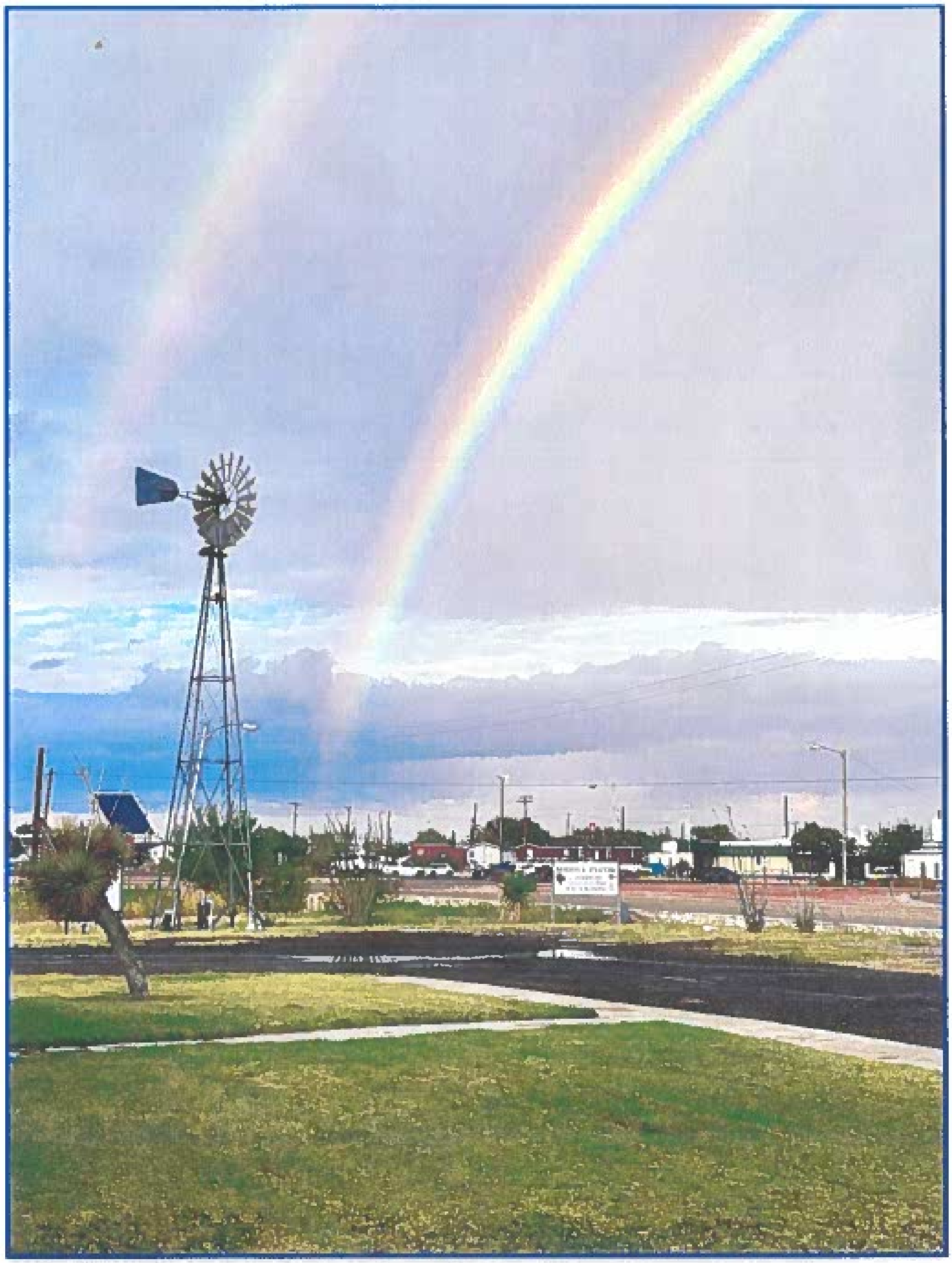
Middle Pecos Groundwater Conservation District
2025- Annual Report

General Manager: Ty Edwards



Submitted by Ty Edwards, General Manager
02/17/2025

Middle Pecos Groundwater Conservation District
2025 Annual Report

Table of Contents

Conservation Letters: (6.2) (6.7)

- Annual Newspaper Article for Publics Information Regarding Groundwater Conservation (6.2) (6.7.1)
- Rainwater Harvesting (6.7.3)

FSH Threshold Dashboard

2025 Trans-Pecos Well Modification Annual Report (6.7.4)

2025 DFC Comparisons (6.8)

List of Appendices:

Annual Audit Fiscal Year Ending 09-30-2025.

Middle Pecos Groundwater Conservation District 2025

Directors		
Janet Groth	President: Director Since June 15, 2010	Precinct 1
Vanessa Cardwell	Vice President: Director Since July 21, 2009	City of Fort Stockton
M. R. Gonzalez	Secretary/Treasurer: Director Since December 11, 2000	Precinct 2
Wayne Tinkler	Director Since June 17, 2025	Precinct 1
Puja Boinpally	Director Since April 18, 2017	Precinct 2
Weldon Blackwelder	Director Since August 16, 2011	Precinct 3
Larry Drgac	Director Since August 13, 2019	Precinct 3
Alvaro Mandujano, Jr.	Director Since November 5, 2002	Precinct 4
Ronnie Cooper	Director Since September 15, 2009	Precinct 4
Jeff Sims	Director Since November 8, 2016	City of Iraan
Billy Jackson	Director Since November 5, 2024	At Large
Current Employees		
Ty Edwards	General Manager: Since January 17, 2017	Assistant Manager: Since December 2, 2013
Gail Reeves	Office Secretary: Since June 3, 2013	
Anthony Bodnar	Field Technician: Since May 7, 2018	
Sheila Lehnert	Office Secretary: Since October 1, 2025	

Left Blank Intentionally

MIDDLE PECOS GROUNDWATER CONSERVATION DISTRICT
P.O. Box 1644 Fort Stockton, TX 79735 Phone (432)336-0698 Fax (432)336-3407
405 North Spring Drive Fort Stockton, Texas 79735
Email: mpgcd@mpgcd.org Website: www.middlepecosgcd.org

2025 Annual Manager's Report
MPGCD Board of Directors

2025 has been an extremely busy and successful year for MPGCD Board Members and staff. The District continues its commitment to manage and protect the groundwater resources of Pecos County and help maintain a sustainable, adequate, reliable, cost effective and high-quality source of groundwater to promote the vitality, economy and environment of the District. Below is a summary of work done this year.

Governance and Administration

- **Board Leadership Changes:** In May 2025, Board President Jerry McGuairt resigned because he moved out of his precinct. In June, Wayne Tinkler was appointed to fill the Precinct 1 vacancy, and the Board reorganized officers, electing Janet Groth as President, Vanessa Cardwell as Vice President, and M.R. Gonzalez as Secretary/Treasurer.
- **The District hired additional administrative help.** Sheila Lehnert started October 1, 2025.
- **Financial Audit:** The Board approved the financial audit for the year ending September 30, 2024, which received an unmodified opinion. Due to the retirement of the previous auditor, the Board engaged Garza/Gonzalez & Associates, LLC for the 2025 fiscal audit.
- **Budget and Tax Rate:**
  - The Board adopted the budget for the fiscal year ending September 30, 2026, in August 2025.
  - The Board adopted a tax rate of **$0.0202 per $100 valuation**, which represented the "No New Revenue" tax rate.

Groundwater Management and Permitting

- **Management Plan:** The Board adopted the 2025 Amendment to the District Management Plan and a corresponding resolution on May 20, 2025.
  - Fort Stockton Holdings (FSH) and Clayton Williams Farms submitted comments supporting the plan's data collection but criticizing references to a "sustainability" report by Dr. Robert Mace, arguing it reflected policy aspirations rather than law.
- **Permit Approvals:**
  - **Pecos County WCID #1:** An amendment was approved to add two wells and increase production authorization to **465 acre-feet/year**.
  - **Longfellow Ranch Partners:** A production permit was approved for **322.6 acre-feet/year** from the Rustler Aquifer for irrigation.
  - **Pecos County (Rooney Park):** A permit was approved for **250 acre-feet/year** for irrigation.
  - **Raymundo and Beverlie Franco**: The Board approved a drilling permit for an irrigation well to produce 100-500 gpm from the Edwards-Trinity Aquifer.

- **Export Fees:**
    - The Board designated a separate account for export fees to serve as a mitigation fund.
    - Following a statutory 3% increase, the export fee was set at **21.22 cents per 1,000 gallons**.
    - Representatives from Upton County voiced concerns regarding these fee increases in June.

Legal Matters and Regulatory Actions

- **Cockrell Investment Partners Petition for Inquiry:**
    - Cockrell filed a petition with the TCEQ alleging the District failed to adopt rules to protect the aquifer, specifically criticizing the FSH settlement and lack of production cutback rules.
    - The TCEQ Commissioners heard the petition on May 22, 2025, and **unanimously dismissed it**, issuing an order on May 27, 2025, affirming that MPGCD rules were sufficient.
- **Cockrell Litigation (Supreme Court):** The Texas Supreme Court granted Cockrell's petition for review in the *Cockrell I* and *Cockrell II* lawsuits, The Court granted the petition to consider the appeal and take oral arguments, which occurred on November 4, 2025. Waiting for a decision from the Court.

- **Railroad Commission (RRC) Litigation and Well Plugging Efforts:**
    - The District sued the RRC after the Commission denied requests to add specific wells to its plugging list.
    - On August 19, 2025, the District Court judge granted the RRC's plea to the jurisdiction and **dismissed the lawsuit**.
    - **TCEQ Grant:** The District received draft contract documents for the Leaking Water Wells Grant Program (LWWGP), with a deadline for comments set for December 5, 2025.
    - **Railroad Commission (RRC):** General Manager Ty Edwards and President Janet Groth met with RRC Chairman Jim Wright in Austin to discuss the **600 orphan wells** in Pecos County. Chairman Wright was receptive but noted funding as a major concern, suggesting future collaboration with the Department of Energy.

Scientific Initiatives

- **Rustler Monitor Well:** The District moved forward with drilling a new Rustler Monitor Well on Williams Farms. As of December, the well has been completed, and are in the process of moving the rig. Water samples have been sent to the laboratory for final water analysis. The results are still pending. A final report will be submitted.
- **Groundwater Model:** Work continued on the Pecos County Groundwater Flow Model, with completion expected by year-end 2026.

Rulemaking and Policy Changes

- **Adoption of Rule Amendments:** On November 18, 2025, the Board held a public hearing and subsequently approved amendments to the District's rules to align with statutory changes from the 89th Texas Legislature. Key changes include:
    - **Civil Penalties:** The civil penalty for rule violations was increased from a maximum of $10,000 to **$25,000 per violation per day**, with provisions for higher penalties if the economic benefit gained by the violator exceeds that amount.
    - **Meeting Notices:** The notice period for Board agendas regarding rule petitions and permit administrative completeness was changed from three "calendar" days to **three "business" days**.

- **Brackish Groundwater Production Zones (BGPZ):** On October 21, 2025, the Board approved a resolution to amend the BGPZs for the Rustler Aquifer.
    - **Technical Basis:** A technical memorandum recommended these amendments to protect **Diamond Y Spring** and the endangered **Pecos gambusia.** The recommendation includes

removing specific BGPZ footprints that are regionally downgradient of the spring to prevent flow reduction.
    - **Missed Wells:** The amendment also seeks to include qualifying wells (domestic, municipal, or agricultural) that were omitted during the original 2016 designation, applying a three-mile exclusionary buffer around them.

89Th Texas Legislature- Texas made a major, long-term investment in the state's water infrastructure and science, which includes significant attention to groundwater resources. The overall focus was on securing Texas's water future amidst population growth and drought.

1. Water Funding and Infrastructure (HJR 7 & SB 7)

- **House Joint Resolution 7 (HJR 7):** This proposed a constitutional amendment (approved by Texas voters as **Proposition 4** in November 2025) to dedicate **$1 billion annually** of state sales and use tax revenue to the **Texas Water Fund** for 20 years, beginning in September 2027.
    - **Groundwater Restriction:** The amendment explicitly **prohibits** using this dedicated public funding stream to finance infrastructure whose primary purpose is to **transport non-brackish (fresh) groundwater** out of a rural area, with an exception for Aquifer Storage and Recovery (ASR) projects. This provision is a safeguard for local and rural groundwater supplies.
- **Senate Bill 7 (SB 7):** This bill provides the statutory framework for the Texas Water Fund and the appropriation process.
    - It also provided an initial, **one-time appropriation of approximately $2.5 billion** to jumpstart water infrastructure development.
    - It expands eligible projects to include **water reuse, desalination, and out-of-state water acquisition**, diversifying water sources, which indirectly reduces reliance on fresh groundwater.

2. Groundwater Science and Management

- **Groundwater Science Funding:** The Legislature included **$7.5 million** in the General Appropriations Act for grants to **Groundwater Conservation Districts (GCDs)** for **research, science, and data collection** projects. This is a significant step toward improving the local, science-based management of aquifers.
- **HB 2078:** This bill revises **joint groundwater planning requirements** for Desired Future Conditions (DFCs) in Groundwater Management Areas to increase transparency and accountability in the DFC process, which is critical for the long-term sustainability of aquifers.
- **HB 1633:** Requires Groundwater Conservation Districts to **consider the impact of new permits on registered and exempt wells** within the district before granting or denying a permit, adding another layer of protection for existing water users.

3. Produced Water and Wastewater

- **Senate Bill 1145 (SB 1145):** This bill authorizes the Texas Commission on Environmental Quality (TCEQ) to issue permits for the **land application of water produced from oil and gas extraction operations** (produced water), transferring the permitting authority from the Railroad Commission to the TCEQ. This created debate regarding the safety standards for applying this type of wastewater to the land.

The 89th Legislative Session was dominated by a concerted effort to address the state's rapidly growing water demand, exacerbated by persistent drought conditions. This resulted in a **generational investment** in water infrastructure.

- **Focus on Funding:** The primary accomplishment was establishing the **Texas Water Fund** and its dedicated, long-term funding stream, which was a top priority for state leadership.

- **Local Control vs. State Liability:** While the funding bills passed, there was significant debate and several bills were filed (though ultimately not passed in the regular session) regarding the balance between the **Rule of Capture** (the Texas common law giving landowners the right to pump groundwater beneath their land) and the authority of local Groundwater Conservation Districts (GCDs).
    - One notable special session bill (HB 215, which did not pass the full legislature) would have introduced state-level liability for large-scale groundwater withdrawal (over 25,000 gallons/day) causing harm to neighboring landowners, challenging the traditional *Rule of Capture* for large projects.
- **Export Restrictions:** The Legislature showed a clear intent to restrict the use of *public funds* for exporting fresh groundwater from rural areas (via HJR 7), signaling an effort to protect rural communities from large-scale water transfers to urban centers.

Annual Production Reporting by Management Zone and Aquifer

- **2025 Rainfall**
  According to the United States Drought Monitor for Pecos County, TX, the 2025 year began with more than 90% of Pecos County experiencing moderate to exceptional drought conditions (Figure 1, Water Data for Texas, 2025). By year-end, drought coverage had improved significantly, with just over 30%, of the County remaining in drought and less than 2% classified as severe to extreme drought. Throughout the County and surrounding areas, most weather stations recorded reported higher annual precipitation in 2025 (Figure 2), as compared to recent prior years. However, at the Fort Stockton Pecos County Airport station, the 2025 precipitation total was roughly 60% below its historic annual average (Figure 3).

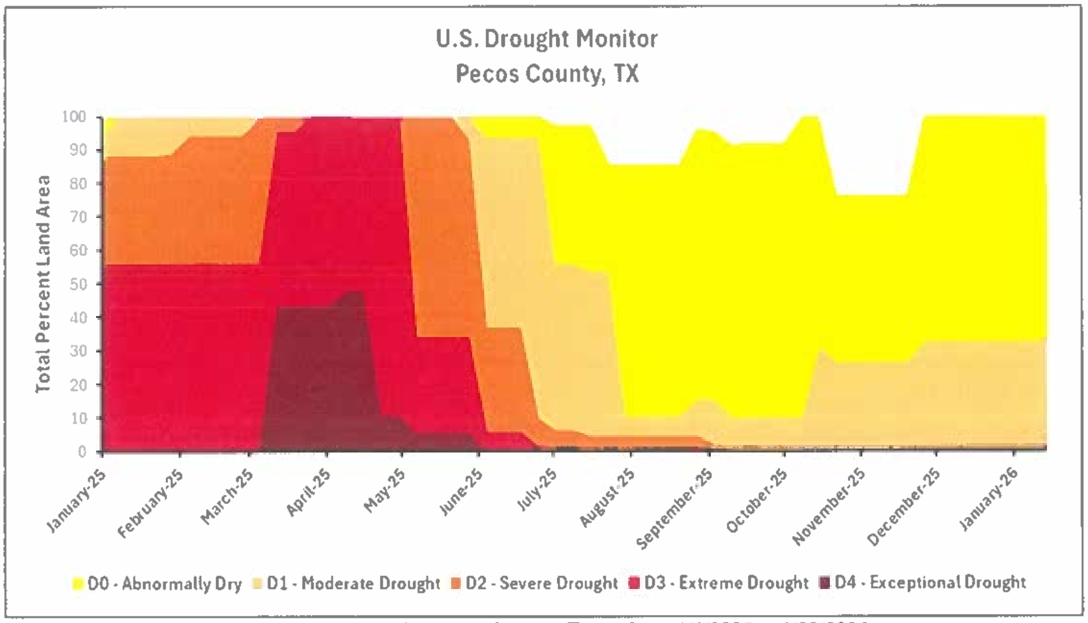


Figure 1 – United States Drought Monitor for Pecos County, Texas from 1/1/2025 to 1/20/2026.

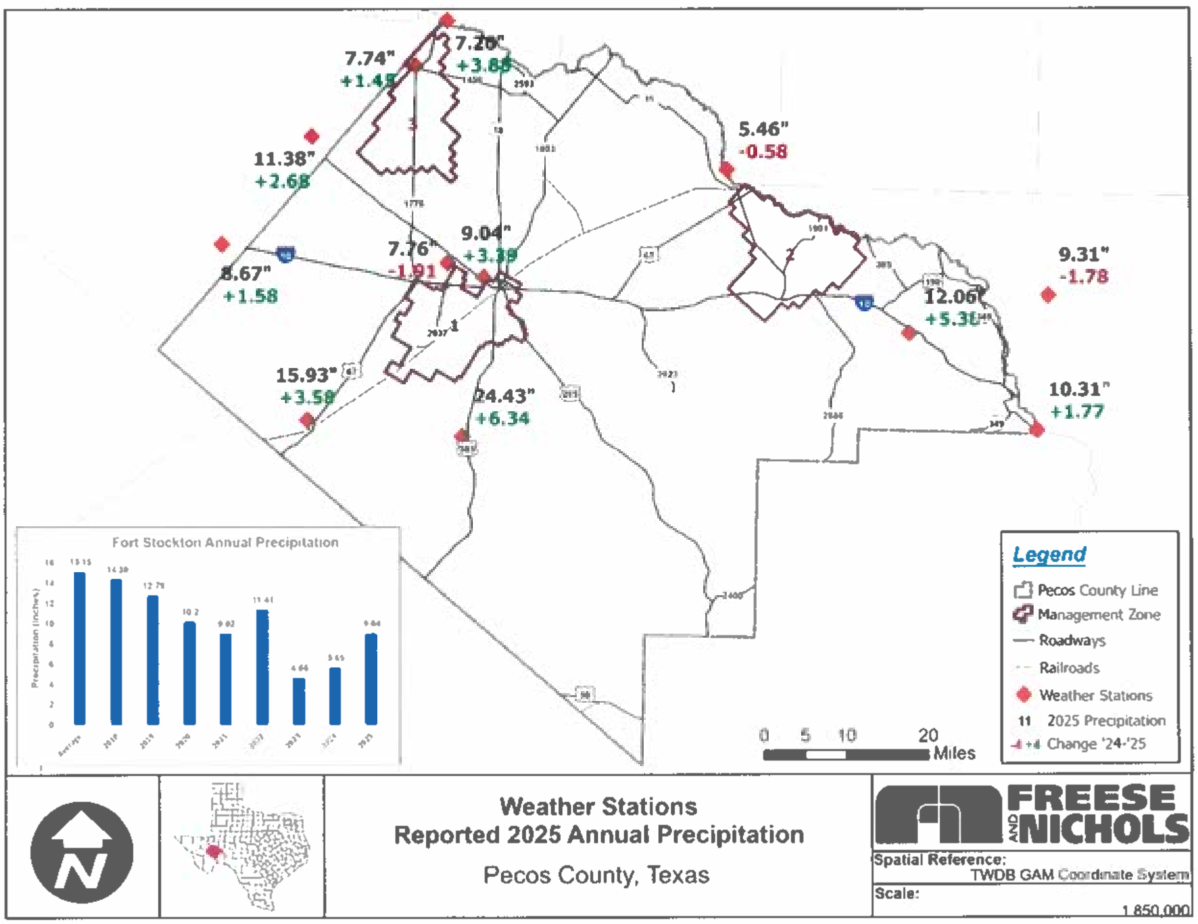


Figure 2 – TexMesonet weather stations across Pecos County, TX and surrounding areas with reported precipitation totals and change from prior year. Measured precipitation data downloaded from Iowa Environmental Mesonet, TexMesonet, National Center for National Centers for Environmental Information, and West Texas Mesonet.

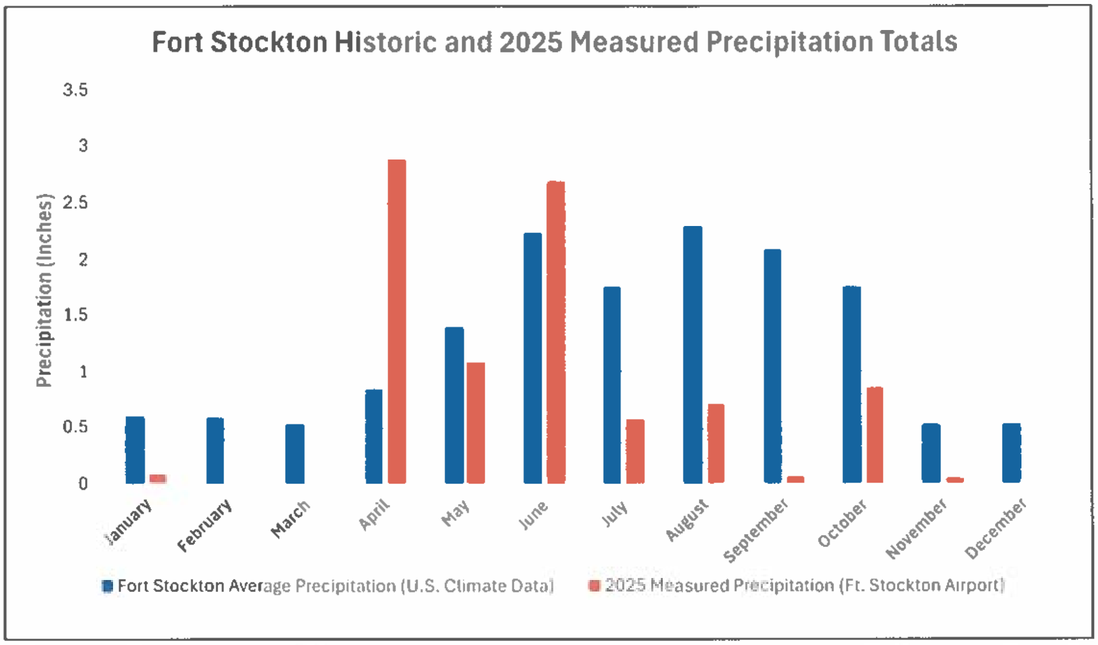


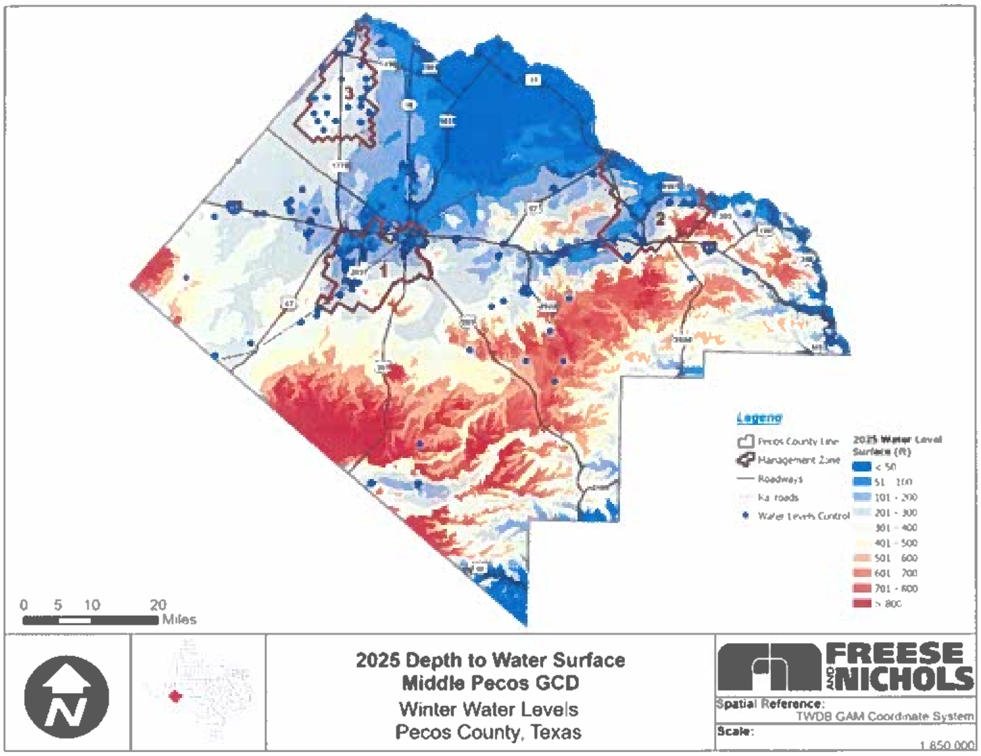
Figure 3 – Fort Stockton, Pecos County, TX Historic and 2025 Measured Precipitation Totals. Historic precipitation data according to the U.S. Climate Data Center and measured precipitation according to National Centers for Environmental Information station data

- **2025 Water Levels**

Gradual water level declines and seasonal fluctuations consistent with drought were observed across the County (Figure 4). In areas with limited pumping, water levels remained relatively stable. Whereas, areas with irrigated croplands (Management Zone 1 and 3) showed relatively mild year-over-year drawdowns.

