Texas Water Conditions Report

Texas Water Development Board

April 2019

RAINFALL

Rainfall is the primary source influencing water conditions in Texas. Observations from the National Oceanic and Atmospheric Administration – National Weather Service (NOAA-NWS) indicate that total rainfall for April [Figure 1(a)] over the North Central, East Texas, northern South Central, western Edwards Plateau, northeastern Trans Pecos, and the Low Rolling Plains climate divisions was above-average compared to historical data from 1981–2010. Rainfall exceeded 10" in portions of the East Texas and North Central climate divisions. Rainfall in the northern High Plains, southwestern Trans Pecos, southwestern Southern, Lower Valley, and the Upper Coast climate divisions was below-average [Figure 1(b)].

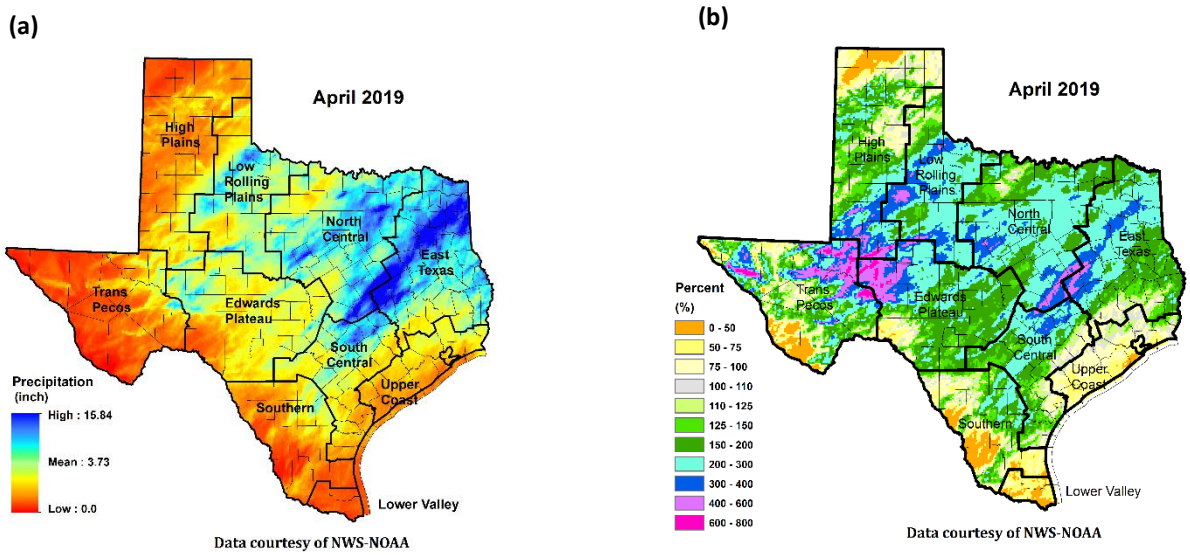

Figure 1: (a) Monthly accumulated rainfall, and (b) Percent of normal rainfall for April 2019

1700 N. Congress Ave., P.O. Box 13231, Austin, TX 78711-3231
Telephone (512) 463-7847 • Fax (512) 936-0816 • 1-800-RELAYTX (for the hearing impaired)
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RESERVOIR STORAGE

At the end of April 2019, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 28.34 million acre-feet or 88 percent of total conservation storage capacity (Figure 2). This is approximately 0.25 million acre-feet more than a month ago and 1.68 million acre-feet more than end-April 2018.

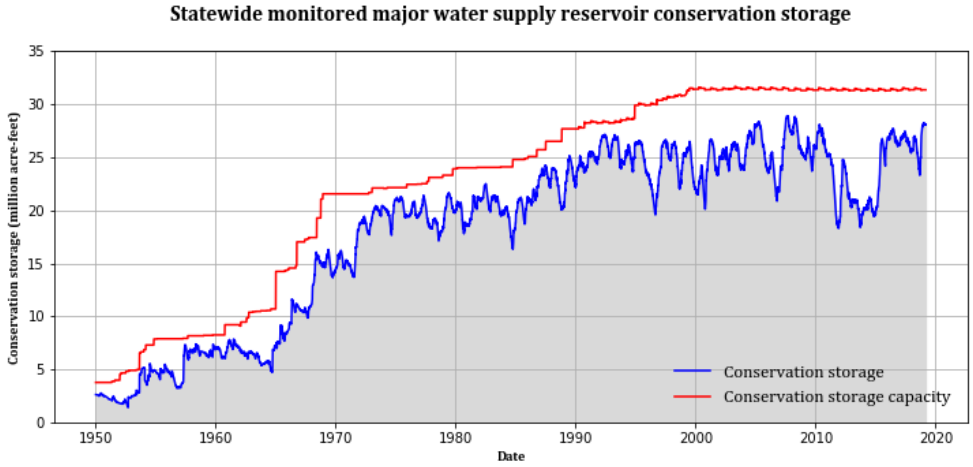


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 83 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 15 were above 90 percent full. Palo Duro Reservoir was only 0.5 percent full and another five reservoirs [Mackenzie (12 percent full), O. C. Fisher (14 percent full), White River (17 percent full) Greenbelt (21 percent full), and E. V. Spence (27 percent full)] remained below 30 percent full. There were 12 reservoirs with low storage (below 70 percent full) located in the Panhandle, West, and South Texas regions. Elephant Butte Reservoir (located in New Mexico) was at 16 percent full, which is an improvement of 5 percentage points from the end of March 2019.

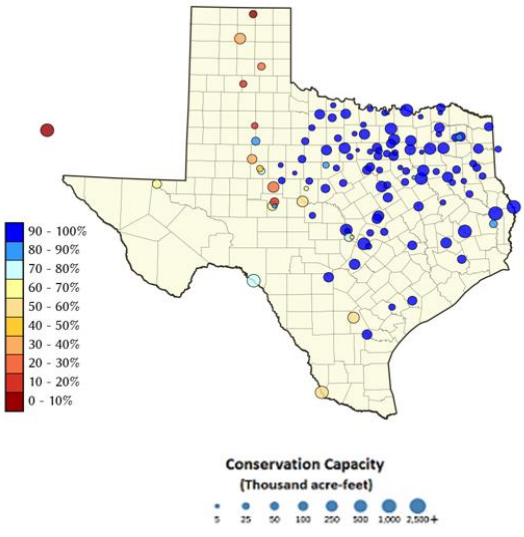


Figure 3: Reservoir conservation storage expressed as percent full

*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 Upper Coast (97.1 percent full), East Texas (98.5 percent full), North Central (99.9 percent full), South Central (99.7 percent full), and Low Rolling Plains (75.9 percent full) climate divisions (Figure 3). Storage in the High Plains region was severely low (32.1 percent full) and storage in the Southern climate division was moderately low (54.8 percent full). Storage was severely low (23.3 percent full) in the Trans Pecos climate division. Combined conservation storage by river basin or sub-basin depicts a similar picture (Figure 4). Storage in basins/sub-basins in the North Central, Eastern, and South-Central regions of the state is normal to high (>70 percent full). The Upper/Mid Rio Grande and the Canadian River Basin had severely low storage, the Upper Colorado had moderately low storage, and the Lower Rio Grande and the Nueces had abnormally low storage.

