



## **2023-24 Preliminary Winter Weather Outlook**

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ERCOT Lead Meteorologist

Winter Weatherization Workshop  
October 26, 2023

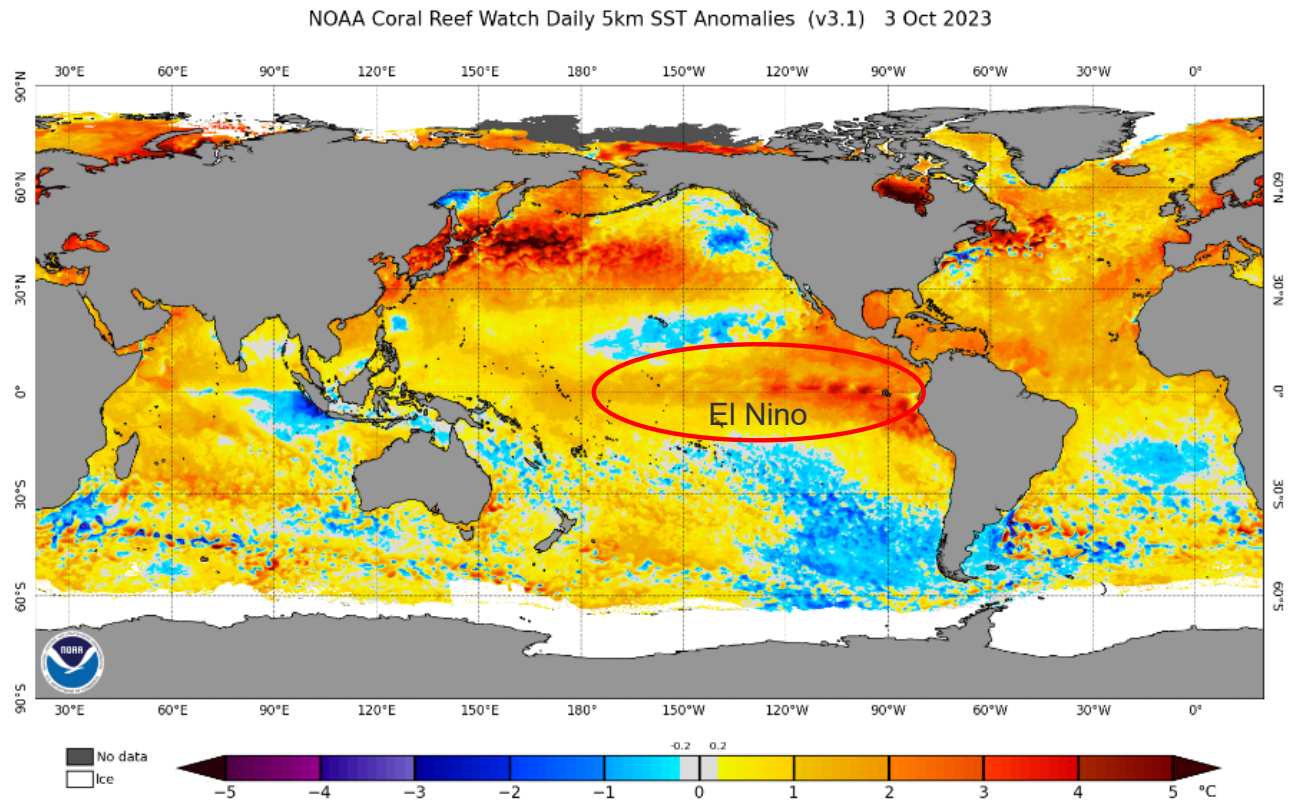
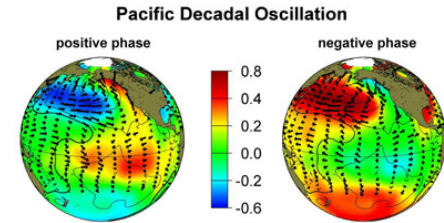
## Agenda

1. Review of the 2023 year-to-date weather
2. Review of last winter
3. Expectations for the upcoming winter 2023-24



# Unusual Pattern

- Fast and aggressive turnover from prolonged La Niña to strong El Niño
- El Niño (especially strong cycles) occurring during a negative PDO (Pacific Decadal Oscillation) are very uncommon
  - The last time this happened was 1963
- Texas went from the 80<sup>th</sup> driest April-June (2023) period to a very hot (#2) and dry (#7) summer (June-September)
  - 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)
  - Texas has never experienced a flip this extreme
- **There is very little historical precedence for what is occurring in 2023**



# 2023 Year-to-Date Review

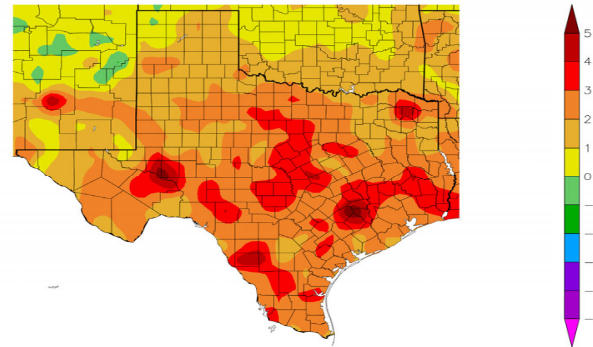
January through September 2023 ranks as the #1 warmest Jan-Sep period for Texas (since 1895)

The past two Jan-Sep periods (2022-23) are the warmest since 2011-12

January through September 2023 ranks as the 21<sup>st</sup> driest Jan-Aug period for Texas (since 1895)

The past two Jan-Sep periods (2022-2023) are the driest since 2011-12

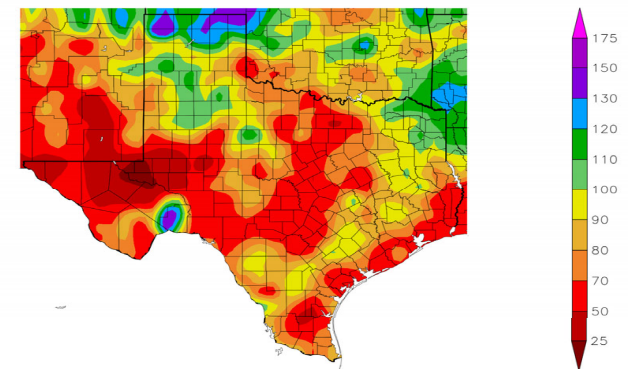
Departure from Normal Temperature (F)  
1/1/2023 – 10/19/2023



