



2016-17 Preliminary Winter Weather Outlook

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Generator Weatherization Workshop
September 7, 2017

Agenda

- Review of last winter (and other recent winters)
- Current conditions
- Expectations for the upcoming winter

Seasonal versus Extremes

*****Mild winters can have very cold periods*****

- **December 23, 1989:**

- **Dallas:** -1° (8MPH wind)
- **Houston:** 7° (9MPH wind)
- **San Antonio:** 6° (7MPH wind)
- **Austin:** 4° (9MPH wind)
- **Brownsville:** 17° (15MPH wind)
- **Abilene:** -3° (6MPH wind)
- **Midland:** 0° (4MPH wind)

Winter of 1989-90: 72nd coldest in TX weather history

(ERCOT system has not been colder since December 23, 1989)

- **February 2, 2011:**

- **Dallas:** 13° (20MPH wind)
- **Houston:** 21° (16MPH wind)
- **San Antonio:** 19° (25MPH wind)
- **Austin:** 18° (26MPH wind)
- **Brownsville:** 32° (26MPH wind)
- **Abilene:** 7° (16MPH wind)
- **Midland:** 6° (16MPH wind)

Winter of 2010-11: 69th coldest in TX weather history

- **January 6, 2017:**

- **Dallas:** 22° (14MPH wind)
- **Houston:** 34° (25MPH wind)
- **San Antonio:** 31° (18MPH wind)
- **Austin:** 30° (20MPH wind)
- **Brownsville:** 36° (18MPH wind)
- **Abilene:** 21° (17MPH wind)
- **Midland:** 23° (12MPH wind)

Winter of 2016-17: 122nd coldest in TX weather history

*****Warmest winter on record*****

All-time winter peak load on this date: 59,650 MW (PM Peak)

Peak would have been the morning of Jan 7, but was a Saturday

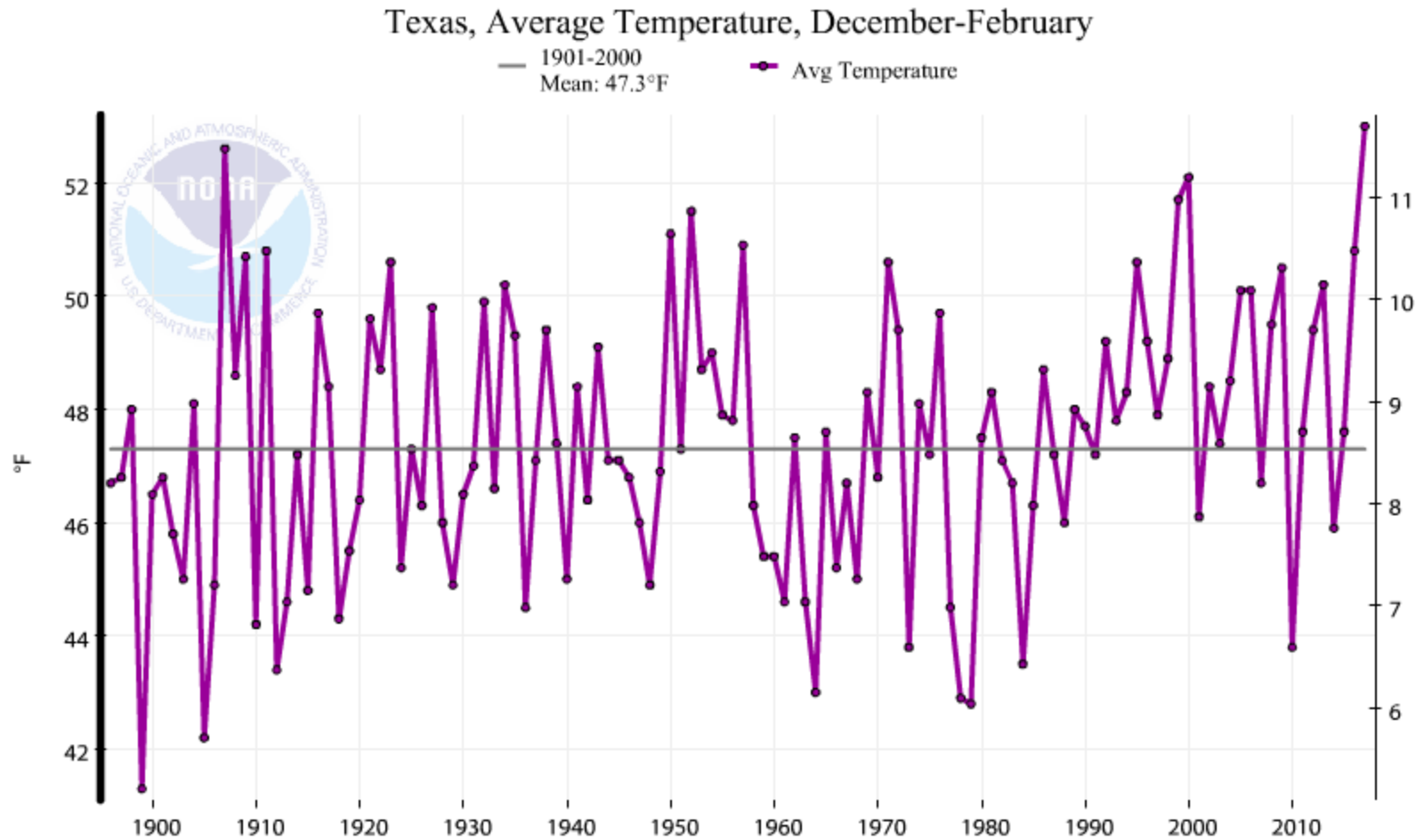
Jan 7: DFW: 14°, IAH: 21°, SAT: 20°, AUS: 19°, BRO: 30°, ABI: 9°, MAF: 10°

Temperature Ranking of Recent Winters (Texas)

2016-17	122nd coldest (warmest winter on record)
2015-16	115th coldest (8th warmest of 122)
2014-15	69 th
2013-14	30 th
2012-13	108th
2011-12	98th
2010-11	69 th
2009-10	8th
2008-09	109th
2007-08	99th
2006-07	43 rd

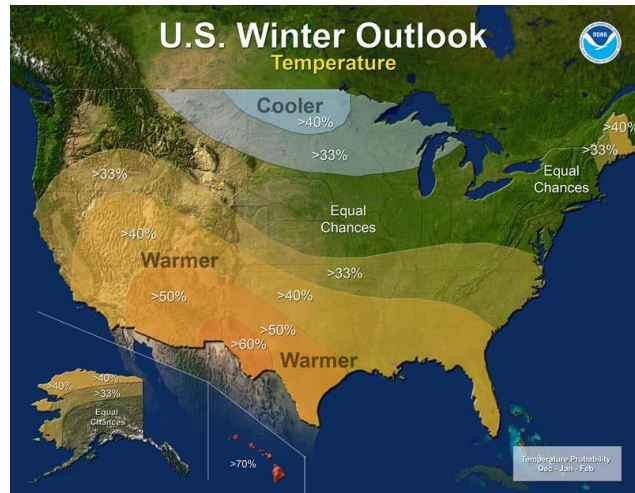
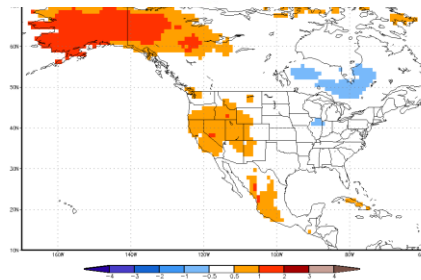
Since 2001, only two winters have ranked
in the coldest third of historical winters

