Texas Water Conditions Report

Texas Water Development Board

August 2019

RAINFALL

Rainfall observations from the National Oceanic and Atmospheric Administration – National Weather Service (NOAA-NWS) indicate that much of the state except for north Texas, the Upper Coast, and southeast Texas received little or no rainfall in August [orange and red shading in Figure 1(a)]. Monthly rainfall for August was below-average, compared to historical data from 1981–2010, for much of the state [Figure 1(b)], except for southern East Texas, lower Upper Coast, northern North Central, northern High Plains, and the Trans Pecos climate division. Rainfall in East Texas and the northern Upper Coast exceeded 16".

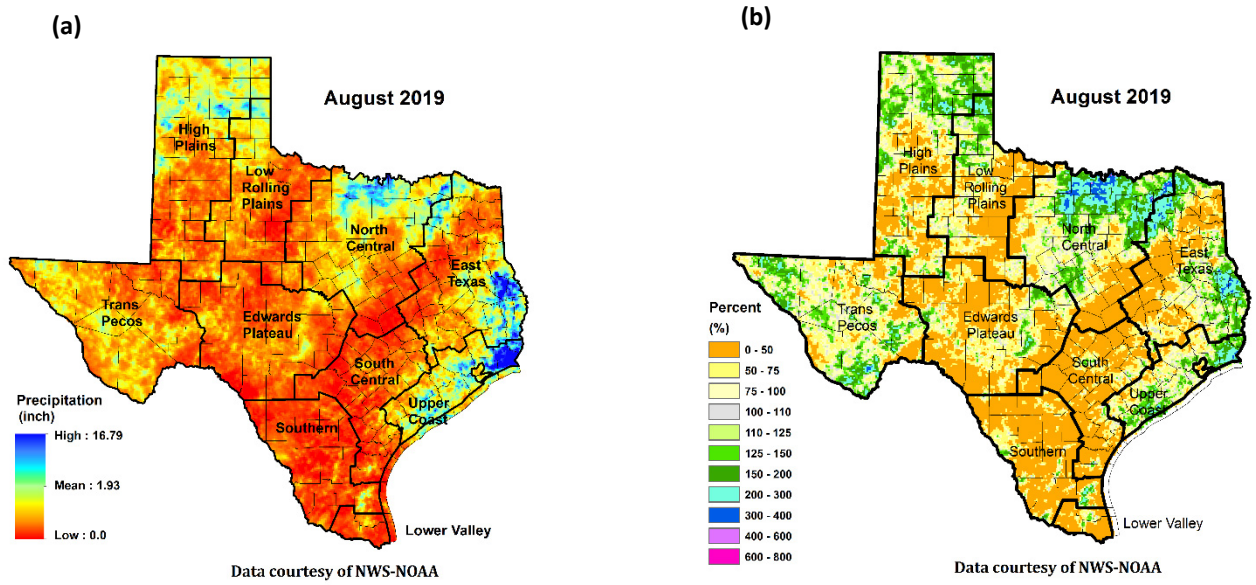

Figure 1: (a) Monthly accumulated rainfall, and (b) Percent of normal rainfall for August 2019

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RESERVOIR STORAGE

At the end of August 2019, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 26.7 million acre-feet or 83 percent of total conservation storage capacity (Figure 2). This is approximately 1.1 million acre-feet less than a month ago and 3.3 million acre-feet more than end-August 2018.

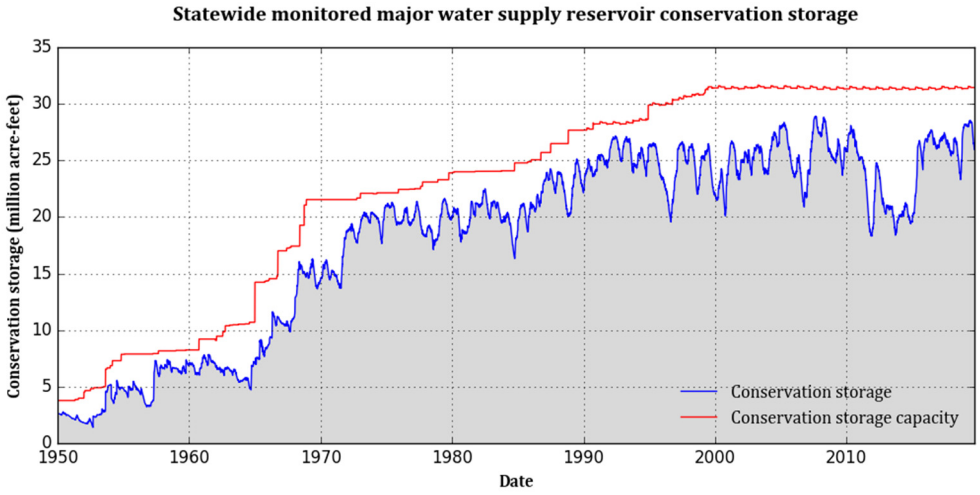


Figure 2: Statewide reservoir conservation storage

Out of 118 reservoirs in the state, 11 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 68 were above 90 percent full. Eight reservoirs [E.V. Spence (29 percent full), Falcon (23 percent full), Greenbelt (20 percent full), J.B. Thomas (29 percent full), Mackenzie (12 percent full), O. C. Fisher (12 percent full), Palo Duro Reservoir (9 percent full), and White River (21 percent full)] remained below 30 percent full. Elephant Butte Reservoir (located in New Mexico) was at 23 percent full, which was down five percentage points from the end of July 2019.

