Midwest/Great Plains Climate-Drought Outlook

20 July 2017

Drought-damaged wheat, Beulah, ND July 2017.
Photo: Nicole Wardner, NDSU Extension Service.

Flooding along I-70, Licking County, Ohio on July 14, 2017.
Photo courtesy of Ohio DOT, Aaron Wilson, OSU.

Jeff Andresen and Adnan Akyüz

Michigan State University

North Dakota State University

MICHIGAN STATE UNIVERSITY

NDSU NORTH DAKOTA STATE UNIVERSITY FARGO

National Drought Mitigation Center

REGIONAL CLIMATE CENTERS

AASC AMERICAN ASSOCIATION OF STATE CLIMATOLOGISTS

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

USDA United States Department of Agriculture Midwest Climate Hub

General Information

- **Providing climate services to the Central Region**
  - Collaboration Activity Between:
    - NOAA NCEI/NWS/OAR/NIDIS/CPC
    - USDA Climate Hubs
    - American Association of State Climatologists
    - Midwest and High Plains Regional Climate Centers
    - National Drought Mitigation Center

- **Next Regular Climate/Drought Outlook Webinar**
  - August 17, 2017 (1 PM CST) Brian Fuchs, National Drought Mitigation Center, Lincoln, NE
- **Access to Future Climate Webinars and Related Information**
- www.drought.gov/drought/content/regional-programs/regional-drought-webinars
- **Access to Past Climate Webinars**
- *mrcc.isws.illinois.edu/multimedia/webinars.jsp*
- *www.hprcc.unl.edu/webinars.php*

