



Drought Status & Climate Outlook

Texas and Oklahoma Climate Extremes Workshop
October 13, 2015

Brian Hoeth
NWS Southern Region Headquarters



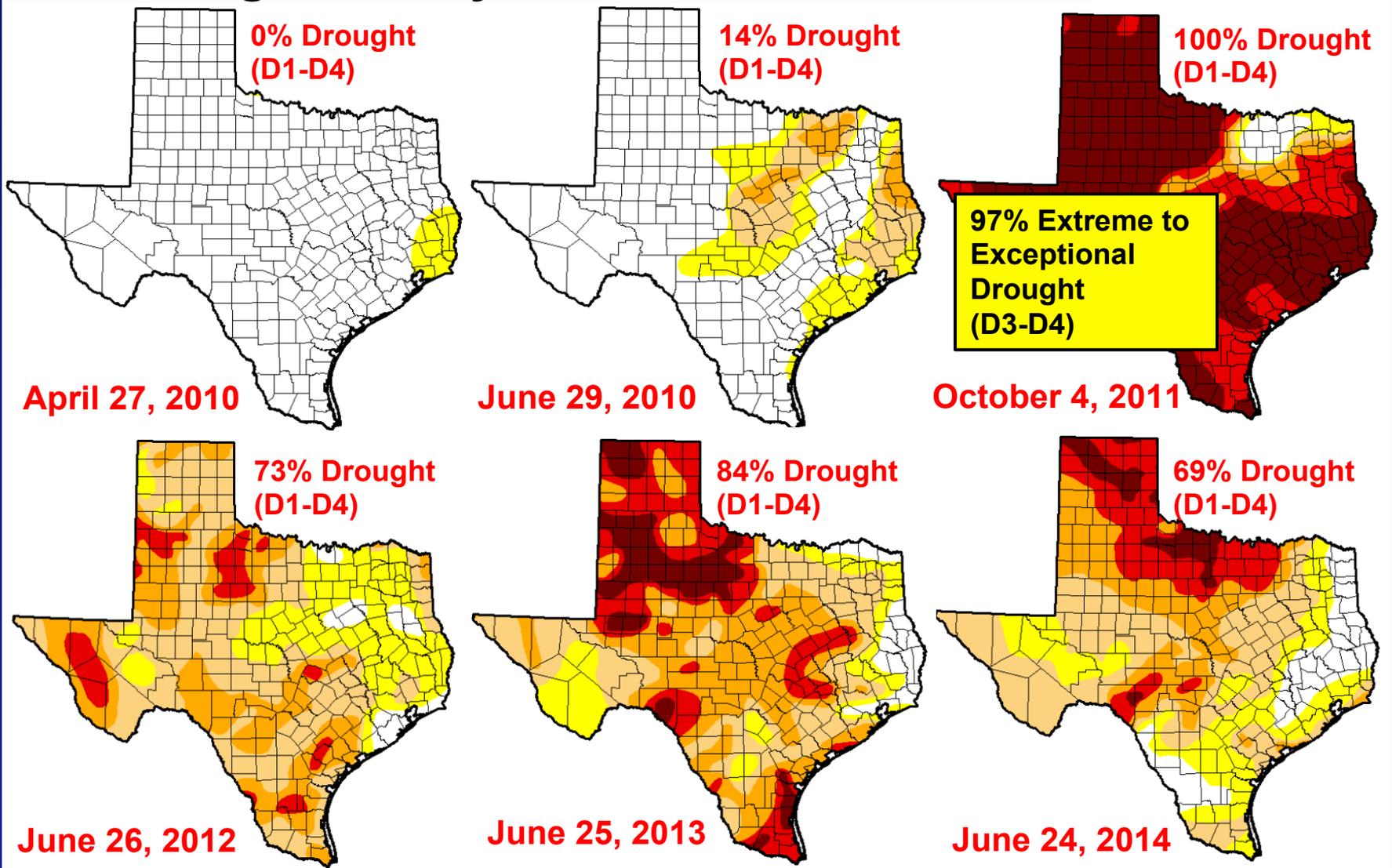
TX & OK Drought Summary

“The 50,000 foot view”

- 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

2010-2014 Texas Drought

➤ Texas was in a historic multi-year drought that began in May 2010...

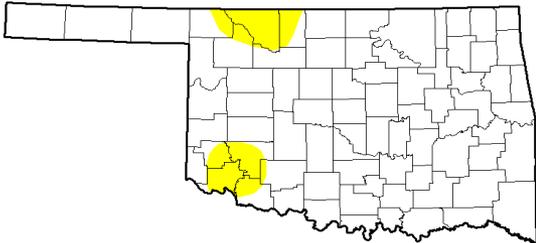


2010-2014 Oklahoma Drought

➤ Oklahoma was also in a historic multi-year drought that began in May 2010...

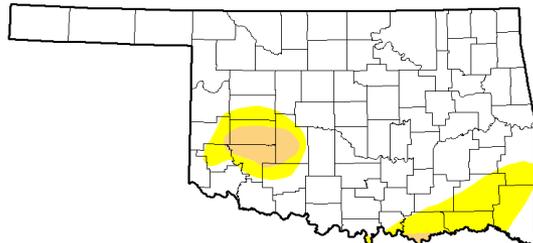


0% Drought
(D1-D4)



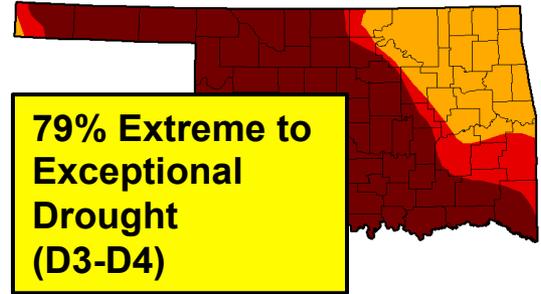
April 27, 2010

3% Drought
(D1-D4)



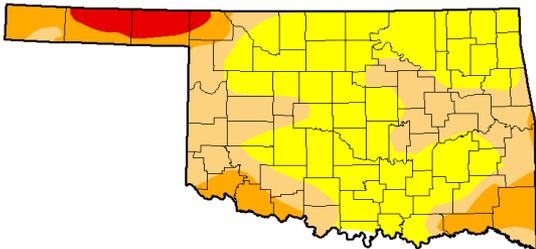
June 29, 2010

96% Drought
(D1-D4)



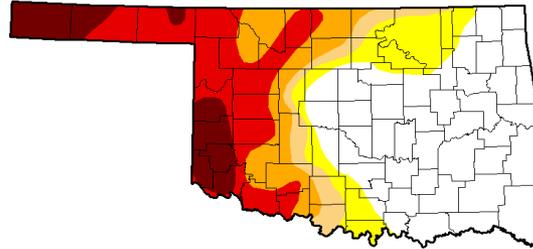
October 4, 2011

48% Drought
(D1-D4)



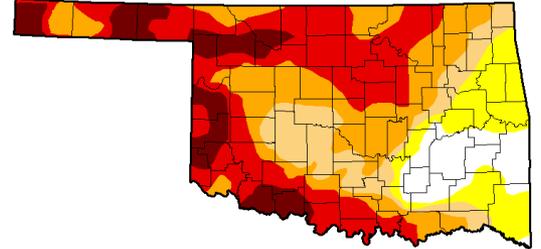
June 26, 2012

42% Drought
(D1-D4)



June 25, 2013

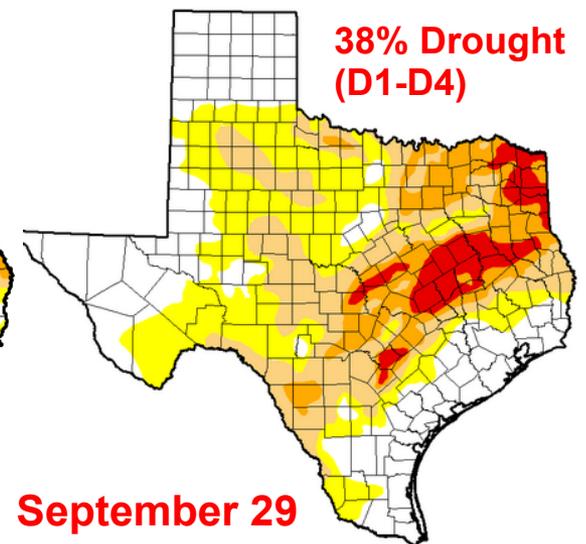
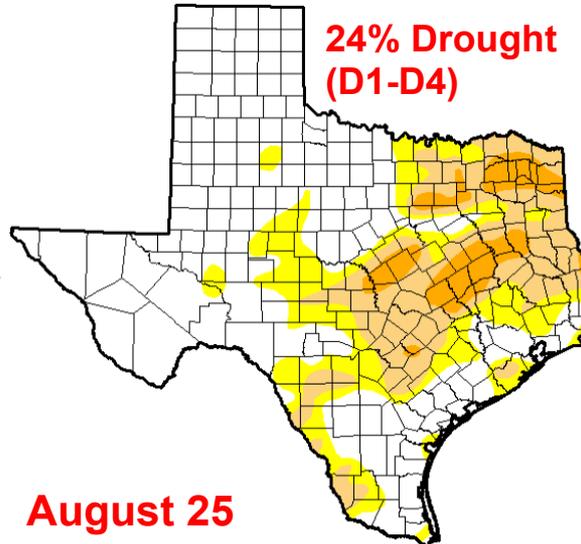
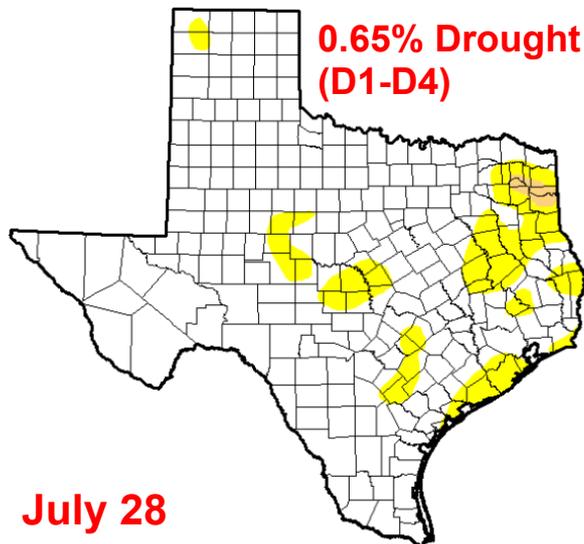
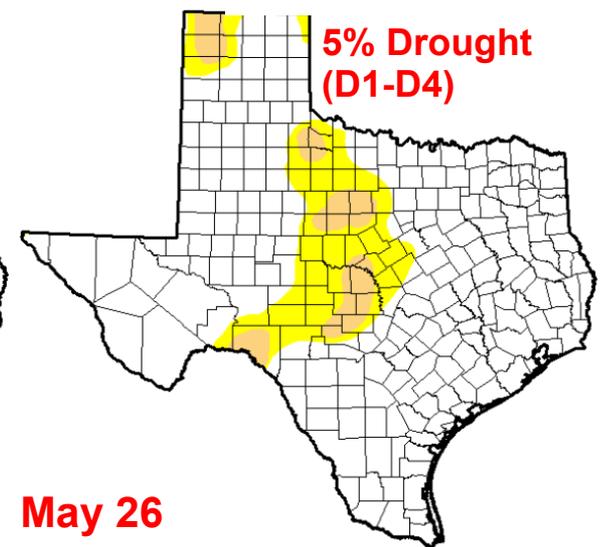
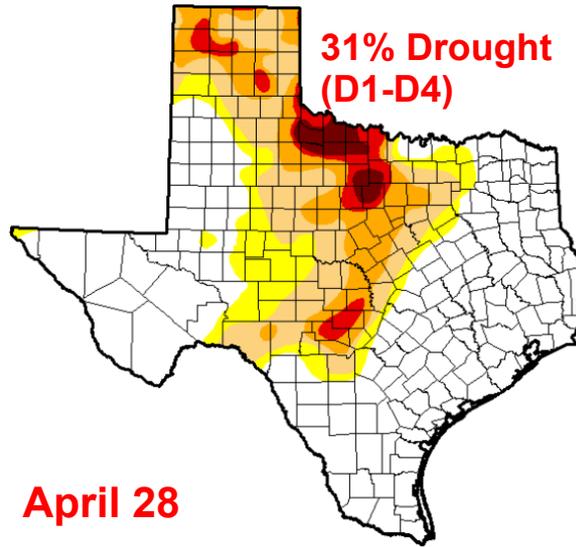
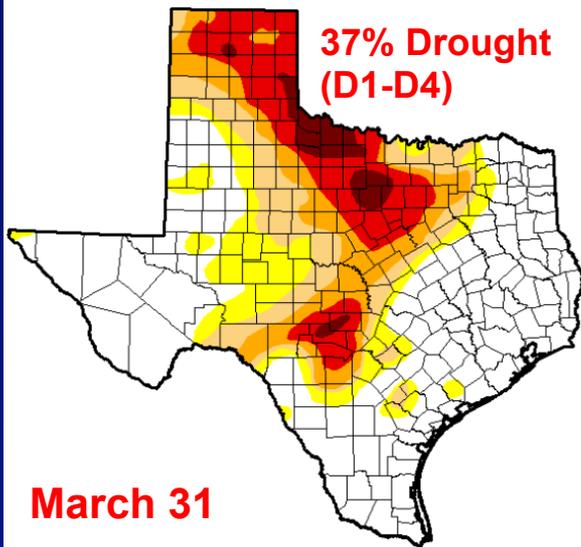
78% Drought
(D1-D4)