Generated 10/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

Percent of Normal Precipitation (%)  
1/1/2023 – 10/19/2023



Generated 10/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers



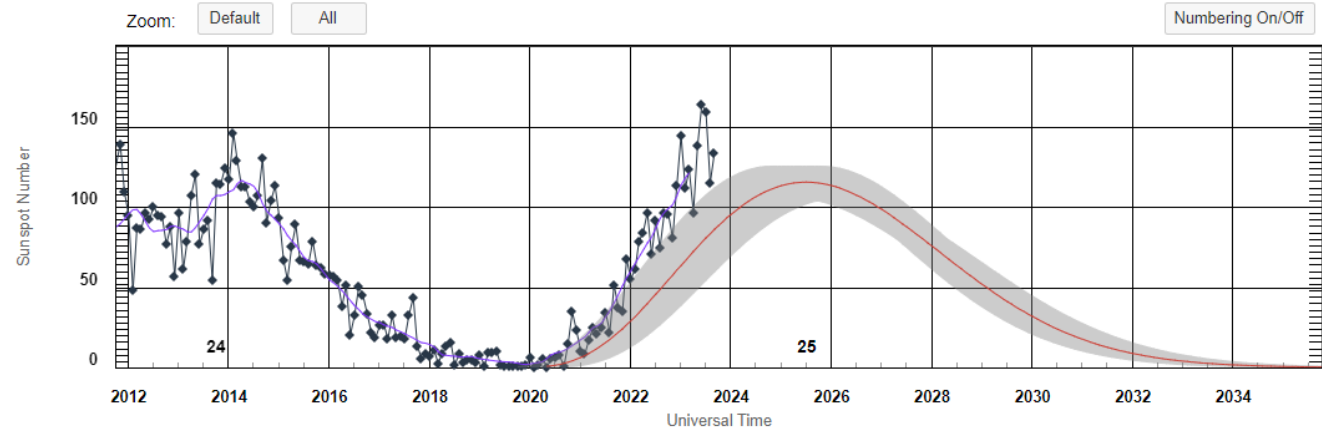


## Why was Summer 2023 so hot?

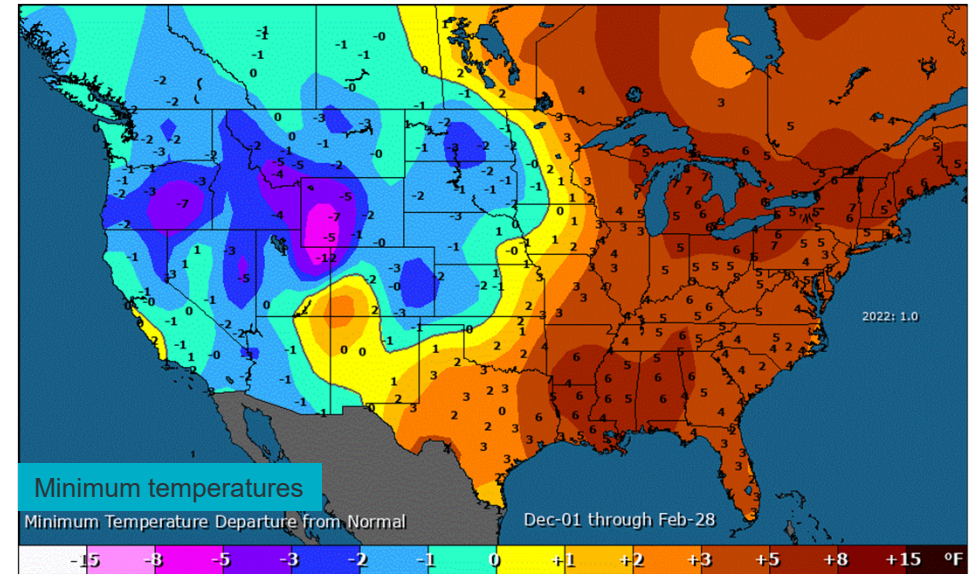
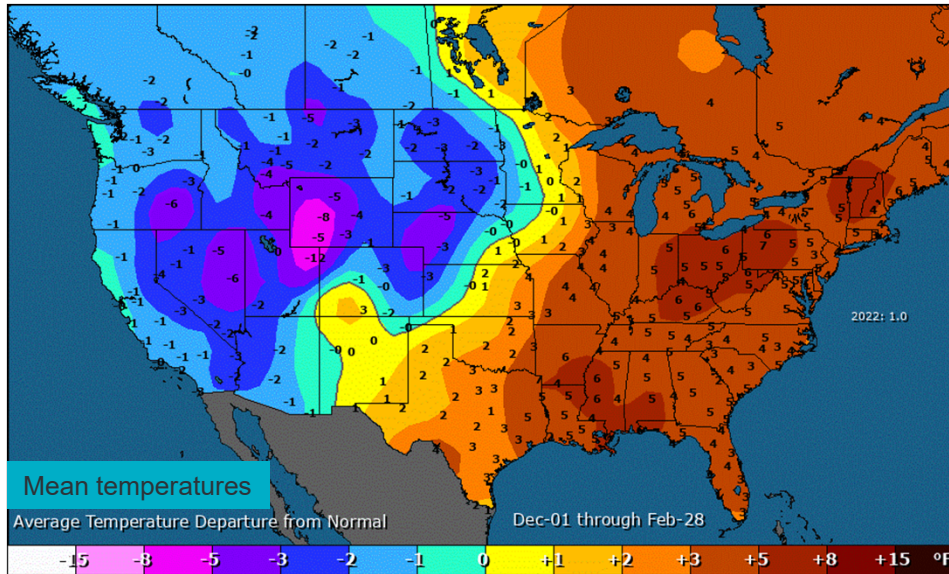
- Underwater volcanic eruption near Tonga (South Pacific)
- January 14, 2022 eruption of Hunga Tonga-Hunga Ha-apai, an underwater volcano near Tonga, in the South Pacific
  - 50 million tons of water vapor from Tonga's eruption could warm Earth for years
- Solar Max
  - At the high point in this cycle, a surge in solar energy warms the Earth by around 0.09 degrees F (0.05 degrees C).
- El Niño
  - The last strong El Niño raised global temperatures by 0.25 degrees F
- Climate change (whether a cycle, man-made, or both)
  - Earth has warmed by 2.2°F since about 1850



ISES Solar Cycle Sunspot Number Progression



## Winter 2022-23 Review



Last winter ranked **6<sup>th</sup> warmest** for the state of Texas, based on both **mean** and **minimum** temperatures

**2<sup>nd</sup> warmest** winter this century (behind only 2016-17, which was the warmest winter on record back to 1895)



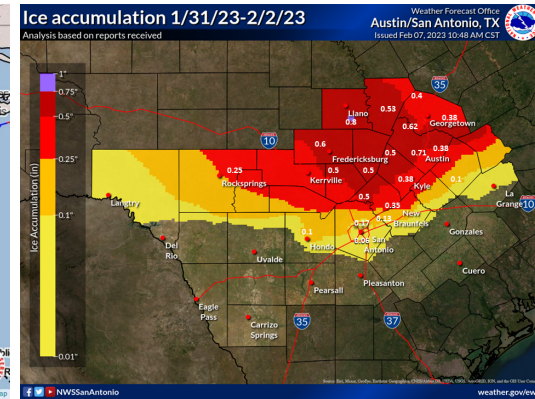
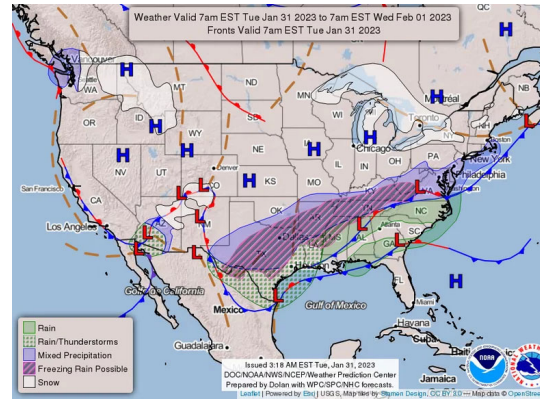
# Winter 2022-23 Review

