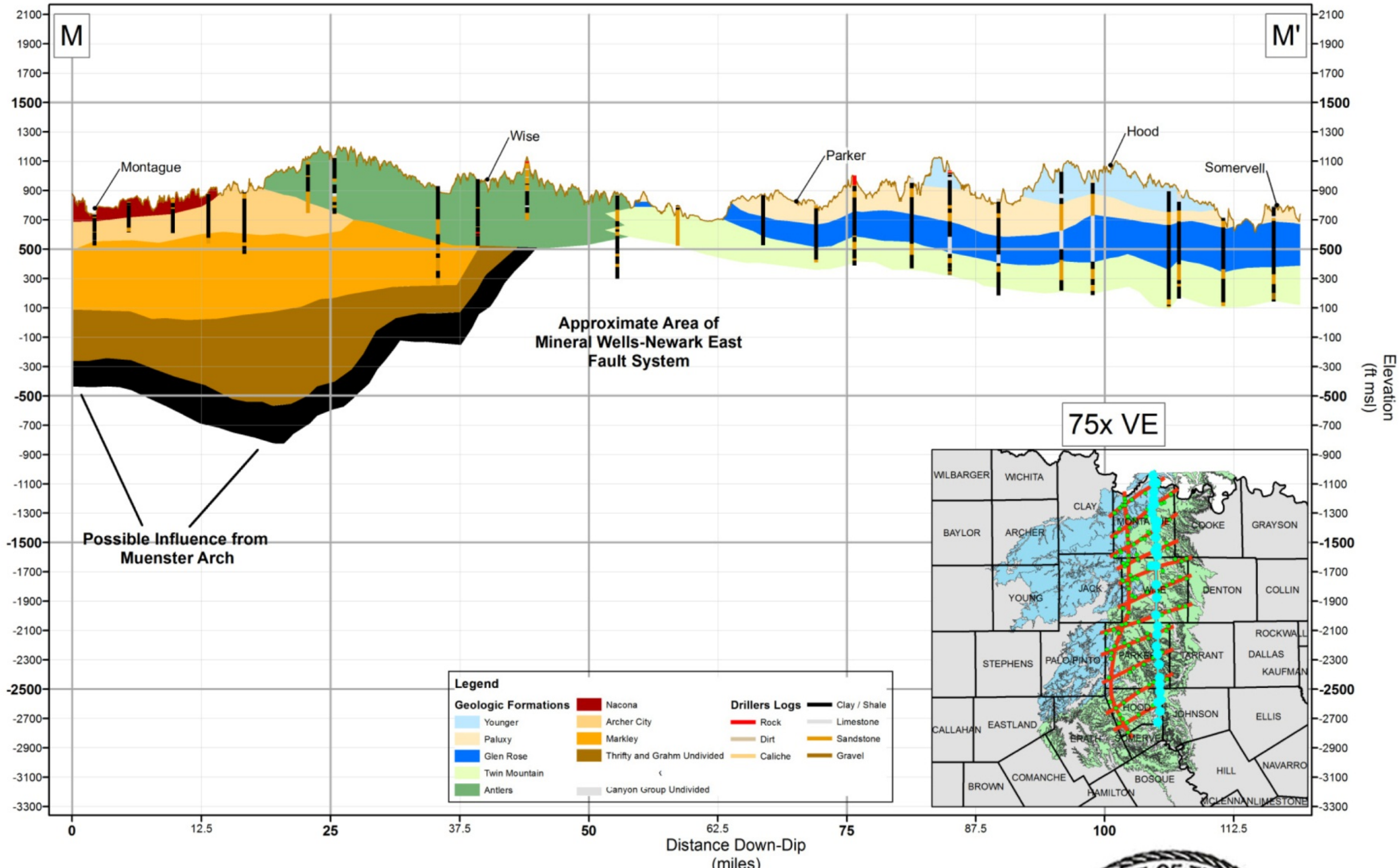


Figure 16. Hydrogeologic Cross-Section M – M.

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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 facing 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.