Historical Temperatures



What Other Weather Sources Were Saying (last winter)

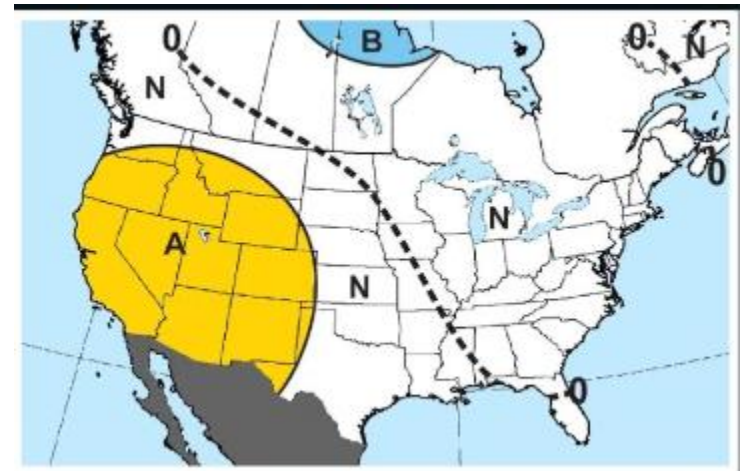
Early 2016-17 Winter Forecast
Firsthand Weather - Matthew Holliday



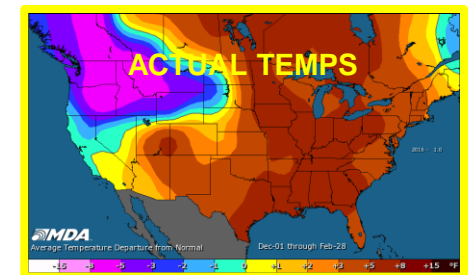
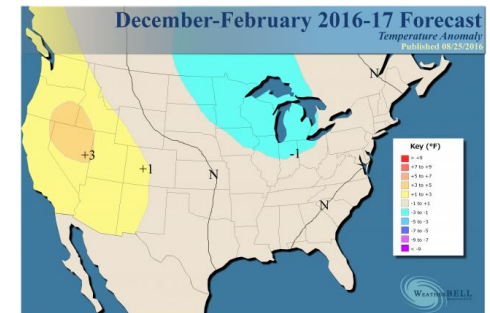
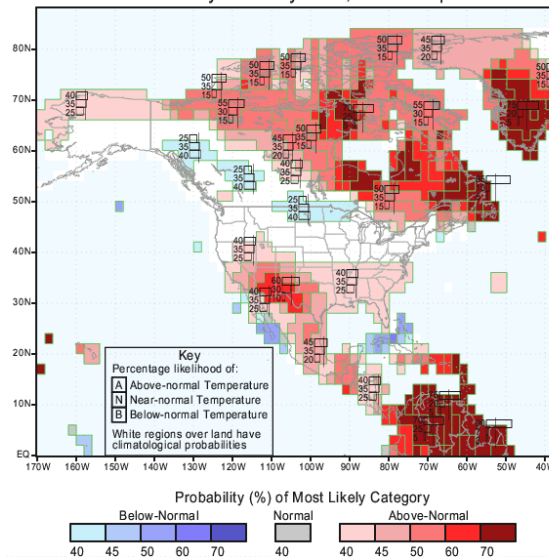
Winter Weather Outlook



Life is On Schneider Electric



IRI Multi-Model Probability Forecast for Temperature
for December-January-February 2017, Issued September 2016



Reviewing Last Winter's Forecast

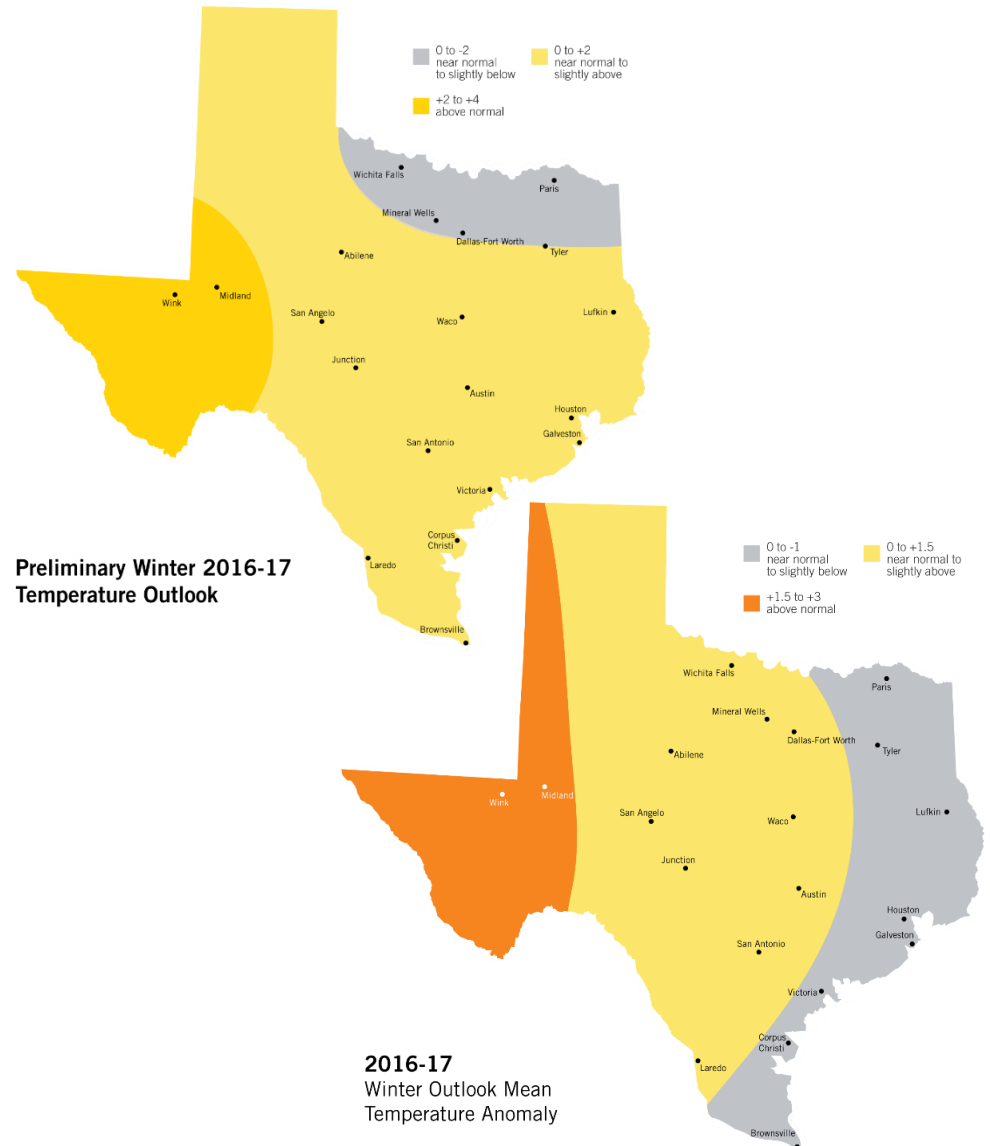
Top Row: Preliminary Forecast given at last September's winterization seminar