While last winter was the 6<sup>th</sup> warmest since 1895 (and 2<sup>nd</sup> warmest this century), there were two significant winter weather extremes

1. December 22-24 extreme cold
  - Austin fell to 15° the morning of 12/23
    - The only other period since 1990 to drop to at least 15° was February 2021
    - 15° or colder happened in 25 of 92 winters prior to 1990
  - Dallas dropped to 11° on 12/22 and 12/23
    - Coldest non-February 2021 period since Feb 1996
  - Houston reached 15° on 12/23
    - Coldest non-February 2021 period since Dec 1989
  - Brownville recorded 27° on 12/23
    - Coldest non-February 2021 period since Dec 1989
  - Less extreme over West Texas. Abilene recorded 10° on 12/22-23
    - That's happened in 6 previous winters since 2005

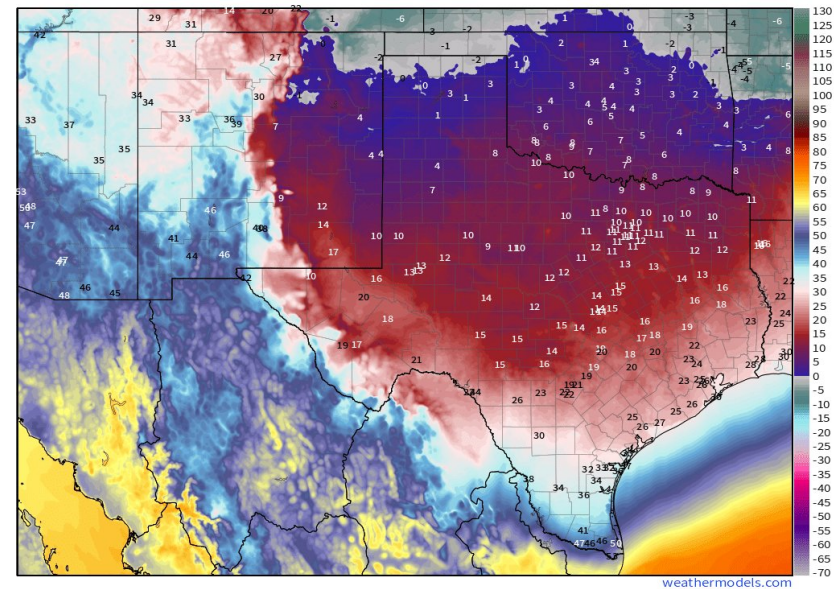
## 2. February ice storm

Last winter was perfect example of the message stated prior to each winter:  
 Even very mild(warm) winters can have a period (or more) With extreme cold temperatures



RTMA | Temperature [°F] Fri 03:45Z23DEC2022

MIN|MAX -16.46° | 78.25°F



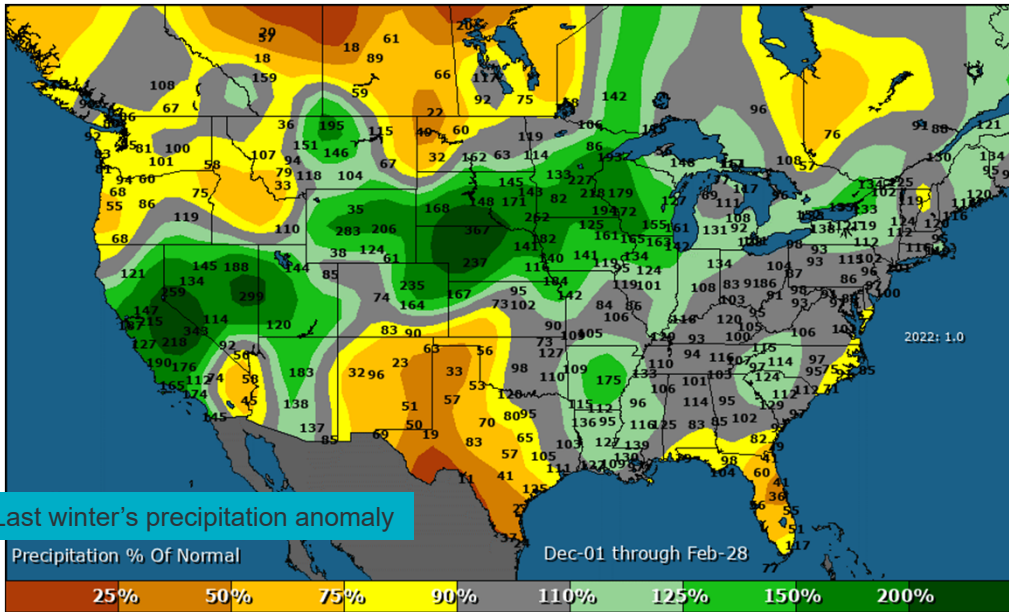
## Mean Temperature Ranking of Recent Texas Winters (128 historical winters)

<b>2022-23</b>	<b>123<sup>rd</sup> coldest (6<sup>th</sup> warmest)</b>
<b>2021-22</b>	<b>112<sup>th</sup> coldest</b>
2020-21	42 <sup>nd</sup>
<b>2019-20</b>	<b>112<sup>th</sup></b>
<b>2018-19</b>	<b>94<sup>th</sup></b>
2017-18	76 <sup>th</sup>
<b>2016-17</b>	<b>128<sup>th</sup> coldest (warmest winter on record)</b>
<b>2015-16</b>	<b>119<sup>th</sup></b>
2014-15	68 <sup>th</sup>
2013-14	30 <sup>th</sup>
<b>2012-13</b>	<b>110<sup>th</sup></b>
2011-12	100 <sup>th</sup>

Since 2001, only 3 winters have ranked in the coldest third (1-43) of historical winters (2009-10 is the other)



# Winter 2022-23 Review



Last winter's precipitation anomaly

Last winter was the **45<sup>th</sup> driest** on record (128 historical winters)