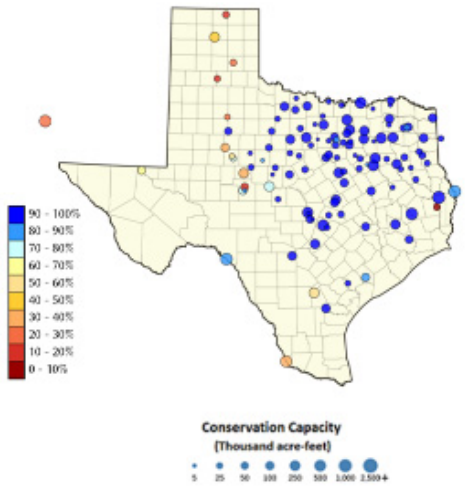


Figure 3: Reservoir conservation storage at end-August expressed as percent full

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 Upper Coast (88.2 percent full), East Texas (91.3 percent full), North Central (95.2 percent full), South Central (95 percent full), Edwards (74.4 percent full), and Low Rolling Plains (72.8 percent full) climate divisions (Figure 3). Storage in the High Plains region was severely low (34.7 percent full) and storage in the Southern climate division was moderately low (40.3 percent full). Storage was severely low (28.9 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 was normal to high (>70 percent full). The Upper/Mid Rio Grande and the Canadian River Basin had severely low storage, the Upper Colorado and the Lower Rio Grande had moderately low storage, and the Nueces had abnormally low storage.

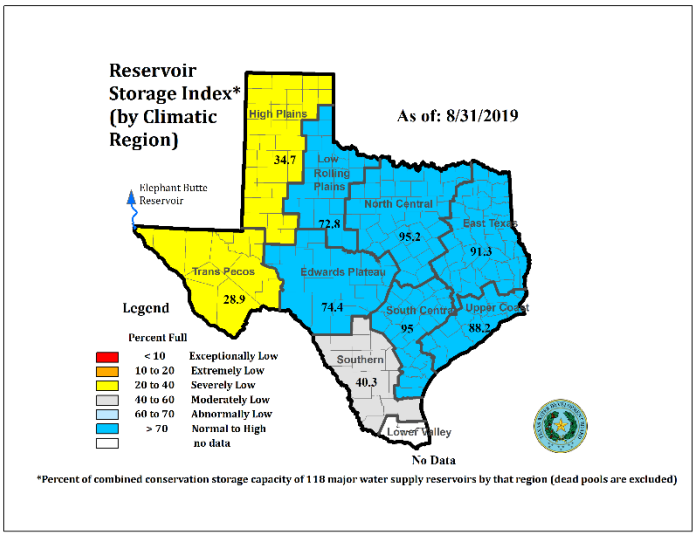


Figure 3: Reservoir Storage Index by climate division at 8/31/2019

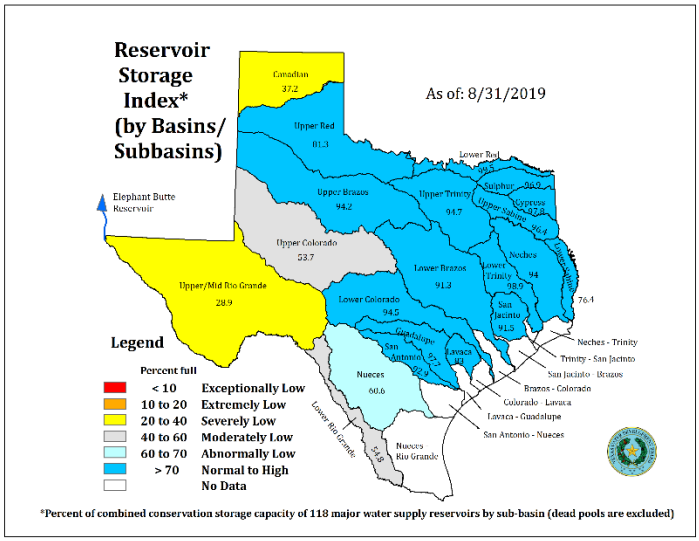


Figure 4: Reservoir Storage Index by river basin/sub-basin at 8/31/2019

*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-Aug		Storage change from end-July 2019		Storage change from end-Aug 2018	
	(acre-feet)	(acre-feet)	(%)	(acre-feet)	(%)	(acre-feet)**	(%)
Abilene, Lake	7,900	6,086	77	-993	-13	3,521	45
Alan Henry Reservoir	96,207	87,840	91	-2,430	-3	12,976	13
*Amistad Reservoir (Texas & Mexico)	1,840,849	1,432,803	78	-79,950	-4	388,325	21
*Amistad Reservoir (Texas)	3,275,532	1,639,210	50	-79,349	-2	202,555	6
Amon G Carter, Lake	19,266	19,266	100	85	0	2,138	11
Aquilla Lake	43,243	39,625	92	-2,454	-6	2,156	5
Arlington, Lake	40,188	32,256	80	-4,268	-11	3,003	7
Arrowhead, Lake	230,359	212,908	92	-5,871	-3	34,448	15
Athens, Lake	29,503	28,573	97	-930	-3	1,658	6
*Austin, Lake	23,972	22,942	96	124	1	31	0
B A Steinhagen Lake	66,961	23,291	35	23,105	35	-40,228	-60
Bardwell Lake	46,122	42,937	93	-2,217	-5	-918	-2
Belton Lake	435,225	429,541	99	-5,684	-1	56,587	13
Benbrook Lake	85,648	70,151	82	-8,583	-10	11,244	13
Bob Sandlin, Lake	192,417	186,856	97	-4,318	-2	6,347	3
Bonham, Lake	11,027	9,797	89	-576	-5	869	8
Brady Creek Reservoir	28,808	26,656	93	-1,085	-4	12,771	44
Bridgeport, Lake	366,236	342,414	93	-16,973	-5	52,301	14
*Brownwood, Lake	128,839	118,481	92	-6,393	-5	32,964	26
Buchanan, Lake	860,607	797,002	98	-14,048	-2	150,296	18
Caddo, Lake	29,898	29,898	100	0	0	6,712	22
Canyon Lake	378,781	374,187	99	-4,594	-1	51,153	14
Cedar Creek Reservoir in Trinity	644,686	606,234	94	-20,632	-3	25,452	4
Champion Creek Reservoir	41,580	28,957	70	-856	-2	8,940	22
Cherokee, Lake	40,094	37,735	94	-2,265	-6	5,740	14
Choke Canyon Reservoir	662,820	328,993	50	-15,280	-2	173,397	26
*Cisco, Lake	29,003	26,837	93	-868	-3	5,508	19
Coleman, Lake	38,075	35,395	93	-1,189	-3	5,980	16
Colorado City, Lake	31,040	26,303	85	-1,904	-6	4,203	14
*Coleto Creek Reservoir	30,758	15,116	49	-769	-3	5,882	19
Conroe, Lake	410,988	375,059	91	-25,826	-6	182	0
Corpus Christi, Lake	256,062	227,860	89	-18,985	-7	58,605	23
Crook, Lake	9,195	8,183	89	-420	-5	183	2
Cypress Springs, Lake	66,756	65,757	99	-740	-1	4,299	6
E. V. Spence Reservoir	517,272	151,848	29	-6,344	-1	91,602	18
Eagle Mountain Lake	179,880	166,458	93	-8,042	-4	9,295	5
Elephant Butte Reservoir (Texas)	852,491	198,672	23	-36,597	-4	161,384	19
Elephant Butte Reservoir (Total Storage)	1,973,358	459,888	23	-84,716	-4	373,574	19
*Falcon Reservoir (Texas & Mexico)	1,551,007	425,964	27	-58,017	-4	-18,089	-1
*Falcon Reservoir (Texas)	2,646,817	607,187	23	-78,500	-3	97,479	4
Fork Reservoir, Lake	605,061	579,842	96	-12,358	-2	33,280	6
Fort Phantom Hill, Lake	70,030	66,563	95	-3,075	-4	13,564	19
Georgetown, Lake	36,823	29,658	81	-5,830	-16	10,048	27
Graham, Lake	45,288	41,939	93	-1,999	-4	5,737	13
Granbury, Lake	132,949	132,704	100	1,057	1	14,324	11

