Texas Water Conditions Report

Texas Water Development Board

March 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 March [Figure 1(a)] over a swath of the state extending from the western through the southeastern part of the state was below-average compared to historical data from 1981–2010. Rainfall in the western Trans Pecos region was much above average. There was above-average rainfall in the High Plains, the southern regions of the Southern climate division and in the Lower Valley [Figure 1(b)].

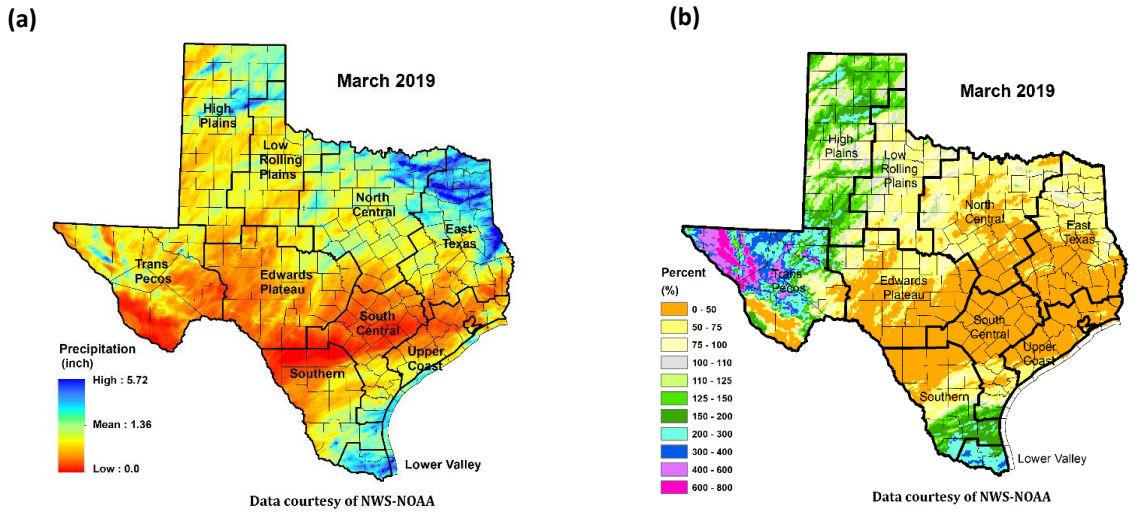

Figure 1: (a) Monthly accumulated rainfall, and (b) Percent of normal rainfall for March 2019

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RESERVOIR STORAGE

At the end of January 2019, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 28.1 million acre-feet or 87 percent of total conservation storage capacity (Figure 2). This is approximately 0.08 million acre-feet less than a month ago and 1.1 million acre-feet more than end-March 2018.

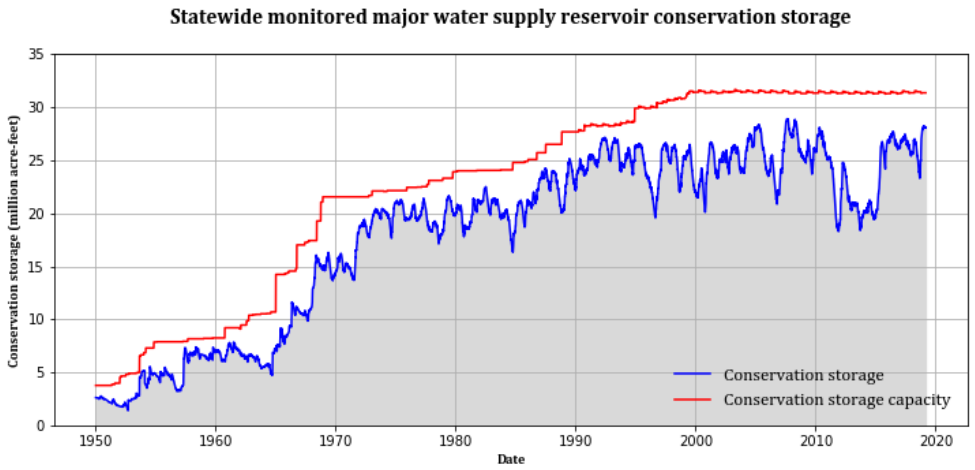


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 67 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 28 were above 90 percent full. Palo Duro Reservoir was only 1 percent full and another five reservoirs [Mackenzie (12 percent full), O. C. Fisher (14 percent full), White River (15 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 11 percent full, which is an improvement of 4 percentage points from the end of February 2019.

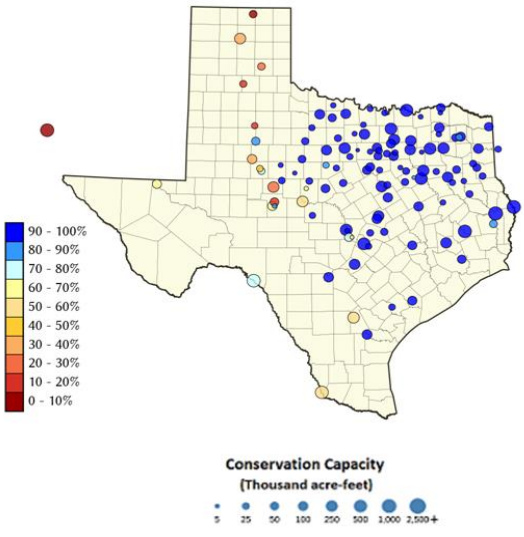


Figure 3: Reservoir conservation storage expressed as percent full

*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 (98 percent full), East Texas (98.5 percent full), North Central (98.8 percent full), South Central (99.7 percent full), and Low Rolling Plains (75 percent full) climate divisions (Figure 3). Storage in the High Plains region was severely low (31.9 percent full) and storage in the Southern climate division was moderately low (56.4 percent full). Storage was extremely low (19.2 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 had extremely low storage, 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.