June 24, 2014

2015 Texas Drought

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



2015 Oklahoma Drought

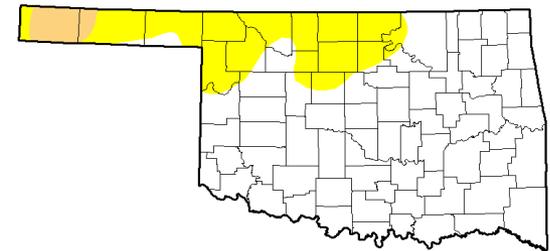
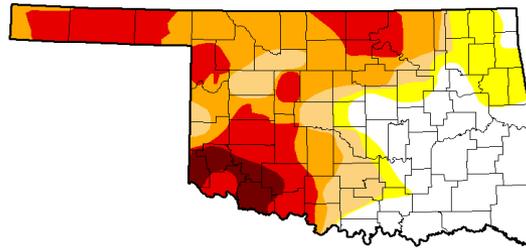
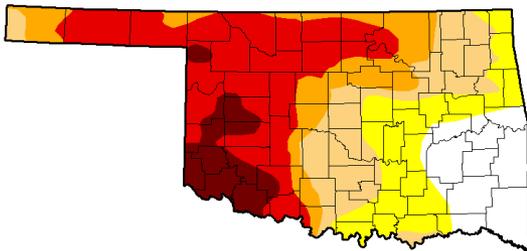
➤ Spring rain eliminated drought before “Flash Drought” conditions returned by September!



68% Drought
(D1-D4)

59% Drought
(D1-D4)

2% Drought
(D1-D4)



March 31

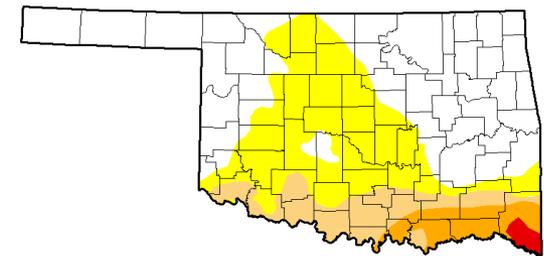
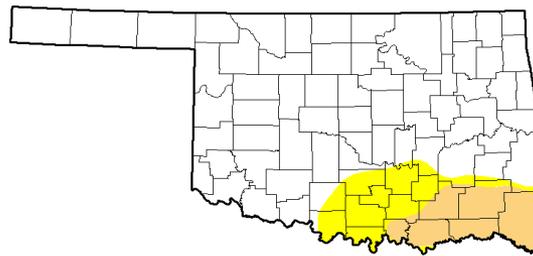
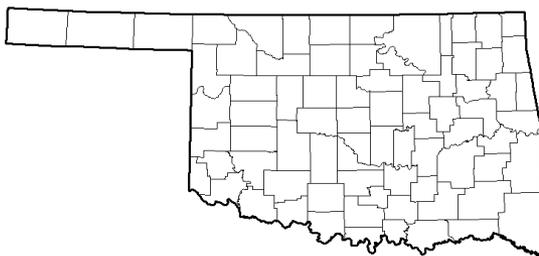
April 28

May 26

0% Drought
(D1-D4)

9% Drought
(D1-D4)

17% Drought
(D1-D4)



July 28

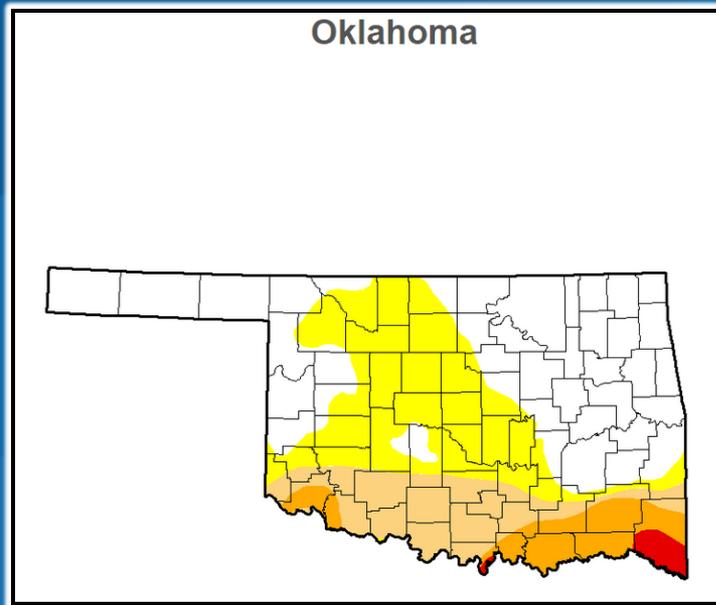
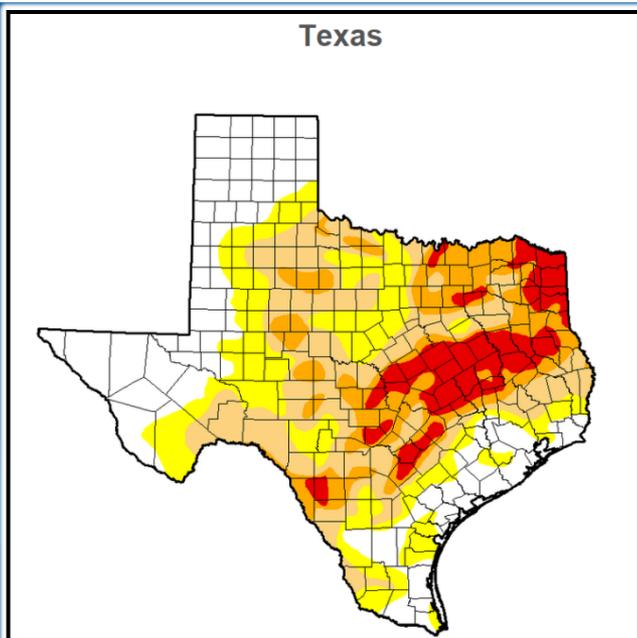
August 25

September 29



Drought Status

October 6, 2015
 (Released Thursday October 8, 2015)
 Valid 8 a.m. EDT



Intensity:

- D0 (Abnormally Dry)
- D2 (Severe Drought)
- D4 (Exceptional Drought)
- D1 (Moderate Drought)
- D3 (Extreme Drought)

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

State	Oct 6, 2015	Oct 7, 2014	Oct 8, 2013	Oct 9, 2012	Oct 11, 2011
Texas	48%	49%	70%	65%	100%
Oklahoma	23%	73%	43%	100%	100%



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
- 4. Currently:** “Strong” El Nino
- 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.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2009	-0.8	-0.7	-0.4	-0.1	0.2	0.4	0.5	0.6	0.7	1.0	1.2	1.3
2010	1.3	1.1	0.8	0.5	0	-0.4	-0.8	-1.1	-1.3	-1.4	-1.3	-1.4
2011	-1.3	-1.1	-0.8	-0.6	-0.3	-0.2	-0.3	-0.5	-0.7	-0.9	-0.9	-0.8
2012	-0.7	-0.6	-0.5	-0.4	-0.3	-0.1	0.1	0.3	0.4	0.4	0.2	-0.2
2013	-0.4	-0.5	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3
2014	-0.5	-0.6	-0.4	-0.2	0	0	0	0	0.2	0.4	0.6	0.6
2015	0.5	0.4	0.5	0.7	0.9	1.0	1.2	1.5				

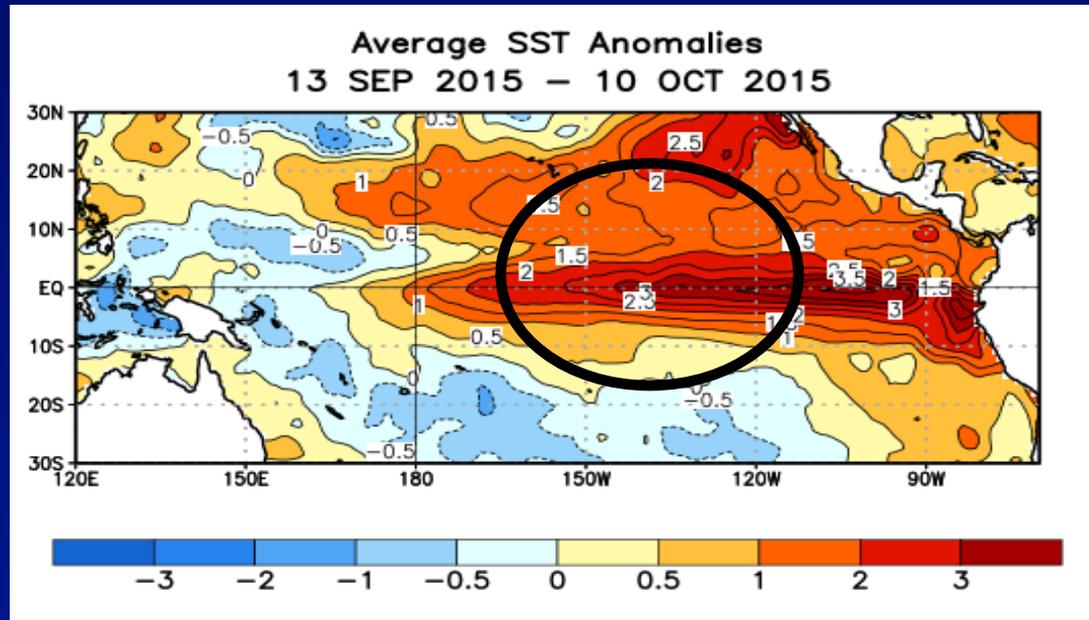
0.5-1.0 = "weak" El Nino
1.0-1.5 = "moderate" El Nino
1.5+ = "strong" El Nino