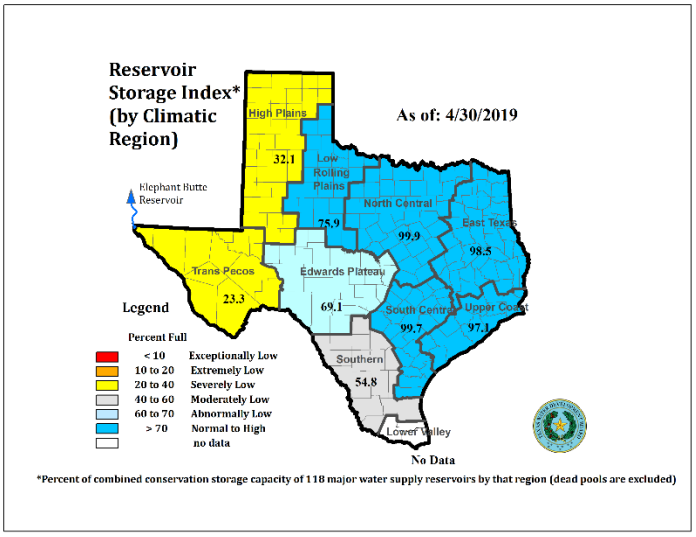


Figure 3: Reservoir Storage Index by climate division at 4/30/2019

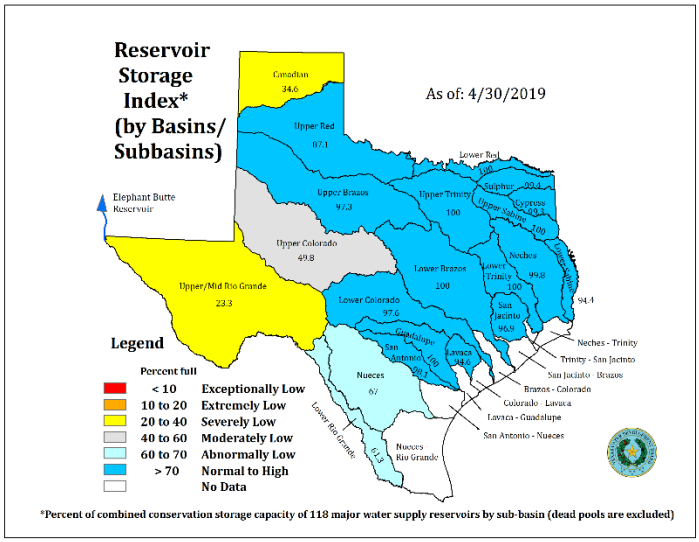


Figure 4: Reservoir Storage Index by river basin/sub-basin at 4/30/2019

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

CONSERVATION STORAGE DATA FOR SELECTED MAJOR TEXAS RESERVOIRS							
Name of lake or reservoir	Storage capacity	Storage at end-April		Storage change from end-March 2019		Storage change from end-April 2018	
	(acre-feet)	(acre-feet)	(%)	(acre-feet)	(%)	(acre-feet)**	(%)
Abilene, Lake	7,900	7,900	100	365	5	3,963	50
Alan Henry Reservoir	96,207	90,217	94	9,159	10	12,719	13
*Amistad Reservoir (Texas & Mexico)	1,840,849	1,342,370	73	-72,836	-4	72,594	4
*Amistad Reservoir (Texas)	3,275,532	1,788,299	55	-233,192	-7	-57,963	-2
Amon G Carter, Lake	19,266	19,266	100	0	0	0	0
Aquilla Lake	43,243	43,243	100	0	0	154	0
Arlington, Lake	40,188	40,188	100	1,625	4	1,568	4
Arrowhead, Lake	230,359	230,359	100	2,169	1	22,686	10
Athens, Lake	29,503	29,503	100	0	0	0	0
*Austin, Lake	23,972	22,972	96	46	0	322	1
B A Steinhagen Lake	66,961	61,072	91	-3,585	-5	-4,001	-6
Bardwell Lake	46,122	46,122	100	0	0	0	0
Belton Lake	435,225	435,225	100	0	0	27,072	6
Benbrook Lake	85,648	85,648	100	0	0	0	0
Bob Sandlin, Lake	192,417	192,417	100	0	0	0	0
Bonham, Lake	11,027	11,027	100	106	1	252	2
Brady Creek Reservoir	28,808	28,808	100	32	0	13,684	48
Bridgeport, Lake	366,236	366,236	100	0	0	12,501	3
*Brownwood, Lake	128,839	128,839	100	0	0	27,125	21
Buchanan, Lake	860,607	815,386	95	-1,952	0	46,426	5
Caddo, Lake	29,898	29,898	100	0	0	0	0
Canyon Lake	378,781	378,781	100	164	0	29,763	8
Cedar Creek Reservoir in Trinity	644,686	644,686	100	0	0	5,223	1
Champion Creek Reservoir	41,580	28,192	68	-1,280	-3	9,584	23
Cherokee, Lake	40,094	40,094	100	0	0	0	0
Choke Canyon Reservoir	662,820	360,802	54	2,463	0	176,069	27
*Cisco, Lake	29,003	25,243	87	1,104	4	1,805	6
Coleman, Lake	38,075	38,075	100	397	1	5,119	13
Colorado City, Lake	31,040	30,993	100	-47	0	4,275	14
*Coleto Creek Reservoir	30,758	14,840	48	-41	0	3,429	11
Conroe, Lake	410,988	394,291	96	-16,697	-4	-16,505	-4
Corpus Christi, Lake	256,062	255,075	100	-987	0	39,919	16
Crook, Lake	9,195	9,195	100	125	1	104	1
Cypress Springs, Lake	66,756	66,756	100	0	0	97	0
E. V. Spence Reservoir	517,272	141,746	27	2,430	0	81,767	16
Eagle Mountain Lake	179,880	179,880	100	0	0	172	0
Elephant Butte Reservoir (Texas)	852,491	134,423	16	39,825	5	-36,487	-4
Elephant Butte Reservoir (Total Storage)	1,973,358	311,165	16	92,187	5	-84,461	-4
*Falcon Reservoir (Texas & Mexico)	1,551,007	736,780	48	-41,754	-3	98,092	6
*Falcon Reservoir (Texas)	2,646,817	930,717	35	-82,323	-3	133,630	5
Fork Reservoir, Lake	605,061	605,061	100	5,547	1	12,601	2
Fort Phantom Hill, Lake	70,030	70,030	100	0	0	10,445	15
Georgetown, Lake	36,823	36,823	100	0	0	12,886	35
Graham, Lake	45,288	45,288	100	0	0	2,608	6
Granbury, Lake	132,949	131,728	99	-1,058	-1	1,777	1