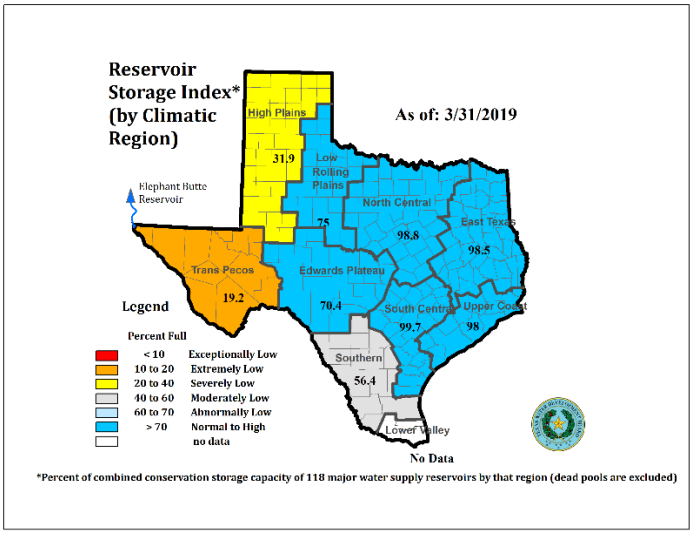


Figure 3: Reservoir Storage Index by climate division at 3/31/2019

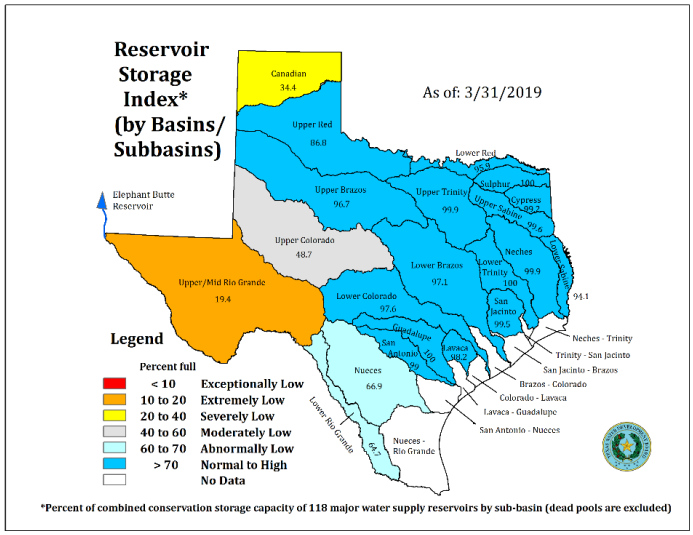


Figure 4: Reservoir Storage Index by river basin/sub-basin at 3/31/2019

*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-March		Storage change from end-February 2019		Storage change from end-March 2018	
	(acre-feet)	(acre-feet)	(%)	(acre-feet)	(%)	(acre-feet)**	(%)
Abilene, Lake	7,900	7,535	95	-240	-3	3,393	43
Alan Henry Reservoir	96,207	81,058	84	-312	0	1,805	2
*Amistad Reservoir (Texas & Mexico)	1,840,849	1,415,206	77	18,863	1	34,364	2
*Amistad Reservoir (Texas)	3,275,532	2,021,491	62	30,093	1	10,564	0
Amon G Carter, Lake	19,266	19,266	100	0	0	0	0
Aquilla Lake	43,243	43,243	100	0	0	0	0
Arlington, Lake	40,188	38,563	96	-1,375	-3	-1,625	-4
Arrowhead, Lake	230,359	228,190	99	577	0	16,391	7
Athens, Lake	29,503	29,503	100	0	0	0	0
*Austin, Lake	23,972	22,926	96	-46	-0	-155	-1
B A Steinhagen Lake	66,961	64,657	97	3,989	6	7,686	11
Bardwell Lake	46,122	46,122	100	0	0	0	0
Belton Lake	435,225	435,225	100	0	0	26,018	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	10,921	99	-106	-1	-106	-1
Brady Creek Reservoir	28,808	28,776	100	-32	0	12,883	45
Bridgeport, Lake	366,236	366,236	100	0	0	7,890	2
*Brownwood, Lake	128,839	128,839	100	0	0	23,483	18
Buchanan, Lake	860,607	817,338	95	14,726	2	42,630	5
Caddo, Lake	29,898	29,898	100	0	0	0	0
Canyon Lake	378,781	378,617	100	no data		26,860	7
Cedar Creek Reservoir in Trinity	644,686	644,686	100	0	0	0	0
Champion Creek Reservoir	41,580	29,472	71	-201	0	10,517	25
Cherokee, Lake	40,094	40,094	100	0	0	0	0
Choke Canyon Reservoir	662,820	358,339	54	-3,345	-1	165,908	25
*Cisco, Lake	29,003	24,139	83	-74	0	245	1
Coleman, Lake	38,075	37,678	99	-73	0	3,911	10
Colorado City, Lake	31,040	31,040	100	0	0	3,688	12
*Coleto Creek Reservoir	30,758	14,881	48	-296	-1	3,038	10
Conroe, Lake	410,988	410,988	100	0	0	0	0
Corpus Christi, Lake	256,062	256,062	100	0	0	27,635	11
Crook, Lake	9,195	9,070	99	-94	-1	-125	-1
Cypress Springs, Lake	66,756	66,756	100	0	0	0	0
E. V. Spence Reservoir	517,272	139,316	27	-700	0	76,688	15
Eagle Mountain Lake	179,880	179,880	100	0	0	0	0
Elephant Butte Reservoir (Texas)	852,491	94,598	11	21,224	2	-93,832	-11
Elephant Butte Reservoir (Total Storage)	1,973,358	218,978	11	49,129	2	-217,204	-11
*Falcon Reservoir (Texas & Mexico)	1,551,007	778,534	50	-11,068	-1	51,369	3
*Falcon Reservoir (Texas)	2,646,817	1,013,040	38	-6,504	0	-180,939	-7
Fork Reservoir, Lake	605,061	599,514	99	524	0	-1,844	0
Fort Phantom Hill, Lake	70,030	70,030	100	0	0	8,286	12
Georgetown, Lake	36,823	36,823	100	0	0	12,210	33
Graham, Lake	45,288	45,288	100	123	0	1,399	3
Granbury, Lake	132,949	132,786	100	-163	0	-163	0

