



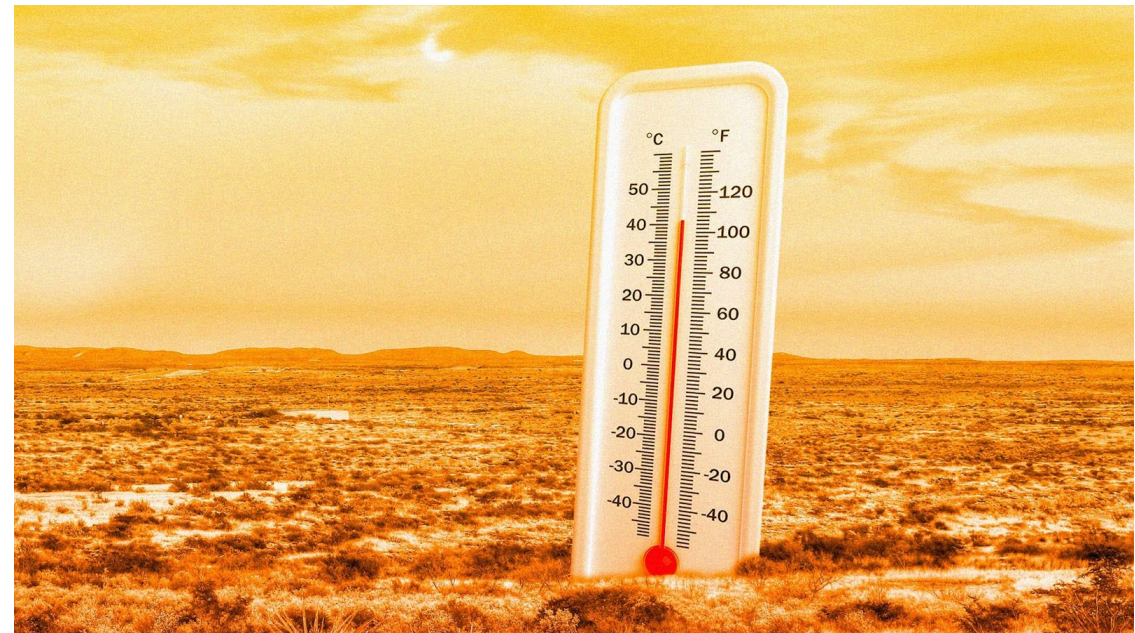
2024 Preliminary Summer Weather Outlook

Chris Coleman
ERCOT Supervisor of Operational Forecasting

OTS
March-April 2024

Agenda

- Review of recent summers
- Extreme events
- El Niño/La Niña
- 2023 Review
- Summer temperature and precipitation outlooks
- Drought update/outlook
- Early hurricane forecast



Mean Temperature Ranking of Recent Texas Summers (1895-current, 129 historical years, Jun-Sep)

Year	Ranking
2023	#2 hottest
2022	#3 hottest
2021	#55
2020	#28
2019	#6 hottest
2018	#10 hottest
2017	#55
2016	#25
2015	#21
2014	#55
2013	#25
2012	#16
2011	#1 hottest

The remaining
Top 10 hottest:

- 2010
- 1998
- 1954
- 1934
- 1911

Mean Temperature Ranking of Recent Texas Summers (1895-current, 129 historical years, Jun-Sep)

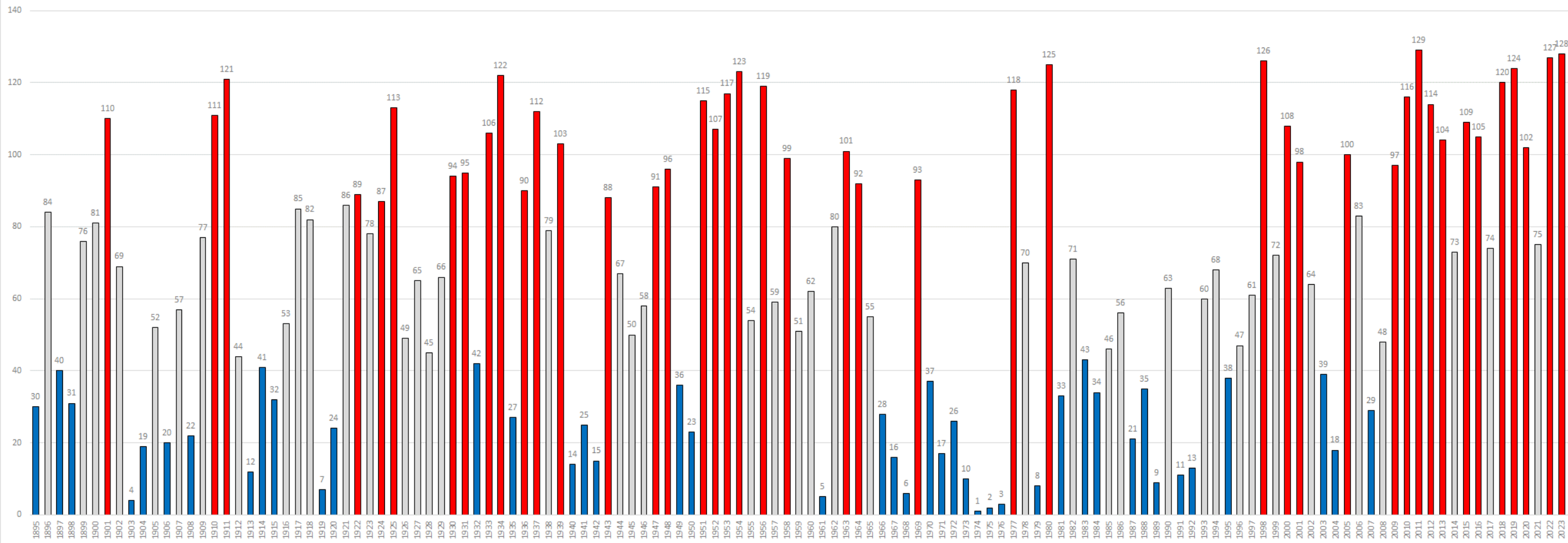
AMO-, 6 of 24 summers
in the hottest third

AMO+, 17 of 38 summers
in the hottest third

AMO-, 4 of 30 summers
in the hottest third

AMO+, 16 of 26 summers
in the hottest third

Texas Summer (Jun-Sep) Mean Temperature Rankings
1895-2023, 129 = hottest, 1 = coolest



AMO = Atlantic Multidecadal Oscillation

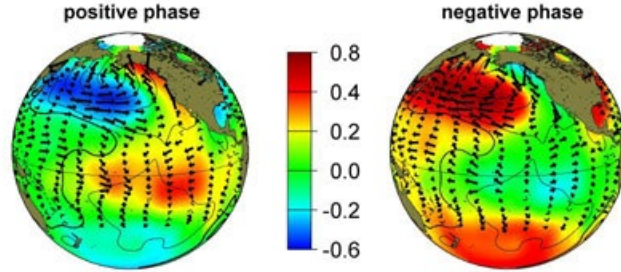
2007: last summer in coolest third



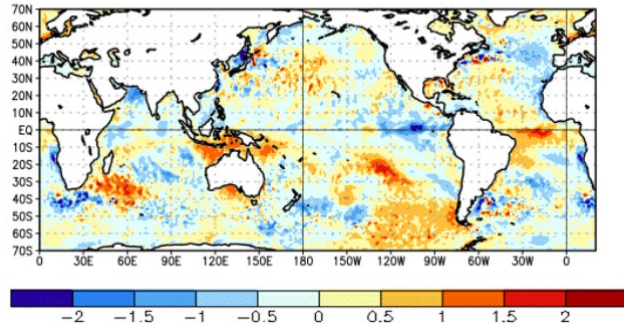
El Niño/La Niña

2019	0.8	0.8	0.8	0.8	0.7	0.5	0.3	0.1	0.1	0.3	0.5	0.5
2020	0.5	0.6	0.5	0.3	0.0	-0.2	-0.4	-0.6	-0.9	-1.2	-1.3	-1.2
2021	-1.1	-0.9	-0.8	-0.7	-0.5	-0.4	-0.4	-0.5	-0.7	-0.8	-1.0	-1.0
2022	-1.0	-0.9	-1.0	-1.1	-1.0	-0.9	-0.8	-0.9	-1.0	-1.0	-0.9	-0.8
2023	-0.7	-0.4	-0.1	0.1	0.5	0.8	1.1	1.3	1.5	1.8	1.9	2.0
	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ

Pacific Decadal Oscillation

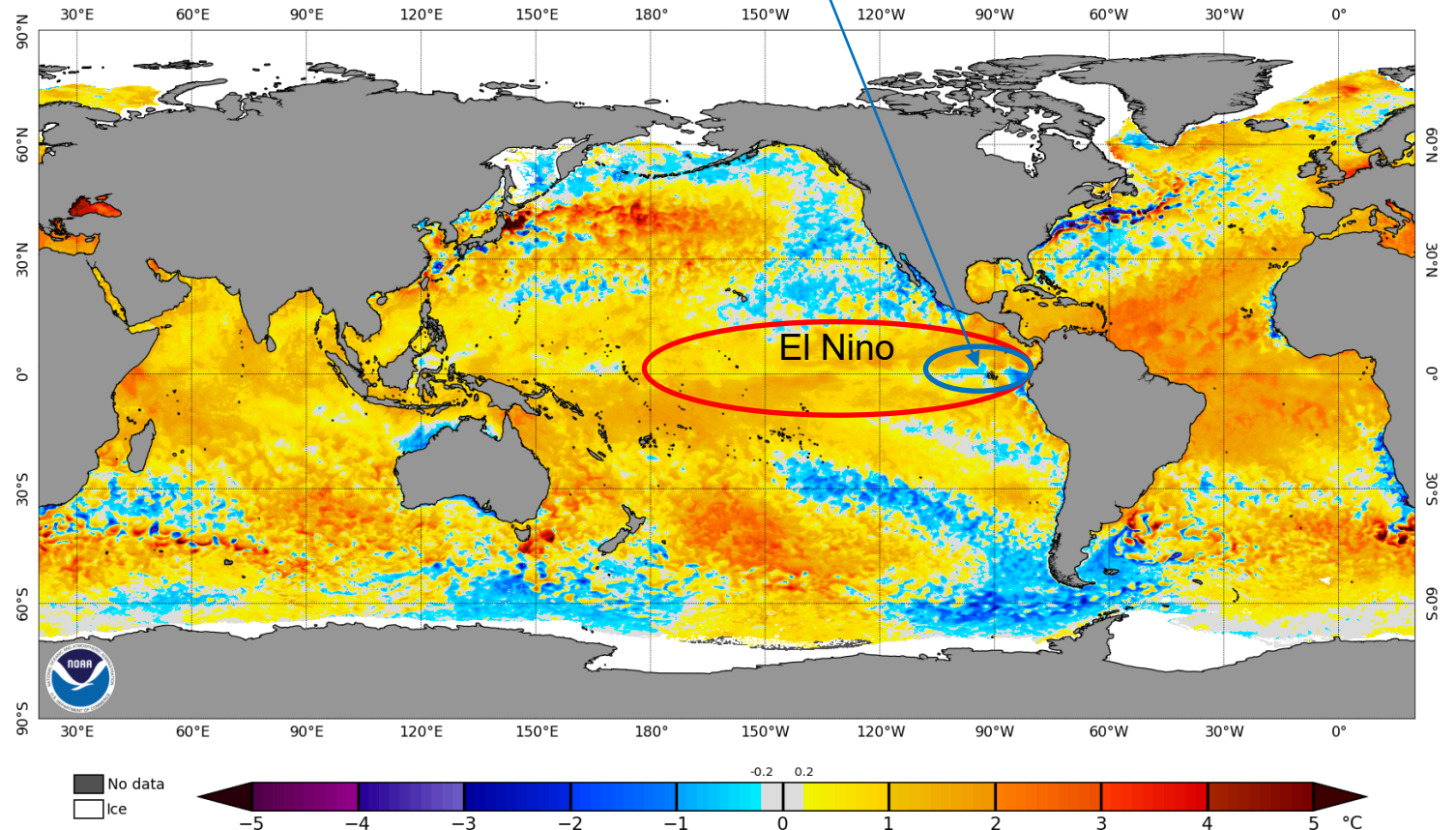


Change in Weekly SST Anoms (°C)
06MAR2024 minus 07FEB2024



Sign of a decaying El Niño

NOAA Coral Reef Watch Daily 5km SST Anomalies (v3.1) 10 Apr 2024



- 2023: fast and aggressive turnover from prolonged La Niña to strong El Niño
- 2024: return to La Niña is expect by summer or fall
- A negative PDO better supports La Niña
- La Niña supports drought in Texas, drought supports summer heat



El Niño/La Niña

- **8 historical strong El Niño events prior to 2023-24**
- 5 became a La Niña no later than ASO (most by mid-to-late-summer)
- Only 1 returned to a second year of El Niño
- 4 historical very strong El Niño events (+2.0 or greater); **ALL 4** transitioned to a La Niña later in the year

2023-24: +2.0°, ?