CONSERVATION STORAGE DATA FOR SELECTED MAJOR TEXAS RESERVOIRS							
Name of lake or reservoir	Storage capacity	Storage at end-April		Storage change from end-March 2019		Storage change from end-April 2018	
	(acre-feet)	(acre-feet)	(%)	(acre-feet)	(%)	(acre-feet)**	(%)
Continued							
Granger Lake	51,822	51,822	100	0	0	0	0
Grapevine Lake	164,703	164,703	100	0	0	0	0
Greenbelt Lake	59,968	12,757	21	244	0	-1,906	-3
*Halbert, Lake	6,033	5,439	90	160	3	55	1
Hords Creek Lake	8,443	5,657	67	113	1	541	6
Houston County Lake	17,113	17,113	100	0	0	0	0
Houston, Lake	120,686	120,686	100	2,723	2	0	0
Hubbard Creek Reservoir	313,298	313,298	100	314	0	55,515	18
Hubert H Moss Lake	24,058	24,058	100	76	0	345	1
Inks, Lake	13,962	12,892	92	-60	0	0	0
J. B. Thomas, Lake	199,931	67,659	34	-523	0	-18,182	-9
Jacksonville, Lake	25,670	25,670	100	0	0	0	0
Jim Chapman Lake (Cooper)	260,332	260,332	100	0	0	4,074	2
Joe Pool Lake	175,358	175,358	100	1,107	1	1,033	1
Kemp, Lake	245,307	245,307	100	0	0	40,199	16
Kickapoo, Lake	86,345	86,345	100	0	0	15,109	17
Lavon Lake	406,388	406,388	100	0	0	0	0
Leon, Lake	27,762	27,762	100	436	2	4,959	18
Lewisville Lake	563,228	563,228	100	0	0	9,412	2
Limestone, Lake	203,780	203,780	100	744	0	11,751	6
*Livingston, Lake	1,785,348	1,785,348	100	0	0	0	0
*Lost Creek Reservoir	11,950	11,937	100	13	0	126	1
Lyndon B Johnson, Lake	115,249	109,662	95	-913	-1	-547	0
Mackenzie Reservoir	46,450	5,611	12	-58	0	-896	-2
Marble Falls, Lake	6,901	6,809	99	43	1	27	0
Martin, Lake	75,726	75,726	100	1,183	2	396	1
Medina Lake	254,823	249,874	98	-2,408	-1	100,634	39
Meredith, Lake	500,000	193,575	39	856	0	-5,462	-1
Millers Creek Reservoir	26,768	26,768	100	0	0	3,926	15
*Mineral Wells, Lake	5,273	5,273	100	0	0	162	3
Monticello, Lake	34,740	30,726	88	315	1	772	2
Mountain Creek, Lake	22,850	22,850	100	0	0	0	0
Murvaul, Lake	38,285	38,285	100	0	0	0	0
Nacogdoches, Lake	39,522	39,129	99	388	1	624	2
Nasworthy	9,615	8,506	88	0	0	470	5
Navarro Mills Lake	49,827	49,827	100	0	0	330	1
New Terrell City Lake	8,583	8,583	100	0	0	0	0
Nocona, Lake (Farmers Crk)	21,444	21,444	100	0	0	0	0
North Fork Buffalo Creek Reservoir	15,400	15,400	100	0	0	4,873	32
O' the Pines, Lake	241,363	241,363	100	0	0	0	0
O. C. Fisher Lake	119,445	16,793	14	-68	0	5,964	5
*O. H. Ivie Reservoir	554,340	318,792	58	16,036	3	221,252	40
Oak Creek Reservoir	39,210	39,210	100	0	0	21,124	54

CONSERVATION STORAGE DATA FOR SELECTED MAJOR TEXAS RESERVOIRS							
Name of lake or reservoir	Storage capacity	Storage at end-April		Storage change from end-March 2019		Storage change from end-April 2018	
	(acre-feet)	(acre-feet)	(%)	(acre-feet)	(%)	(acre-feet)**	(%)
Continued							
Palestine, Lake	367,303	367,303	100	0	0	0	0
Palo Duro Reservoir	61,066	276	0	-30	0	-135	0
Palo Pinto, Lake	26,766	26,766	100	152	1	3,301	12
Pat Cleburne, Lake	26,008	26,008	100	0	0	15	0
*Pat Mayse Lake	113,683	113,683	100	0	0	0	0
Possum Kingdom Lake	538,139	537,065	100	-1,074	0	20,786	4
Proctor Lake	54,762	54,762	100	46	0	11,320	21
Ray Hubbard, Lake	439,559	437,888	100	-1,671	0	5,586	1
Ray Roberts, Lake	788,167	788,167	100	850	0	0	0
Red Bluff Reservoir	151,110	98,939	65	-843	-1	-9,812	-6
Richland-Chambers Reservoir	1,087,839	1,087,839	100	0	0	856	0
Sam Rayburn Reservoir	2,857,077	2,857,077	100	0	0	0	0
Somerville Lake	147,104	147,104	100	542	0	0	0
Squaw Creek, Lake	151,250	151,250	100	1,199	1	0	0
Stamford, Lake	51,570	51,570	100	0	0	7,595	15
Stillhouse Hollow Lake	227,771	227,771	100	0	0	27,280	12
Striker, Lake	16,934	16,932	100	-2	0	-2	0
Sweetwater, Lake	12,267	12,267	100	0	0	10,032	82
*Sulphur Springs, Lake	17,747	14,502	82	-3,245	-18	-1,714	-10
Tawakoni, Lake	871,685	871,685	100	0	0	2,588	0
Texana, Lake	159,566	150,951	95	-5,686	-4	22,890	14
Texoma, Lake (Texas & Oklahoma)	1,258,113	1,258,113	100	58,708	5	48,015	4
Texoma, Lake (Texas)	2,525,281	2,603,911	100	205,094	8	183,709	7
Toledo Bend Reservoir (Texas & Louisiar	2,236,450	2,110,821	94	6,763	0	-31,285	-1
Toledo Bend Reservoir (Texas)	4,472,900	4,225,742	94	13,525	0	-62,570	-1
Travis, Lake	1,113,348	1,113,348	100	2,111	0	236,979	21
Twin Buttes Reservoir	182,454	123,733	68	3,614	2	113,202	62
Tyler, Lake	72,073	72,073	100	0	0	0	0
Waco, Lake	189,418	189,418	100	81	0	9,664	5
Waxahachie, Lake	10,780	10,780	100	0	0	71	1
Weatherford, Lake	17,812	17,747	100	163	1	368	2
White River Lake	29,880	5,177	17	635	2	297	1
Whitney, Lake	553,344	553,344	100	56,040	10	44,692	8
Worth, Lake	33,495	33,495	100	239	1	3,401	10
Wright Patman Lake	310,382	310,382	100	187,789	61	0	0
STATEWIDE TOTOL							
STATEWIDE TOTAL	**32,386,135**	**28,345,459**	**88**	**252,422**	**1**	**1,682,478**	**5**