CONSERVATION STORAGE DATA FOR SELECTED MAJOR TEXAS RESERVOIRS							
Name of lake or reservoir	Storage capacity	Storage at end-March		Storage change from end-February 2019		Storage change from end-March 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	12,513	21	321	1	-2,447	-4
*Halbert, Lake	6,033	5,279	88	-132	-2	-260	-4
Hords Creek Lake	8,443	5,544	66	-77	-1	262	3
Houston County Lake	17,113	17,113	100	0	0	0	0
Houston, Lake	120,686	117,963	98	799	1	-2,723	-2
Hubbard Creek Reservoir	313,298	312,984	100	-314	0	48,500	15
Hubert H Moss Lake	24,058	23,982	100	-76	0	54	0
Inks, Lake	13,962	12,952	93	-114	-1	-114	-1
J. B. Thomas, Lake	199,931	68,182	34	-1,700	-1	-21,636	-11
Jacksonville, Lake	25,670	25,670	100	0	0	0	0
Jim Chapman Lake (Cooper)	260,332	260,332	100	0	0	0	0
Joe Pool Lake	175,358	174,251	99	3,985	2	-1,107	-1
Kemp, Lake	245,307	245,307	100	0	0	35,382	14
Kickapoo, Lake	86,345	86,345	100	0	0	13,259	15
Lavon Lake	406,388	406,388	100	0	0	0	0
Leon, Lake	27,762	27,326	98	-121	0	3,739	13
Lewisville Lake	563,228	563,228	100	0	0	0	0
Limestone, Lake	203,780	203,036	100	-744	0	12,334	6
*Livingston, Lake	1,785,348	1,785,348	100	0	0	0	0
*Lost Creek Reservoir	11,950	11,924	100	12	0	-26	0
Lyndon B Johnson, Lake	115,249	110,575	96	0	0	122	0
Mackenzie Reservoir	46,450	5,669	12	-5	0	-960	-2
Marble Falls, Lake	6,901	6,766	98	2,854	41	-32	0
Martin, Lake	75,726	74,543	98	-1,134	-1	-936	-1
Medina Lake	254,823	252,282	99	-2,420	-1	96,930	38
Meredith, Lake	500,000	192,719	39	1,850	0	-8,719	-2
Millers Creek Reservoir	26,768	26,768	100	0	0	2,837	11
*Mineral Wells, Lake	5,273	5,273	100	0	0	0	0
Monticello, Lake	34,740	30,411	88	-166	0	-519	-1
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	38,741	98	-781	-2	-781	-2
Nasworthy	9,615	8,506	88	0	0	506	5
Navarro Mills Lake	49,827	49,827	100	0	0	1,031	2
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	144	1	4,262	28
O' the Pines, Lake	241,363	241,363	100	0	0	0	0
O. C. Fisher Lake	119,445	16,861	14	-142	0	5,320	4
*O. H. Ivie Reservoir	554,340	302,756	55	5,571	1	200,246	36
Oak Creek Reservoir	39,210	39,210	100	0	0	20,572	52

CONSERVATION STORAGE DATA FOR SELECTED MAJOR TEXAS RESERVOIRS							
Name of lake or reservoir	Storage capacity	Storage at end-March		Storage change from end-February 2019		Storage change from end-March 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	306	1	-26	0	-146	0
Palo Pinto, Lake	26,766	26,614	99	-130	0	1,960	7
Pat Cleburne, Lake	26,008	26,008	100	0	0	0	0
*Pat Mayse Lake	113,683	113,683	100	0	0	0	0
Possum Kingdom Lake	538,139	538,139	100	0	0	13,656	3
Proctor Lake	54,762	54,716	100	-46	0	8,992	16
Ray Hubbard, Lake	439,559	439,559	100	835	0	1,253	0
Ray Roberts, Lake	788,167	787,317	100	-850	0	-850	0
Red Bluff Reservoir	151,110	99,782	66	113	0	-11,758	-8
Richland-Chambers Reservoir	1,087,839	1,087,839	100	0	0	2,140	0
Sam Rayburn Reservoir	2,857,077	2,857,077	100	0	0	0	0
Somerville Lake	147,104	146,562	100	-542	0	-542	0
Squaw Creek, Lake	151,250	150,051	99	-1,199	-1	-31	0
Stamford, Lake	51,570	51,570	100	0	0	5,211	10
Stillhouse Hollow Lake	227,771	227,771	100	0	0	23,581	10
Striker, Lake	16,934	16,934	100	0	0	0	0
Sweetwater, Lake	12,267	12,267	100	0	0	9,961	81
*Sulphur Springs, Lake	17,747	17,747	100	2,555	14	1,076	6
Tawakoni, Lake	871,685	871,685	100	0	0	0	0
Texana, Lake	159,566	156,637	98	-1,644	-1	23,702	15
Texoma, Lake (Texas & Oklahoma)	1,258,113	1,199,405	95	no data		-34,636	-3
Texoma, Lake (Texas)	2,525,281	2,398,817	95	no data		-69,272	-3
Toledo Bend Reservoir (Texas & Louis	2,236,450	2,104,058	94	-89,424	-4	-132,392	-6
Toledo Bend Reservoir (Texas)	4,472,900	4,212,217	94	-178,847	-4	-440,203	-10
Travis, Lake	1,113,348	1,111,237	100	-2,111	0	217,852	20
Twin Buttes Reservoir	182,454	120,119	66	4,372	2	107,798	59
Tyler, Lake	72,073	72,073	100	0	0	0	0
Waco, Lake	189,418	189,337	100	-81	0	10,056	5
Waxahachie, Lake	10,780	10,780	100	0	0	0	0
Weatherford, Lake	17,812	17,584	99	-65	0	-196	-1
White River Lake	29,880	4,542	15	46	0	-744	-2
Whitney, Lake	553,344	497,304	90	-40,506	-7	-8,380	-2
Worth, Lake	33,495	33,256	99	682	2	-239	-1
Wright Patman Lake	122,593	122,593	100	0	0	0	0
STATEWIDE TOTOL							
STATEWIDE TOTAL	**32,198,346**	**28,093,037**	**87**	**-78,510**	**-0**	**1,112,867**	**3**