2015-16: **+2.6°**, La Niña by JAS (25th hottest summer)

2009-10: +1.6°, La Niña by JJA (14th)

1997-98: **+2.3°**, La Niña by JJA (4th)

1991-92: +1.6°, Neutral by JJA (117th Mt Pinatubo)

1982-83: **+2.2°**, La Niña by ASO (87th)

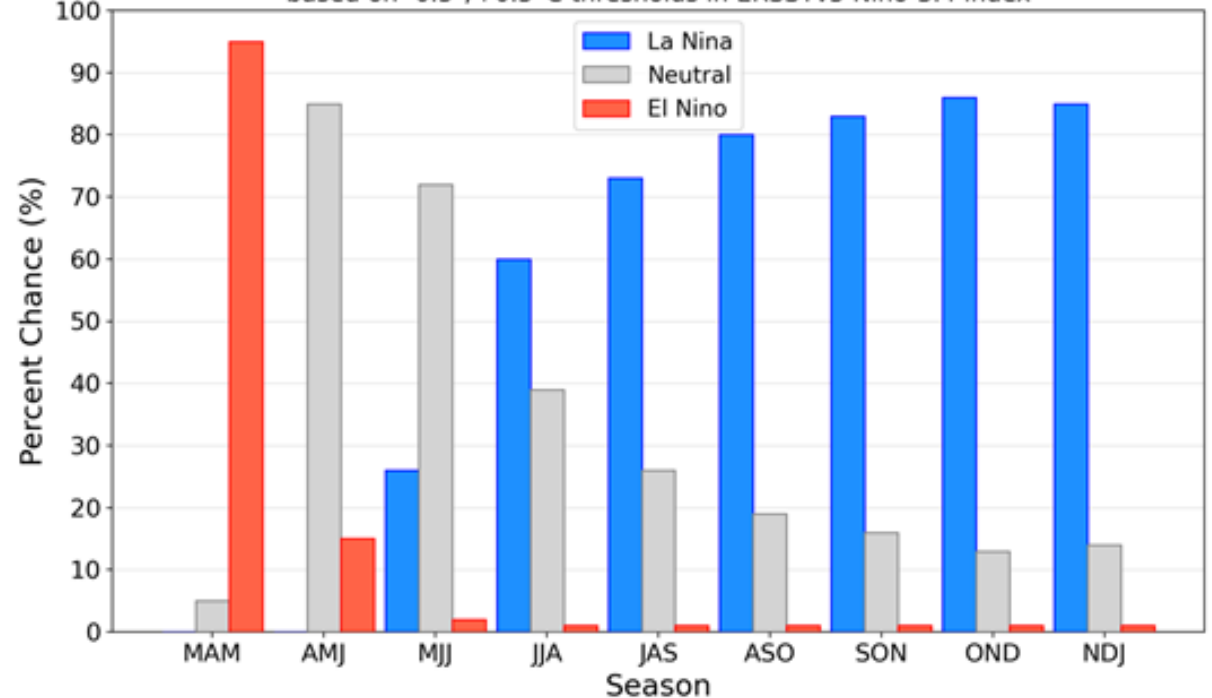
1972-73: **+2.1°**, La Niña by AMJ (119th)

1965-66: +1.7°, Neutral by AMJ (101st)

1957-58: +1.8°, Neutral by JAS (then a return to El Niño heading into a second winter) (30th)

Official NOAA CPC ENSO Probabilities (issued Apr. 2024)

based on -0.5°/+0.5°C thresholds in ERSSTv5 Niño-3.4 index



2023 Review

2023 was the warmest year for Texas
(and nationally)

◆ Period	◆ Average Temperature	Rank ▼ (out of 129)	◆ Anomaly ◆ 2009-2023 Mean: 66.4°F
January -December 2023	68.0°F	129	1.6°F
January -December 2012	67.8°F	128	1.4°F
January -December 2011	67.3°F	127	0.9°F
January -December 2017	67.3°F	127	0.9°F
January -December 2016	67.2°F	125	0.8°F
January -December 2006	67.1°F	124	0.7°F
January -December 1998	67.0°F	123	0.6°F
January -December 2020	66.9°F	122	0.5°F
January -December 1933	66.6°F	121	0.2°F
January -December 1954	66.6°F	121	0.2°F
January -December 1999	66.6°F	121	0.2°F
January -December 1921	66.5°F	118	0.1°F
January -December 1934	66.5°F	118	0.1°F
January -December 2000	66.5°F	118	0.1°F
January -December 2022	66.5°F	118	0.1°F

15 of 129 years rank above the 15-year normal

Seasonal Rankings – what is normal?

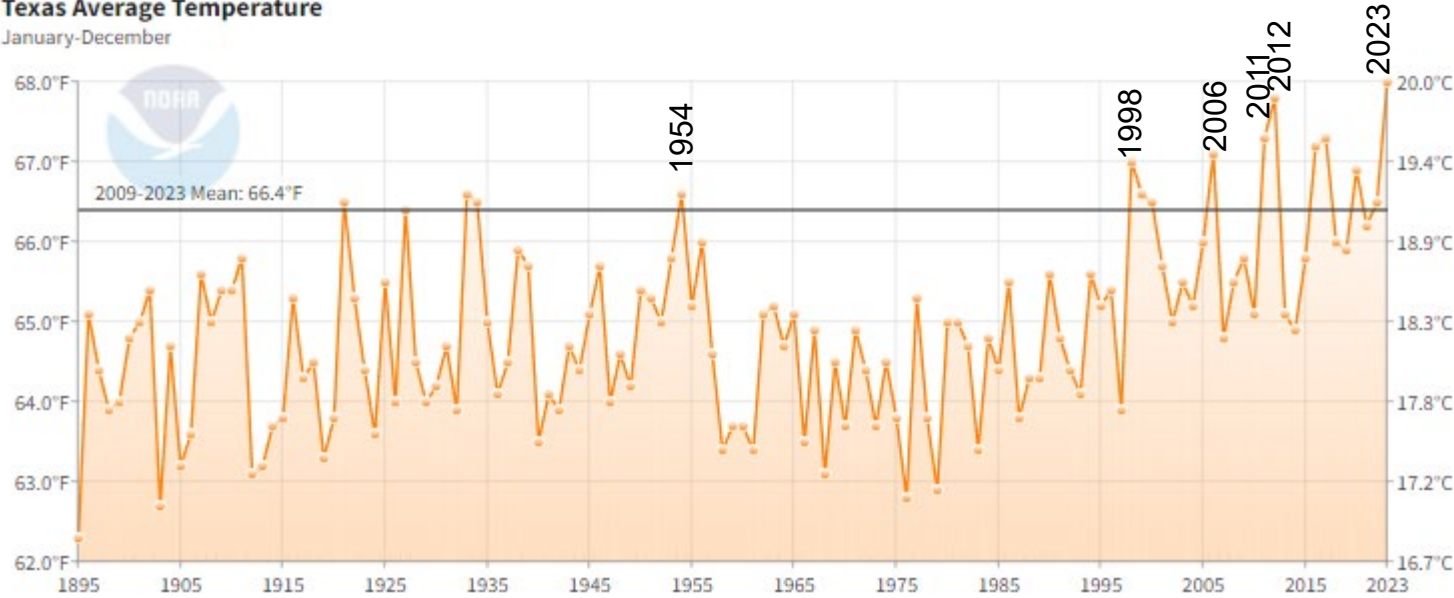
- ❑ “Normal” may no longer be the best way to express seasonal (or monthly, or possibly even daily) temperatures
- ❑ As Texas keeps having many more above normal temperature seasons, it keeps raising the bar for what is “normal”
- ❑ **We commonly use a 15-year normal (2009-2023). Applying that normal to all historical summers (1895-2023) results in only 15 of 129 summers coming in above normal**
- ❑ This is why I’ll oftentimes give all-time rankings and comparisons with recent years (in addition to or instead of “normal”)



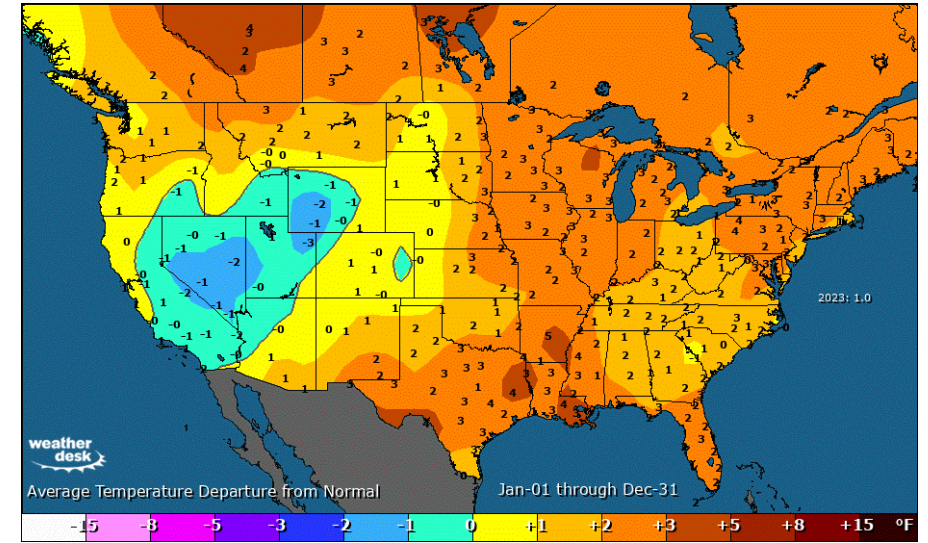
2023 Review

Labeled years indicate record breaking warm years, starting with 1954

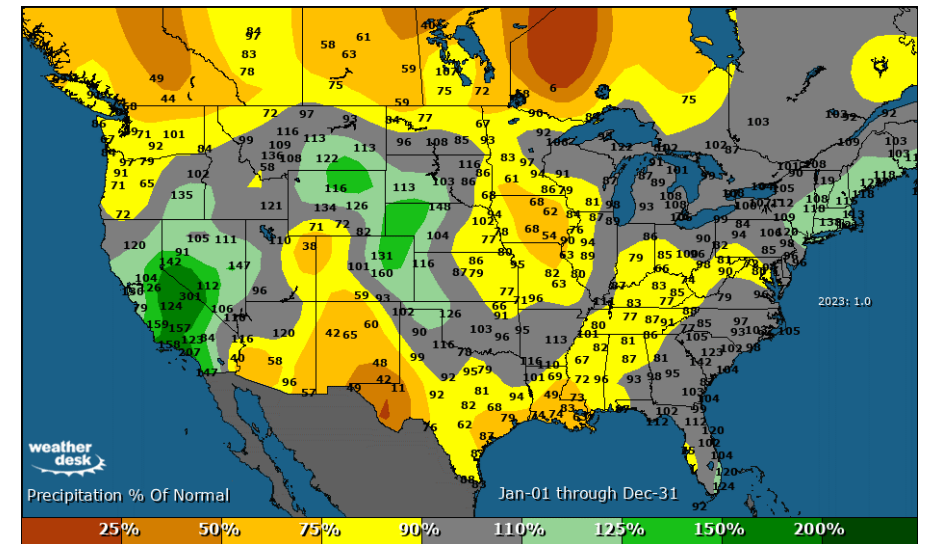
Texas Average Temperature
January-December