Red = El Nino
Blue = La Nina
Black = Neutral

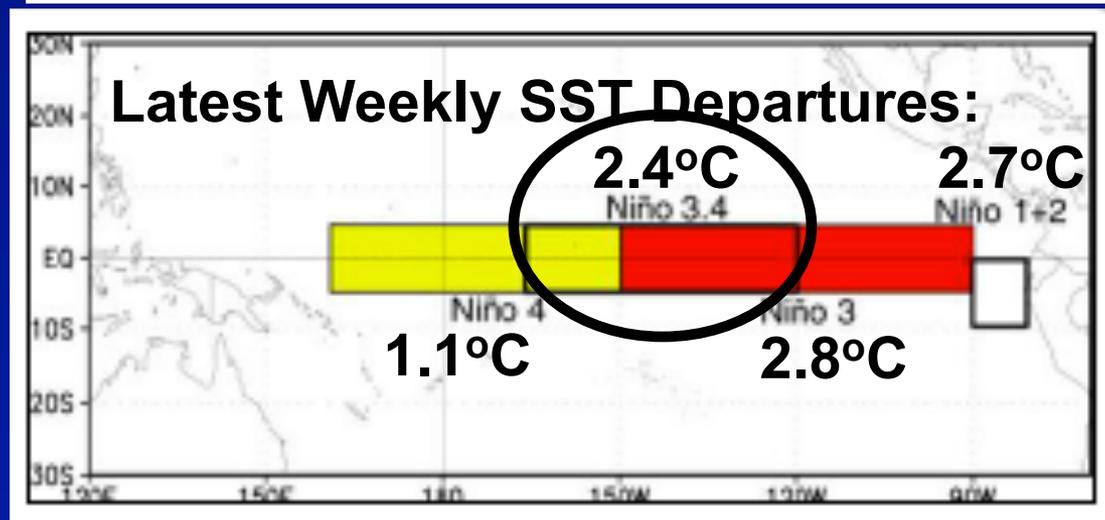
0.5-1.0 = "weak" La Nina
1.0-1.5 = "moderate" La Nina
1.5+ = "strong" La Nina

Strong El Niño Conditions Present

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



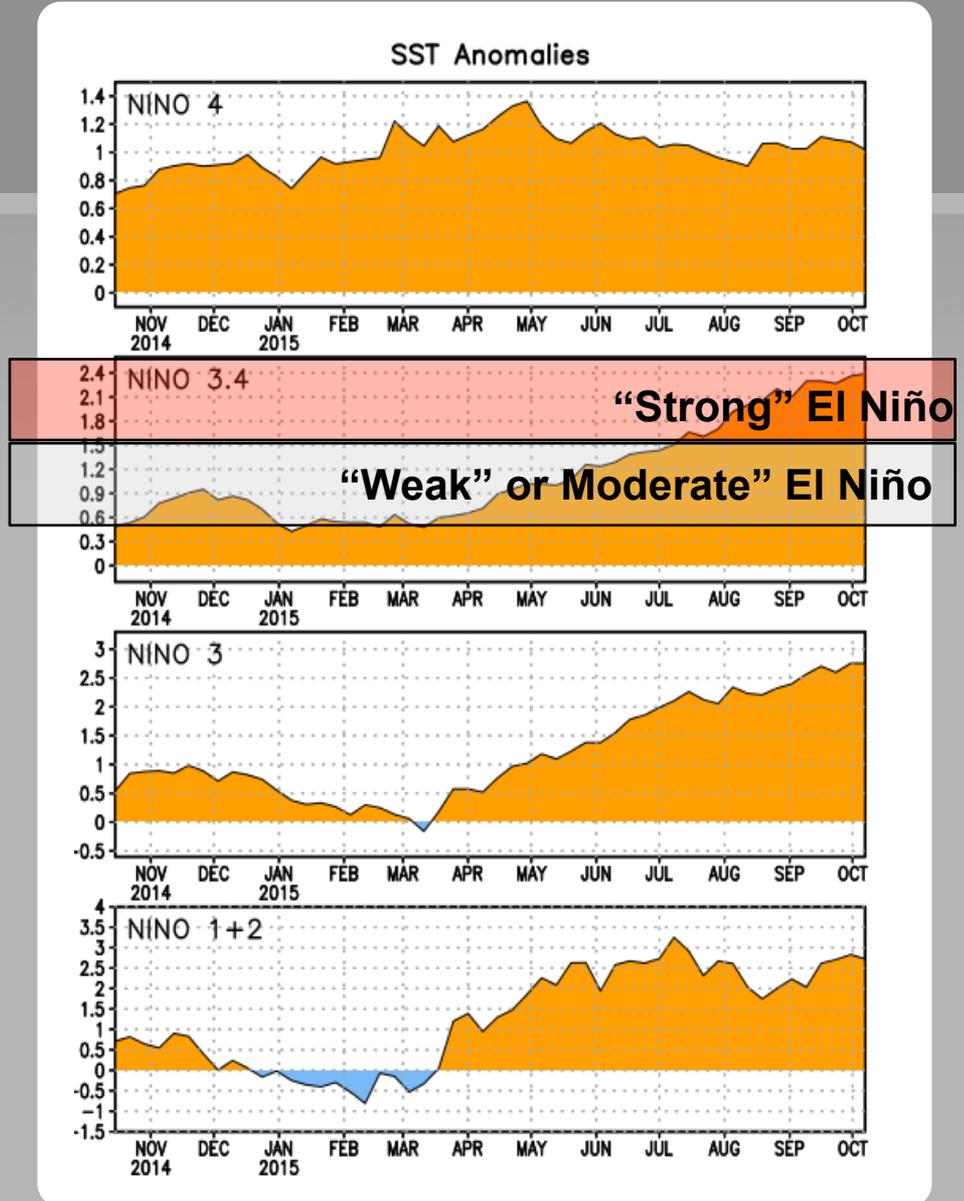
Niño 3.4 SSTs exceeding $+0.5^{\circ}\text{C}$ for at least five 3-month periods denotes an El Niño



Niño 3.4 SSTs exceeding $+1.5^{\circ}\text{C}$ denotes a Strong El Niño

How Long Have we been experiencing El Niño Conditions?

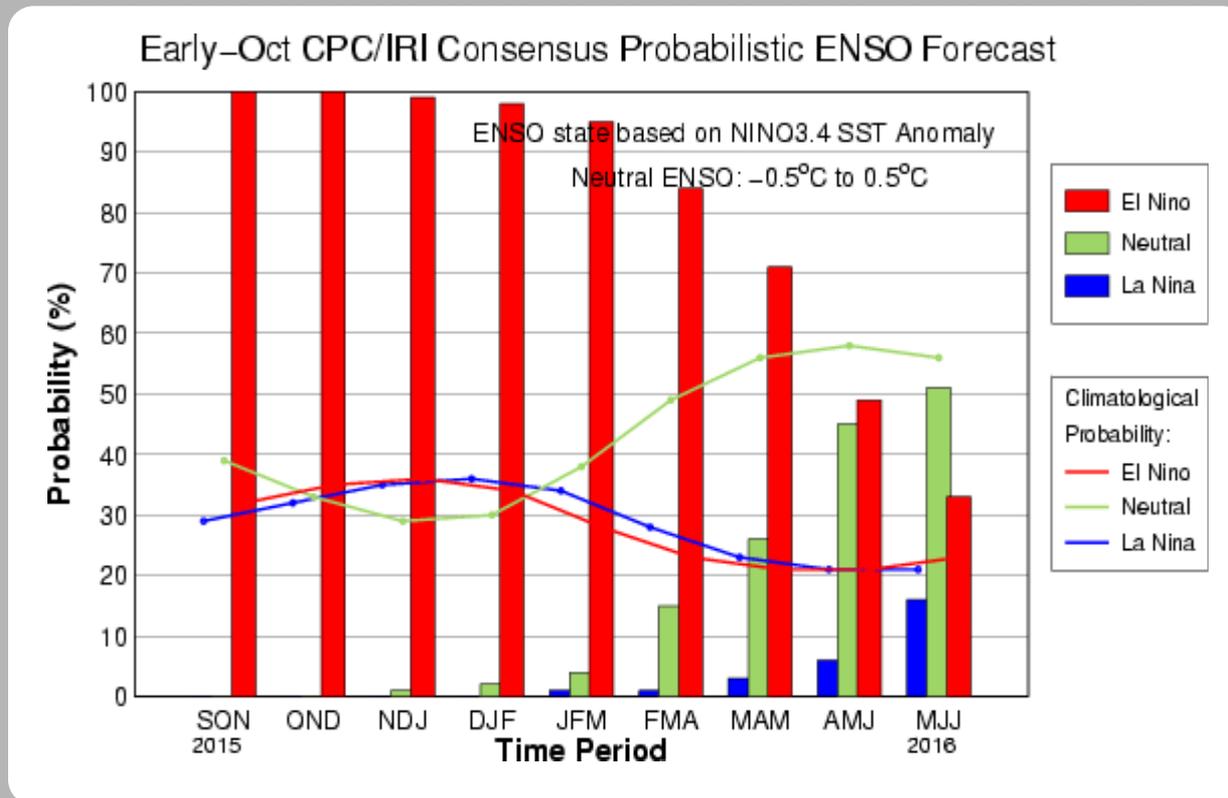
- Weak to Moderate El Niño conditions have been developing since Late 2014 / Early 2015
- Strong El Niño has developed over the past few months



CPC/IRI Probabilistic ENSO Outlook

Updated: 8 October 2015

The chance of El Niño is approximately 95% through Northern Hemisphere winter and is just under 50% by late spring (AMJ) 2016.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

“Strong”
El Niño

“Weak” or
“Moderate”
El Niño

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.