It was the **2<sup>nd</sup> driest** of the past 9 winters

Drought expanded to 62% of the state by winter's end

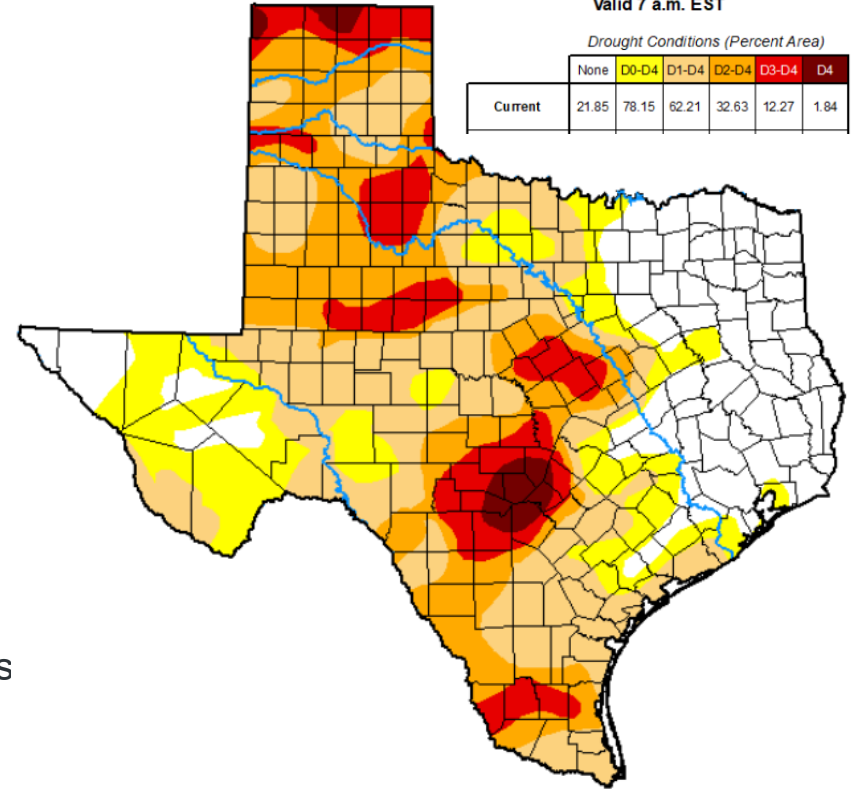
February 28, 2023

(Released Thursday, Mar. 2, 2023)

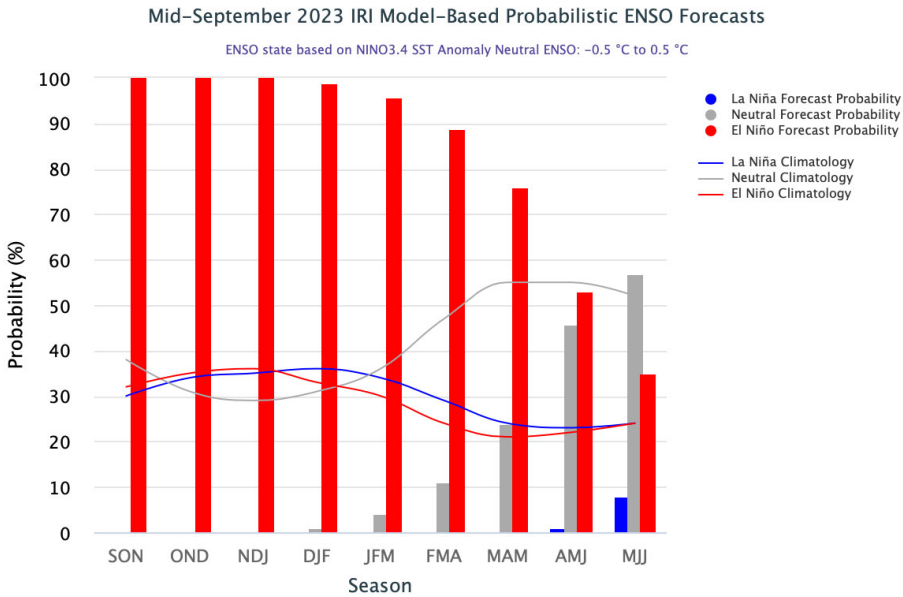
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	21.85	78.15	62.21	32.63	12.27	1.84



# El Niño



**Red** = warmest third of all winters (1895-current)  
**Blue** = coldest third of all winters  
**Black** = middle third of all winters

**The coldest winter since 2001 was during an El Niño**  
 -- but many more **warm** winters since 1991-92

- El Niño reached the “strong” threshold in late-August
- Coming off a La Niña in early-2023, this tied the fastest, most aggressive change to El Niño (1965)
- The current El Niño will continue through the upcoming winter (likely remaining strong)

## El Niño winters (**bold** = strong):

2019-20: <b>112<sup>th</sup> coldest</b>	<b>1991-92: 96<sup>th</sup> coldest</b>	1963-64: 5 <sup>th</sup> coldest
2018-19: <b>94<sup>th</sup> coldest</b>	1987-88: 31 <sup>st</sup> coldest	1958-59: 26 <sup>th</sup> coldest
<b>2015-16: 119<sup>th</sup> coldest</b>	1986-87: 58 <sup>th</sup> coldest	<b>1957-58: 35<sup>th</sup> coldest</b>
2014-15: 68 <sup>th</sup> coldest	<b>1982-83: 44<sup>th</sup> coldest</b>	1953-54: <b>93<sup>rd</sup> coldest</b>
<b>2009-10: 8<sup>th</sup> coldest</b>	1977-78: 4 <sup>th</sup> coldest	1951-52: 124 <sup>th</sup> coldest
2006-07: 44 <sup>th</sup> coldest	1976-77: 12 <sup>th</sup> coldest	
2004-05: <b>108<sup>th</sup> coldest</b>	<b>1972-73: 8<sup>th</sup> coldest</b>	
2002-03: 64 <sup>th</sup> coldest	1969-70: 48 <sup>th</sup> coldest	
<b>1997-98: 92<sup>nd</sup> coldest</b>	1968-69: <b>81<sup>st</sup> coldest</b>	
1994-95: <b>115<sup>th</sup> coldest</b>	<b>1965-66: 24<sup>th</sup> coldest</b>	