Sea surface temperatures average across the globe are currently the warmest on record – this will drive weather patterns



Warmest year on record



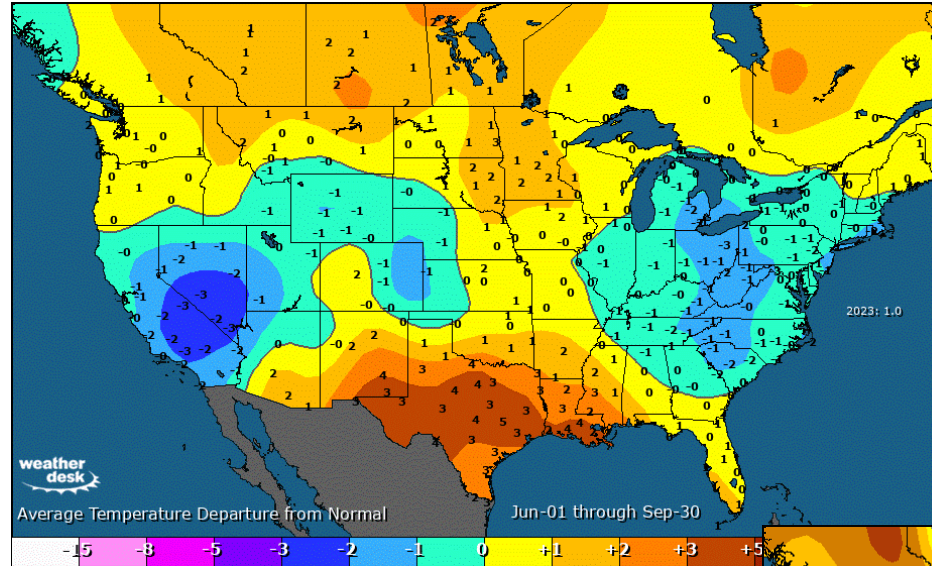
34th driest year



Summer 2023 Review

- **June-September 2023** was the **second** hottest on record for the state of Texas – pushing 2022 down to third. 2011 remains the hottest summer (POR 1895-current)
- **July-September 2023** was **the hottest** on record, easily breaking 2011's record
- Summer 2023 was the **8th driest** on record. 2011 was the 1st driest. Summer 2023 ranks as the 2nd driest since 1956
- Last year, Texas went from the 80th driest April-June (2023) period to a very hot (#2) and dry (#7) summer (June-August)
 - 2011, 2022, and 1998 (the other three top 4 hottest summers) were all preceded by top 7 driest April-June periods
 - A dry spring is typically a good indicator of a hot summer (2023 was not a dry spring)

Departure from Normal Temperature (F)



1	2023	84.6°
2	2011	84.4°
3	2022	83.1°
4	1998	83.0°
5	1980	82.5°
6	1954	82.3°
7	2019	82.3°
8	1934	82.2°
9	1911	82.0°
10	2018	81.9°

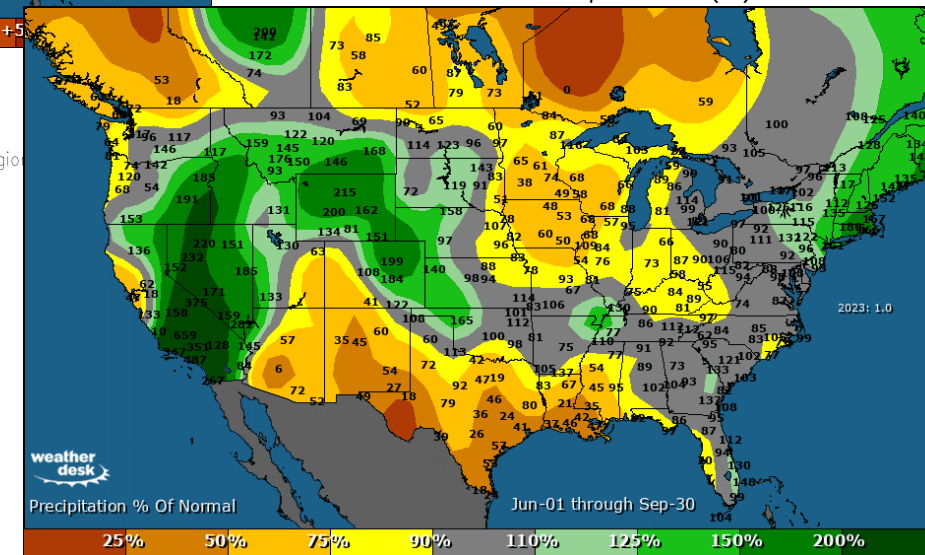
5 of the 10 hottest summers in Texas Have occurred since 2011

Percent of Normal Precipitation (%)

Generated 9/20/2023 at HPRCC using provisional data.

NOAA Region

1	2011	-6.82"
2	1956	-6.59"
3	1954	-5.32"
4	1952	-4.77"
5	1934	-4.41"
6	1910	-4.32"
7	1930	-4.15"
8	2023	-4.11"
9	1947	-4.04"
10	1917	-3.93"



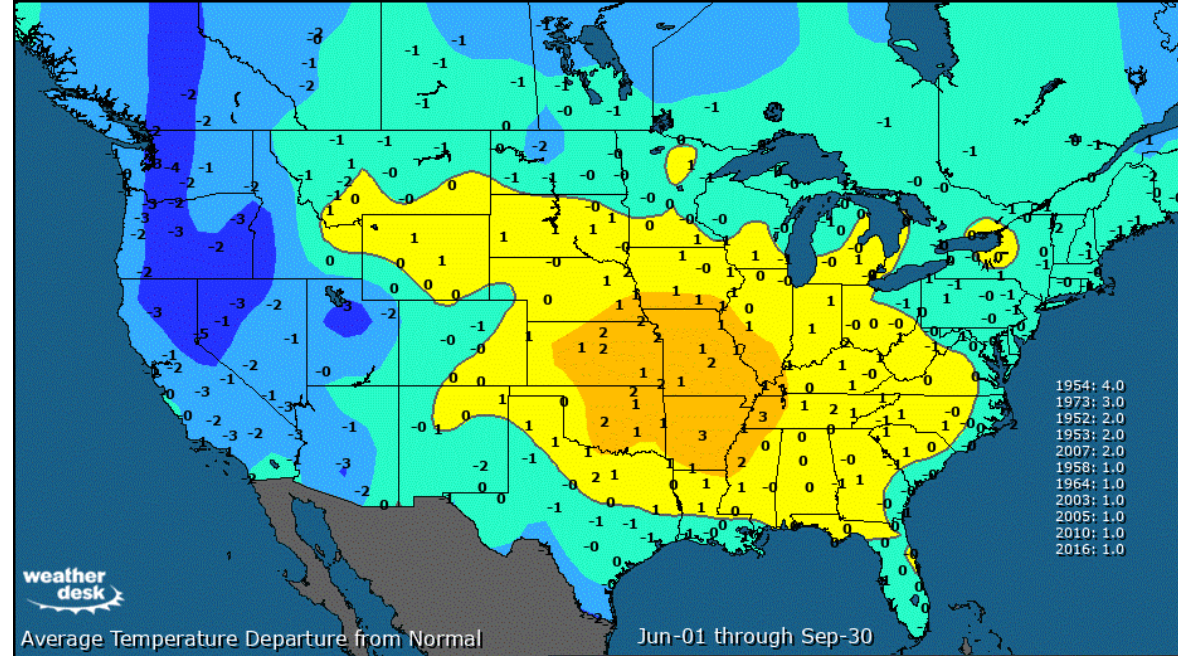
Generated 9/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

2024 Historical Matches (Analog)

- OVERALL (as of 2/26/2024)
1. 1954
 2. 1973
 3. 1952
 4. 1953
 5. 2007
 6. 1958
 7. 1964
 8. 2003
 9. 2005
 10. 2010
 11. 2016 ↑

Analogues are listed in initial priority order



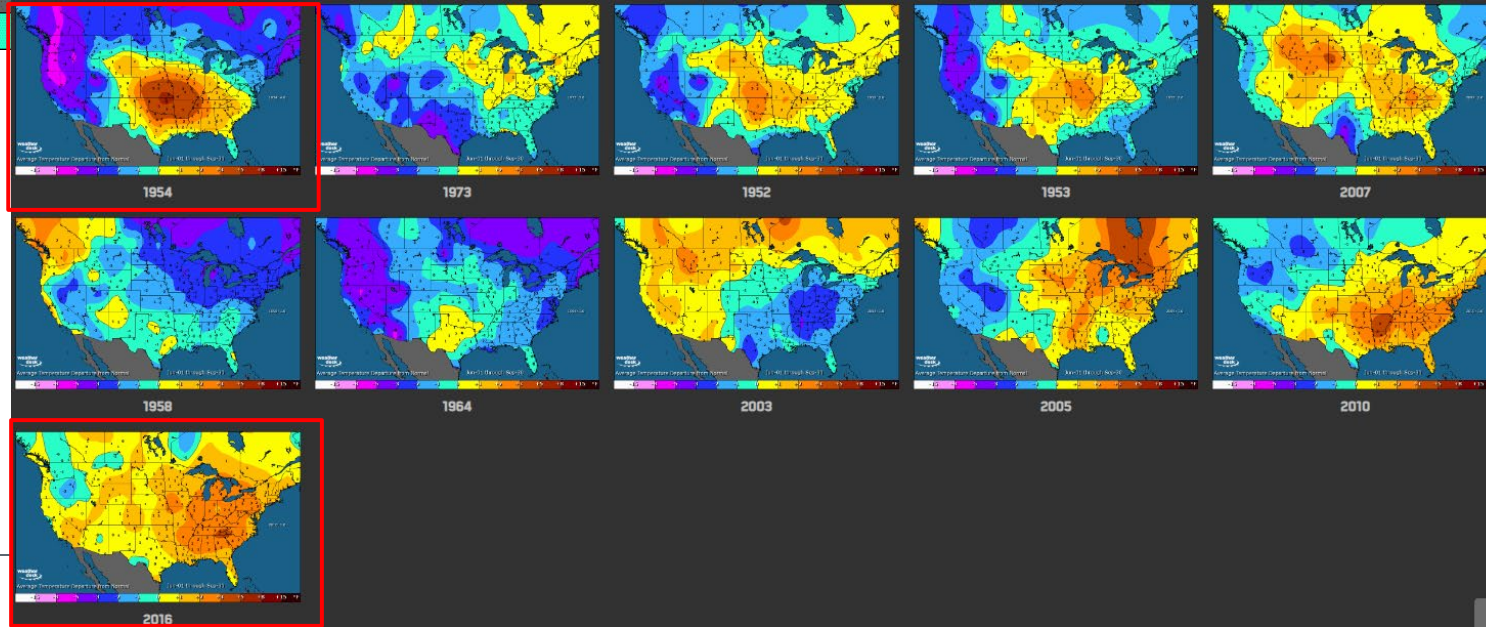
7 of the 11 analogs show a similar pattern to the analog composite
 1954, 1952, 1953, 2007, 2005, 2010, 2016

- 1954: 6th hottest summer
- 1973: 119th hottest summer
- 1952: 21st hottest summer
- 1953: 12th hottest summer
- 2007: 101st hottest summer