<table>
<tr><th colspan="2">District Geology</th><th colspan="2">GAM Model</th></tr>
<tr><th>Montague and northern Wise counties</th><th>Hood, Parker, southern Wise counties</th><th>Model Stratigraphy</th><th>Model Layer</th></tr>
<tr><td rowspan="5">Antlers Formation</td><td>Paluxy Sand</td><td>Paluxy aquifer</td><td>3</td></tr>
<tr><td>Glen Rose Formation</td><td>Glen Rose aquifer</td><td>4</td></tr>
<tr><td rowspan="3">Twin Mountains Formation</td><td>Hensell aquifer</td><td>5</td></tr>
<tr><td>Pearsall/Cow Creek/Hammett/ Sligo confining unit</td><td>6</td></tr>
<tr><td>Hosston aquifer</td><td>7</td></tr>
</table>

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**

(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.

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Upper Trinity Groundwater Conservation District

ANNUAL FINANCIAL REPORT

FOR THE YEAR ENDED DECEMBER 31, 2020

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Annual Financial Report
For the Year Ended December 31, 2020

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Boucher, Morgan and Young, a P.C.

INDEPENDENT AUDITORS' REPORT

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

Report on the Financial Statements

We have audited the accompanying financial statements of the governmental activities and the major fund information of the Upper Trinity Groundwater Conservation District (the District) as of and for the year ended December 31, 2020, and the related notes to the financial statements, which collectively comprise the District's basic financial statements as listed in the table of contents.

Management's Responsibility 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; this includes 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.

Auditor's Responsibility

Our responsibility is to express opinions on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statement 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 entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

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Opinions

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the governmental activities and the major fund of Upper Trinity Groundwater Conservation District as of December 31, 2020, and the respective changes in financial position for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Other Matters

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 on pages 4 through 8, page 30, and pages 31 through 33, respectively, be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of the financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Boucher, Morgan & Young

Granbury, Texas
July 19, 2021

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, 2020. 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 $6,195,438.

The District's total net position increased by $666,215 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 $4,178,045 compared to the $3,671,145 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 17-28 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 $6,195,438 as of December 31, 2020.

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 2019	Governmental Activities 2020
Current assets	$ 3,740,931	$ 4,292,757
Capital assets	1,795,200	1,948,751
Total assets	5,536,131	6,241,508
Deferred outflows	57,891	38,227
Total assets and deferred outflows	5,594,022	6,279,735
Current liabilities	69,786	114,712
Non-current liabilities (assets)	(4,987)	(37,013)
Total liabilities	64,799	77,699
Deferred inflows	-	6,598
Total deferred inflows	-	6,598
Net position:		
Net investment in capital assets	1,795,200	1,948,751
Unrestricted	3,734,023	4,246,687
Total Net Position	$ 5,529,223	$ 6,195,438

As of December 31, 2020, 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, 2020. Governmental-type activities increased the District's net position by $666,215.

Upper Trinity Groundwater Conservation District's Changes in Net position

	Governmental Activities 2019	Governmental Activities 2020
Revenues:		
Program Revenues:		
Water usage fees	$ 868,277	$ 839,223
New well registration fees	662,375	877,674
Other program revenue	35,439	80,705
Total program revenues	1,566,091	1,797,602
General Revenues:		
Miscellaneous revenue	5,972	8,815
Gain on disposal of capital assets	-	11,500
Net Investment earnings	41,002	34,915
Total revenues	1,613,065	1,852,832
Expenses:		
Groundwater conservation	1,175,182	1,192,381
Total expenses	1,175,182	1,192,381
Change in net position	437,883	666,215
Net position - beginning of year	5,091,340	5,529,223
Net position - end of year	$ 5,529,223	$ 6,195,438

Financial Analysis of the Government's Funds

The net position increased in 2020 by $666,215 compared to a $437,883 increase in 2019. Increased new well registrations caused an increase in program revenue of $231,511. Expenditures increased from the previous year by $17,199.

Capital Assets

The Upper Trinity Groundwater Conservation District's investment in capital assets as of December 31, 2020, amounts to $1,948,751 (net of accumulated depreciation). This investment in capital assets includes land, vehicles, furniture, equipment, and software.

Capital Assets at Year-End Net of Accumulated Depreciation

	Governmental - Type Activities 2019	Governmental - Type Activities 2020
Land	$ 267,834	$ 267,834
Building	1,021,918	985,956
Vehicles	86,787	142,939
Furniture and equipment	197,257	358,695
Software	221,404	193,327
Total	$ 1,795,200	$ 1,948,751

Depreciation expense on all assets amounted to $112,427 for the year.