At this time, not seeing a strong cold signal

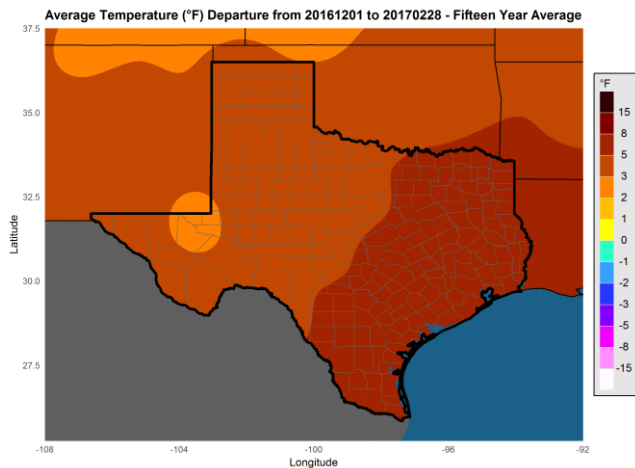
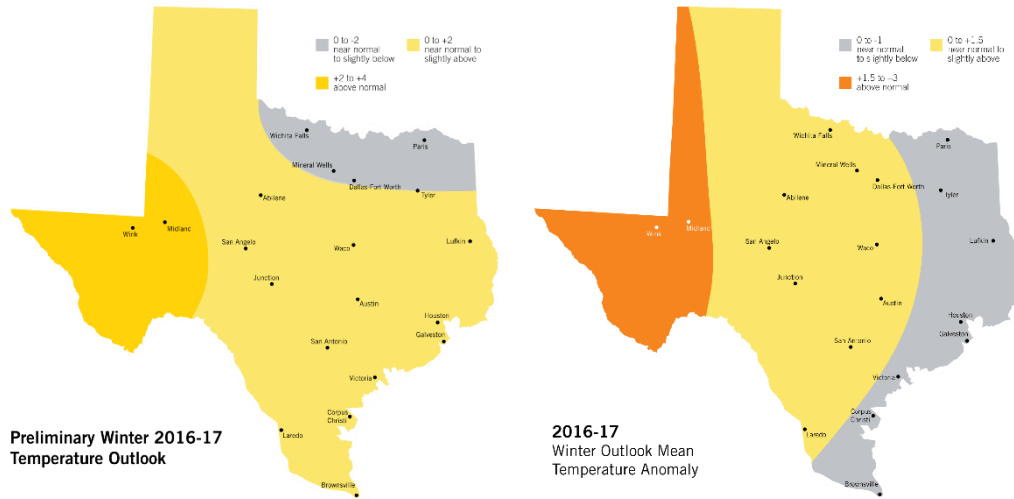
January and February could both feature some periods of below-normal temperatures

Unlikely to be as warm as last winter (114th coldest) ... but not impossible

Bottom Row: Final Forecast, Issued November 1



Last Winter, Forecast versus Actual



Top 10 warmest:

1. 2016-17
2. 1906-07
3. 1999-2000
4. 1998-99
5. 1951-52
6. 1949-50
7. 1956-57
8. 1910-11
9. 2015-16
10. 1908-09

Last Winter's Lack of Austin Freezes

(122nd)

	2016-17 frz #	COLDEST	#SUB-40
November	0	35	1
December	2	23	9
January	3	19	7
February	0	40	0
	5		17

(115th)

	2015-16 frz #	COLDEST	#SUB-40
November	1	32	2
December	0	34	8
January	3	31	15
February	1	32	5
	5		30

(69th)

	2014-15 frz#	COLDEST	#SUB-40
November	4	30	7
December	2	30	6
January	4	23	20
February	5	30	15
	15		48

(30th)

	2013-14 frz #	COLDEST	#SUB-40
November	1	32	10
December	8	27	19
January	9	22	17
February	5	26	12
	23		58

(69th)

	2010-11 frz #	COLDEST	#SUB-40
November	0	34	5
December	4	28	13
January	6	26	21
February	9	17	12
	19		51

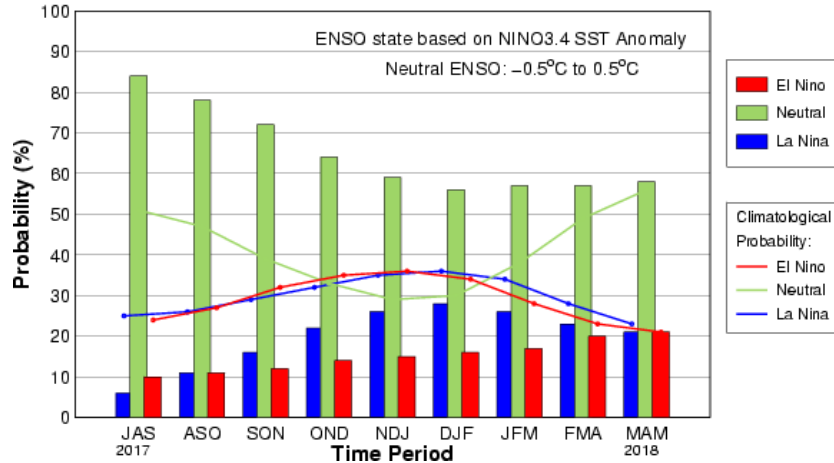
1996-2017:

	avg frz #	avg coldest	avg sub-40 #
November	0.4	34.7	4.1
December	4.1	27.8	13.5
January	4.8	26.9	14.1
February	2.8	29.2	10.3
	12	27	42

**1997-98: 2 freezes. 2016-17,
2015-16, 1999-00: 5 freezes**

This Winter: El Niño, La Niña, or Neutral?

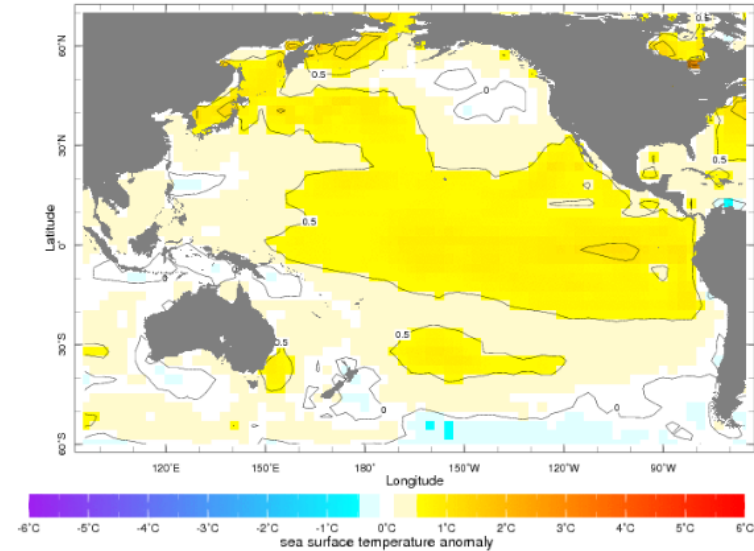
Early-Aug CPC/IRI Official Probabilistic ENSO Forecast