CONSERVATION STORAGE DATA FOR SELECTED MAJOR TEXAS RESERVOIRS							
Name of lake or reservoir	Storage capacity	Storage at end-Aug		Storage change from end-July 2019		Storage change from end-Aug 2018	
	(acre-feet)	(acre-feet)	(%)	(acre-feet)	(%)	(acre-feet)**	(%)
Continued							
Granger Lake	51,822	51,822	100	0	0	5,578	11
Grapevine Lake	164,703	164,703	100	0	0	21,666	13
Greenbelt Lake	59,968	12,250	20	-383	-1	-507	-1
*Halbert, Lake	6,033	4,924	82	-69	-1	153	3
Hords Creek Lake	8,443	7,469	88	-290	-3	3,043	36
Houston County Lake	17,113	16,817	98	-270	-2	2,031	12
Houston, Lake	130,147	119,882	92	-1,408	-1	-10,265	-8
Hubbard Creek Reservoir	313,298	296,794	95	-12,131	-4	69,805	22
Hubert H Moss Lake	24,058	23,767	99	225	1	1,427	6
Inks, Lake	13,962	12,840	92	-218	-2	-75	-1
J. B. Thomas, Lake	199,931	57,915	29	-3,470	-2	-13,154	-7
Jacksonville, Lake	25,670	25,082	98	-588	-2	1,241	5
Jim Chapman Lake (Cooper)	260,332	245,180	94	-9,499	-4	47,725	18
Joe Pool Lake	175,358	163,946	93	-6,098	-3	3,870	2
Kemp, Lake	245,307	234,417	96	-10,890	-4	70,949	29
Kickapoo, Lake	86,345	78,247	91	-5,137	-6	16,375	19
Lavon Lake	406,388	359,332	88	-27,659	-7	33,656	8
Leon, Lake	27,762	25,579	92	-1,008	-4	6,699	24
Lewisville Lake	563,228	546,616	97	-16,612	-3	64,548	11
Limestone, Lake	203,780	186,148	91	-11,227	-6	31,803	16
*Livingston, Lake	1,785,348	1,765,919	99	-19,429	-1	722	0
*Lost Creek Reservoir	11,950	11,426	96	-197	-2	533	4
Lyndon B Johnson, Lake	115,249	110,942	96	489	0	428	0
Mackenzie Reservoir	46,450	5,417	12	-174	0	-574	-1
Marble Falls, Lake	6,901	6,841	99	54	1	-55	-1
Martin, Lake	75,726	66,550	88	-4,218	-6	5,526	7
Medina Lake	254,823	236,670	93	-11,884	-5	121,202	48
Meredith, Lake	500,000	203,416	41	-3,470	-1	18,263	4
Millers Creek Reservoir	26,768	25,376	95	-1,392	-5	6,889	26
*Mineral Wells, Lake	5,273	5,038	96	-133	-3	414	8
Monticello, Lake	34,740	28,547	82	-884	-3	1,267	4
Mountain Creek, Lake	22,850	22,850	100	0	0	1,246	5
Murvaul, Lake	38,285	37,158	97	-511	-1	4,667	12
Nacogdoches, Lake	39,522	36,064	91	-1,257	-3	2,925	7
Nasworthy	9,615	8,331	87	25	0	898	9
Navarro Mills Lake	49,827	44,142	89	-3,495	-7	1,114	2
New Terrell City Lake	8,583	8,514	99	-69	-1	410	5
Nocona, Lake (Farmers Crk)	21,444	20,357	95	-303	-1	1,497	7
North Fork Buffalo Creek Reservoir	15,400	12,908	84	-1,127	-7	546	4
O' the Pines, Lake	241,363	268,566	100	0	0	54,545	20
O. C. Fisher Lake	119,445	14,721	12	-1,098	-1	5,316	4
*O. H. Ivie Reservoir	554,340	405,041	73	-14,014	-3	329,507	59
Oak Creek Reservoir	39,210	36,864	94	-1,548	-4	20,740	53