* Total volume below elevation of conservation pool top is used as conservation storage capacity, because the dead pool storage is unknown.
**Monthly and yearly changes do not include reservoirs that did not have data in the last month or last year.

Note:
Conservation storage capacity is the space available to store water above the lowest outlet and below the top of the conservation pool (some may have seasonal variations), or normal maximum operating level. Conservation storage refers to the volume of water held within the conservation storage space. Not included is any water in flood control storage (above the top of the conservation pool or normal maximum operating level) or any water in the dead pool storage. Conservation storage percentage is based on the conservation storage capacity of the reservoir and the conservation storage in the reservoir on date shown. Percent change is given by 100 * (current conservation storage - past conservation storage)/conservation storage capacity.

STREAMFLOW CONDITIONS

Computed runoff by hydrologic unit codes for April 2019 show that much of the state had near normal streamflow (25–75th percentile, green shading in Figure 6) or above normal (76–90th percentile, light blue shading in Figure 6) streamflow. A couple of sub-basins in the Lower Red, Upper Brazos, Upper Colorado, and Lower Colorado river basins had much above normal (> 90th percentile, dark blue shading in Figure 6) streamflow. A few sub-basins in the Upper Red, and in the Colorado-Lavaca, Brazos-Colorado, and San Jacinto-Brazos coastal basins, had below normal streamflow (10–24th percentile, light brown shading in Figure 6).

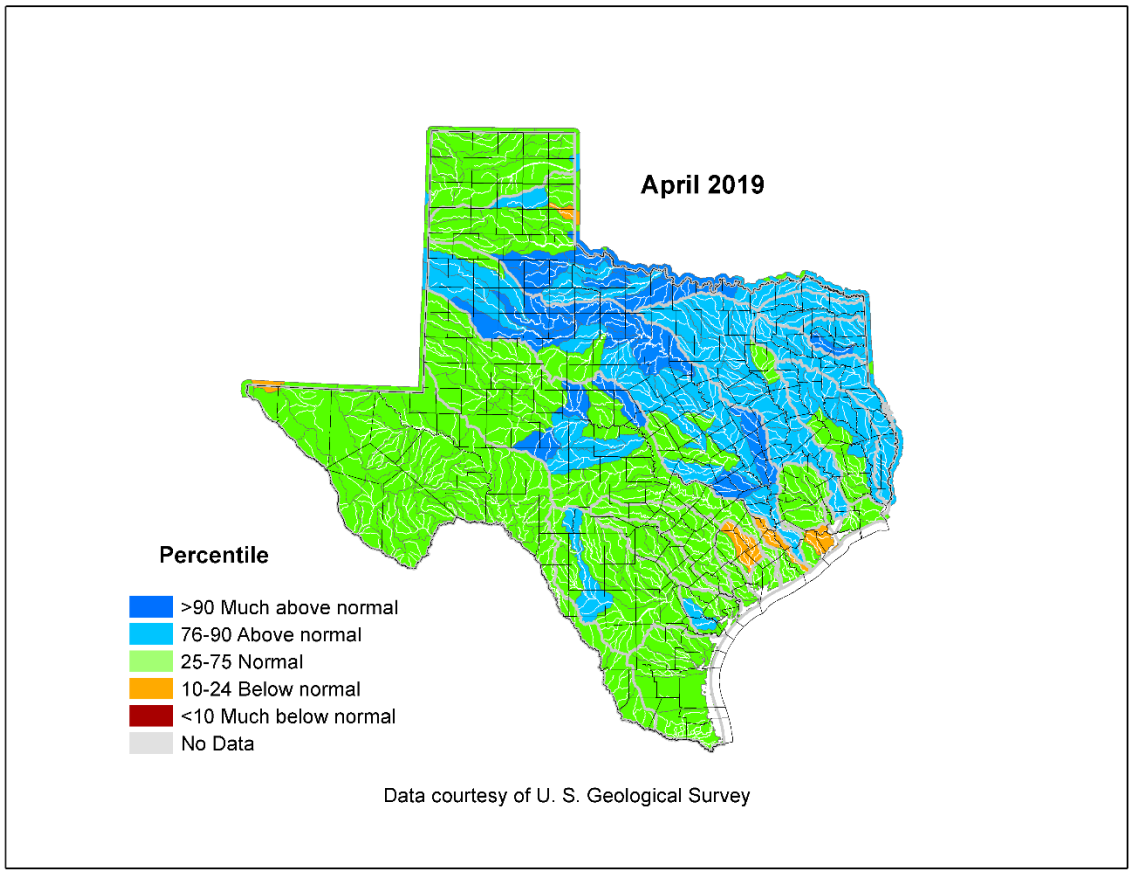
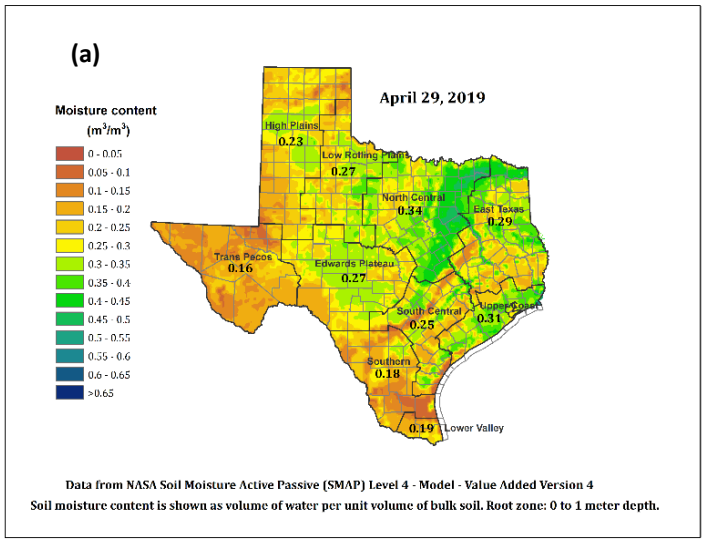


Figure 6: Runoff percentiles by the U.S. Geological Survey's Hydrologic Unit Codes

*A 30-day moving average flow is calculated from the historical mean daily flow records. For each day, the 30-day average flow is presented as a percentile of the historical record for that calendar day.

