Drought Status & Climate Outlook

Texas and Oklahoma Climate Extremes Workshop
October 13, 2015

Brian Hoeth
NWS Southern Region Headquarters
1. Mid 2010-Mid 2014: TX & OK in multi-year drought

2. Mid 2014-Early 2015: Improvement for TX, improvement then worsening for OK

3. Spring 2015: “Drought Free” in TX & OK due to record breaking rains that led to widespread flooding

4. July-Oct 2015: Some re-development (“Flash Drought”) for parts of OK/TX

5. Outlook: Some improvement likely late Fall into Winter
Texas was in a historic multi-year drought that began in May 2010...

2010-2014 Texas Drought

- 0% Drought (D1-D4) - April 27, 2010
- 14% Drought (D1-D4) - June 29, 2010
- 100% Drought (D1-D4) - October 4, 2011
- 73% Drought (D1-D4) - June 26, 2012
- 84% Drought (D1-D4) - June 25, 2013
- 69% Drought (D1-D4) - June 24, 2014

97% Extreme to Exceptional Drought (D3-D4)
Oklahoma was also in a historic multi-year drought that began in May 2010...
2015 Texas Drought

- Spring rain eliminated drought before “Flash Drought” conditions returned by August!

Maps showing the extent of drought conditions in Texas over different dates:
- March 31: 37% Drought (D1-D4)
- April 28: 31% Drought (D1-D4)
- May 26: 5% Drought (D1-D4)
- July 28: 0.65% Drought (D1-D4)
- August 25: 24% Drought (D1-D4)
- September 29: 38% Drought (D1-D4)
2015 Oklahoma Drought

Spring rain eliminated drought before “Flash Drought” conditions returned by September!

March 31: 68% Drought (D1-D4)
April 28: 59% Drought (D1-D4)
May 26: 2% Drought (D1-D4)
June 28: 0% Drought (D1-D4)
August 25: 9% Drought (D1-D4)
September 29: 17% Drought (D1-D4)
Drought Status

Percentage of the State in Drought (D1-D4) (Moderate to Exceptional Drought)

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<tr>
<td>Texas</td>
<td>48%</td>
<td>49%</td>
<td>70%</td>
<td>65%</td>
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<tr>
<td>Oklahoma</td>
<td>23%</td>
<td>73%</td>
<td>43%</td>
<td>100%</td>
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El Nino/La Nina Summary

“The 50,000 foot view”

1. Late 2009–Late 2010: Major shift from El Nino to La Nina

2. Late 2010-Late 2014: La Nina to neutral conditions

3. Late 2014 – Early 2015: El Nino developed


5. Outlook: El Nino likely to continue through early 2016, then trend towards neutral by Spring or Summer 2016
El Nino/La Nina Summary

DESCRIPTION: Warm (red) and cold (blue) periods based on a threshold of +/- 0.5°C for the Oceanic Niño Index (ONI) [3 month running mean of ERSST.v4 SST anomalies in the Niño 3.4 region (5°N-5°S, 120°-170°W)], based on centered 30-year base periods updated every 5 years.

For historical purposes, periods of below and above normal SSTs are colored in blue and red when the threshold is met for a minimum of 5 consecutive overlapping seasons. The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods.

<table>
<thead>
<tr>
<th>Year</th>
<th>DJF</th>
<th>JFM</th>
<th>FMA</th>
<th>MAM</th>
<th>AMJ</th>
<th>MJJ</th>
<th>JJA</th>
<th>JAS</th>
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0.5-1.0 = “weak” El Nino
1.0-1.5 = “moderate” El Nino
1.5+ = “strong” El Nino

Red = El Nino
Blue = La Nina
Black = Neutral

0.5-1.0 = “weak” La Nina
1.0-1.5 = “moderate” La Nina
1.5+ = “strong” La Nina
**Strong El Niño Conditions Present**

- Much warmer than normal sea surface temperatures (SSTs) in Pacific.

Niño 3.4 SSTs exceeding $+0.5^\circ C$ for at least five 3-month periods denotes an El Niño.

Niño 3.4 SSTs exceeding $+1.5^\circ C$ denotes a Strong El Niño.
How Long Have we been experiencing El Niño Conditions?

- Weak to Moderate El Niño conditions have been developing since Late 2014 / Early 2015
- Strong El Niño has developed over the past few months
The chance of El Niño is approximately 95% through Northern Hemisphere winter and is just under 50% by late spring (AMJ) 2016.
Most models indicate that Niño 3.4 will be above +1.5°C (a “strong” El Niño) during late 2015 into early 2016.

Positive anomalies are predicted to weaken through the Northern Hemisphere Spring 2016.
Southern Plains Impacts (during Winter)

- Storms track shift further south with jet
- Increased frequency of storm systems

How far south the storm track shifts determines where in the Southern Plains there are more storms
Comparing with La Niña

- Storms track shift further north, blocked by High Pressure
- Decreased frequency of storm systems
Texas State Climatologist John Nielsen-Gammon likes to say:

El Nino = EL = Extra Liquid
La Nina = LA = Less Agua

for the Southern U.S.
Precipitation Outlook (Oct – Dec)

- Of the 3 scenarios (above normal, near normal, below normal), above normal is most likely
- There’s still a decent chance (~50%) that precipitation will be near normal to below normal
- Even if precipitation is above normal this tells you nothing about how much above normal

What does this graphic tell you about the precipitation outlook for OND (October-November-December) for the area in Texas denoted by the star? (Choose all that apply)

a) Above normal precipitation is forecast
b) Much above normal precipitation is forecast
c) There’s a 50% chance that there will be above normal precipitation
d) There’s a 50% chance that there will be normal or below normal precipitation
Drought conditions will gradually improve in many areas of TX & OK through December, but will remain in isolated spots (particularly those under D2-D3 conditions now.)