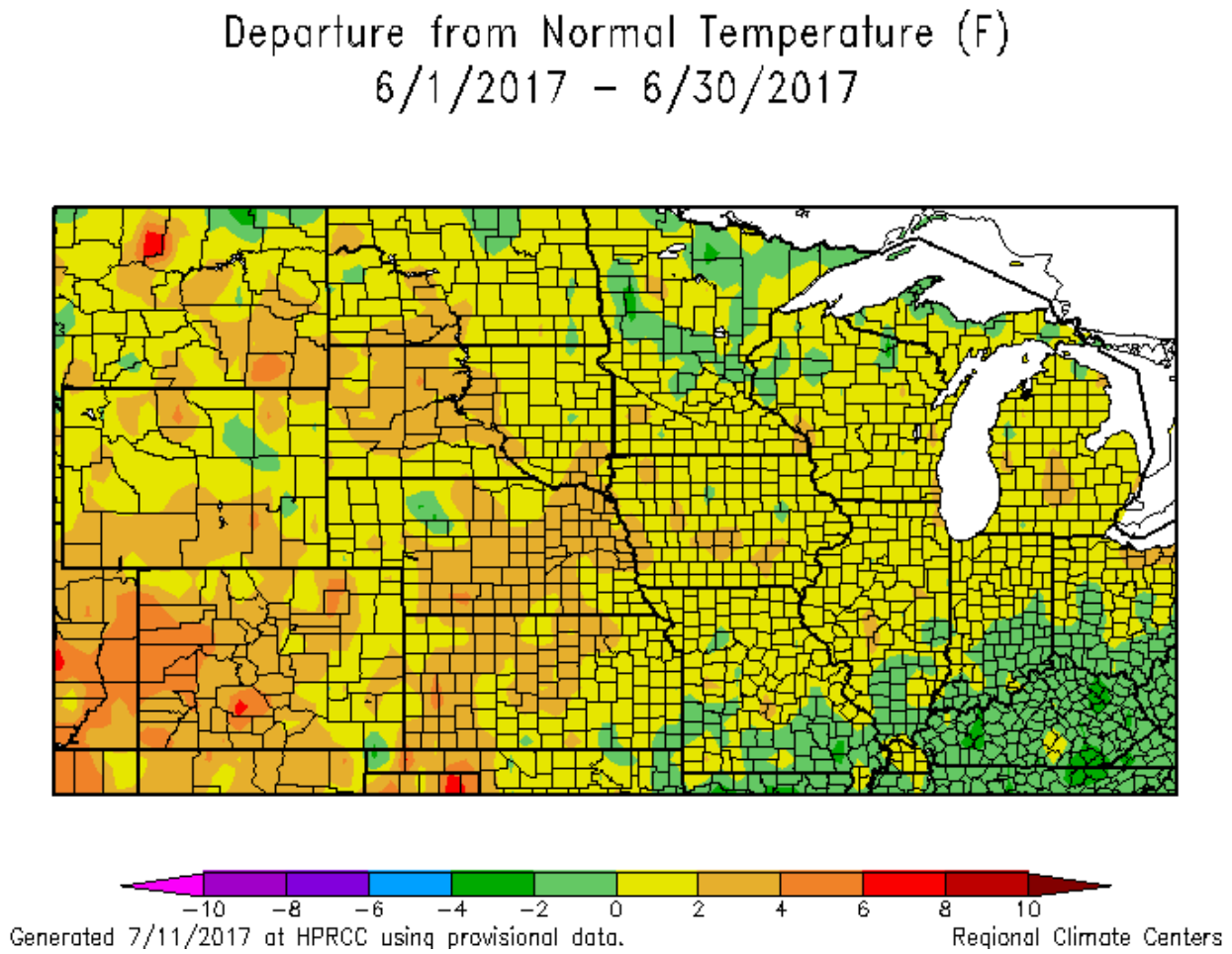
Agenda

* Current/Recent Past Conditions
* Regional Impacts
  * General
  * Agricultural
* Update on Northern Great Plains Drought
* Outlooks
* Questions

