

# Midwest/Great Plains Climate-Drought Outlook

17 December 2015



Jeff Andresen, State Climatologist  
Michigan State University  
[andresen@msu.edu](mailto:andresen@msu.edu)

517-432-4756



December golf at Odana Hills Golf Course, Madison, WI. Photo courtesy of Gordon Severson, WKOW Madison, WI.

# General Information

- \* **Providing climate services to the Central Region**

- \* Collaboration Activity Between:

- \* State Climatologists
    - \* Doug Kluck & John Eise (NOAA)
    - \* American Association of State Climatologists
    - \* Midwest and High Plains Regional Climate Centers
    - \* National Drought Mitigation Center/USDA

- \* **Next Regular Climate/Drought Outlook Webinar**

- \* January 21, 2016 (1 PM CST)

- \* **Access to Future Climate Webinars and Related Information**

- \* [www.drought.gov/drought/content/regional-programs/regional-drought-webinars](http://www.drought.gov/drought/content/regional-programs/regional-drought-webinars)

- \* **Access to Past Climate Webinars**

- \* [mrcc.isws.illinois.edu/multimedia/webinars.jsp](http://mrcc.isws.illinois.edu/multimedia/webinars.jsp)

- \* [www.hprcc.unl.edu/webinars.php](http://www.hprcc.unl.edu/webinars.php)

- \* **Open for questions at the end**



# Agenda

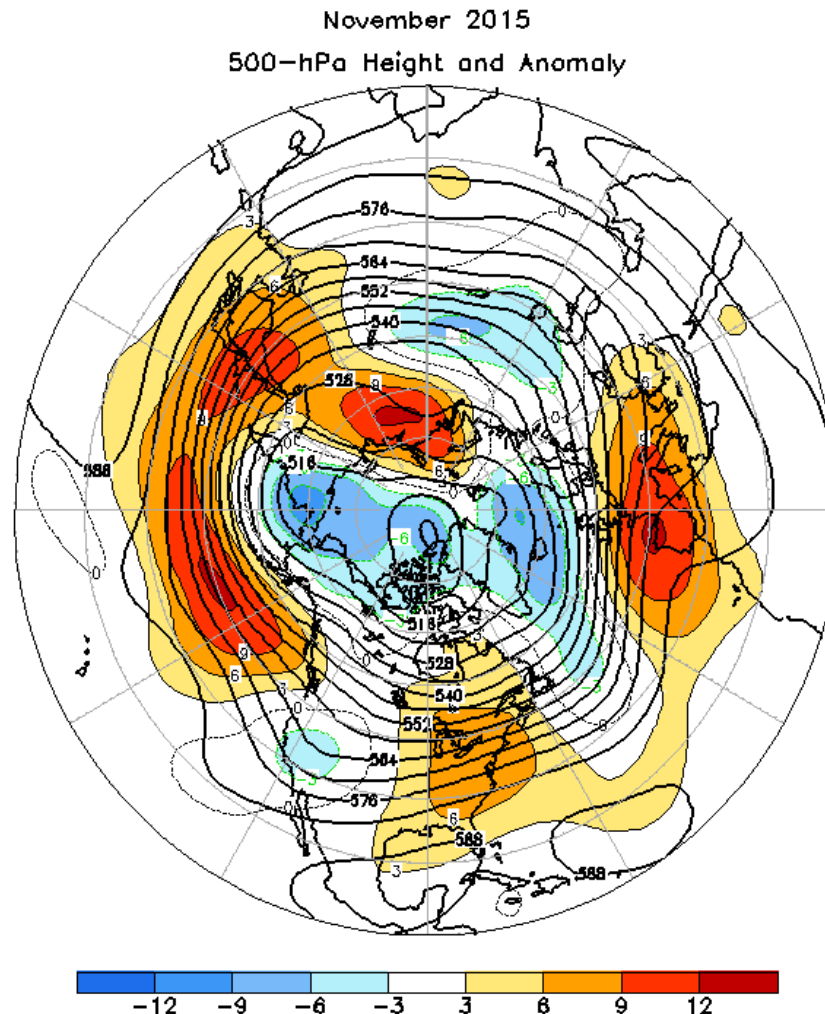
- \* **Current/Recent Past Conditions**
- \* **Impacts**
  - \* **General**
  - \* **Agricultural**
- \* **Outlooks**
- \* **Questions**

Current/Recent Past Conditions

# Mean Upper Air Flow November 2015

The mean pattern was characterized by a strong single jet stream across the northern Pacific and a split flow pattern downstream across North America, resulting in:

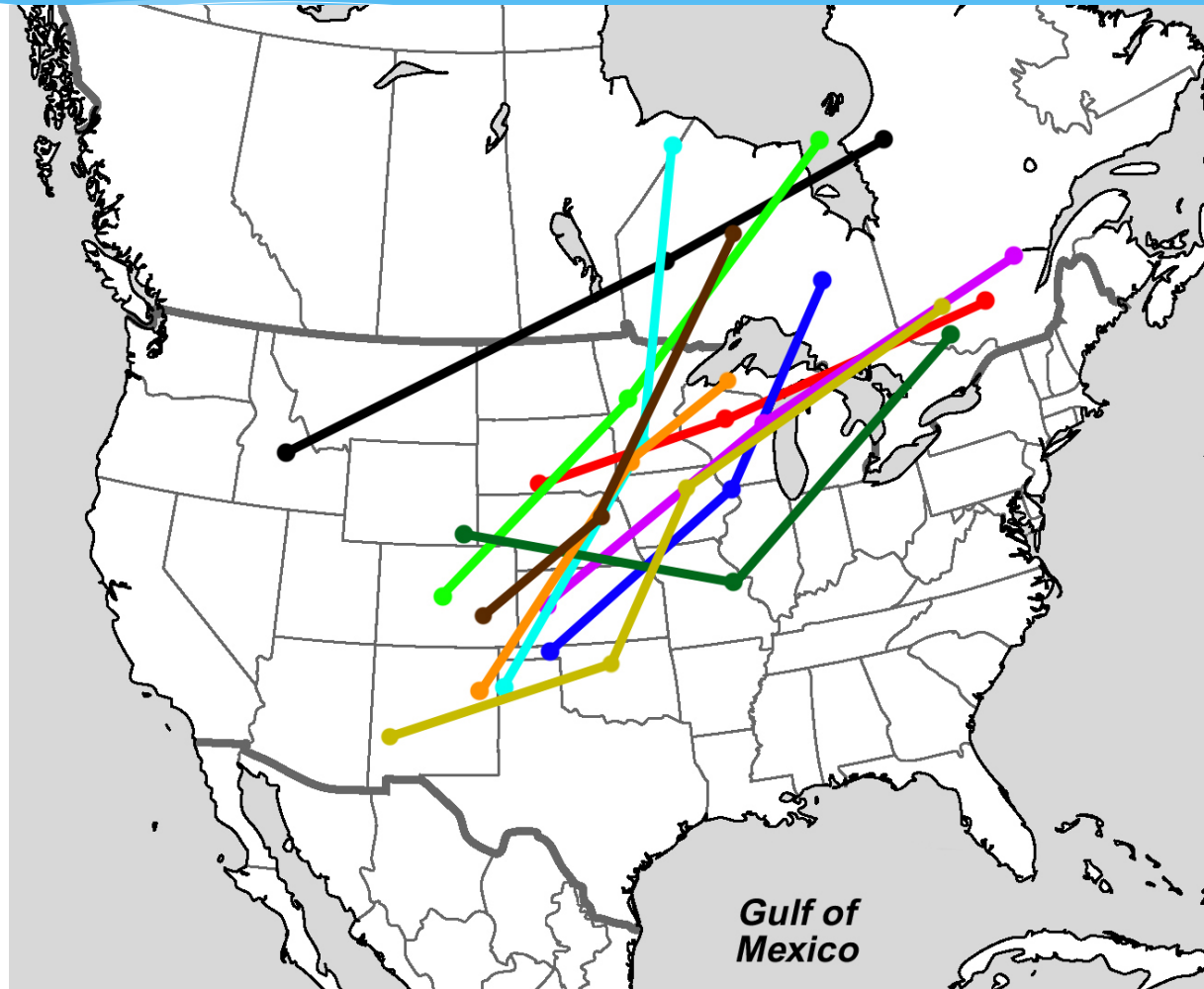
- 1) Above normal temperatures across central, eastern NA
- 2) An active storm track and heavy precip. across the central USA



# Late Fall/Early Winter Storm Tracks

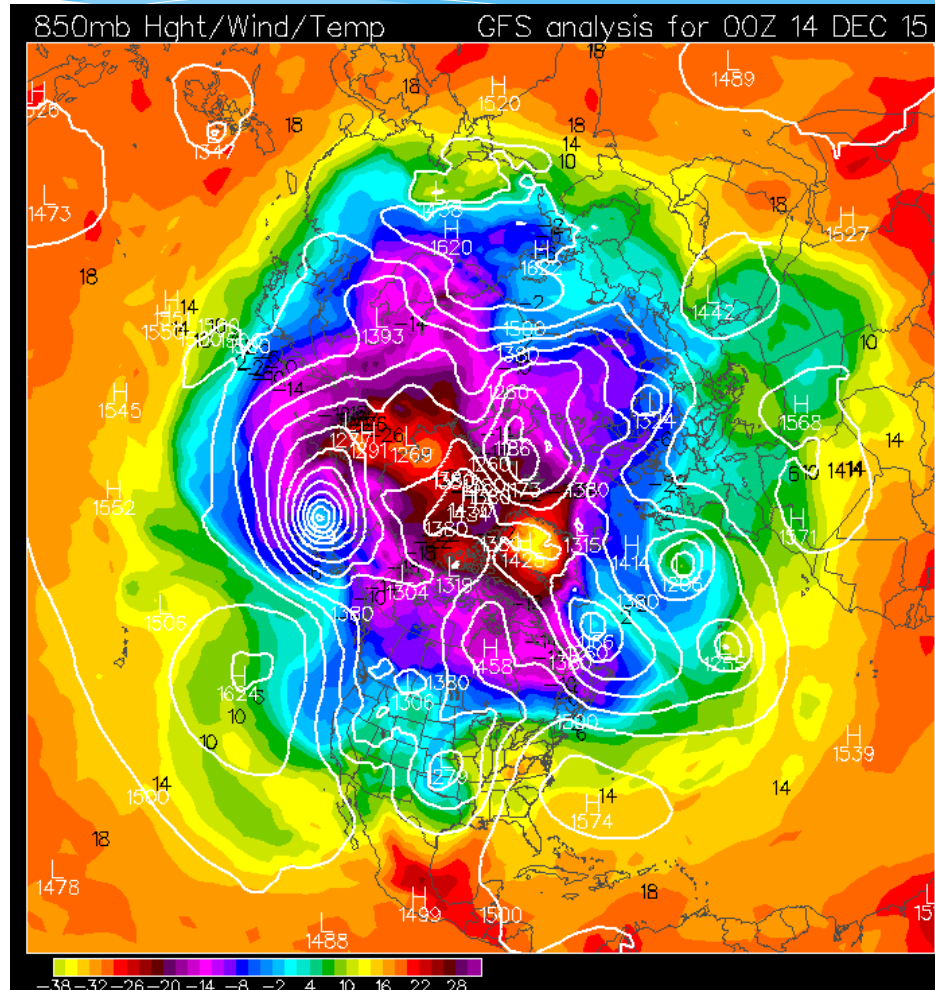
## 15 OCT – 17 DEC 2015

The active subtropical jet stream has led to the passage of a series of upper air troughs across the USA and to a very active storm track through central sections of the country.



# N. Hemisphere 850 mb Temperatures 00Z 14 DEC 2015

**Arctic air is  
confined to the  
polar region, NE  
Asia, and the  
extreme NW  
Atlantic.**



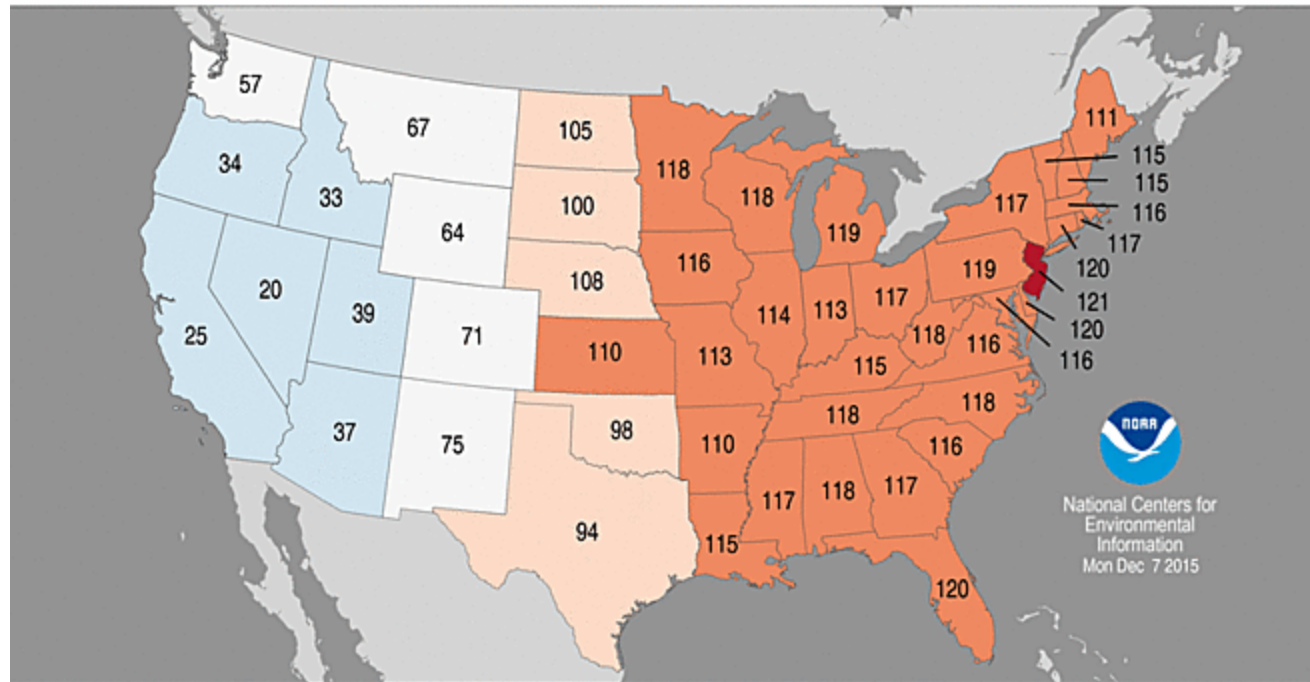
<http://weather.unisys.com/>

# November Temperature Recap

The pattern closely reflects the upper air pattern described earlier, western troughing and eastern ridging.