SOIL MOISTURE CONDITIONS

Soil moisture at the end of April 2019 **[**Figure 7(a)] was moderate [> 0.20 cubic meters of water per bulk cubic meter soil (m^3/m^3)] in all climate divisions of the state except in the Trans Pecos and the Southern climate divisions where the area averaged soil moisture was 0.16 and 0.18 m^3/m^3, respectively. On a regional basis, and compared to conditions at the end of March 2019, soil moisture content increased [green to blue shading in Figure 7(b)]in the southern High Plains, Low Rolling Plains, North Central, Edwards Plateau, eastern Trans Pecos, northern East Texas, and South Central climate divisions. Soil moisture content decreased [brown and yellow shading in Figure 7(b)] in the Southern, Lower Valley, Upper Coast, northern High Plains, and far-western Trans Pecos climate divisions.



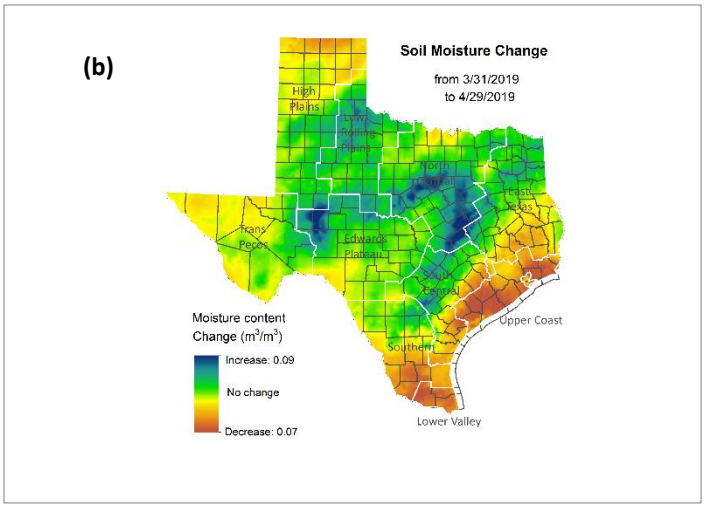
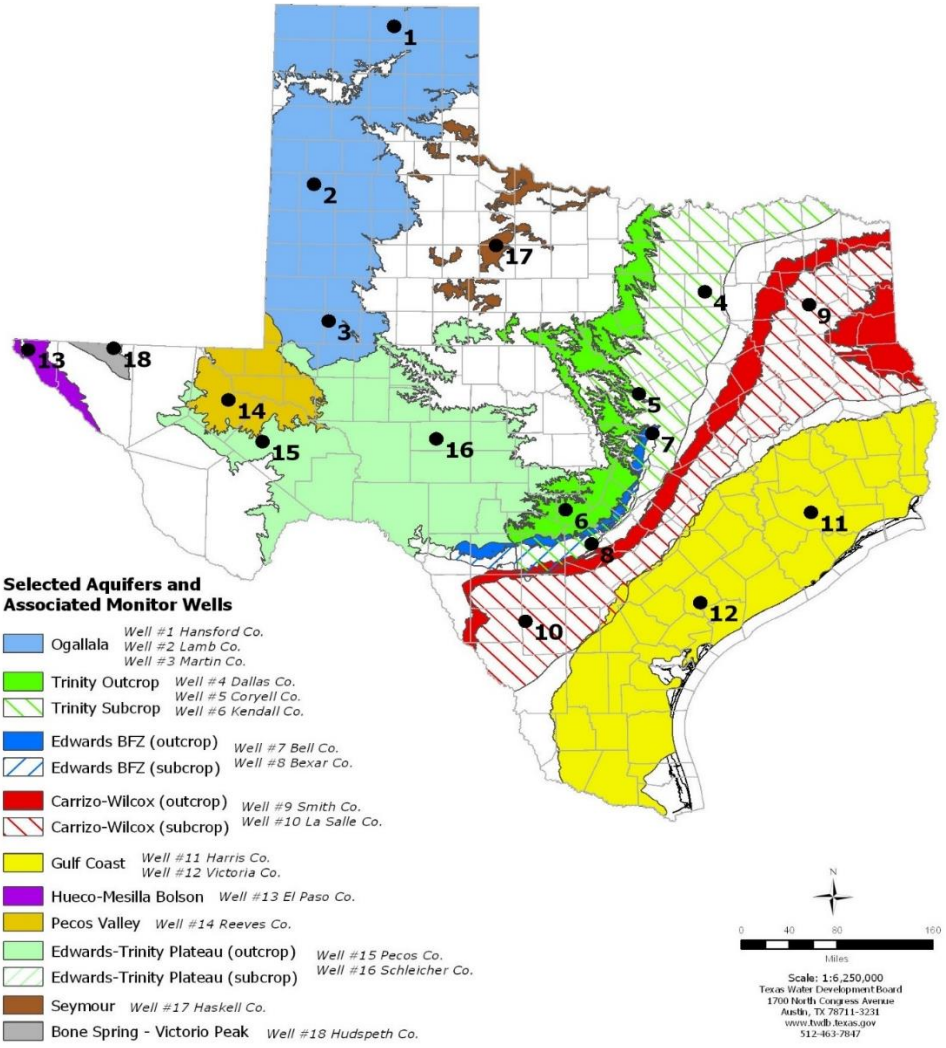


Figure 7: Root zone soil moisture conditions on April 31, 2019 (a) and the difference in root zone soil moisture from end-March 2019 and end-April 2019 (b)

April 2019 GROUNDWATER LEVELS IN OBSERVATION WELLS

Water-level measurements were available for all 18 key monitoring wells in the state. Water levels rose in 8 monitoring wells since the beginning of April, ranging from an increase of 0.22 feet in the Haskell County Seymour Aquifer well (#17 on map) to 1.84 feet in the La Salle County Carrizo-Wilcox Aquifer well (#10 on map). Water levels declined in 10 monitoring wells, ranging from a decline of -0.05 feet in the Lamb County Ogallala Aquifer well (#2 on map) to -10.14 feet in the Pecos County Edwards-Trinity Plateau Aquifer well (#15 on map). The J-17 well (#8 on map) in San Antonio recorded a water level of 50.2 feet below land surface or 680.4 feet above mean sea level. Water levels are 20.8 feet above the Stage 1 critical management level for the San Antonio portion of the Edwards (Balcones Fault Zone) Aquifer.