* 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 March 2019 show that much of the state had near normal streamflow (25–75th percentile, green shading in Figure 6). A couple of sub-basins in the Lower Red, Upper Brazos, Lower Colorado, and Nueces river basins had above normal (76–90th percentile, light blue shading in Figure 6) or much above normal (> 90th percentile, dark blue shading in Figure 6) streamflow. A few sub-basins in the Upper Red, the Upper Colorado, the San Antonio-Guadalupe, and the Neches had below normal streamflow (10–24th percentil, light brown shading in Figure 6).

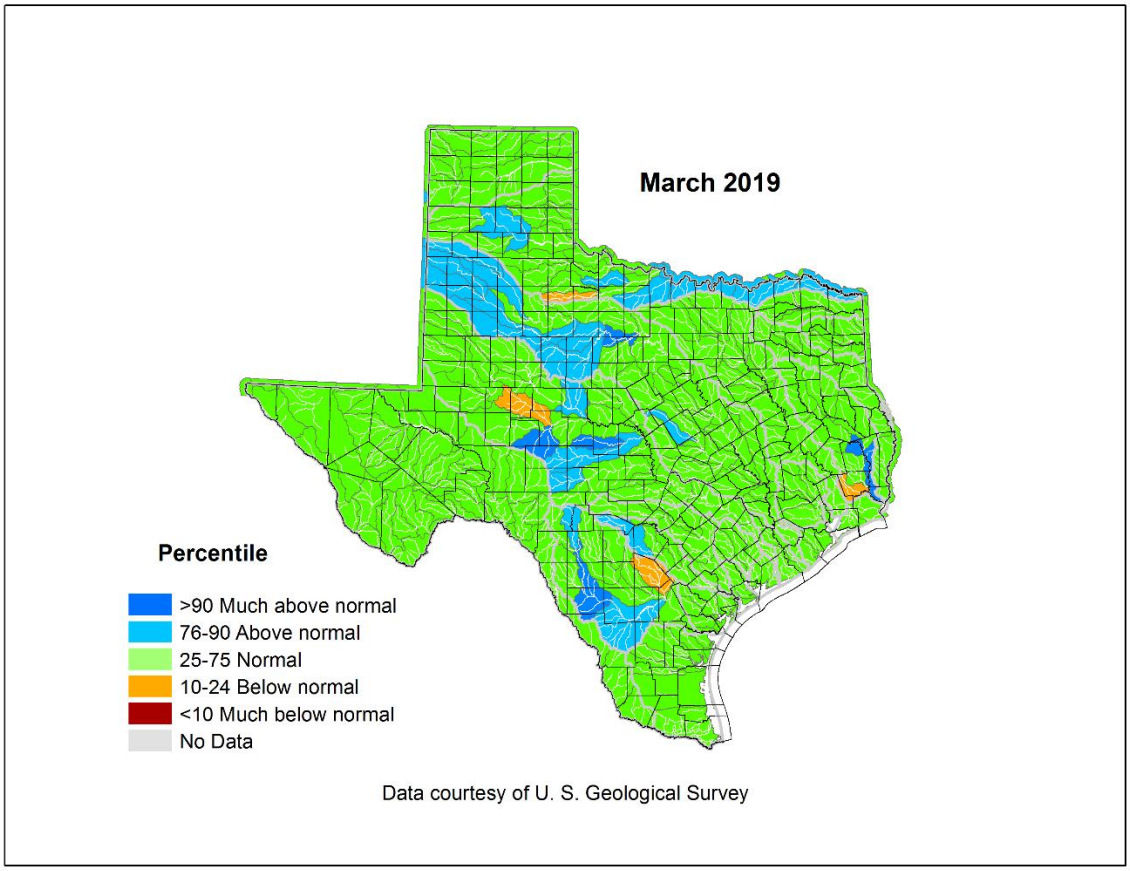


Figure 6: Runoff percentiles by the U.S. Geological Survey's Hydrologic Unit Codes

*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 March 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 February 2019, soil moisture content increased [green to blue shading in Figure 7(b)]in the High Plains, Low Rolling Plains, North Central, Edwards Plateau, Trans Pecos, Southern, and Lower Valley climate divisions. Soil moisture content decreased [brown and yellow shading in Figure 7(b)] in the South Central, Upper Coast and East Texas climate divisions.

