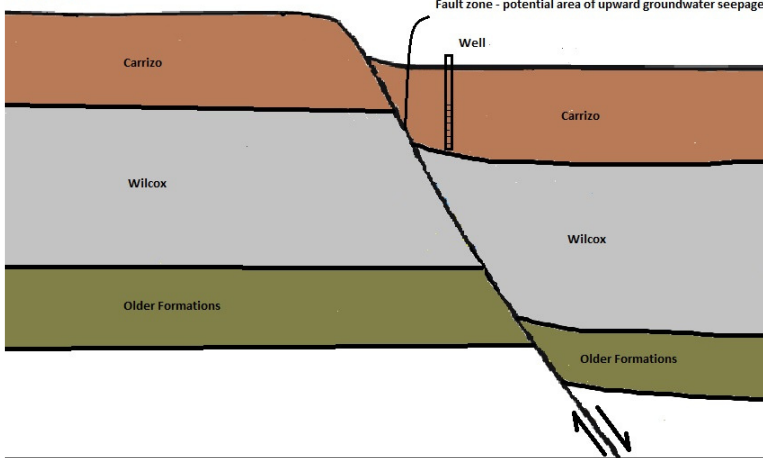


FIGURE 3



Klemt & Sengelmann, 2023

## Fault Zone Salinity Study

### Introduction

It has been postulated that salinity in the Carrizo aquifer increases as recharge travels down dip due to dissolving minerals along its path. However, salinity is also increased by the mixing of higher salinity ground-water from formations below the Carrizo moving upward along fault zones (Kreitler, 1979 and Hamlin, 1988)

### Purpose

The purpose of this paper is to test the hypothesis that higher salinity ground-water from formations below the Carrizo is moving upward along faults. Ground water from wells at two well sites, close to faults, in Guadalupe and Gonzales Counties will be used to test this theory. Data used in this study is from the following: ... Cont. on pg. 4

[WWW.GCGCD.ORG](http://WWW.GCGCD.ORG)

# GCGCD NEWS



**BONUS**

Pre-Fall 2023 Newsletter



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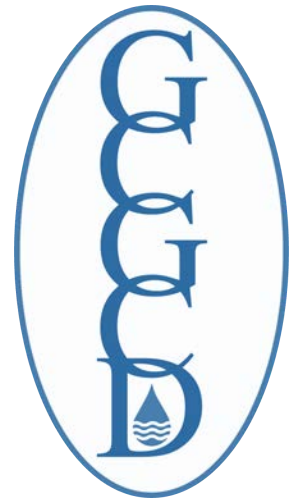


# News @ GCGCD

This is our first-ever *Bonus Newsletter*! We're excited to share District updates and give our Hydrogeologist Bill Klemt and the former GM of GCUWCD, Greg Sengelmann, a space to host their recent study. The **Fault Zone Salinity Study** gives insight to how water quality can change depending on where a well field is located in relation to a fault zone. To learn more about how fault zones affect water quality and Total Dissolved Solids (TDS), continue to page 4 of our Bonus Newsletter.

This *Bonus Newsletter* also includes information on the recent proclamation of drought by the Governor of Texas, conservation tips to help us get through the drought, and information on how this Summer broke heat records in Texas.

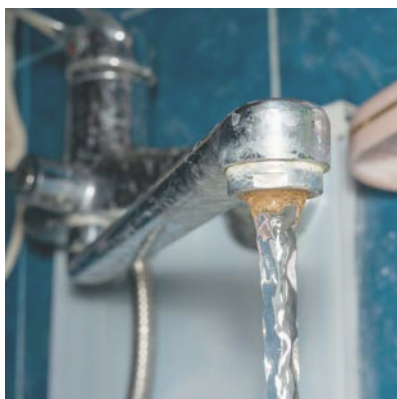
Our regularly scheduled Fall Newsletter will be released on October 31st.



## Conservation Tip!

Sink aerators are a common and simple way to reduce the waste of water in your home! You may already have some installed, but if you do not, there are many examples of the benefits they offer. Aerators reduce the amount of water used, reduce faucet noise, are inexpensive, offer more consistent water pressure, and increase water filtration.