The District currently monitors 139 water wells in Pecos County. Of these, 132 wells had water level measurements available for comparison to the prior year, and 61% (80 of 132) were stable or showed net recovery relative to their 2025 winter measurement (Figure 5). Of the 52 wells that showed decline, 41 experienced less than 10 feet of drawdown while only one well had a decline of more than 20 feet.

When comparing 2012 to 2026 water level measurements, the general trend is flat to slightly downward, with most drawdown observed in Management Zone 3 and along the Reeves County Line (Figure 6). Monitor well #230 ("Allison Ranch Generator Well") in southern Pecos County has shown the most significant decline over the period. This trend has been documented and discussed in prior General Manager Reports, with more recent measurements showing the water levels in that well are stabilizing.



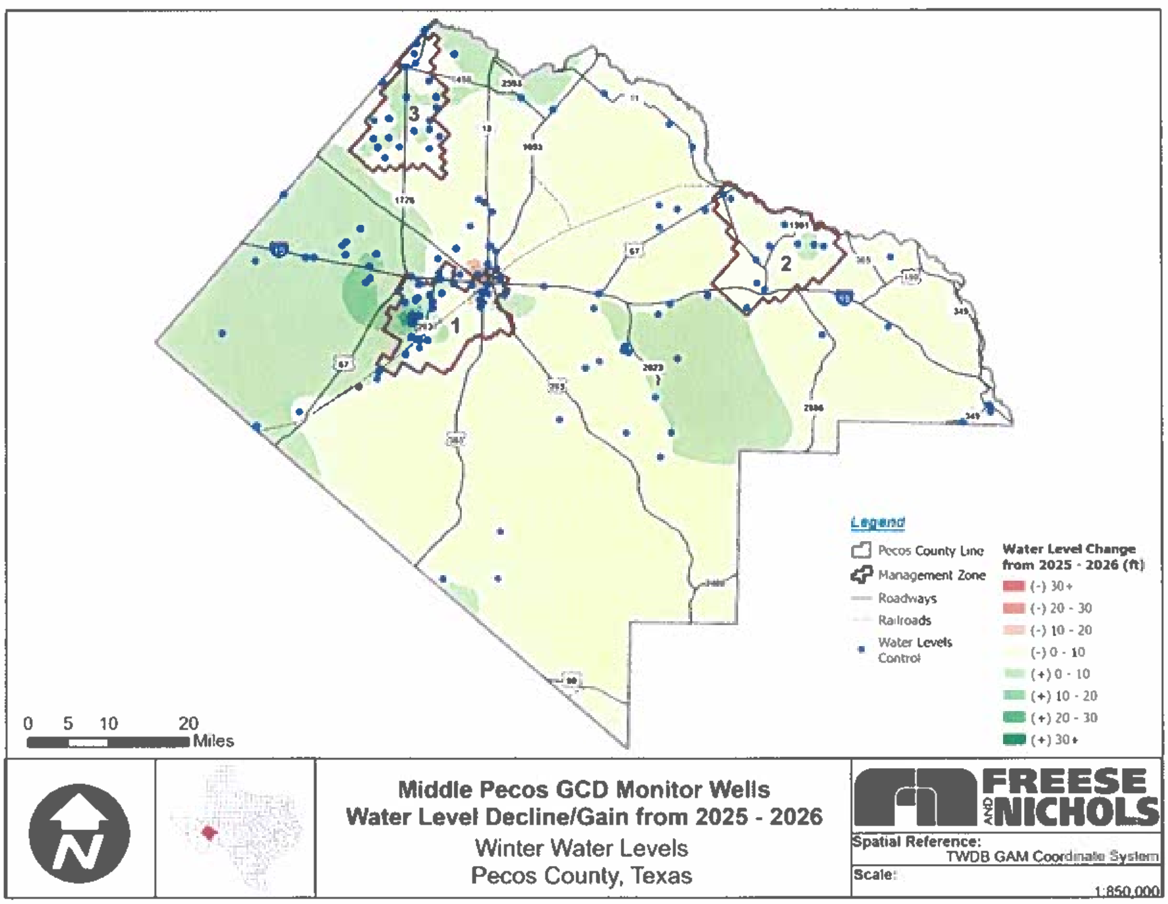


Figure 4 – Pecos County, TX Water Level Decline/Gain from 2023 – 2024. Gains are visible as shades of green while declines are illustrated as yellow to shades of red.

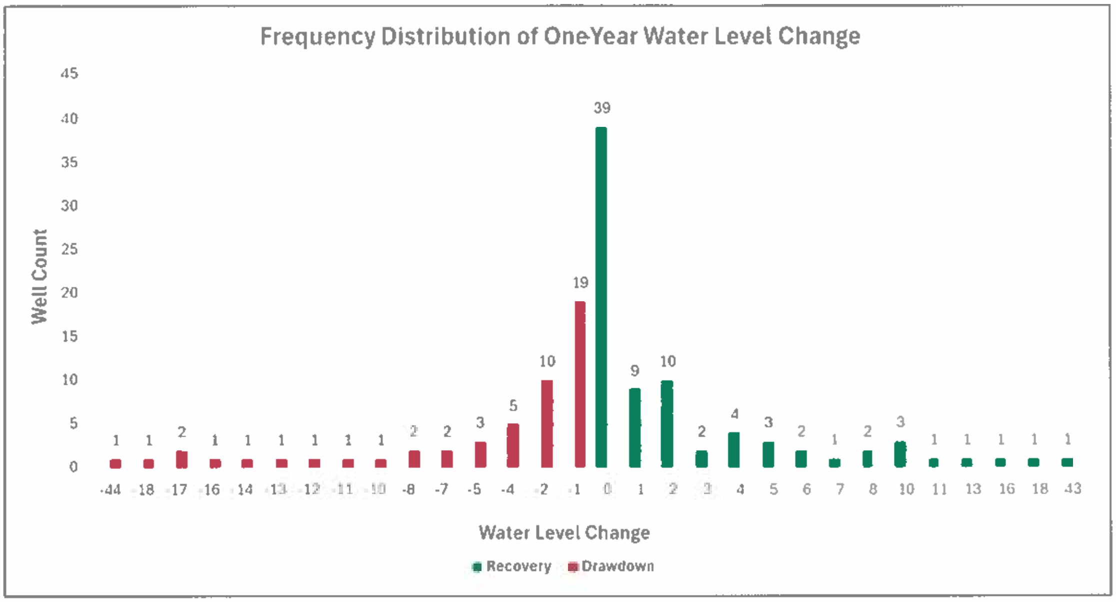


Figure 5 – Monitor well winter water level change from 2025 to 2026. Red illustrates a year-over-year decline while green illustrates a water level gain (recovery). This chart includes data from the monitor wells where 2024 and 2025 winter measurements were available.

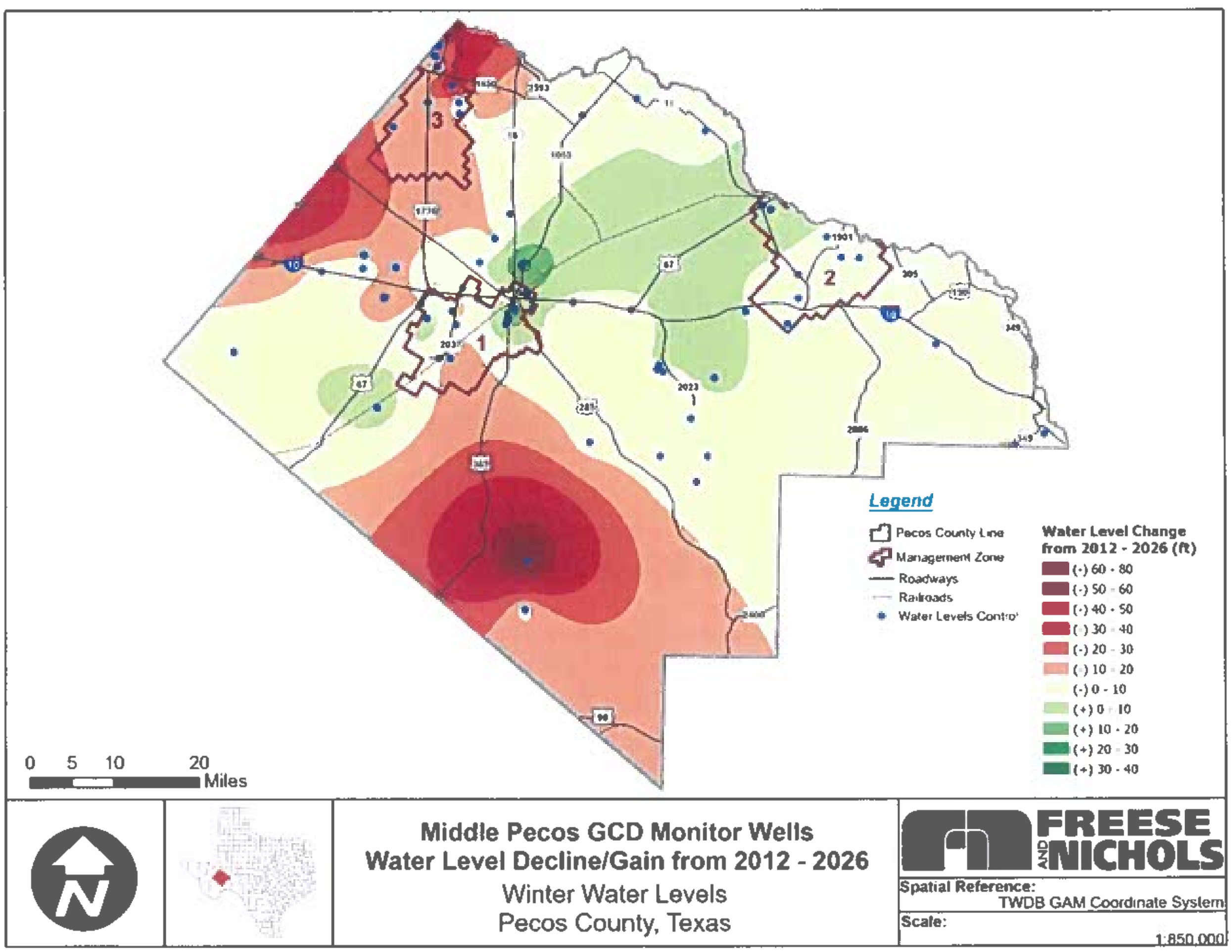


Figure 6 - Pecos County, TX Water Level Decline/Gain from 2012 - 2025. Gains are visible as shades of green while declines are illustrated as yellow to shade of red.

- **Water Samples-** In Corporation with local landowners **44** water samples have been collected across Pecos County in 2025.

- **Diamond Y Spring**-The Nature Conservancy has installed Telemetry in Diamond Y Springs. The Conservancy has created an extensive groundwater monitoring program to track spring flows, water quality, and the health of the pupfish and other species. Over the last few years, we have seen a decrease in flows during the summer months and a recovery in winter months. Diamond Y Spring Preserve protects one of the largest and last remaining Cienega systems in West Texas. The District updated the geologic model in 2021 and 2023, around the Diamond Y Spring area and was able to map several faults. The District has installed 6 full time monitoring wells equipped with In-Situ Transducers recording water level and water quality in real time. This equipment is installed in 5 Edwards Trinity Wells and 1 Rustler Well around the spring area.

- **Santa Rosa Spring-** continues to remain dry. The spring bed is being monitored and we are tracking changes in pressure during rain fall events.

- **Comanche Spring**- is continually monitored for flow, pressure, and conductivity during the Winter Spring Season. No Flow at Comanche Spring was measured in Winter of 2025.

- The District drilled a **Monitor Well at the MPGCD Office located at 405 North Spring Drive**. The purpose of the well is for an educational monitoring site outside the office. An 8ft Aeromotor windmill has been installed over the well with full time In-Situ monitoring equipment downhole. A full exhibit has been erected at the site.

- **PECOS COUTNY GROUNDWATER MODEL Phase 1** of building a groundwater flow model has begun with completion of the model anticipated for 2026. The objective is to develop a tool that would assist the District in groundwater management. The google link for the tech memos is available at:

  https://drive.google.com/drive/folders/1HYj8JRV4omAgKPJWBta-T20hZUbtyaPS.

  Specific uses that are contemplated include:

  - DFC development without the need to use regional GAM's.
  - Provide a quantitative basis for future updates to the District's rules that set a threshold on well size/pumping amount for requiring permit applicants to prepare hydrologic reports.
  - Provide a tool that can be used to review permit applications by quantifying the potential impacts of new pumping for any formation/aquifer in the District on a regional scale.
  - Assess the relationship between groundwater pumping and spring flow at Comanche Springs on a monthly time scale.

- The **third round of joint planning** for Groundwater Management **Areas 3 and 7** is complete and the fourth round of joint planning is underway. For this round, the statutory deadline to propose desired future conditions (DFC's) is May 1, 2026, and the deadline to submit final DFC's to the Texas Water Development Board is January 5, 2027. I attended 100% of all the GMA 3 and GMA 7 meetings held in 2025.

  https://www.twdb.texas.gov/groundwater/management_areas/gma3.asp

  https://www.twdb.texas.gov/groundwater/management_areas/gma7.asp

- The **Region F Water Planning Group** is tasked with developing and adopting a regional water plan in accordance with Texas Senate Bill 1 and Texas Senate Bill 2. The 2026 Region F Plan was submitted to the Texas Water Development Board, and we held our last meeting to adopt the 2026 plan on September 18, 2025. The seventh cycle of regional planning is underway for the 2031 State Water Plan. I am a voting member of Region F representing Groundwater Management Area 3 and have attended 100 percent of the scheduled meetings for Region F in 2025.

  https://www.twdb.texas.gov/waterplanning/rwp/plans/2026/index.asp

- **Fort Stockton Holdings** 28,400 ac/ft export permit was renewed for a 3-year permit term effective July 18, 2023-2026, in accordance with District Rule 11.8(f) and Texas Water Code 36.1145. FSH and MPGCD approved a Joint Study to be proactive, to develop scientific data that will provide FSH, the District, and other stakeholders with more certainty about conditions in the Edwards-Trinity Aquifer. FSH agreed to pay $250,000 to contribute to the study. As of this date the District has installed transducers, which record pressure, temperature, and conductivity at the 11 Threshold monitor well sites. Completed drilling and installing monitoring equipment in New Rustler Monitoring Well.

  FSH Threshold Well Dashboard is available at https://mpgcd.halff.com/Dashboard.

- **Management Zone 1 Threshold Wells**- Management Zone 1 Threshold Wells are continuously monitored, and data is provided by telemetry in HydroVu (Figure 7). Water levels demonstrate relative year-over-year consistency as they are mostly in line with 2022 and 2023 measurements. All threshold wells will be evaluated on April 1st for Winter 1 – 4 water level threshold trigger levels.

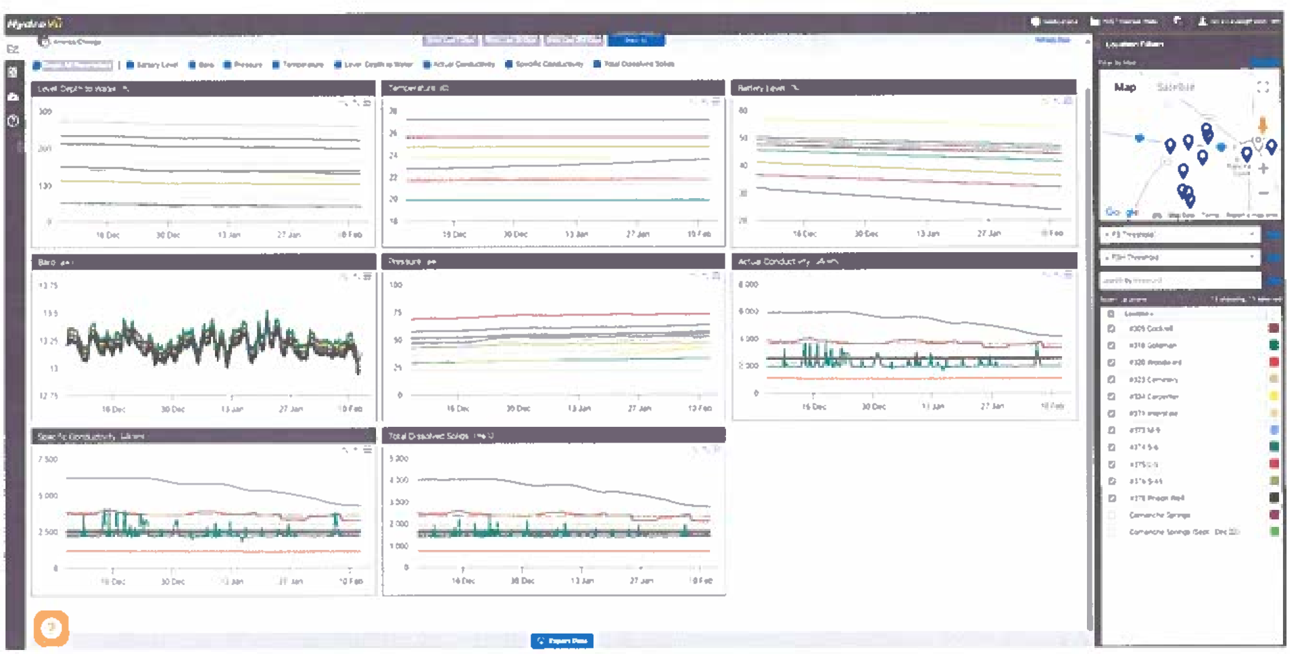


Figure 7 – HydroVu Threshold Well Dashboard. The HydroVu dashboard provides continuous reporting of water level depth, temperature, pressure, conductivity, and total dissolved solids.

- As General Manager of the District, I would like to thank MPGCD Directors for all the hard work and time you dedicated to 2025.

Ty Edwards, General Manager

- References

IEM (Iowa Environmental Mesonet). DCP/HADS Data Download. Data was downloaded on January 22nd, 2026. (https://mesonet.agron.iastate.edu/request/dcp/fe.phtml)

Middle Pecos Groundwater Conservation District Groundwater Database. Water Level Data Downloaded on January 26th, 2025.

NOAA National Centers for Environmental Information (NCEI). Climate Data Online (CDO): Global Summary of the Month (GSOM) Station Detail (GHCND:USW00023091). Data was downloaded on January 22nd, 2026. (https://www.ncdc.noaa.gov/cdo-web/datasets/GSOM/stations/GHCND:USW00023091/detail)

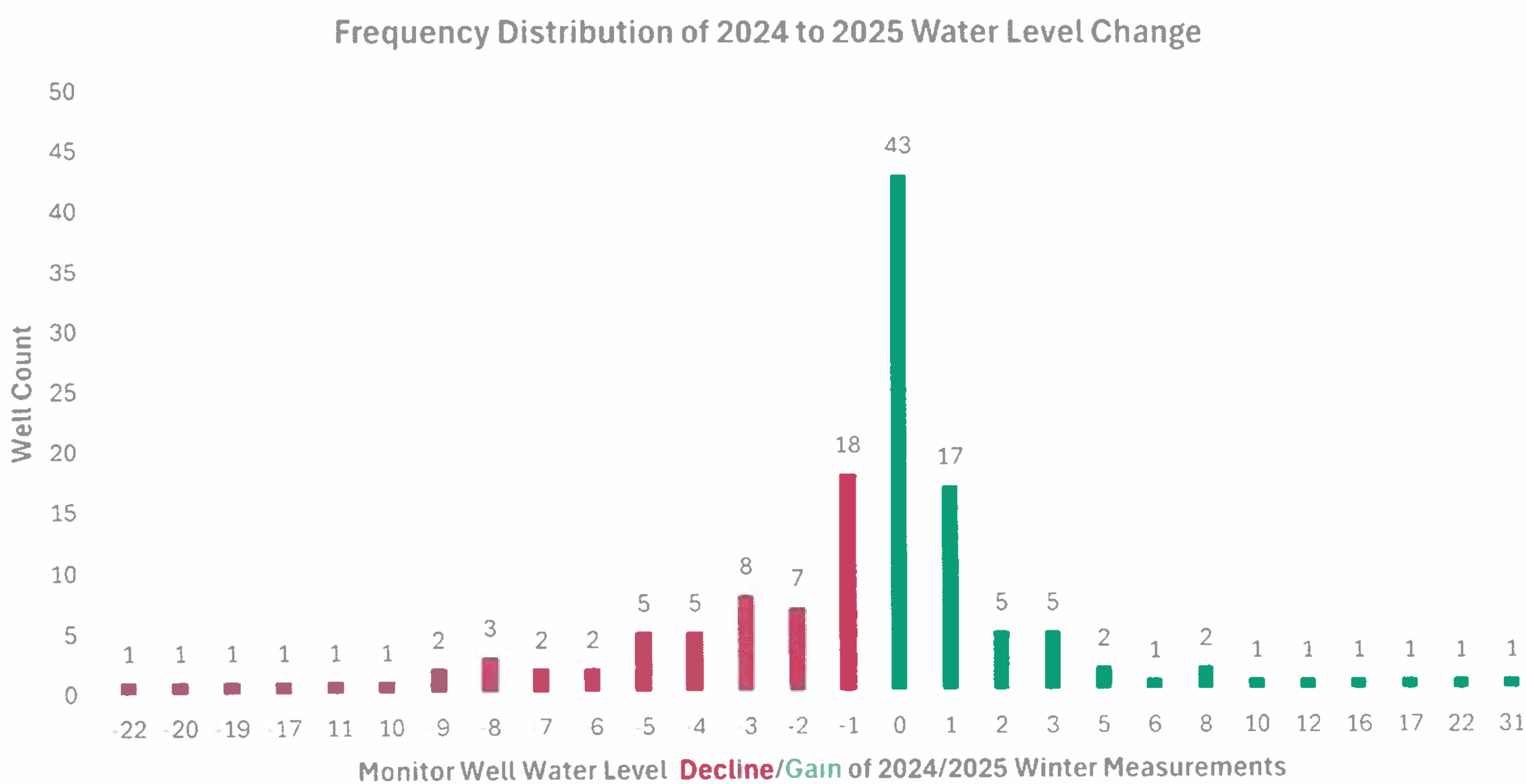
Texas Mesonet. Data Products: Custom Downloads. Data was downloaded on January 22nd, 2026. (https://www.texmesonet.org/DataProducts/CustomDownloads)

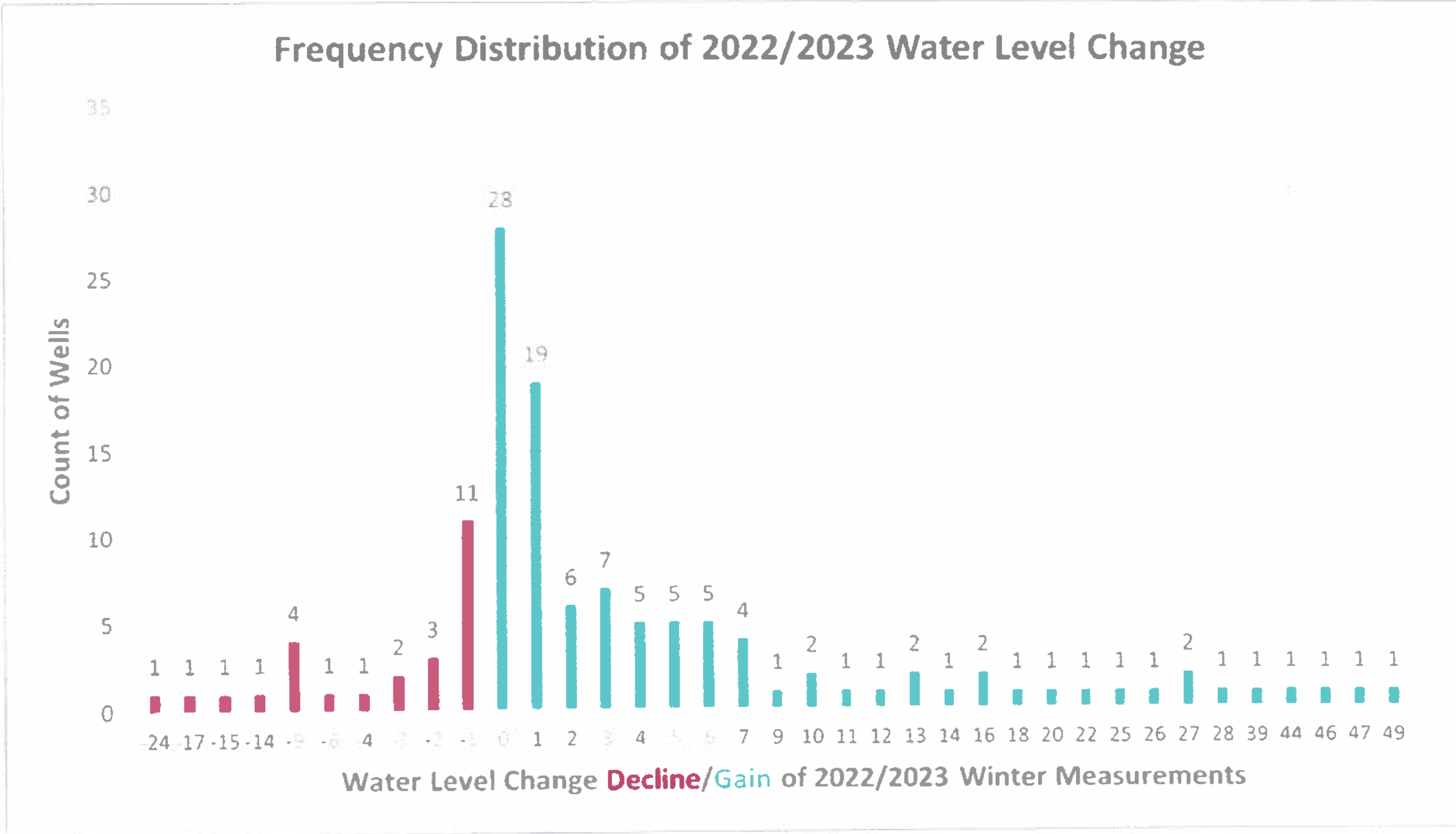
Texas Tech University (TTU) Mesonet. Historical Precipitation Data. Data was downloaded on January 22nd, 2026. (https://mesonet.ttu.edu/precip-hst)