Current/Recent Past Conditions

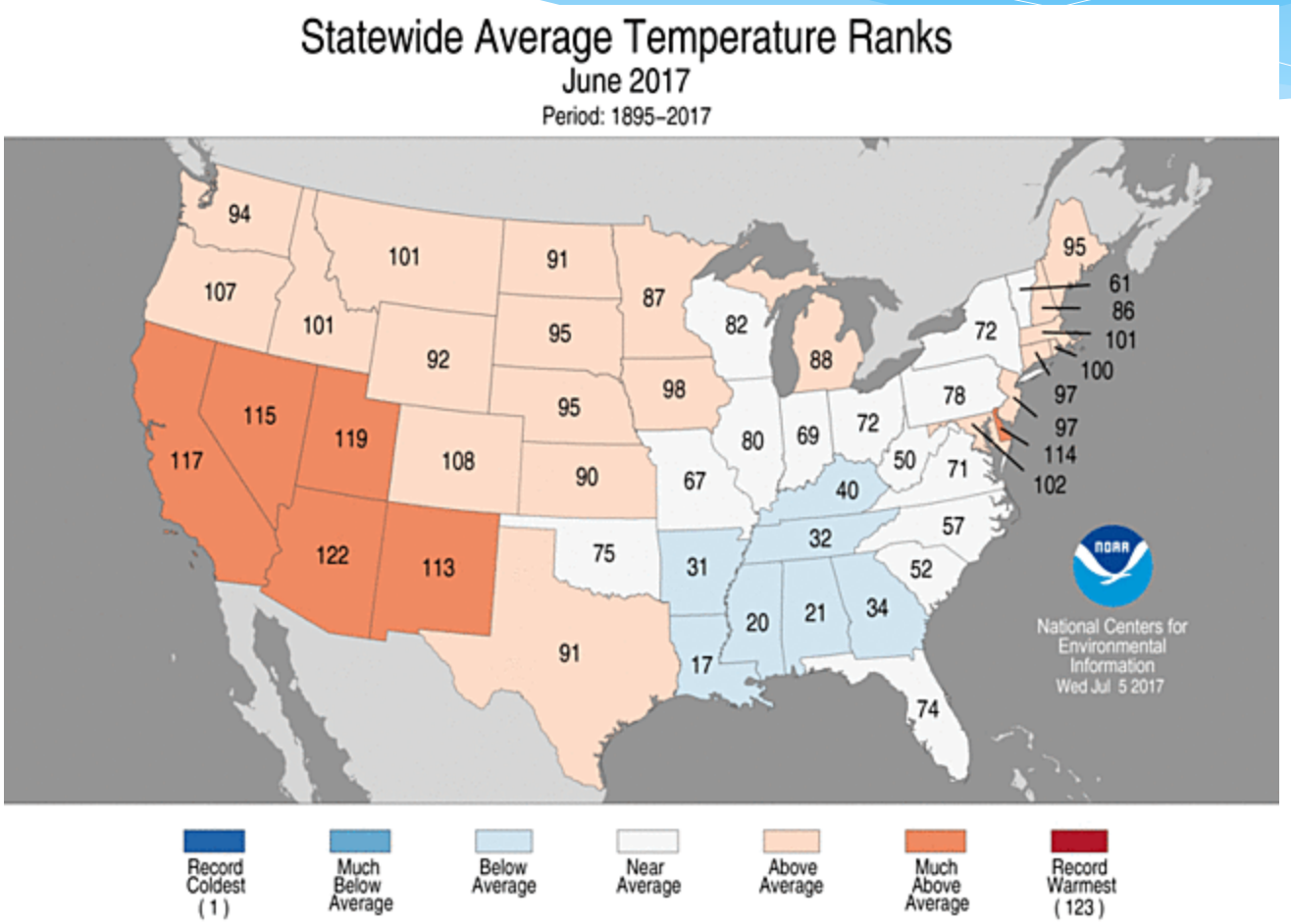
June Temperature Recap

Generally normal to above normal temperatures across the region. Greatest positive departures were observed in western sections.