- 1958: 30th hottest summer
- 1964: 37th hottest summer
- 2003: 91st hottest summer
- 2005: 30th hottest summer
- 2010: 14th hottest summer
- 2016: 25th hottest summer

1954, 1964, 1973, and 2016 were the Best matches for Jan 1-Mar 11

2016 was the best match for this past winter



Preliminary 2024 Summer Temperature Outlook

Preferred analogs:

2016: 25th hottest summer (129 historical summers)

1954: 6th hottest summer

2010: 14th hottest summer

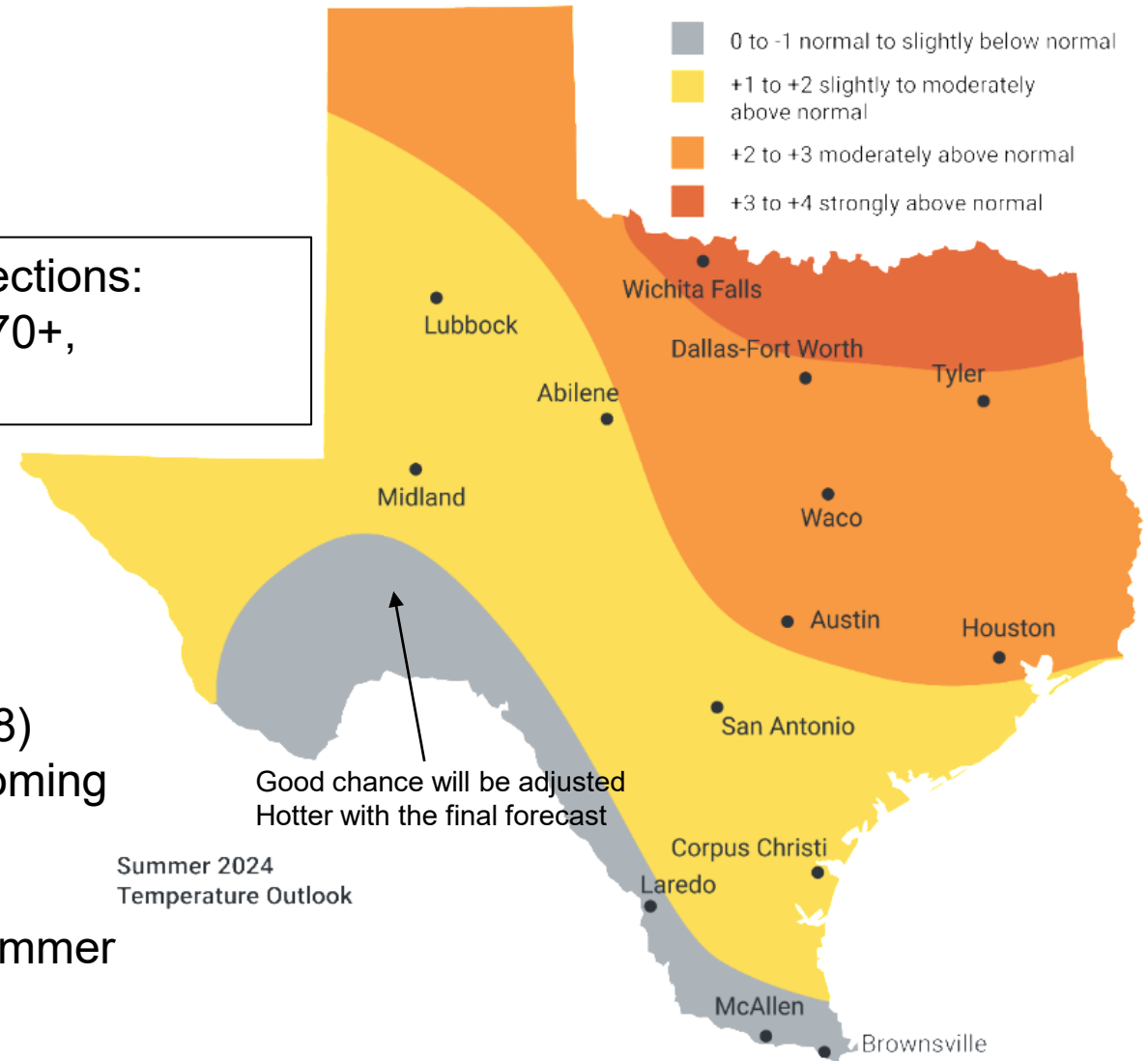
Preliminary 100°-day projections:
Austin 60-90+, Dallas 50-70+,
Houston 30-45+

What could change?

The top analogs listed above (2016 and 1954) were assisted by dry summers

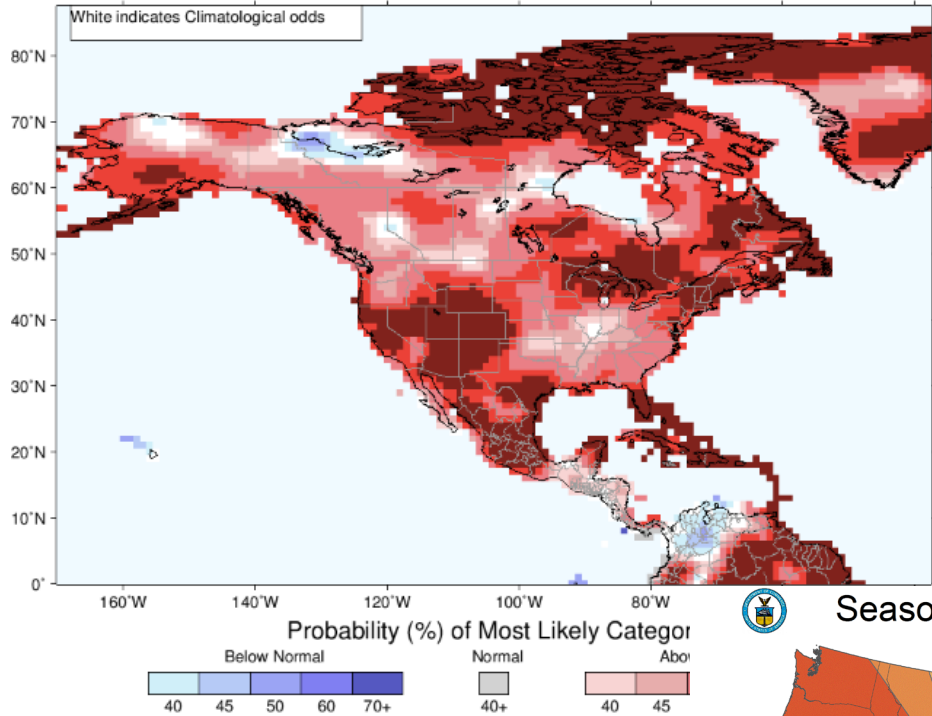
3 of the 11 analogs were both wet and mild (2007, 1973, 1958)
2007 and 1973 were also both wet in the spring. 1958 was coming off the 7th wettest year on record

A cooler/milder summer will likely require a wet spring into summer
Texas is still in a drought

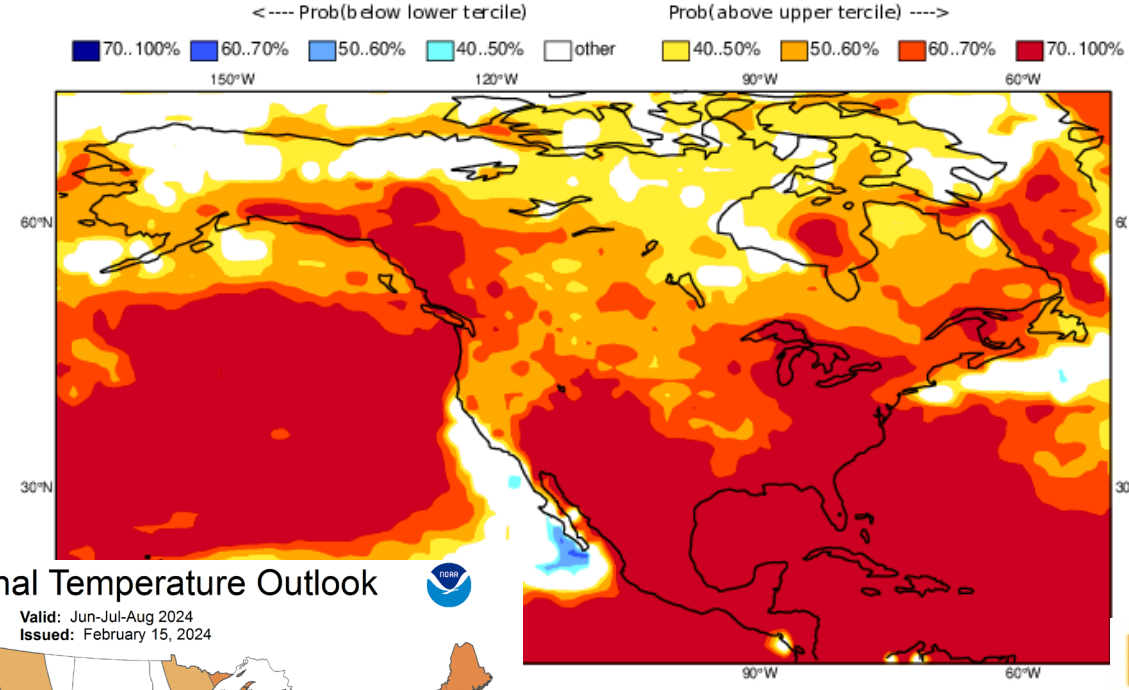


Other Summer Forecasts

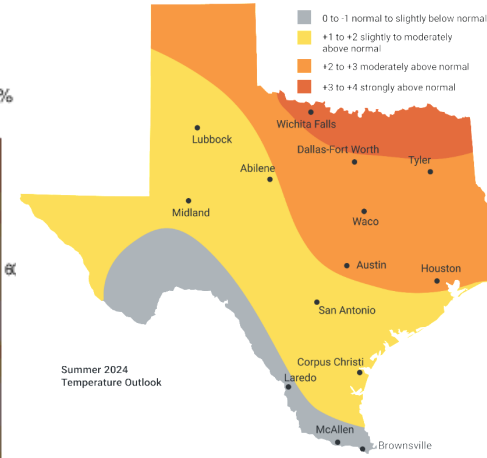
IRI Multi-Model Probability Forecast for Temperature for June-July-August 2024, Issued February 2024



ECMWF Seasonal Forecast
 Prob(most likely category of 2m temperature)
 Forecast start is 01/03/24, climate period is 1993-2016
 Ensemble size = 51, climate size = 600