CONSERVATION STORAGE DATA FOR SELECTED MAJOR TEXAS RESERVOIRS							
Name of lake or reservoir	Storage capacity	Storage at end-Aug		Storage change from end-July 2019		Storage change from end-Aug 2018	
	(acre-feet)	(acre-feet)	(%)	(acre-feet)	(%)	(acre-feet)**	(%)
Continued							
Palestine, Lake	367,303	349,099	95	-15,208	-4	28,359	8
Palo Duro Reservoir	61,066	5,266	9	-1,170	-2	4,762	8
Palo Pinto, Lake	26,766	23,634	88	-2,007	-7	6,590	25
Pat Cleburne, Lake	26,008	23,908	92	-1,167	-4	1,899	7
*Pat Mayse Lake	113,683	110,655	97	-3,028	-3	6,930	6
Possum Kingdom Lake	538,139	525,713	98	-12,068	-2	58,960	11
Proctor Lake	54,762	48,597	89	-4,698	-9	20,506	37
Ray Hubbard, Lake	439,559	402,839	92	-19,675	-4	38,247	9
Ray Roberts, Lake	788,167	782,788	99	-1,980	0	37,818	5
Red Bluff Reservoir	151,110	91,462	61	-3,879	-3	8,029	5
Richland-Chambers Reservoir	1,087,839	1,032,041	95	-37,885	-3	26,582	2
Sam Rayburn Reservoir	2,857,077	2,720,985	95	-99,031	-3	247,237	9
Somerville Lake	147,104	147,104	100	0	0	27,459	19
Squaw Creek, Lake	151,250	148,235	98	-1,753	-1	-3,015	-2
Stamford, Lake	51,570	48,626	94	-2,944	-6	14,062	27
Stillhouse Hollow Lake	227,771	224,372	99	-3,142	-1	43,491	19
Striker, Lake	16,934	16,836	99	-98	-1	2,440	14
Sweetwater, Lake	12,267	12,094	99	-173	-1	10,412	85
*Sulphur Springs, Lake	17,747	17,127	97	383	2	3,470	20
Tawakoni, Lake	871,685	851,510	98	-16,848	-2	62,993	7
Texana, Lake	159,566	132,512	83	-10,397	-7	-8,656	-5
Texoma, Lake (Texas & Oklahoma)	1,258,113	1,258,113	100	0	0	12,644	1
Texoma, Lake (Texas)	2,525,281	2,532,705	100	-124,270	-5	41,761	2
Toledo Bend Reservoir (Texas & Louisiar	2,236,450	1,707,822	76	-206,998	-9	-207,798	-9
Toledo Bend Reservoir (Texas)	4,472,900	3,419,744	76	-413,997	-9	-415,596	-9
Travis, Lake	1,113,348	1,024,756	92	-52,900	-5	338,860	30
Twin Buttes Reservoir	182,454	123,207	68	-9,561	-5	117,640	64
Tyler, Lake	72,073	66,752	93	-3,315	-5	4,031	6
Waco, Lake	189,418	176,695	93	-10,221	-5	20,525	11
Waxahachie, Lake	10,780	9,460	88	-875	-8	377	3
Weatherford, Lake	17,812	16,150	91	-962	-5	2,349	13
White River Lake	29,880	6,199	21	-660	-2	2,266	8
Whitney, Lake	553,344	440,561	80	-61,753	-11	18,978	3
Worth, Lake	33,495	31,427	94	1,432	4	5,529	17
Wright Patman Lake	310,382	231,496	100	0	0	0	0
STATEWIDE TOTOL							
STATEWIDE TOTAL	**32,300,210**	**26,733,016**	**83**	**-1,112,940**	**-3**	**3,296,440**	**10**

* 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 August 2019 show that much of the state had near normal (25–75th percentile, green shading in Figure 6) streamflow. A couple of sub-basins in the Sabine and lower Brazos river basins had much above normal (> 90th percentile, dark blue shading in Figure 6) streamflow. Several sub-basins in the upper Rio Grande, upper and lower Colorado, upper Brazos, lower Trinity, and lower Guadalupe river basins had below normal (10–24th percentile, light brown shading in Figure 6) streamflow. Several sub-basins in the upper Rio Grande, upper Colorado, upper Red, Lavaca, Guadalupe, and Nueces river basins had much below normal (less than the 10th percentile, dark brown shading in Figure 6) streamflow.