[Source](#)



# Rainfall

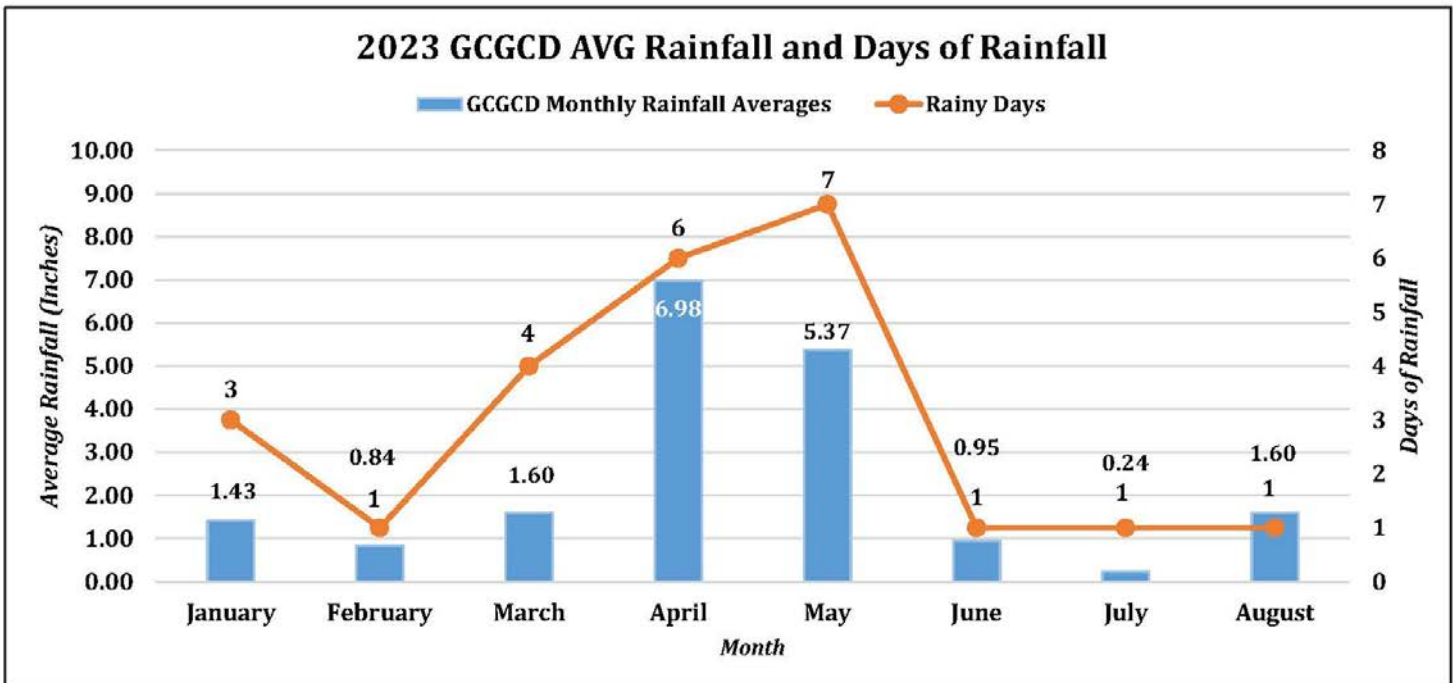


## GCGCD Average Monthly Rainfall (in.) for 2023



TWDB TexMesonet Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual Total By Site
Baker Ranch	0.32	0.19	1.95	6.09	5.33	0.11	0.07	0.14					14.20
Diamond Half Ranch	1.91	1.27	2.88	13.95	8.62	1.26	1.04	2.10					33.03
Grones Ranch	1.94	0.96	1.61	6.27	5.27	1.00	0.06	0.51					17.62
Jones Ranch	1.73	1.51	1.90	12.08	7.63	2.03	0.20	0.34					27.42
Randolph Auxiliary*	1.71	0.65	0.91	4.01	1.61	0.57	0.03	2.10					11.59
SHWSC Office	1.50	0.79	1.34	4.29	3.83	0.95	0.18	1.52					14.40
SHWSC Plant ★	2.05	1.00	1.60	4.99	5.37	0.82	0.27	5.55					21.65
Strey Ranch	0.27	0.34	0.60	4.13	5.26	0.86	0.06	0.50					12.02
													Total Avg
Monthly Avg	1.43	0.84	1.60	6.98	5.37	0.95	0.24	1.60					18.99

\* Maintained by the NWS/FAA



## FAULT ZONE SALINITY STUDY

By William B. Klemt, P.G., Consulting Geologist

Greg Sengelmann, P.G., Consulting Geologist

1) Monitor well drilling program initiated by the Gonzales County Underground Water Conservation District with cooperation by Plum Creek Conservation District in Caldwell County and the Guadalupe County Groundwater Conservation District (Perry, 2021).