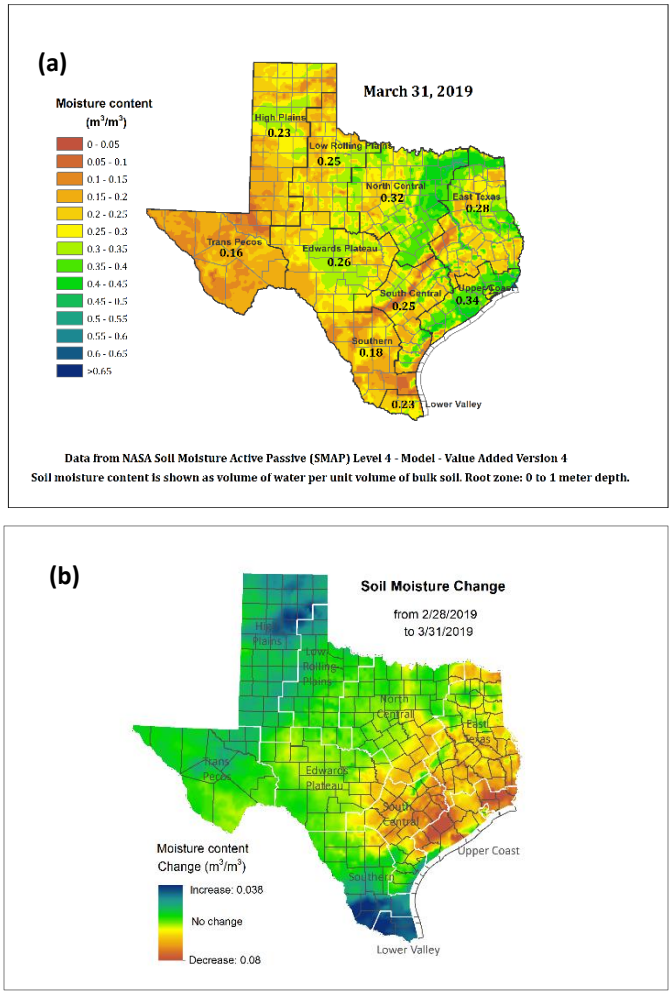
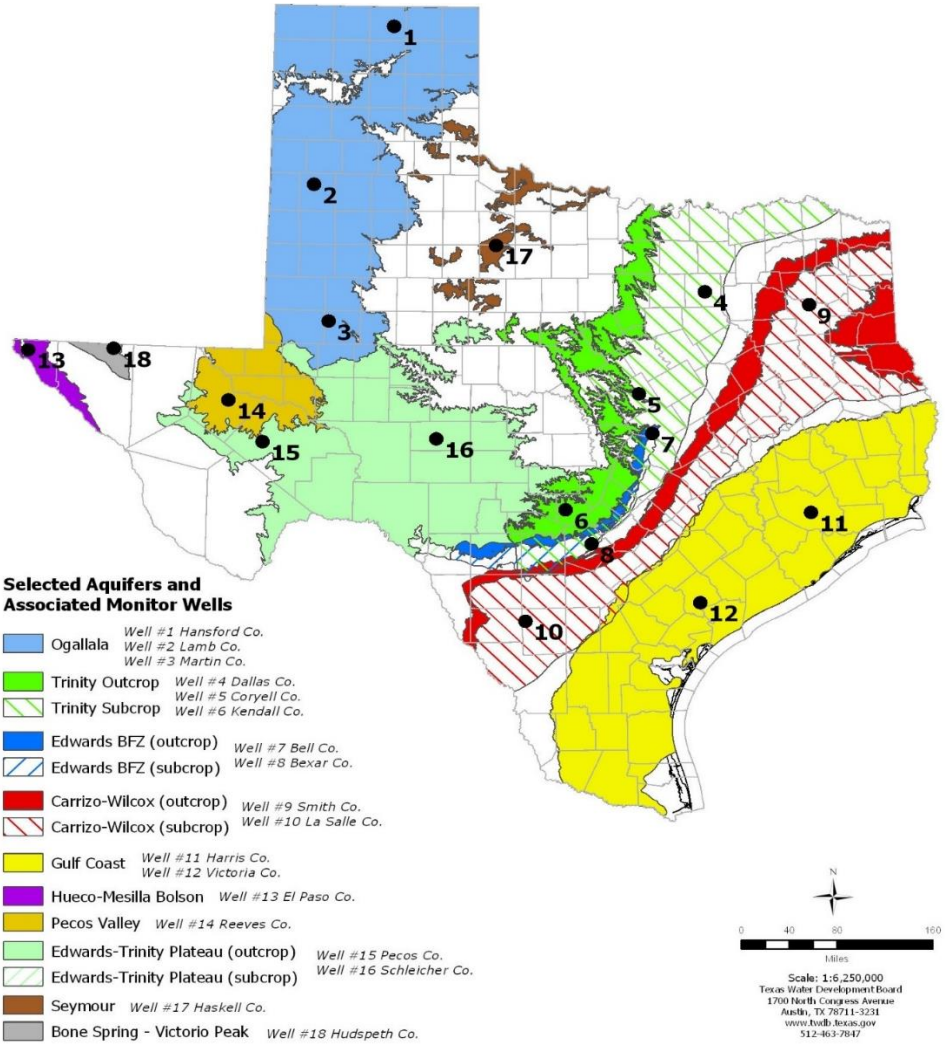


Figure 7: Root zone soil moisture conditions on March 30, 2019 (a) and the difference in root zone soil moisture from end-February 2019 and end-March 2019 (b)

March 2019 GROUNDWATER LEVELS IN OBSERVATION WELLS

Water-level measurements were available for all 18 key monitoring wells in the state. Water levels rose in 7 monitoring wells since the beginning of March, ranging from an increase of 0.24 feet in the Haskell County Seymour Aquifer well (#17 on map) to 1.62 feet in the La Salle County Carrizo-Wilcox Aquifer well (#10 on map). Water levels declined in 11 monitoring wells, ranging from a decline of -0.05 feet in the Lamb County Ogallala Aquifer well (#2 on map) to -10.65 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 46.80 feet below land surface or 679.60 feet above mean sea level. Water levels are 20 feet above the Stage 1 critical management level for the San Antonio portion of the Edwards (Balcones Fault Zone) Aquifer.