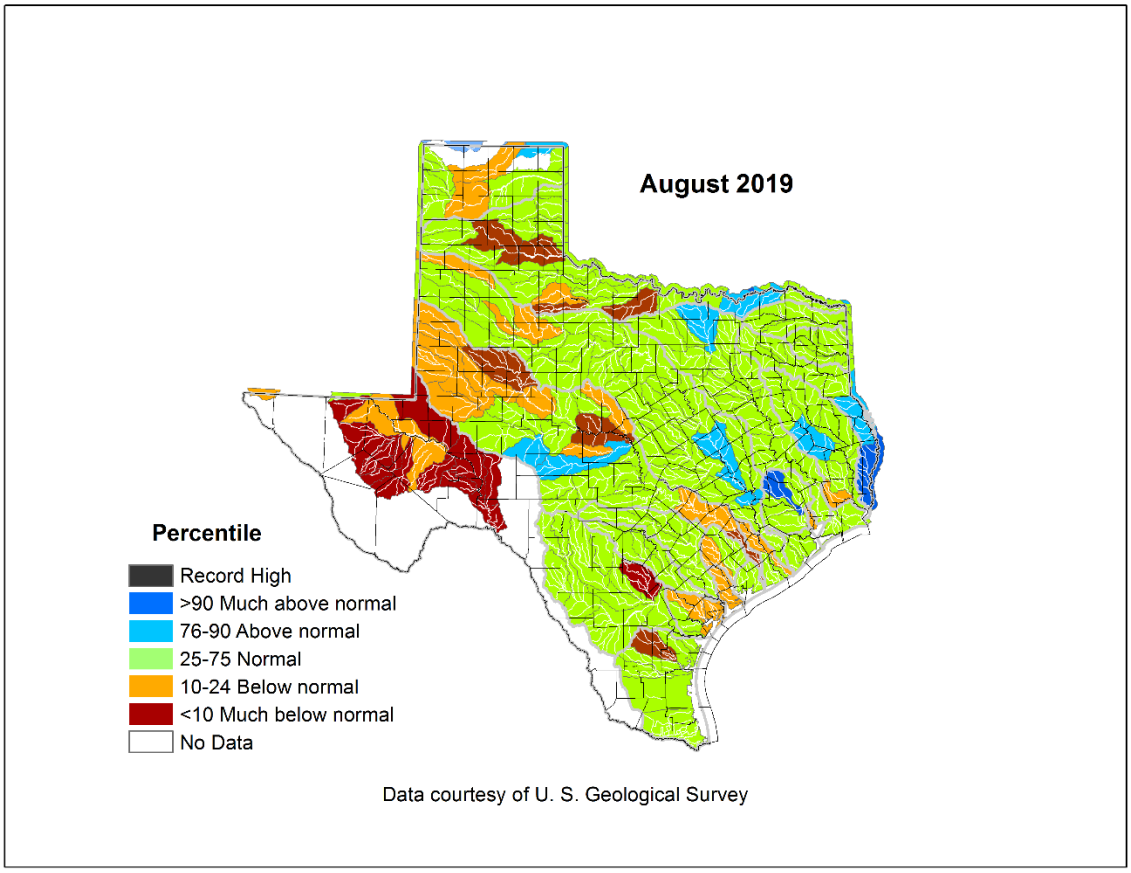


Figure 6: Runoff percentiles by the U.S. Geological Survey's Hydrologic Unit Codes

SOIL MOISTURE CONDITIONS

Root zone soil moisture at the end of August 2019 [Figure 7(a)] was moderate [> 0.20 cubic meters of water per bulk cubic meter soil (m^3/m^3)] in the Lower Rolling Plains, Edwards Plateau, and Upper Coast climate divisions. In all other climate divisions, root zone soil moisture was low, with regions in the northern Trans Pecos, South Central, Southern, and Lower Valley ranging from ~0.05–15 m^3/m^3 [dark brown sharing in Figure 7(a)]. On a regional basis, and compared to conditions at the end of July 2019, soil moisture content increased [green to blue shading in Figure 7(b)]in the northeastern and southern High Plains, North Central, northern and southern East Texas, Southern, and southern and western Trans Pecos climate divisions. Soil moisture content decreased [brown and yellow shading in Figure 7(b)] in northeastern East Texas, Low rolling Plains, central High Plains, South Central, northern Southern, and central Upper Coast climate divisions.

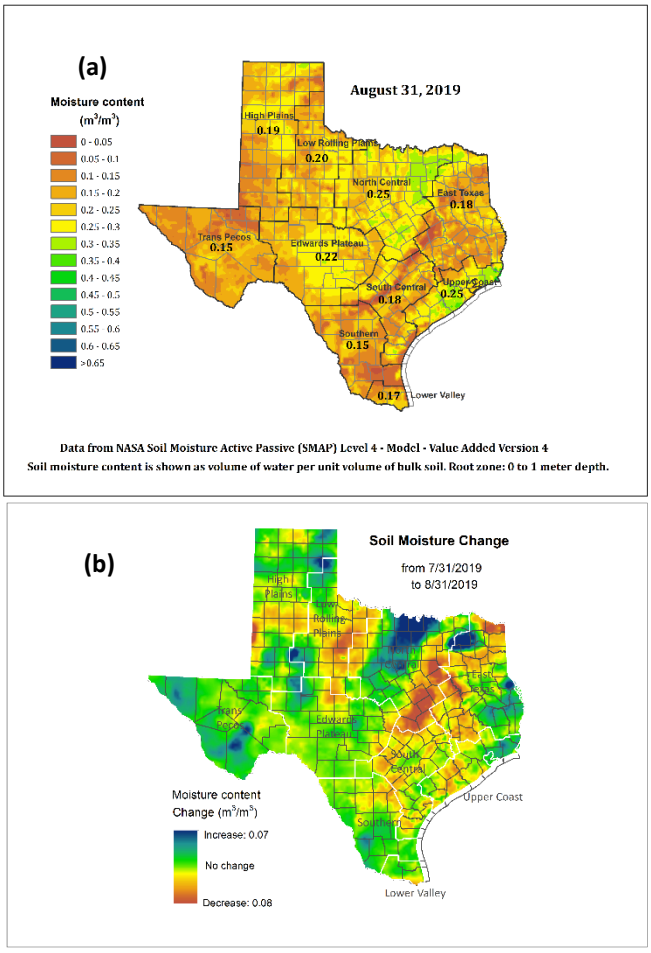
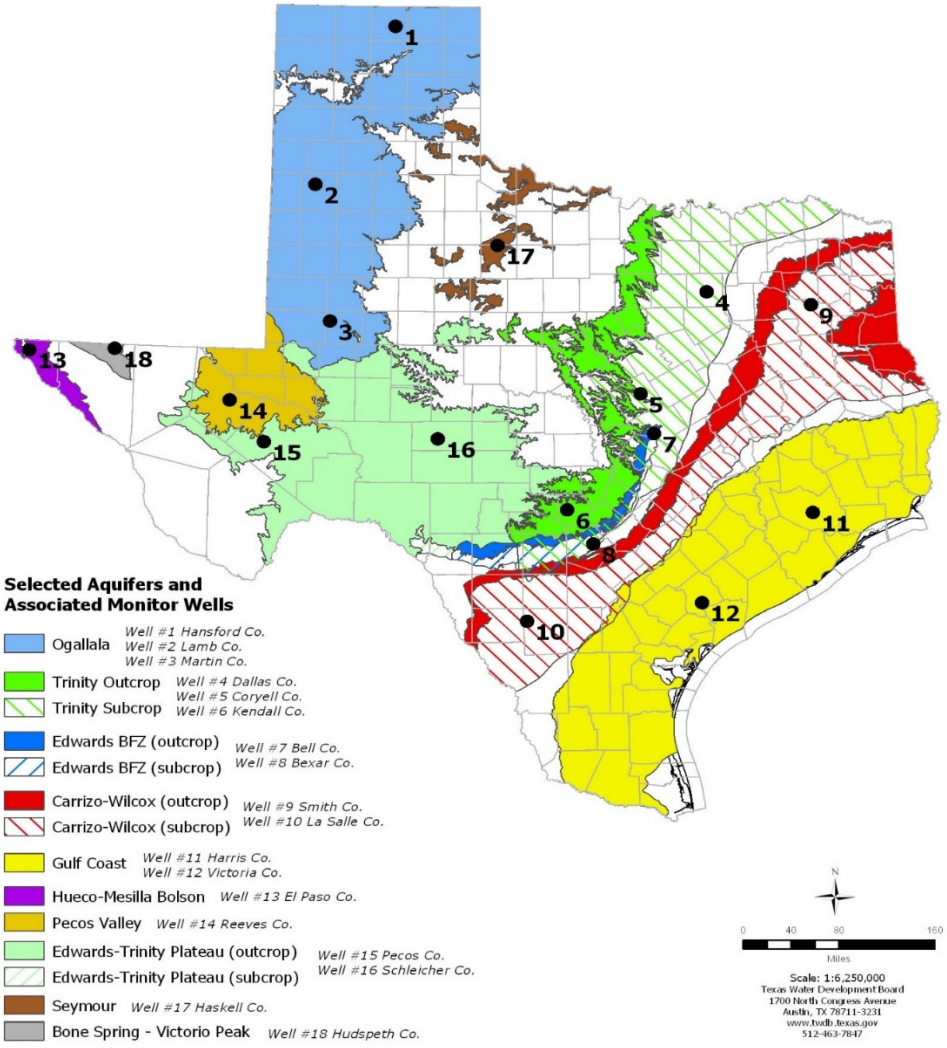