U.S. Climate Data. Climate data for Fort Stockton, Texas. Data was downloaded on February 4th, 2025. (https://www.usclimatedata.com/climate/fort-stockton/texas/united-states/ustx0473)

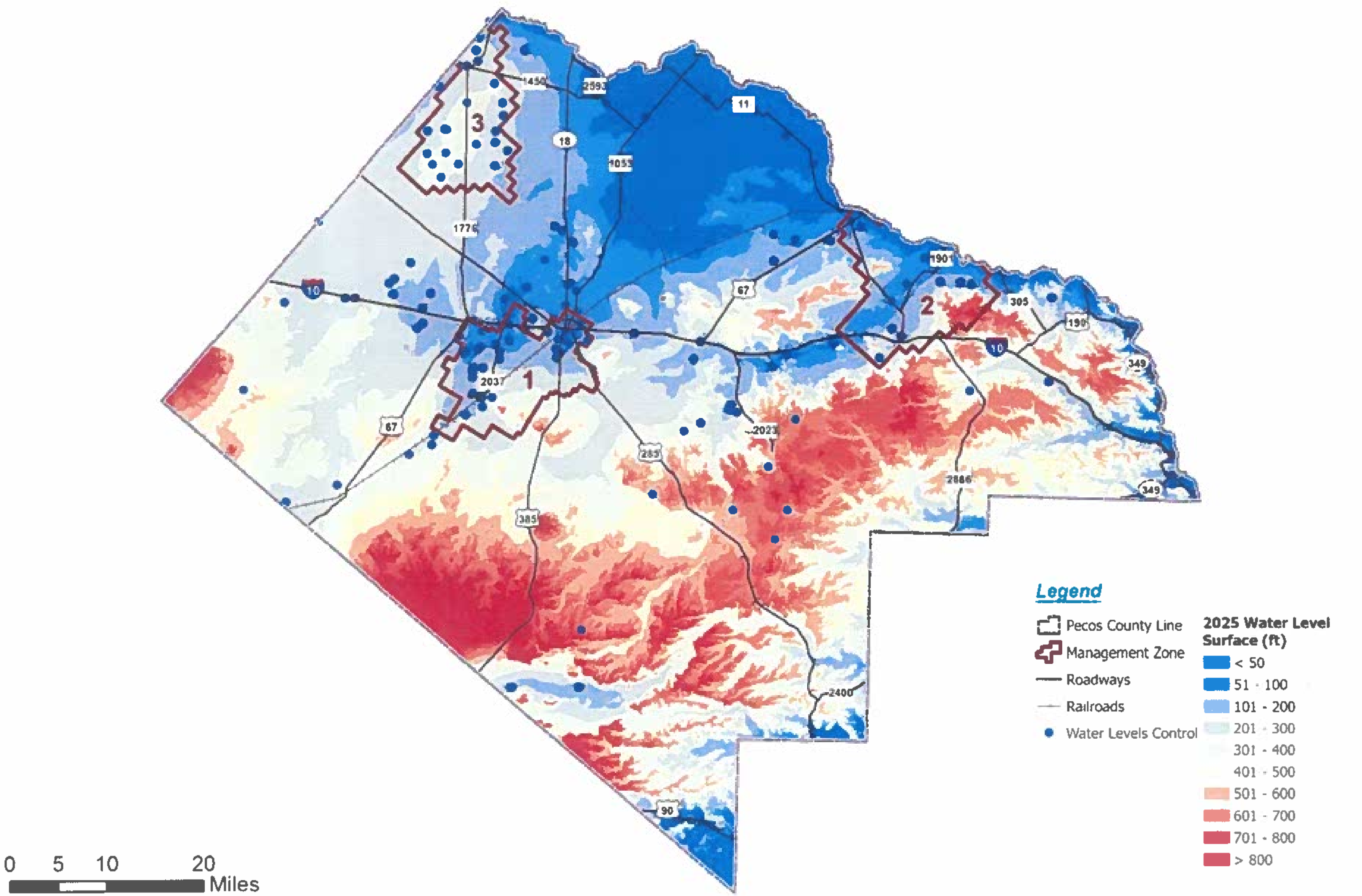
Water Data for Texas. Drought Monitor Drought Dashboard. Data was downloaded on January 22nd, 2026.

Left Blank Intentionally


Frequency Distribution of 2024 to 2025 Water Level Change
Well Count
50 45 40 35 30 25 20 15 10 5 0
1 1 1 1 1 1 2 3 2 2 5 5 8 7 18 43 17 5 5 2 1 2 1 1 1 1 1 1
-22 -20 -19 -17 11 10 -9 -8 -7 6 -5 -4 -3 -2 -1 0 1 2 3 5 6 8 10 12 16 17 22 31
Monitor Well Water Level Decline/Gain of 2024/2025 Winter Measurements



Frequency Distribution of 2022/2023 Water Level Change
Count of Wells
30
25
20
15
10
5
0
1 1 1 1 4 1 1 2 3 11 28 19 6 7 5 5 5 4 1 2 1 1 2 1 2 1 1 1 1 1 2 1 1 1 1 1 1
-24 -17 -15 -14 4 1 2 4 7 9 10 11 12 13 14 16 18 20 22 25 26 27 28 39 44 46 47 49
Water Level Change Decline/Gain of 2022/2023 Winter Measurements



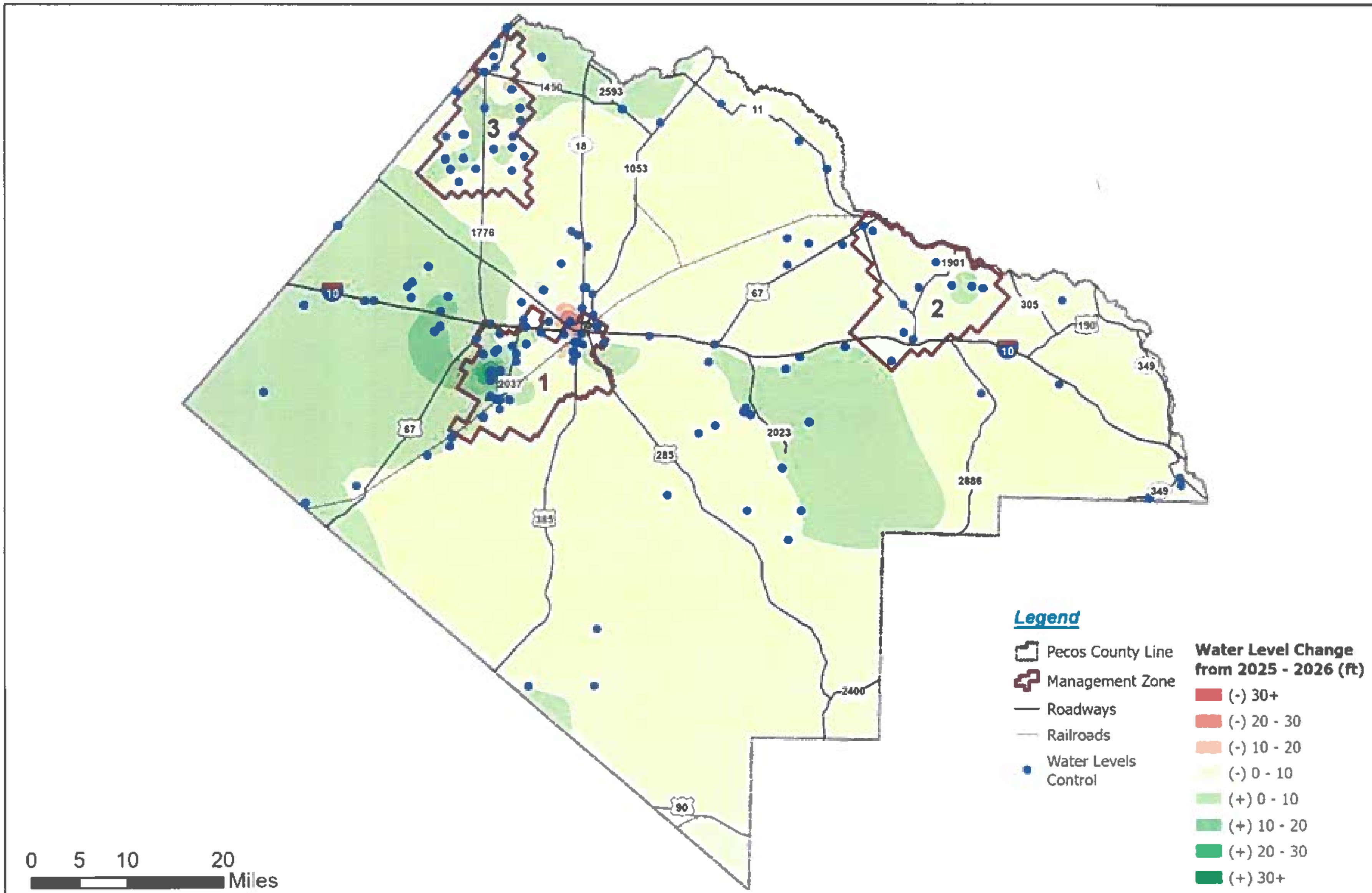
2025 Depth to Water Surface
Middle Pecos GCD

Winter Water Levels
Pecos County, Texas

FREESE AND NICHOLS

Spatial Reference: TWDB GAM Coordinate System

Scale: 1:850,000

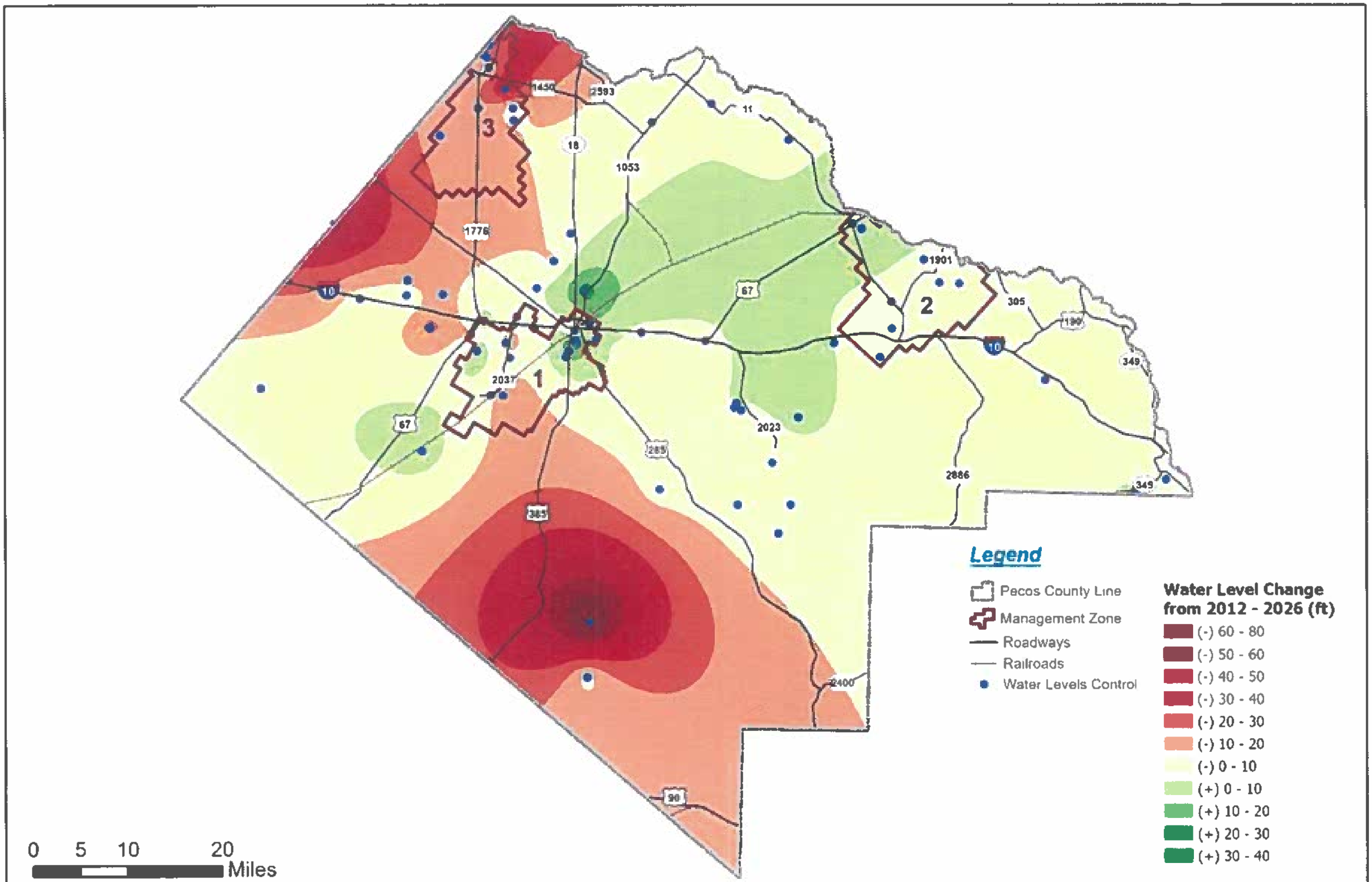


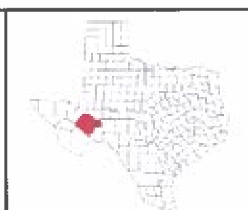
Middle Pecos GCD Monitor Wells
Water Level Decline/Gain from 2025 - 2026
Winter Water Levels
Pecos County, Texas

FREESE AND NICHOLS

Spatial Reference: TWDB GAM Coordinate System

Scale: 1:850,000





Middle Pecos GCD Monitor Wells
Water Level Decline/Gain from 2012 - 2026

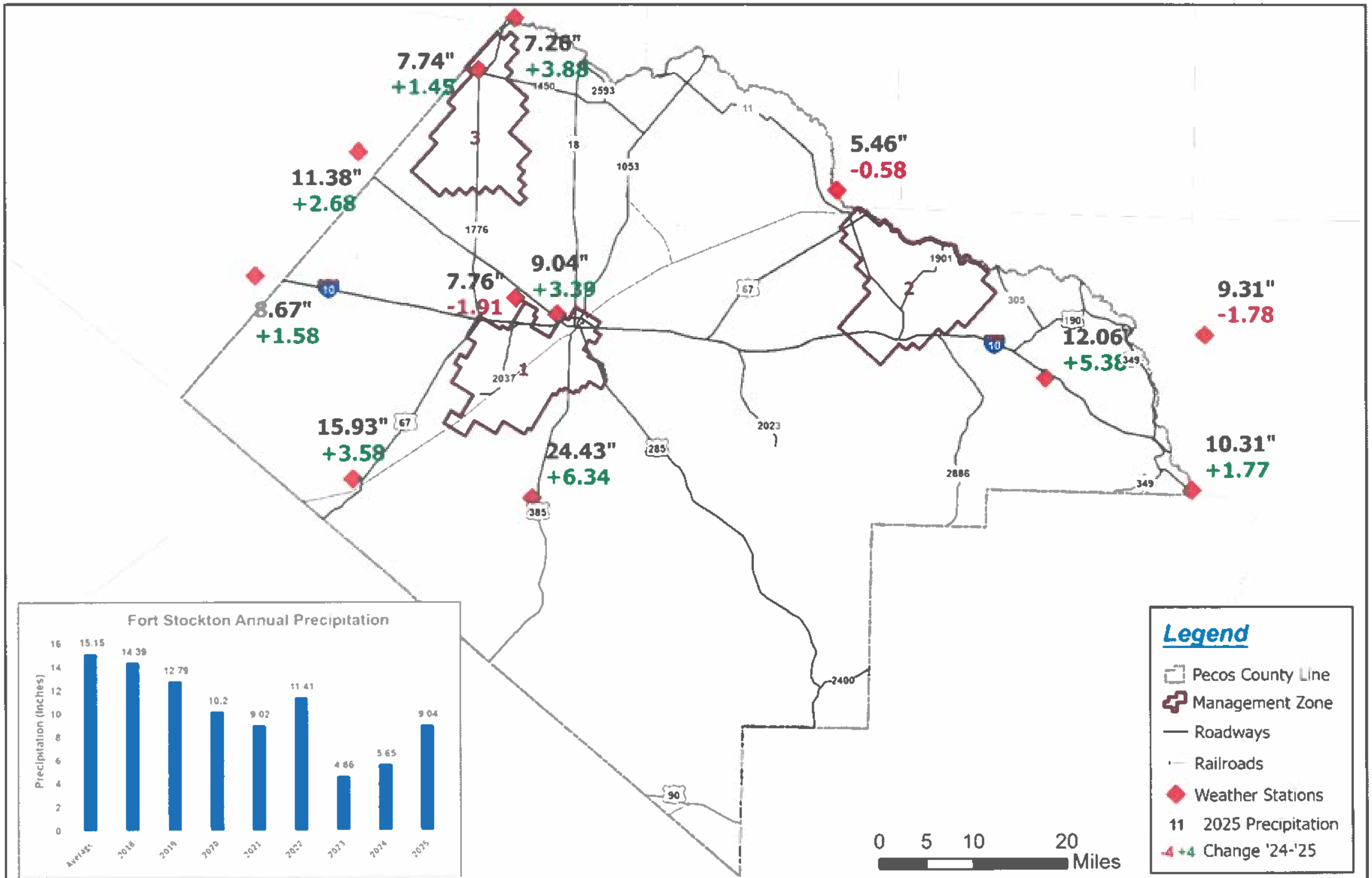
Winter Water Levels

Pecos County, Texas

FREESE AND NICHOLS

Spatial Reference: TWDB GAM Coordinate System

Scale: 1:850,000

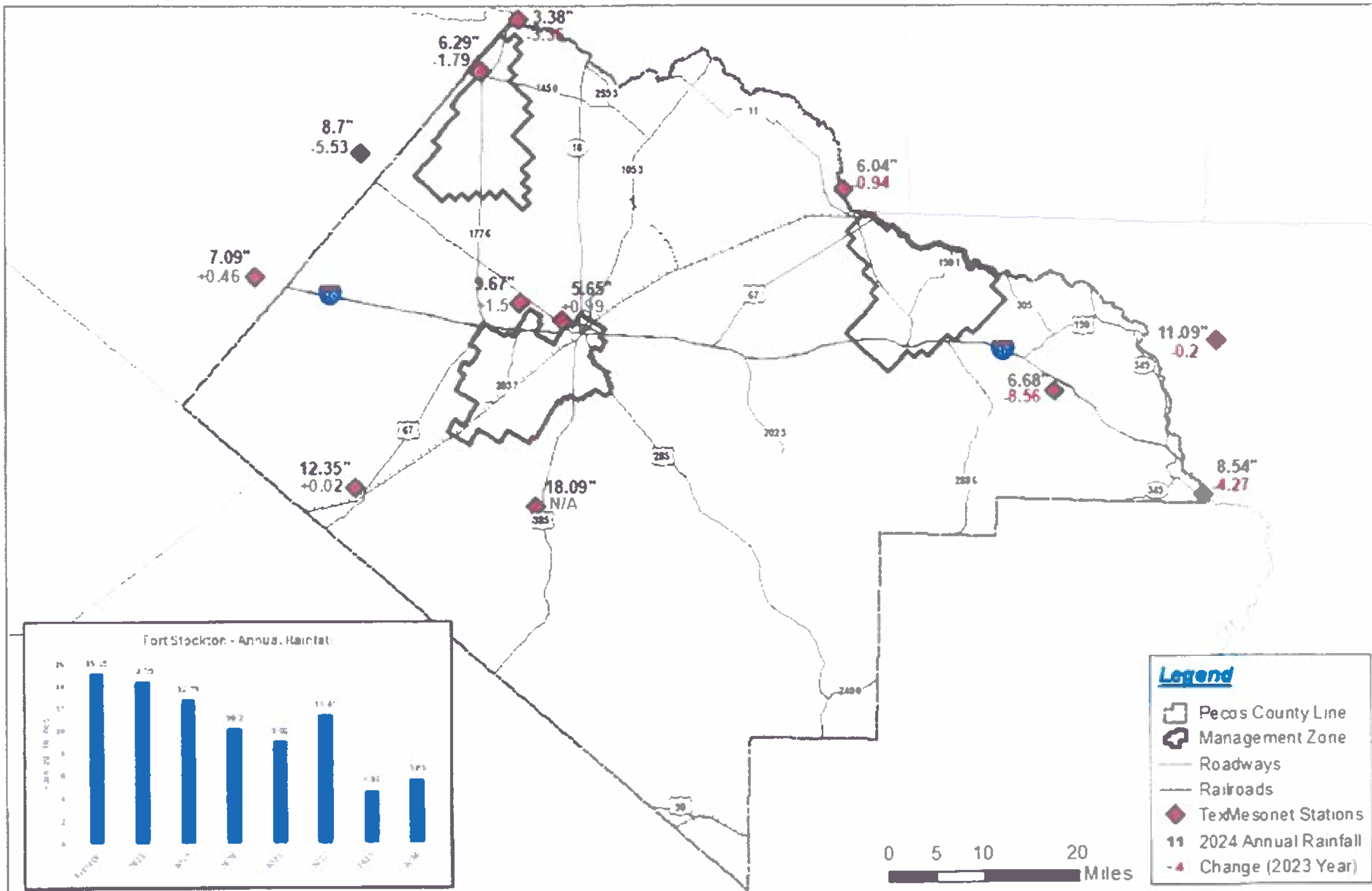


Weather Stations
Reported 2025 Annual Precipitation
Pecos County, Texas

FREESE AND NICHOLS

Spatial Reference: TWDB GAM Coordinate System

Scale: 1:850,000



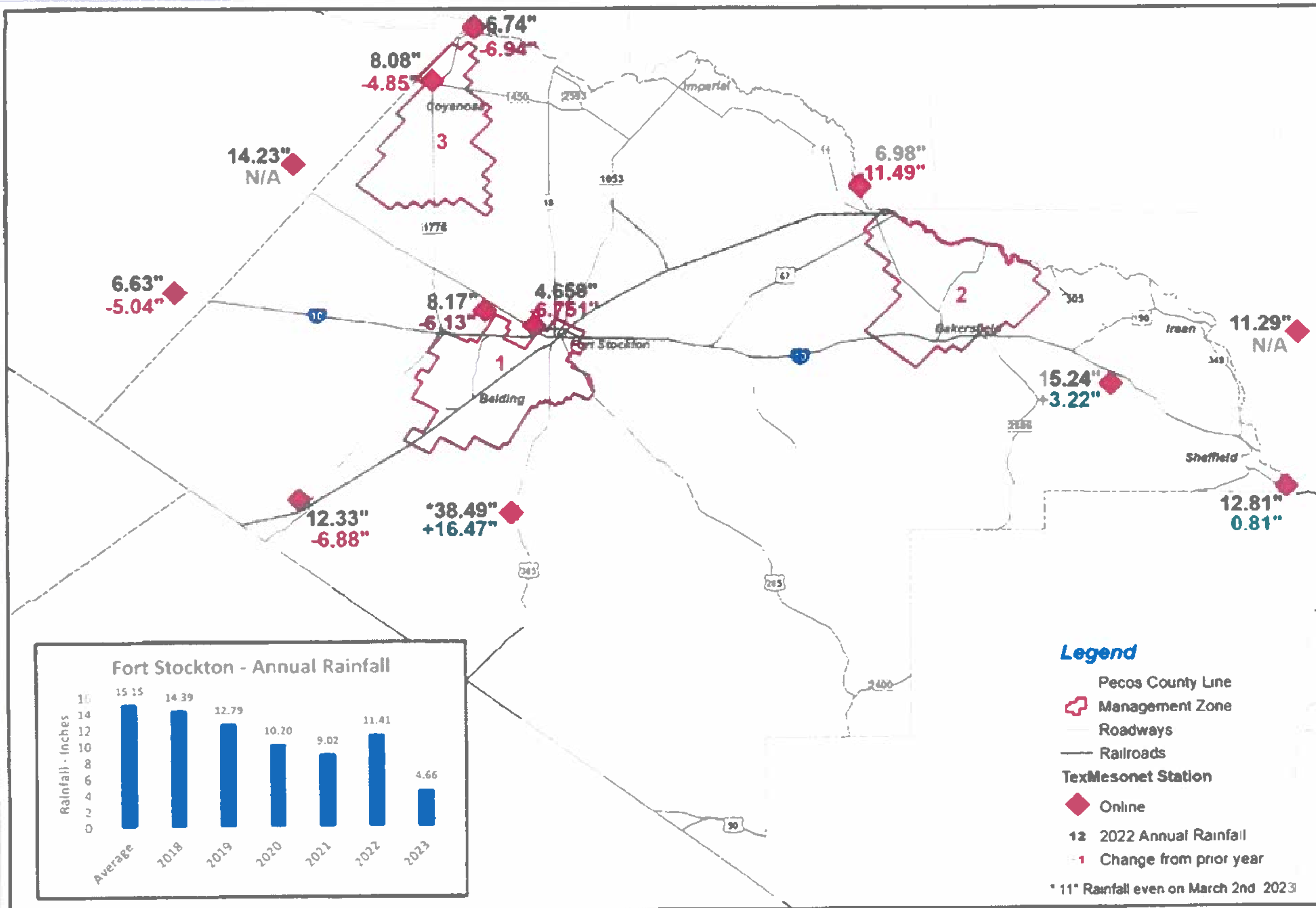
TexMesonet Weather Stations
Reported 2024 Annual Rainfall