Mid-Sep 2015 Plume of Model ENSO Predictions

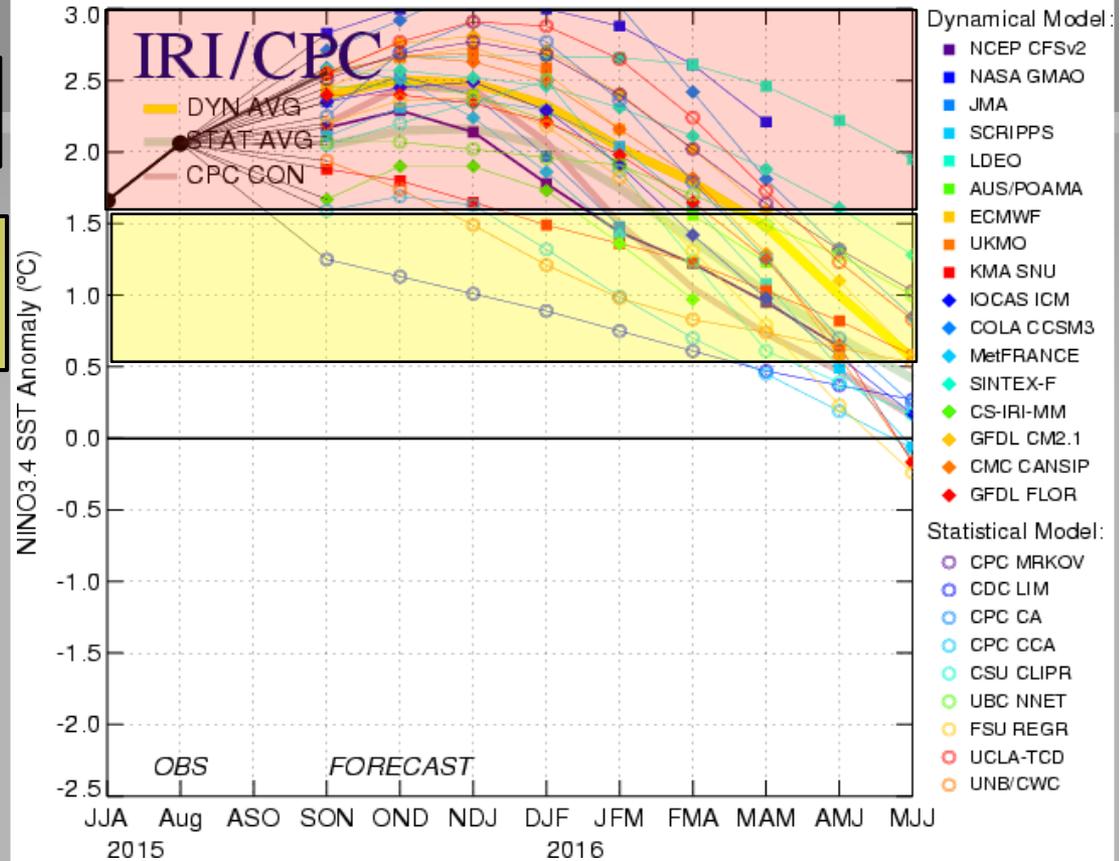


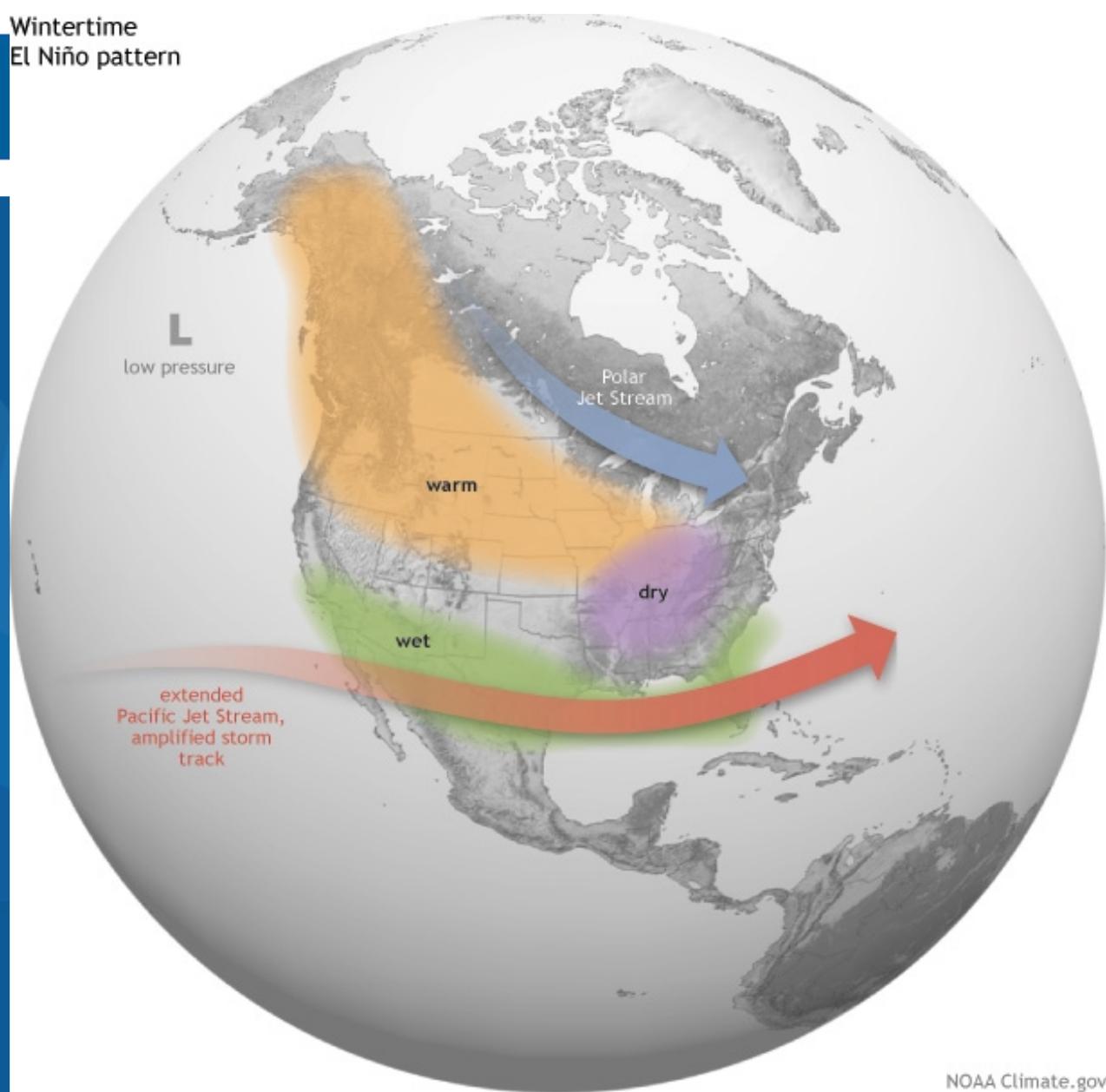
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 15 September 2015).



Wintertime
El Niño pattern

Southern Plains Impacts (during Winter)

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

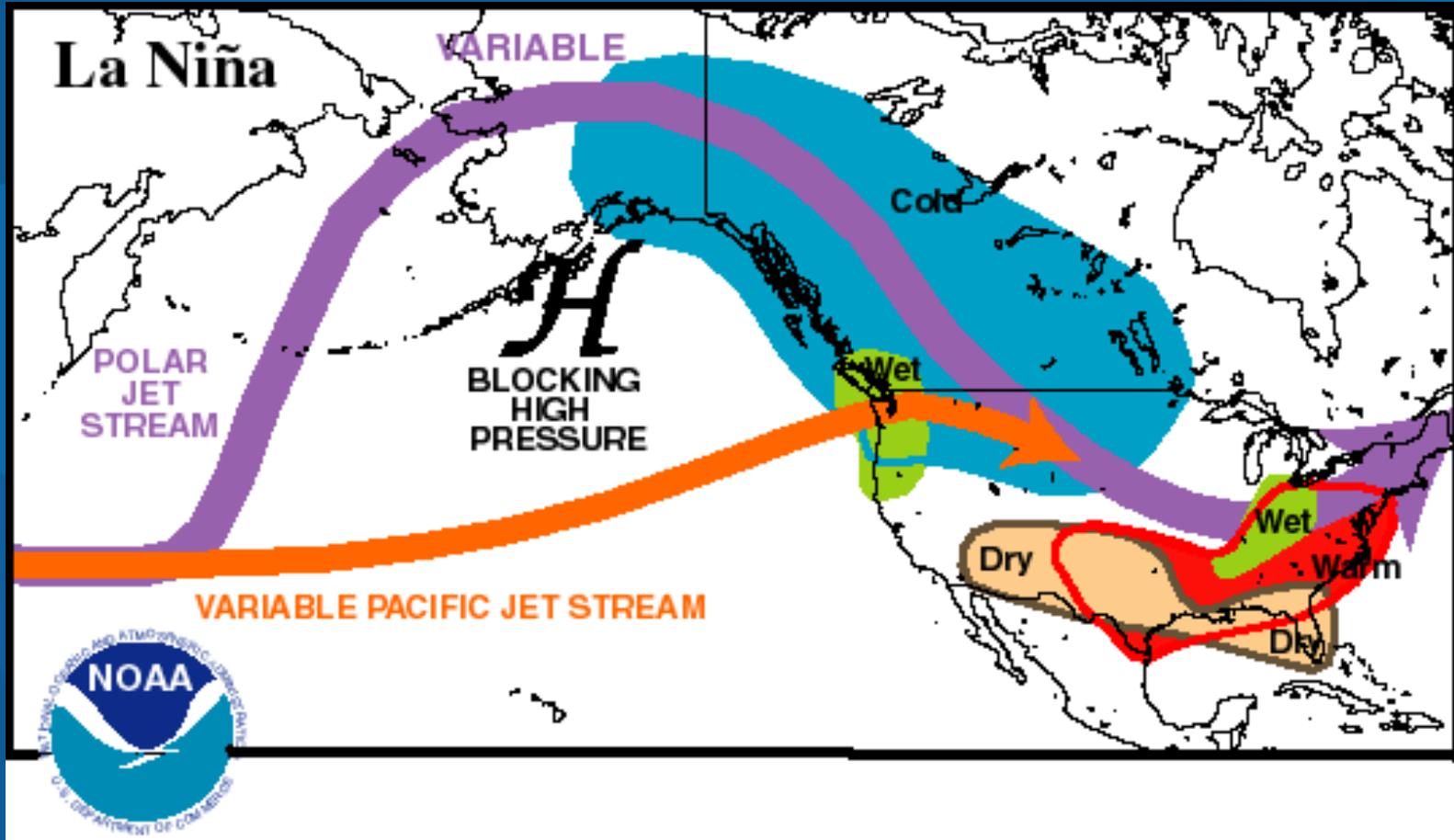


NOAA Climate.gov

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



El Nino / La Nina Summary

Texas State Climatologist John Nielsen-Gammon likes to say:

El Nino = EL = Extra Liquid

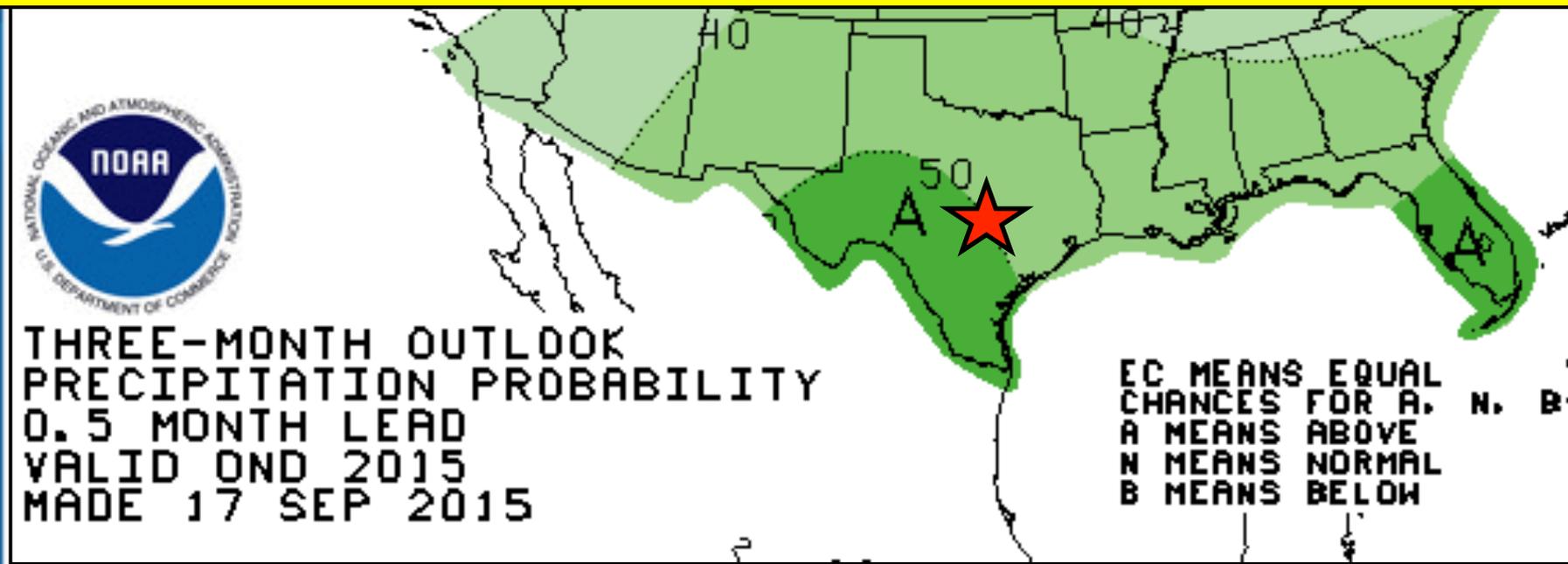
La Nina = LA = Less Agua

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)