Much above normal temperatures were observed across most of the central and eastern half of country .

Statewide Average Temperature Ranks  
November 2015  
Period: 1895-2015

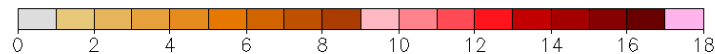
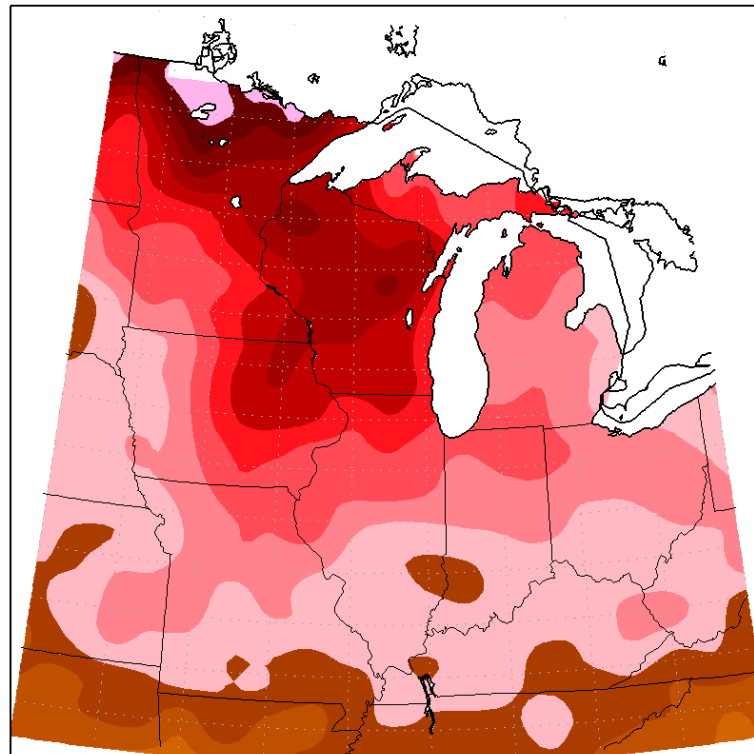




# December Temperature Departures

## 1-15 DEC 2015

Average Temperature ( $^{\circ}\text{F}$ ): Departure from Mean  
December 1, 2015 to December 15, 2015

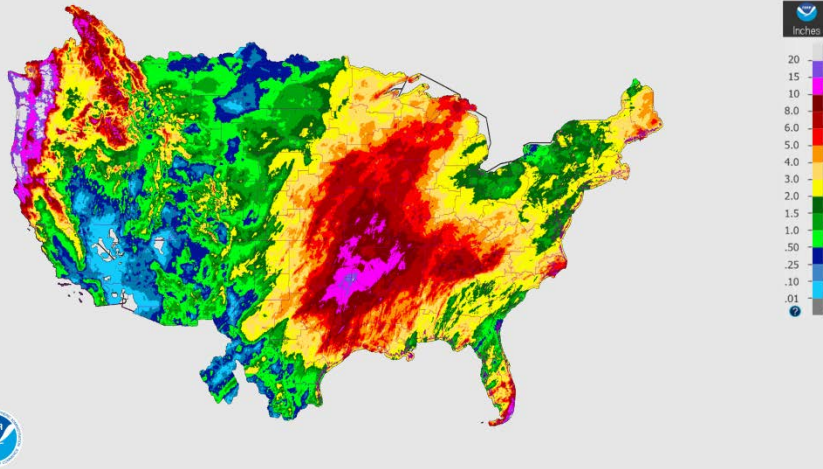


Midwestern Regional Climate Center  
Illinois State Water Survey, Prairie Research Institute  
University of Illinois at Urbana–Champaign

# Most recent 30 and 90-day precipitation

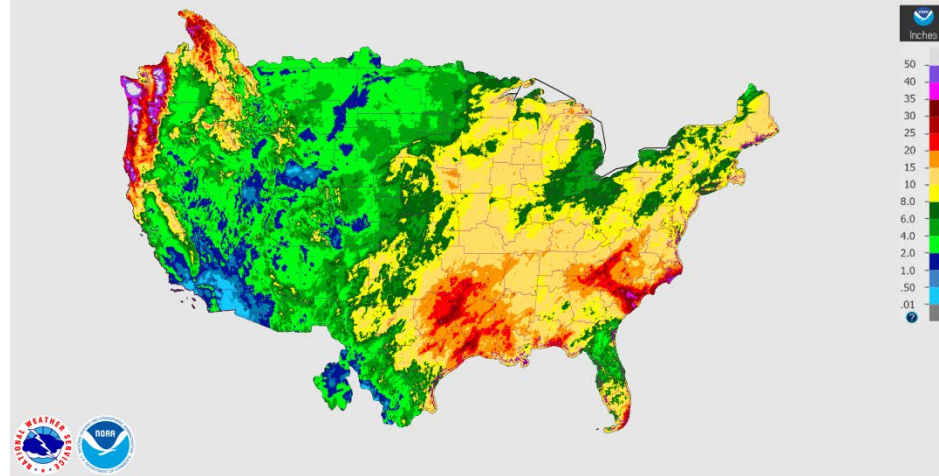
December 16, 2015 30-Day Observed Precipitation - Continental United States

Created on: December 17, 2015 - 14:06 UTC  
Valid on: December 16, 2015 12:00 UTC



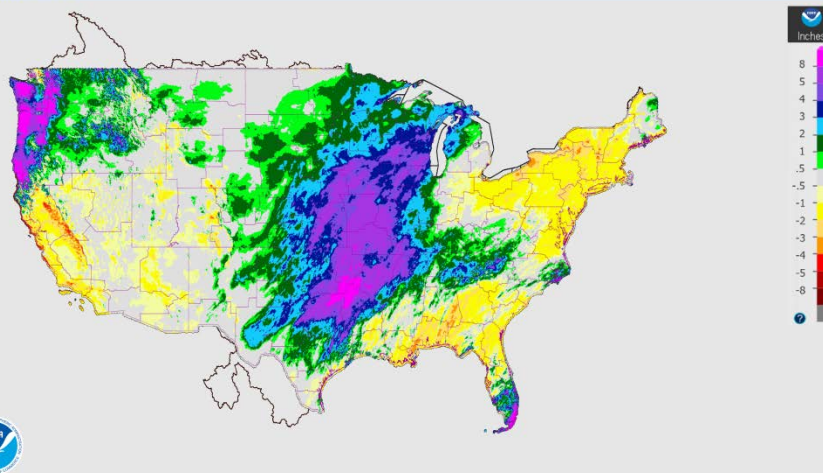
December 16, 2015 90-Day Observed Precipitation - Continental United States

Created on: December 17, 2015 - 14:11 UTC  
Valid on: December 16, 2015 12:00 UTC



December 16, 2015 30-Day Departure Precipitation - Continental United States

Created on: December 17, 2015 - 14:12 UTC  
Valid on: December 16, 2015 12:00 UTC



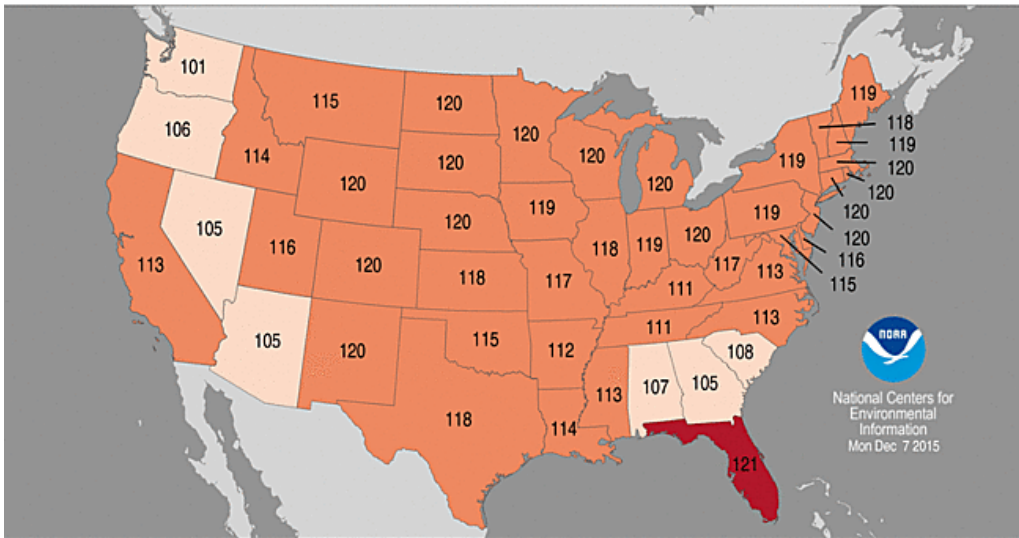


# Statewide Average Temperature Ranks

September–November 2015

Period: 1895–2015

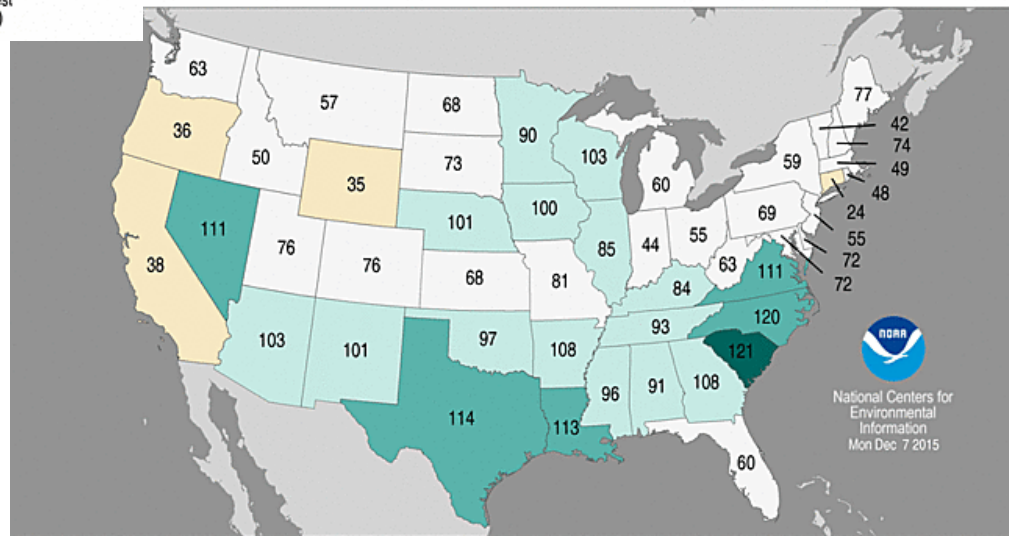
90 day  
temperature and  
precipitation ranks



# Statewide Precipitation Ranks

September–November 2015

Period: 1895–2015



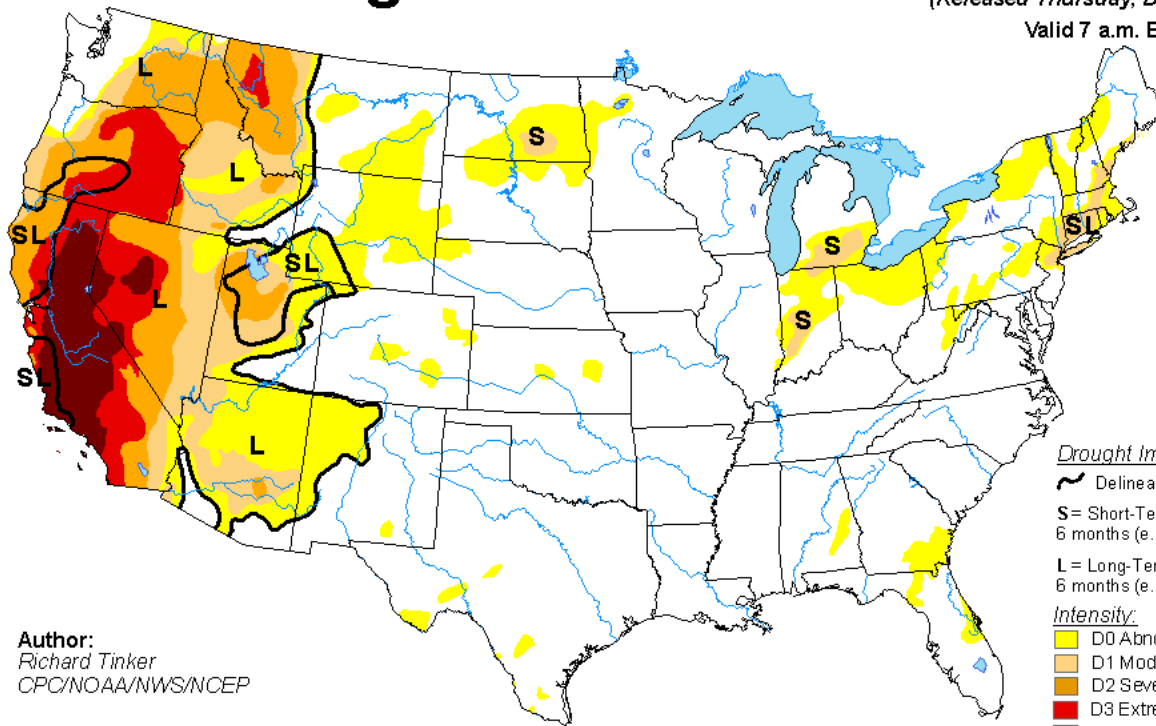
# US Drought Monitor

## U.S. Drought Monitor

December 15, 2015

(Released Thursday, Dec. 17, 2015)