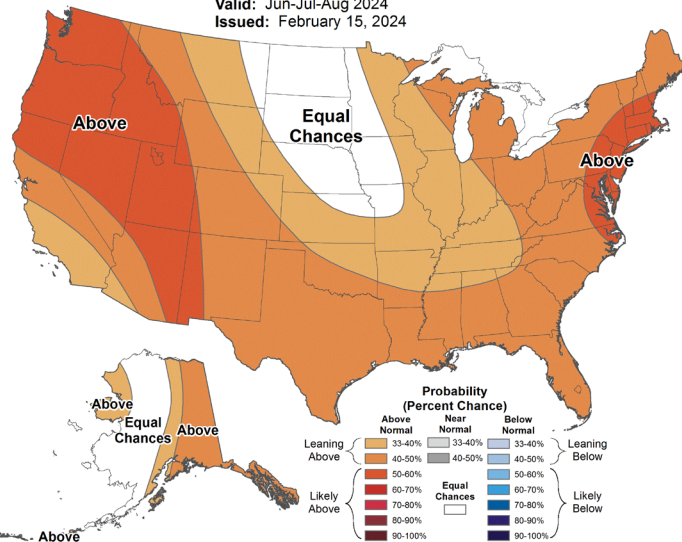


System 5
 JJA 2024



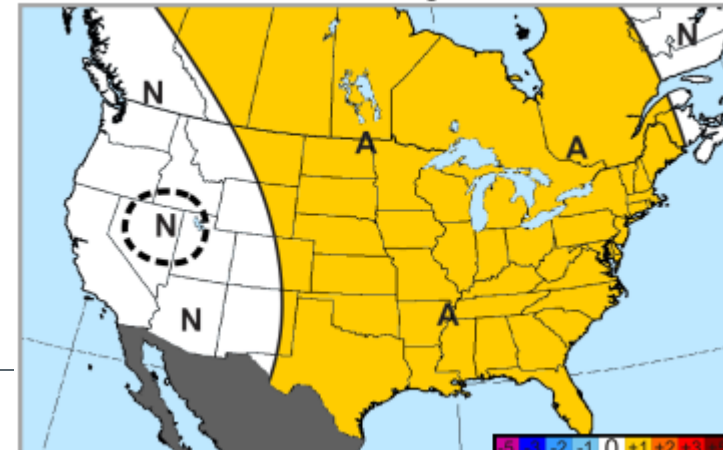
Seasonal Temperature Outlook

Valid: Jun-Jul-Aug 2024
 Issued: February 15, 2024



MAXAR

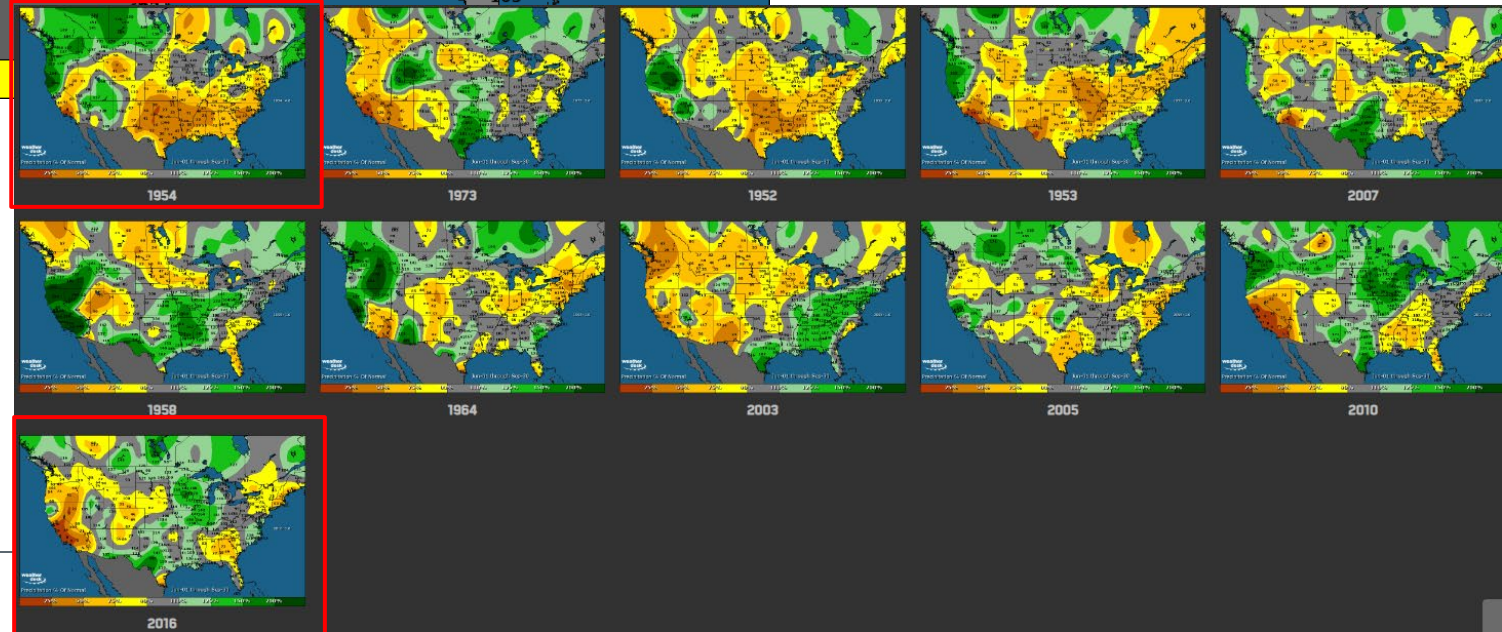
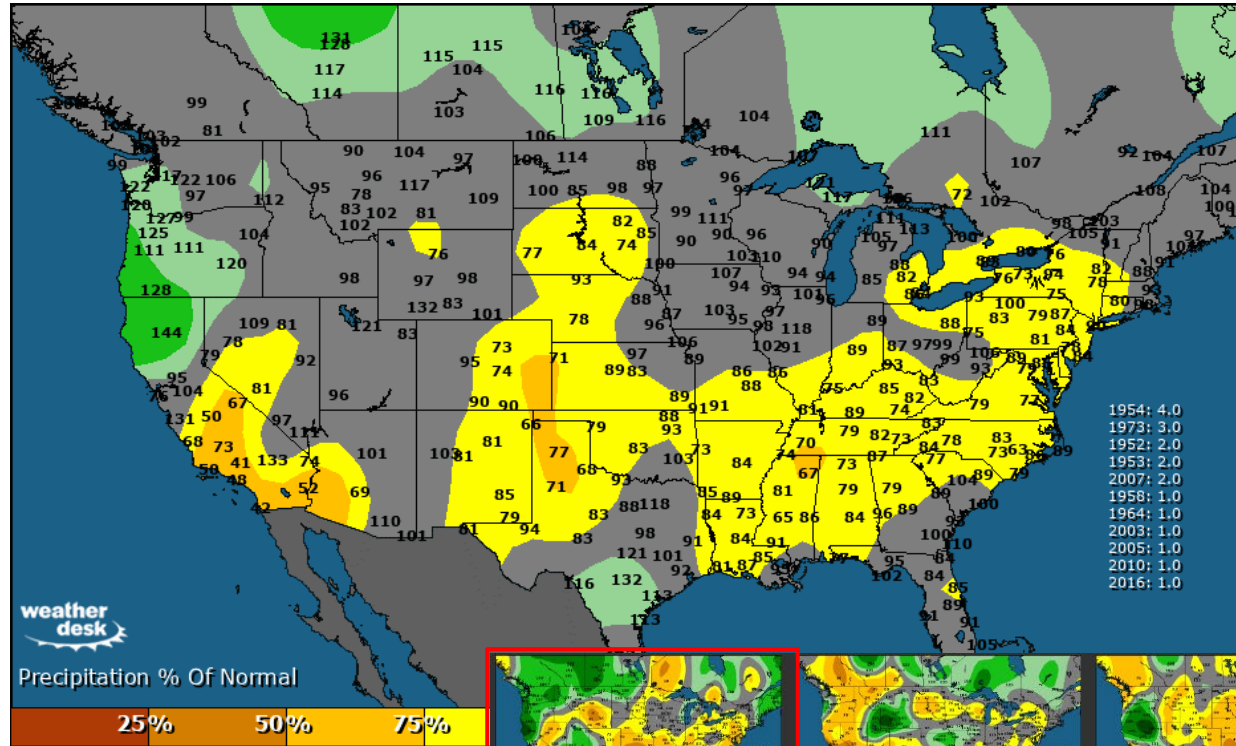
June - August



2024 Summer Historical Matches (Analog)

OVERALL (as of 2/26/2024)

1. 1954
2. 1973
3. 1952
4. 1953
5. 2007
6. 1958
7. 1964
8. 2003
9. 2005
10. 2010
11. 2016



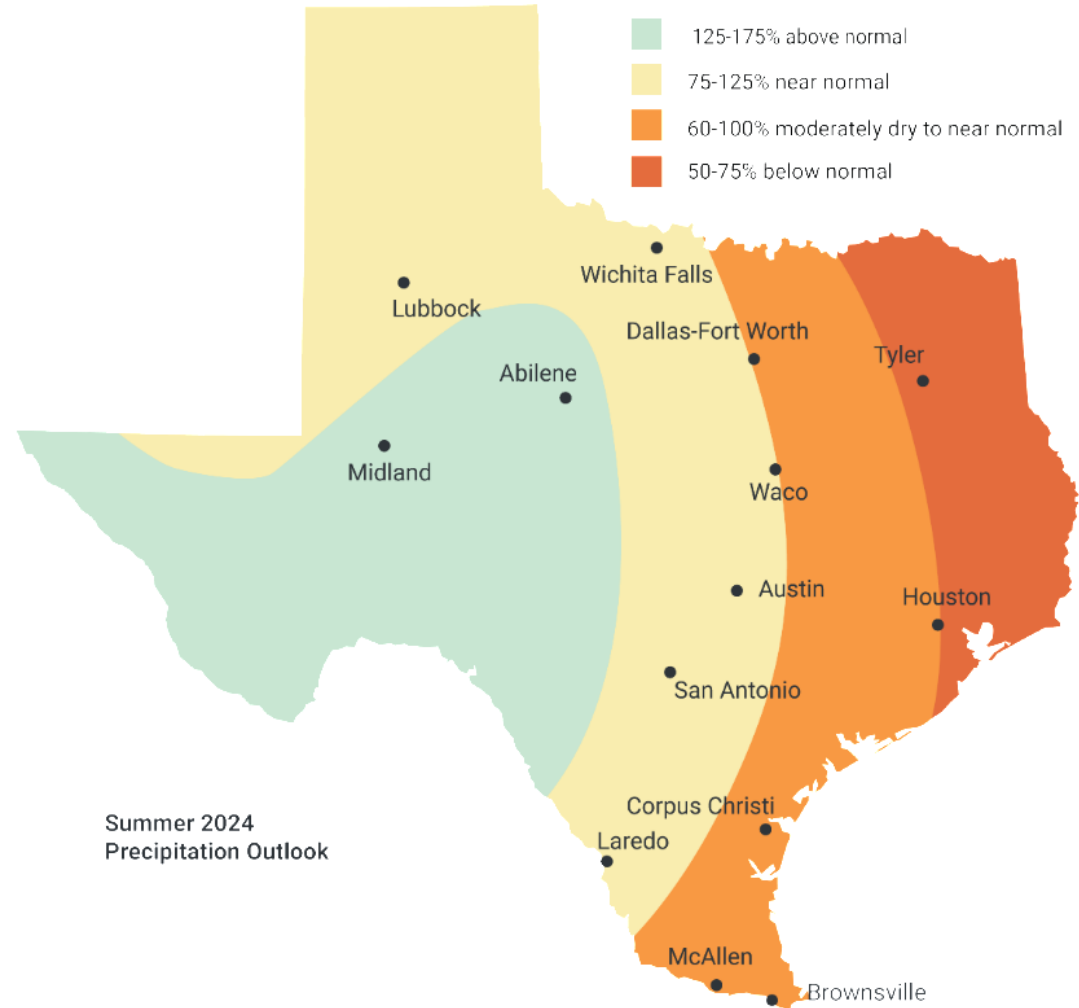
1954 was the 3rd driest summer, resulting in the 6th hottest summer since 1895