Pecos County, Texas

FREESE AND NICHOLS

Spatial Reference: TWDB GAM Coordinate System

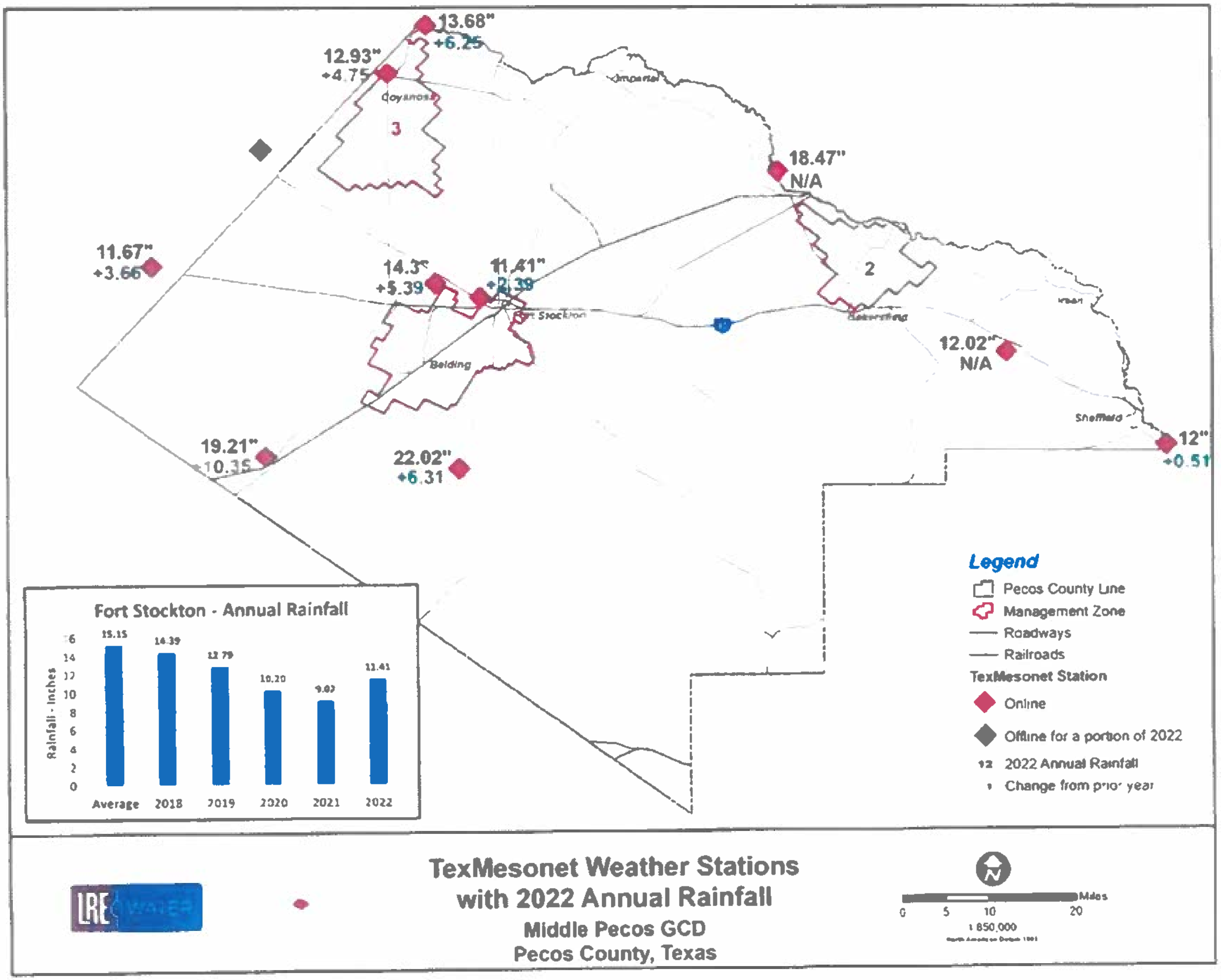
Scale: 1 850 000



TexMesonet Weather Stations
Reported 2023 Annual Rainfall

Middle Pecos GCD
Pecos County, Texas

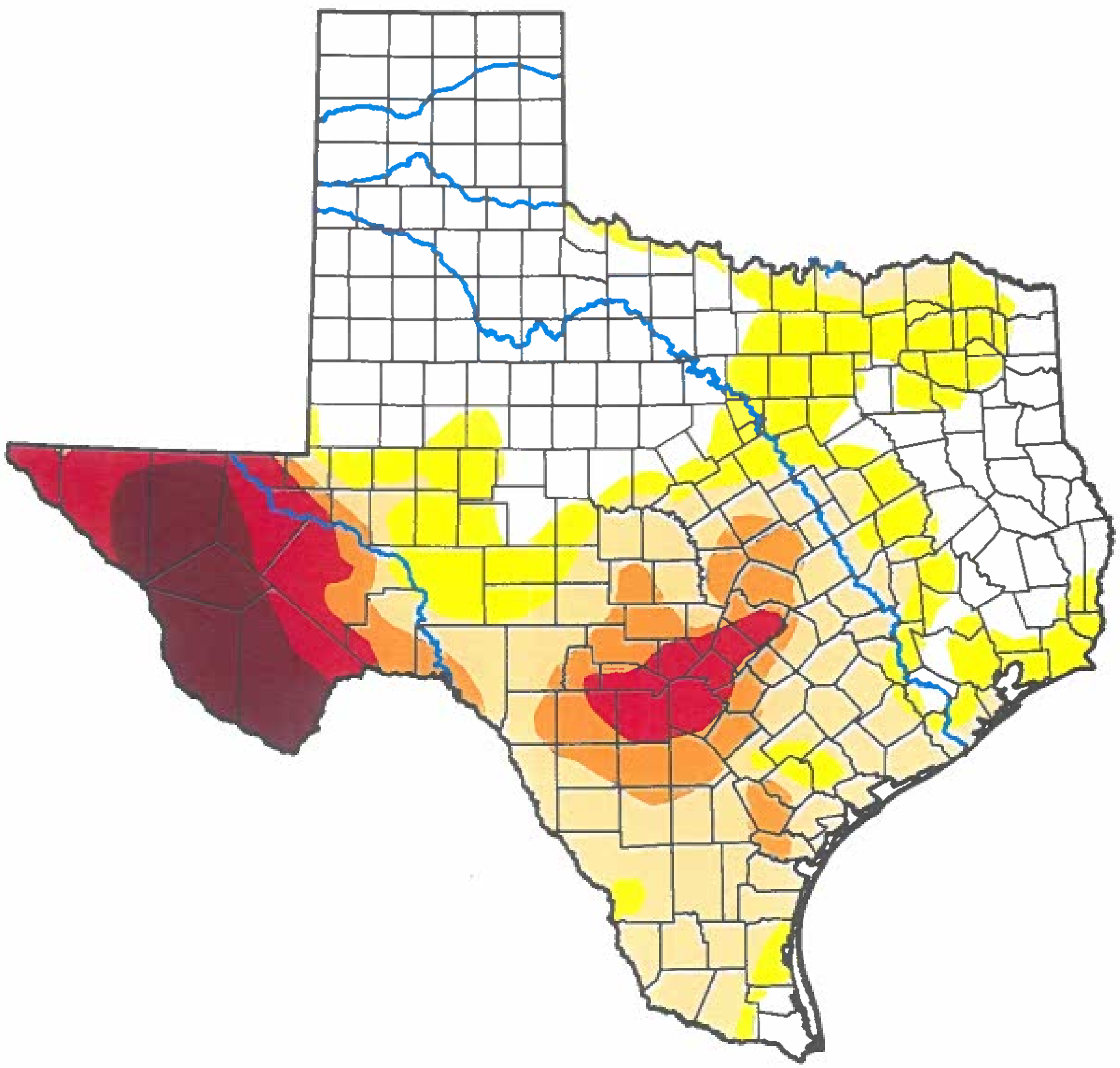
Tex Mesonet Weather Station 2022 Rainfall



Left Blank Intentionally

U.S. Drought Monitor

Texas



January 7, 2025

(Released Thursday, Jan. 9, 2025)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	36.81	63.19	43.63	21.45	13.26	6.30
Last Week 12-31-2024	36.58	63.42	43.51	20.19	12.99	6.30
3 Months Ago 10-08-2024	17.13	82.87	41.66	19.17	11.34	4.58
Start of Calendar Year 01-07-2025	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year 10-01-2024	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago 01-09-2024	43.51	56.49	29.98	12.72	4.02	0.00

Intensity:

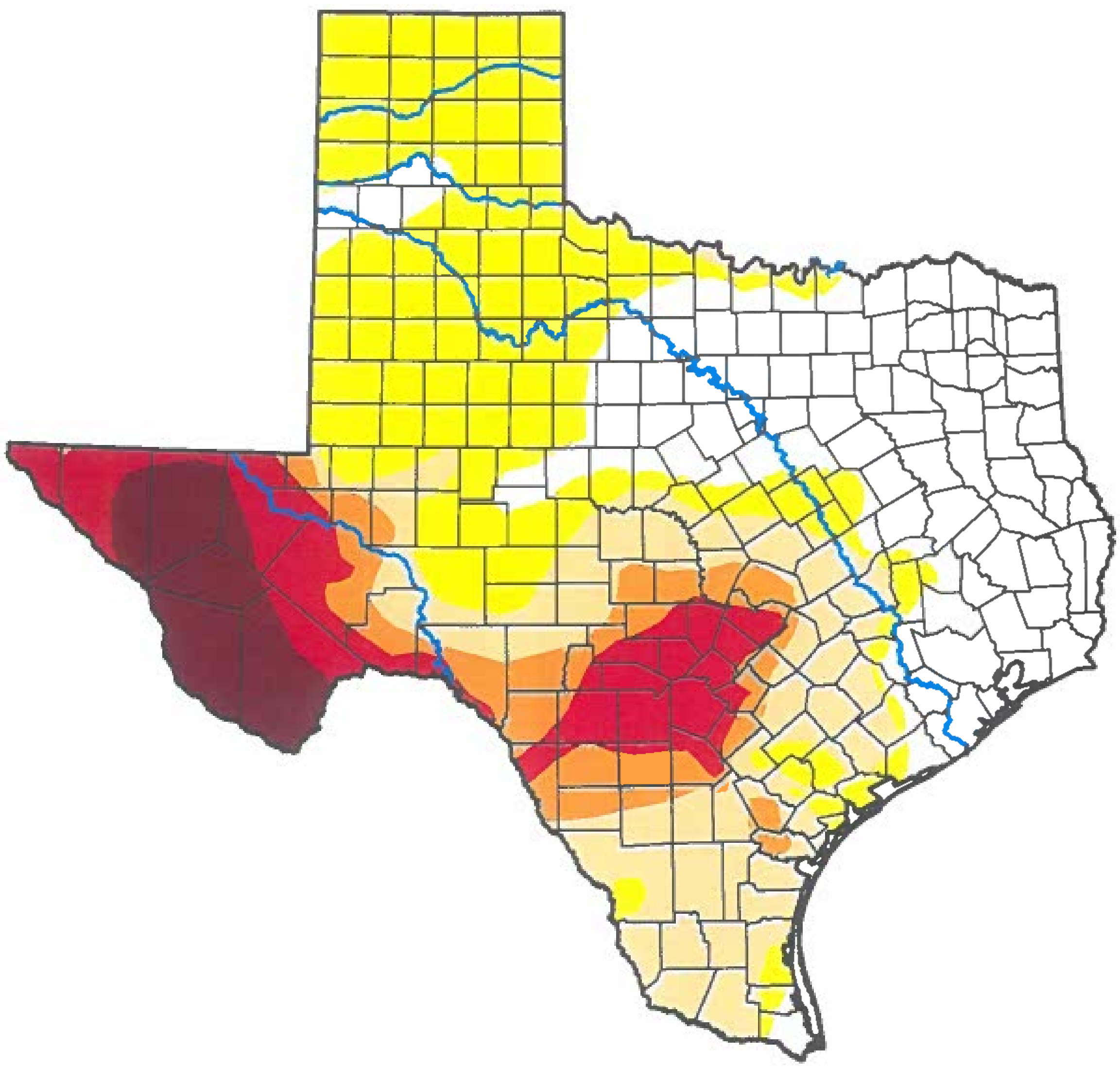
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Brad Pugh
CPC/NOAA

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas



February 4, 2025
(Released Thursday, Feb. 6, 2025)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	28.22	71.78	41.26	23.51	15.74	6.30
Last Week *01-28-2025*	46.95	53.05	42.35	24.11	15.74	6.30
3 Months Ago *11-05-2024*	9.78	90.22	68.08	23.81	11.64	4.58
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *02-06-2024*	60.12	39.88	20.83	9.09	2.04	0.00

Intensity:

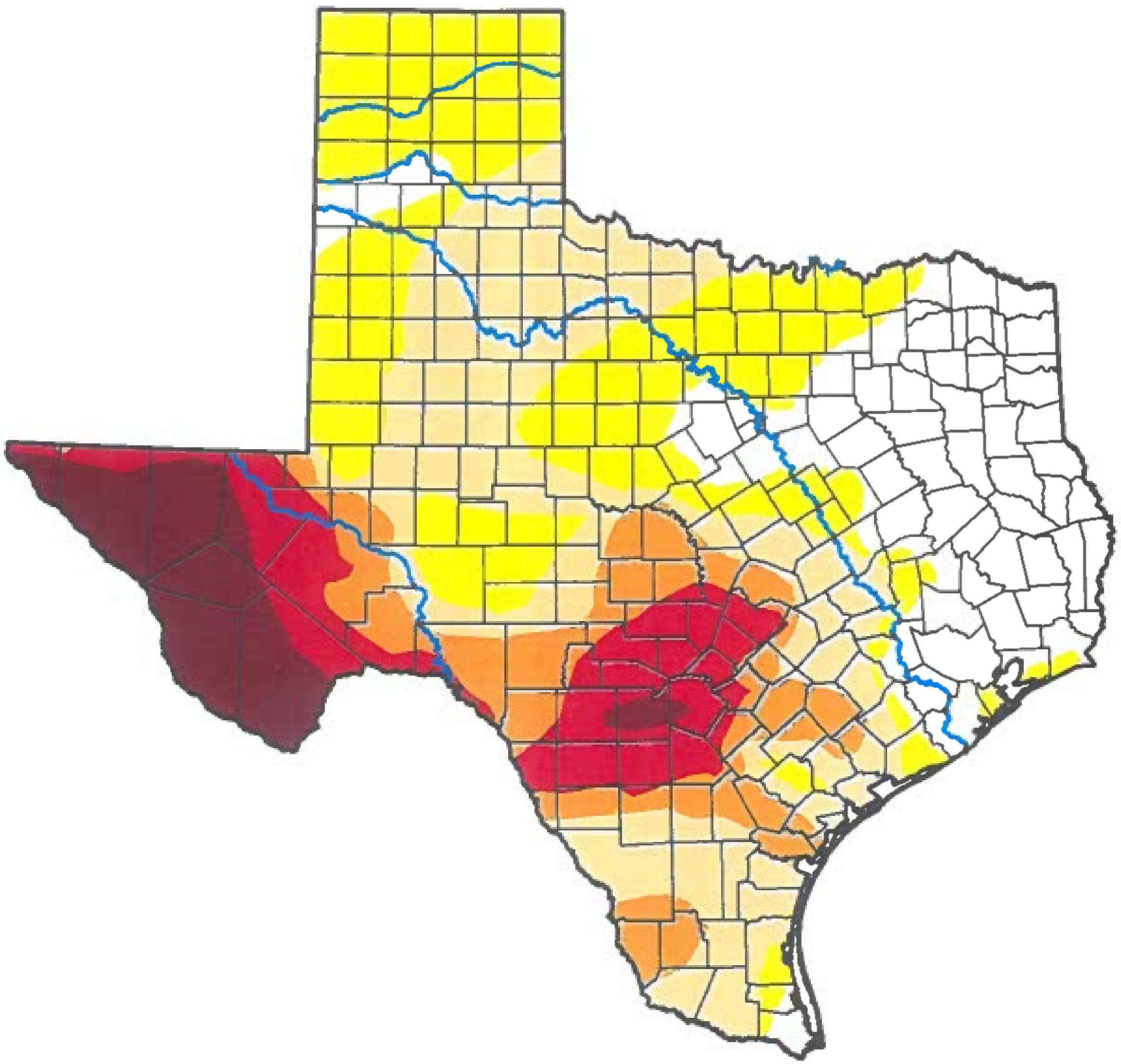
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Lindsay Johnson
National Drought Mitigation Center

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas



March 4, 2025
(Released Thursday, Mar. 6, 2025)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	20.06	79.94	53.92	28.85	17.34	7.69
Last Week *02-25-2025*	20.06	79.94	49.01	27.76	17.34	6.30
3 Months Ago *12-03-2024*	32.02	67.98	50.38	22.68	12.99	6.30
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *03-05-2024*	55.96	44.04	22.67	8.94	1.97	0.00

Intensity:

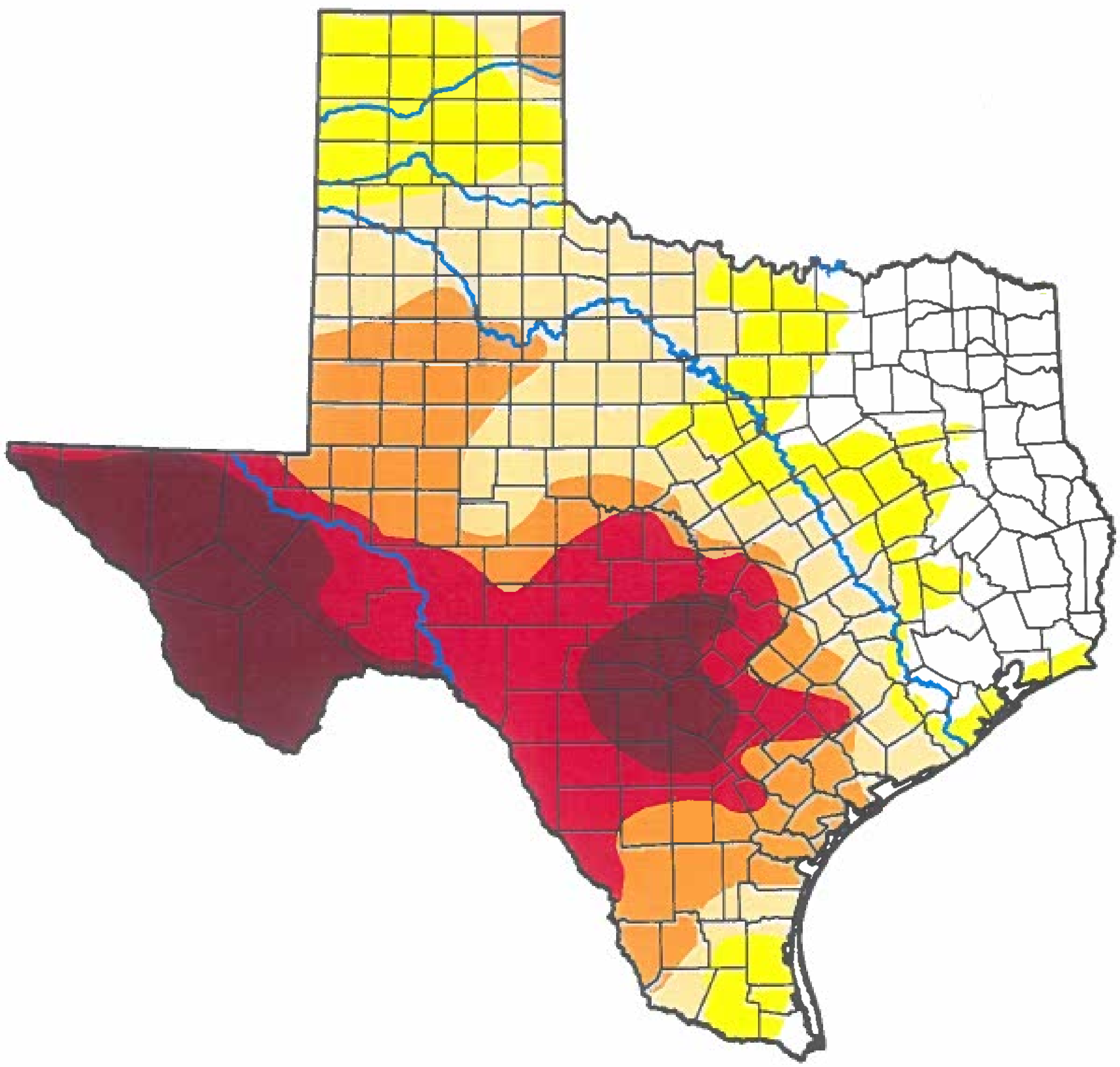
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Curtis Riganti
National Drought Mitigation Center

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas



April 1, 2025
(Released Thursday, Apr. 3, 2025)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	14.77	85.23	67.65	45.93	28.87	13.76
Last Week *03-25-2025*	13.85	86.15	69.66	47.72	28.69	13.76
3 Months Ago *12-31-2024*	36.58	63.42	43.51	20.19	12.99	6.30
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *04-02-2024*	54.66	45.34	25.10	9.85	1.97	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

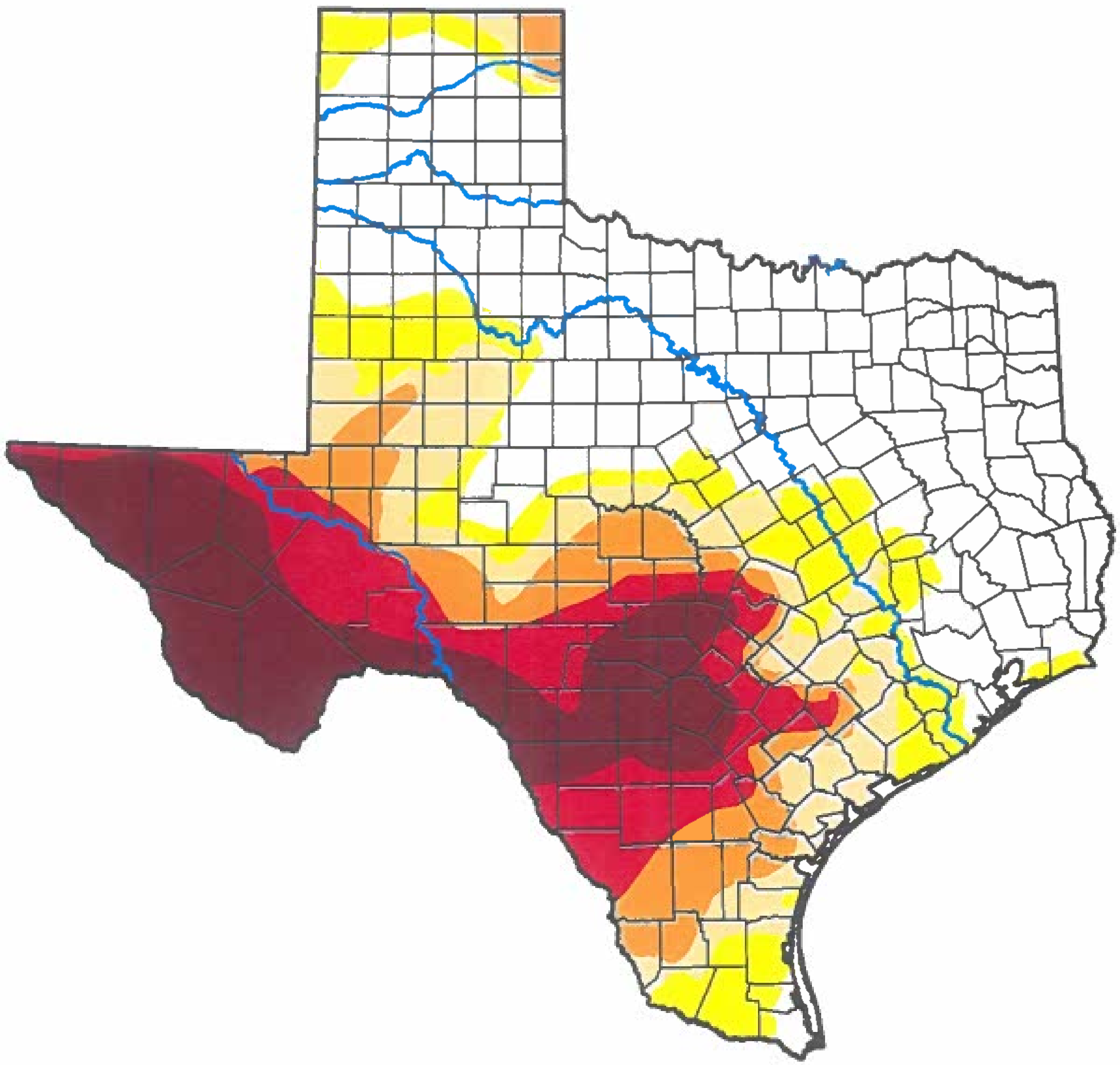
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
David Simeral
Western Regional Climate Center

droughtmonitor.unl.edu

U.S. Drought Monitor

Texas



May 6, 2025

(Released Thursday, May. 8, 2025)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	40.47	59.53	46.31	35.42	25.70	15.06
Last Week *04-29-2025*	36.16	63.84	52.72	40.11	26.05	15.06
3 Months Ago *02-04-2025*	28.22	71.78	41.26	23.51	15.74	6.30
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *05-07-2024*	53.52	46.48	26.41	13.21	2.05	0.00