Valid 7 a.m. EST



Author:  
Richard Tinker  
CPC/NOAA/NWS/NCEP

### Drought Impact Types:

~ Delineates dominant impacts

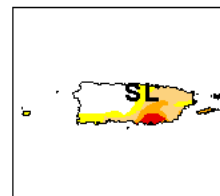
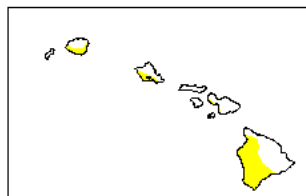
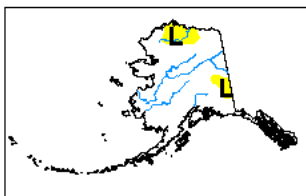
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

### Intensity:

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

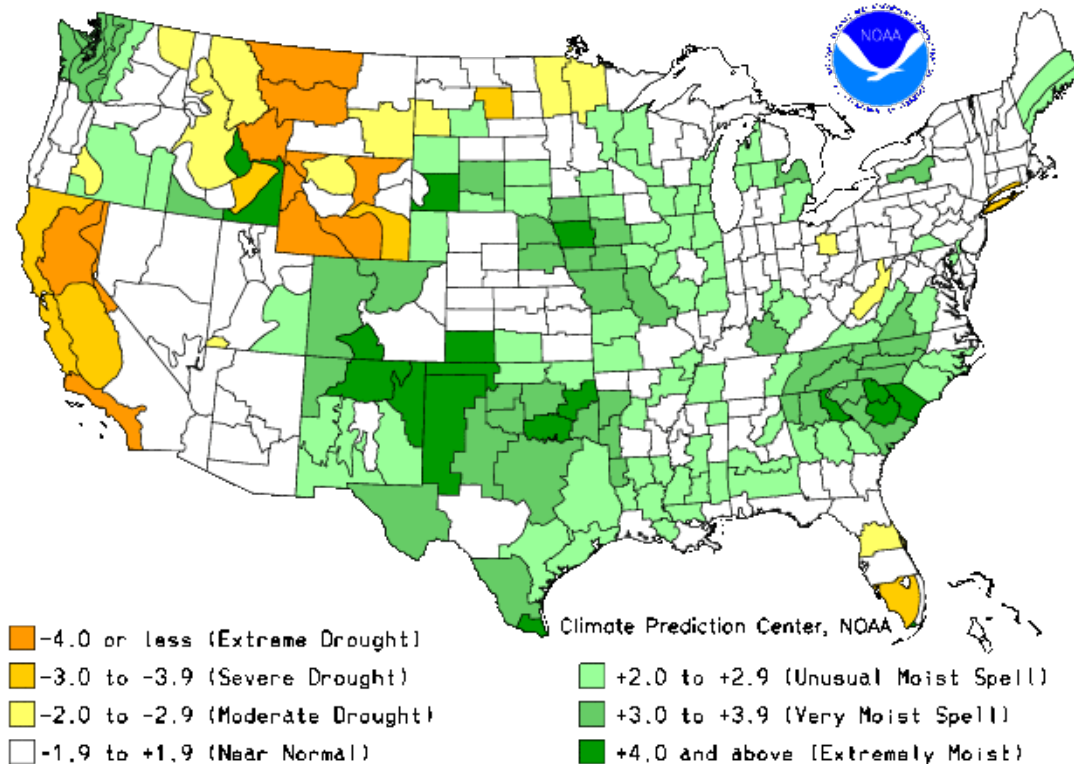
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

# Palmer Drought Severity Index

Drought Severity Index by Division  
Weekly Value for Period Ending DEC 5, 2015  
Long Term Palmer



# Impacts



MHSAA Div. 7 State Semi-Final Football Playoff game, Fenton, MI, 21 November 2015. Photo courtesy of Nicole Hester, Bay City Times.

# General Impacts

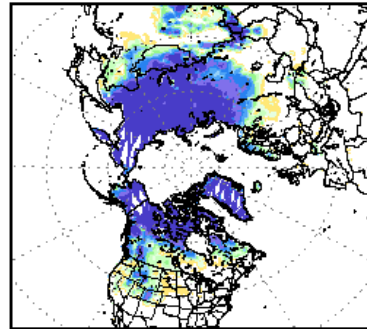
- \* Abnormal Warmth Regionwide –
  - \* Extended season for some recreational activities (e.g. golf)
  - \* Reduced heating needs
  - \* Reduced snowfall removal costs in eastern and southern sections
  - \* Late start to winter recreational season (skiing, snowmobiling)
- \* Abnormal wetness in central sections –
  - \* High streamflows



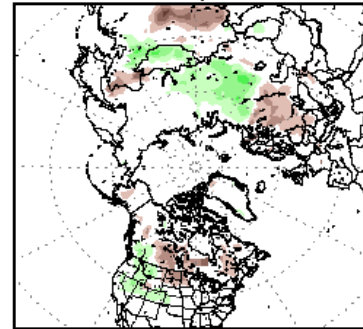
# November Snowfall Totals

SSM/I Snow Cover for Nov 2015  
anomaly based on departure from 1987-2010 baseline

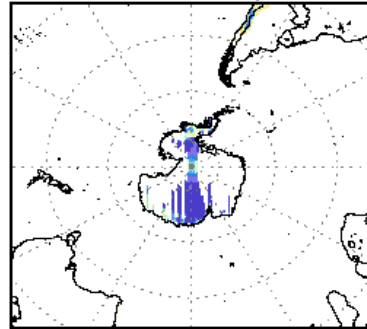
Northern Hemisphere



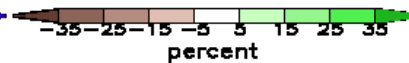
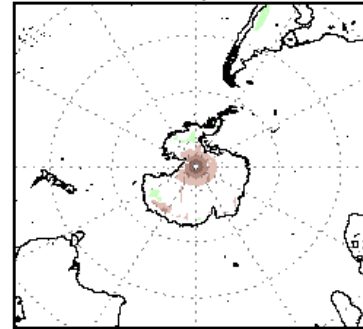
Northern Hemisphere Anomaly



Southern Hemisphere

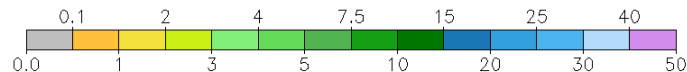
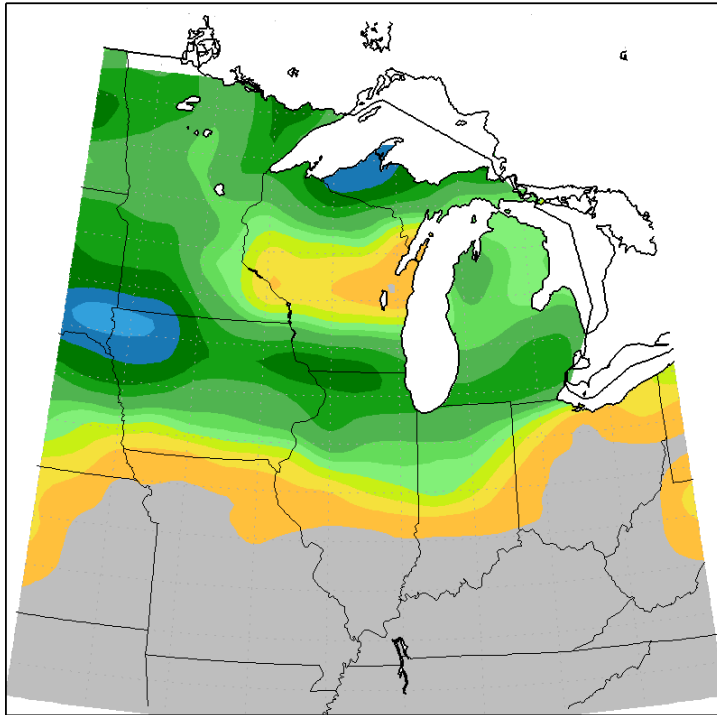


Southern Hemisphere Anomaly



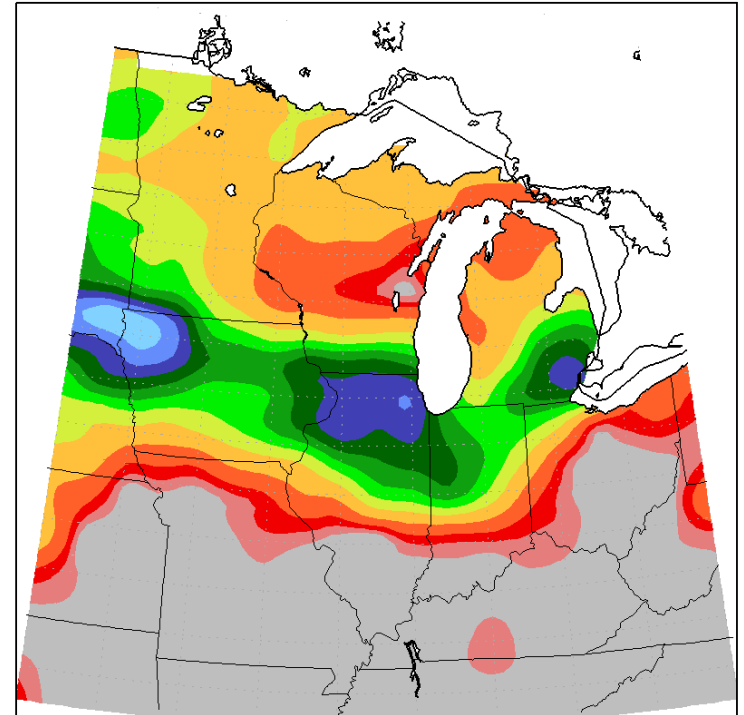
# Seasonal Snowfall Totals

Accumulated Snowfall (in)  
July 1, 2015 to December 15, 2015

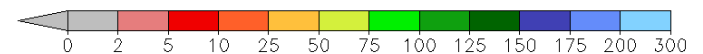


Midwestern Regional Climate Center  
Illinois State Water Survey, Prairie Research Institute  
University of Illinois at Urbana-Champaign

Accumulated Snowfall: Percent of Mean  
July 1, 2015 to December 15, 2015



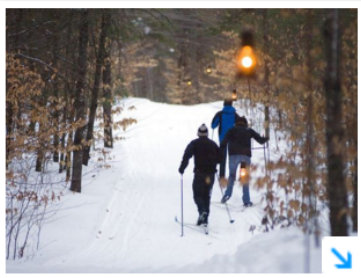
Mean period is 1981-2010.



Midwestern Regional Climate Center  
Illinois State Water Survey, Prairie Research Institute  
University of Illinois at Urbana-Champaign

# Northern Michigan cancels ski race due to lack of snow

Associated Press 6:45 p.m. EST December 9, 2015



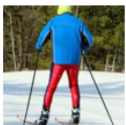
(Photo: DNR)

MARQUETTE, Mich. — A lack of snow in Michigan's typically snowy Upper Peninsula has forced the rare cancellation of a cross-country ski race.

Northern Michigan University announced Wednesday it had to call off the NMU Wildcat Open scheduled for Saturday and Sunday. The Wildcats now will start their season at the USSA Regional Opener Dec. 19-20 in Houghton.

Northern Michigan head ski coach Sten Fjeldheim says it's only the third time since 1986 the Marquette university had to cancel a competition during the second week of December. He added it's a "huge contrast" to last year, when the area had "outstanding snow" starting in November.

Fjeldheim says there is usually enough snow to hold the competition, but this year there's "no snow to even shovel on the trail."