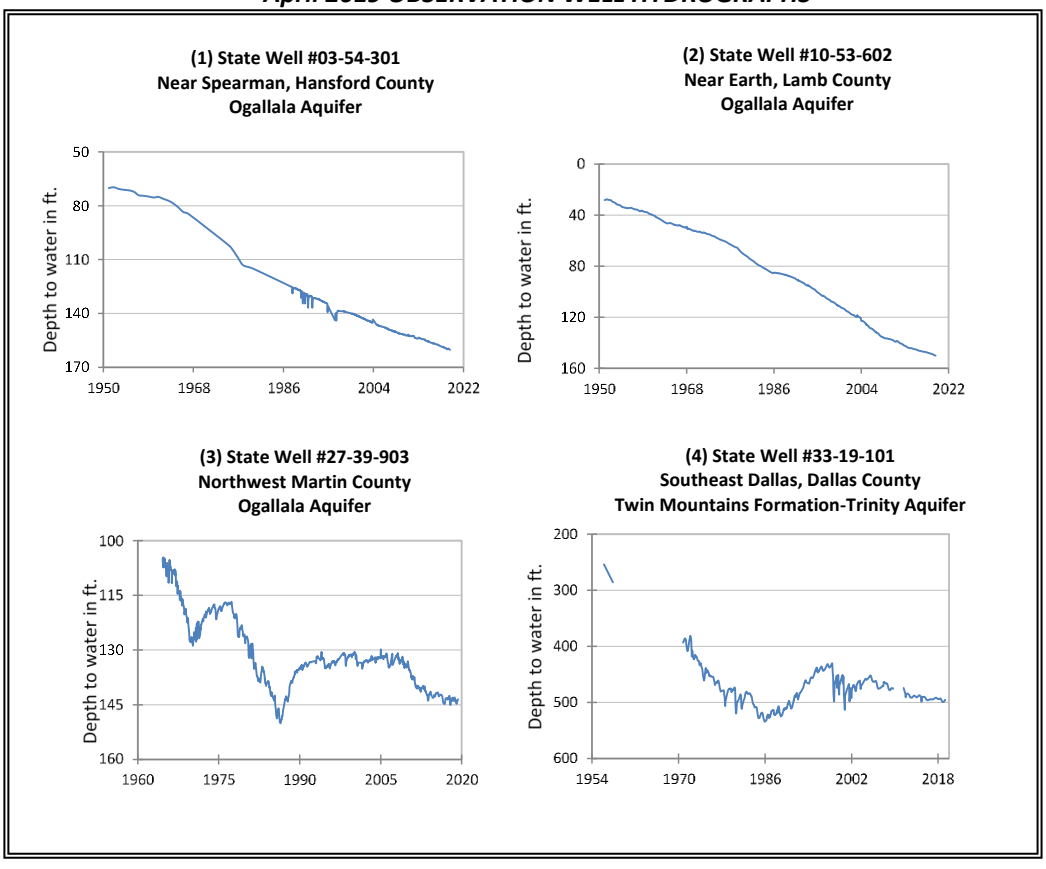


***Well numbers used in this publication on the aquifer map to indicate the monitoring well location (numbers 1 - 18) are different than the TWDB's seven-digit state well number.**

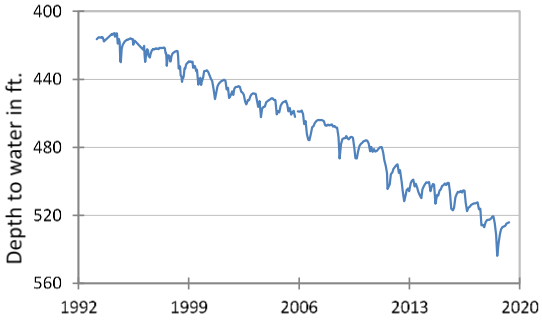
Monitoring Well	April	March	Month Change	Year Change	Historical Change	First Measured
(1) Hansford 0354301	160.28	160.13	*-0.15*	*-1.08*	*-90.16*	1951
(2) Lamb 1053602	150.06	150.01	*-0.05*	*-1.50*	*-121.89*	1951
(3) Martin 2739903	143.47	143.76	*0.29*	*-0.14*	*-38.58*	1964
(4) Dallas 3319101	495.19	495.99	*0.80*	*-2.09*	*-273.19*	1954
(5) Coryell 4035404	524.11	524.42	*0.31*	*-1.68*	*-232.11*	1955
(6) Kendall 6802609	117.75	117.06	*-0.69*	*15.72*	*-57.75*	1975
(7) Bell 5804816	120.02	119.83	*-0.19*	*5.42*	*3.49*	2008
(8) Bexar 6837203	50.20	51.00	*0.80*	*19.41*	*-3.56*	1932
(9) Smith 3430907	432.91	433.20	*0.29*	*-1.91*	*-132.91*	1977
(10) La Salle 7738103	494.67	496.51	*1.84*	*25.33*	*-241.60*	2003
(11) Harris 6514409	190.07	189.51	*-0.56*	*1.35*	*-54.57**	1947**
(12) Victoria 8017502	34.54	34.42	*-0.12*	*-2.37*	*-0.54*	1958
(13) El Paso 4913301	296.87	295.84	*-1.03*	*-2.72*	*-64.97*	1964
(14) Reeves 4644501	163.38	164.09	*0.71*	*5.74*	*-71.29*	1952
(15) Pecos 5216802	198.49	188.35	*-10.14*	*-6.47*	*48.39*	1976
(16) Schleicher 5512134	272.18	269.95	*-2.23*	*43.21*	*29.72*	2003
(17) Haskell 2135748	45.19	45.41	*0.22*	*1.24*	*-2.19*	2002
(18) Hudspeth 4807516	147.71	142.77	*-4.94*	*0.78*	*-43.79*	1966

*Change since the original measurement of 135.5 feet below land surface in 1947 (**measurement not shown on the hydrograph)