Intensity:

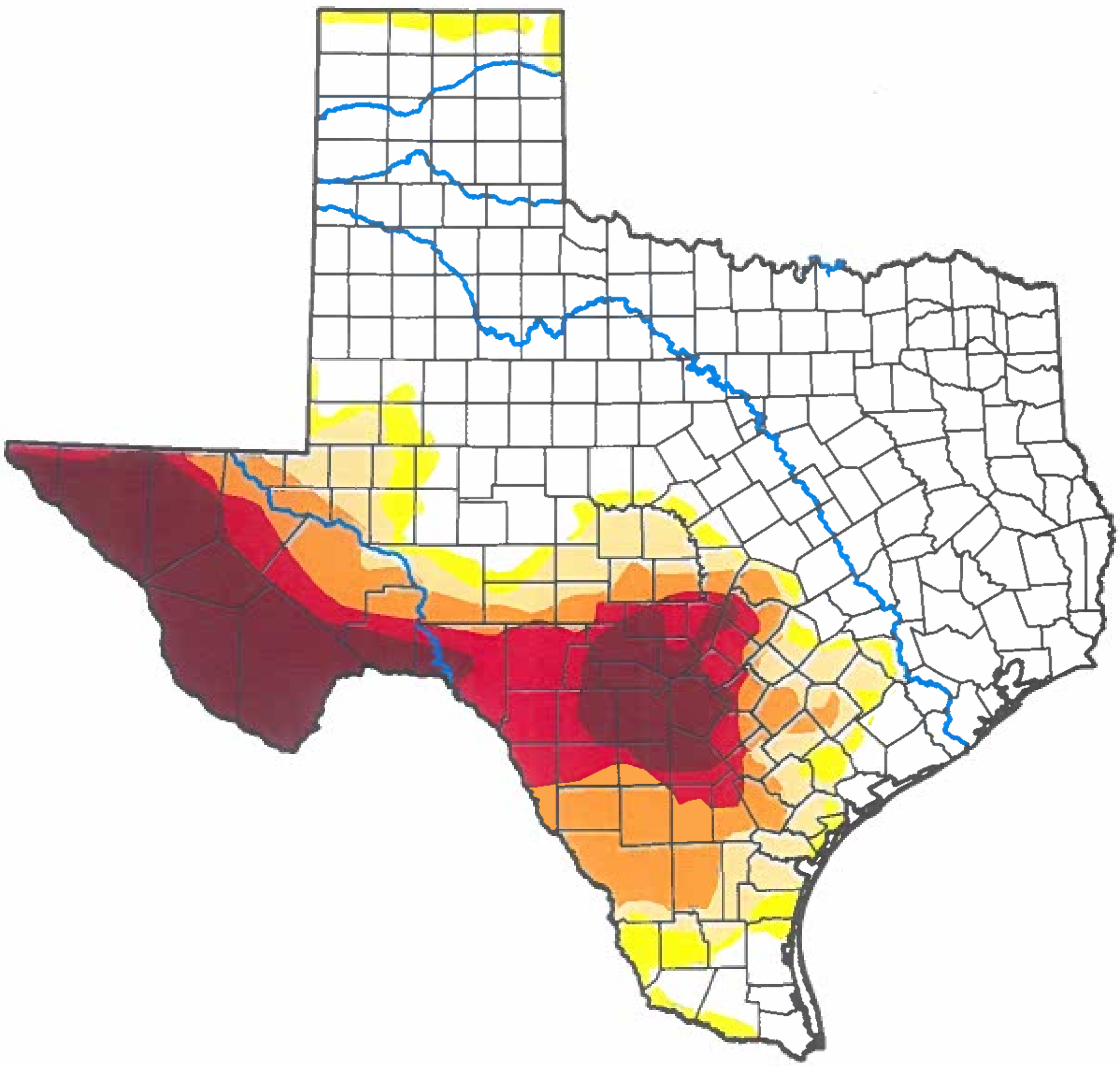
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Brad Pugh
CPC/NOAA

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas



June 3, 2025
(Released Thursday, Jun. 5, 2025)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	57.52	42.48	36.06	28.17	18.73	11.92
Last Week *05-27-2025*	51.37	48.63	38.87	29.70	22.41	14.03
3 Months Ago *03-04-2025*	20.06	79.94	53.92	28.85	17.34	7.69
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *06-04-2024*	54.75	45.25	25.88	12.24	2.45	0.00

Intensity:

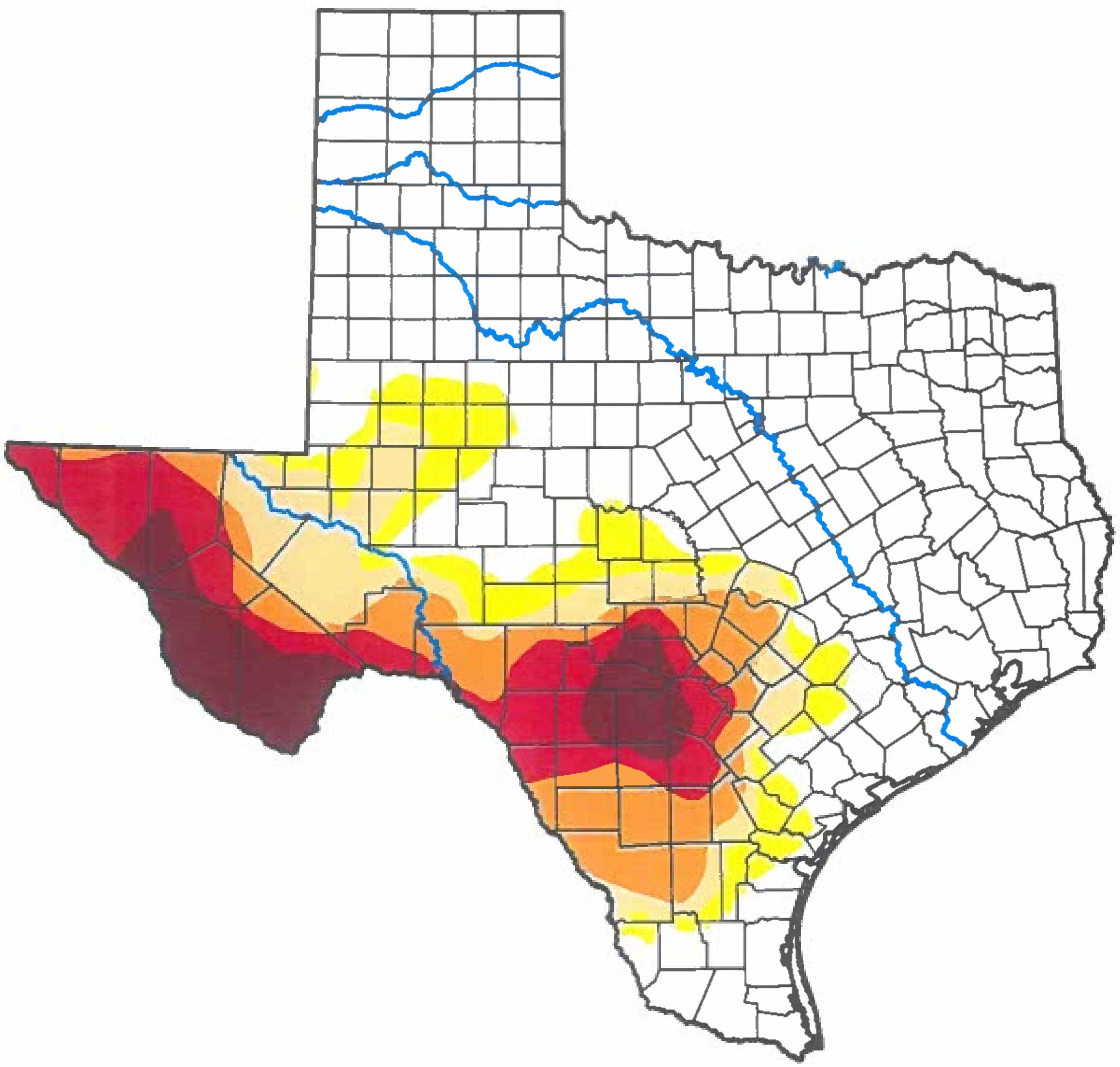
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Brad Pugh
CPC/NOAA

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas



July 1, 2025
(Released Thursday, Jul. 3, 2025)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	62.15	37.85	29.50	22.20	13.48	5.75
Last Week *06-24-2025*	61.81	38.19	29.50	23.26	14.61	9.06
3 Months Ago *04-01-2025*	14.77	85.23	67.65	45.93	28.87	13.76
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *07-02-2024*	53.95	46.05	25.62	12.86	5.04	0.00

Intensity:

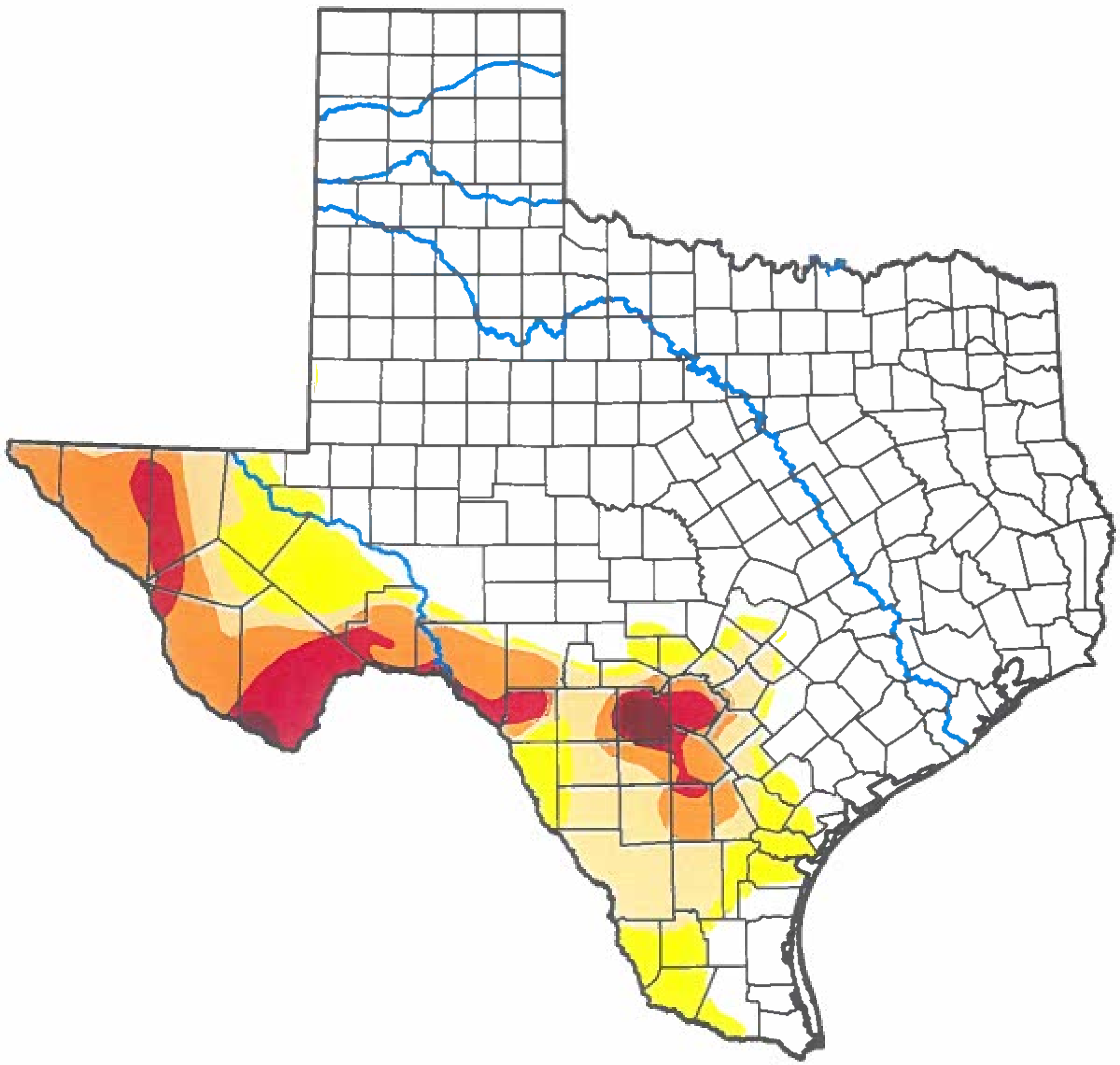
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Curtis Riganti
National Drought Mitigation Center

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas



August 5, 2025
(Released Thursday, Aug. 7, 2025)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	72.37	27.63	19.31	11.88	4.21	0.52
Last Week *07-29-2025*	73.20	26.80	20.42	12.28	6.12	0.52
3 Months Ago *05-06-2025*	40.47	59.53	46.31	35.42	25.70	15.06
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *08-06-2024*	52.18	47.82	24.08	13.24	4.77	1.82

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

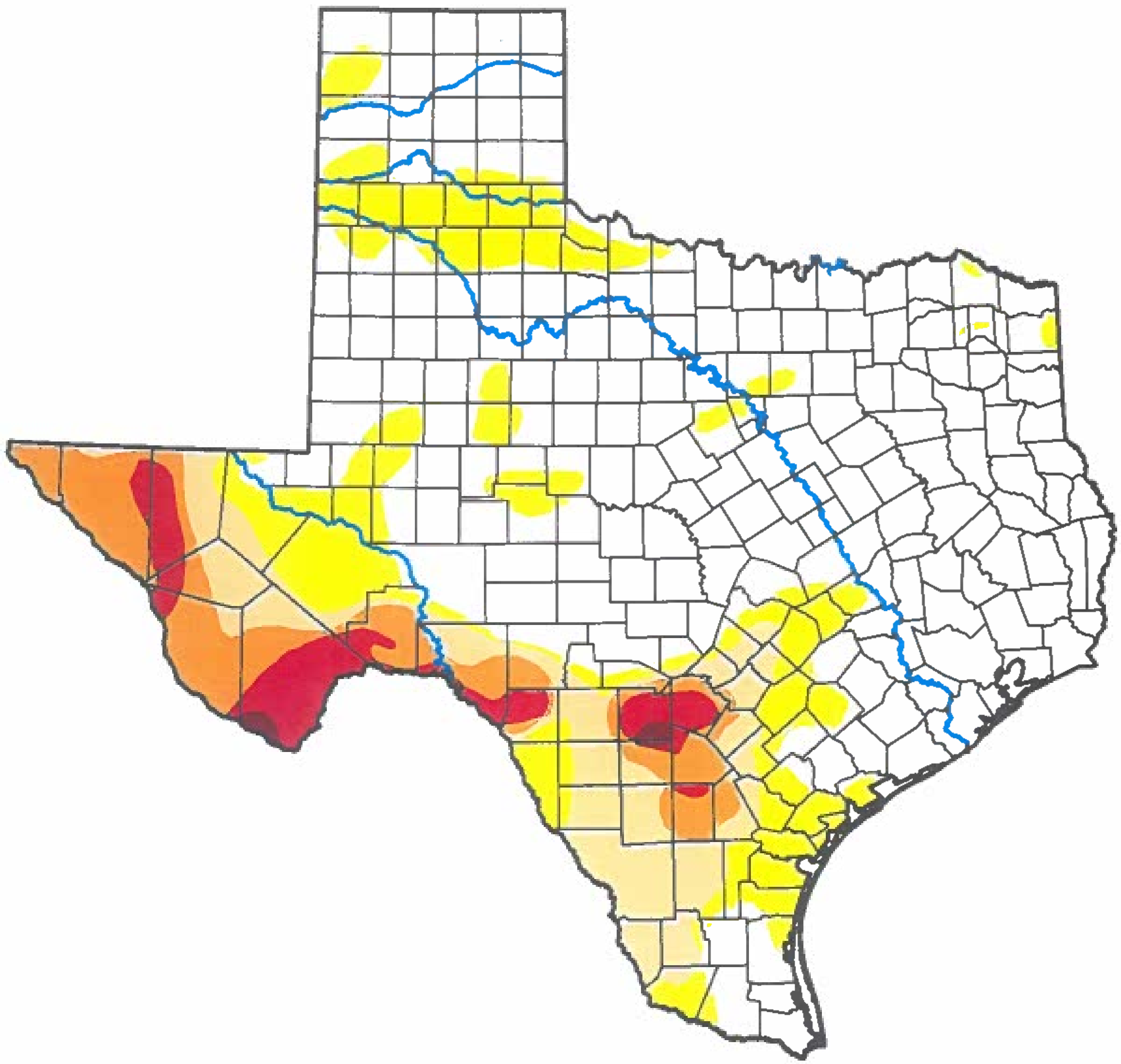
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

droughtmonitor.unl.edu

U.S. Drought Monitor

Texas



September 2, 2025

(Released Thursday, Sep. 4, 2025)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	61.88	38.12	20.30	11.19	4.05	0.29
Last Week *08-26-2025*	68.34	31.66	19.62	11.19	4.05	0.29
3 Months Ago *06-03-2025*	57.52	42.48	36.06	28.17	18.73	11.92
Start of Calendar Year *01-07-2025*	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year *10-01-2024*	26.09	73.91	34.39	16.62	8.91	3.36
One Year Ago *09-03-2024*	30.39	69.61	35.93	15.45	6.25	1.65

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
David Simeral
Western Regional Climate Center

USDA NDMC NOAA

droughtmonitor.unl.edu

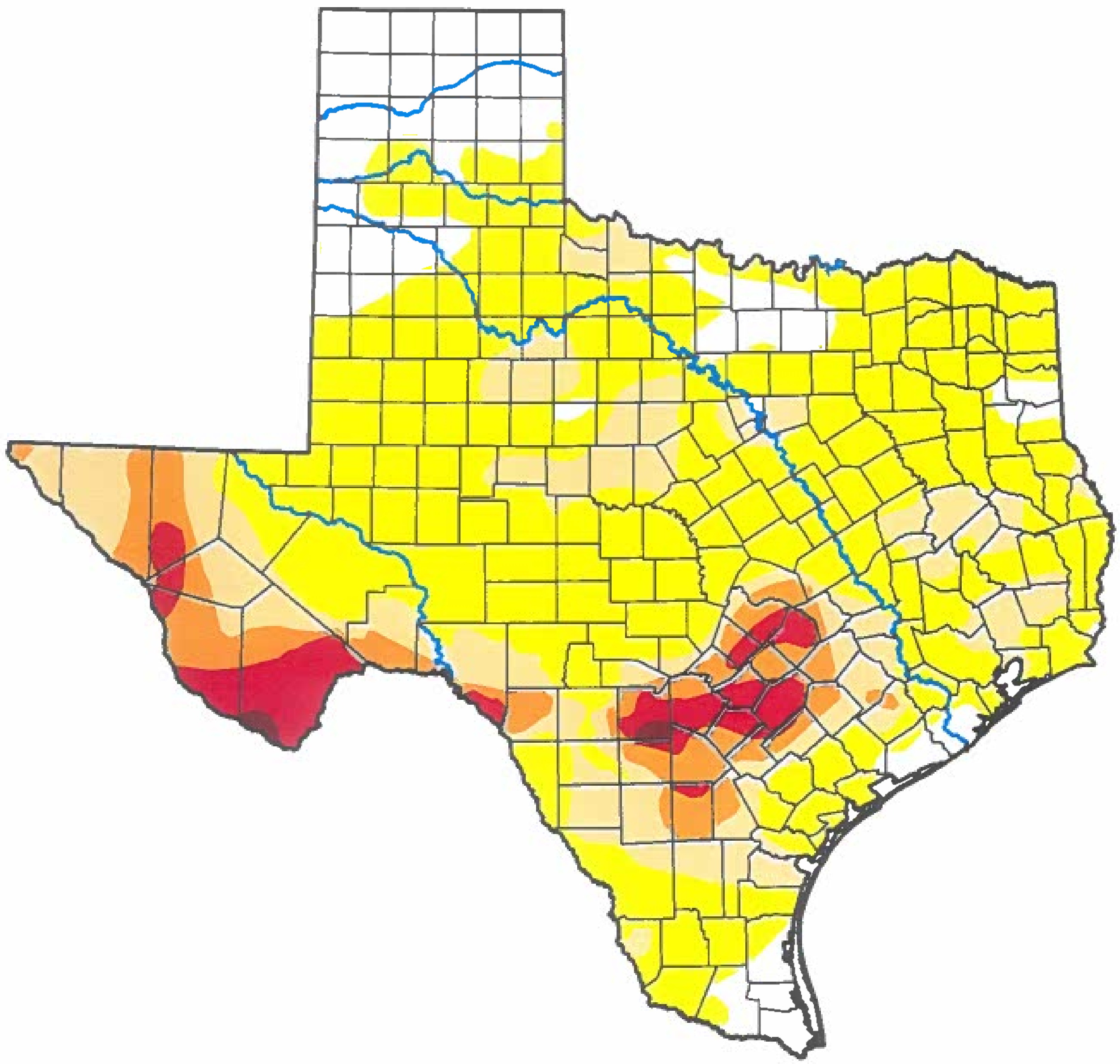
U.S. Drought Monitor

Texas

October 14, 2025

(Released Thursday, Oct. 16, 2025)

Valid 8 a.m. EDT



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

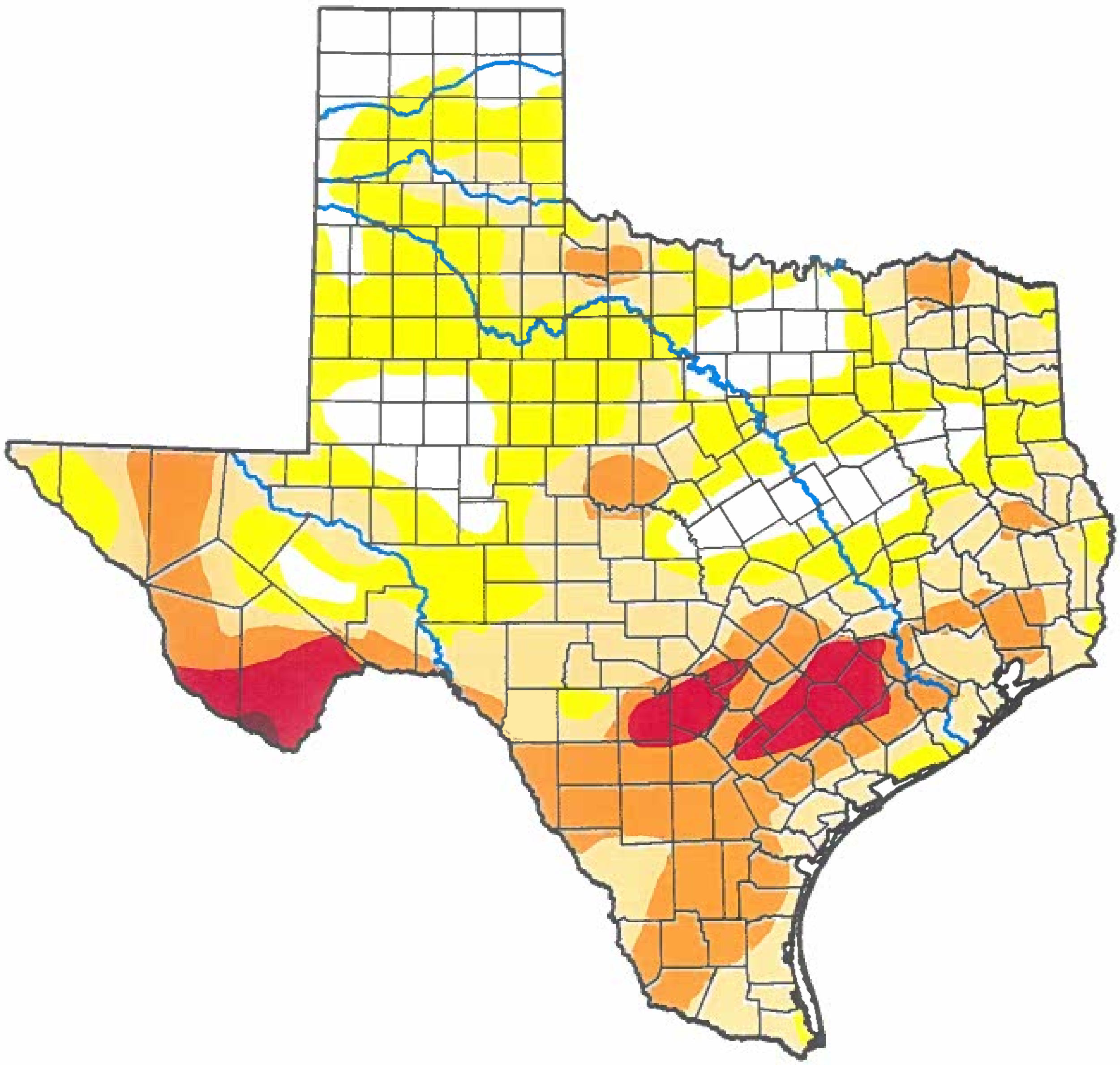
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas

November 11, 2025
(Released Thursday, Nov. 13, 2025)
Valid 7 a.m. EST



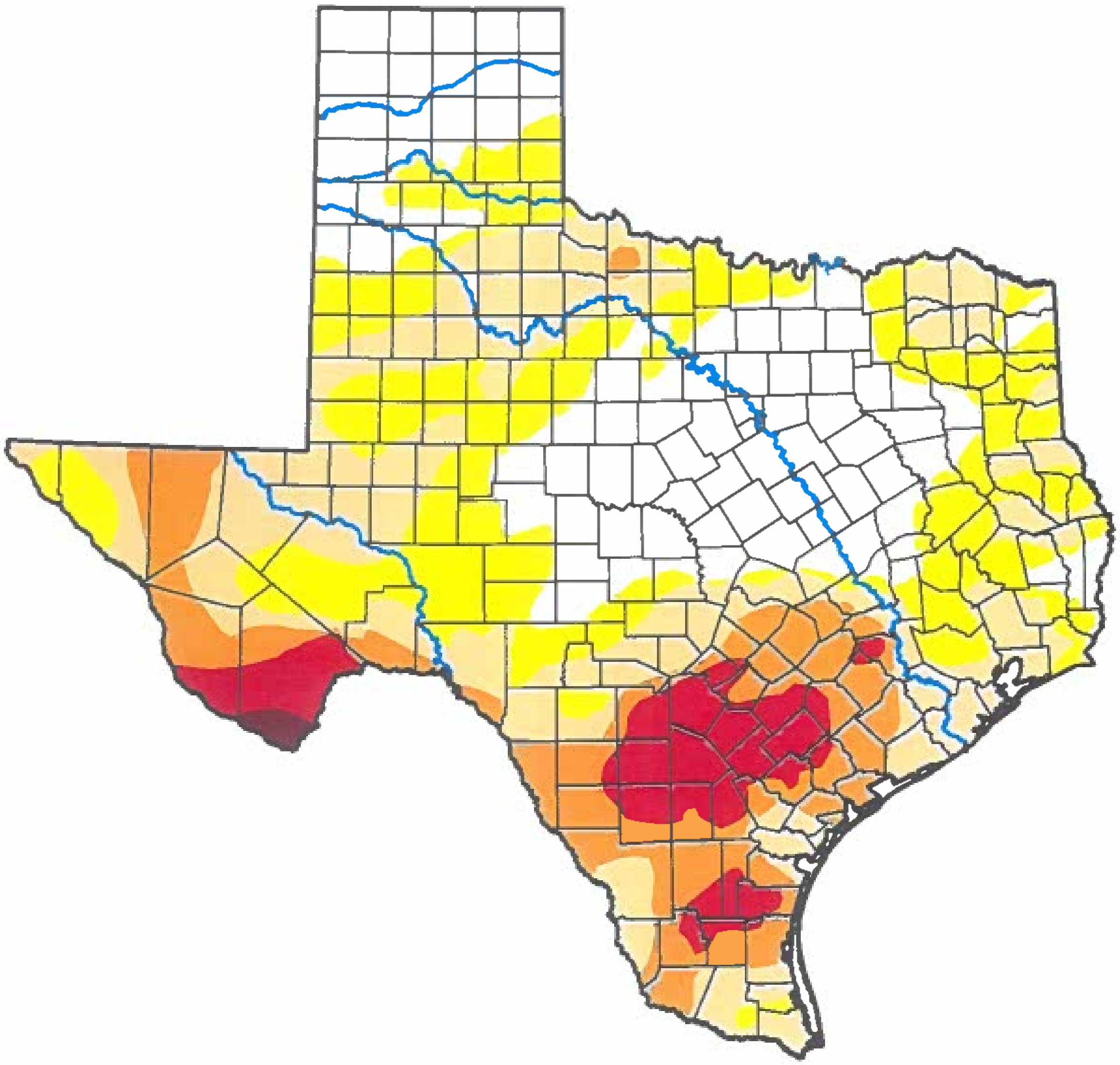
Intensity:
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Curtis Riganti
National Drought Mitigation Center

droughtmonitor.unl.edu

U.S. Drought Monitor
Texas



December 16, 2025
(Released Thursday, Dec. 18, 2025)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	27.94	72.06	46.50	20.92	7.49	0.36
Last Week 12-09-2025	28.06	71.94	44.76	20.77	4.00	0.36
3 Months Ago 09-16-2025	46.62	53.38	20.74	10.94	3.33	0.29
Start of Calendar Year 01-07-2025	36.81	63.19	43.63	21.45	13.26	6.30
Start of Water Year 09-30-2025	37.15	62.85	23.67	13.00	3.33	0.29
One Year Ago 12-17-2024	33.64	66.36	49.52	22.88	12.99	6.30

Intensity:
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

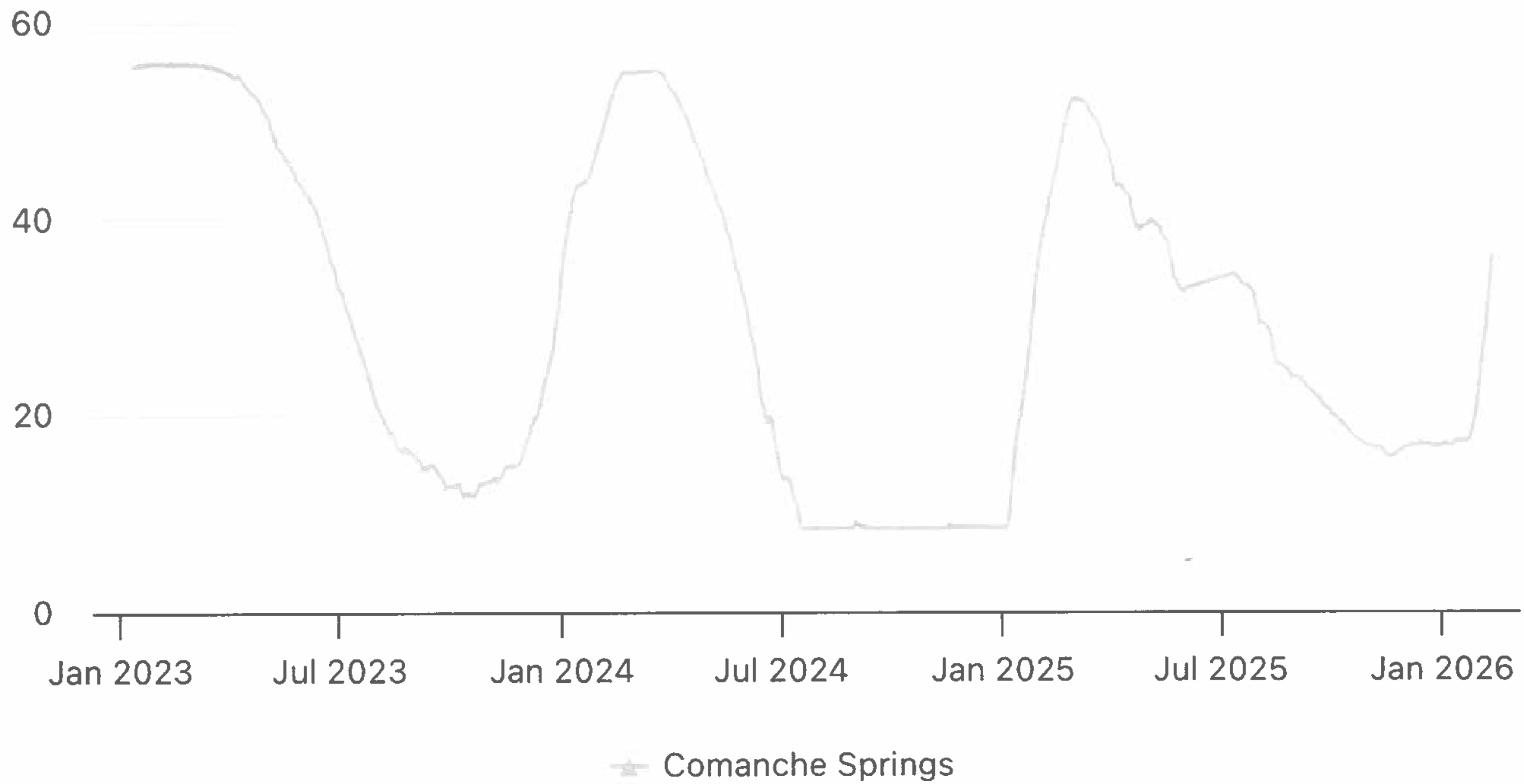
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

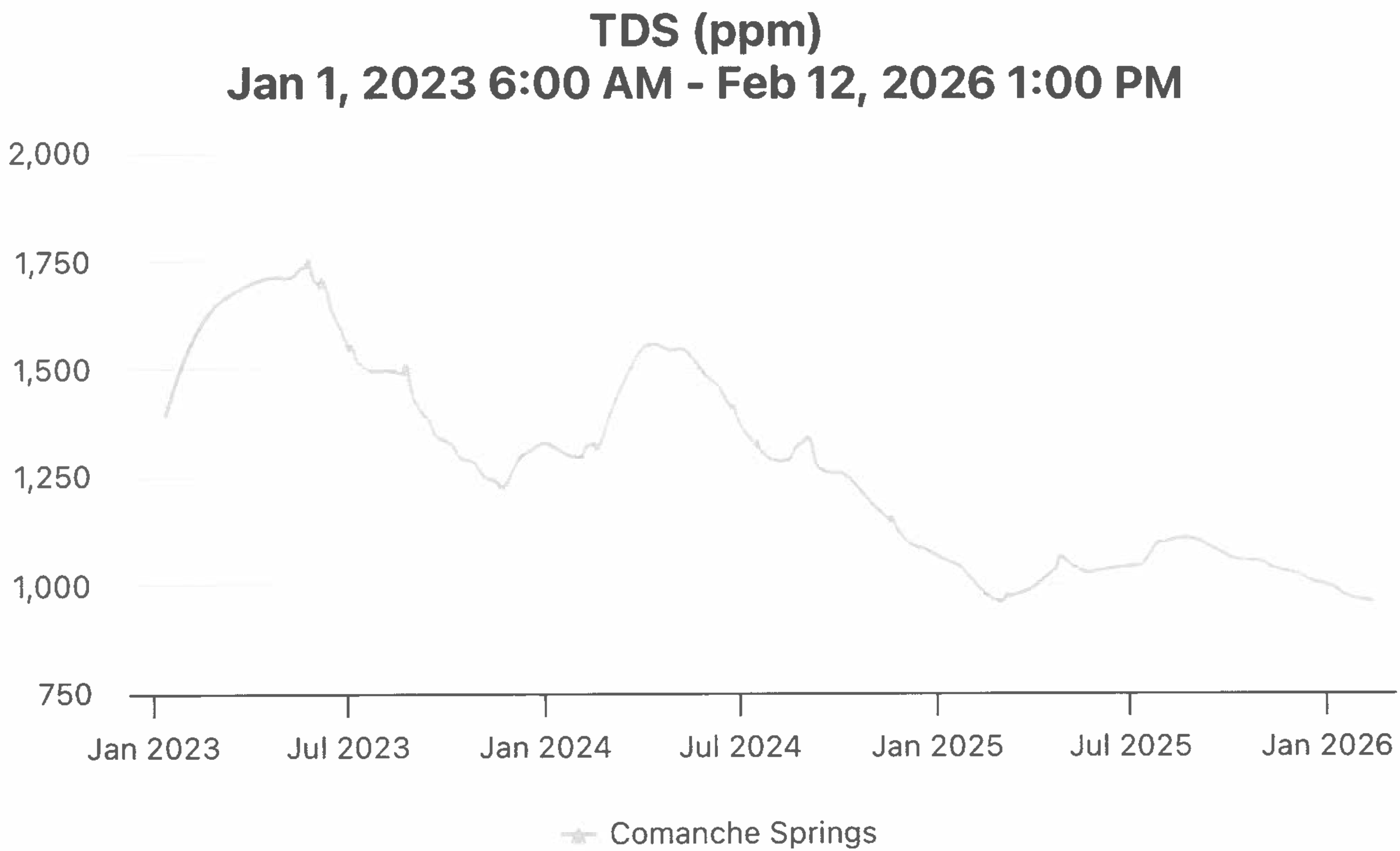
Author:
Lindsay Johnson
National Drought Mitigation Center

droughtmonitor.unl.edu

Left Blank Intentionally

Depth (ft)
Jan 1, 2023 6:00 AM - Feb 12, 2026 1:00 PM

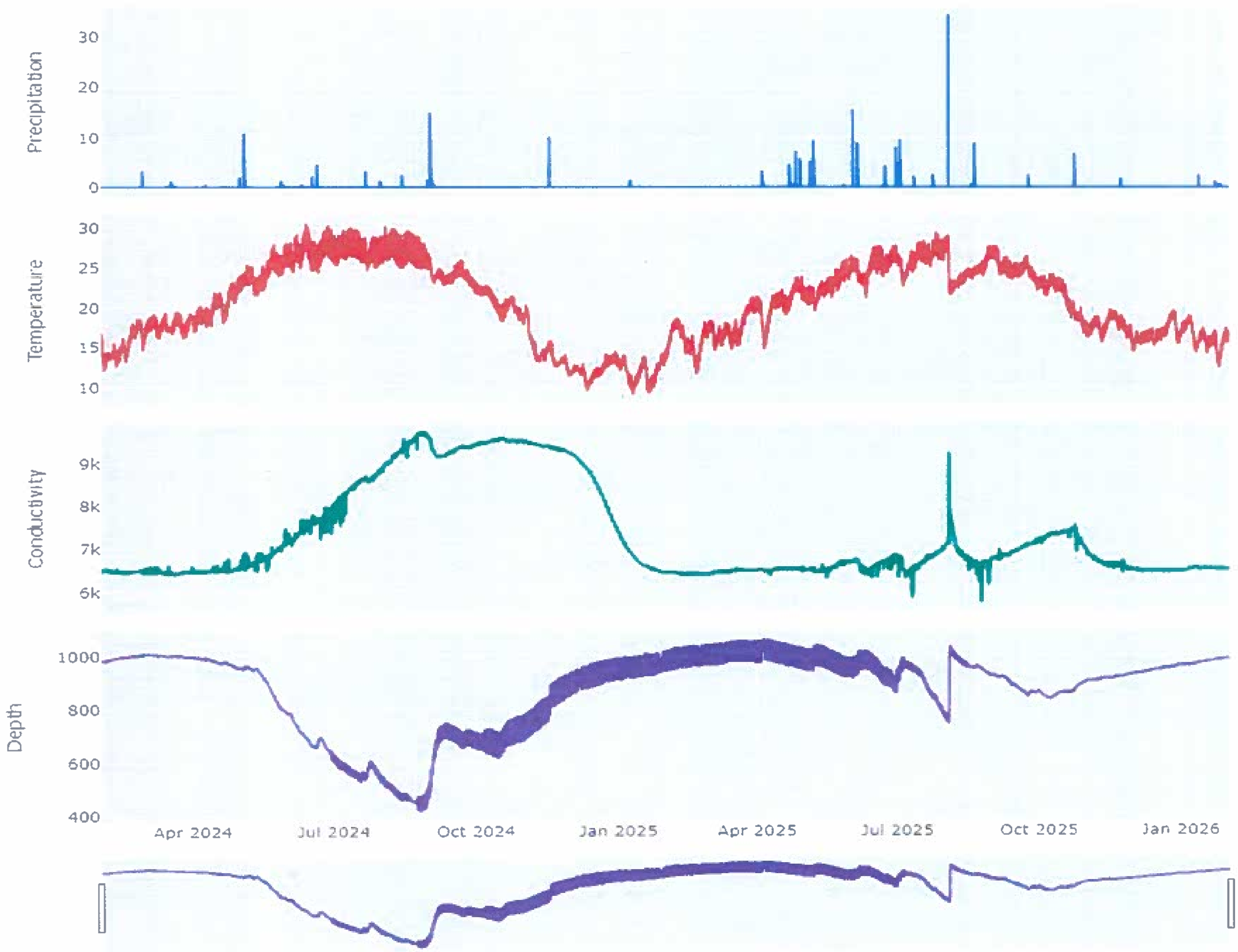




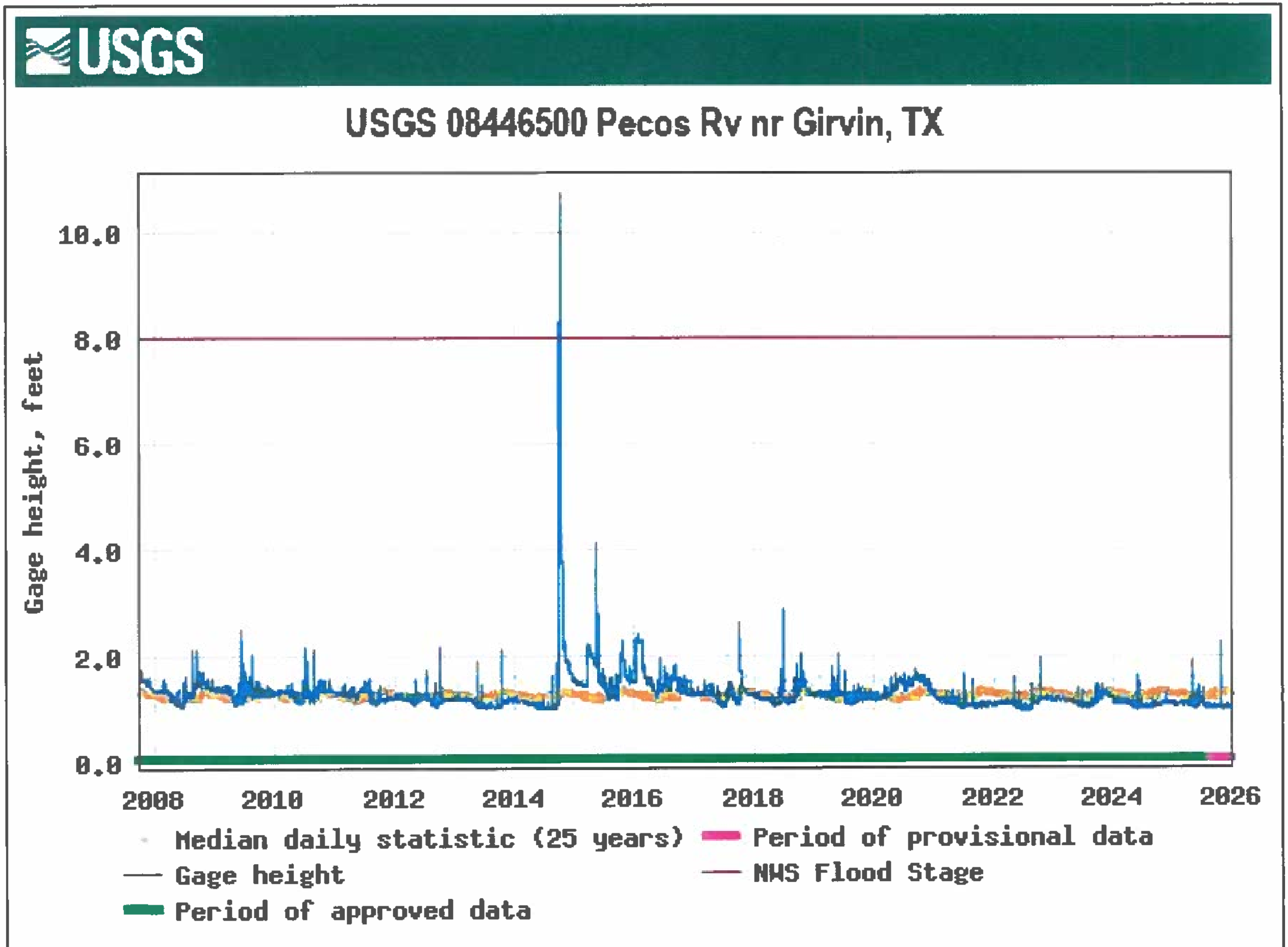
TDS (ppm)
Jan 1, 2023 6:00 AM - Feb 12, 2026 1:00 PM
2,000
1,750
1,500
1,250
1,000
750
Jan 2023
Jul 2023
Jan 2024
Jul 2024
Jan 2025
Jul 2025
Jan 2026
Comanche Springs

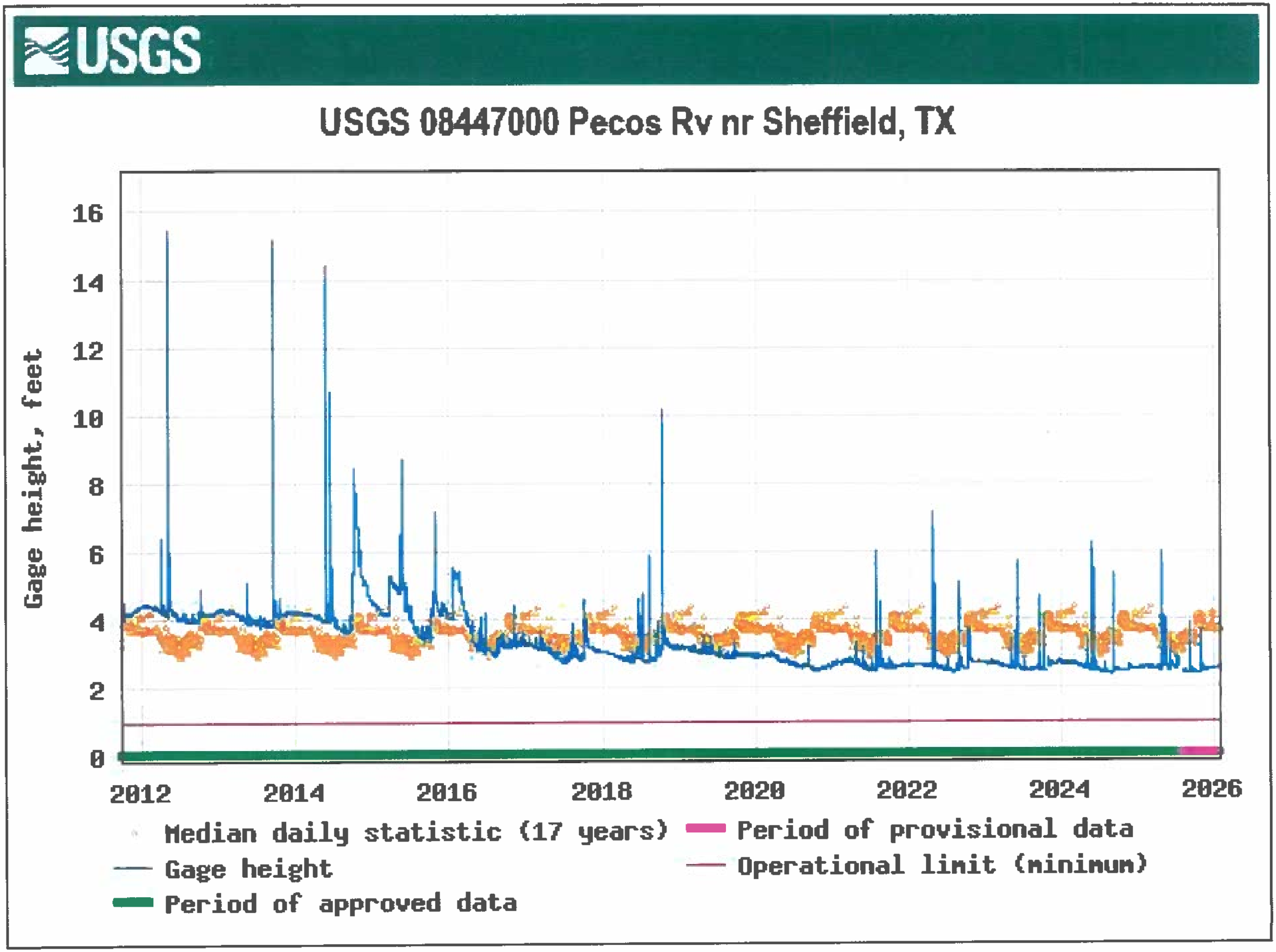
Left Blank Intentionally

DIAMOND Y SPRING GRAPH 2025



Left Blank Intentionally


USGS
USGS 08446500 Pecos Rv nr Girvin, TX
Gage height, feet
10.0
8.0
6.0
4.0
2.0
0.0
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
Median daily statistic (25 years)
Gage height
Period of approved data
Period of provisional data
NWS Flood Stage



USGS
USGS 08447000 Pecos Rv nr Sheffield, TX
Gage height, feet
16
14
12
10
8
6
4
2
0
2012
2014
2016
2018
2020
2022
2024
2026
Median daily statistic (17 years)
Gage height
Period of approved data
Period of provisional data
Operational limit (minimum)

Left Blank Intentionally

6.2 Controlling and Preventing Waste of Groundwater

Our mission at *Middle Pecos Groundwater Conservation District (MPGCD)* is to develop and implement an efficient, economical and environmentally sound groundwater management program to protect, maintain and enhance the groundwater resources of the District, and to communicate and administer to the needs and concerns of the citizens of Pecos County associated with these groundwater resources.

We have an 11-member Board of Directors that is elected by the citizens of Pecos County. There are two directors representing each county precinct, one representing the City of Fort Stockton, one representing the City of Iraan, and one representing Pecos County at large. Your current Directors are: Janet Groth, Vanessa Cardwell, Weldon Blackwelder, Puja Boinpally, Wayne Tinkler, Billy Jackson, Ronald Cooper, Larry Drgac, M. R. Gonzalez, Alvaro Mandujano, Jr., and Jeff Sims.

In keeping an eye on Pecos County groundwater, the District monitors 140 water wells that are scattered throughout Pecos County. We check water quality analysis and depth of water levels monthly.

The public is invited to join us at our monthly Board Meetings that are normally held on the 3rd Tuesday of each month at our office located at 405 North Spring Drive in Fort Stockton, Texas. Our agendas are posted on our website three business days before our meetings and can be reviewed at: https://www.middlepecosgcd.org/.