2) Schertz-Seguín Local Government Corporation's Well Field in western Gonzales County.

It is assumed that where the salinity of ground water from the fault-line well exceeds the average salinity of other wells in the vicinity of the fault-line well, then there is a possibility of high saline water moving upward along the fault.

### Scope

The following fault-line well sites were selected for this study:

- 1) Outcrop Monitoring Well MWCZ-3; and
- 2) Schertz-Seguín Local Government Corporation (SSLGC) Well 11.

The MWCZ-3 well is located in southern Guadalupe County (Figure 1). The Well is located on the outcrop of the Carrizo aquifer under water-table conditions in an area of intense faulting near the Guadalupe River. The top and base of the Carrizo is at +362 and +288 above sea level, respectively and the well screen of 40 feet is set in this interval. The Nash Creek Fault is very close to the MWCZ-3 Well. Other associated outcrop monitor wells (10) drilled by the ground-water districts (2018 - 2020), and used in this study, are located northeast and southwest of the MWCZ-3 well Site. The Nash Creek Fault, MWCZ-3 Well, and other associated outcrop monitor wells are shown on Figure 1.

The SSLGC- 11 is located down dip from the MWCZ-3 Well in western Gonzales County (Figure 2) close to the Sandies-O'Neal Creek Fault. The water level in the well is at +285 and the well is under artesian conditions. Top of the Carrizo is at -530 and the well screen is set from -730 to - 1,145 feet below sea level. The SSLGC-11 well site, Sandies-O'Neal Creek Fault, and other associated SSLGC wells are shown on Figure 2.

### Methodology

The investigation consists of the following:

- 1) Total dissolved solids concentrations were averaged from wells in the district's outcrop study (9 wells) and from the down dip SSLGC Well Field (11 wells). It was noted that the range of TDS values in the outcrop wells ranged from 104 - 286mg/L and in the down dip SSLGC Well Field, 101 - 171mg/L. Fault-line Wells MWCZ-3 and SSLGC-11 are not included in the above calculations and observations. TDS sample data for the outcrop wells and the SSLGC well field wells are included in Tables 1 and 2, respectively.
- 2) The average TDS concentration from the district's outcrop study wells and from the down dip SSLGC Well Field wells, were approximately 166 mg/L and 132 mg/L. The TDS concentrations at MWCZ-3 and SSLGC-11 were 474mg/L and 211 mg/L, respectively.
- 3) Comparison of the TDS fault-line well values with the average TDS values of the associated wells indicates the following calculated factors:
  - a) SSLGC-11, 1.6 times higher than the average value for the associated wells; and
  - b) MWCZ-3, 2.9 times higher than the average value for the associated wells.

### Conclusion

The salinity in the Carrizo outcrop is more variable with TDS values ranging widely as compared to the range of TDS values in the SSLGC Well Field. This salinity comparison indicates, as ground water moves deeper down dip, the change in salinity is complex and becomes less variable. Also, in certain situations, salinity may not increase with depth. With regard to MWCZ-3, the data suggests upward movement of saline ground water into the Carrizo along the Nash Creek fault and other faults associated with this well. Likewise in the down dip SSLGC-11 well, data also suggests movement of saline water upward into the Carrizo along the Sandies-O'Neal fault. Figure 3 depicts the typical type of faulting in the area and potential for upward movement of ground-water along the fault trace. In selecting drilling sites for large capacity Carrizo wells, care should be taken not to locate a well site near a fault where water quality is a concern. However, in some situations, overall water quality of the well field can be improved by locating next to a fault.