https://hprcc.unl.edu/maps.php?map=ACISClimateMaps

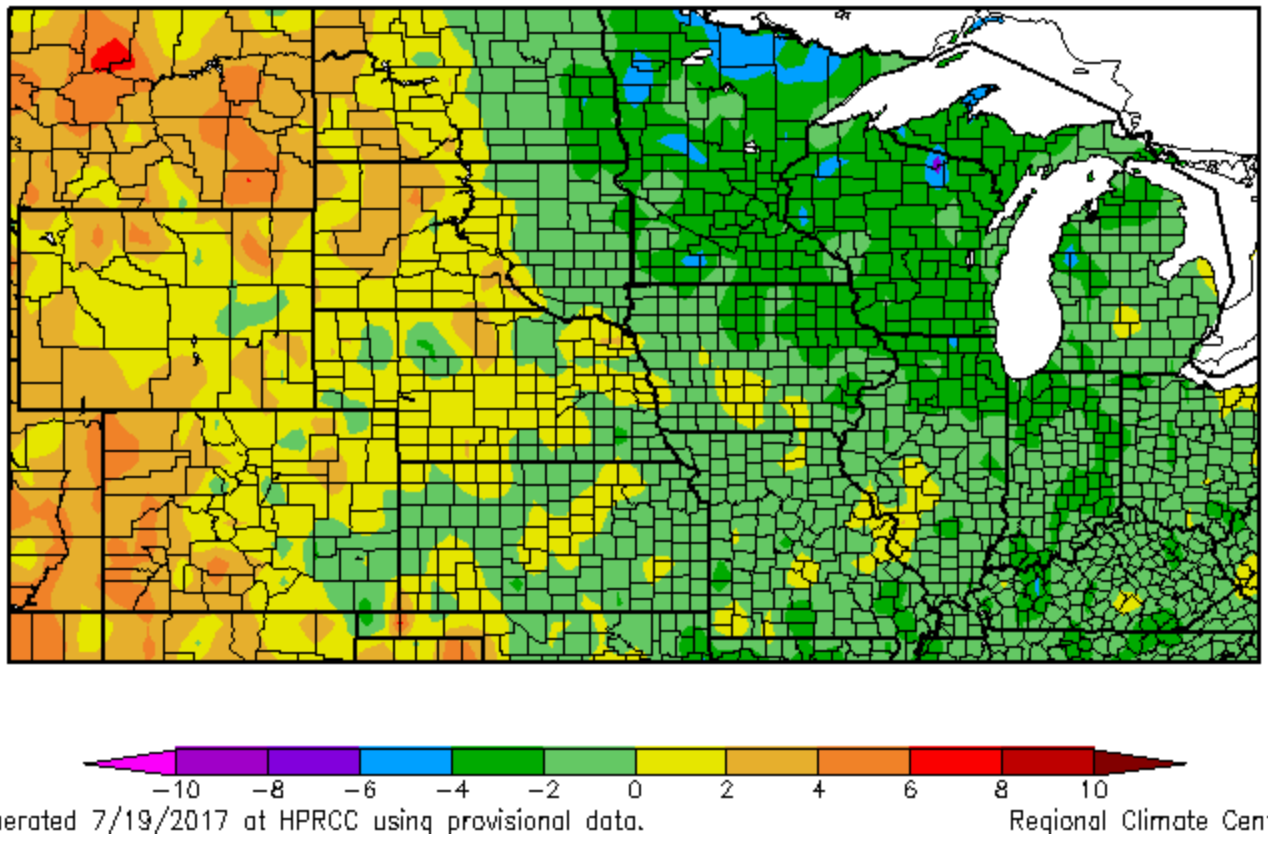
June Temperature Recap



http://www.ncdc.noaa.gov/temp-and-precip/us-maps/