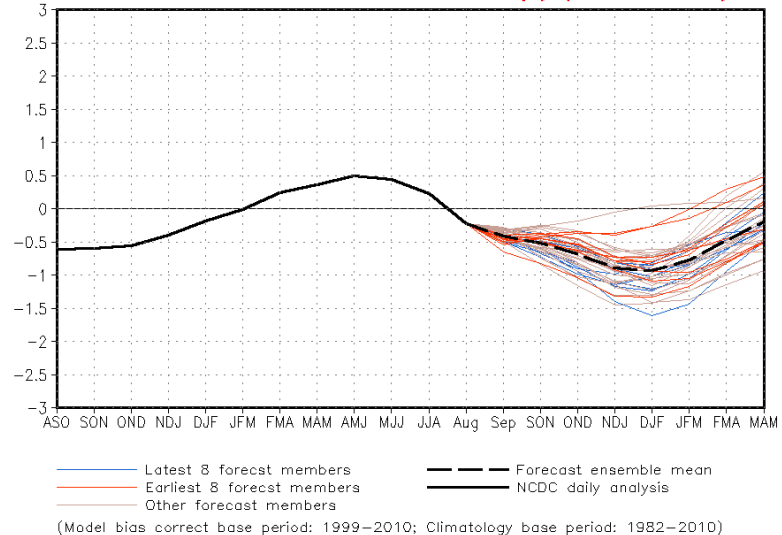
Likely either neutral or weak La Niña this winter

Last winter began with a weak La Niña but faded mid-winter

Oct-Dec 2017 IRI seasonal Forecast SSTA issued 0000 1 May 2017



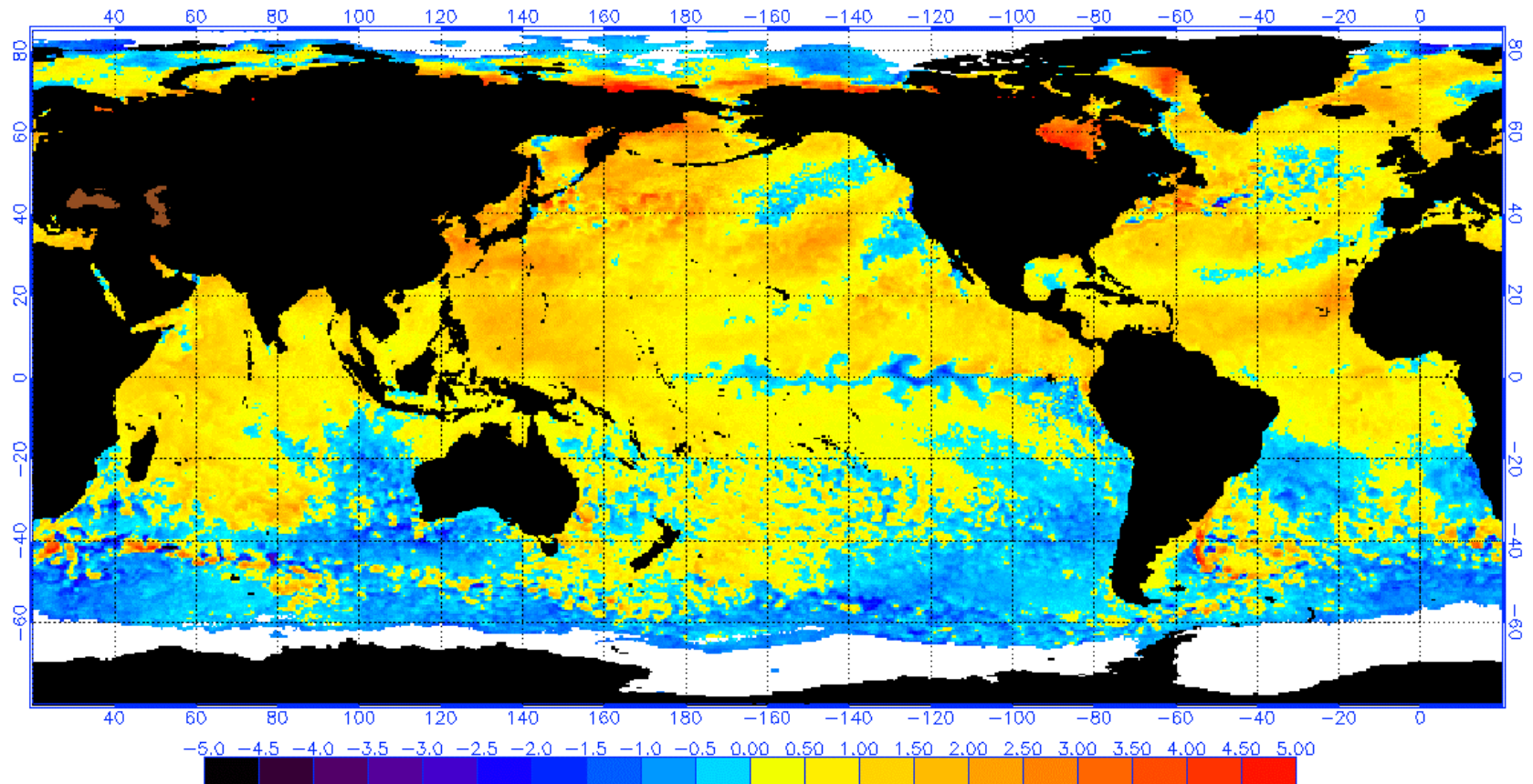
CFSv2 forecast Nino3.4 SST anomalies (K) (PDF corrected)



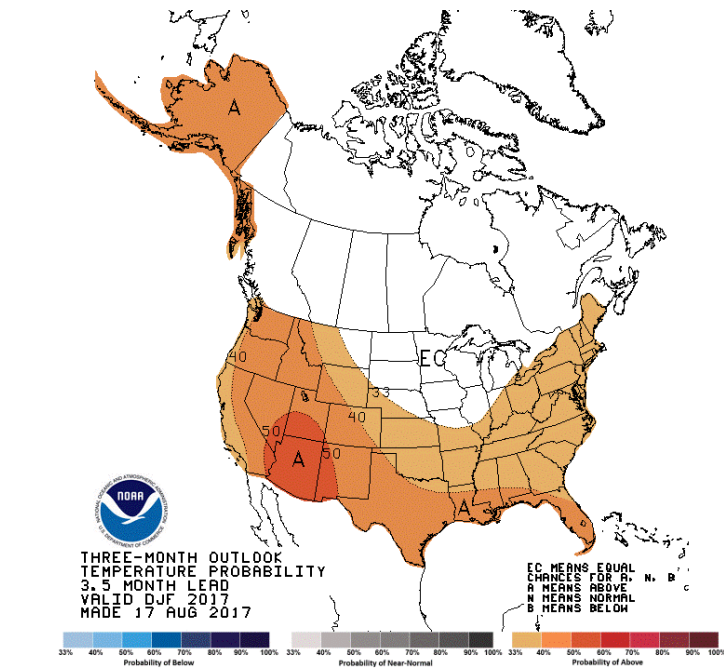
Pacific Decadal Oscillation

Pacific Ocean is still quite warm. The PDO remains positive (warm phase) but not as strongly positive as the three years prior. Since turning positive in 2014, it's resulted in a mostly warm, above-normal pattern for Texas.