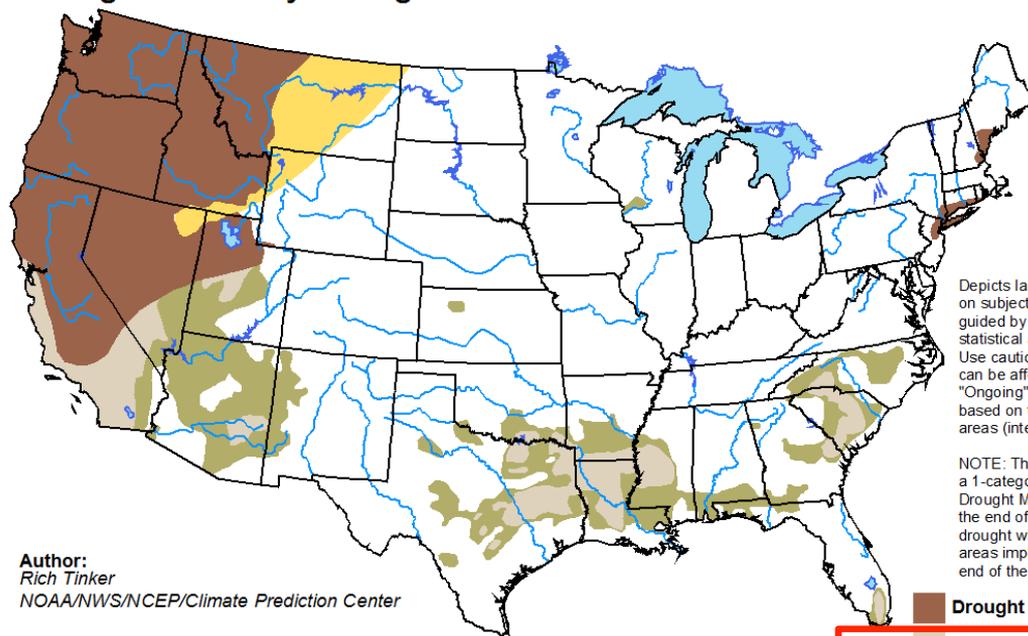
- a) Above normal precipitation is forecast
- b) Much above normal precipitation is forecast
- c) There's a 50% chance that there will be above normal precipitation
- d) There's a 50% chance that there will be normal or below normal precipitation



Seasonal Outlook (Sep 17 – Dec 31)

➤ 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 Released September 17, 2015

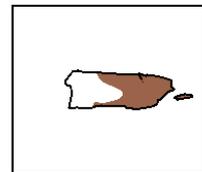
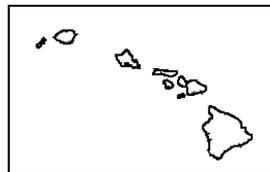
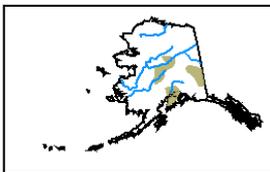


Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author:
Rich Tinker
NOAA/NWS/NCEP/Climate Prediction Center

- Drought persists/intensifies
- Drought remains but improves
- Drought removal likely
- Drought development likely



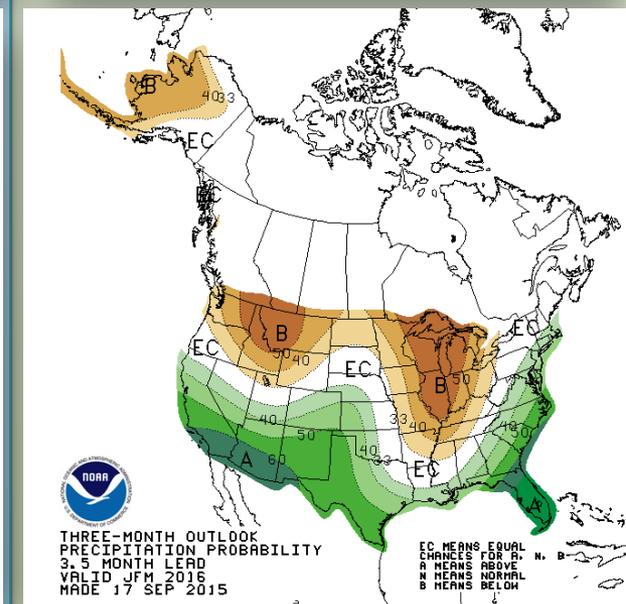
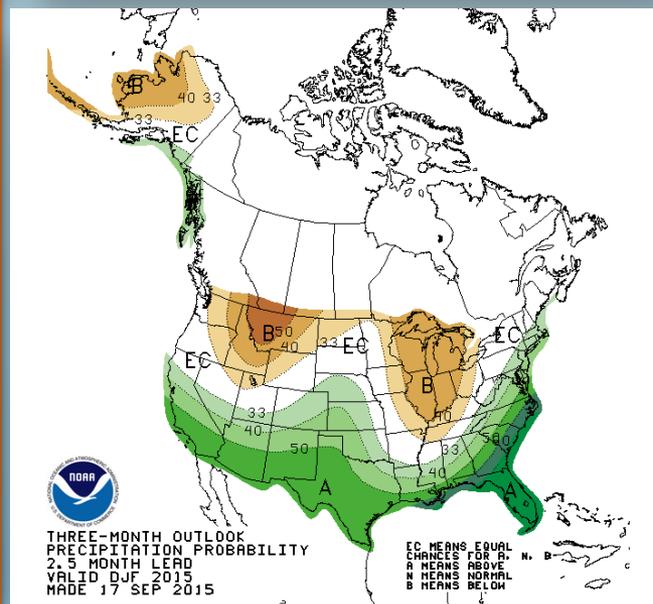
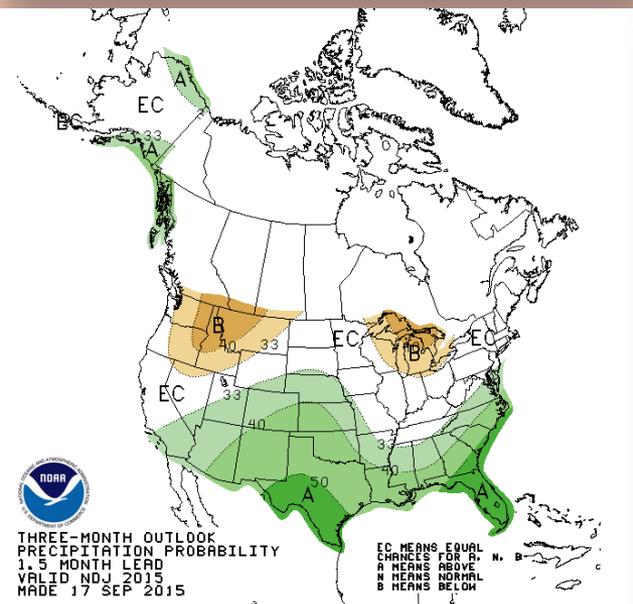
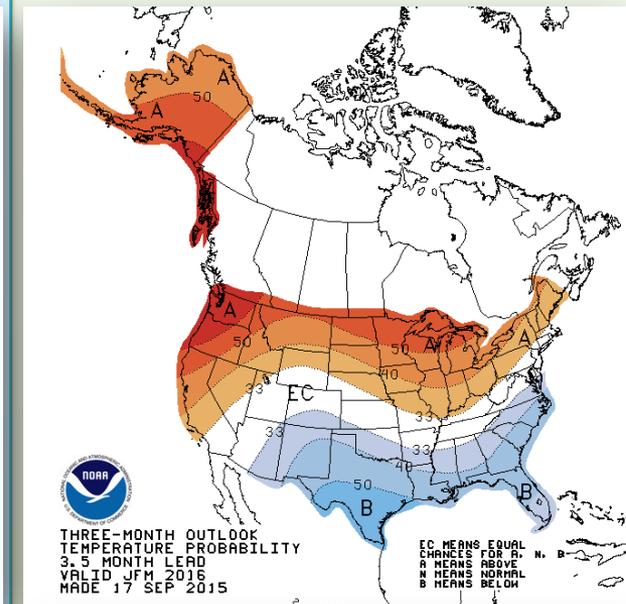
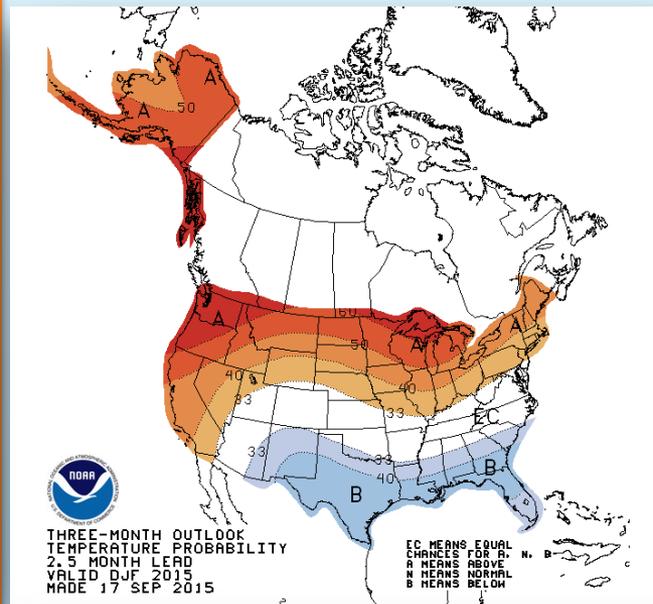
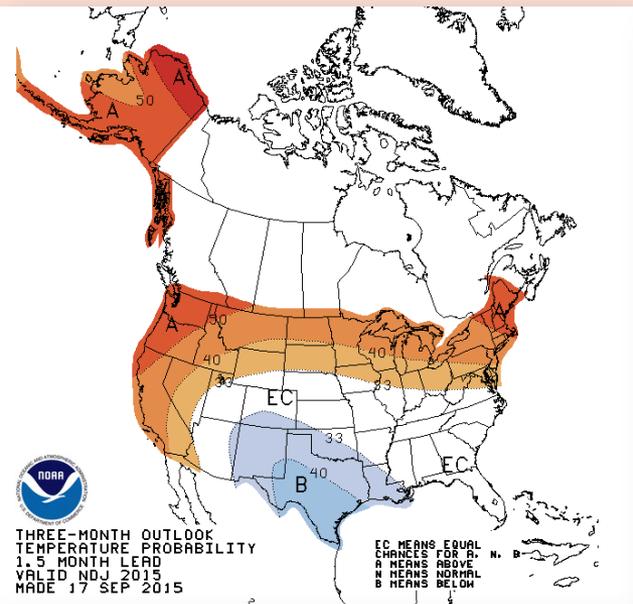
<http://go.usa.gov/3eZ73>

* Official NWS Outlooks *

Nov-Dec-Jan 2015-16

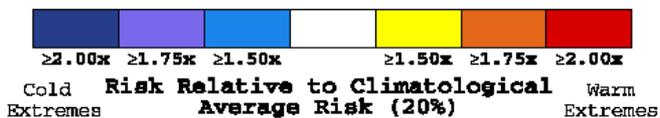
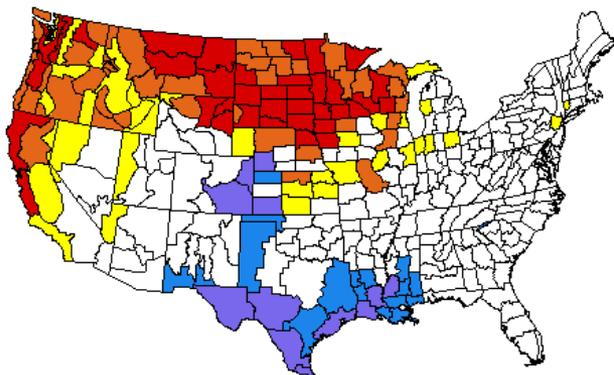
Dec-Jan-Feb 2015-16