Figure 7: Root zone soil moisture conditions on August 31, 2019 (a) and the difference in root zone soil moisture from end-July 2019 and end-August 2019 (b)

August 2019 GROUNDWATER LEVELS IN OBSERVATION WELLS

Water-level measurements were available for 17 of the 18 key monitoring wells in the state. Water levels rose in 1 monitoring well since the beginning of August, with an increase of 1.05 feet in the Coryell County Trinity Aquifer well (#5 on map). Water levels declined in 16 monitoring wells, ranging from a decline of -0.07 feet in the Lamb County Ogallala Aquifer well (#2 on map) to -10.97 feet in the La Salle County Carrizo-Wilcox Aquifer well (#10 on map). The J-17 well (#8 on map) in San Antonio recorded a water level of 65.60 feet below land surface or 665 feet above mean sea level. Water levels are 5.4 feet above the Stage 1 critical management level for the San Antonio portion of the Edwards (Balcones Fault Zone) Aquifer.

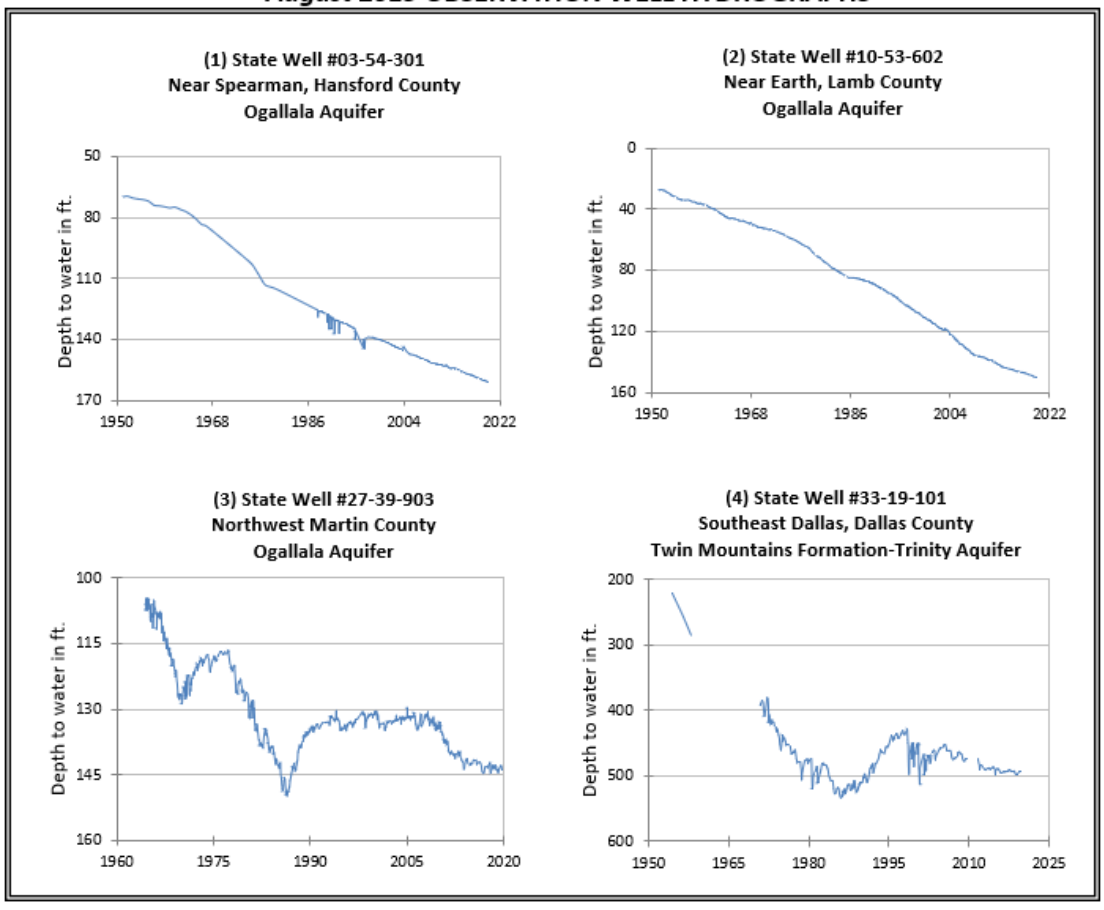


***Well numbers used in this publication on the aquifer map to indicate the monitoring well location (numbers 1–18) are different to the TWDB's seven-digit state well number.**