2016 was the 24th driest summer, resulting in the 25th hottest summer since 1895

Preliminary 2024 Summer Precipitation Outlook

Most of Texas is forecasted to see normal to Below normal rainfall this summer

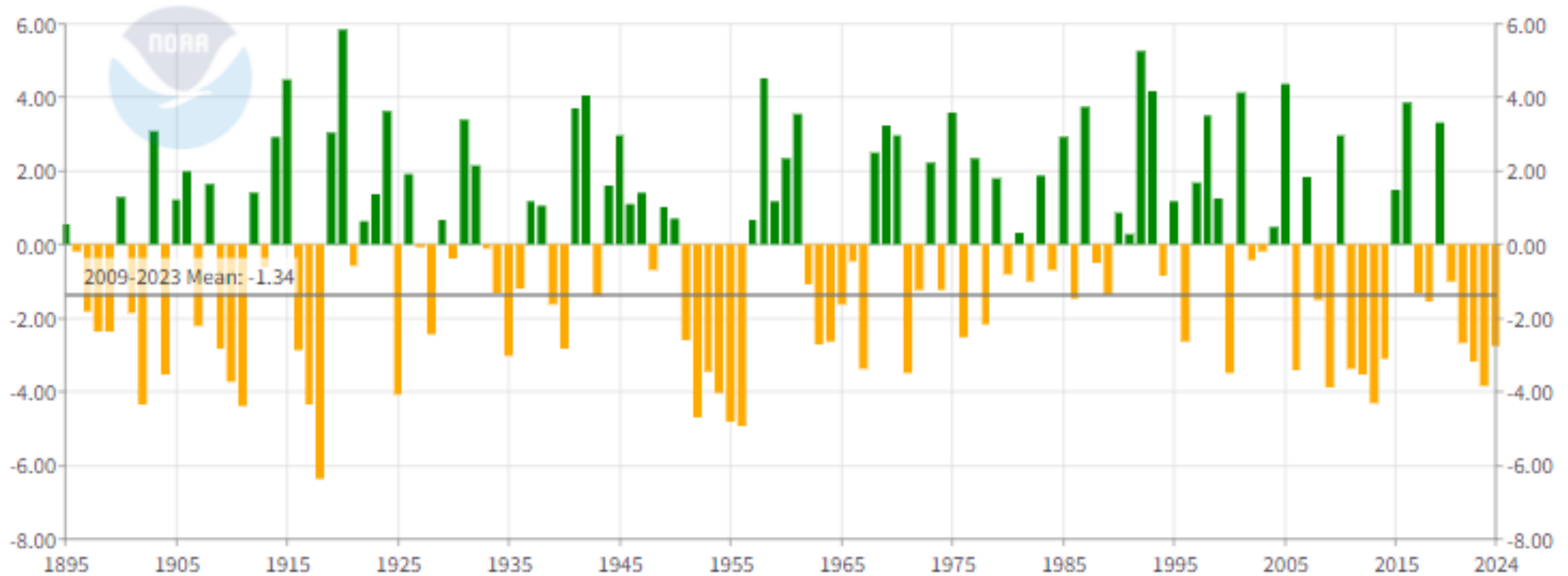
Best chance for above normal precipitation this Summer is in parts of West Texas; however, this forecast may trend drier. South Texas may trend wetter (especially with a tropical influence)



Drought Update

Texas Palmer Drought Severity Index (PDSI)

March



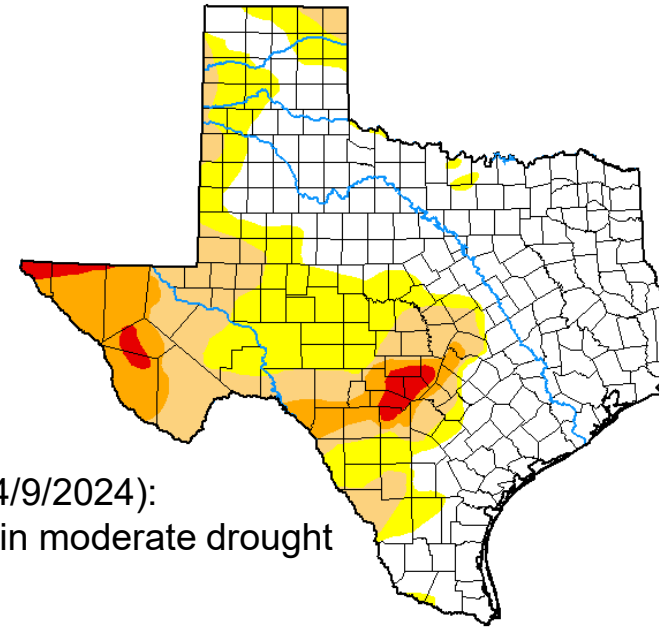
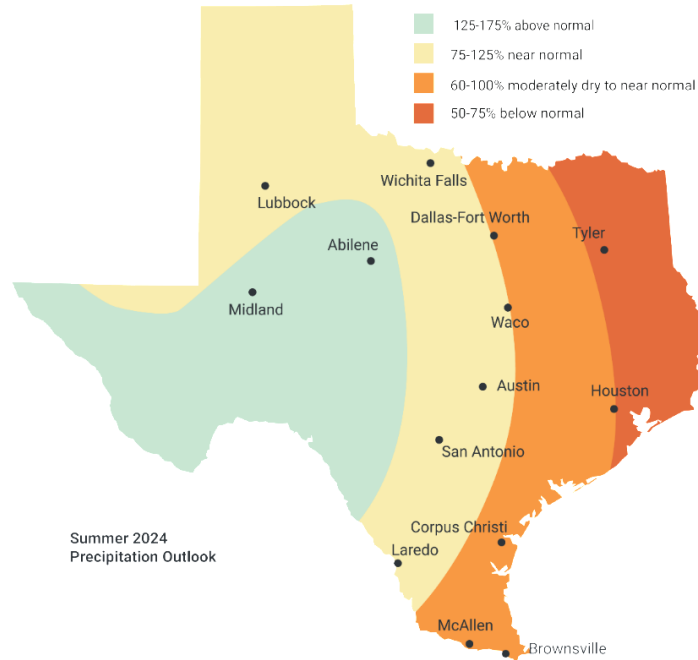
Powered by ZingChart

2024: 28th most severe drought in March

Drought Update

U.S. Drought Monitor Texas

April 9, 2024
(Released Thursday, Apr. 11, 2024)
Valid 8 a.m. EDT

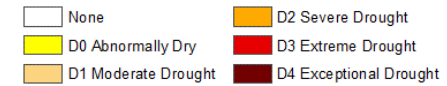


Current Drought (as of 4/9/2024):
25% of the state's area in moderate drought
or worse

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	54.63	45.37	25.19	9.85	1.97	0.00
Last Week 04-02-2024	54.66	45.34	25.10	9.85	1.97	0.00
3 Months Ago 01-09-2024	43.51	56.49	29.98	12.72	4.02	0.00
Start of Calendar Year 01-02-2024	39.60	60.40	39.47	17.78	5.68	0.68
Start of Water Year 09-26-2023	3.03	96.97	80.64	59.66	38.06	12.68
One Year Ago 04-11-2023	22.13	77.87	58.63	37.64	16.24	4.07

Intensity:



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

The Palmer Drought Severity Index ranks the drought as the 28th worst at this point in the year (1895-current, 129 years) -- worse than the drought monitor map might suggest

While winter precipitation was above normal (6.13"), that's the driest season climatologically in Texas (6.13" is below normal for any non-winter season)

With a transition back to a La Nina, increasing drought is a real possibility this summer



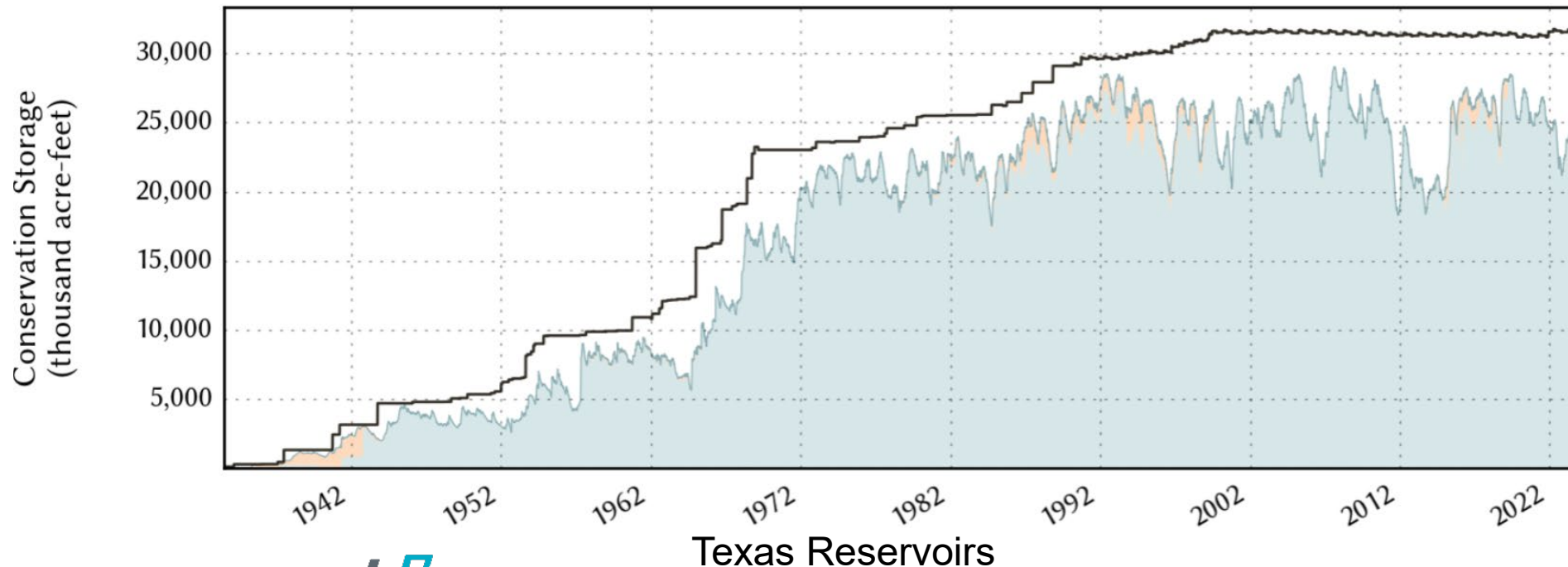
Drought Update

Texas Reservoirs

	Date	Percent Full	Reservoir Storage (acre-ft)	Conservation Storage (acre-ft)	Conservation Capacity (acre-ft)
Today	2024-04-11	73.2	28,429,763	23,210,387	31,722,600
Yesterday	2024-04-10	72.9	28,180,312	23,128,710	31,722,600
2 days ago	2024-04-09	72.5	27,734,116	22,988,695	31,722,600
1 week ago	2024-04-04	72.3	27,719,949	22,939,228	31,722,600
1 month ago	2024-03-11	72.6	27,457,338	22,907,131	31,534,811
3 months ago	2024-01-11	69.3	26,216,524	21,862,976	31,534,811
6 months ago	2023-10-11	65.5	24,824,197	20,626,091	31,502,800
1 year ago	2023-04-11	75.3	28,674,838	23,897,675	31,738,681

* Percent Full is based on Conservation Storage and Conservation Capacity and doesn't account for storage in flood pool.

** Water supply reservoirs include reservoirs which provide water for all beneficial purposes such as power generation, recreation, and municipal water supply. Today's total is subject to change as data are updated. See footnotes on individual lakes for cases where special conditions apply.