DETROIT FREE PRESS

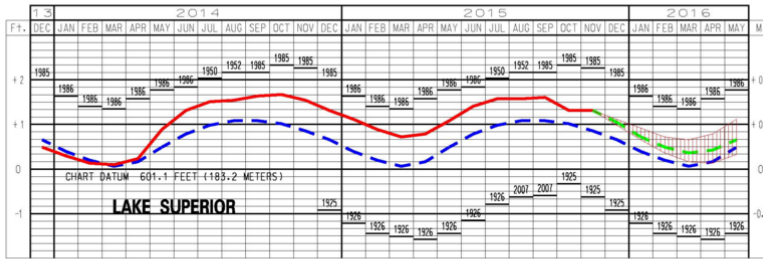
It's too darn warm for Michigan ski slopes to open

Impacts

# Great Lakes

# Great Lakes Water Levels

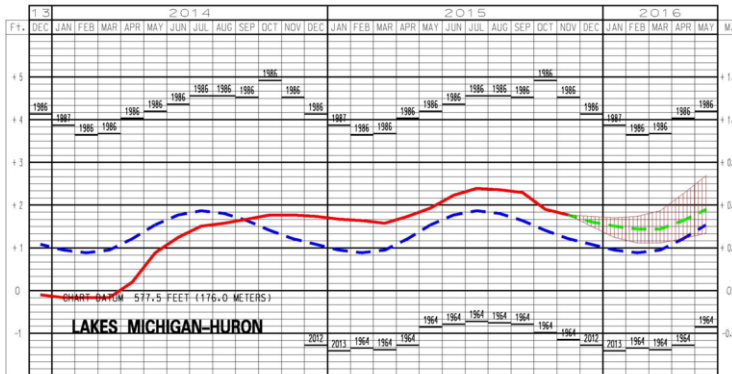
LAKE SUPERIOR WATER LEVELS - DECEMBER 2015



LEGEND	
LAKE LEVELS	
RECORDED	
PROJECTED	
AVERAGE **	
MAXIMUM **	1985      1985      1973      1973
MINIMUM **	1936      1934      1926      1934

\*\* Average, Maximum and Minimum for period 1918-2014

LAKES MICHIGAN-HURON WATER LEVELS - DECEMBER 2015

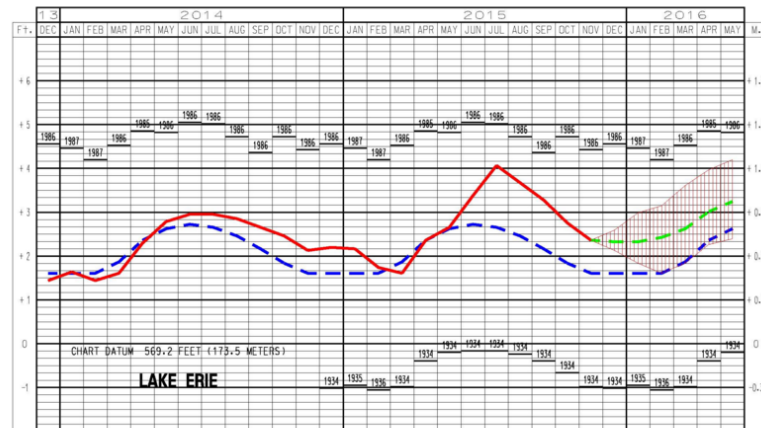


LEGEND	
LAKE LEVELS	
RECORDED	
PROJECTED	
AVERAGE **	
MAXIMUM **	1985      1985      1973      1973
MINIMUM **	1936      1934      1926      1934

\*\* Average, Maximum and Minimum for period 1918-2014

- Still above long term normals

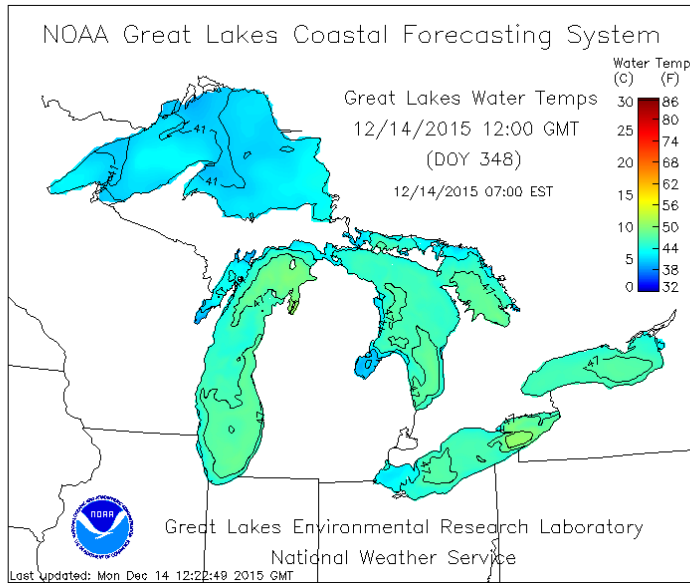
LAKE ERIE WATER LEVELS - DECEMBER 2015



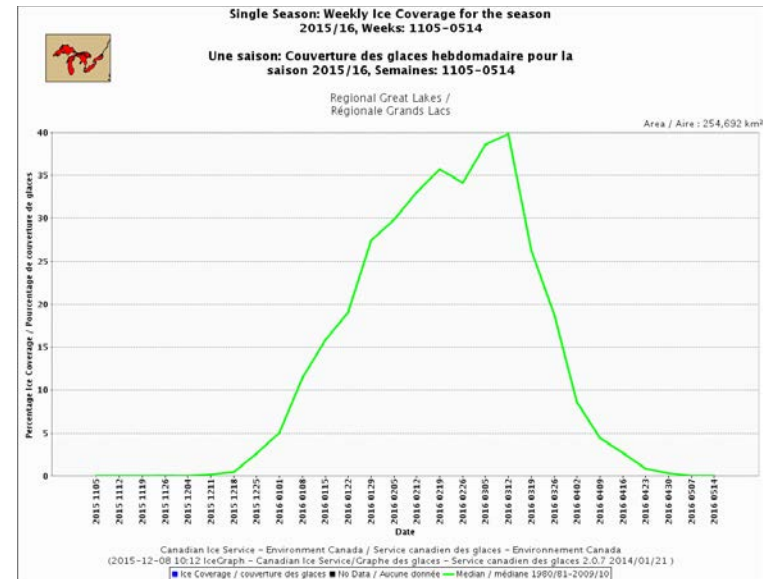
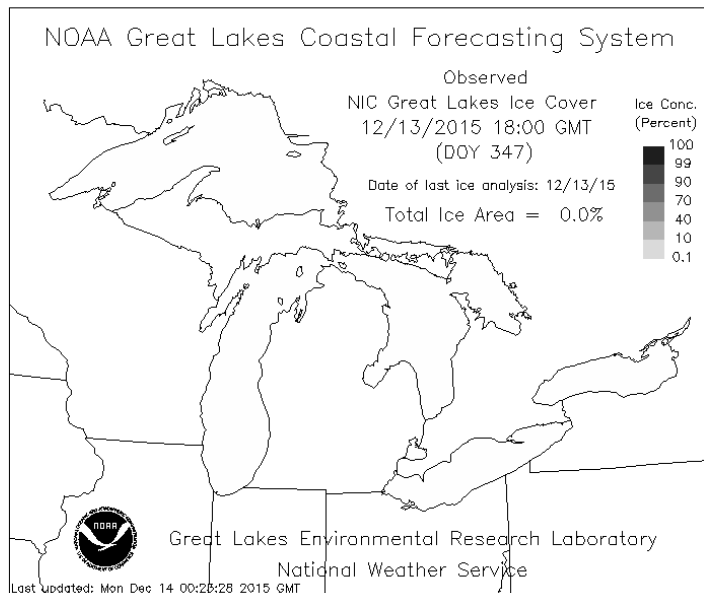
LEGEND	
LAKE LEVELS	
RECORDED	
PROJECTED	
AVERAGE **	
MAXIMUM **	1985      1985      1973      1973
MINIMUM **	1936      1934      1926      1934

\*\* Average, Maximum and Minimum for period 1918-2014

# Great Lakes Ice Cover



- No ice cover currently due to abnormally high air and water temperatures
- Extended shipping season

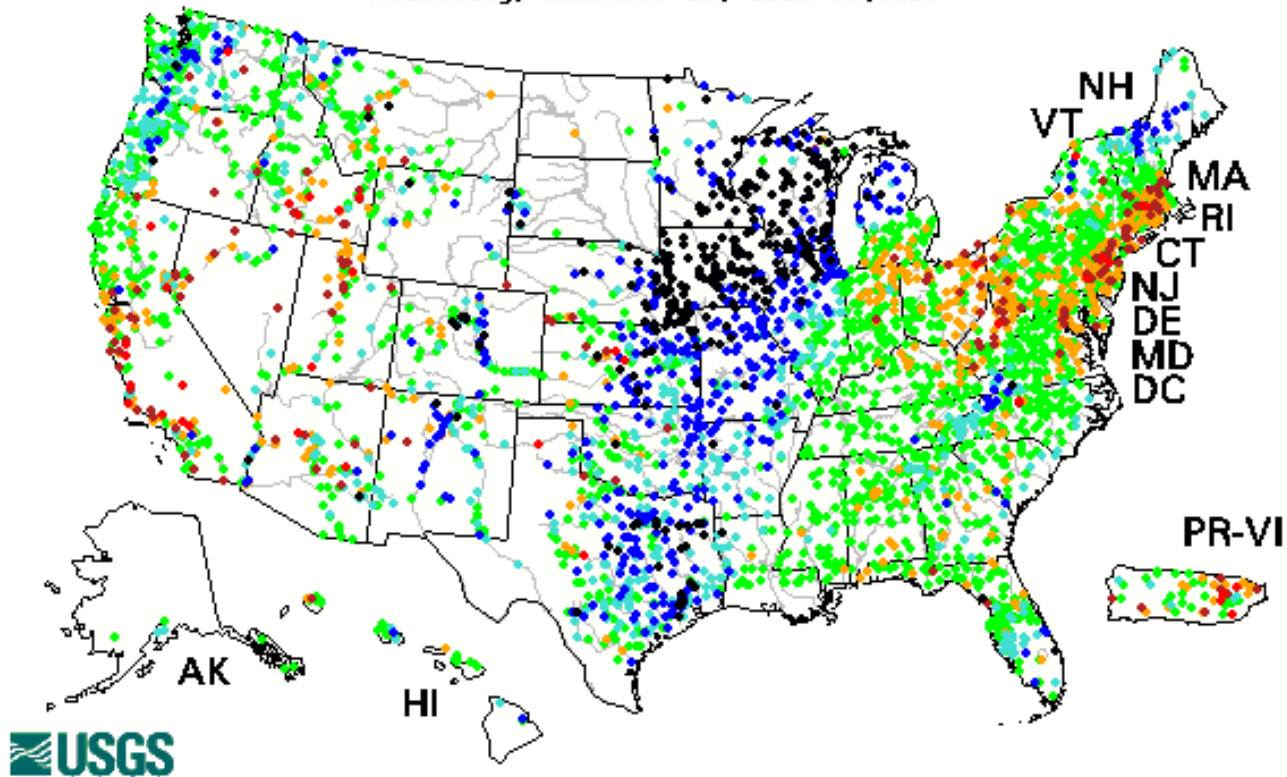


Impacts

# Regional Streamflow

# 7-Day Average Streamflow

Wednesday, December 16, 2015 08:30ET



Wednesday, 18 Dec. 2015  
 General conditions much above normal  
 central to below normal east

Explanation - Percentile classes						
<span style="color: red;">●</span>	<span style="color: darkred;">●</span>	<span style="color: orange;">●</span>	<span style="color: green;">●</span>	<span style="color: cyan;">●</span>	<span style="color: blue;">●</span>	<span style="color: black;">●</span>
Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High



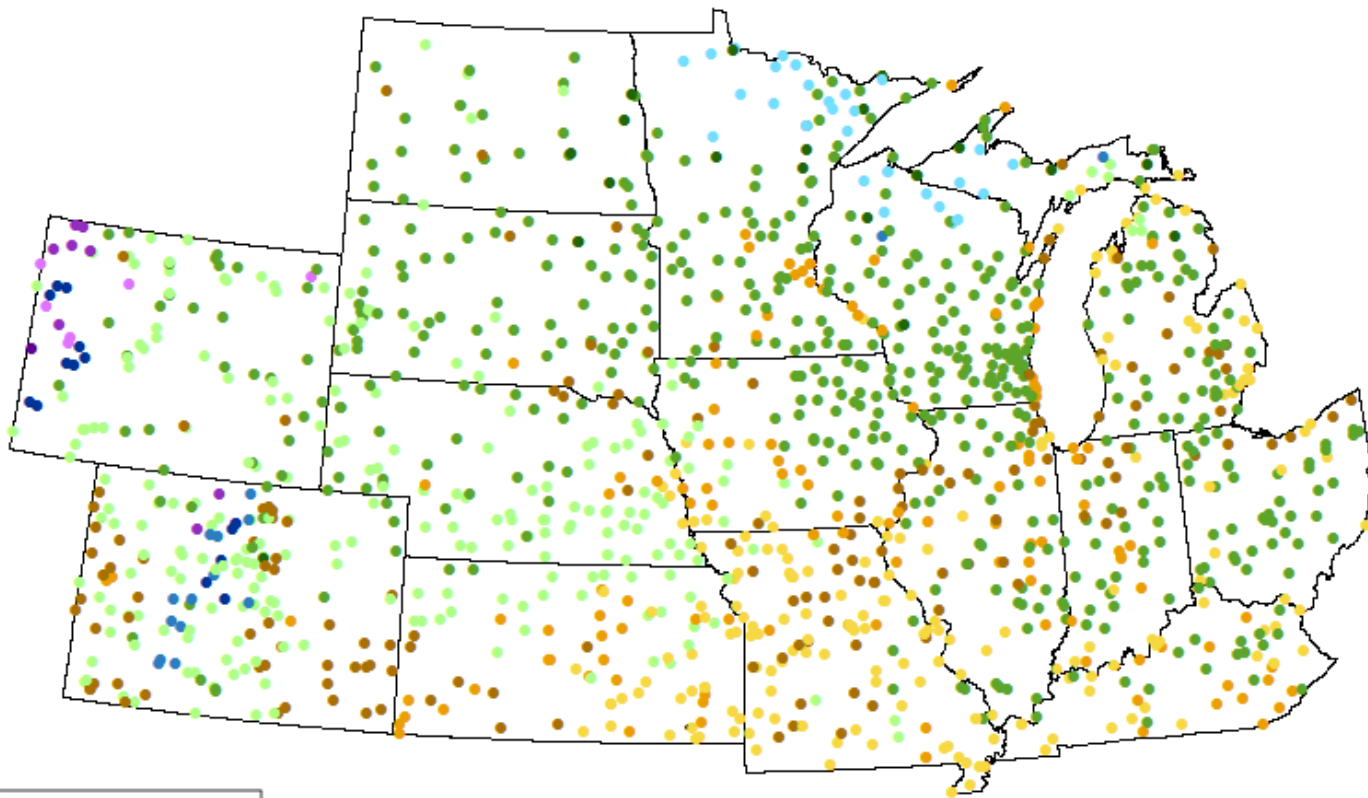
# Agricultural Impacts

- \* Mild, dry fall generally favored fall harvest and other fieldwork activities.
- \* Recent rain and snow have slowed fieldwork progress, but have begun the seasonal recharge of soil moisture profiles. Soils in eastern sections remain relatively dry.
- \* Mild temperatures have led to extended late season growth of many perennial and fall planted crops.
- \* Soil frost has been limited to far northern sections of the region.
- \* Conditions were favorable for planting, germination, and establishment of winter wheat crop.