Jan-Feb-Mar 2016



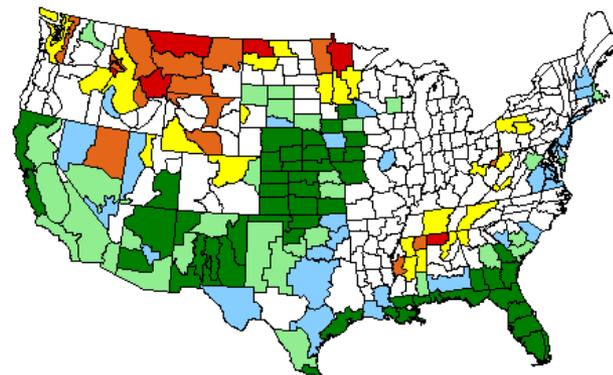
RISK OF EXTREMES DURING EL NIÑO

DJF Temperature Extremes During El Niño
Risk of Extreme Warm or Cold Years



NOAA-CIRES/Climate Diagnostics Center

DJF Precipitation Extremes During El Niño
Risk of Extreme Wet or Dry Years



NOAA-CIRES/Climate Diagnostics Center

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

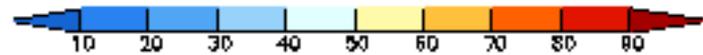
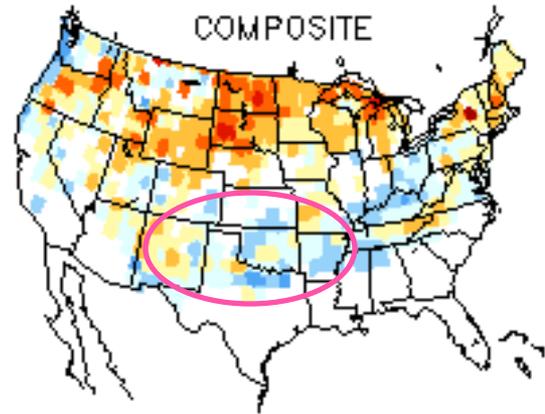
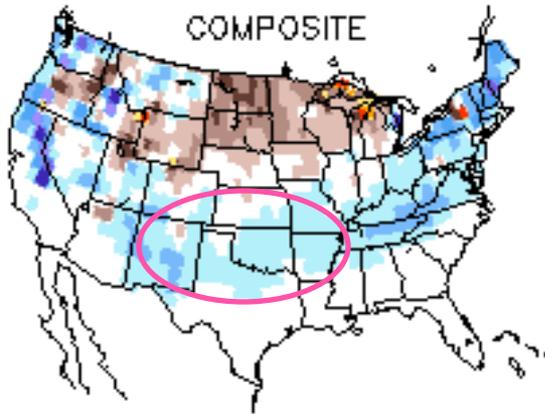
NDJ EL NIÑO SNOW ANOMALIES (IN)
AND FREQUENCY OF OCCURRENCE (%)

ANOMALIES

FREQUENCY

COMPOSITE

COMPOSITE



**1" - 3" more than
normal**

**20%-60% of the time
during El Niño**



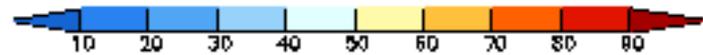
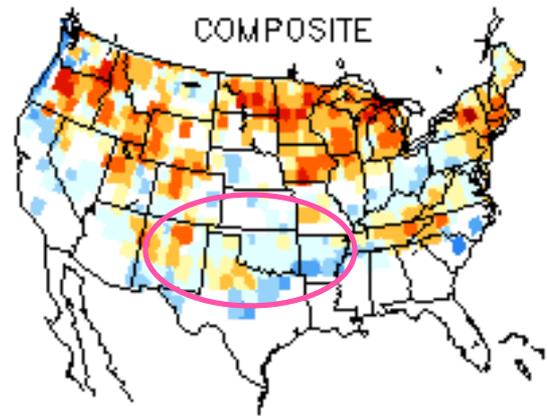
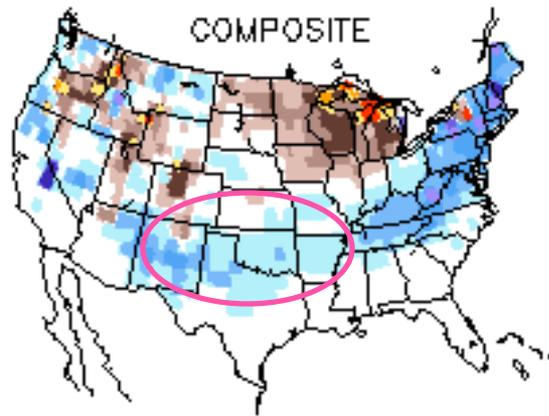
SNOW ANOMALIES (18 EL NIÑO EVENTS)

3-MONTH PERIOD: DECEMBER-JANUARY-FEBRUARY

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

ANOMALIES

FREQUENCY



**1" - 5" more than
normal**

**20%-70% of the time
during El Niño**



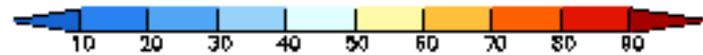
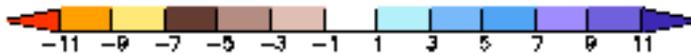
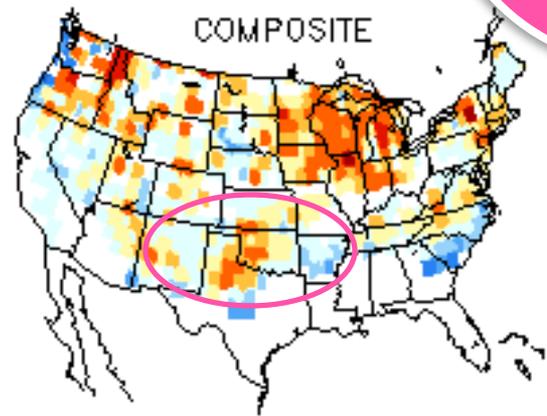
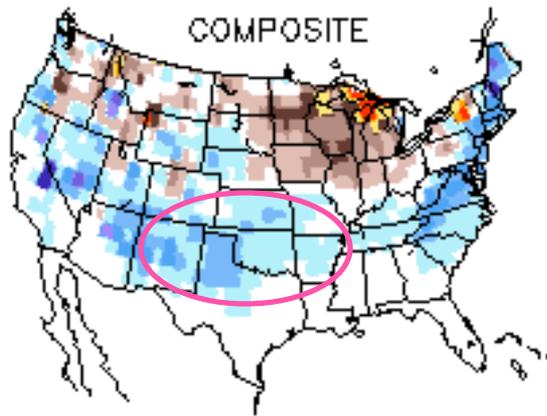
SNOW ANOMALIES (14 EL NIÑO EVENTS)

3-MONTH PERIOD: JANUARY-FEBRUARY-MARCH

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

ANOMALIES

FREQUENCY



**1" - 5" more than
normal**

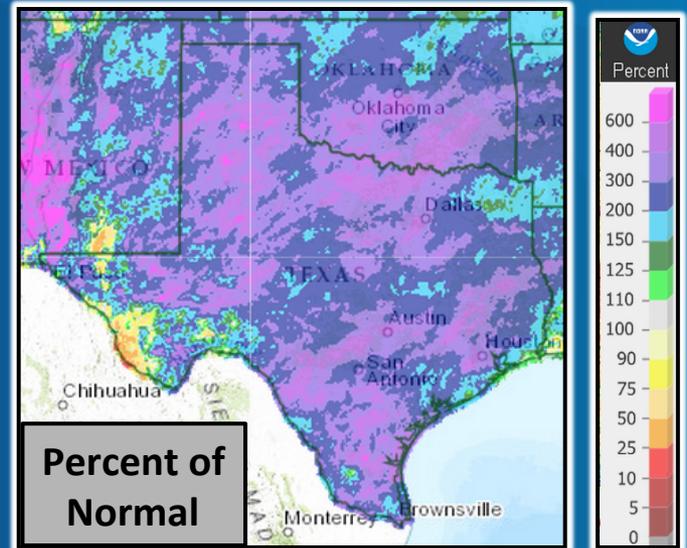
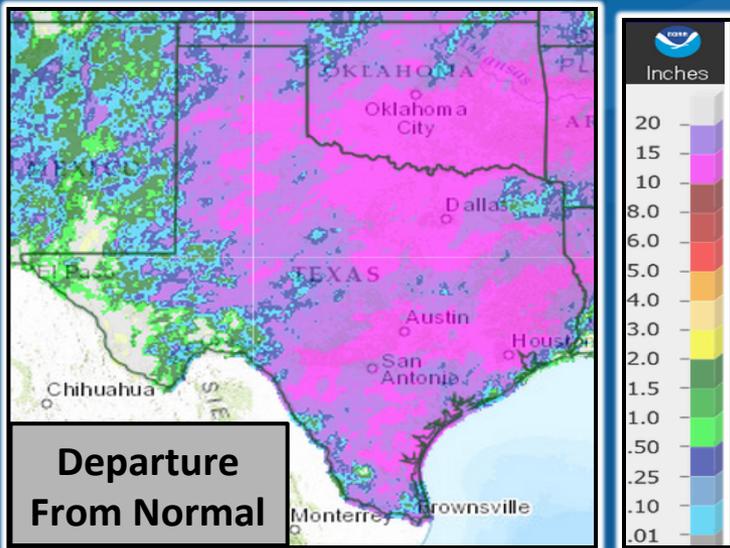
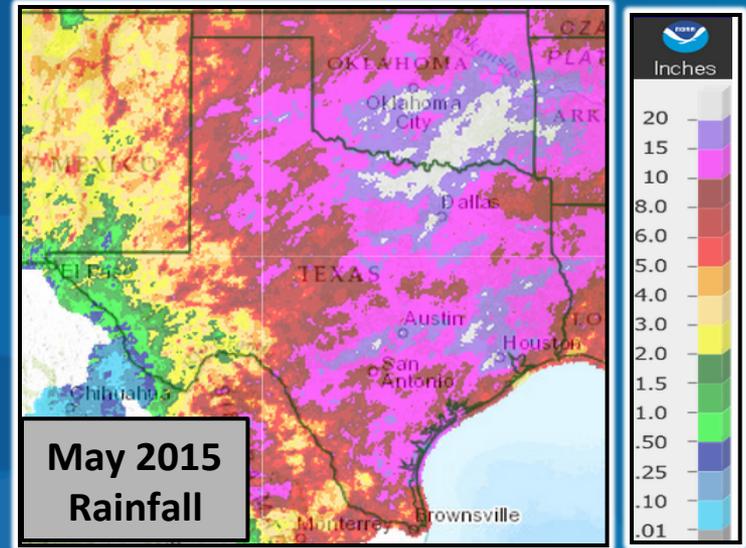
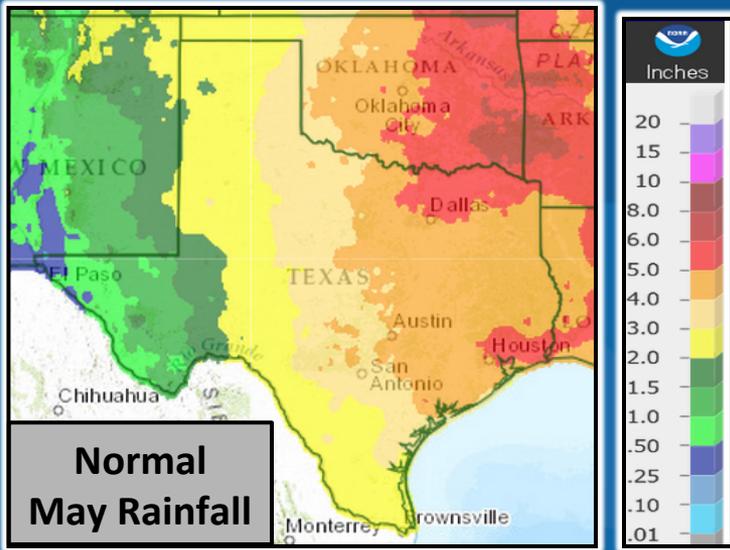
**30%-80% of the time
during El Niño**

Late Winter
has
strongest
signal for
above
normal
snow





Is Spring Rainfall More Important?