## Seasonal Rankings – what is normal?

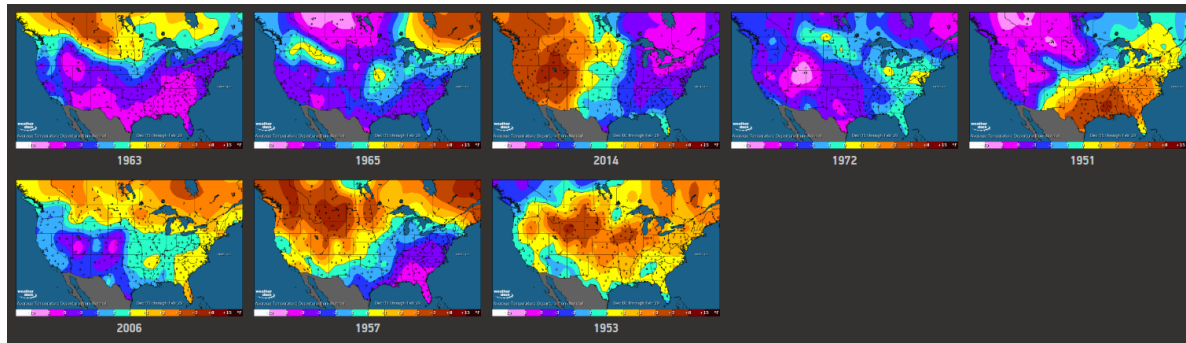
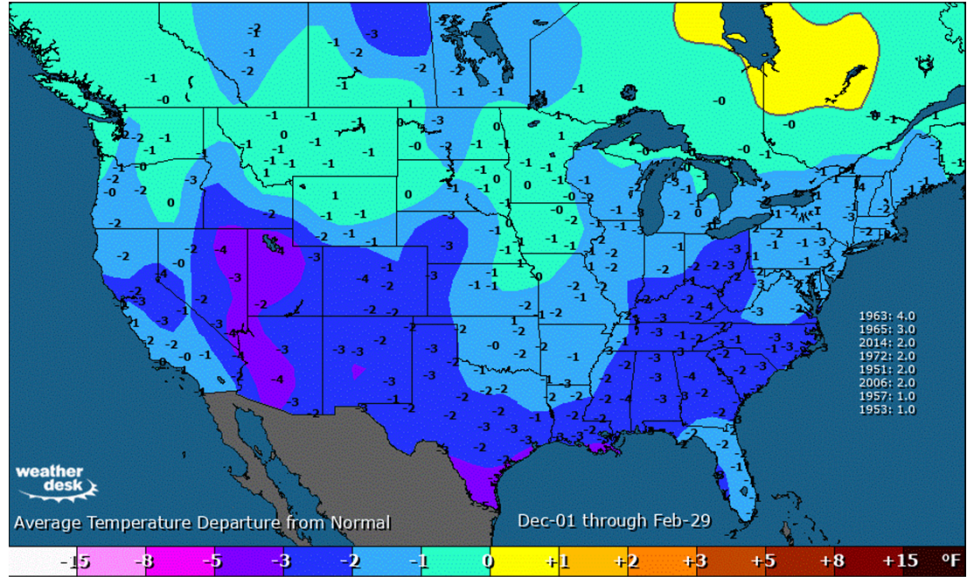
- ❑ “Normal” may no longer be the best way to express seasonal (or monthly, or possibly even daily) temperatures
- ❑ As Texas keeps having many more above normal temperature seasons, it keeps raising the bar for what is “normal”
- ❑ **We commonly use a 15-year normal (2008-2022). Applying that normal to all historical summers (1895-2023) results in only 19 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”)

What is normal?



# 2023-24 Winter Historical Matches (Analog)

- OVERALL (as of 10/3/2023)
1. 1963-64
  2. 1965-66
  3. 2014-15
  4. **1972-73**
  5. 1951-52
  6. **2006-07**
  7. 1957-58
  8. 1953-54



Analogues are listed in priority order

A lack of above normal temperatures is shown in the 6 of the 8 analogs

What was the **coldest** temperature at **DFW** in each of those winters?

*Note: the coldest lows don't always correlate to the coldest winters*

- 1963-64: 4° (Jan); 5<sup>th</sup> coldest winter
- 1965-66: 9° (Jan); 24<sup>th</sup> coldest
- 2014-15: 16° (Jan); 68<sup>th</sup> coldest
- 1972-73: 8° (Jan); 8<sup>th</sup> coldest
- 1951-52: 16° (Dec); 124<sup>th</sup> coldest
- 2006-07: 16° (Feb); 44<sup>th</sup> coldest
- 1957-58: 18° (Feb); 35<sup>th</sup> coldest
- 1953-54: 13° (Jan); 93<sup>rd</sup> coldest

4° or colder has occurred in 12 past winters – but only twice (1989, 2021) since 1964

Winter rankings are based on 128 historical winters

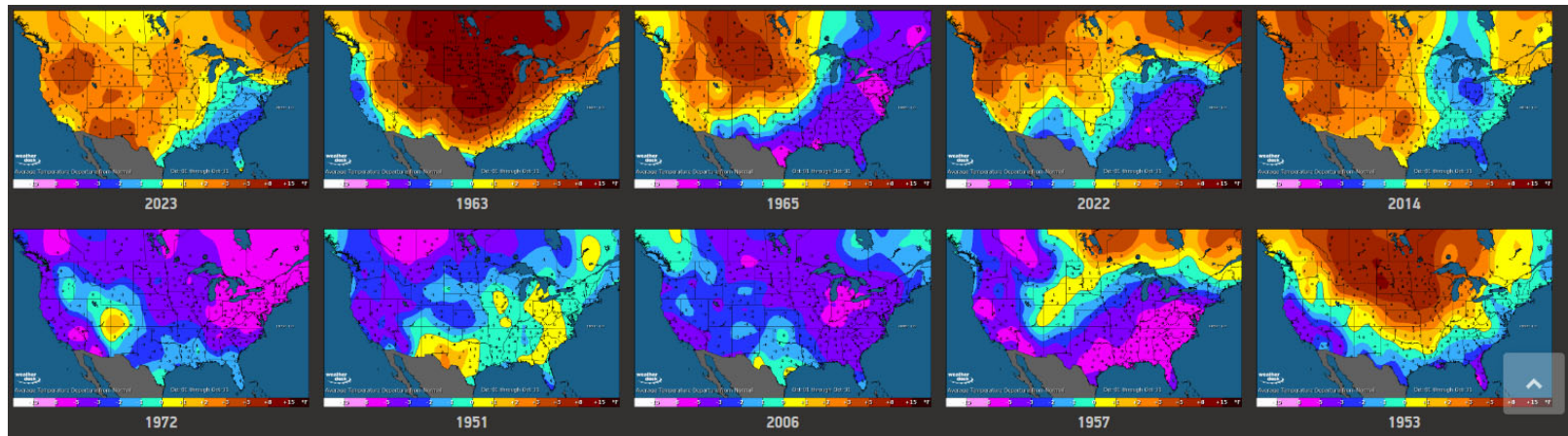
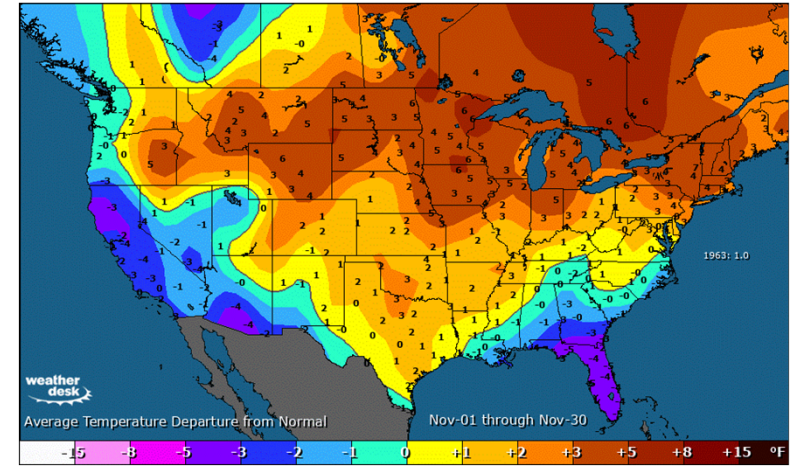
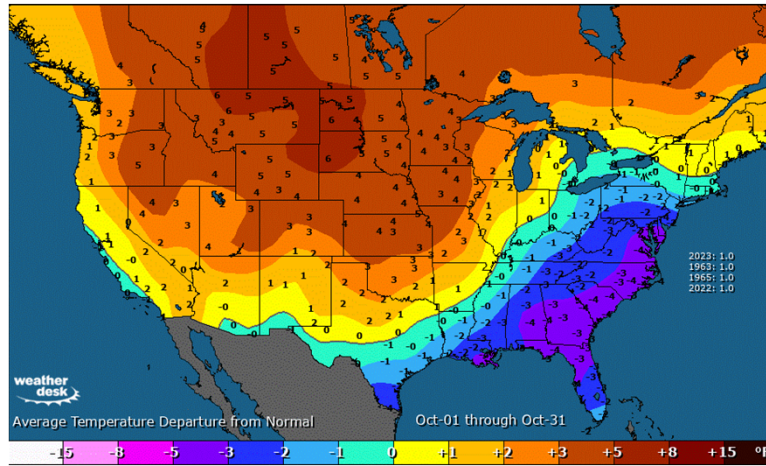