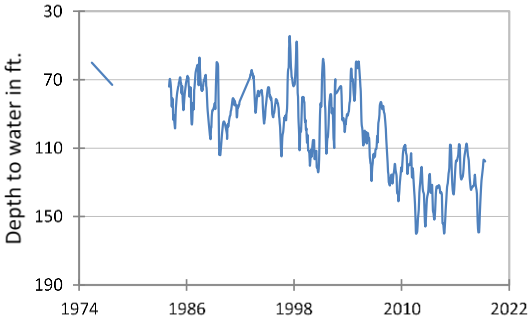
April 2019 OBSERVATION WELL HYDROGRAPHS



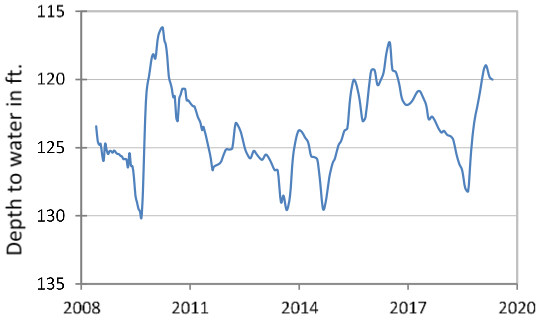
(5) State Well #40-35-404
Gatesville, Coryell County
Hosston Formation-Trinity Aquifer



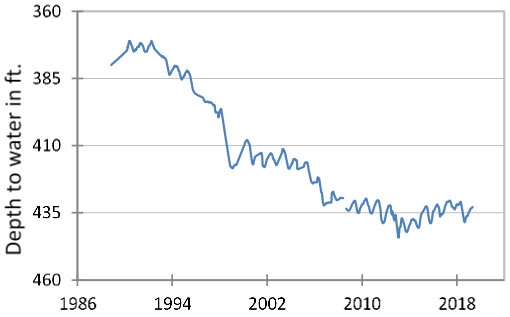
(6) State Well #68-02-609
Waring, Kendall County
Cow Creek Formation-Trinity Aquifer



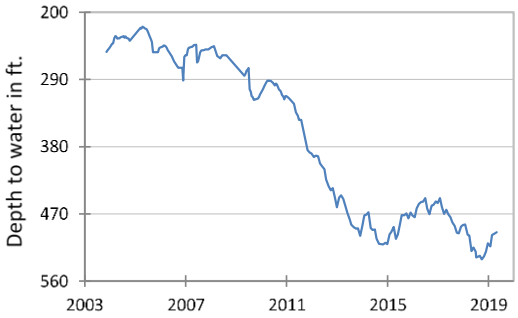
(7) State Well #58-04-816
Near Salado, Bell County
Edwards (Balcones Fault Zone) Aquifer



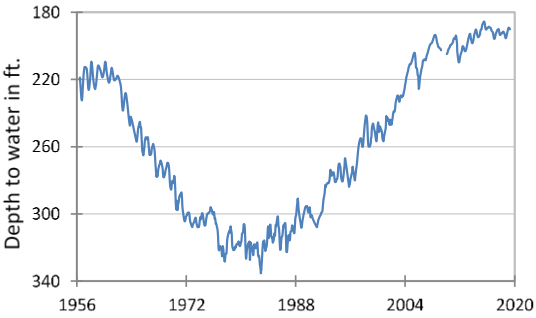
(9) State Well #34-30-907
Red Springs, Smith County
Carrizo-Wilcox Aquifer



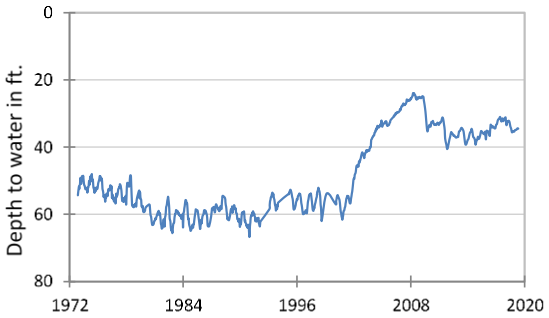
(10) State Well #77-38-103
Near Cotulla, La Salle County
Carrizo-Wilcox Aquifer



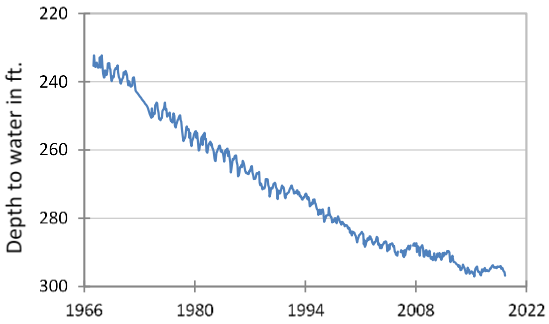
(11) State Well #65-14-409
Alief, Harris County
Evangeline Formation-Gulf Coast Aquifer



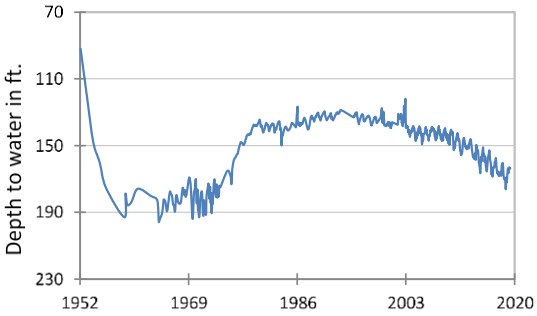
(12) State Well #80-17-502
Near Bloomington, Victoria County
Lissie Formation-Gulf Coast Aquifer



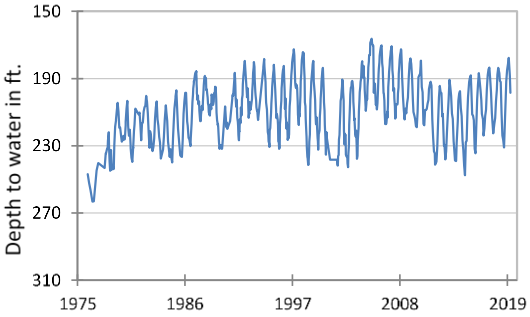
(13) State Well #49-13-301
El Paso, El Paso County
Hueco-Mesilla Bolson Aquifer



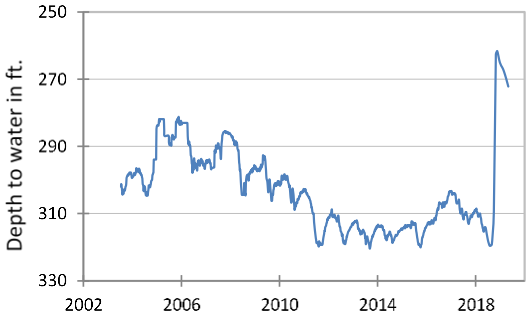
(14) State Well #46-44-501
Near Pecos, Reeves County
Pecos Valley Aquifer