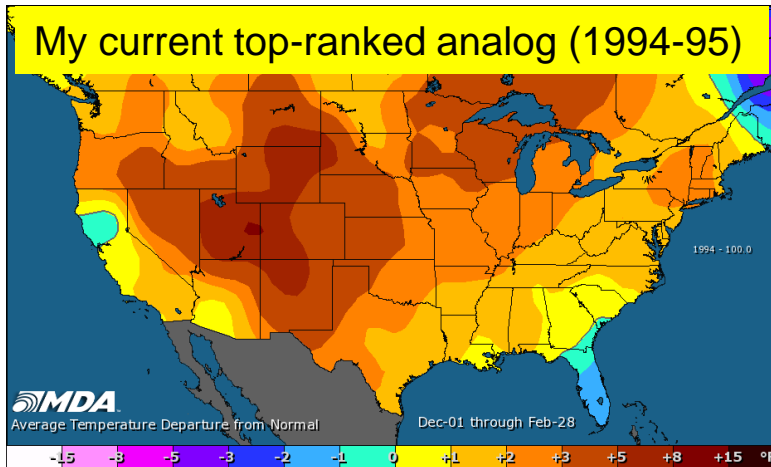
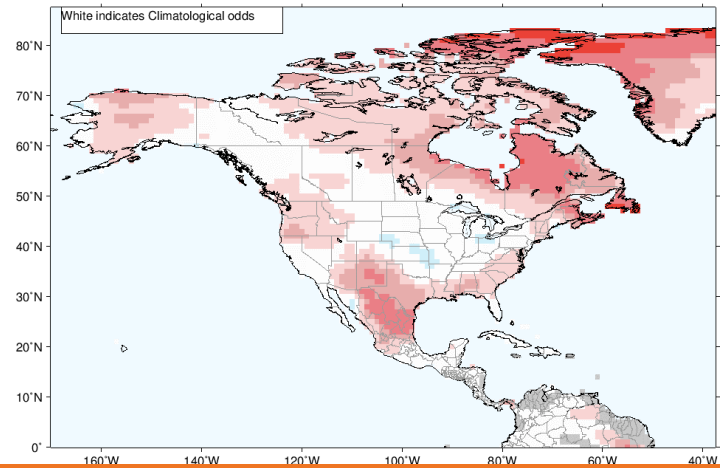
NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 8/28/2017
(white regions indicate sea-ice)



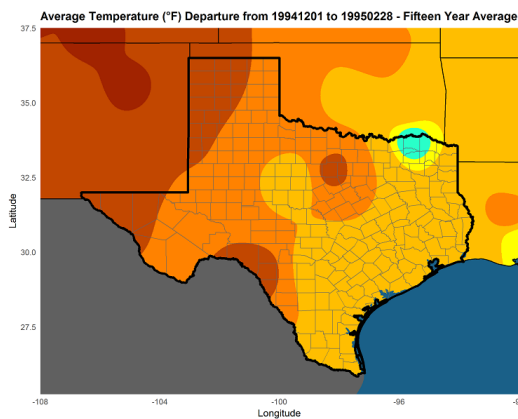
What Other Weather Sources are Forecasting (this winter)



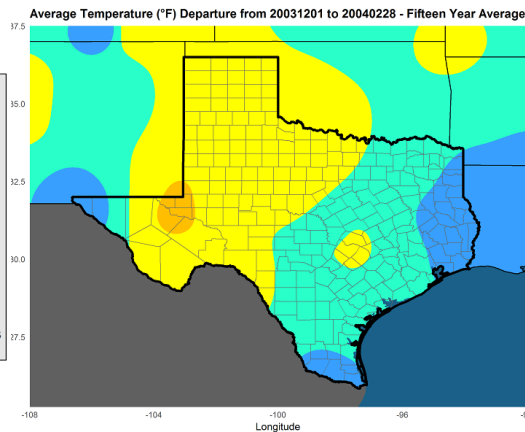
IRI Multi-Model Probability Forecast for Temperature for December-January-February 2017, Issued August 2017



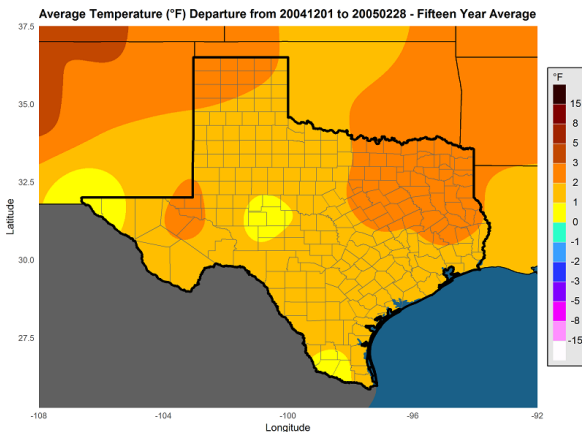
Historical Matches (Analog)



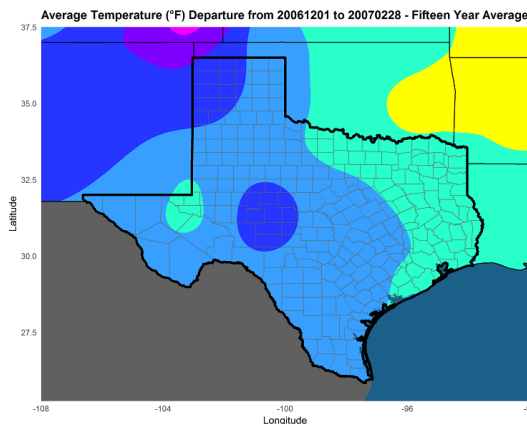
1994-95 (112th coldest)



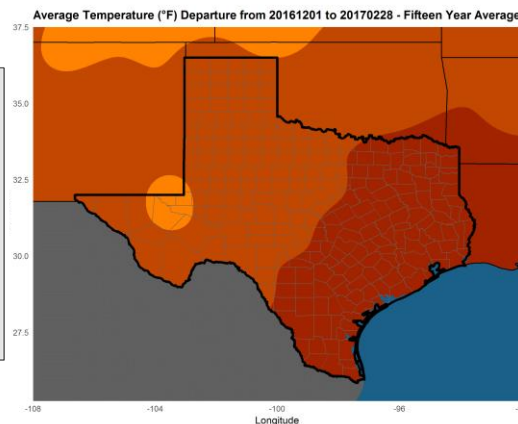
2003-04 (85th)



2004-05 (106th)



2006-07 (43rd)



