2023-24 Preliminary Winter Weather Outlook

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Winter Weatherization Workshop
October 26, 2023
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 80th 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
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 21st driest Jan-Aug period for Texas (since 1895)

The past two Jan-Sep periods (2022-2023) are the driest since 2011-12
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
Last winter ranked 6th warmest for the state of Texas, based on both mean and minimum temperatures.

2nd 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 6th warmest since 1895 (and 2nd 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
## Mean Temperature Ranking of Recent Texas Winters (128 historical winters)

<table>
<thead>
<tr>
<th>Year</th>
<th>Ranking</th>
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<tbody>
<tr>
<td>2022-23</td>
<td>123&lt;sup&gt;rd&lt;/sup&gt; coldest (6&lt;sup&gt;th&lt;/sup&gt; warmest)</td>
</tr>
<tr>
<td>2021-22</td>
<td>112&lt;sup&gt;th&lt;/sup&gt; coldest</td>
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<tr>
<td>2020-21</td>
<td>42&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>2019-20</td>
<td>112&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>2018-19</td>
<td>94&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>2017-18</td>
<td>76&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>2016-17</td>
<td>128&lt;sup&gt;th&lt;/sup&gt; coldest (warmest winter on record)</td>
</tr>
<tr>
<td>2015-16</td>
<td>119&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>2014-15</td>
<td>68&lt;sup&gt;th&lt;/sup&gt;</td>
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<tr>
<td>2013-14</td>
<td>30&lt;sup&gt;th&lt;/sup&gt;</td>
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<tr>
<td>2012-13</td>
<td>110&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>2011-12</td>
<td>100&lt;sup&gt;th&lt;/sup&gt;</td>
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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 was the 45th driest on record (128 historical winters).

It was the 2nd driest of the past 9 winters.

Drought expanded to 62% of the state by winter’s end.
El Niño

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: 112th coldest
- 2018-19: 94th coldest
- 2015-16: 119th coldest
- 2014-15: 68th coldest
- 2009-10: 108th coldest
- 2006-07: 44th coldest
- 2004-05: 8th coldest
- 2002-03: 92nd coldest
- 1997-98: 115th coldest
- 1994-95: 96th coldest
- 1991-92: 31st coldest
- 1987-88: 12th coldest
- 1986-7: 12th coldest
- 1982-83: 44th coldest
- 1979-78: 4th coldest
- 1976-77: 8th coldest
- 1972-73: 8th coldest
- 1969-70: 48th coldest
- 1968-69: 81st coldest
- 1965-66: 24th coldest

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

Red = warmest third of all winters (1895-current)
Blue = coldest third of all winters
Black = middle third of all winters
“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 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); 5th coldest winter
1965-66: 9° (Jan); 24th coldest
2014-15: 16° (Jan); 68th coldest
1972-73: 8° (Jan); 8th coldest
1951-52: 16° (Dec); 124th coldest
2006-07: 16° (Feb); 44th coldest
1957-58: 18° (Feb); 35th coldest
1953-54: 13° (Jan); 93rd 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

Analogs are listed in priority order

A lack of above normal temperatures is shown in the 6 of the 8 analogs
2023-24 Winter Historical Matches (Analogs)

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

**Note:** 1963 is tracking well
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
Note the lack of above normal temperatures across Texas
More of a mixed bag of solutions than the temperature analogs show

Generally, more dry than wet

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.
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

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.