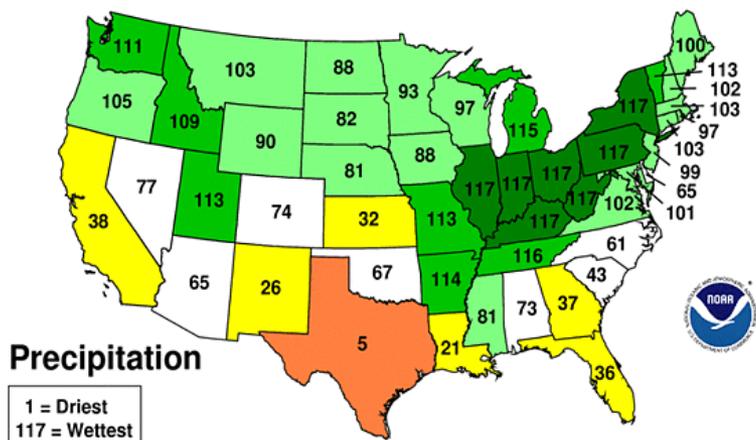
Is Spring Rainfall More Important?

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

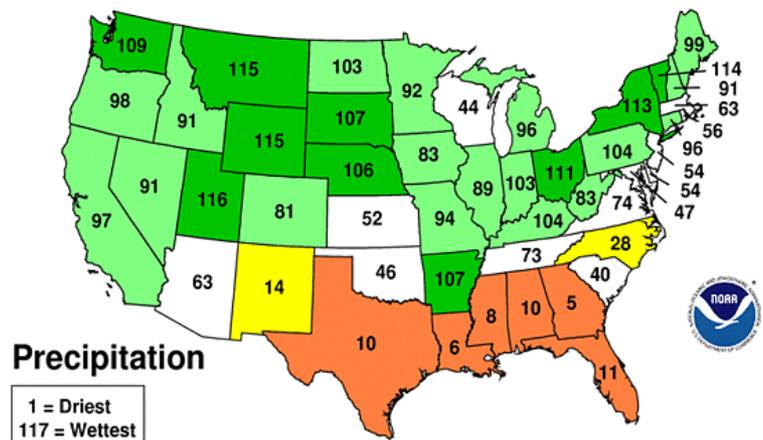
April 2011 Statewide Rank

National Climatic Data Center/NESDIS/NOAA



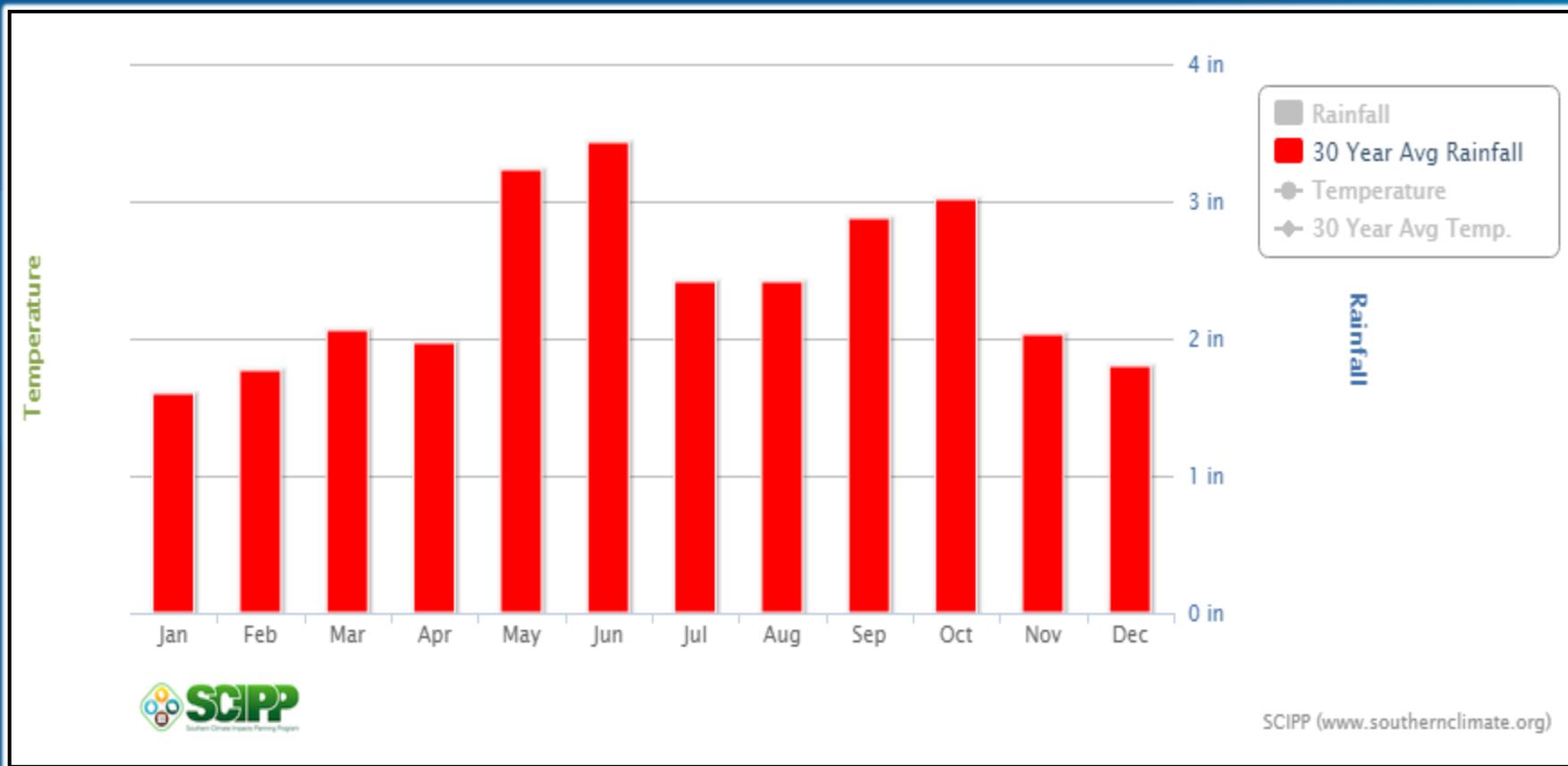
May 2011 Statewide Rank

National Climatic Data Center/NESDIS/NOAA





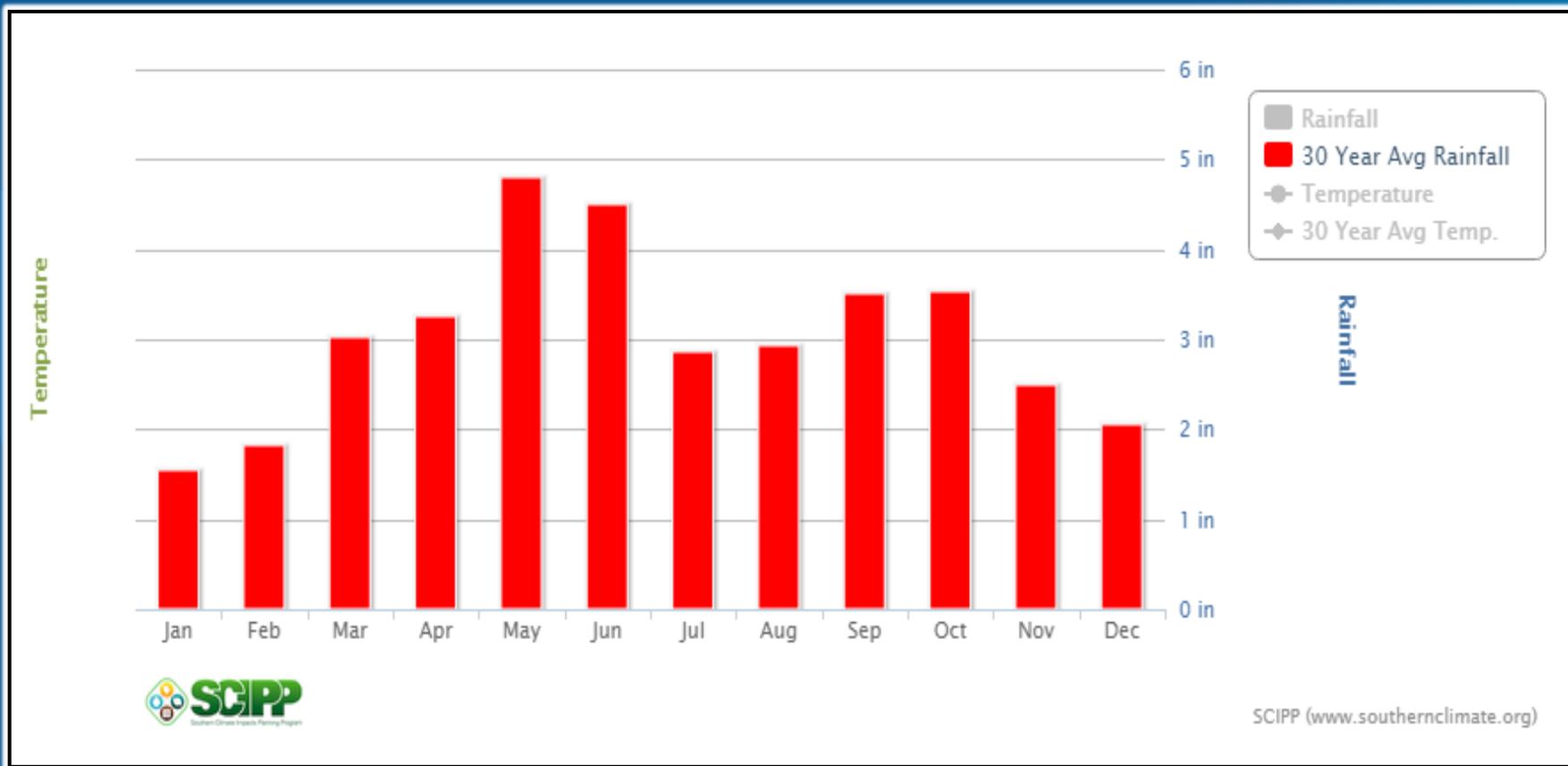
30 Year Avg Rainfall for TX



- 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?