MPGCD requires water well owners to register all water well(s) with in Pecos County. A non-potable analysis can be provided by the District at no cost. MPGCD can carry out the overall responsibility of protecting our water supply by knowing where and how many wells we have in Pecos County. Examples of protection are oil/gas activity, excessive water production, monitoring water levels/analysis, and contamination.

Our office is willing to discuss any concerns, issues, etc., pertaining to our most precious natural resource – GROUNDWATER. You may contact us at 432-336-0698 or come by 405 North Spring Drive, Fort Stockton, Texas.

6.7.1 Efforts to Control and Prevent Waste of Groundwater and Addressing Conservation

To promote conservation and prevent waste of groundwater related to agricultural, the following are the best management practices as stated by the Texas Water Development Board Conservation Division : * Irrigation water use management - irrigation scheduling, measurement of irrigation water use, crop residue management and conservation tillage, irrigation audit; * land management systems – furrow dikes, land leveling, contour farming, conversion of supplemental irrigated farm land to dry land, brush management; * on-farm water delivery systems – lining of on-farm irrigation ditches, replacement of on-farm irrigation ditches and pipelines, low-pressure center pivot sprinkler irrigation systems, drip/micro-irrigation systems, gated and flexible pipe for field water distribution systems, surge flow for field water distribution systems, and linear move sprinkler irrigation systems; * Water district delivery systems – lining of district delivery systems, replacement of irrigation district canals and lateral canals with pipelines; * Miscellaneous systems – tailwater recovery and reuse system, nursery production systems.

Other ways to promote conservation and prevent waste of groundwater: Sweep rather than hose driveways and other areas; use drip irrigation rather than spray irrigation; wash your car at a car wash; downsize your lawn area and/or Xeriscape; irrigate during the coolest part of the day; never water on windy days; protect plants with mulch and compost to reduce water loss; install low flow shower heads; insulate hot water pipes; reduce showering time; operate dishwasher and washing machine on full loads; install an aerator on kitchen faucet; and turn the water off while brushing teeth and on to rinse. If you see signs of contaminating substances on the surface, remember it could end up contaminating the water source below, so please report to us if you find signs of contamination that need to be checked out.

Rainwater Harvesting

For centuries, people have relied on rainwater harvesting to supply water for household, landscape, livestock, and agricultural uses. Before the advent of large centralized water supply systems, rainwater was collected from roofs and stored on site in tanks known as cisterns. With the development of large, reliable water treatment and distribution systems and more affordable well drilling equipment, rain harvesting was all but forgotten, even though it offered a source of pure, soft, low-sodium water.

A renewed interest in this time-honored approach of collecting water has emerged in Texas and elsewhere because of escalating environmental and economic costs of providing water by centralized water systems or by well drilling. The health benefits of rainwater and potential cost savings associated with rainwater collection systems have further spurred this interest.

Texas is one of only a few states in the nation that has devoted a considerable amount of attention to rainwater harvesting and has enacted many laws regulating the practice of collecting rainwater.

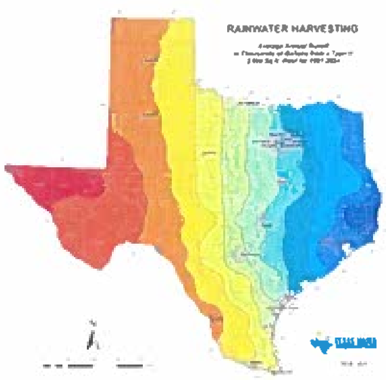
- Texas Tax Code 151.355 allows for a state sales tax exemption on rainwater harvesting equipment.
- Texas Property Code 202.007 prevents homeowners associations from banning rainwater harvesting installations.
- Texas House Bill 3391 requires rainwater harvesting system technology to be incorporated into the design of new state buildings and allows financial institutions to consider making loans for developments using rainwater as the sole source of water supply.

For in-depth descriptions of rules in Texas and other states, visit the National Conference of State Legislatures.

Recent Maps

Roof Runoff Map

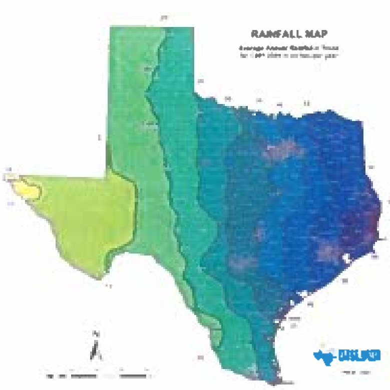
Average Annual Runoff, 1991 to 2024



Rainfall Map

Texas Rain Catcher Award Winners

Average Annual Rainfall, 1991 to 2024



Award Winners, 2007 to 2017

Left Blank Intentionally

Threshold Table

Show more threshold data

Well		Winter Threshold 1	Winter Threshold 2 (Historic Minimum)	Winter Threshold 3	Winter Threshold 4	Most recent Depth to Water	
Short Name	Long Name	Depth to Water	Depth to Water	Depth to Water	Depth to Water	Depth to water	Measure... Date
Mpgcd320	King, Woodward, #320	205	200	195	190	134.35	02/12/2026
Mpgcd323	Ft Stockton, Cemetery, #323	198	193	188	183	156.1	02/12/2026
C-5	C-5, FSH Well	110	105	100	95	39.05	02/12/2026
M-9	M-9, FSH Well	313	308	303	298	257.35	02/12/2026
S-45	S-45, FSH Well	165	160	155	150	99.21	02/12/2026
S-6	S-6, FSH Well	205	200	195	190	120.46	02/11/2026
Mpgcd305	Cockrell_Belding, #305	292	287	282	277	219.53	02/12/2026
Mpgcd318	Goldman Ranch, Well 1	72	67	62	57	47.35	01/14/2026
Mpgcd334	Carpenter, #334	140	135	130	125	115.78	02/12/2026
Interstate	Interstate Well, FSH Well	96	91	86	81	49.92	02/12/2026
Prison	TDCJ, Prison Well	258	253	248	243	195.87	02/12/2026

HydroVu Water Levels

Table 6. Monitor Well Threshold Recommendations

Well		Reference Point Elevation (ft MSL)	Winter Threshold 1		Winter Threshold 2 (Historic Minimum)		Winter Threshold 3		Winter Threshold 4		Maximum Recent Drawdown (Winter to Summer)	Summer Threshold		Recent Depth to Water	
Short Name	Long Name		Depth to Water (ft)	Basis	Depth to Water (ft)	Basis	Depth to Water (ft)	Basis	Depth to Water (ft)	Basis		Depth to Water (ft)	Basis	Winter	Summer
Mpgcd320	King, Woodward, #320	3068	205	Win2+5	200	Data 1 1999	195	Win2-5	190	Win2-10	45	245	Win2+Max DD	113	148
Mpgcd323	Ft Stockton, Cemetery, #323	3031	198	Win2+5	193	Data 1/2000	188	Win2-5	183	Win2-10	15	208	Win2+Max DD	146	148
C-5	C-5 FSH Well	3009	110	Win2+5	105	WPC 1973	100	Win2-5	95	Win2-10	72	177	Win2+Max DD	60	107
M-9	M-9 FSH Well	3261	313	Win2+5	308	WPC 1973	303	Win2-5	298	Win2-10	48	356	Win2+Max DD	246	283
S-45	S-45 FSH Well	3067	165	Win2+5	160	WPC 1973	155	Win2-5	150	Win2-10	56	216	Win2+Max DD	92	115
S-6	S-6, FSH Well	3123	205	Win2+5	200	WPC 1973	195	Win2-5	190	Win2-10	62	262	Win2+Max DD	118	159
Mpgcd305	Cockrell_Belding, #305	3233	292	Win2+5	287	WPC 1973	282	Win2-5	277	Win2-10	75	362	Win2+Max DD	206	250
Mpgcd318	Goldman Ranch, Well 1	2957	72	Win2+5	67	WPC 1975	62	Win2-5	57	Win2-10	33	100	Win2+Max DD	30	49
Mpgcd334	Carpenter, #334	3051	140	Win2+5	135	WPC 1975	130	Win2-5	125	Win2-10	36	171	Win2+Max DD	104	126
Interstate	Interstate Well FSH Well	2988	96	Win2+5	91	WPC 1975	86	Win2-5	81	Win2-10	40	131	Win2+Max DD	49	71
Prison	TDCJ Prison Well	3199	258	Win2+5	253	WPC 1973	248	Win2-5	243	Win2-10	50	303	Win2+Max DD	184	224

Threshold	Action
Winter Threshold 1	If 6 of 11 are below threshold, 100% reduction in FSH non-historical use pumping
Winter Threshold 2	If 6 of 11 are below threshold, 50% reduction in FSH non-historical use pumping
Winter Threshold 3	If 6 of 11 are below threshold, 30% reduction in FSH non-historical use pumping
Winter Threshold 4	If 6 of 11 are below threshold, 10% redcution in FSH non-historical use pumping
Summer Threshold	If 6 of 11 are below threshold, meeting in 60 days between FSH and MPGCD to discuss data

Notes

Maximum Recent Drawdown (Winter to Summer) based on evaluation of recent data (~2010 to 2016)

Summer Thresholds derived by adding maximum recent drawdown (from historic data) to Winter 1 Threshold

Recent Depth to Water are from actual data maximum (summer) and minimum (winter) from spring 2016 to winter 2017

4. Management Zone 1 Threshold Wells

Management Zone 1 Threshold Wells are continuously monitored, and data is provided by telemetry in HydroVu (Figure 7). Water levels demonstrate relative year-over-year consistency as they are mostly in line with 2022 and 2023 measurements. All threshold wells will be evaluated on April 1st for Winter 1
– 4 water level threshold trigger levels.

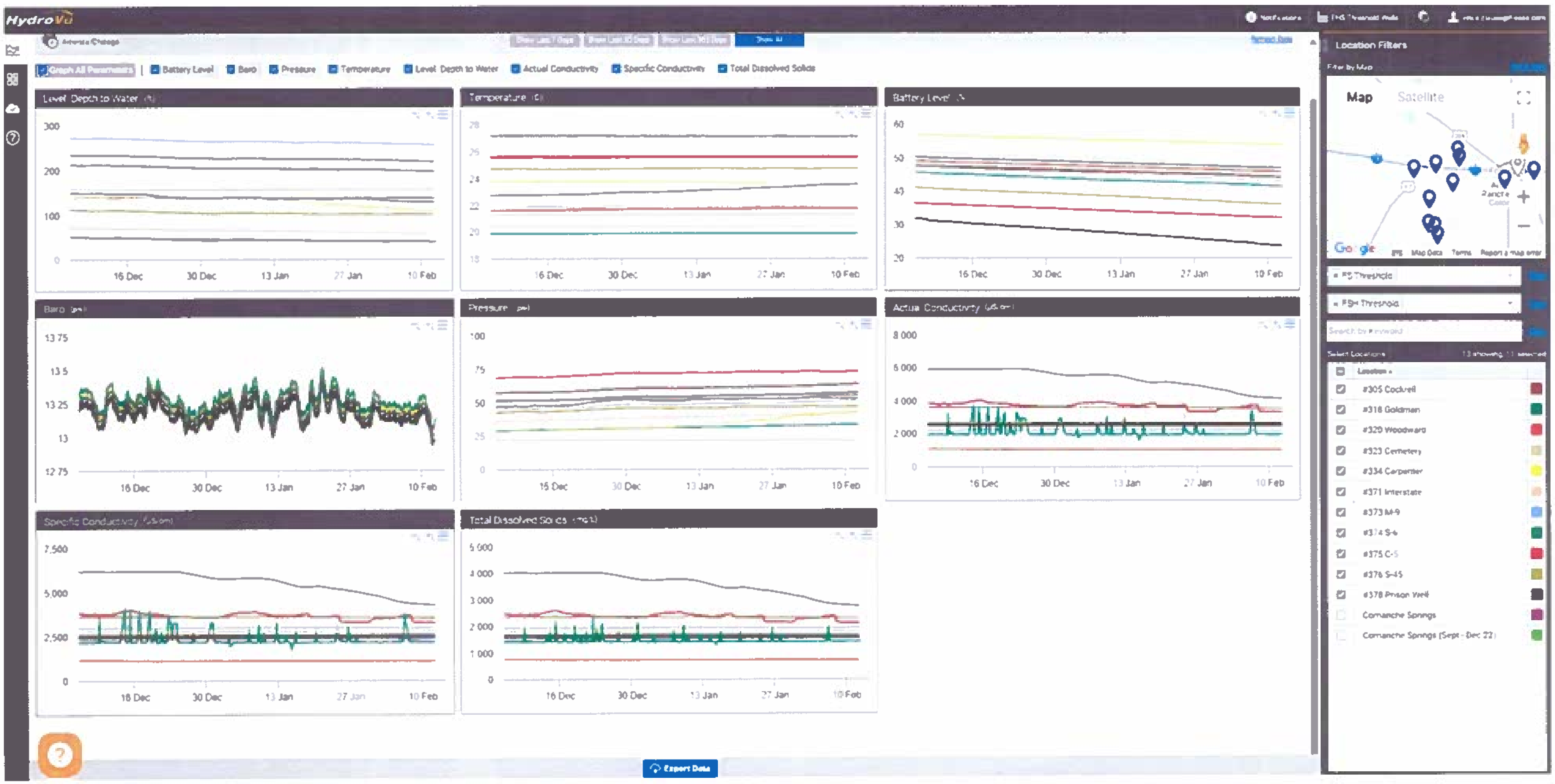


Figure 7 – HydroVu Threshold Well Dashboard. The HydroVu dashboard provides continuous reporting of water level depth, temperature, pressure, conductivity, and total dissolved solids.

ANNUAL EVALUATION REPORT 2025 **TPWMA (Trans-Pecos)**

Dr. Arquimedes Ruiz-Columbié
Active Influence & Scientific Management

In March 2025, cloud seeding operations began over the Trans-Pecos Weather Modification target area. This annual report summarizes the results. **Sixty-eight clouds** were seeded and identified by TITAN in **twenty-nine operational days**. Table 1 on page 1 summarizes the general figures:

Table 1 Generalities

First operational day: **March 27th, 2025**
Last operational day: **September 13th, 2025**

Number of operational days: 28
(One in March, seven in April, four in May, seven in June, none in July, eight in August, and one in September)

According to the daily reports, operational days were qualified as:

Fifteen with excellent performance

Nine with very good performance

Five with good performance

Number of seeded clouds: 65
(29 small-seeded clouds, 17 large-seeded clouds, and 19 type B-seeded clouds)

Opportunities missed: none with a lifespan longer than 1 hour,

Small Clouds

Table 2 shows the results from the classic TITAN evaluation for the 29 small-seeded clouds that obtained proper control clouds.

Table 2. Seeded Sample versus Control Sample (29 couples, averages)

Variable	Seeded Sample	Control Sample	Simple Ratio	Increases (%)
Lifetime	60 min	40 min	1.50	50 **(33)**
Area	74.7 km^2	27.5 km^2	2.72	172 **(34)**
Volume	344.4 km^3	87.4 km^3	3.94	294 **(35)**
Top Height	11.2 km	9.5 km	1.18	18 **(2)**
Max dBz	52.0	48.4	1.07	7 **(4)**
Top Height of max dBz	4.5 km	3.8 km	1.18	18 **(2)**
Volume Above 6 km	142.2 km^3	22.1 km^3	6.43	543 **(70)**
Prec.Flux	472.2 m^3/s	99.8 m^3/s	4.73	373 **(64)**
Prec.Mass	1705.5 ktons	293.9 ktons	5.80	480 **(145)**
CloudMass	232.6 ktons	42.5 ktons	5.47	447 **(40)**
η	7.3	6.9	1.06	6 **(73)**

Bold values in parentheses are modeled values, whereas η is defined as the quotient of Precipitation Mass divided by Cloud Mass and is interpreted as efficiency; 447 AgI and 13 hygroscopic flares were used in this sub-sample with perfect timing **(100 %)**, for an average effective dose of **50 ice nuclei per liter**. An excellent increase of **145 % in precipitation mass** indicates the use of dynamic doses for small clouds. The seeded sub-sample seemed 73 % more efficient than the control sub-sample. Results are evaluated as **excellent** for this subsample.

An increase of 145 % in precipitation mass for a control value of 293.3 ktons in 29 cases means:

Δ_1 = 29 x 1.45 x 293.3 ktons ≈ 12 342 ktons ≈ 10 009 ac-f (layer: 5.7 mm ≈ 0.22 in)

Large Clouds

The sub-sample of 17 large-seeded clouds received a synergetic analysis. On average, the seeding operations on these large clouds affected 75 % of their whole volume, with perfect timing (100 % of the material went to the clouds in their first half-lifetime); 303 AgI and 21 hygroscopic flares were used in this sub-sample for an effective AgI dose of about **30 ice-nuclei per liter**.

On average, large clouds were 25 minutes old when the operations took place; the operation lasted about 19 minutes, and the large-seeded clouds lived 225 minutes.

Table 3 shows the corresponding results:

Table 3. Large Seeded Sample versus Virtual Control Sample (17 couples, averages)

Variable	Seeded Sample	Control Sample	Simple Ratio	Increases (%)
Lifetime	225 min	185 min	1.22	22
Area	750 km^2	607 km^2	1.24	24
Volume	3653 km^3	2943 km^3	1.24	24
Volume Above 6 km	1671 km^3	1155 km^3	1.55	55
Prec.Flux	5875 m^3/s	4155 m^3/s	1.41	41
Prec.Mass	84 146 ktons	46 748 ktons	1.80	80

An increase of 80 % in precipitation mass for a control value of 46 748 ktons in 17 cases may mean:

$$\Delta_2 = 17 \times 0.80 \times 46\,748 \text{ ktons} \approx 635\,773 \text{ ktons} \approx 515\,612 \text{ ac-f}$$

(Layer: 49.86 mm ≈ 1.96 in)

Type B Clouds

The sub-sample of 19 type B seeded clouds received a synergetic analysis. On average, the seeding operations on these type B clouds affected 3 % of their whole volume, with excellent timing (94 % of the material went to the clouds in their first half-lifetime); 371 AgI and 13 hygroscopic flares were used in this sub-sample for an effective dose of about **30 ice nuclei per liter (static)**.

On average, type B clouds were 90 minutes old when the operations took place; the operation lasted about 21 minutes, and the type B seeded clouds lived 285 minutes.

Table 4 shows the results:

Table 4. Type B Seeded Sample versus Virtual Control Sample (19 couples, averages)

Variable	Seeded Sample	Control Sample	Simple Ratio	Increases (%)
Lifetime	285 min	280 min	1.02	2
Area	552 km^2	547 km^2	1.01	1
Volume	3025 km^3	3001 km^3	1.01	1
Volume Above 6 km	1676 km^3	1603 km^3	1.01	1
Prec.Flux	6176 m^3/s	6103 m^3/s	1.01	1
Prec.Mass	100 346 ktons	98 564 ktons	1.02	2

An increase of 2 % in precipitation mass for a control value of 98 564 ktons in 19 cases may mean:

Δ_3 = 19 x 0.02 x 98 564 ktons ≈ 37 454 ktons ≈ 30 375 ac-f
(Layer: ~ 3.6 mm ≈ 0.14 in)

The total increase: $\Delta_1 + \Delta_2 + \Delta_3$ = 555 996 ac-f

(Average layer: ~ 0.65 in)

(~ 345 ac-f per small storm; ~ 30 330 ac-f per large storm; ~ 1 599 per B storm)

Micro-regionalization (information per county)

	seeded (initial)	seeded (extended)	ac-f (Δ)	increase (in) (δ)	seasonal (in) (March-Sept.)	%
Culberson	2	3	4 900	0.02	8.06	0.2 %
Reeves	20	24	145 900	1.23	7.92	15.5 %
Pecos	35	36	304 500	1.32	7.01	18.8 %
Ward	3	5	28 000	0.65	5.27	12.3 %
Loving	1	2	52 300	1.31	7.31	17.9 %
Sub-total	61	70	535 600			
Outside	4	12	20 400	(~ 4 % of the total increase) (Downwind effects)		
Total	65	82	556 000			
Averages				0.90 in	7.11 in	12.9 %

Season: March 27th – September 13th, 2025: 140 days (July days and precipitation are not included)

Final Comments

- Results are evaluated as **excellent;** excellent average timing (98 %) and dose (40 in per liter). A noticeable increase of **12.9 %** for the whole target area is a strong signal. Additionally, no missed opportunities occurred, and **more than a half-million acre-ft increase!**
- Hygroscopic seeding was well-applied; forty-seven hygroscopic flares were used.
- Radar estimations of precipitation should be considered as measurements of trend. Nevertheless, according to the results reported, seeding operations improve the dynamics of seeded clouds.

Addendum: A brief comparison between the last eight campaigns

Year	seeded storms	operational days	increases (million ac-f)	%	season precipitation	SONI
2018	19	9	0.14	2.7	9.28 in	0.0
2019	26	18	0.33	10.7	7.83 in	0.4
2020	30	15	0.34	13.2	4.12 in	-0.4
2021	59	30	0.75	13.3	8.50 in	-0.5
2022	44	23	0.65	13.4	7.90 in	-1.0
2023	32	19	0.33	7.3	6.03 in	0.9
2024	27	12	0.034	2.2	3.17 in	- 0.1
2025	**65**	**28**	**0.556**	**12.9**	**7.11**	**- 0. 2**

The last column, SONI, shows the seasonal values (March to October) of the Oceanic Niño Index (ONI), the basic index for tracking the El Niño – Southern Oscillation climate pattern.

Season 2025 appears to be the best one in acre-feet increases!

Left Blank Intentionally

Final Report

2025 Update: Comparison of Groundwater Elevations and Drawdowns: GAM DFC Simulation and Measured Data from TWDB

Prepared for:
Middle Pecos Groundwater Conservation District
PO Box 1644
Ft. Stockton, TX 79735
432-336-0698

Prepared by:
William R. Hutchison, Ph.D., P.E., P.G.
Independent Groundwater Consultant
909 Davy St
Brenham, TX 77833
512-745-0599
billhutch@texasgw.com

February 6, 2026

Table of Contents

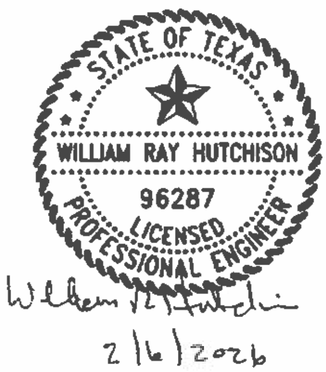
List of Tables

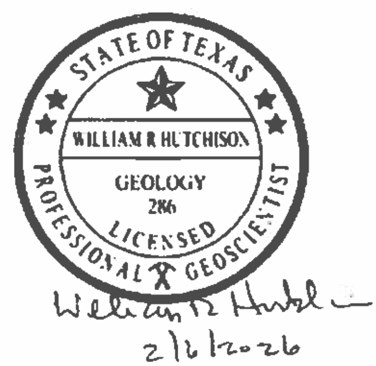
List of Figures

Professional Engineer and Professional Geoscientist Seals

This report was prepared by William R. Hutchison, Ph.D., P.E., P.G., who is licensed in the State of Texas as follows:

- Professional Engineer (Geological and Civil) No. 96287
- Engineering Firm Registration No. 14526
- Professional Geoscientist (Geology) No. 286





1.0 Introduction

One of the required goals (Goal 8) of the Middle Pecos Groundwater Conservation District Management Plan is a how the District addresses the desired future conditions in a quantitative manner. This report:

- Summarizes the available data from the TWDB Groundwater Database
- Describes the analyses that were completed to select monitoring wells for the comparison with the simulations that are the basis for the desired future condition
- Provides a comparison of model simulated groundwater elevations and drawdowns with actual data and provides some context to the results with an analysis of precipitation in the area.

The current management plan included an appendix providing documentation of this comparison (Hutchison, 2025). This report represents an updated analysis that ends in 2024 because complete groundwater level and precipitation data for 2025 are not yet available on the TWDB website.

2.0 TWDB Data

2.1 Groundwater Level Data

The TWDB groundwater database includes a site for water levels by county:

https://www3.twdb.texas.gov/apps/reports/GWDB/WaterLevelsByCounty

Data for Pecos County were downloaded on February 5, 2026 for use in this report. The raw data were filtered to only include records with water level data after 2005 (the base year for the desired future condition). Sorting the data by date resulted in the identification of 35 wells that could be used for this analysis.

The Fortran program *TWDBData.exe* was written to read the list of wells, read the water level data, and return end-of-year water levels. For purposes of this selection, the monthly priority of groundwater levels to assign an end-of-year groundwater level was:

1. December of the current year
2. January of the next year
3. November of the current year
4. February of the next year

This effort yielded 397 groundwater level records for the 35 wells in the Edwards-Trinity (Plateau) and Pecos Valley Alluvium. Data are not available to evaluate the DFCs for the Capitan Reef Complex, Dockum, and Rustler aquifers.

The Fortran program *etppvrowcol.exe* was written to locate each well on the grid of the Groundwater Availability Model used as the basis for the desired future conditions (DFC) in GAM 3 and GAM 7. The results are expressed in terms of the model row and column.

Table 1 summarizes information on the 35 wells, and Figure 1 presents their locations. Please note that the Well ID from Table 1 is used to identify each well location in Figure 1.