Recent Temperature Departures 6/19 -7/18 2017

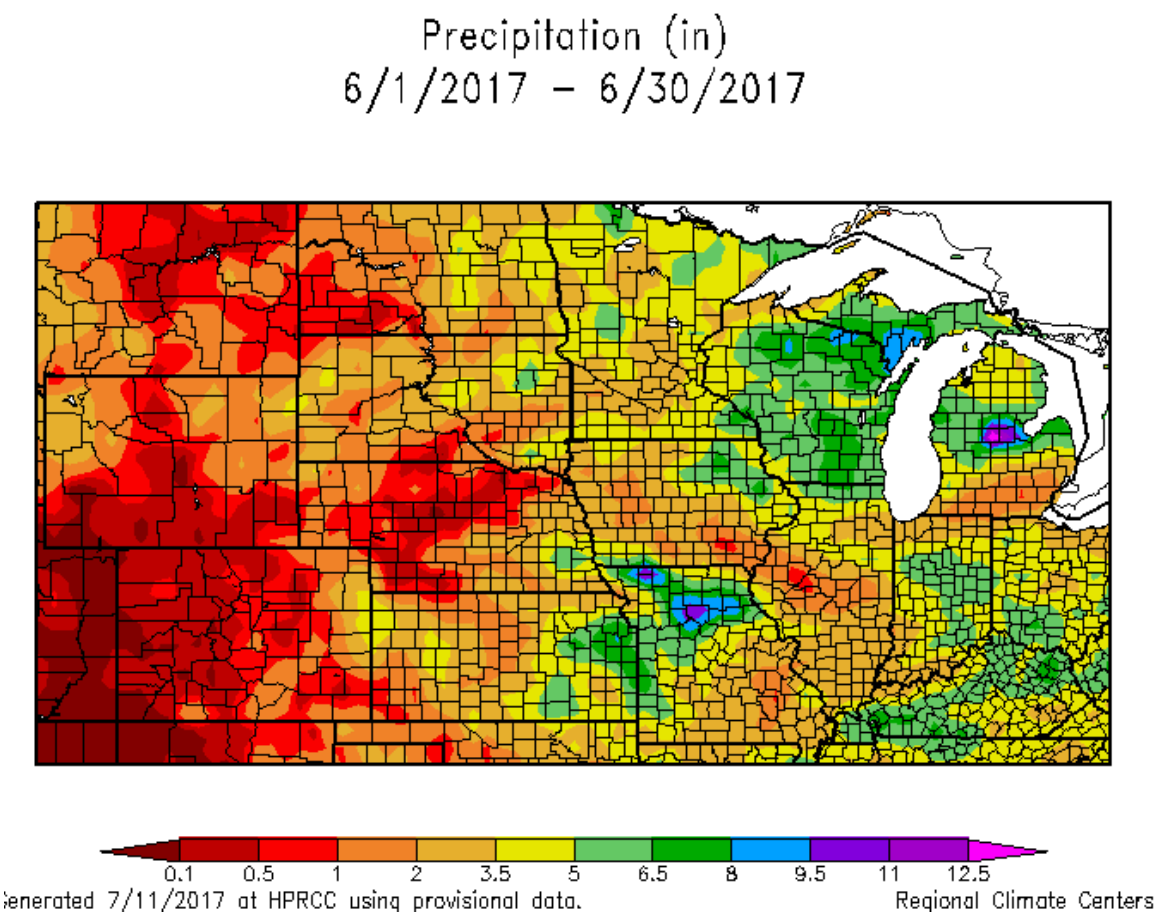
Cooler than normal recently across central, eastern sections