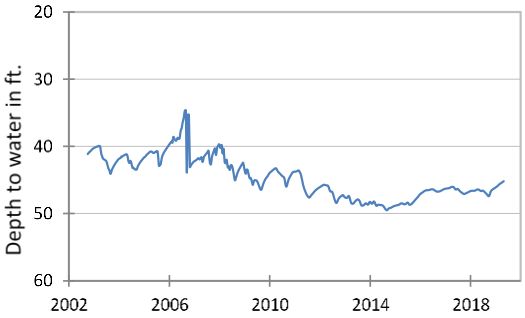
(15) State Well #52-16-802
Fort Stockton, Pecos County
Edwards-Trinity (Plateau) Aquifer



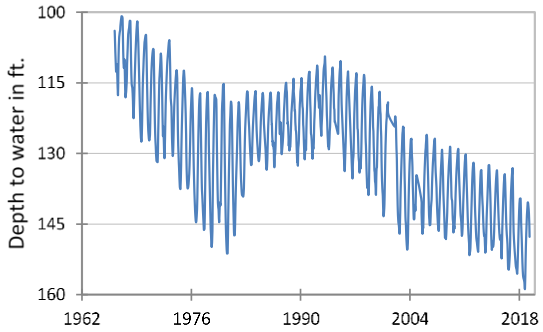
(16) State Well #55-12-134
Eldorado, Schleicher County
Trinity Aquifer



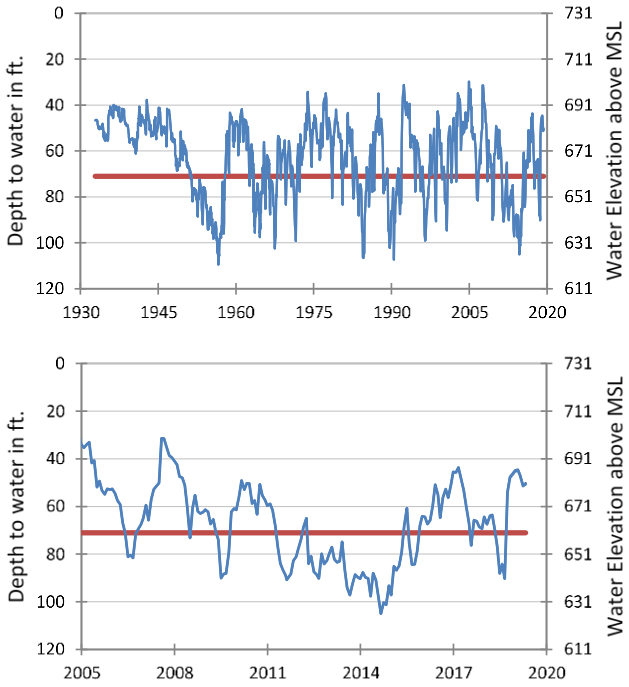
(17) State Well #21-35-748
Near O'Brien, Haskell County
Seymour Aquifer



(18) State Well #48-07-516
Dell City, Hudspeth County
Bone Spring - Victorio Peak Aquifer



(8) State Well #68-37-203 (J-17)
San Antonio, Bexar County
Edwards (Balcones Fault Zone) Aquifer



The late April water-level measurement in this Edwards (Balcones Fault Zone) Aquifer well, elevation 731 feet above mean sea level, was 50.20 feet below land surface, or 680.4 feet above mean sea level. This was 0.80 feet below last month's measurement, 19.41 feet above last year's measurement and 3.56 feet below the initial measurement recorded in 1932.

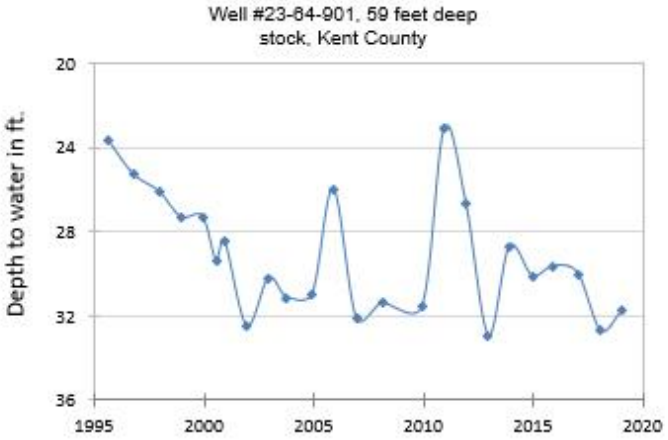
Water levels below the red line indicate periods in which Edwards Aquifer Authority Stage 1 drought restrictions are in effect.

HYDROGRAPH OF THE MONTH

Each month this space features a new hydrograph (marked with the • symbol on the map) depicting different aquifers and their conditions in Texas.

Dockum Aquifer

The Dockum Aquifer is a minor aquifer located in the northwest part of the state. It is defined stratigraphically by the Dockum Group and includes, from youngest to oldest, the Santa Rosa Formation, the Tecavos Formation, the Trujillo Sandstone, and the Cooper Canyon Formation. The Dockum Group consists of gravel, sandstone, siltstone, mudstone, shale, and conglomerate. Groundwater located in the sandstone and conglomerate units is recoverable. The water quality in the aquifer is generally poor-with freshwater outcrop areas in the east and brine in the western subsurface portions of the aquifer-and the water is very hard. Naturally occurring radioactivity from uranium present within the aquifer has resulted in gross alpha radiation in excess of the state's primary drinking standard. Radium-226 and -228 also occur in amounts above acceptable standards. Groundwater from the aquifer is used for irrigation, municipal water supply, and oil field waterflooding operations, particularly in the southern high plains. Water level rises and declines have occurred in different areas of the aquifer.



The initial measurement of 23.7 feet below land surface was recorded by the Texas Water Development Board in August of 1995. The TWDB has since recorded yearly water level measurements in the well. The period of record reveals a gradual decline in water level with two major spikes from 2004 to 2005 (+4.98 ft) and from 2009 to 2010 (+8.46 ft). These spikes may be attributed to seasons with less pumping. Overall, water levels have remained within a 9.81 ft range with a high of 23.13 ft below land surface and low of 32.94 ft. The most recent measurement was from January of 2019 at 31.79 ft. This is 8.09 ft below the initial measurement in 1995.

Far away (left), and close-up (right) images of well #23-64-901.