30 Year Avg Rainfall for OK

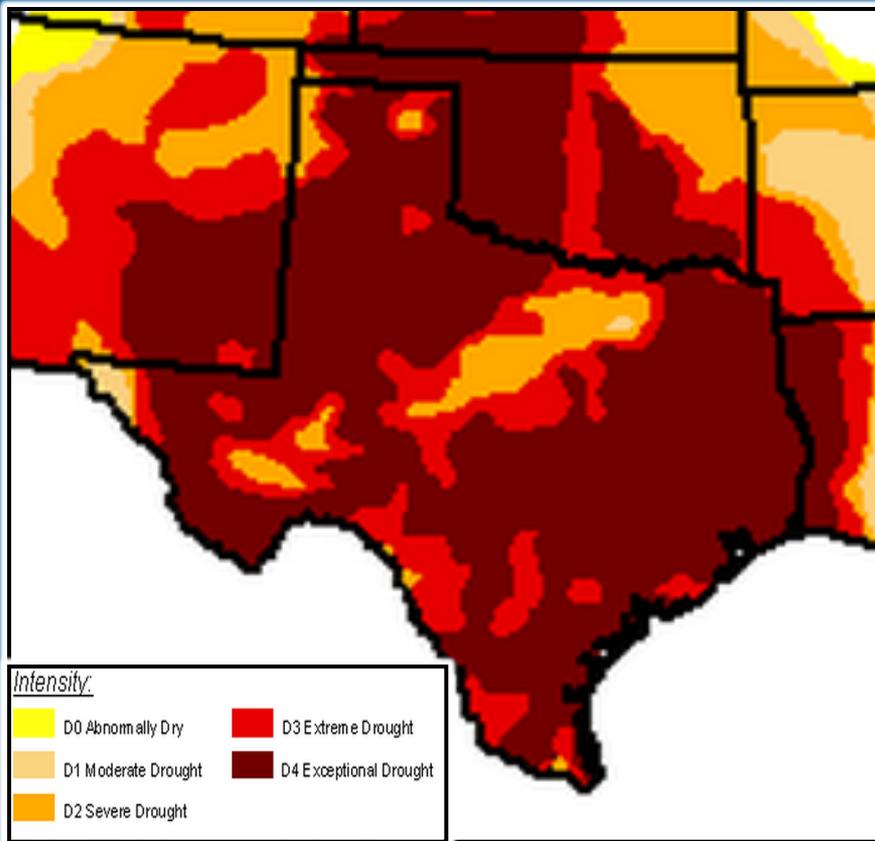


- On average, Oklahoma gets the least amount of rainfall during the late Fall and Winter months (Nov – Feb) ... even less than the summer months!
- While above normal rainfall during the late Fall into Winter is good, does it really buy us that much as far as overall drought relief?

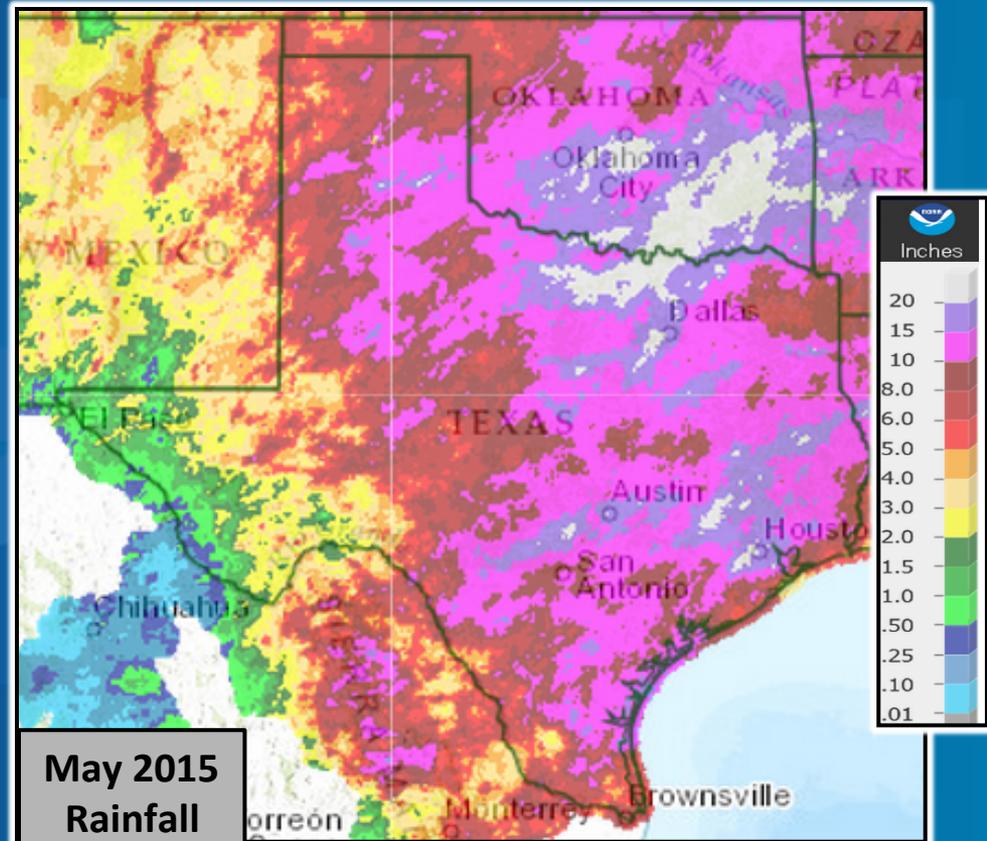


Linking “Extreme Climate” Events

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



Backup Slides



WORLD



Information provided by:

National Weather Service
Southern Region Headquarters
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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> (**NEW link!!**)

twitter

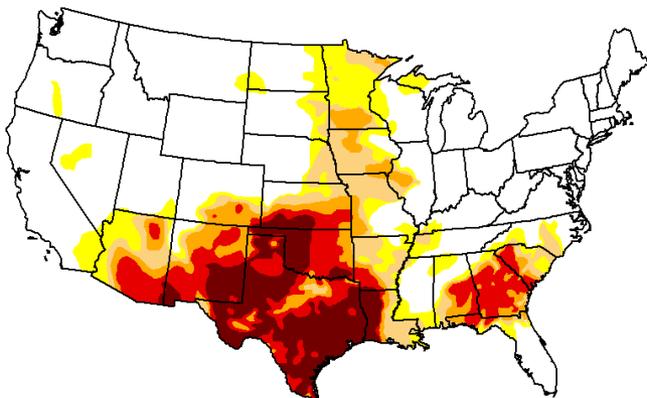
@NWS_Southern_US https://twitter.com/NWS_Southern_US



Future Regional Climate Services

U.S. Drought Monitor
CONUS

November 1, 2011
(Released Thursday, Nov. 3, 2011)
Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

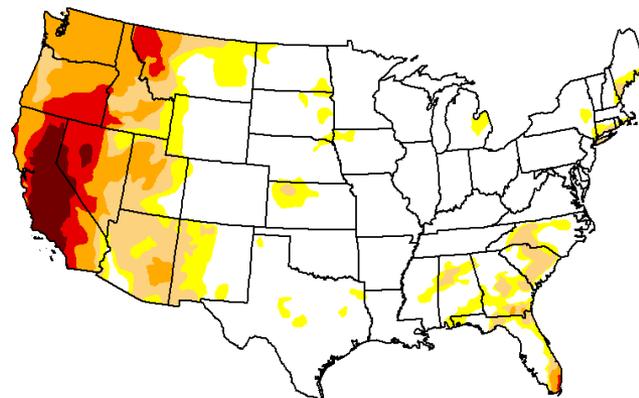
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brian Fuchs
National Drought Mitigation Center



U.S. Drought Monitor
CONUS

July 21, 2015
(Released Thursday, Jul. 23, 2015)
Valid 8 a.m. EDT



Intensity:

- 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. See accompanying text summary for forecast statements.

Author:
David Srineral
Western Regional Climate Center



- 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



	Severe Weather	Flash Flooding	Dangerous Heat	Tropical System	Freezing Temps	Wintry Precip	Arctic Outbreak	Fire Weather
Confidence hazard will occur	2	2	2	2				2
	1	1	1	1	Category Out of Season	Category Out of Season	Category Out of Season	1
Low predictability	Uncertain	Uncertain	Uncertain	Uncertain				Uncertain
	-1	-1	-1	-1				-1
Confidence hazard will not occur	-2	-2	-2	-2				-2

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

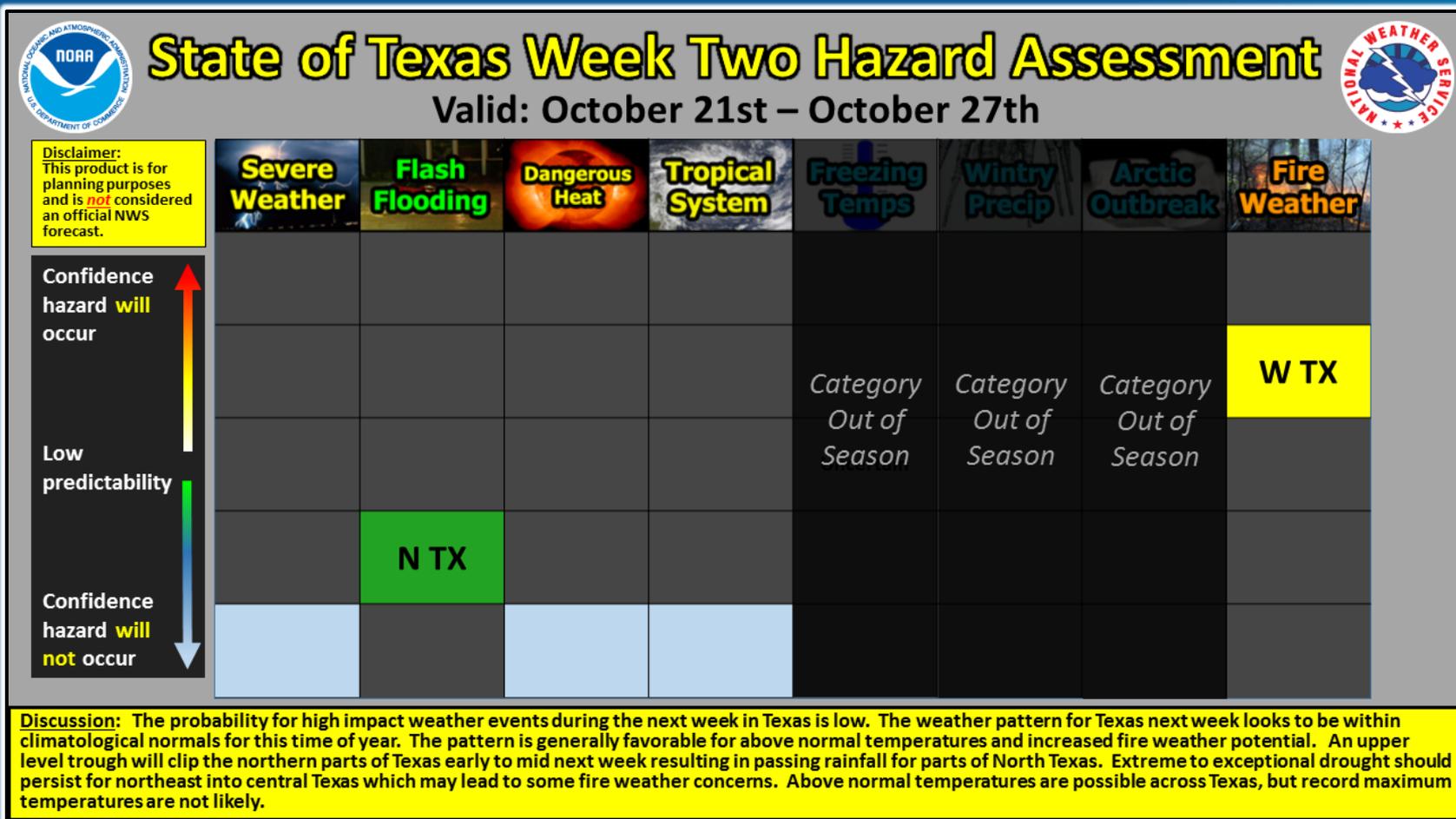
	Severe Weather	Flash Flooding	Dangerous Heat	Tropical System	Freezing Temps	Wintry Precip	Arctic Outbreak	Fire Weather
Confidence hazard will occur	2	2	2	2				2
	1	TX Panhandle and far west TX	Nearly statewide	1	Category Out of Season	Category Out of Season	Category Out of Season	Increasing danger south and east TX
Low predictability	Uncertain	Uncertain	Uncertain	Uncertain				Uncertain
		-1	-1					-1
Confidence hazard will not occur	-2	-2	-2					

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



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