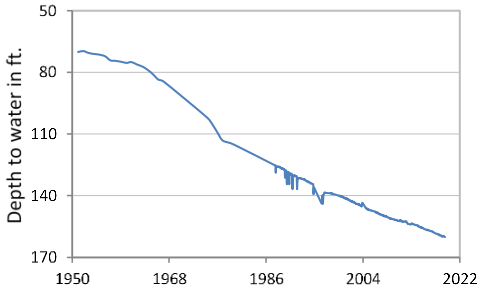
***Well numbers used in this publication on the aquifer map to indicate the monitoring well location (numbers 1 - 18) are different than the TWDB's seven-digit state well number.**

Monitoring Well	March	February	Month Change	Year Change	Historical Change	First Measured
(1) Hansford 0354301	160.13	159.93	-0.20	-0.79	-90.01	1951
(2) Lamb 1053602	150.01	149.96	-0.05	-1.49	-121.84	1951
(3) Martin 2739903	143.76	144.10	0.34	0.15	-38.87	1964
(4) Dallas 3319101	495.99	497.55	1.56	-2.32	-273.99	1954
(5) Coryell 4035404	524.42	524.82	0.40	-3.62	-232.42	1955
(6) Kendall 6802609	117.06	116.84	-0.22	13.40	-57.06	1975
(7) Bell 5804816	119.83	118.97	-0.86	4.63	3.68	2008
(8) Bexar 6837203	51.00	46.80	-4.20	12.51	-4.36	1932
(9) Smith 3430907	433.20	433.57	0.37	-1.98	-133.20	1977
(10) La Salle 7738103	496.51	498.13	1.62	2.43	-243.44	2003
(11) Harris 6514409	189.51	189.06	-0.45	2.28	-54.01*	1947**
(12) Victoria 8017502	34.42	34.80	0.38	-2.07	-0.42	1958
(13) El Paso 4913301	295.84	295.55	-0.29	-1.16	-63.94	1964
(14) Reeves 4644501	164.09	163.14	-0.95	1.62	-72.00	1952
(15) Pecos 5216802	188.35	177.70	-10.65	2.99	58.53	1976
(16) Schleicher 5512134	269.95	267.66	-2.29	43.13	31.95	2003
(17) Haskell 2135748	45.41	45.65	0.24	1.04	-2.41	2002
(18) Hudspeth 4807516	142.77	139.36	-3.41	2.06	-38.85	1966

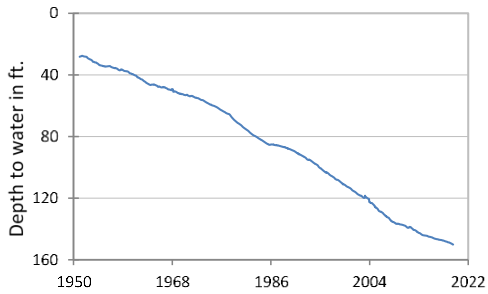
*Change since the original measurement of 135.5 feet below land surface in 1947 (**measurement not shown on the hydrograph)

March 2019 OBSERVATION WELL HYDROGRAPHS

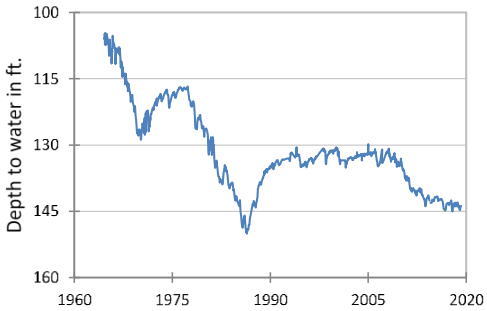
(1) State Well #03-54-301
Near Spearman, Hansford County
Ogallala Aquifer



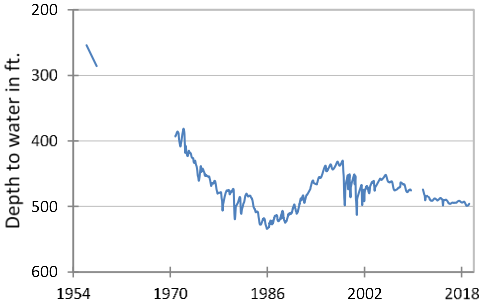
(2) State Well #10-53-602
Near Earth, Lamb County
Ogallala Aquifer



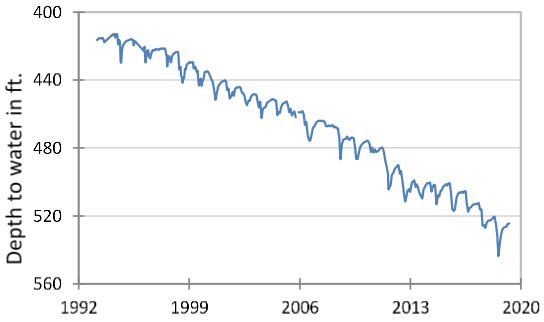
(3) State Well #27-39-903
Northwest Martin County
Ogallala Aquifer



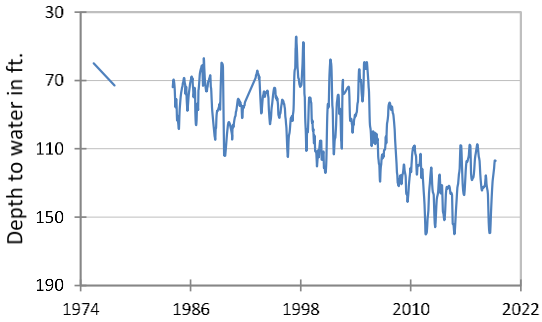
(4) State Well #33-19-101
Southeast Dallas, Dallas County
Twin Mountains Formation-Trinity Aquifer



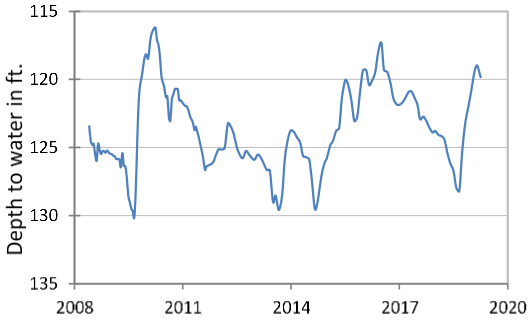
(5) State Well #40-35-404
Gatesville, Coryell County
Hosston Formation-Trinity Aquifer