Lake Travis:
 37.6% full as of 4/9/24
 44.5% full a year ago on
 this date

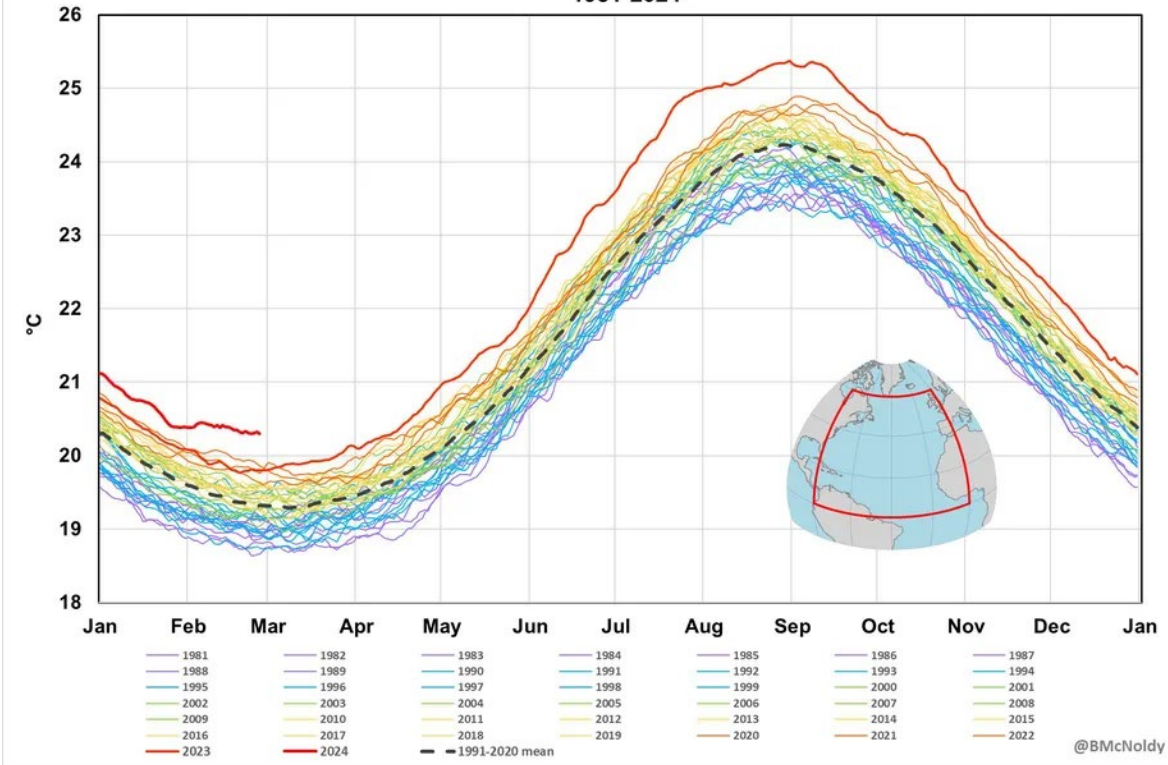
Medina Lake:
 2.8% full

Texas Reservoirs



Preliminary 2024 Hurricane Season Forecast

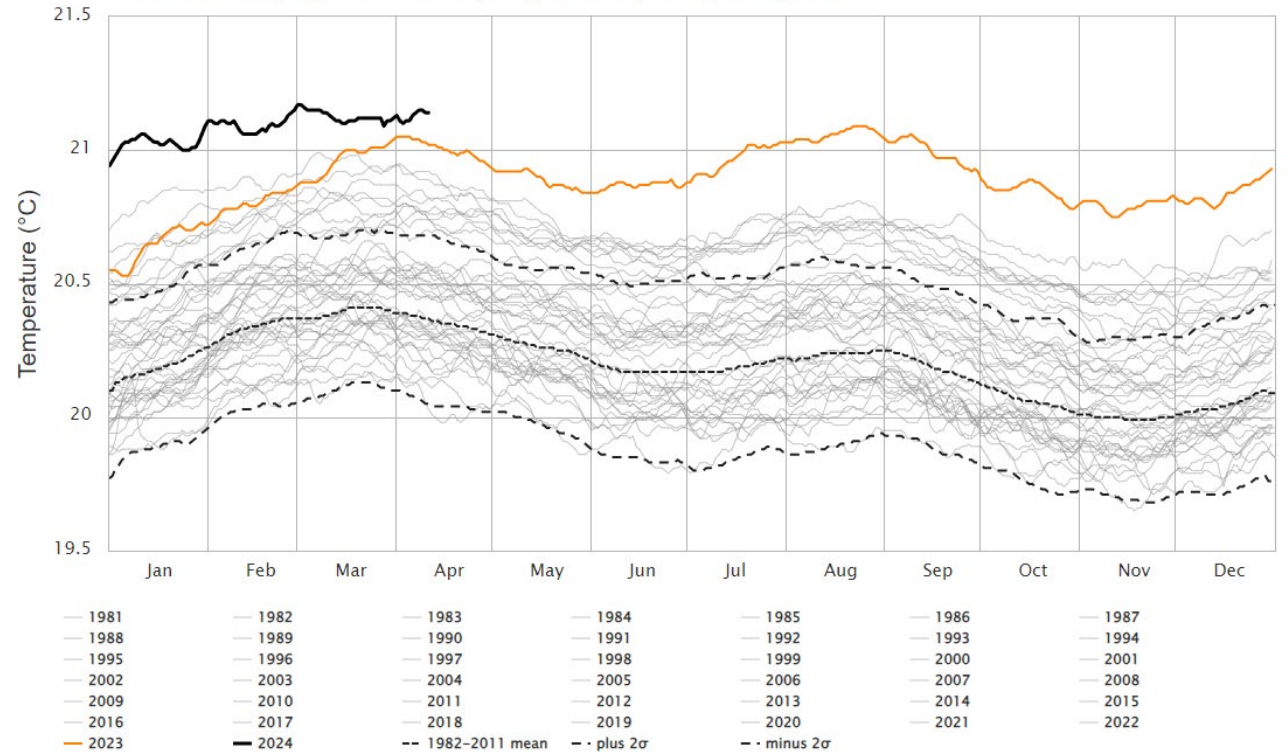
North Atlantic Sea Surface Temperature
1981-2024



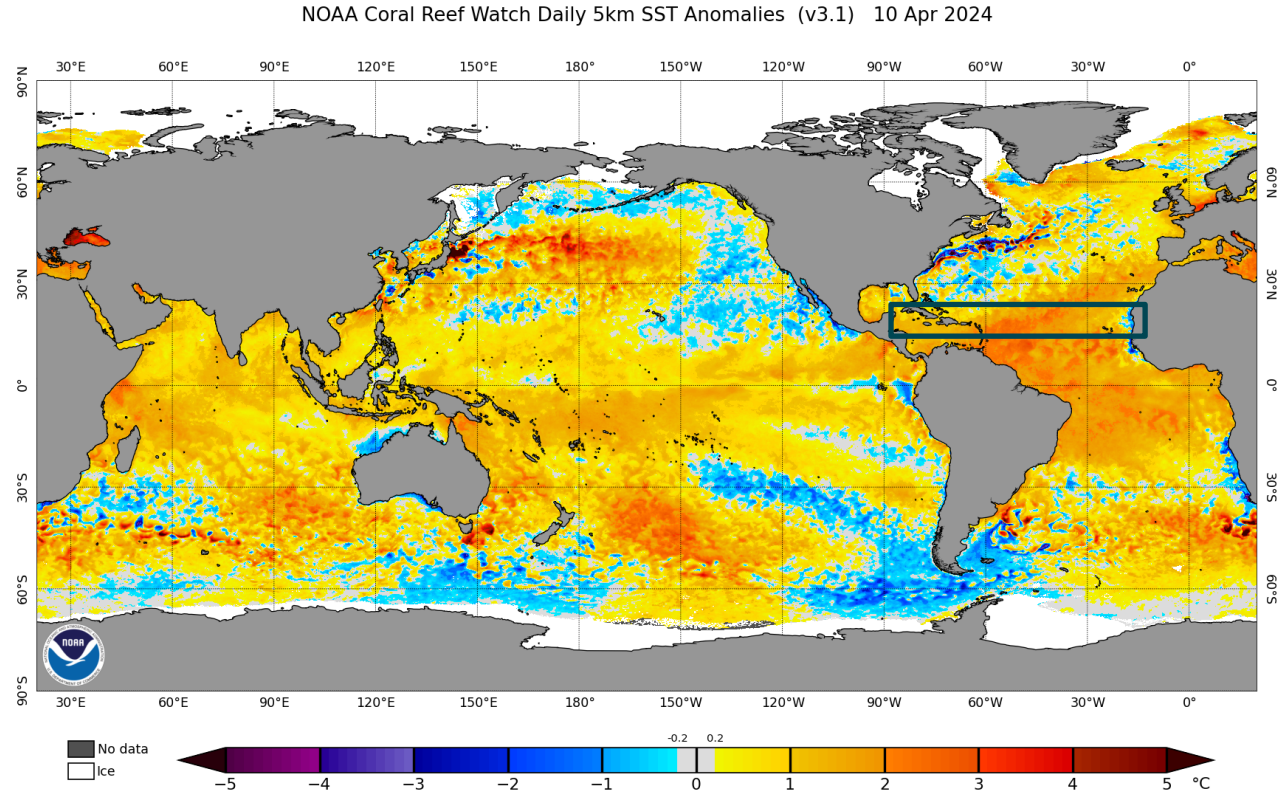
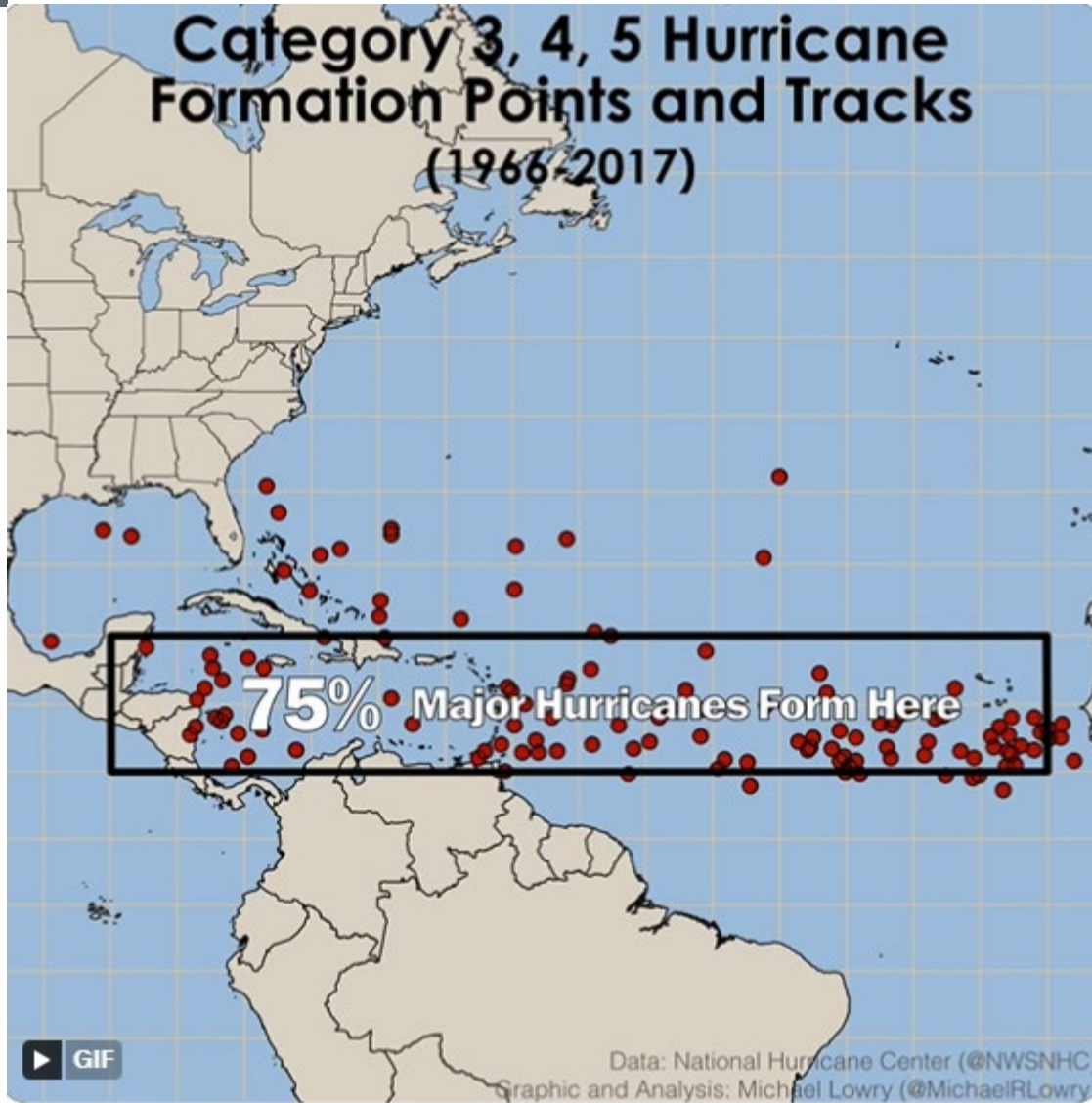
Daily Sea Surface Temperature, World (60°S-60°N, 0-360°E)