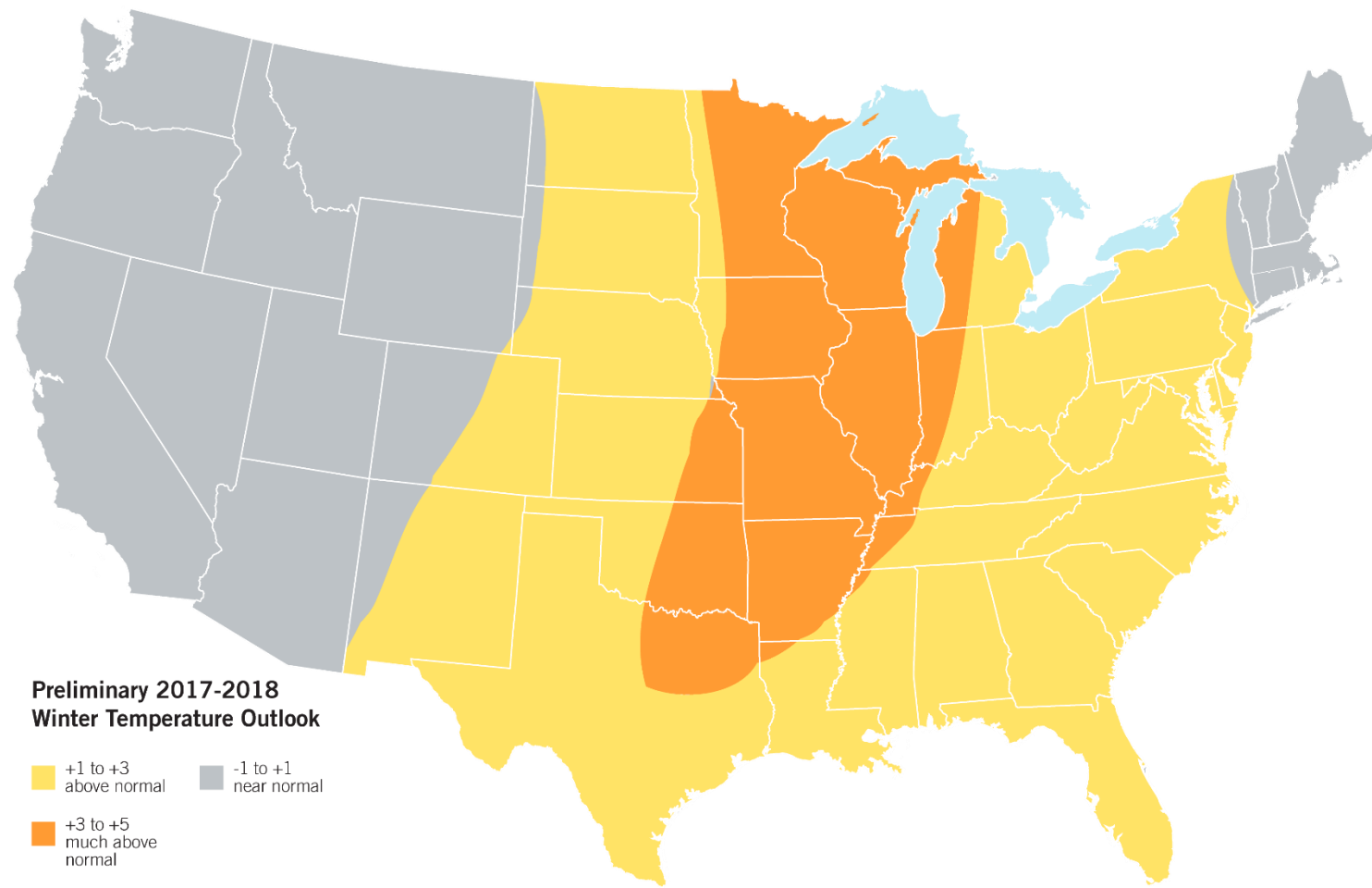
2016-17 (122nd)

2006 (4), 2016 (5), 2004 (3),
2003 (2), 1994 (1)
(ranked based on current season;
ordered prior to summer)

None ranked in the bottom
third of coldest winters for
Texas

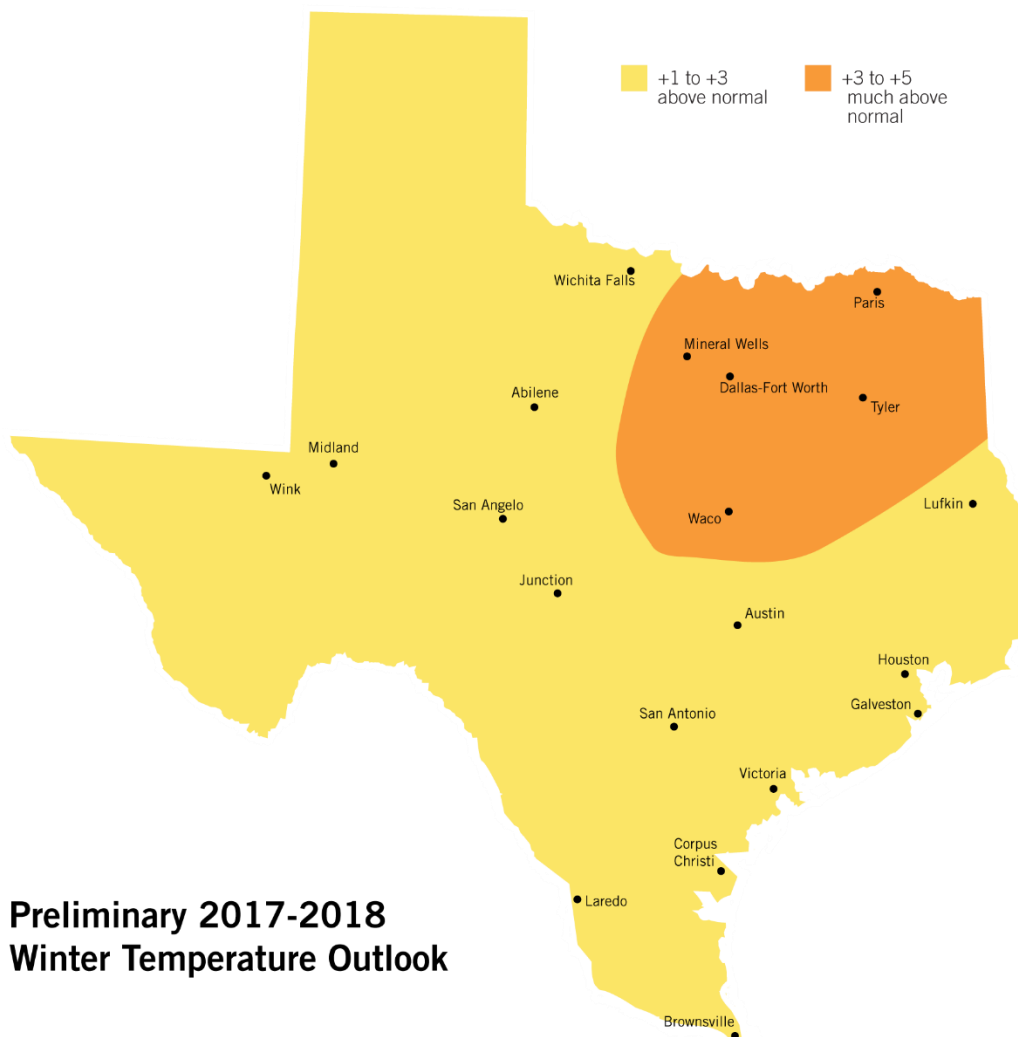
Winter 2017-18 Temperature Outlook

Analog weighted consensus:



Winter 2017-18 Temperature Outlook

- General pattern may change with finalized forecast (Nov 1)
- If trends toward 1994-95, would be warmer (especially West Texas)
- Can't yet rule out a finalized, colder forecast (2006-07?)
- Nothing currently to suggest, however, it will be among the coldest winters (upper-third)
- Mild winters can – and oftentimes do – have very cold periods!