Economic Factors for Next Year

The original budget for the 2021 fiscal year shows projected revenues of $1,560,500 and expenditures of $1,620,350.

On November 16, 2020 the Board of Directors of UTGCD passed and adopted Resolution 20-005 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, Desired Future Conditions Preparation Fund, Facilities/Building 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 DISTRICT
STATEMENT OF NET POSITION
DECEMBER 31, 2020

		Governmental Activities
ASSETS:		
Current assets:		
Cash and cash equivalents	$	723,690
Certificates of deposit		3,091,136
Receivables, net of allowance		466,160
Prepaid expenses		6,626
Deposits		1,610
Undeposited funds		3,535
Total current assets		4,292,757
Capital assets:		
Nondepreciable		267,834
Depreciable, net		1,680,917
Total assets		6,241,508
DEFERRED OUTFLOWS:		
Deferred retirement contributions		36,973
Deferred assumption/input changes		1,254
Total deferred outflows		38,227
Total assets and deferred outflows	$	6,279,735
LIABILITIES:		
Current liabilities:		
Accounts and credit card payables		36,270
Payroll liabilities		25,602
Driller deposits		52,840
Non-current liabilities:		
Net pension liability (asset)		(37,013)
Total liabilities		77,699
DEFERRED INFLOWS:		
Deferred investment experience		5,129
Deferred actual vs. assumption		1,469
Total deferred inflows		6,598
NET POSITION		
Net investment in capital assets		1,948,751
Unrestricted		4,246,687
Total net position	$	6,195,438

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, 2020

	Expenses	Program Revenues Charges for Services	Net (Expense) Revenue and Changes in Net Position Primary Government Governmental Activities
Primary Government			
Governmental Activities			
General government	$ 1,186,617	$ 1,797,602	$ 610,985
Total governmental	1,186,617	1,797,602	610,985
General revenues			
Miscellaneous revenue			8,815
Gain on disposal of capital assets			11,500
Investment earnings			34,915
Total general revenues			55,230
Change in net position			666,215
Net position - beginning			5,529,223
Net position - ending			$ 6,195,438

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

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
BALANCE SHEET - GOVERNMENTAL FUND
DECEMBER 31, 2020

		General Fund
ASSETS		
Cash and cash equivalents	$	723,690
Certificates of deposit		3,091,136
Accounts receivable, net of allowance		466,160
Prepaid expenses		6,626
Security deposits		1,610
Undeposited funds		3,535
Total assets	$	4,292,757
LIABILITIES		
Accounts and credit cards payable	$	36,270
Payroll liabilities		25,602
Driller deposits		52,840
Total liabilities		114,712
FUND BALANCE		
Nonspendable		6,626
Committed		1,000,000
Assigned		1,100,000
Unassigned		2,071,419
Total fund balance		4,178,045
Total liabilities and fund balance	$	4,292,757

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, 2020

Total Fund Balance - Governmental Fund		$ 4,178,045
Capital assets used in governmental activities are not financial resources and therefore are not reported in governmental funds balance sheet.		1,948,751
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)	37,013	
Deferred retirement contributions	36,973	
Deferred investment experience	(5,129)	
Deferred actual vs. assumption	(1,469)	
Deferred assumption/input changes	1,254	68,642
Net Position of Governmental Activities		$ 6,195,438

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, 2020

	General Fund
Revenues:	
Exception fees	$ 6,100
Export fees	831
Penalties assessed	28,674
Forfeited deposits	3,100
New well registration fees	877,674
Permit application fees	42,000
Semi-annual program income	839,223
Total program revenue	1,797,602
Investment earnings	34,915
Other sources	8,815
Total revenues	1,841,332
Expenditures:	
General government	1,079,954
Capital outlay	254,478
Total expenditures	1,334,432
Net change in fund balance	506,900
Fund balance - beginning of year	3,671,145
Fund balance - end of year	$ 4,178,045

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, 2020

Total Net Change in Fund Balance - Governmental Fund	$	506,900
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 2020 capital outlays is to increase net position.		254,478
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.		(112,427)
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 govenrmental funds. These balances increased (decreased) by this amount.		5,764
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.		11,500
Change in Net Position of Governmental Activities	$	666,215

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

NOTES TO FINANCIAL STATEMENTS

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Notes to Financial Statements
December 31, 2020

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.