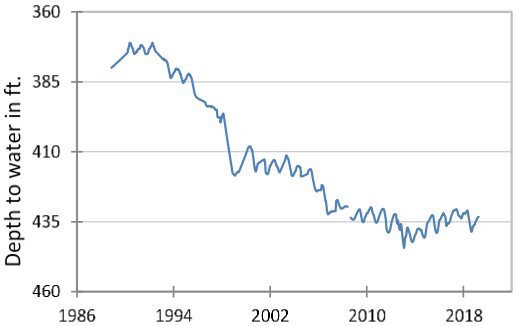
(6) State Well #68-02-609
Waring, Kendall County
Cow Creek Formation-Trinity Aquifer



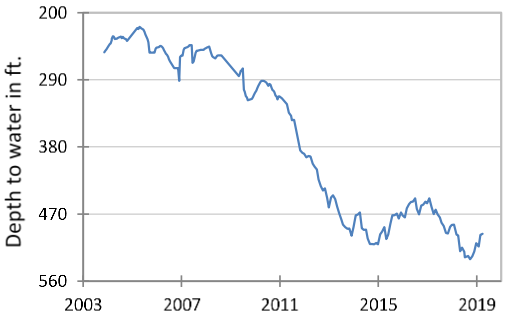
(7) State Well #58-04-816
Near Salado, Bell County
Edwards (Balcones Fault Zone) Aquifer



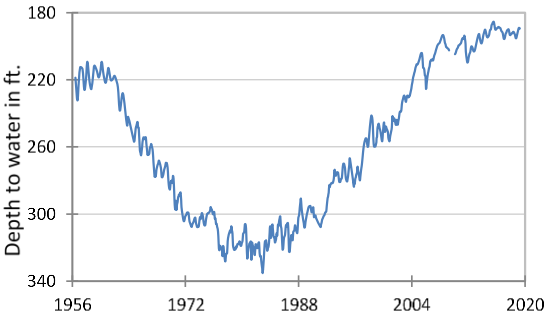
(9) State Well #34-30-907
Red Springs, Smith County
Carrizo-Wilcox Aquifer



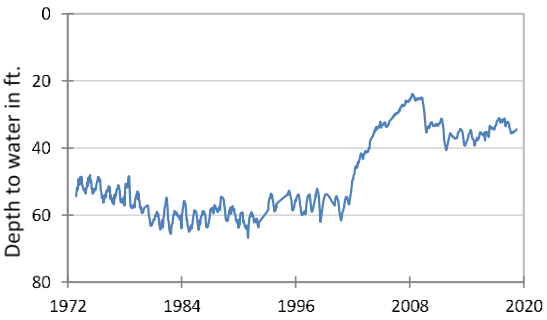
(10) State Well #77-38-103
Near Cotulla, La Salle County
Carrizo-Wilcox Aquifer



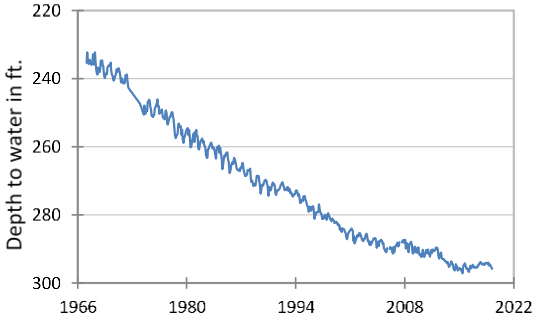
(11) State Well #65-14-409
Alief, Harris County
Evangeline Formation-Gulf Coast Aquifer



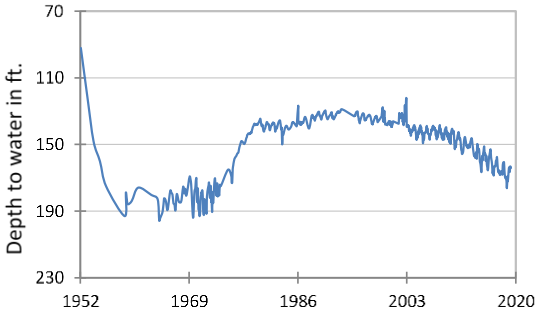
(12) State Well #80-17-502
Near Bloomington, Victoria County
Lissie Formation-Gulf Coast Aquifer



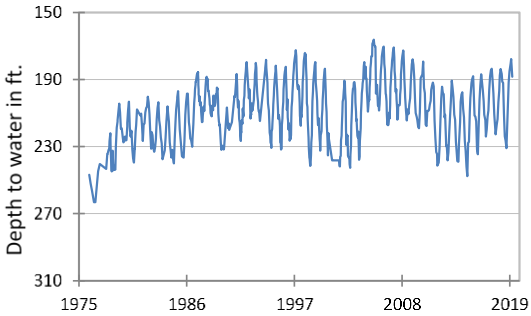
(13) State Well #49-13-301
El Paso, El Paso County
Hueco-Mesilla Bolson Aquifer



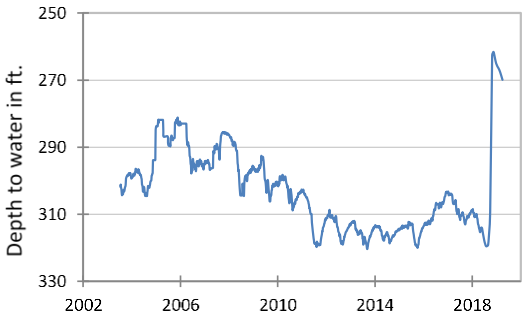
(14) State Well #46-44-501
Near Pecos, Reeves County
Pecos Valley Aquifer