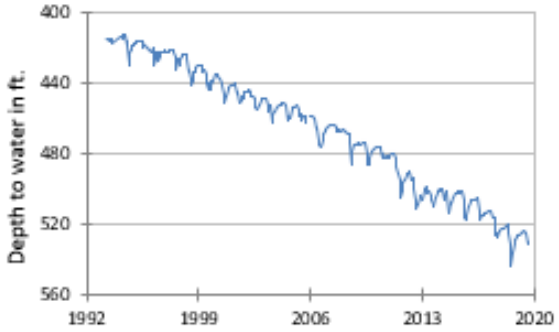
Monitoring Well	August	July	Month Change	Year Change	Historical Change	First Measured
(1) Hansford 0354301	160.56	160.43	*-0.13*	*-0.71*	*-90.44*	1951
(2) Lamb 1053602	150.31	150.24	*-0.07*	*-1.39*	*-122.14*	1951
(3) Martin 2739903	144.06	143.21	*-0.85*	*-1.03*	*-39.17*	1964
(4) Dallas 3319101	494.17	493.15	*-1.02*	*2.65*	*-272.17*	1954
(5) Coryell 4035404	529.65	530.70	*1.05*	*6.61*	*-237.65*	1955
(6) Kendall 6802609	132.94	123.34	*-9.60*	*26.14*	*-72.94*	1975
(7) Bell 5804816	120.59	120.04	*-0.55*	*7.61*	*2.92*	2008
(8) Bexar 6837203	65.60	57.80	*-7.80*	*24.31*	*-18.96*	1932
(9) Smith 3430907	436.22	434.23	*-1.99*	*2.35*	*-136.22*	1977
(10) La Salle 7738103	515.21	504.24	*-10.97*	*10.98*	*-262.14*	2003
(11) Harris 6514409	192.38	191.64	*-0.74*	*2.73*	*-56.88**	1947**
(12) Victoria 8017502	35.07	34.31	*-0.76*	*0.54*	*-1.07*	1958
(13) El Paso 4913301	NA	NA	*NA*	*NA*	*NA*	1964
(14) Reeves 4644501	166.68	166.08	*-0.60*	*9.54*	*-74.59*	1952
(15) Pecos 5216802	211.38	205.43	*-5.95*	*19.64*	*35.50*	1976
(16) Schleicher 5512134	283.71	278.03	*-5.68*	*35.42*	*18.19*	2003
(17) Haskell 2135748	44.71	44.45	*-0.26*	*2.43*	*-1.71*	2002
(18) Hudspeth 4807516	157.40	154.74	*-2.66*	*-0.11*	*-53.48*	1966

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

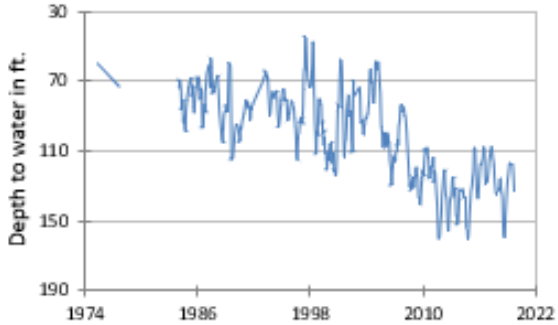
August 2019 OBSERVATION WELL HYDROGRAPHS



(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

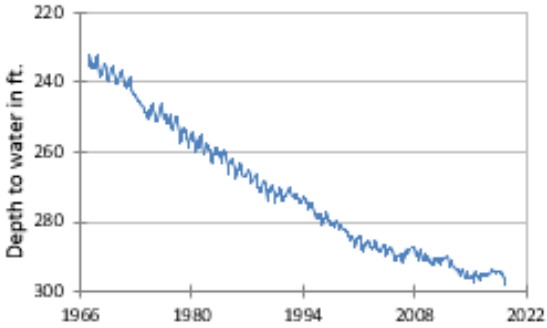
(9) State Well #34-30-907
Red Springs, Smith County
Carrizo-Wilcox Aquifer

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

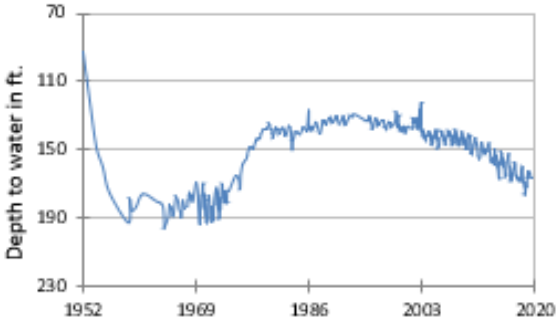
(11) State Well #65-14-409
Alief, Harris County
Evangeline Formation-Gulf Coast Aquifer

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

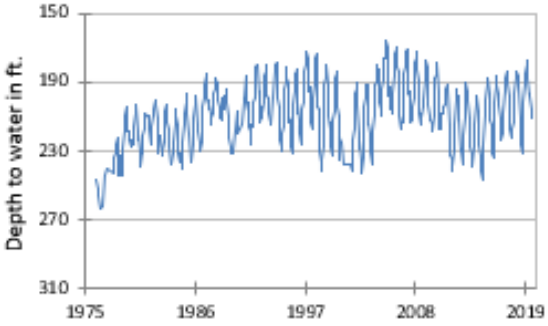
(13) State Well #49-13-301
El Paso, El Paso County
Hueco-Mesilla Bolson Aquifer



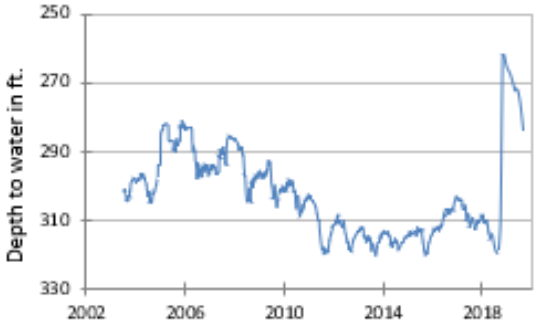
(14) State Well #46-44-501
Near Pecos, Reeves County
Pecos Valley Aquifer