**Table 1**  
**Gonzales County Underground Water Conservation District**  
**Guadalupe County Groundwater Conservation District**  
**Outcrop Monitoring Wells**  
**Water Quality Data**

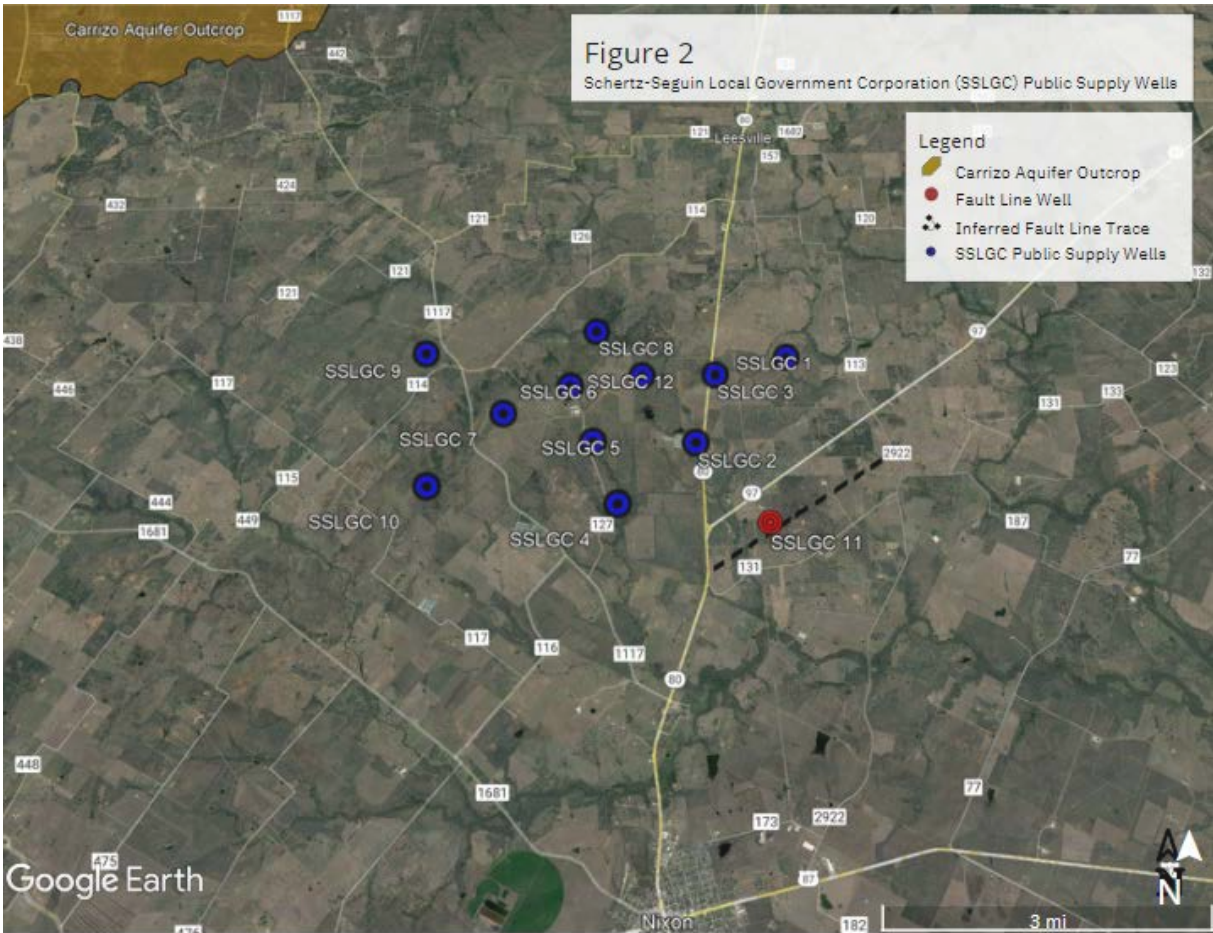