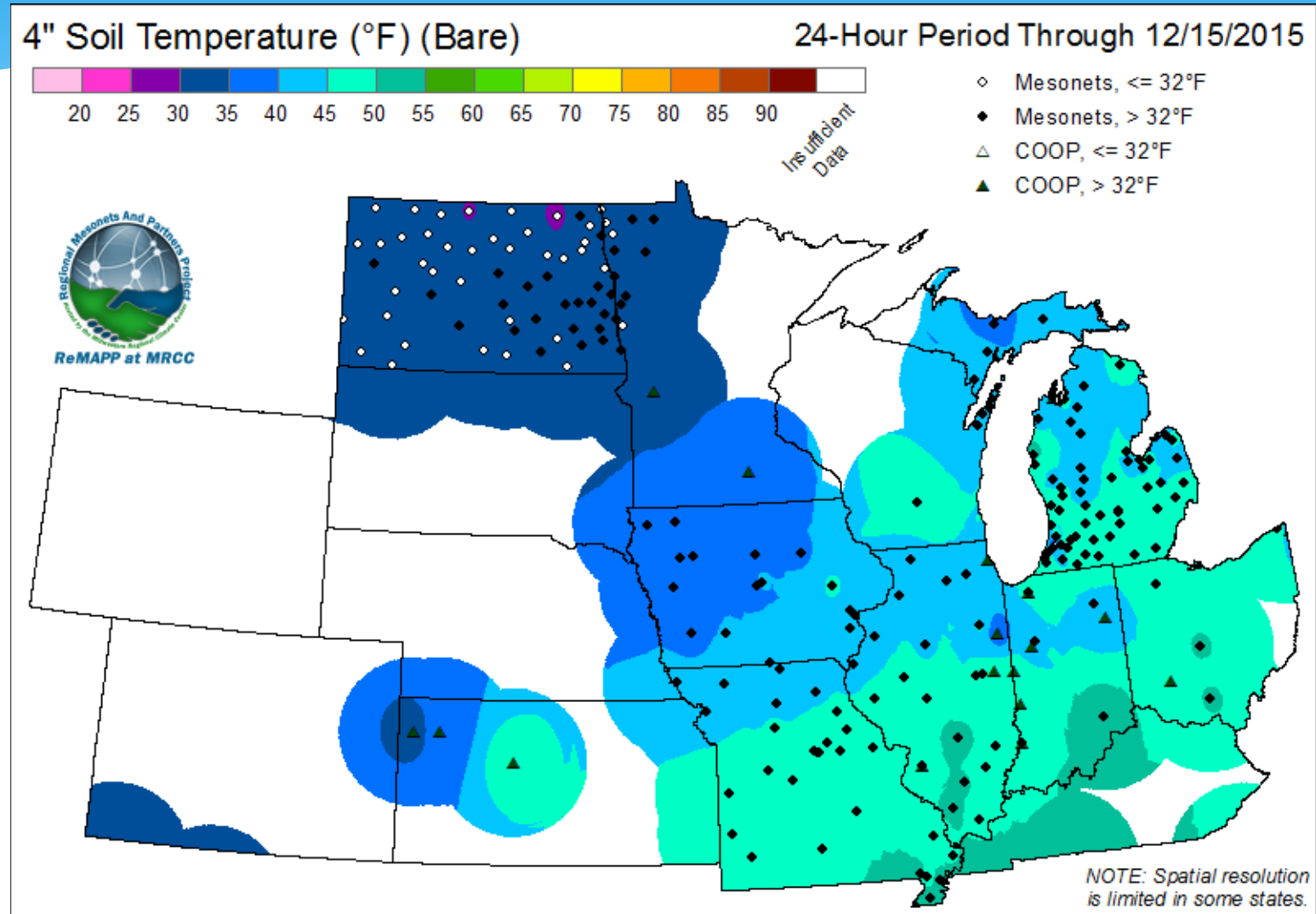
# Date of First Killing Freeze (28°F)

Date of First 28°F Freeze  
through 12/7/2015

- Aug 10 or Earlier
- Aug 11 - 20
- Aug 21 - 31
- Sep 1 - 10
- Sep 11 - 20
- Sep 21 - 30
- Oct 1 - 10
- Oct 11 - 20
- Oct 21 - 31
- Nov 1 - 10
- Nov 11 - 20
- Nov 21 or Later
- Tmin yet to reach 28°F

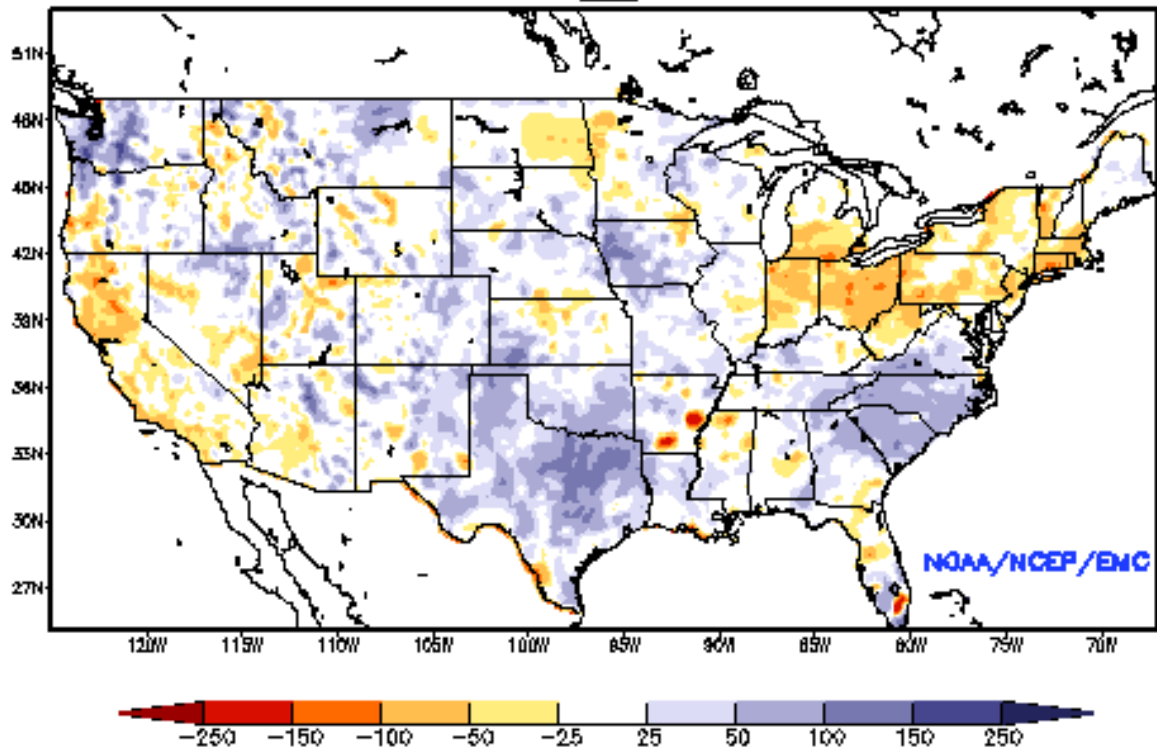


# Soil temperatures



# Soil Moisture

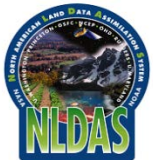
Ensemble-Mean - Current Total Column Soil Moisture Anomaly (mm)  
NCEP NLDAS Products Valid: DEC 12, 2015



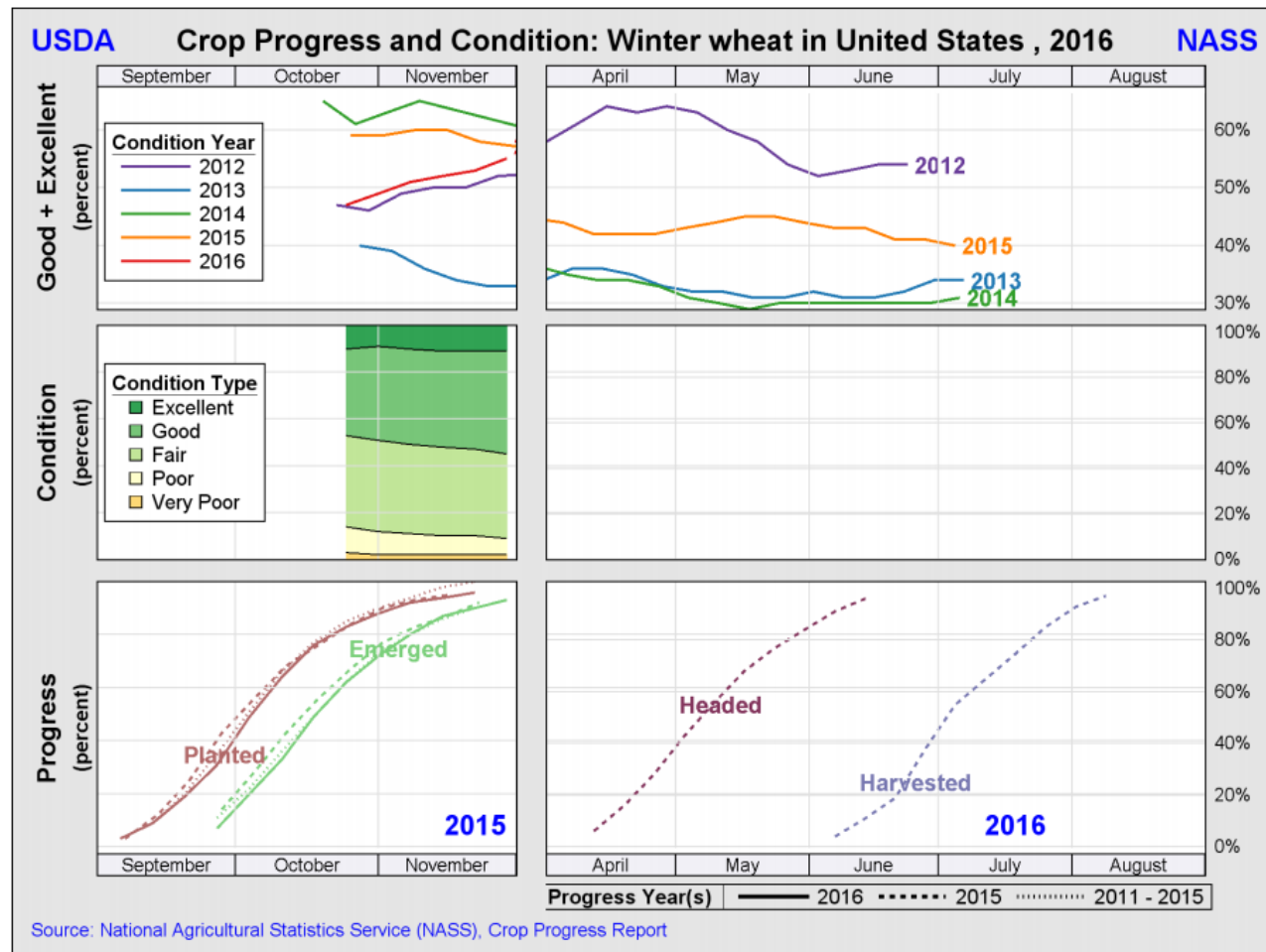
Soil Moisture Anomaly in millimeters

Recent precipitation has brought soil moisture to above normal levels across central and southern sections of the Midwest.

Soils in eastern sections of the region remain drier than normal.