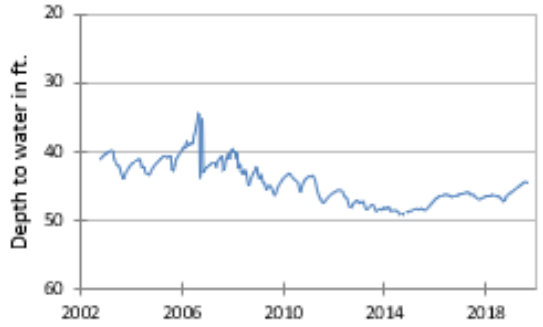
(15) State Well #52-16-802
Fort Stockton, Pecos County
Edwards-Trinity (Plateau) Aquifer



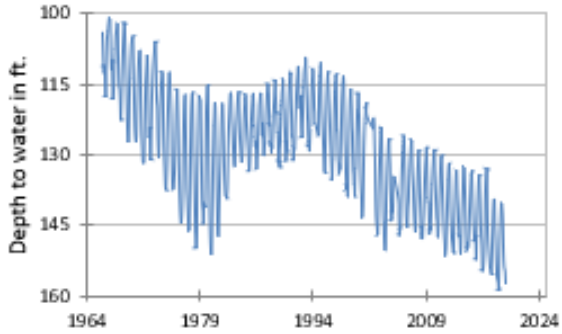
(16) State Well #55-12-134
Eldorado, Schleicher County
Trinity Aquifer



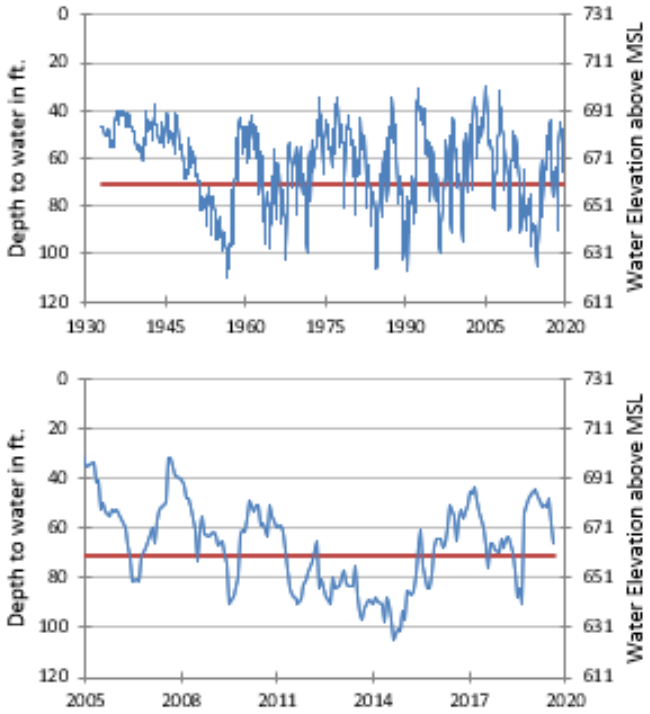
(17) State Well #21-35-748
Near O'Brien, Haskell County
Seymour Aquifer



(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



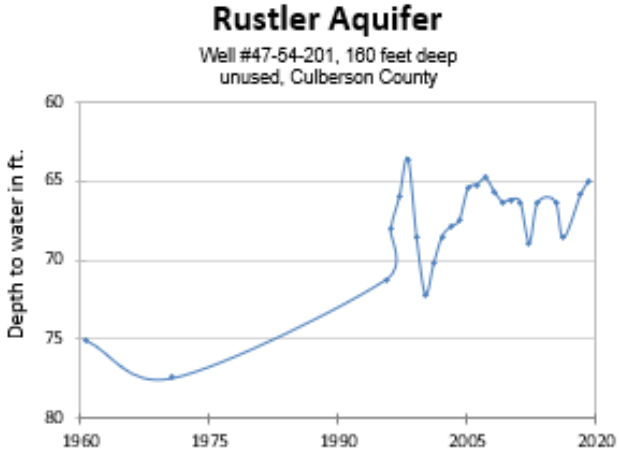
The late August water-level measurement in this Edwards (Balcones Fault Zone) Aquifer well, elevation 731 feet above mean sea level, was 65.60 feet below land surface, or 665 feet above mean sea level. This was 7.80 feet below last month's measurement, 24.31 feet above last year's measurement and 18.96 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.

The Rustler Aquifer is a minor aquifer located in Brewster, Culberson, Jeff Davis, Loving, Pecos, Reeves, and Ward counties. The aquifer consists of carbonates and evaporates of the Rustler Formation, which is the youngest unit of the late Permian Ochoan Series. The Rustler Formation is 250 to 670 feet thick and extends downdip into the subsurface toward the center of the Delaware Basin to the east. It becomes thinner along the eastern margin of the Delaware Basin and across the Central Basin Platform and Val Verde Basin. There it conformably overlies the Salado Formation. Groundwater occurs in partly dissolved dolomite, limestone, and gypsum. Most of the water production comes from fractures and solution openings in the upper part of the formation. Although some parts of the aquifer produce freshwater containing less than 1,000 milligrams per liter of total dissolved solids, the water is generally slightly to moderately saline and contains total dissolved solids ranging between 1,000 and 4,600 milligrams per liter. The water is primarily for irrigation, livestock, and water- flooding operations in oil-producing areas.



The initial measurement of 75.05 feet below land surface was recorded by the USGS in July of 1960. Roughly ten years later, the Texas Water Development Board recorded a water level of 77.42 feet below land surface. It wasn't until 1995 that the TWDB continued to take measurements in the well on a near-annual basis. The period of record reveals a general upward trend in water level with some fluctuations. Long-term variations in water levels are likely attributed to variations in water use patterns.

Far away (left), and close-up (right) images of well #47-54-201.