Table 1. Summary of Well Information

ID	State Well Number	Depth (ft)	2005 Depth to Water (ft)	2005 Groundwater Elevation (ft MSL)	Reference Point Elevation (ft MSL)	x-Coordinate (GAM in ft)	y-coordinate (GAM in ft)	GAM Row	GAM Column	Aquifer (TWDB Designation)
1	4562402	120	74.00	2,459.00	2533	4180198	19622464	169	141	Edwards-Trinity Plateau
2	4562901	190	52.30	2,249.70	2302	4215271	19605324	167	148	Edwards-Trinity Plateau
3	4563701	138	53.26	2,244.74	2298	4221824	19602964	166	150	Edwards-Trinity Plateau
4	4648502	724	271.85	2,253.15	2525	3969727	19718808	182	99	Pecos Valley Dockum
5	4648503	625	203.50	2,309.50	2513	3971254	19725630	181	99	Pecos Valley Dockum
6	4648604	425	278.49	2,249.51	2528	3975771	19716692	182	100	Pecos Valley
7	4648801	400	250.04	2,327.96	2578	3968880	19702396	184	101	Pecos Valley
8	4655603	600	212.49	2,481.51	2694	3943140	19674652	192	101	Pecos Valley Dockum
9	4656201	865	337.13	2,285.87	2623	3964642	19690156	187	102	Pecos Valley Dockum
10	4656301	568	287.01	2,330.99	2618	3974916	19685516	186	104	Pecos Valley Edwards-Trinity Plateau
11	4656306	615	224.19	2,369.81	2594	3984143	19690126	184	105	Edwards-Trinity Plateau
12	4656401	400	199.70	2,486.30	2686	3947946	19675934	191	102	Pecos Valley
13	5206501	351	202.57	2,874.43	3077	3881571	19588218	212	104	Edwards-Trinity Plateau
14	5206701	510	275.00	2,962.00	3237	3871409	19565630	216	105	Edwards-Trinity Plateau
15	5207302	501	168.87	2,795.13	2964	3938323	19599728	203	110	Edwards-Trinity Plateau
16	5207502	280	147.11	2,872.89	3020	3924183	19585546	207	110	Edwards-Trinity Plateau
17	5207901	612	137.41	2,943.59	3081	3937221	19567040	208	114	Edwards-Trinity Plateau
18	5208302	310	143.00	2,875.00	3018	3975494	19595652	199	116	Edwards-Trinity Plateau
19	5208801	200	130.50	2,955.50	3086	3959985	19562958	205	118	Edwards-Trinity Plateau
20	5216302	320	82.11	2,997.89	3080	3973890	19552850	205	121	Edwards-Trinity Plateau
21	5216505	246	126.00	3,015.00	3141	3962364	19545166	207	120	Pecos Valley
22	5216802	448	173.80	3,027.20	3201	3967842	19530824	209	123	Edwards-Trinity Plateau
23	5221301	350	332.85	3,179.15	3512	3853463	19511174	226	109	Edwards-Trinity Plateau
24	5301707	98	26.08	2,942.92	2969	3986189	19573280	200	120	Edwards-Trinity Plateau
25	5301805	341	145.00	2,884.00	3029	4000338	19572294	199	122	Edwards-Trinity Plateau
26	5301902	180	56.64	2,924.36	2981	4018510	19565434	197	126	Edwards-Trinity Plateau
27	5302708	227	135.68	2,889.32	3025	4030552	19560160	197	128	Edwards-Trinity Plateau
28	5303901	462	145.39	2,730.61	2876	4092037	19559444	189	137	Edwards-Trinity Plateau
29	5306501	425	98.58	2,311.42	2410	4196970	19581700	173	149	Edwards-Trinity Plateau
30	5307202	Unknown	156.40	2,268.60	2425	4234979	19591762	166	153	Edwards-Trinity Plateau
31	5307203	Unknown	142.40	2,211.60	2354	4241304	19590826	166	154	Edwards-Trinity Plateau
32	5309105	200	107.37	2,979.63	3087	3982084	19550196	204	122	Edwards-Trinity Plateau
33	5309301	210	88.04	2,923.96	3012	4015507	19553902	199	127	Edwards-Trinity Plateau
34	5309306	235	44.00	2,927.00	2971	4018968	19559648	198	126	Edwards-Trinity Plateau
35	5312702	Unknown	159.00	2,757.00	2916	4108293	19521890	192	144	Edwards-Trinity Plateau

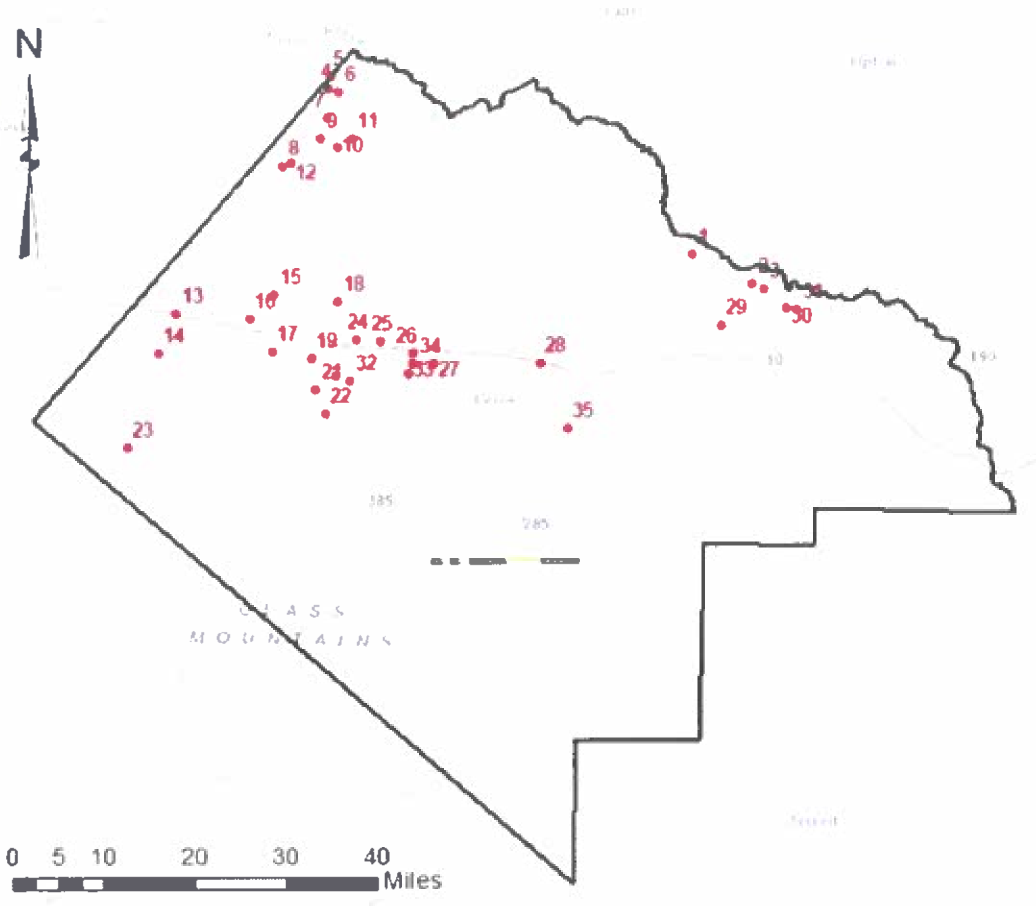


Figure 1. Well Locations

2.2 Precipitation Data

Precipitation data were downloaded from the TWDB website:

https://waterdatafortexas.org/lake-evaporation-rainfall

As seen in Figure 2, Pecos County is in parts of four quadrangles (604, 605, 704, and 705). The available data for the four quadrangles include monthly totals of precipitation from 1940 to 2024. Data for 2025 are limited to the first quarter (January, February, and March). These data were saved to the file *MPGCD Pcp.xlsx*. The monthly data were averaged across all four quadrangles, the annual totals for each year were calculated and presented in Column M. The annual rainfall was also expressed in terms of a percent average for the entire period in Column N. The average rainfall from 1940 to 2024 was 13.24 inches. Annual departures from the average are presented in Column O. The pertinent data for the years of interest (2005 to 2023) are summarized in Table 2.

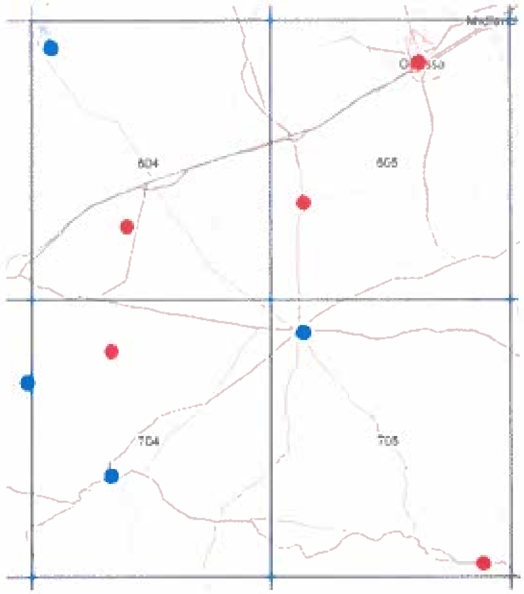


Figure 2. Location of Precipitation Quads

Table 2. Precipitation for Quadrangles 604, 605, 704, and 705: 2005 to 2023

Year	Annual Precipitation (in)	Annual Precipitation (% of Average)	Annual Difference from Average (in)
2005	15.60	116.75	2.24
2006	11.17	83.59	-2.19
2007	18.79	140.66	5.43
2008	12.02	89.99	-1.34
2009	12.00	89.82	-1.36
2010	16.60	124.27	3.24
2011	3.08	23.07	-10.28
2012	12.32	92.18	-1.05
2013	10.53	78.80	-2.83
2014	11.58	86.70	-1.78
2015	19.41	145.30	6.05
2016	13.32	99.70	-0.04
2017	13.39	100.24	0.03
2018	14.85	111.13	1.49
2019	14.30	107.04	0.94
2020	7.76	58.07	-5.60
2021	10.37	77.62	-2.99
2022	12.50	93.53	-0.87
2023	9.26	69.27	-4.11
2024	7.24	54.17	-6.12

Annual departures from the long term mean precipitation is presented in Figure 3 and highlights the current drought (2020 to 2024). Please note that the last wet year was 2015. Since then, there were four near-average years (2016, 2017, 2018, and 2019) followed by five dry years (2020, 2021, 2022, 2023, and 2024).

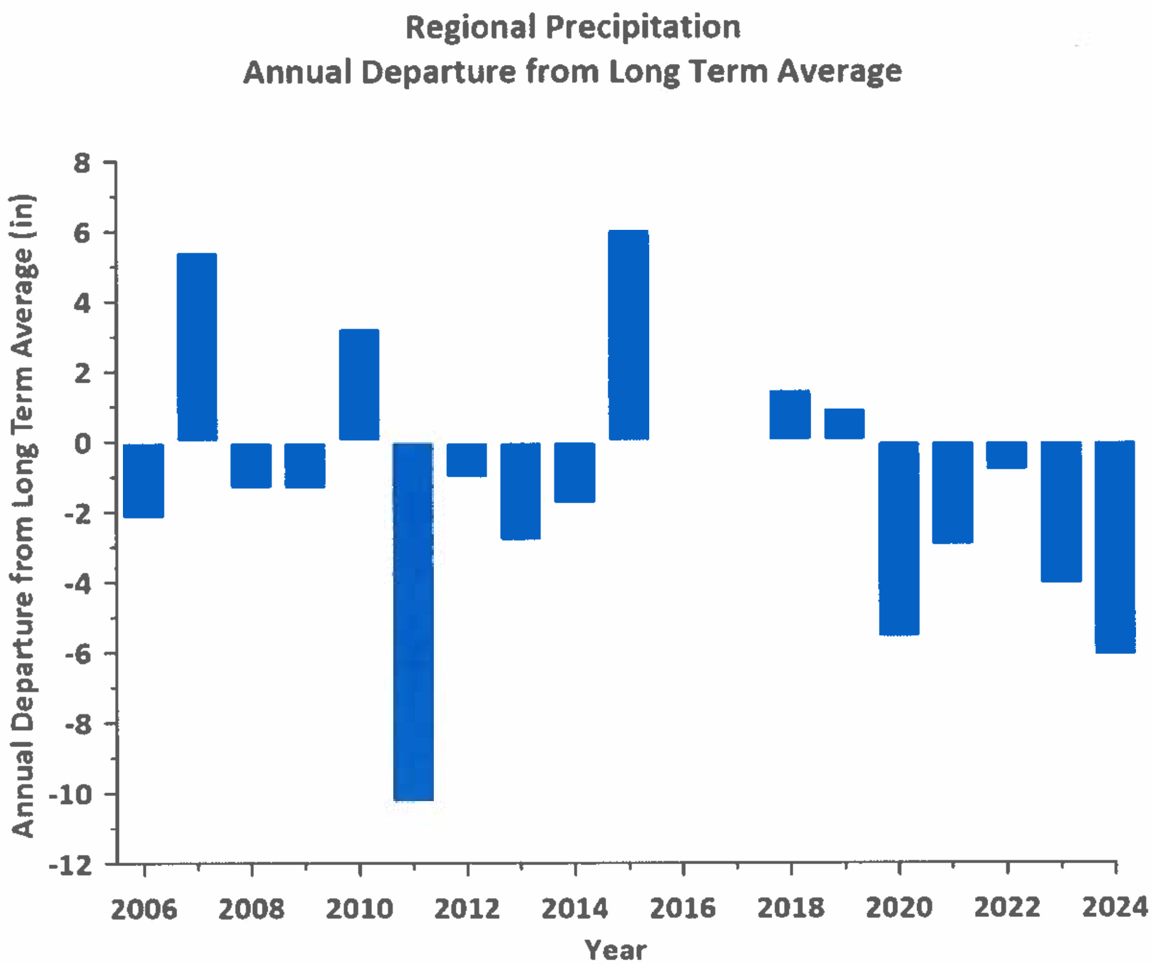


Figure 3. Regional Precipitation Annual Departures from Average

3.0 GAM Results and Comparison to Actual Data

The Fortran program *getDFCdd.exe* reads the actual drawdown data described above (397 records) and extract the groundwater elevations from those same points and years from the calibrated model (2005) and the DFC simulation (2006 to 2070). The results are saved in the file *actsimdd.dat*. These results were copied to the Excel file named *PecosActSimDDCompare.xlsx*, the annual results averaged, and the precipitation data were added. Table 3 presents the annual summary included in the Excel file.

Table 3. Summary of Annual Drawdown Comparison

Year	Data Count	Average Actual Drawdown (ft)	Average Simulated Drawdown (ft)	Precipitation (in)	Precipitation (% of Average)
2006	18	0.40	2.29	11.17	84
2007	18	0.83	3.42	18.79	141
2008	14	9.86	4.34	12.02	90
2009	19	0.02	4.77	12.00	90
2010	18	2.36	4.82	16.60	124
2011	21	10.25	5.40	3.08	23
2012	22	14.88	6.06	12.32	92
2013	22	17.73	6.56	10.53	79
2014	22	16.80	7.03	11.58	87
2015	22	5.60	7.50	19.41	145
2016	21	4.38	8.01	13.32	100
2017	17	4.05	9.00	13.39	100
2018	18	1.55	9.43	14.85	111
2019	18	17.28	9.86	14.30	107
2020	18	14.26	10.30	7.76	58
2021	18	14.03	10.73	10.37	78
2022	18	11.08	11.16	12.50	94
2023	18	12.36	11.59	9.26	69
2024	18	13.04	12.01	7.24	54

Figure 4 presents a hydrograph of actual average drawdown and simulated average drawdown from 2005 to 2024. Please note that the blue numbers represent the annual precipitation for each year expressed as a percentage of long-term average, and the red numbers represent the numbers of records that were compared in each year.

Please note that the simulated drawdown is declining from 2005 to 2021 with only slight variations from a linear trend. The linear trend is expected because the simulation assumed constant and average rainfall and recharge conditions.

Based on the last few years, it is expected that the TWDB precipitation data for 2025 will be posted in April or May 2026. The groundwater level data for 2025 does not yet appear complete. This may suggest that this analysis be completed later in the calendar year in the future to get a more complete picture in the annual assessment.

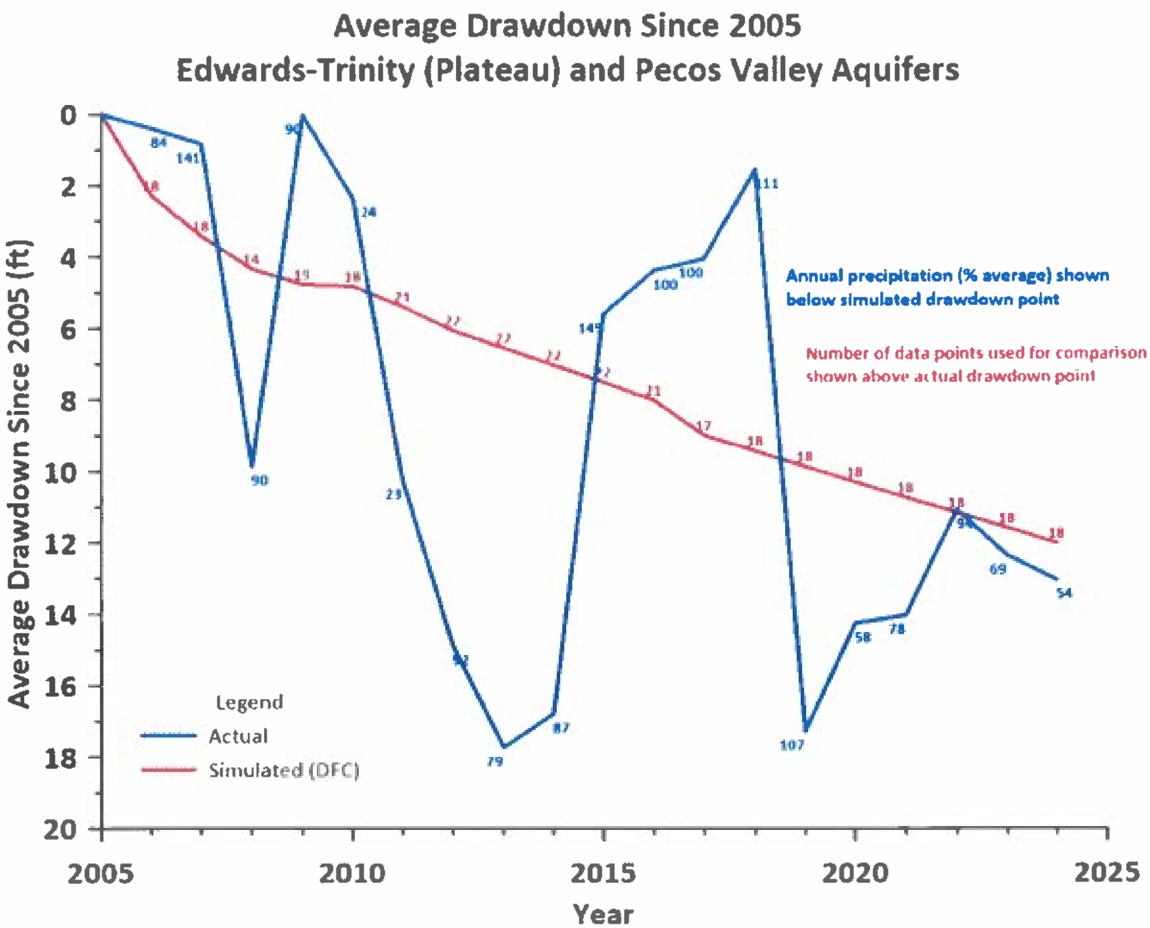


Figure 4. Average Drawdown Comparison (2005 to 2024)

The actual drawdown appears to rise and fall generally with precipitation (wet years yield low drawdowns and dry years yield higher drawdowns). This is expected since pumping generally increases during drought years as irrigation demands are higher.

A more complete analysis of this observation is presented in Figure 5, which presents a plot of annual precipitation (as a percentage of average) vs. measured average drawdown, along with the best-fit line based on a second-order polynomial regression of drawdown in feet (DD) and annual precipitation in inches (PCP):

$$DD = 11.451087 + (0.065875744 * PCP) - (0.00093313511 * PCP^2)$$

The 98% confidence of the linear regression is also shown.

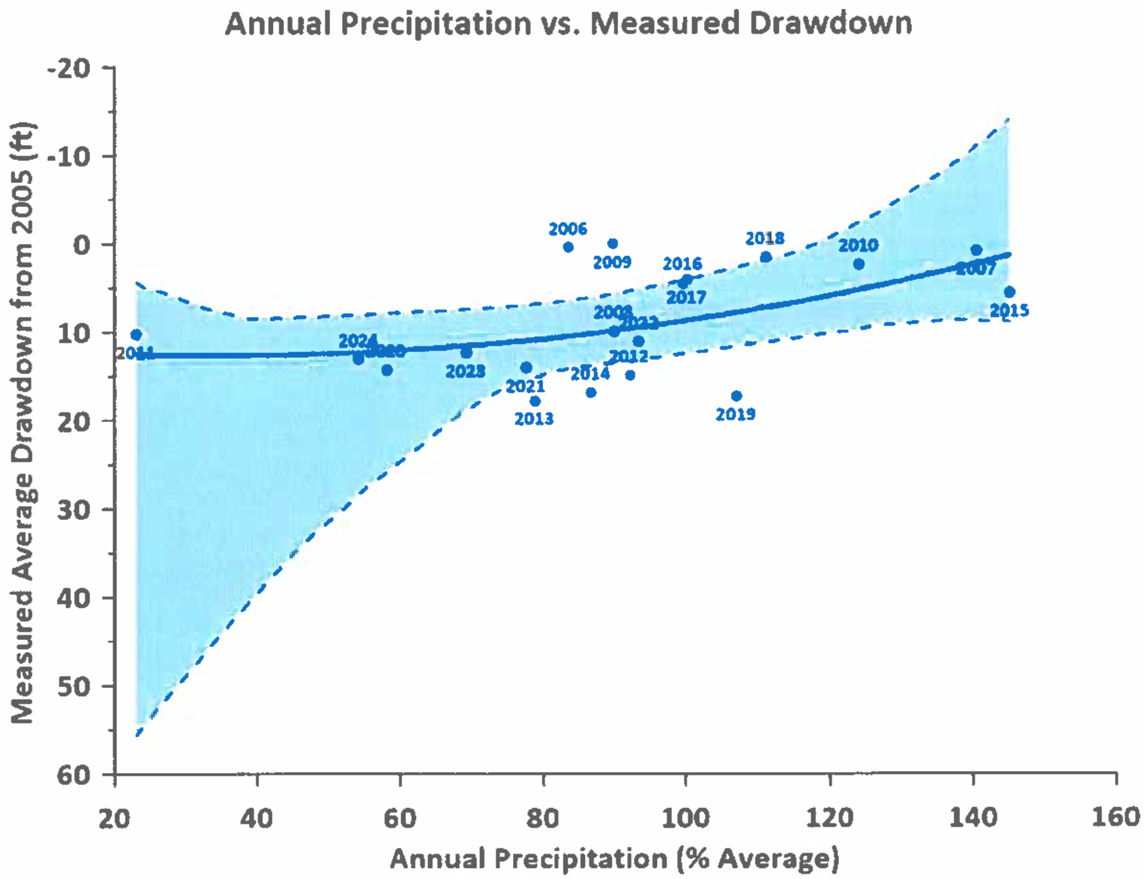


Figure 5. Annual Precipitation vs. Measured Drawdown

Please note that the year is also shown on each data point. As expected, the higher the rainfall, the lower the drawdown. However, the plot shows considerable scatter. During dry years, the confidence band is wider due to that general lack of data (2011 was an exceptionally dry year with only 21 percent of average precipitation, or about 3 inches).

The correlation is not particularly strong, which means that there are several influences and factors that are not considered in this simple analysis. A cursory review of the figure also shows that 2019 is anomalous. In 2019, the average drawdown is greater than expected given the precipitation that year. Pumping from exempt oil and gas operations was unusually high in 2019 (about 11,000 AF/yr), which could explain the high drawdown in 2019 compared to the other years if the monitoring wells that were used for this analysis were located near the pumping. Please note that since the subsequent years generally fall within the confidence band, there is little need to delve into this issue further for purposes of comparing actual and simulated drawdowns.

4.0 Discussion and Recommendations

The TWDB database was sampled to find wells with groundwater elevation measurements in Pecos County. The analysis showed that the TWDB database did not have sufficient groundwater elevation data to complete a comparison with simulated drawdowns for the Capitan Reef Complex, Dockum, and Rustler aquifers. It is recommended that monitoring of wells completed in these aquifers be identified and data collection from these wells improved, or the aquifers be classified as not relevant for purposes of joint planning. Such a classification would result in no desired future condition for that aquifer in Pecos County and would result in no modeled available groundwater calculation by the Texas Water Development Board. The Regional Planning Group (Region F) would be responsible for establishing groundwater availability if an aquifer is classified as not relevant for purposes of joint planning.

The analysis showed that the TWDB database had sufficient groundwater elevation data to complete a comparison with simulated drawdown for the Edwards-Trinity (Plateau) and Pecos Valley aquifers. The database was sampled to find wells in Pecos County with groundwater elevation measurements in 2005 to compare with simulated drawdowns from the GAM simulation that was the basis for the desired future condition.

The comparison of measured drawdowns with simulated drawdowns showed that, in general, when annual precipitation is higher than average, measured drawdown is less than simulated drawdown and when annual precipitation is less than average, measured drawdown is higher than simulated drawdown. In general, lower than average precipitation correlates with lower-than-average recharge and higher than average pumping. However, this relationship is complex and other factors are important. This analysis shows a weak correlation between annual precipitation and measured drawdown, but the analysis also shows that the measured drawdowns are consistent with the simulation that was the basis for the desired future condition.

Based on this analysis, it is recommended that the future annual updates to this analysis be delayed until later in the year to provide more groundwater level data. If the analysis were completed in the fall, more data from the end of the previous year will be available for analysis.

5.0 References

Hutchison, W.R., 2025. 2024 Update: Comparison of Groundwater Elevations and Drawdowns: GAM DFC Simulation and Measured Data from TWDB. Report to Middle Pecos Groundwater Conservation District, Fort Stockton, Texas. February 13, 2025. 12p.