# 2023-24 Winter Historical Matches (Analog)

The top analogs (especially 1963) applied to the current season

**Note:** 1963 is tracking well



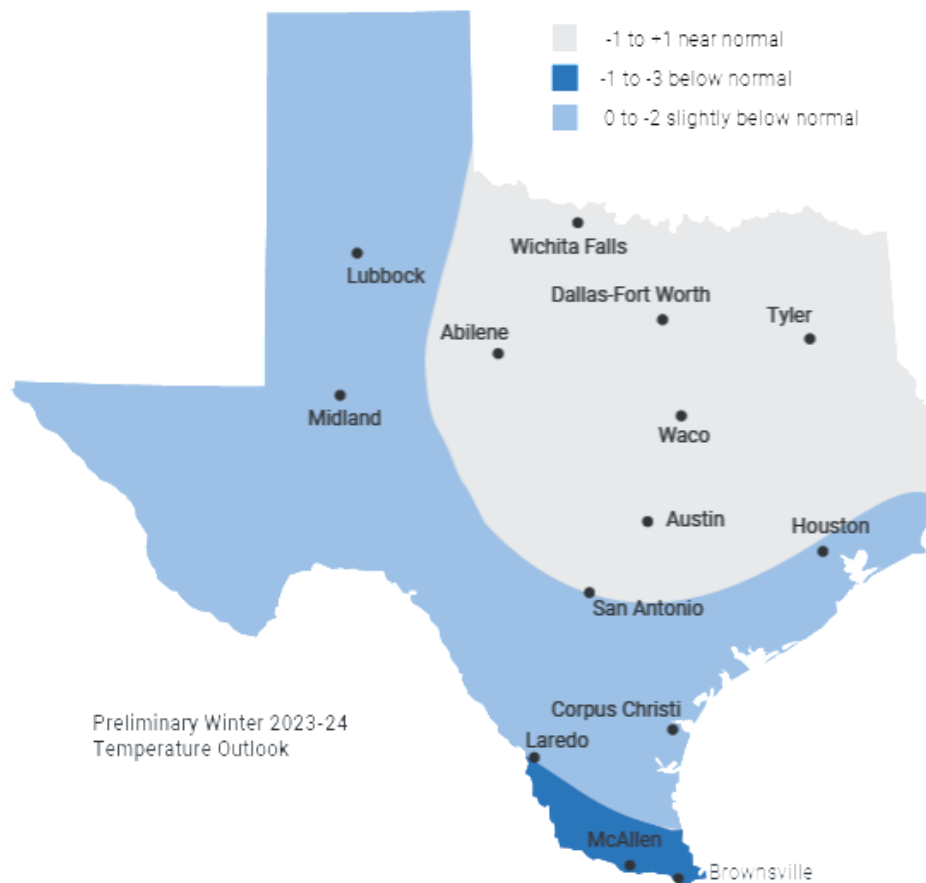
## Preliminary 2023-24 Winter Temperature Outlook

A below normal winter has become uncommon this century

Only 3 of the past 22 winters have fallen in the coldest third of all winters

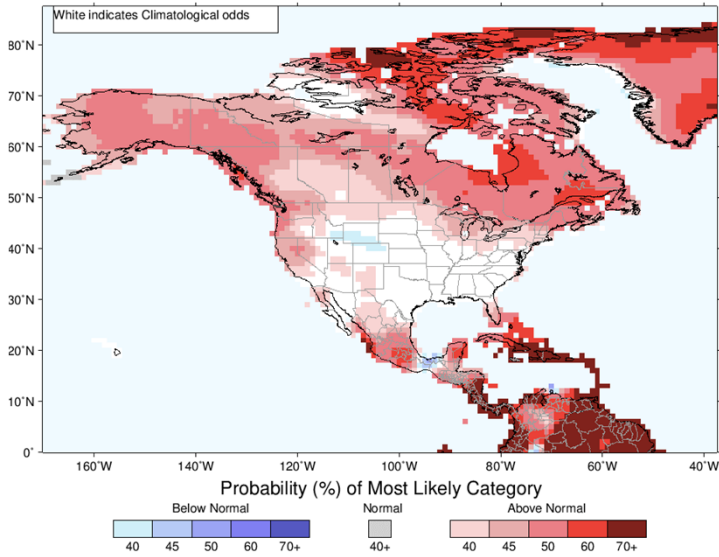
Keep in mind the global factors (Tonga volcano, solar cycle) that could make this winter less cold (but not necessarily warm)

A lack of recent analogs is not ideal – but this is a very unusual pattern

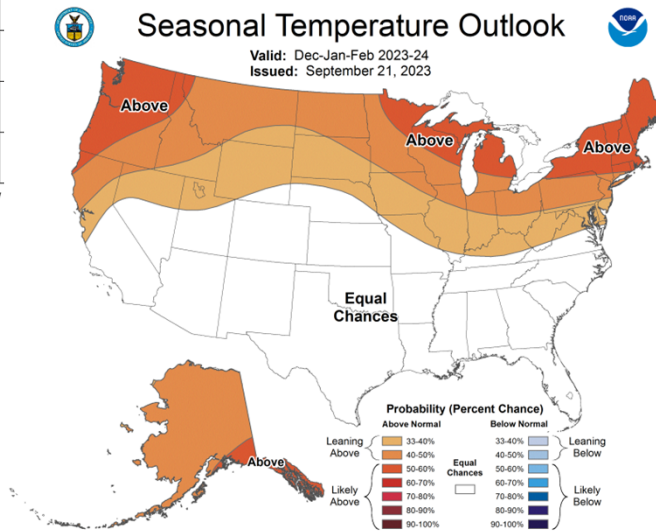


# Other Winter Forecasts

IRI Multi-Model Probability Forecast for Temperature for December–January–February 2024, Issued September 2023