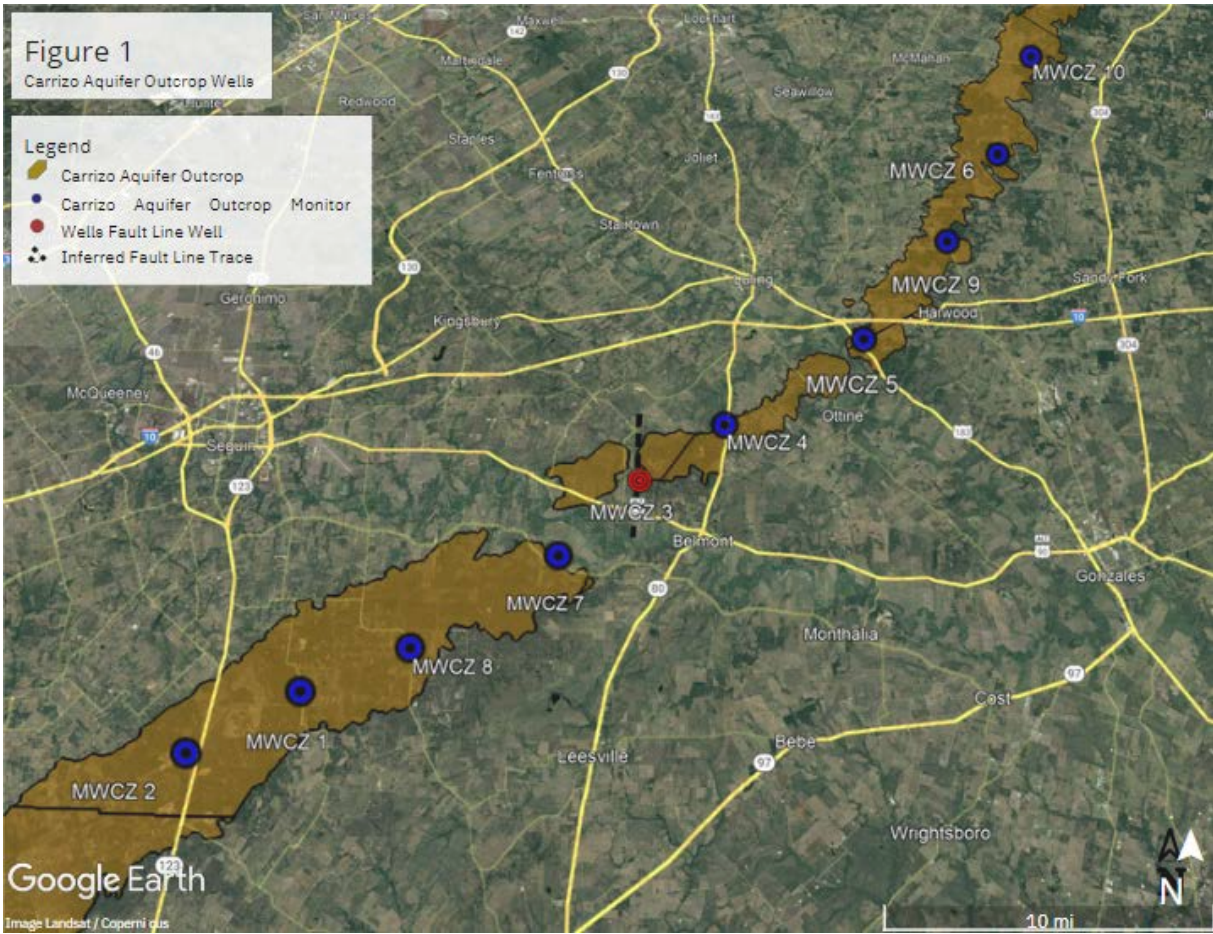
Well ID	Date Sampled	Total Dissolved Solids (Mg/L)
MWCZ 1	2020	122
MWCZ 2	2018	104
*MWCZ 3	2019	474
MWCZ 4	2019	201
MWCZ 5	2019	286
MWCZ 6	2019	156
MWCZ 7	2019	114
MWCZ 8	2019	111
MWCZ 9	2013	226
MWCZ 10	2013	172