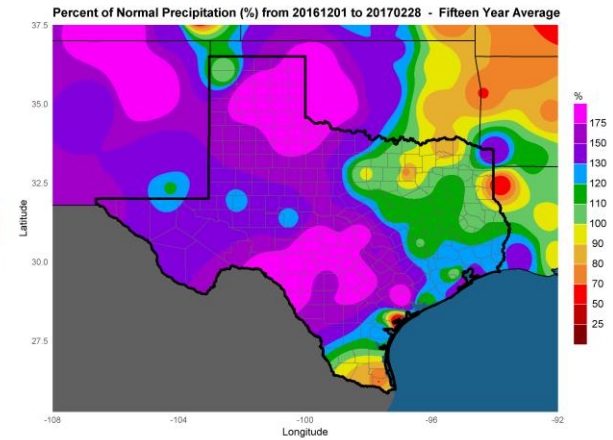
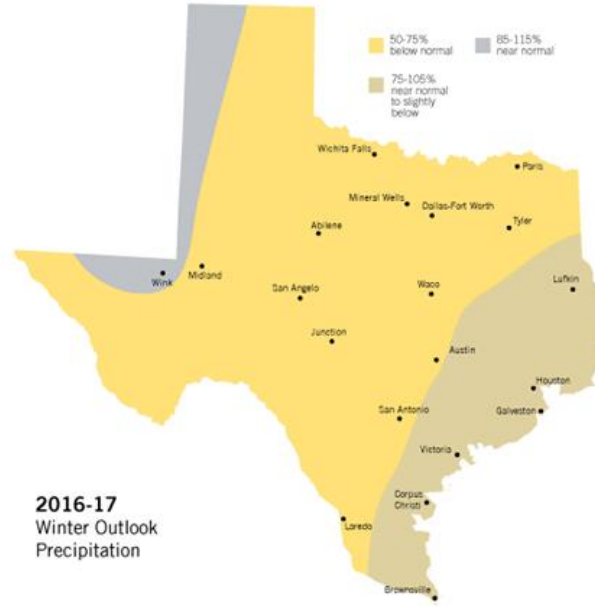
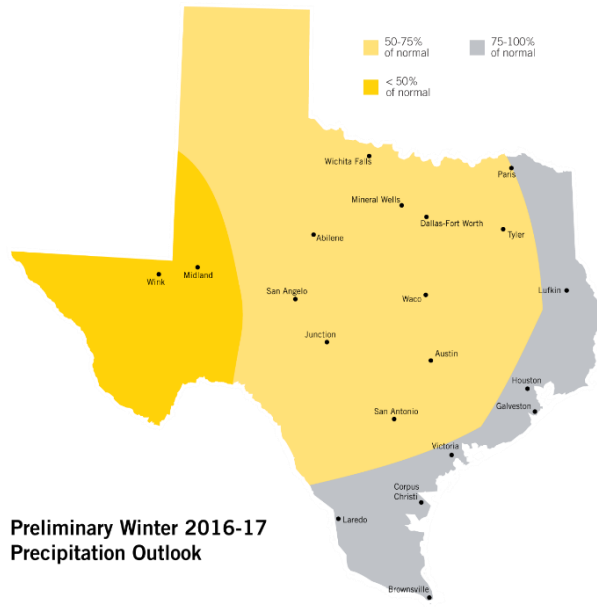


Preliminary 2017-2018
Winter Temperature Outlook

Precipitation Ranking of Recent Winters (Texas)

2016-17	93 rd wettest (out of 122)
2015-16	56 th
2014-15	70 th
2013-14	11th
2012-13	60 th
2011-12	112th
2010-11	17th
2009-10	111th
2008-09	1st
2007-08	24 th
2006-07	104th

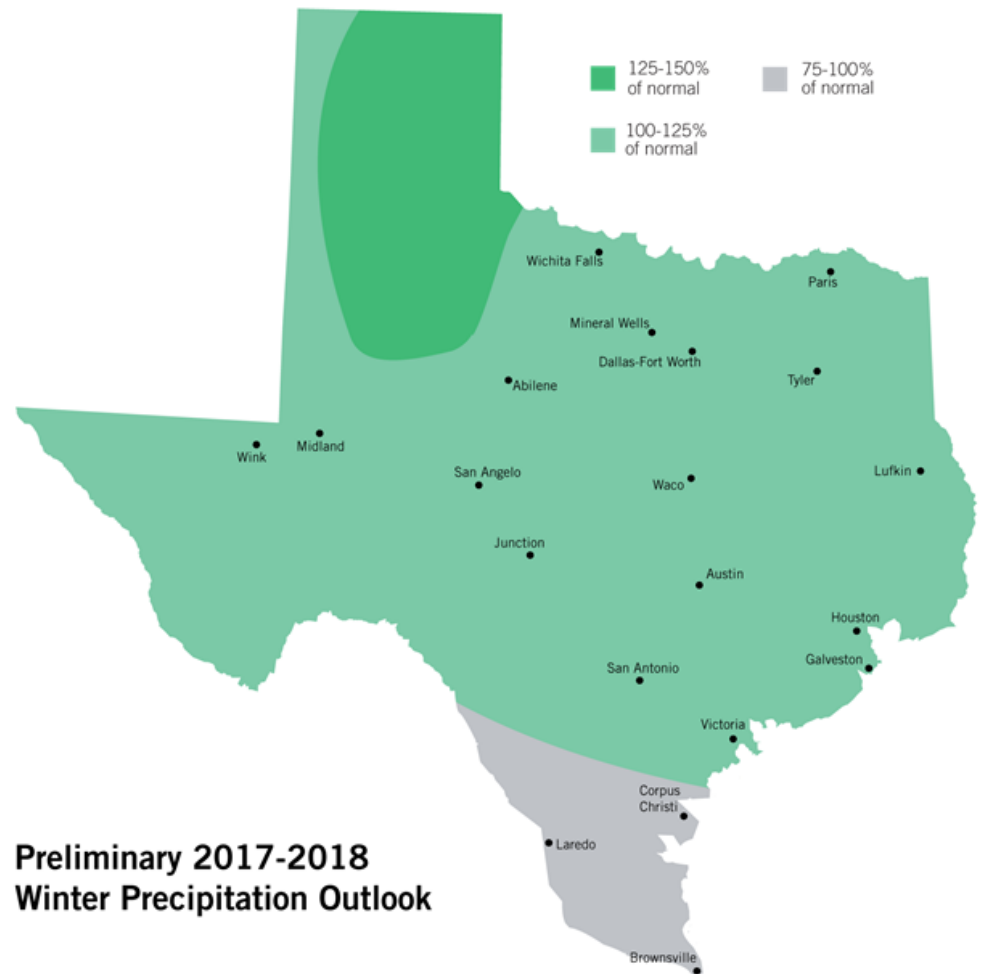
Reviewing Last Winter's Precipitation Forecast



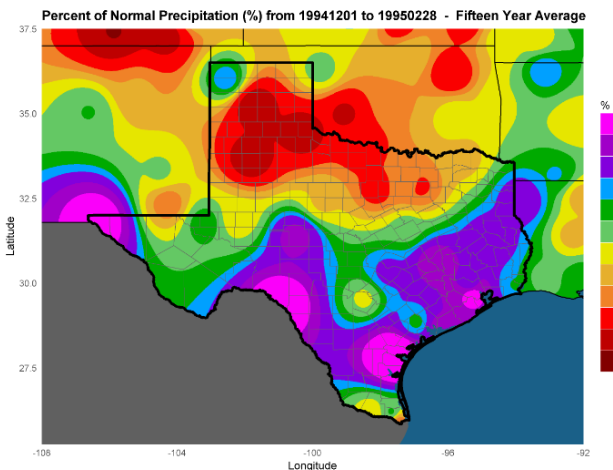
Unlike the temperatures, last winter's precipitation forecast was a bust (other than Northeast Texas and the Rio Grande Valley)