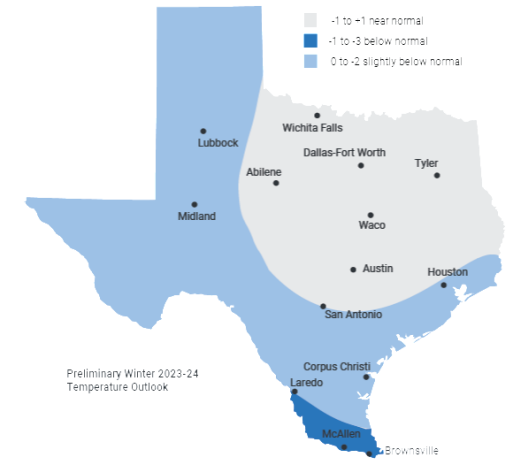
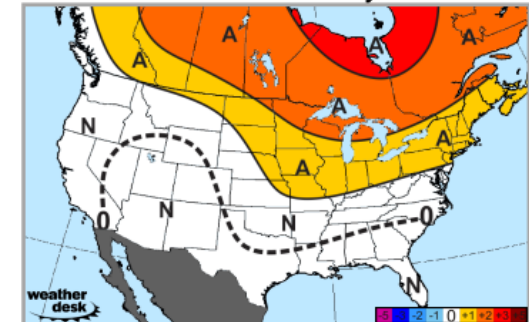
Note the lack of above normal temperatures across Texas



# MAXAR

## INITIAL WINTER OUTLOOK

December 1 - February 29



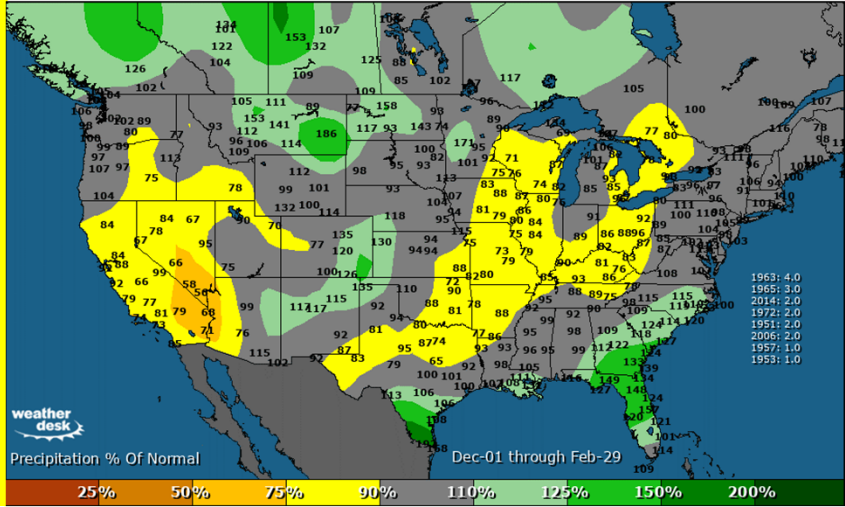
ERCOT preliminary



# 2023-24 Winter Historical Matches (Analog)

OVERALL (as of 10/3/2023)

1. 1963-64
2. 1965-66
3. 2014-15
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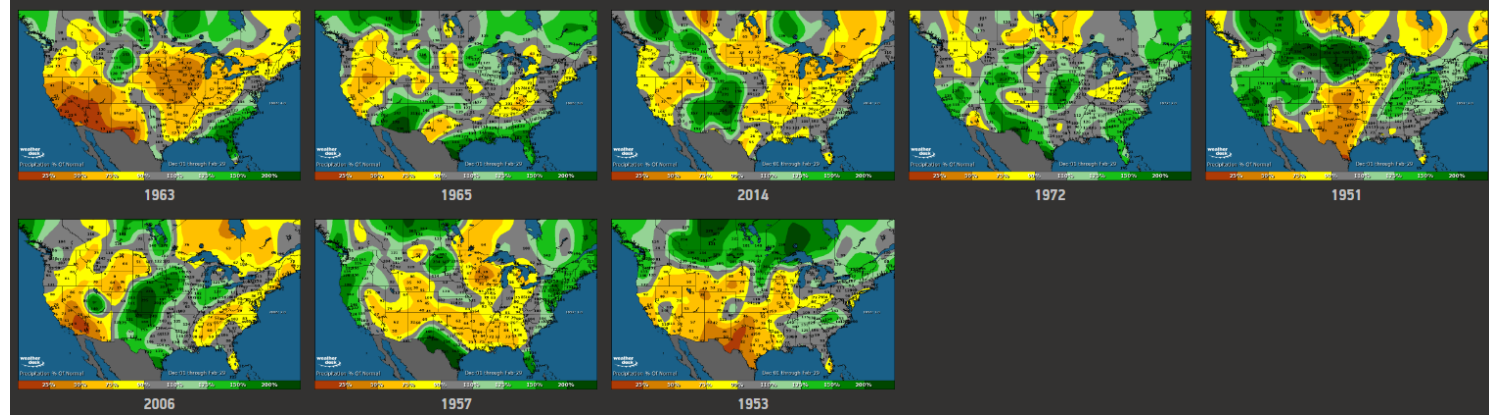
DFW snow accumulations:

- 1963-64: 15.3"
- 1965-66: 7.3"
- 2014-15: 5.8"
- 1972-73: 3.7"
- 1951-52: 0.6"
- 2006-07: 0.3"
- 1957-58: 0.9"
- 1953-54: 3.0"

Normal snowfall is 1.6" Good chance for above normal snowfall in Dallas-Fort Worth this winter