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

2. Summary of Significant Accounting Policies (continued)

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. Capital Assets, Depreciation, and Amortization

The District's property, plant, and equipment 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	5-7 years
Furniture and equipment	5-50 years
Software	3-10 years
Building	30 years

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

2. Summary of Significant Accounting Policies (continued)

E. 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.

F. 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, 2020 totaled $1,726,250. The general fund revenues budgeted for the year were $1,557,500 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.

G. 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.

2. Summary of Significant Accounting Policies (continued)

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.

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.

H. 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.

I. Receivables

Gross accounts receivable of $479,538 are presented in the Balance Sheet and Statement of Net Position net of an allowance for doubtful accounts in the amount of $13,378.

3. Deposits and Investments with Financial Institutions

At year end, the book balance of the District's checking account and certificates of deposit was $3,814,826 which was all unrestricted. The bank balance of $3,864,232 which was partially covered with federal depository insurance ($3,338,974) and pledged collateral ($523,096) while the remaining $2,162 was not collateralized. The District believes it is not exposed to any significant credit risk on its cash and certificates of deposit balance.

3. Deposits and Investments with Financial Institutions (continued)

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, 2020, 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 12/31/2019	Additions	Retirements/ Adjustments	Balance 12/31/2020
Governmental activities:				
Non-depreciable assets:				
Land	$ 267,834	$ -	$ -	$ 267,834
Total non-depreciable assets	267,834	-	-	267,834
Capital assets being depreciated:				
Building	1,078,858	-	-	1,078,858
Vehicles	274,648	87,221	(29,678)	332,191
Furniture and equipment	262,513	178,757	-	441,270
Software	315,374	-	-	315,374
Total capital assets being depreciated	1,931,393	265,978	(29,678)	2,167,693
Less accumulated depreciation:				
Building	(56,940)	(35,962)	-	(92,902)
Vehicles	(187,861)	(31,069)	29,678	(189,252)
Furniture and equipment	(65,256)	(17,319)	-	(82,575)
Software	(93,970)	(28,077)	-	(122,047)
Total accumulated depreciation	(404,027)	(112,427)	29,678	(486,776)
Total capital assets being depreciated, net	1,527,366	153,551	-	1,680,917
Governmental activities capital assets, net	$ 1,795,200	$ 153,551	$ -	$ 1,948,751

Depreciation expense charged to the general government operations was $112,427.

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, 2020, the District's liability for unpaid vacation and comp time was $19,960.

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 2020 in order to commit a total of $1,000,000 for a legal reserve and litigation fund.

The Board has assigned the 2020 fund balance for the following purposes:

Monitoring well drilling fund	$750,000
Desired future conditions preparation fund	50,000
Facilities/building fund	50,000
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 a comprehensive annual financial report (CAFR) on a calendar year basis. The CAFR 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, 2019 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	6
Active employees	10
	18

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 6.38% for the calendar year. The deposit rate payable by the employee members for calendar year 2020 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.

9. Retirement Plan (continued)

Net Pension Liability

The District's Net Pension Liability (NPL) for the year ended December 31, 2020, was measured as of December 31, 2019, 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, 2019 actuarial valuation was determined using the following actuarial assumptions:

Inflation	2.75% per year
Overall payroll growth	4.85% per year
Investment Rate of Return	8.0%, 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 3.25% (made up of 2.75% inflation and .5% productivity increase assumptions) and a merit, promotion and longevity component that on average approximates 1.6% per year for a career employee.

Mortality rates for depositing members were based on 90% of the RP-2014 Active Employee Mortality Table for males and females as appropriate, projected with 110% of the MP-2014 Ultimate scale after 2014. Service retirees, beneficiaries and non-depositing members were based on 130% of the RP-2014 Healthy Annuitant Mortality Table for males and 110% of the RP-2014 Healthy Annuitant Mortality Table for females, both projected with 110% of the MP-2014 Ultimate scale after 2014. Disabled retirees were based on 130% of the RP-2014 Disabled Annuitant Mortality Table for males and 115% of the RP-2014 Disabled Annuitant Mortality Table for females, both projected with 110% of the MP-2014 Ultimate scale after 2014.

All actuarial assumptions that determined the total pension liability as of the December 31, 2019 valuation were based on the results of an actuarial experience study for the period January 1, 2013 – December 31, 2016, except where required to be different by GASB 68.