# Crop Progress and Condition: W. Wheat



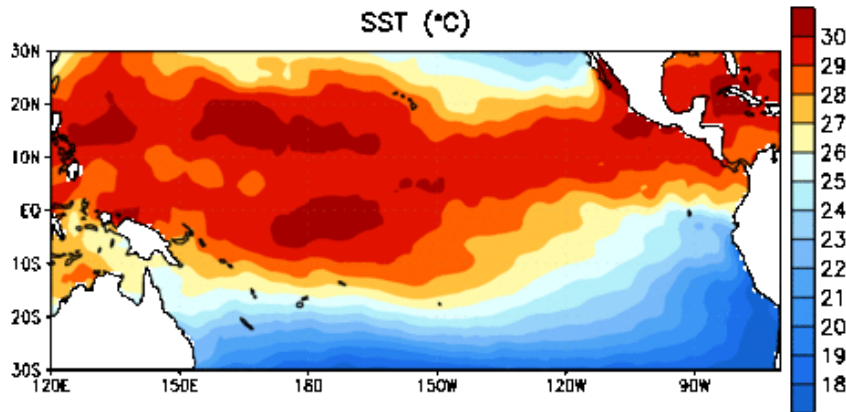
# Outlooks

# Outlooks

- \* **ENSO**
- \* **7-day precipitation forecast**
- \* **6-10 and 8-14 day outlooks**
- \* **Monthly and Seasonal Outlooks (January - March)**
- \* **Extended Seasonal Outlooks**
- \* **Seasonal Drought Outlooks**

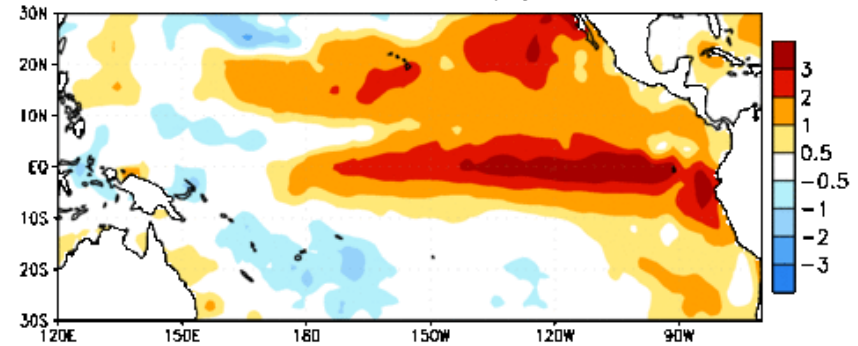
# ENSO Conditions

Week centered on 16 SEP 2015  
SST (°C)



Sea Surface Temperatures

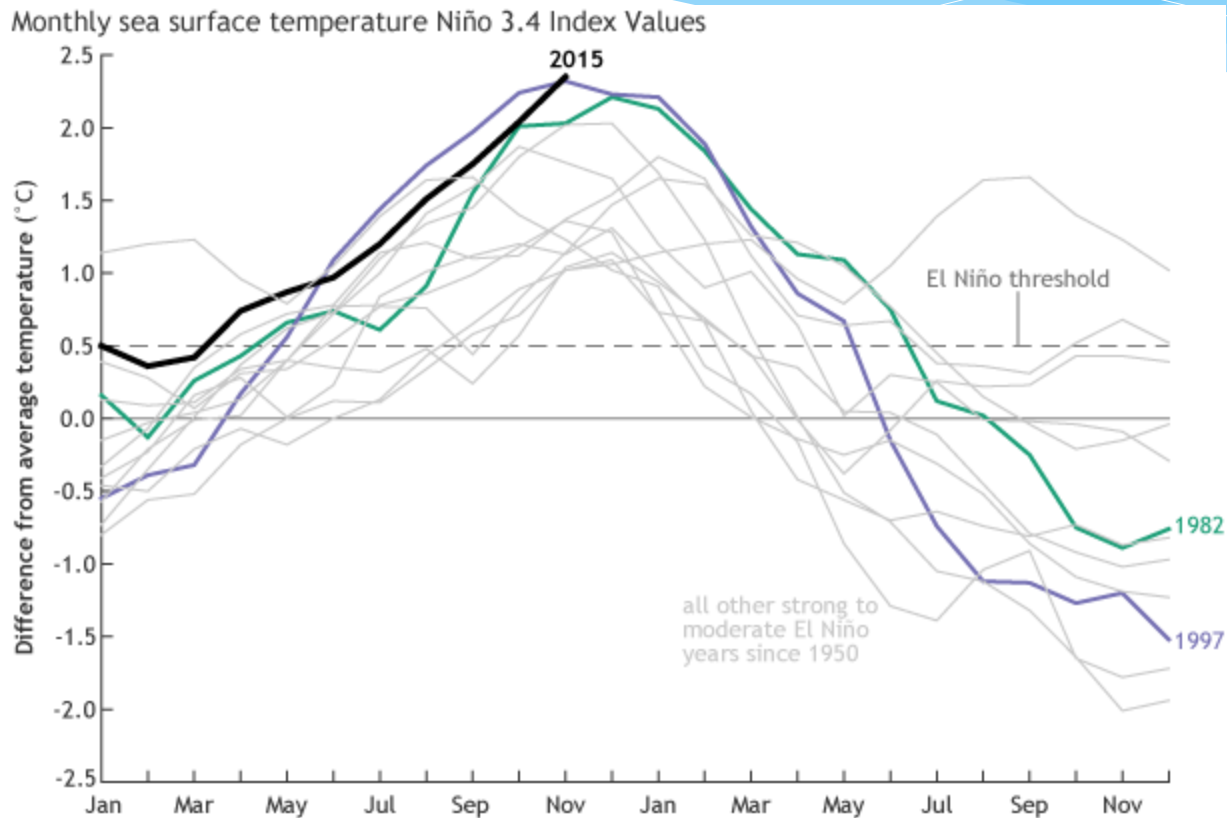
Week centered on 16 SEP 2015  
SST Anomalies (°C)