U.S. Seasonal Drought Outlook
Valid for September 17 - December 31, 2015
Drought Tendency During the Valid Period

http://go.usa.gov/3eZ73
Only 10 El Niños have gone into the analyses and they are heavily influenced by the strongest events.
SNOW ANOMALIES (19 EL NIÑO EVENTS)

3-MONTH PERIOD: NOVEMBER-DECEMBER-JANUARY

1” - 3” more than normal

20%-60% of the time during El Niño
SNOW ANOMALIES (18 EL NIÑO EVENTS)

3-MONTH PERIOD: DECEMBER-JANUARY-FEBRUARY

1” - 5” more than normal

20%-70% of the time during El Niño
SNOW ANOMALIES (14 EL NIÑO EVENTS)

3-MONTH PERIOD: JANUARY-FEBRUARY-MARCH

JFM EL NIÑO SNOW ANOMALIES (IN) AND FREQUENCY OF OCCURRENCE (%)

1” - 5” more than normal

30%-80% of the time during El Niño

Late Winter has strongest signal for above normal snow
<table>
<thead>
<tr>
<th>Normal May Rainfall</th>
<th>May 2015 Rainfall</th>
<th>Departure From Normal</th>
<th>Percent of Normal</th>
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During the height of the drought in TX ...

- **Driest 12-month period ever**
  - October 1, 2010 thru September 30, 2011
  - 2011 was driest calendar year ever (in 117 years)
  - April and May rains ranked in the bottom 10 for TX
• On average, Texas gets the least amount of rainfall during the late Fall and Winter months (Nov – Feb) ... even less than the summer months!

• While above normal rainfall during the late Fall into Winter is good, does it really buy us that much as far as overall drought relief?
• On average, Oklahoma gets the least amount of rainfall during the late Fall and Winter months (Nov – Feb) ... even less than the summer months!

• While above normal rainfall during the late Fall into Winter is good, does it really buy us that much as far as overall drought relief?
Linking “Extreme Climate” Events

Does Extreme Drought Lead to Extreme Flood?

Drought – October 2011

Flood – May 2015
References

1. South Central Texas Fall Climate Outlook
   – October 8, 2015 webinar: NWS Austin-San Antonio, TX

2. Climate Impacts on the Southern Plains
   – October, 2015 briefing to Tulsa airport: NWS Tulsa, OK

3. CPC ENSO Diagnostic Discussion
   – October 8, 2015

4. Short and Long Term Climate Outlooks and Impacts: Implications for Water Resources
   – January 29, 2013: David P. Brown AMS presentation
Questions? / Discussion

Send questions/feedback to:
brian.hoeth@noaa.gov
Information provided by:

National Weather Service
Southern Region Headquarters
Regional Operations Center
Fort Worth, TX

Phone: (817) 978-1100 x147
E-mail: sr-srh roc@noaa.gov
Web: http://www.srh.noaa.gov

facebook: https://www.facebook.com/NWSSouthern
@NWS_Southern_US https://twitter.com/NWS_Southern_US
• Drought much improved across the South so now what?
• Besides drought updates and seasonal outlooks, what do people really want to know? Above normal precip/temp??
  • When is the “big one”? How bad is it gonna be?
  • As much lead time as possible on any potential HAZARDS / IMPACTS
  • Translating climate into “what does it mean to me”
Future Climate Services

NWS Jackson Week Two Hazard Assessment
Valid: July 13th through July 19th

<table>
<thead>
<tr>
<th>Severe Weather</th>
<th>Flash Flooding</th>
<th>Dangerous Heat</th>
<th>Tropical System</th>
<th>Freezing Temps</th>
<th>Wintry Precip</th>
<th>Arctic Outbreak</th>
<th>Fire Weather</th>
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Category Out of Season

Details: A hot weather pattern will continue at the beginning of the period, and dangerous heat stress may still be a concern then, but expect a transition to a potentially stormier and slightly cooler pattern by the end of the period.

- WFO Jackson, MS experimenting with emailing a Week Two Hazard Assessment to their partners
Future Regional Climate Services

**State of Texas Week Two Hazard Assessment**

Valid: August 5th through August 11th

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<tr>
<td>TX Panhandle and far west TX</td>
<td>Nearly statewide</td>
<td>1</td>
<td>Increasing danger south and east TX</td>
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Confidence hazard will occur

Low predictability

Confidence hazard will not occur

**Details:** Hot and mostly dry conditions will persist next week with much of central and south Texas having a medium to high probability of no rain. Below average rain will occur across north Texas and east Texas. Temperatures above normal are favorable nearly statewide, except the Panhandle. The pattern next week is generally not favorable for severe weather or tropical weather over Texas. Flash flooding could possibly occur in the Panhandle and far west Texas, with an increase in monsoonal moisture. With the enhanced dryness, fire dangers should increase over south and east Texas.

- Taking WFO Jackson, MS concept and applying it Regionally … for the State of Texas
Week Two TX Outlook for Next Week

**State of Texas Week Two Hazard Assessment**

Valid: October 21st – October 27th

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<td>Category Out of Season</td>
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**Discussion:** The probability for high impact weather events during the next week in Texas is low. The weather pattern for Texas next week looks to be within climatological normals for this time of year. The pattern is generally favorable for above normal temperatures and increased fire weather potential. An upper level trough will clip the northern parts of Texas early to mid next week resulting in passing rainfall for parts of North Texas. Extreme to exceptional drought should persist for northeast into central Texas which may lead to some fire weather concerns. Above normal temperatures are possible across Texas, but record maximum temperatures are not likely.

- SR ROC is experimenting with this graphic internally & plans to send to state of TX Dept. of EM personnel routinely starting in Nov 2015.