Export Chart

Dataset: NOAA OISST V2.1 | Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine



Preliminary 2024 Hurricane Season Forecast



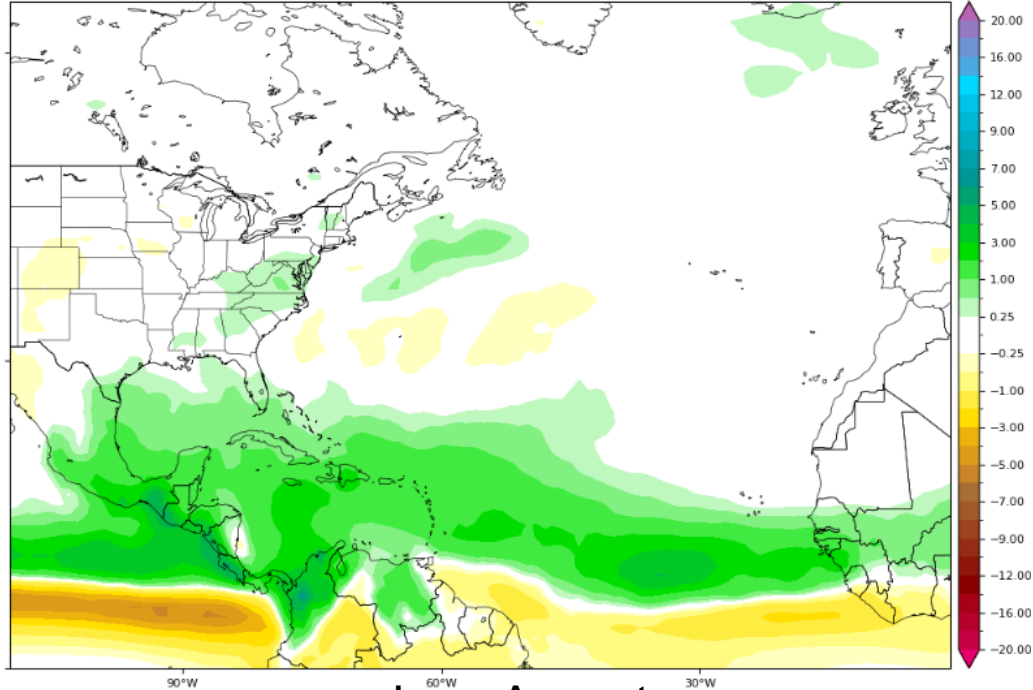
Preliminary 2024 Hurricane Season Forecast

North American Multi-Model Ensemble

NMME Total Accumulated Precipitation Anomaly (inches)

Init: 00z Feb 08 2024 Valid for: Jun-Jul-Aug 2024

TROPICALTIDBITS.COM

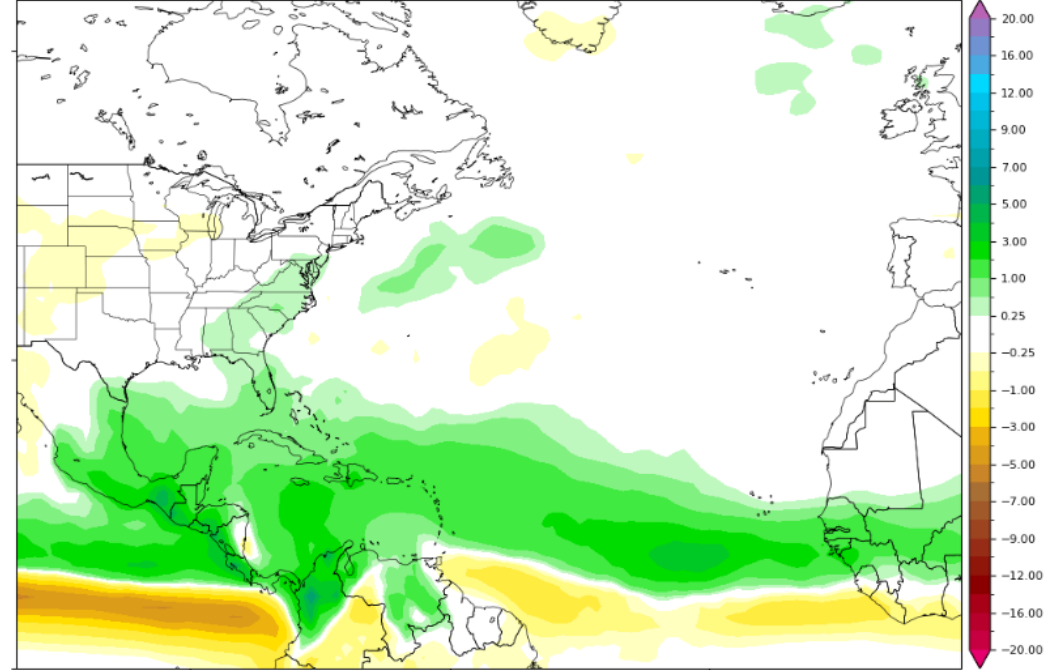


June-August

NMME Total Accumulated Precipitation Anomaly (inches)

Init: 00z Feb 08 2024 Valid for: Jul-Aug-Sep 2024

TROPICALTIDBITS.COM



July-September

Last year, this same ensemble model showed much more of a curve out to sea than this year's model run



2023 season

Preliminary 2024 Hurricane Season Forecast

	# named storms	# hurricanes	# of major hurricanes
2016	15	7	4
2010	19	12	5
2007	15	6	2
2005	28	15	7
2003	16	7	3
1973	8	4	1
1964	13	7	5
1958	12	7	3
1954	16	7	3
1953	14	7	3
1952	11	5	2
Average	15.18	7.64	3.45
30-year normal 1991-2020	14	7	3

gulf	texas
named storms	named storms
4	0
6	1
6	1
11	0
6	3
2	1
4	1
3	3
5	1
4	0
1	0
4.73	1.00

Forecast:

18-22+ named storms

7-12 hurricanes

3-6 major hurricanes

4-6 named storms in the Gulf of Mexico

Better-than-average chance for a Texas landfall

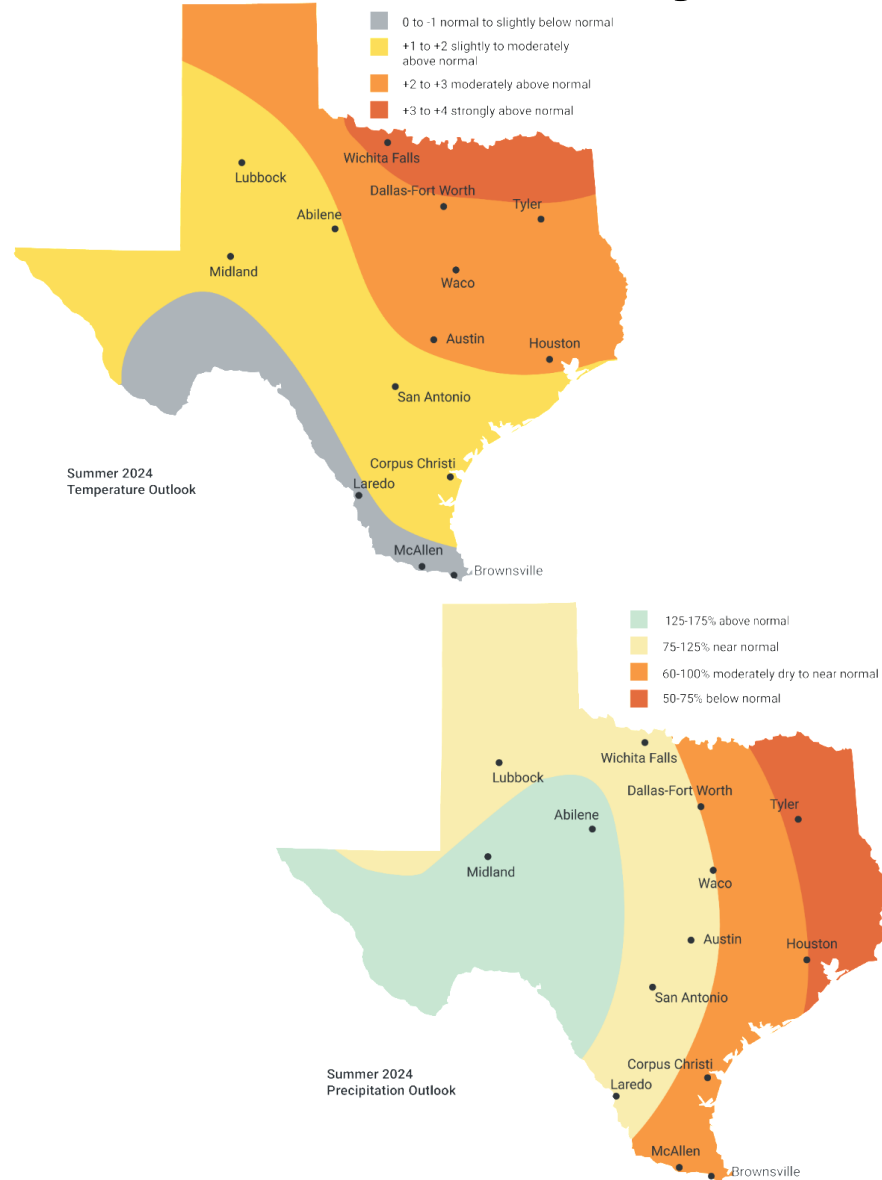


High confidence in more total named storms in the Atlantic Basin than the 30-year normal

La Niña better supports an active season than does El Niño – though 2023 (El Niño) was active (20 total named storms -- 4th most but most steered out into the Atlantic, 7 hurricanes, 3 major hurricanes)

2024 Summer Weather Outlook Summary

- The preliminary summer weather outlook calls for above normal temperatures and mostly normal to below normal rainfall
- The past two summers have been the #2 and #3 hottest in Texas weather history. Much of what drove those summers to extremes are still in place (solar max, drought, warm oceans)
- 2024 could easily bring another top 10 hottest summer to Texas
 - Significant rainfall is needed over the next several months to limit summer temperature extremes
- Drought may continue through the summer, potentially worsening
- The 2024 Atlantic Basic hurricane season should be very active
 - The Gulf of Mexico is also aligned for an active season



This forecast is preliminary. It will be finalized by June 1 and be available on the ERCOT website

<https://www.ercot.com/gridmktinfo/dashboards/weatherforecast>

Weather Forecast Details

General Discussion:

Most of the ERCOT region will continue to see highs in the mid-80s to low-90s over the next seven days; however, cooler temperatures on Saturday. This will be felt mostly in North and West Texas. And a cooler scenario for most this period will be brief as temperatures will return warmer Sunday and into early next week. Beginning next Wednesday there's still quite a bit of disagreement among the computer models, however, so more time is needed to determine.

Today:

Scattered to isolated showers and thunderstorms will again impact the Panhandle and portions of the Far West; thunderstorms will spread into the Rio Grande Valley late tonight, mostly after midnight. The rest of the state will have large metropolitan areas should top out around 90 this afternoon. High will near 90 in Abilene as well. Low-90s will range from the mid-70s north to the mid-80s south.

Tomorrow:

A cold front will move into North and West Texas during the day on Friday. This will result in those regions being cooler today. 91 in Houston tomorrow afternoon. The Rio Grande Valley will see more clouds and scattered rain opportunities.

7-Day Temperature Forecast by City

Low and high temperatures forecast for the next seven days for major cities within the ERCOT system.

Forecast Variability Report

ERCOT's assessment of the potential for load, wind, and solar conditions to vary between forecasts and actuals.

Weather Seasonal Updates

A seasonal forecast for the ERCOT region

Questions?