More of a mixed bag of solutions than the temperature analogs show

Generally, more dry than wet

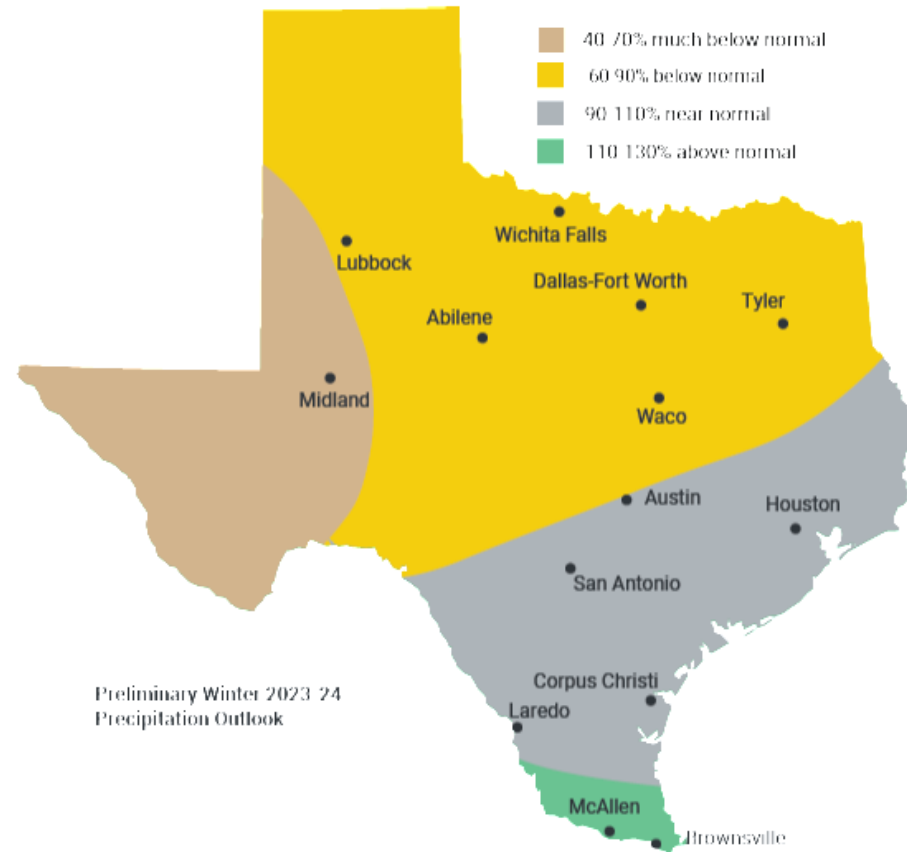




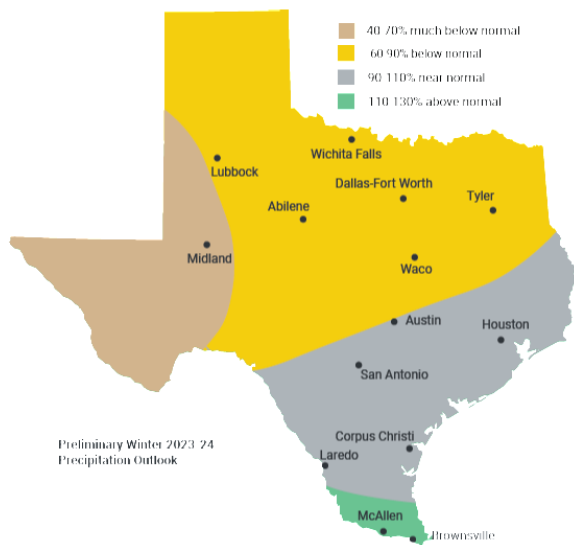
# Preliminary 2023-24 Winter Precipitation Outlook

South Texas has the highest probability  
For a wet winter

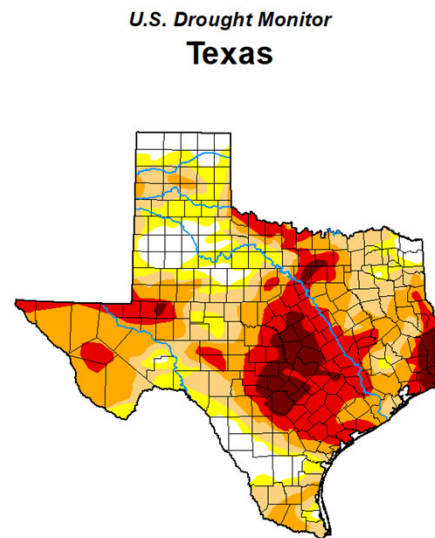
The Panhandle could trend wetter



# Winter 2023-24 Precipitation Outlook vs Drought



Current Drought (as of 10/17/2023):  
74% of the state's area in moderate drought or worse



**October 17, 2023**  
(Released Thursday, Oct. 19, 2023)  
Valid 8 a.m. EDT

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	11.24	88.76	74.43	53.45	26.75	7.02
Last Week 10-10-2023	9.67	90.33	74.95	55.96	28.28	6.27
3 Months Ago 07-18-2023	24.65	75.35	43.06	11.71	4.49	1.06
Start of Calendar Year 01-01-2023	28.84	71.16	49.90	26.60	7.41	1.60
Start of Water Year 09-26-2022	3.03	96.97	80.54	59.66	38.06	12.68
One Year Ago 10-18-2022	6.59	93.41	71.77	43.11	12.80	1.40

**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:**  
Rocky Billotta  
NCEI/NOAA

droughtmonitor.unl.edu

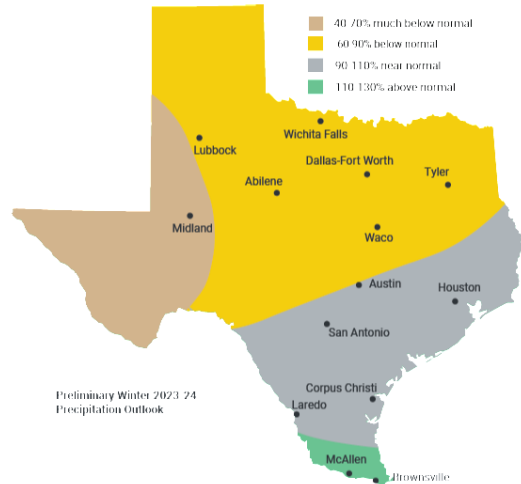
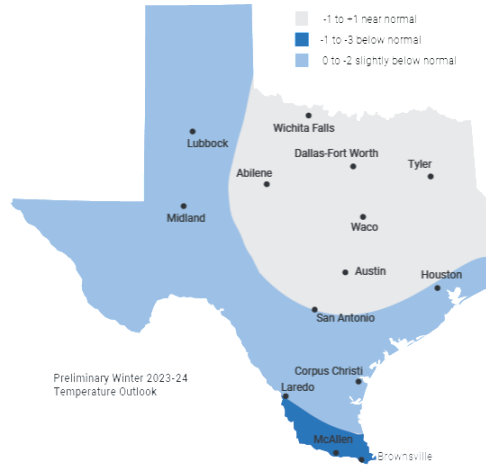
While El Nino is commonly associated with above normal precipitation in Texas, that is not always the case.

The preliminary forecast suggests some regions (especially North and West) will see the drought continue and potentially worsen

Lake Travis was at 36% of capacity as of 10/5/23 – lowest since March 15, 2015 (prior to the Memorial Day floods)

# Winter Weather Outlook Summary

- The preliminary winter weather outlook calls for normal to below normal temperatures and normal to below normal precipitation
- Very unusual pattern of atmospheric drivers
- The top analogs are from the 1960s, which is not ideal
- Highly encouraged to check out the final winter outlook when published in November
- Regardless of the outlook for the entire winter, one or more periods of weather extremes can occur in **any** winter – warm, cold, wet, and dry winters



**This forecast is preliminary. It will be finalized in November 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 as thunderstorms will spread into the Rio Grande Valley late tonight, mostly after midnight. The rest of the state will see 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 in the 80s 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?