Sea Surface Temperature Anomalies



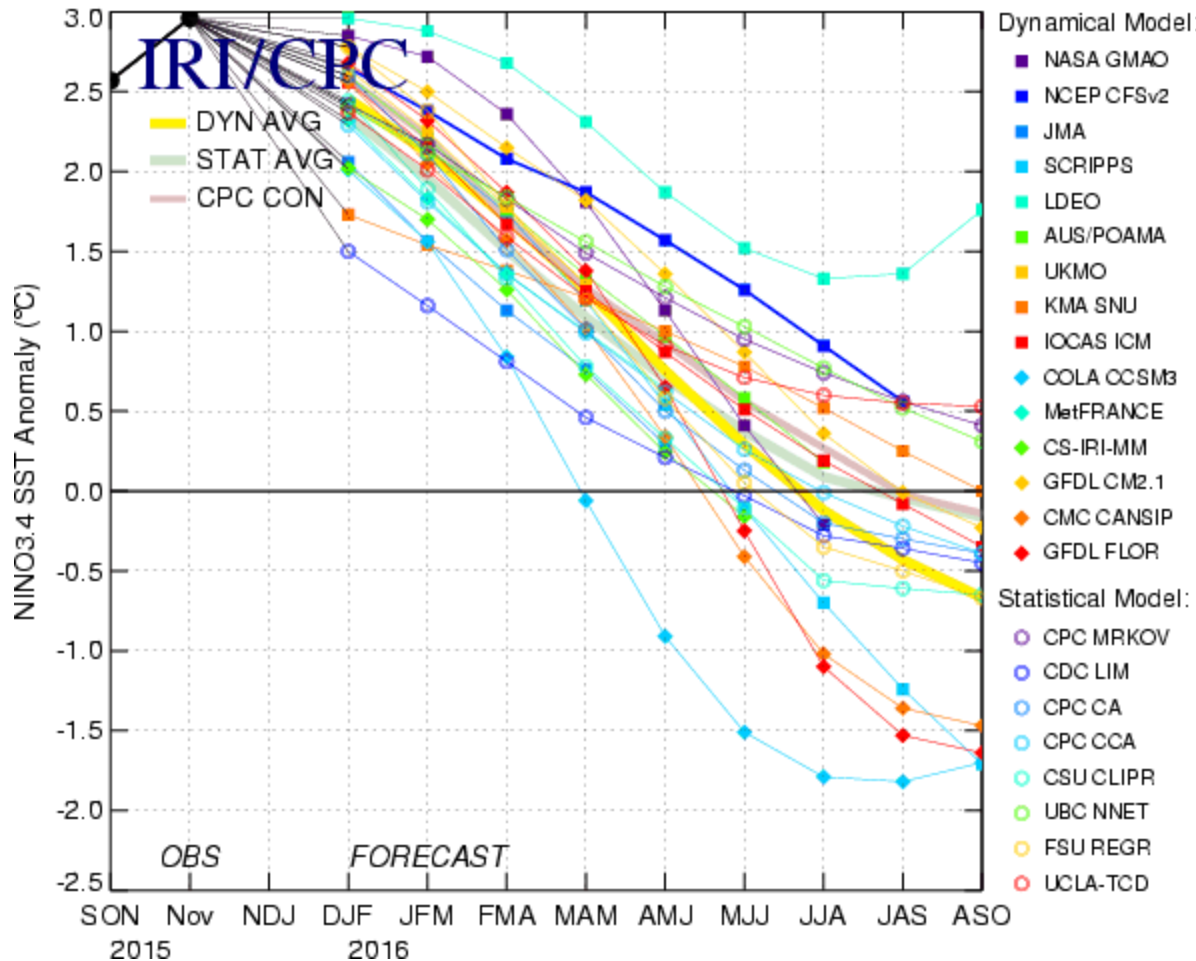
# ENSO Conditions



Sea Surface Temperature Anomalies

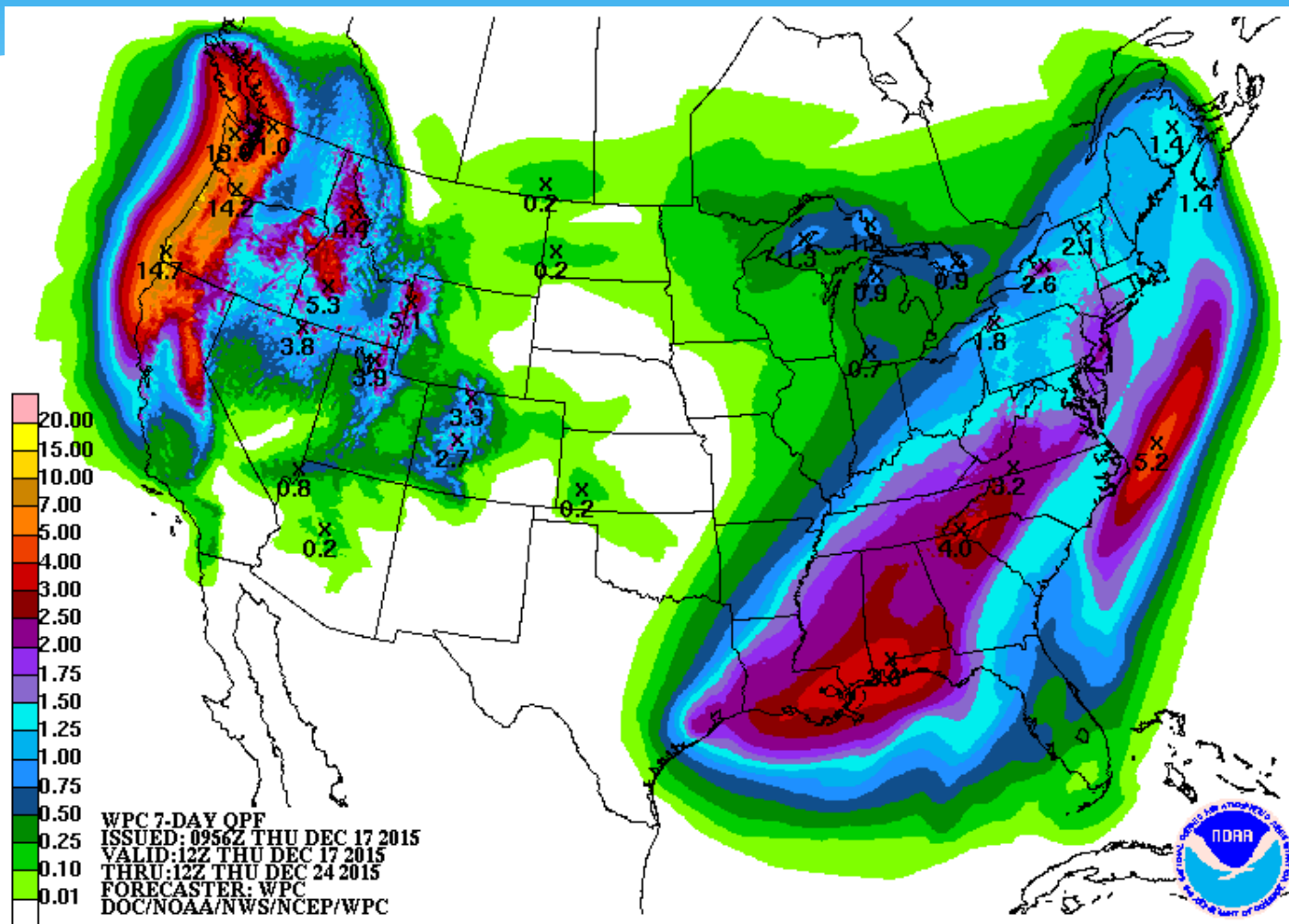
# ENSO Outlook

Mid-Dec 2015 Plume of Model ENSO Predictions



# 7-day Quantitative Precipitation Forecast

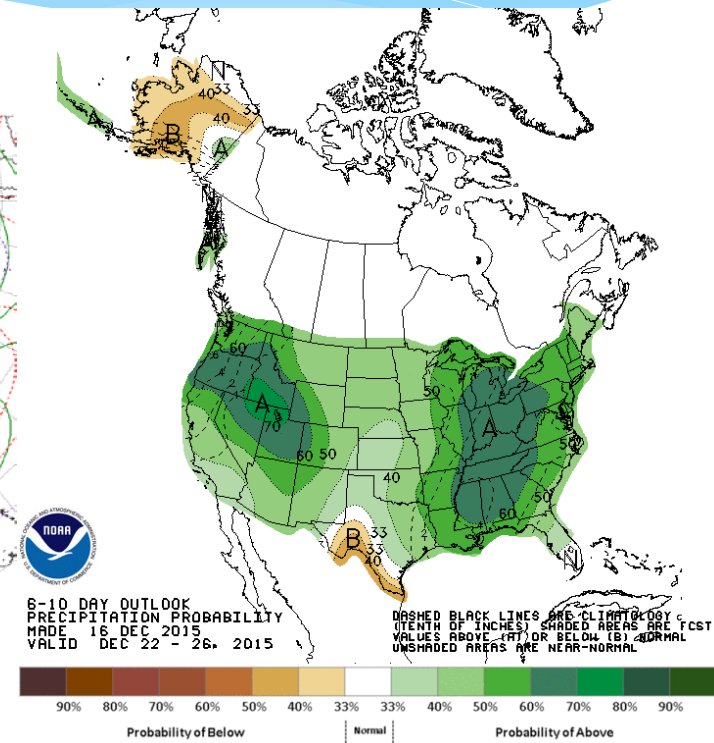
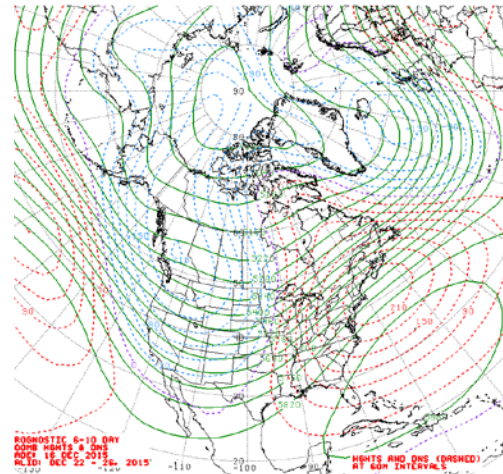
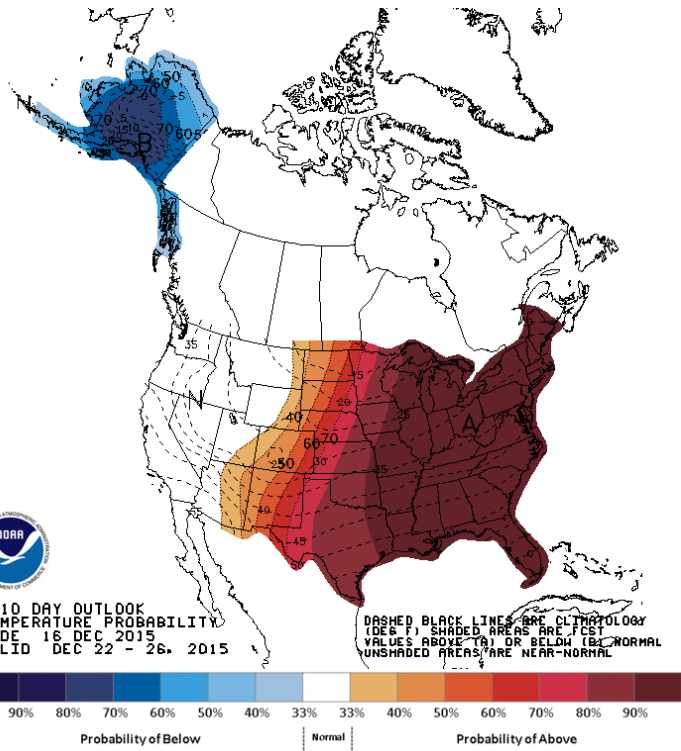
Valid: 7 AM Thu 17 Dec– 7 AM Thu 24 Dec 2015



<http://www.wpc.ncep.noaa.gov/qpf/day1-7.shtml>

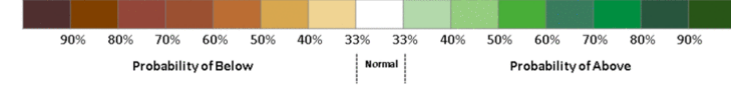
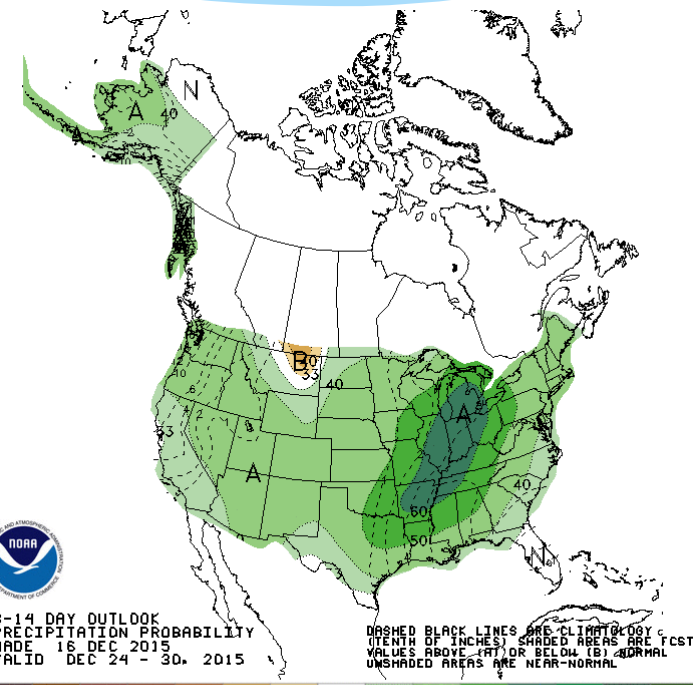
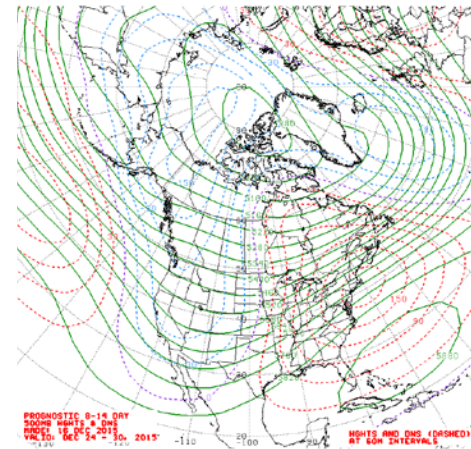
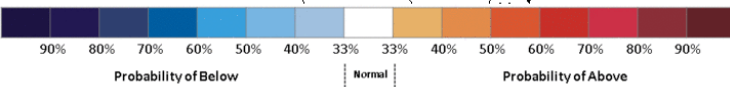
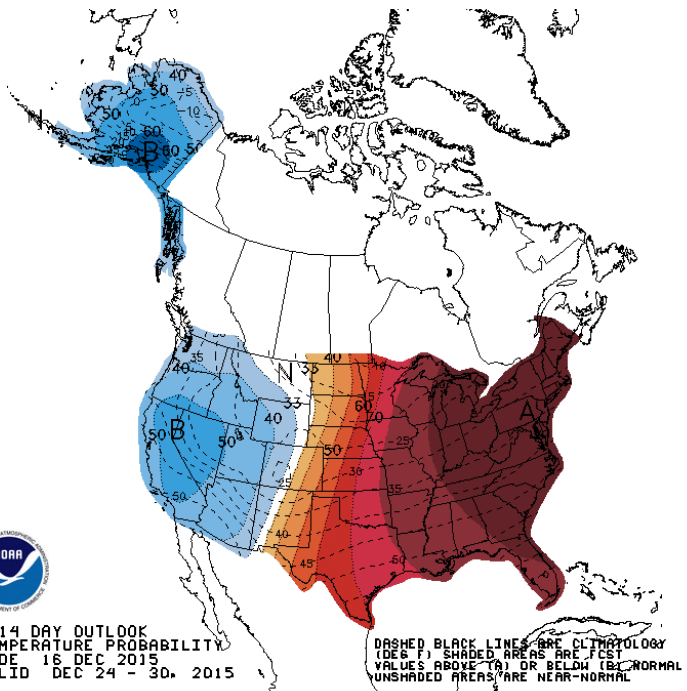
# Temperature and Precipitation Outlook