The long-term expected rate of return of 8.10% 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 April 2020 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; the most recent analysis was performed in 2017. See Milliman's TCDRS Investigation of Experience report for the period January 1, 2013 – December 31, 2016 for more details. Best estimates of geometric real rates of return (net of inflation, assumed at 1.80%) for each major asset class included in the target asset allocation (per Cliffwater's 2020 capital market assumptions) are summarized below:

9. Retirement Plan (continued)

Net Pension Liability (continued)

Asset Class	Benchmark	Target Allocation	Geometric Real Rate of Return (Expected minus inflation)
US Equities	Dow Jones U.S. Total Stock Market Index	14.5%	5.20%
Private Equity	Cambridge Associates Global Private Equity & Venture Capital Index	20.0%	8.20%
Global Equities	MSCI World (net) Index	2.5%	5.50%
Int'l Equities - Developed Markets	MSCI World Ex USA (net)	7.0%	5.20%
Int'l Equities - Emerging Markets	MSCI Emerging Markets (net) Index	7.0%	5.70%
Investment-Grade Bonds	Blomberg Barclays U.S. Aggregate Bond Index	3.0%	-0.20%
Strategic Credit	FTSE High-Yield Cash-Pay Capped Index	12.0%	3.14%
Direct Lending	S&P/LSTA Leveraged Loan Index	11.0%	7.16%
Distressed Debt	Cambridge Associates Distressed Securities Index	4.0%	6.90%
REIT Equities	67% FTSE NAREIT All Equity REITs Index + 33% S&P Global REIT (net) Index	3.0%	4.50%
Master Limited Partnerships (MLPs)	Alerian MLP Index	2.0%	8.40%
Private Real Estate Partnerships	Cambridge Associates Real Estate Index	6.0%	5.50%
Hedge Funds	Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index	8.0%	2.30%
Total		100.0%	

Discount Rate

The discount rate used to measure the Total Pension Liability was 8.1%. 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.

9. Retirement Plan (continued)

Net Pension Liability (continued)

	Increase (Decrease)		
	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)
Balance at 12/31/2018	$ 260,467	$ 265,454	$ (4,987)
Changes for the year:			
Service cost	54,635	-	54,635
Interest on total pension liability	25,386	-	25,386
Effect of plan changes	-	-	-
Effect of economic/demographic gains or losses	(10,528)	-	(10,528)
Effect of assumptions changes or inputs	-	-	-
Refund of contributions	-	-	-
Benefit payments	(3,447)	(3,447)	-
Administrative expenses	-	(277)	277
Member contributions	-	24,822	(24,822)
Net investment income	-	43,539	(43,539)
Employer contributions	-	31,573	(31,573)
Other	1	1,863	(1,862)
Net changes	$ 66,047	$ 98,073	$ (32,026)
Balance at 12/31/2019	**$ 326,514**	**$ 363,527**	**$ (37,013)**

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 8.1%, 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 (7.1%) or 1-percentage point higher (9.1%) than the current rate:

	1% Decrease in Discount Rate (7.1%)	**Discount Rate (8.1%)**	**1% Increase in Discount Rate (9.1%)**
Total pension liability	$ 393,153	$ 326,514	$ 273,568
Fiduciary net position	363,527	363,527	363,527
Net pension liabiltiy (asset)	$ 29,626	$ (37,013)	$ (89,959)

9. Retirement Plan (continued)

Net Pension Liability (continued)

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, 2020, the District recognized pension expense of $31,342.

As of December 31, 2020, 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	$ 27,578	$ 26,109
Changes of assumptions	-	1,254
Net difference between projected and actual earnings	5,129	-
Contributions subsequent to the measurement date	N/A	36,973
Total	$ 32,707	$ 64,336

$36,973 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, 2021. Other amounts reported as deferred outflows and inflows of resources related to pensions will be recognized in pension expense as follows:

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, 2020

	GAAP Basis			Variance
	Budgeted Amounts			Positive
	Original	Final	Actual	(Negative)
Revenues:				
Exception fees	$ 5,000	$ 5,000	6,100	1,100
Export fees	1,000	1,000	831	(169)
Penalties assessed	5,100	5,100	28,674	23,574
Forfeited deposits	6,000	6,000	3,100	(2,900)
New well registration fees	600,000	600,000	877,674	277,674
Permit application fees	50,000	50,000	42,000	(8,000)
Semi-annual program income	850,000	850,000	839,223	(10,777)
Total program revenue	1,517,100	1,517,100	1,797,602	280,502
Investment earnings	35,000	35,000	34,915	(85)
Other sources	5,400	5,400	8,815	3,415
Total revenues	1,557,500	1,557,500	1,841,332	283,832
Expenditures:				
General government	1,460,250	1,460,250	1,079,954	380,296
Capital outlay	115,000	266,000	254,478	11,522
Total Expenditures	1,575,250	1,726,250	1,334,432	391,818
Excess (Deficiency) of Revenues Over (Under) Expenditures	(17,750)	(168,750)	506,900	675,650
Fund balance - beginning of year	3,671,145	3,671,145	3,671,145	-
Fund balance - end of year	$ 3,653,395	$ 3,502,395	$ 4,178,045	$ 675,650

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

Total Pension Liability	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**
Service Cost	$ 54,635	$ 48,441	$ 44,816	$ 42,402	$ 19,962	$ 21,024
Interest on total pension liability	25,387	19,544	14,109	10,705	6,204	4,158
Effect of plan changes	-	-	-	-	(3,620)	-
Effect of assumption changes or inputs	-	-	119	-	1,886	-
Effect of economic/demographic (gains) or losses	(10,528)	1,244	8,751	(25,799)	26,243	3,650
Benefit payments/refunds of contributions	(3,447)	(3,138)	(5,458)	(13,040)	(2,766)	-
Net Change in Total Pension Liability	66,047	66,091	62,337	14,268	47,909	28,832
Total Pension Liability, beginning	260,467	194,376	132,039	117,771	69,862	41,030
Total Pension Liability, ending (a)	$ 326,514	$ 260,467	$ 194,376	$ 132,039	$ 117,771	$ 69,862
Fiduciary Net Position						
Emloyer contributions	$ 31,573	$ 29,233	$ 26,740	$ 28,501	$ 13,860	$ 11,178
Member contributions	24,822	23,845	21,088	19,959	17,724	14,747
Investment income net of investment expenses	43,539	(3,498)	22,875	7,967	(1,459)	3,400
Benefit payments/refunds of contributions	(3,447)	(3,138)	(5,458)	(13,040)	(2,766)	-
Administrative expenses	(277)	(213)	(145)	(86)	(67)	(49)
Other	1,863	1,510	567	4,417	246	(3)
Net Change in Fiduciary Net Position	98,073	47,739	65,667	47,718	27,538	29,273
Fiduciary Net Position, beginning	265,454	217,715	152,048	104,330	76,792	47,519
Fiduciary Net Position, ending (b)	$ 363,527	$ 265,454	$ 217,715	$ 152,048	$ 104,330	$ 76,792
Net Pension Liability (Asset), ending = (a) - (b)	$ (37,013)	$ (4,987)	$ (23,339)	$ (20,009)	$ 13,441	$ (6,930)
Fiduciary net position as a % of total pension liability	111.34%	101.91%	112.01%	115.15%	88.59%	109.92%
Pensionable covered payroll	$ 496,432	$ 476,893	$ 421,761	$ 399,176	$ 354,472	$ 294,939
Net pension liability as a % of covered payroll	-7.46%	-1.05%	-5.53%	-5.01%	3.79%	-2.35%

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 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 Payoll
2012	10,266	10,266	-	252,239	4.1%
2013	10,948	10,948	-	269,002	4.1%
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%

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Notes to Required Supplementary Information
December 31, 2020

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	0.0 years (based on contribution rate calculated in 12/31/2019 valuation)
Asset Valuation Method	5-year smoothed market
Inflation	2.75%
Salary Increases	Varies by age and service. 4.9% average over career including inflation
Investment Rate of Return	8.00%, 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	130% of the RP-2014 Healthy Annuitant Mortality Table for males and 110% of the RP-2014 Healthy Annuitant Mortality Table for females, both projected with 110% of the MP-2014 Ultimate scale after 2014.
Changes in Assumptions and Methods Reflected in the Schdedule of Employer Contributions	2015: New inflation, mortality and other assumptions were reflected 2017: New mortality 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.