\* Fault Line Well not used in averaging of TDS concentrations

**Table 2**  
**Schertz-Seguin Local Government Corporation**  
**Well Field**  
**Water Quality Data**

Well ID	Date Sampled	Total Dissolved Solids (Mg/L)
SSLGC 1	2013	146
SSLGC 2	2013	138
SSLGC 3	2013	132
SSLGC 4	2013	171
SSLGC 5	2013	109
SSLGC 6	2013	109
SSLGC 7	2013	101
SSLGC 8	2013	135
SSLGC 9	2013	111
SSLGC 10	2013	157
*SSLGC 11	2013	211
SSLGC 12	2013	145

\* Fault Line Well not used in averaging of TDS concentrations



## REFERENCES

Hamlin, H.S., 1988, Depositional and ground-water flow systems of the Carrizo-Upper Wilcox, south Texas: The University of Texas at Austin, Bureau of Economic Geology Report of Investigations 175, 61 p.

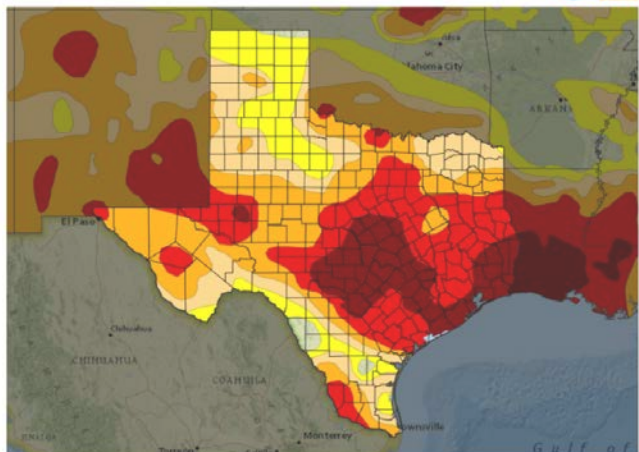
Kreitler, C.W., 1979, Ground water hydrology of depositional systems, in Galloway, W.E., and others, Depositional and ground water flow systems in the exploration for uranium, a research colloquium: The University of Texas at Austin, Bureau of Economic Geology, p. 118 - 176.

Perry, Russell., 2021, Summary Report, Carrizo Outcrop Monitor Wells; Guadalupe, Gonzales, and Caldwell Counties, Texas: Daniel B. Stephens & Associates, 7 p. with 9 Attachments.

# Drought

“Pursuant to his powers as [Governor of the State of Texas](#), Greg Abbott has issued the following: A proclamation declaring and renewing a state of disaster in a certain number of counties based on the existence of serious drought conditions that pose an imminent threat of widespread or severe damage, injury, or loss of life or property.”

U.S. Drought Monitor: Texas



Basemap Sources: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, INCIS, TX

### Drought & Dryness Categories

D0 - Abnormally Dry	22.6%
D1 - Moderate Drought	14.4%
D2 - Severe Drought	29.1%
D3 - Extreme Drought	19.7%
D4 - Exceptional Drought	12.6%
Total Area in Drought (D1-D4)	75.8%

Source(s): NDMC, NOAA, USDA  
Data Valid: 09/05/23

[Drought.gov](#)

To learn more about drought restrictions in accordance with your service provider, visit their website:

[City of Seguin](#)  
[Crystal Clear S.U.D.](#)  
[Green Valley S.U.D.](#)  
[Springs Hill W.S.C.](#)  
[Central States Water Resources](#)

**REMEMBER:** We're still under a burn ban! According to the [Guadalupe County Fire Marshal](#), “When a Declaration of Disaster regarding Fire Danger is in effect, NO burning, for any reason may be conducted outdoors. When a burn ban is in effect, all outdoor burning, except for agricultural purposes, is prohibited.” To learn more, visit their website using the link above.

## Source

131,533

people in Guadalupe County are affected by drought

— No change since last week

— No change since last month

100%

of people in Guadalupe County are affected by drought

— No change since last week

— No change since last month

7th

driest July on record, over the past 129 years

↓ 1.98

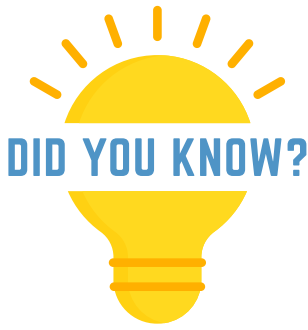
inches from normal

48th

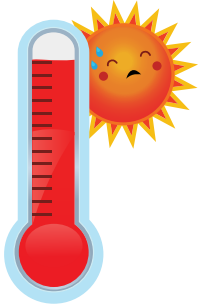
driest year to date over the past 129 years (January-July 2023)

↓ 2.52

inches from normal



This Summer was the second hottest Summer ever recorded in Texas! Listed below are some facts found in a [Texas Tribune](#) article that describe the record heat.



- This Summer's overall average temperature was **85.3** degrees Fahrenheit. The record holder is still 2011 with an overall average temperature of 86.8 degrees.
- Although this Summer didn't break the avg. temp. record, a different record was broken for the number of days in a row that got over 100 degrees. Austin, TX experienced a jaw-dropping **45** consecutive days where the temperature reached over 100 degrees!
- Since record keeping began in **1850**, across the globe, THIS July has been the hottest July ever recorded.
- Along with the hottest July worldwide, the Gulf of Mexico reached **record-high** temperatures in July.



With this Summer coming to an end, we can look forward to cooler temperatures as Astrological Fall begins on September 22nd!

Next GCGCD Board Meeting: October 12, 2023 @ 4:30 PM



**Guadalupe County**  
**Groundwater Conservation District**

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