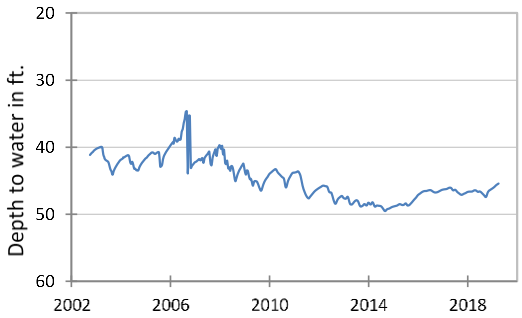
(15) State Well #52-16-802
Fort Stockton, Pecos County
Edwards-Trinity (Plateau) Aquifer



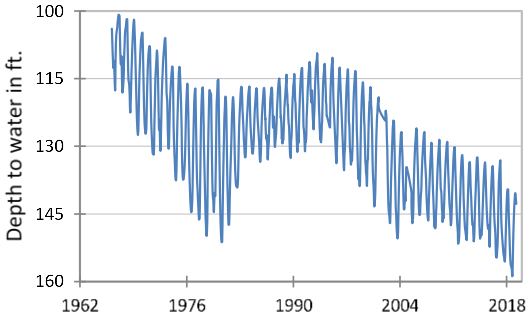
(16) State Well #55-12-134
Eldorado, Schleicher County
Trinity Aquifer



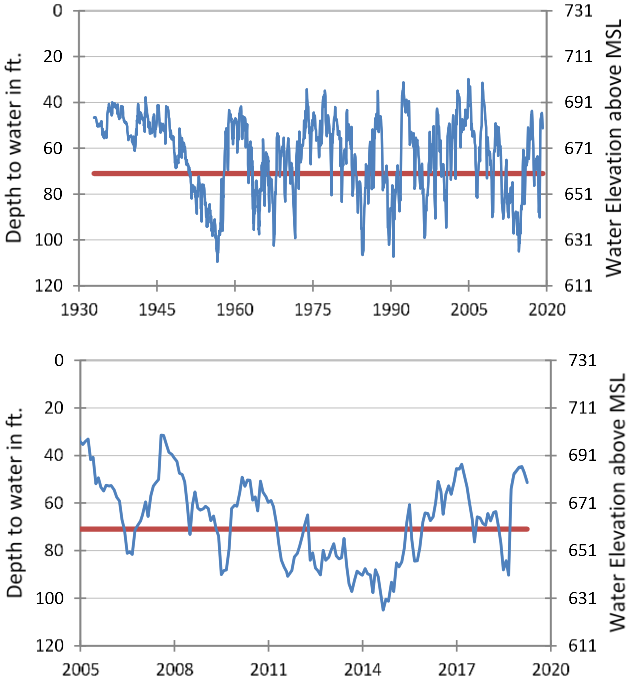
(17) State Well #21-35-748
Near O'Brien, Haskell County
Seymour Aquifer



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

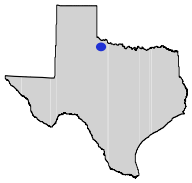


(8) State Well #68-37-203 (J-17)
San Antonio, Bexar County
Edwards (Balcones Fault Zone) Aquifer



The late March water-level measurement in this Edwards (Balcones Fault Zone) Aquifer well, elevation 731 feet above mean sea level, was 51.00 feet below land surface, or 679.6 feet above mean sea level. This was 4.20 feet below last month's measurement, 12.51 feet above last year's measurement and 4.36 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.

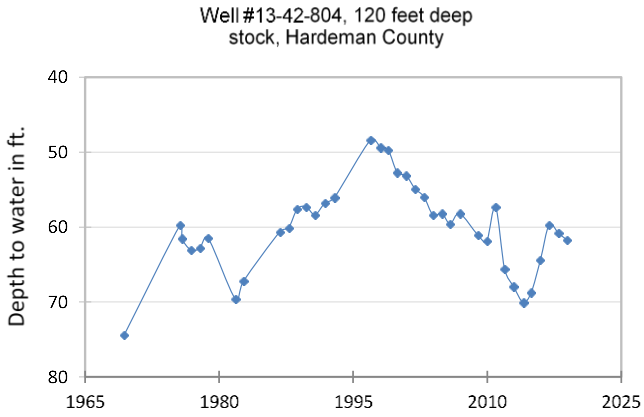


HYDROGRAPH OF THE MONTH

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

Blaine Aquifer

The Blaine Aquifer is a minor aquifer located at the east end of the High Plains in North Texas. The aquifer is part of the Permian Blaine Formation, which is composed of red silty shale, gypsum, anhydrite, salt, and dolomite. The formation consists of cycles of marine and non-marine sediments deposited in a broad, shallow sea that once covered the southwestern United States. Groundwater occurs primarily in solution channels and caverns within the beds of anhydrite and gypsum that contribute to the overall poor quality of the water. Although some wells contain slightly saline water, with total dissolved solids between 1,000 and 3,000 milligrams per liter, most contain moderately saline water, with total dissolved solids between 3,000 and 10,000 milligrams per liter, with almost all exceeding the secondary drinking water standard of 1,000 milligrams per liter. Sulfate values are also well in excess of their secondary drinking water standard of 300 milligrams per liter. Water from the Blaine Aquifer is used for livestock and for irrigation of crops that are highly tolerant of salt.



The initial measurement of 74.4 feet below land surface was recorded by the USGS in May of 1969. In October of 1975, the TWDB then began to take near-yearly water level measurements in the well. The period of record reveals an average increase in water-level from 1965 to 1996 and average decrease from 1996 to present day. Overall, yearly fluctuations in water level are gradual and are typically no more than +/- 3 feet. The most recent water level measurement in December of 2018 was 61.72 feet below land surface. This is 0.92 below above last year's measurement and 12.68 feet above the initial measurement in 1969.

Far away (left), and close-up (right) images of well #13-42-804.