Winter 2017-18 Precipitation Outlook

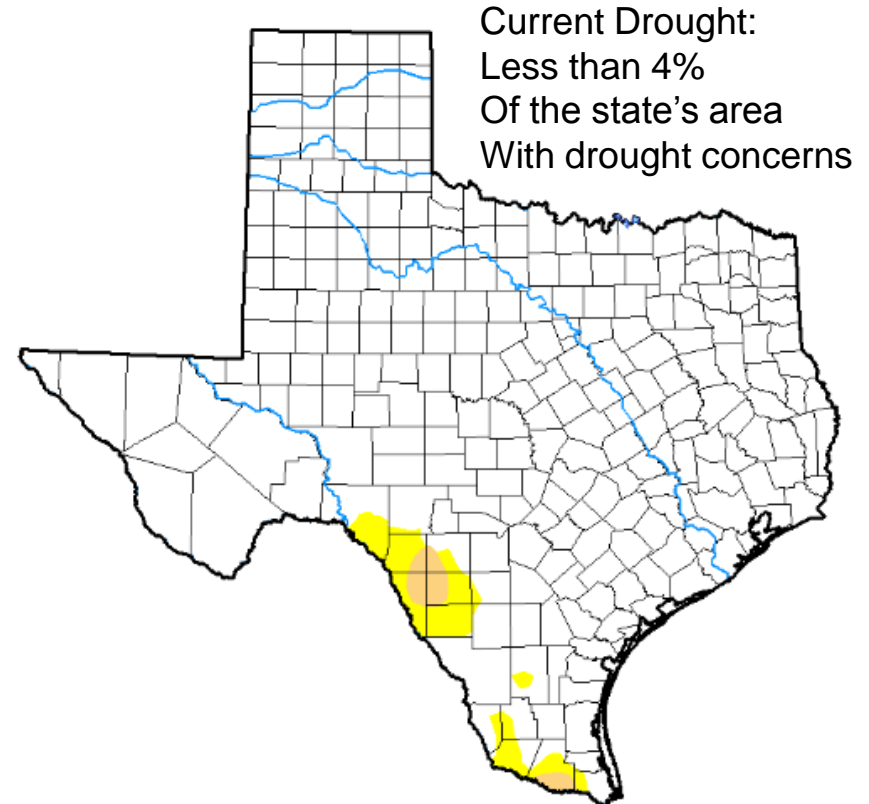
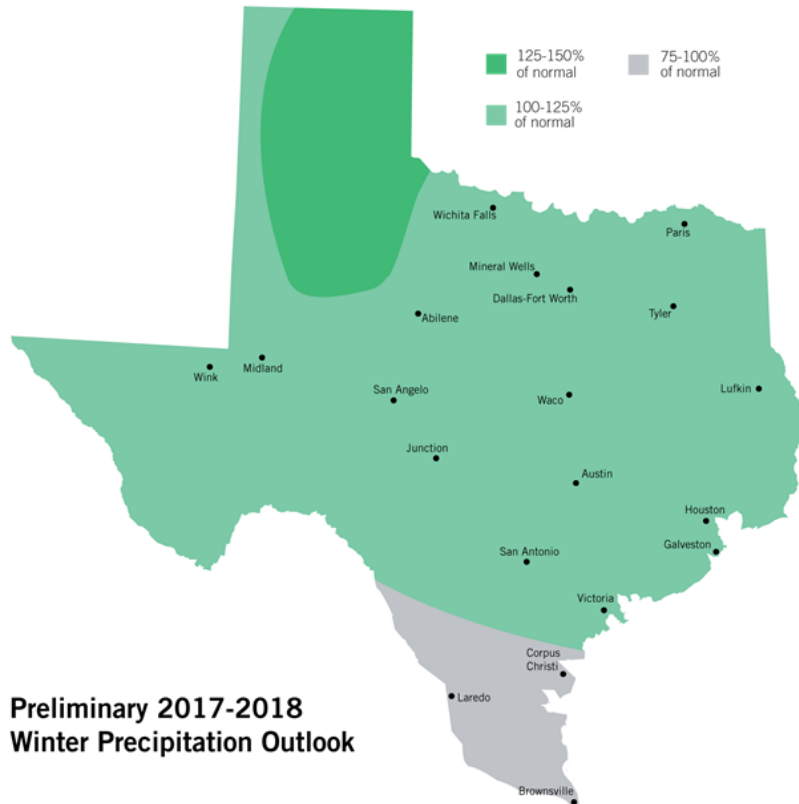
- **Current consensus of all historical analog years results in a wet winter for all but South Texas**
- **The current best-performing analog (1994-95, shown below) has a drier North Texas and the Panhandle**
- **It's possible I will adjust drier for the finalized forecast – but unlikely widespread dry**



**Preliminary 2017-2018
Winter Precipitation Outlook**



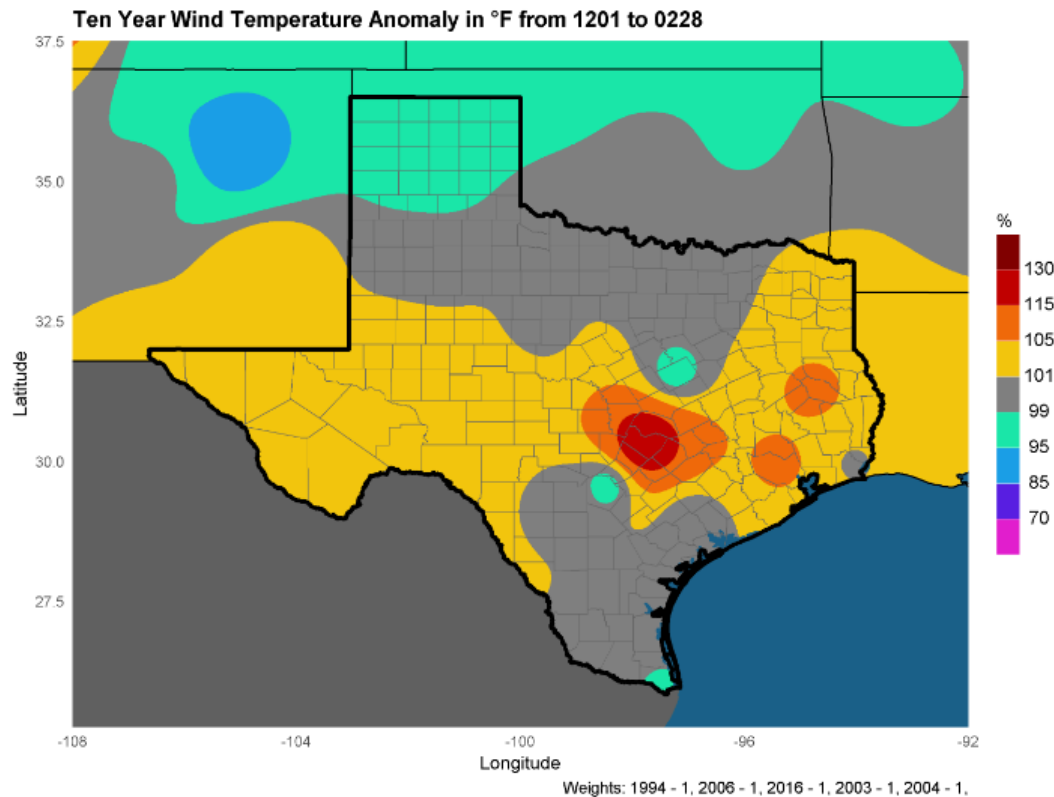
Winter 2017-18 Precipitation Outlook vs Drought



Can't rule out regional concerns, but widespread drought is unlikely to develop this winter

Historical Analog Winds

- 1994-95, 2003-04, 2004-05, 2006-07, 2016-17
- Would project normal to above-normal wind this winter (most of ERCOT)
- At this point, highly-experimental forecast



Summary

- This is a preliminary forecast. It will be **finalized by November 1** and posted to ERCOT.com
- Some changes possible with the finalized forecast
- Early indications suggest a **mild, wet winter**
- **Even with a mild winter forecast, you should always be prepared for a very cold period/worst case scenario!**
- **Unlikely to be as warm as last winter**
(122nd coldest / #1 warmest)
- **Unlikely to be as cold as the winter of 2013-14** (30th coldest)
- Too early to project ice or snow concerns. Check the website on or after Nov 1 for some thoughts on ice and snow.
- Have I yet mentioned that you can have periods of extreme cold in otherwise mild winters?