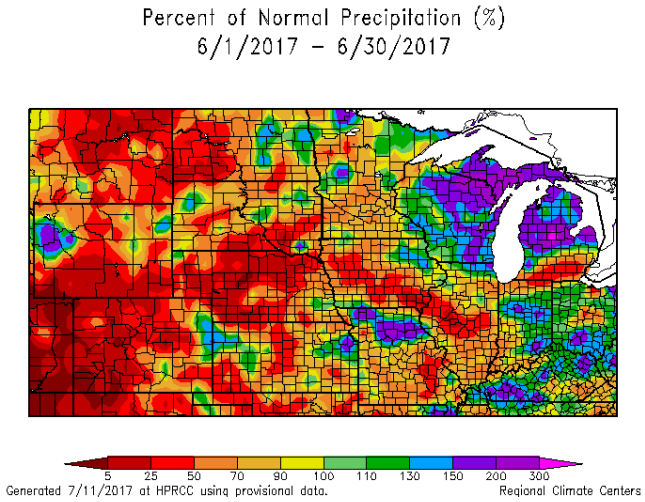


https://hprcc.unl.edu/maps.php?map=ACISClimateMaps

June Precipitation Recap

Highly variable totals across region ranging from much above normal in central and eastern sections to much below normal west.





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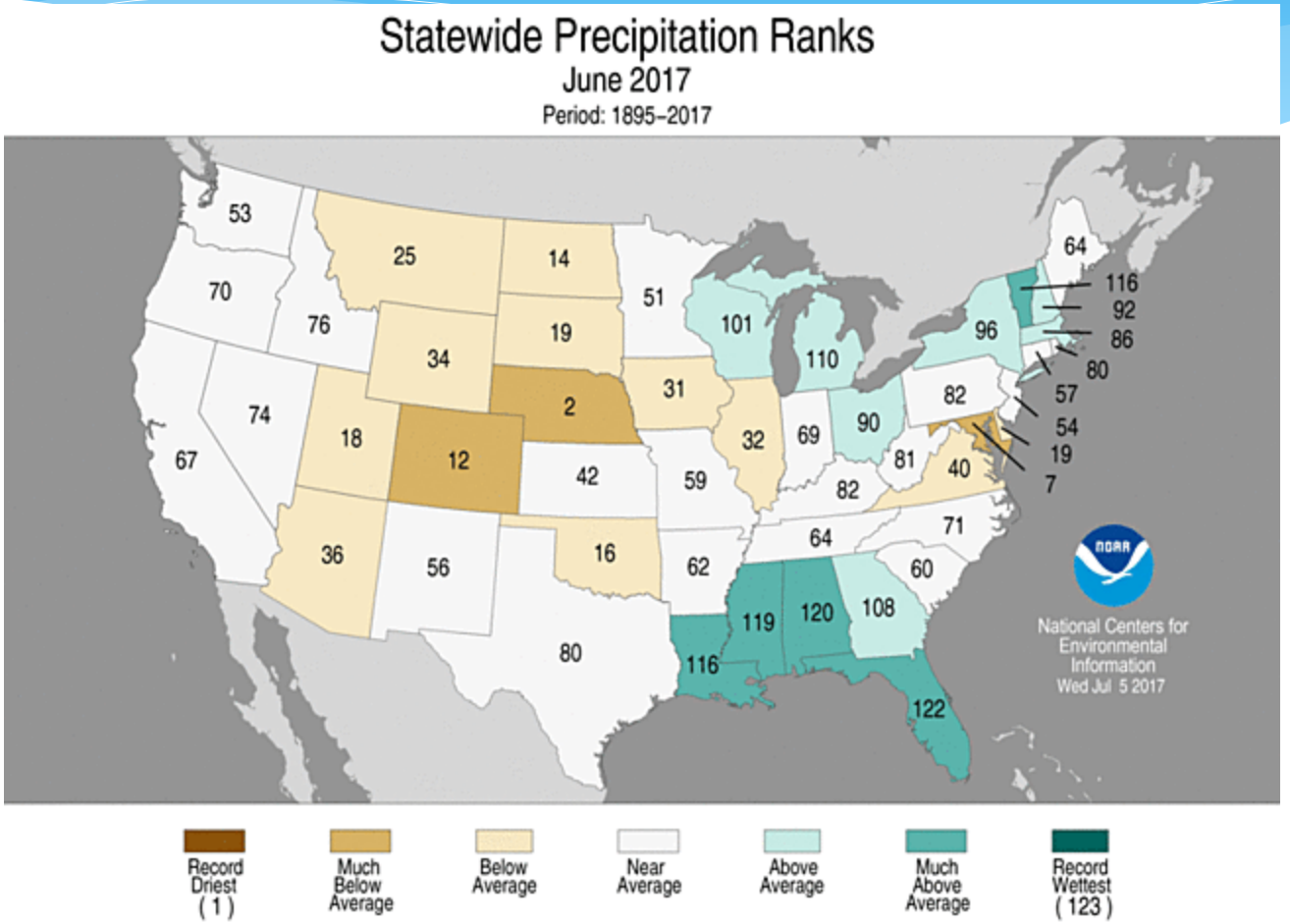
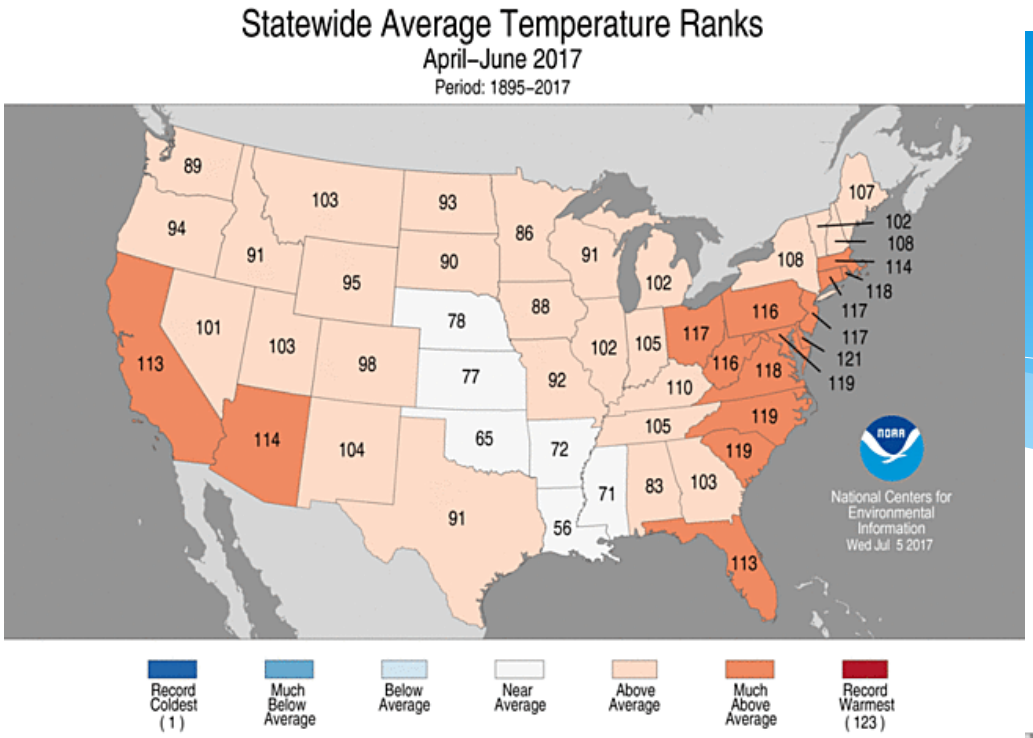
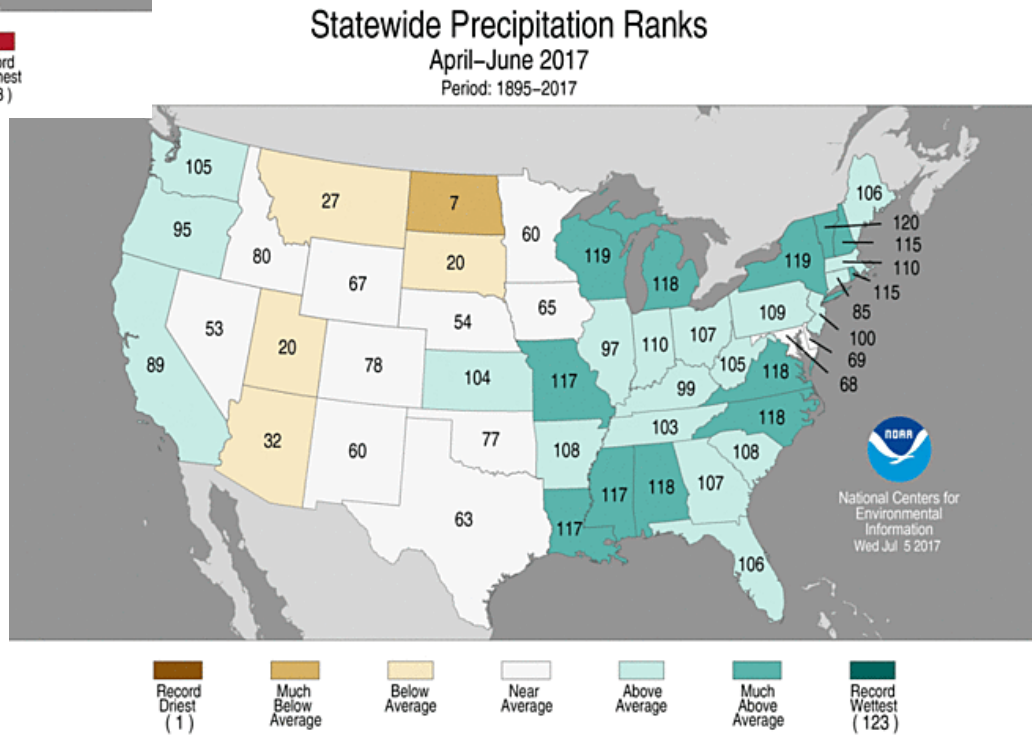
June Precipitation Recap