## 22 – 26 Dec. 2015

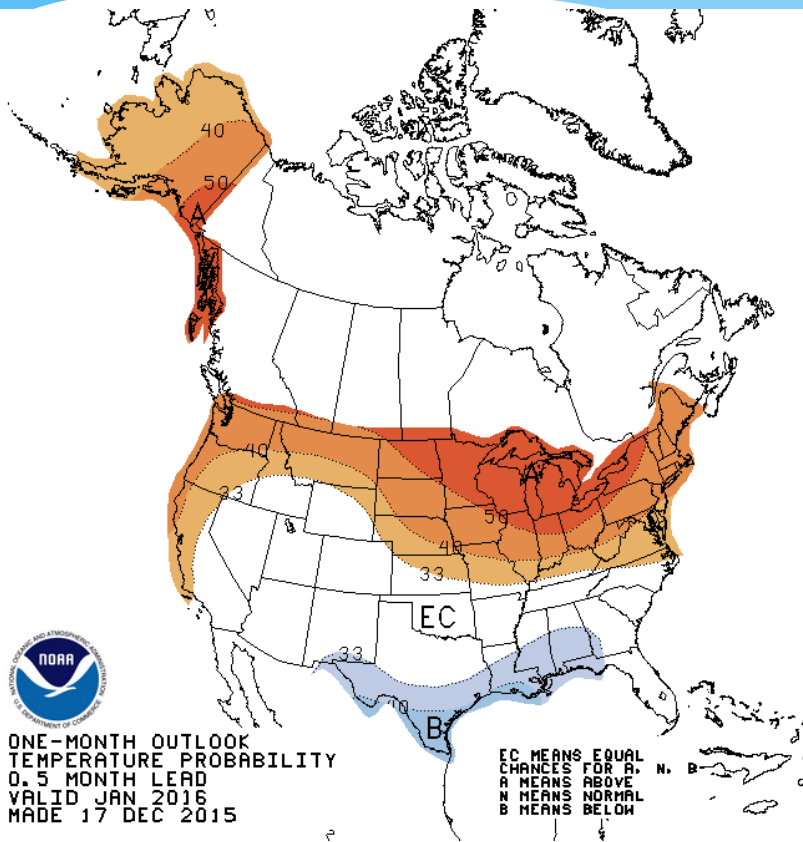


# Temperature and Precipitation Outlook

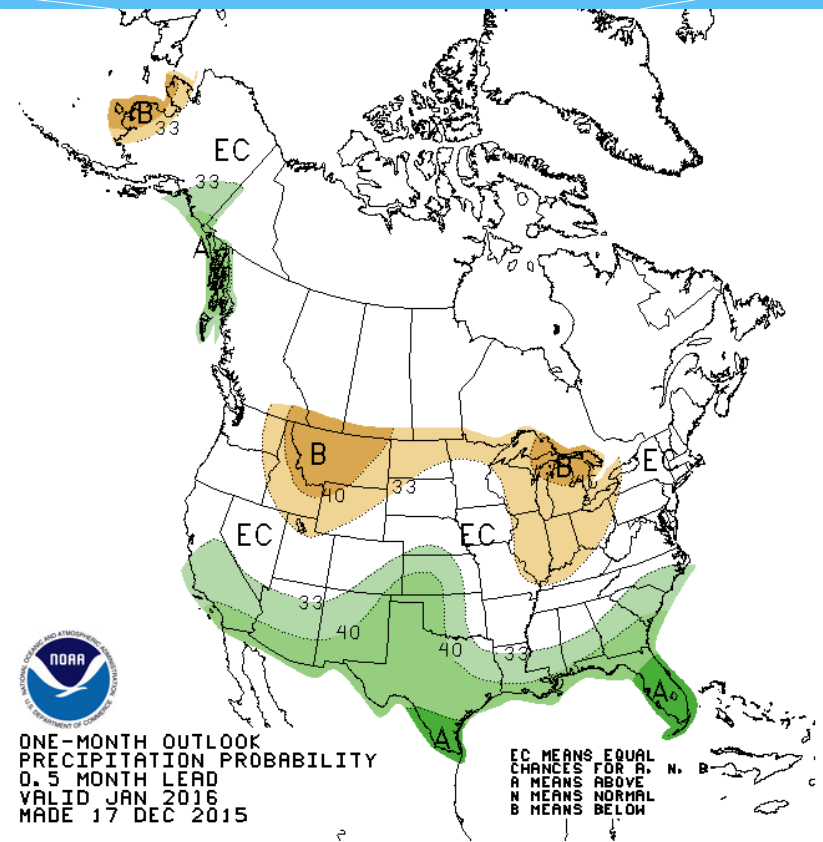
## 24 – 30 Dec. 2015



# Temperature and Precipitation Outlook January 2016



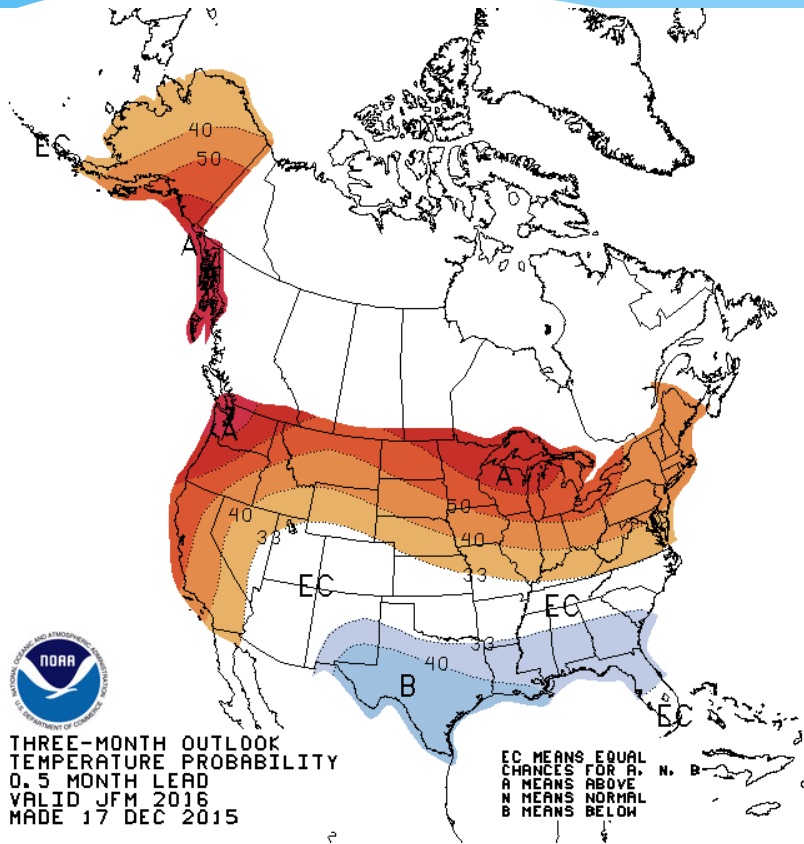
Temperature



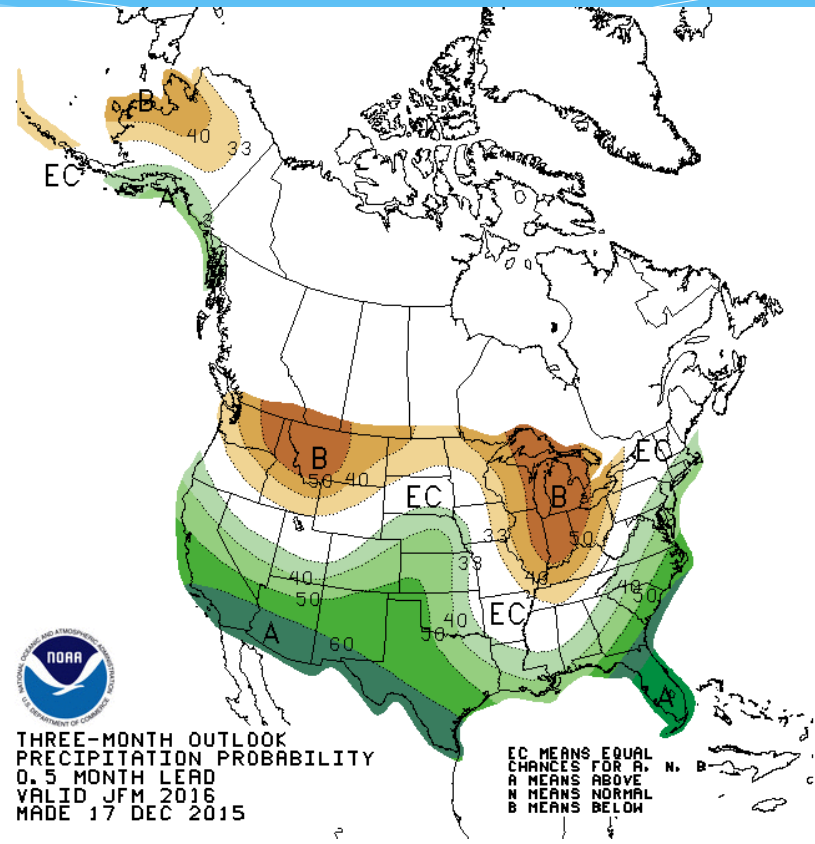
Precipitation

<http://www.cpc.ncep.noaa.gov/products/predictions/30day/>

# Temperature and Precipitation Outlook January-March 2016



Temperature



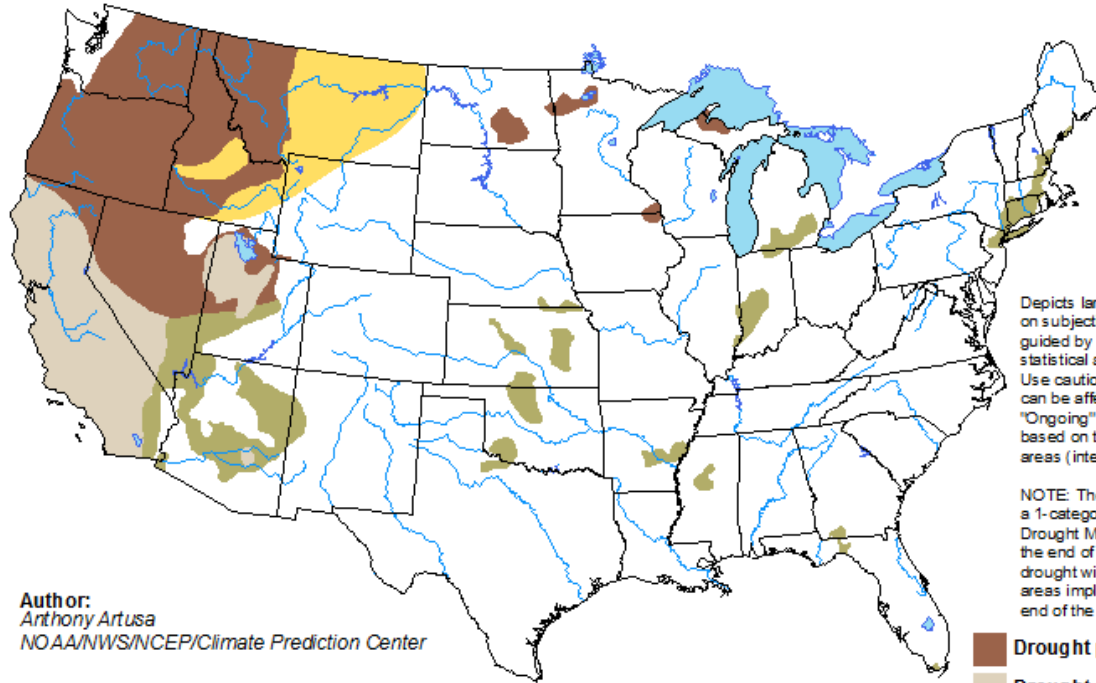
Precipitation

<http://www.cpc.ncep.noaa.gov/products/predictions/90day/>

# Drought Outlook

## 19 Nov. - 29 Feb.





**U.S. Seasonal Drought Outlook** Valid for November 19 - February 29, 2016  
Drought Tendency During the Valid Period Released November 19, 2015

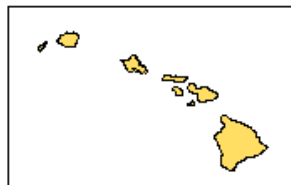
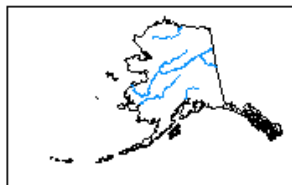


Author:  
Anthony Artusa  
NOAA/NWS/NCEP/Climate Prediction Center

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).

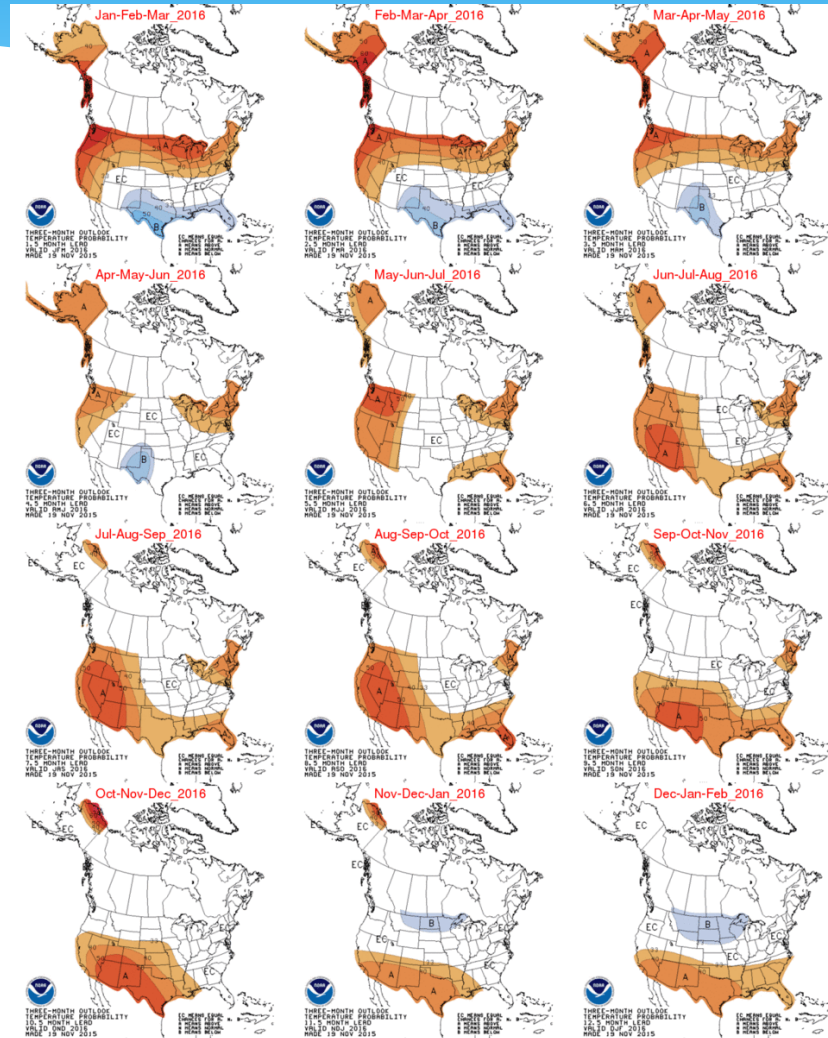
-  Drought persists
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely



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

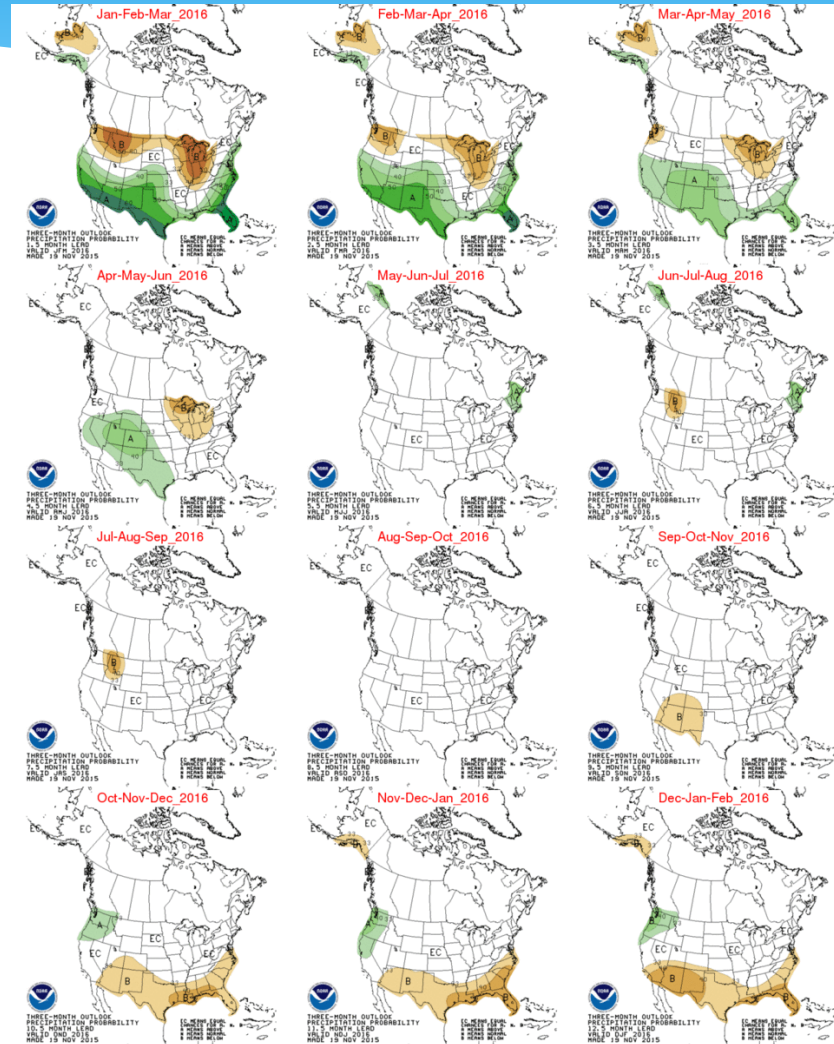


# Seasonal Temperature Outlooks February 2016 - March 2017



# Seasonal Precipitation Outlooks

## February 2016 - March 2017





# Summary

- \* Abnormally mild temperatures have persisted across the region for much of the past 3 months.
- \* An active subtropical jet stream has resulted in an active storm track through the Midwest since October, with above normal precipitation totals over much of the region. Eastern sections of the region remained drier than normal.
- \* The current El Nino event is likely at or near peak strength, with a projected return to neutral conditions by summer 2016 and possibly to La Nina conditions by winter of 2016.
- \* The El Nino event will likely lead to a continuation of milder than normal temperatures and ultimately to drier than normal weather for much of the remainder of the winter and spring of 2016.
- \* Collectively, the outlooks suggest an earlier than normal start to the 2016 growing season. The threat of cold injury to overwintering crops this winter should remain lower than normal given no sudden or severe incursions of Arctic-origin air masses into the region.

## Further Information - Partners

- **Today's and Past Recorded Presentations and :**

- \* <http://mrcc.isws.illinois.edu/webinars.htm>

- <http://www.hprcc.unl.edu>

- NOAA's National Centers for Environmental Information: [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)

- Monthly climate reports (U.S. & Global):  
[www.ncdc.noaa.gov/sotc/](http://www.ncdc.noaa.gov/sotc/)

- NOAA's Climate Prediction Center: [www.cpc.ncep.noaa.gov](http://www.cpc.ncep.noaa.gov)
- Climate Portal: [www.climate.gov](http://www.climate.gov)
- U.S. Drought Portal: [www.drought.gov](http://www.drought.gov)
- National Drought Mitigation Center: <http://drought.unl.edu/>
- State climatologists
  - \* <http://www.stateclimate.org>
- Regional climate centers
  - \* <http://mrcc.isws.illinois.edu>
  - \* <http://www.hprcc.unl.edu>

# Thank You and Questions?

- \* Questions:

- \* **Climate:**

- \* Jeff Andresen: [andresen@msu.edu](mailto:andresen@msu.edu) , 517-432-4756

- \* Doug Kluck: [doug.kluck@noaa.gov](mailto:doug.kluck@noaa.gov), 816-994-3008

- \* John Eise: [john.eise@noaa.gov](mailto:john.eise@noaa.gov), 816-268-3144

- \* Mike Timlin: [mtimlin@illinois.edu](mailto:mtimlin@illinois.edu); 217-333-8506

- \* Natalie Umphlett: [numphlett2@unl.edu](mailto:numphlett2@unl.edu) ; 402 472-6764

- \* Brian Fuchs: [bfuchs2@unl.edu](mailto:bfuchs2@unl.edu) 402 472-6775

- \* **Weather:**

- \* [crhroc@noaa.gov](mailto:crhroc@noaa.gov)