http://www.ncdc.noaa.gov/temp-and-precip/us-maps/

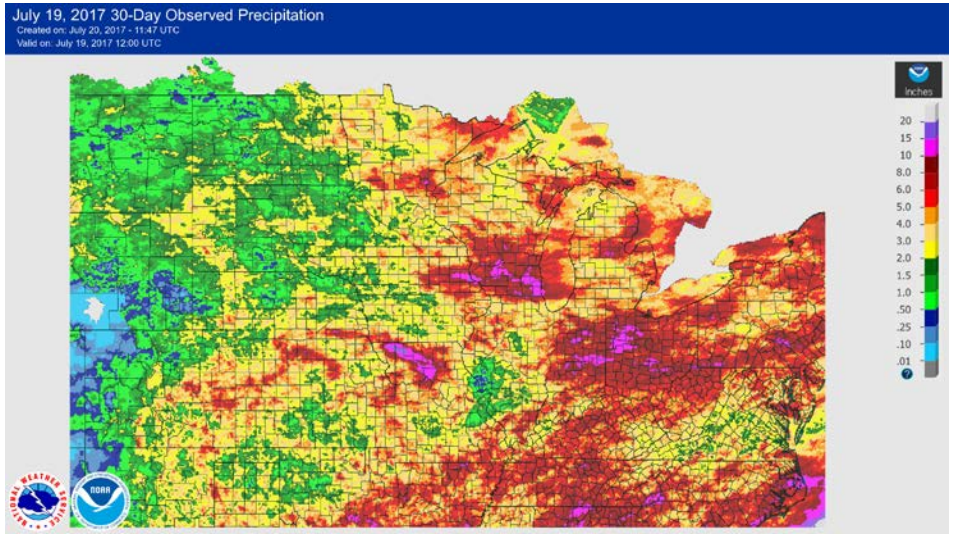
3-month temperature and precipitation ranks

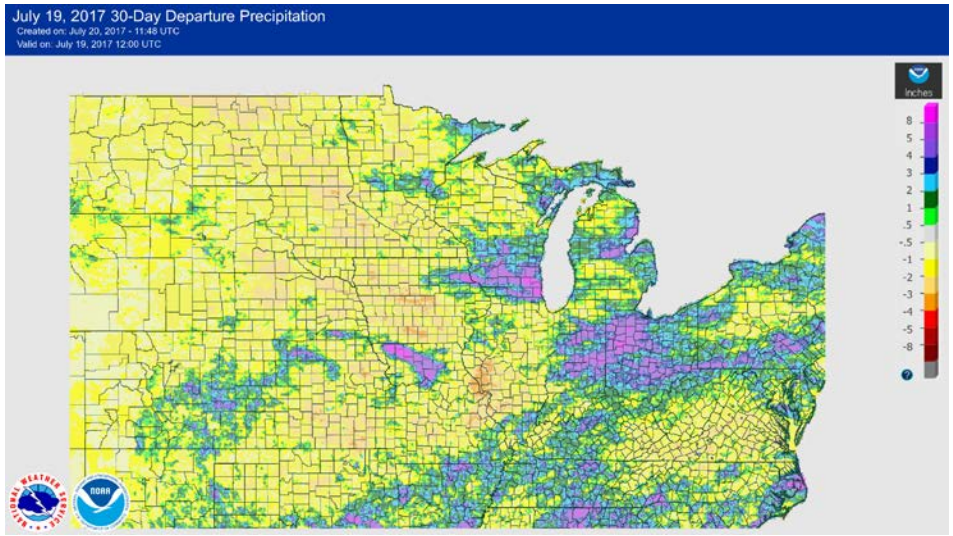


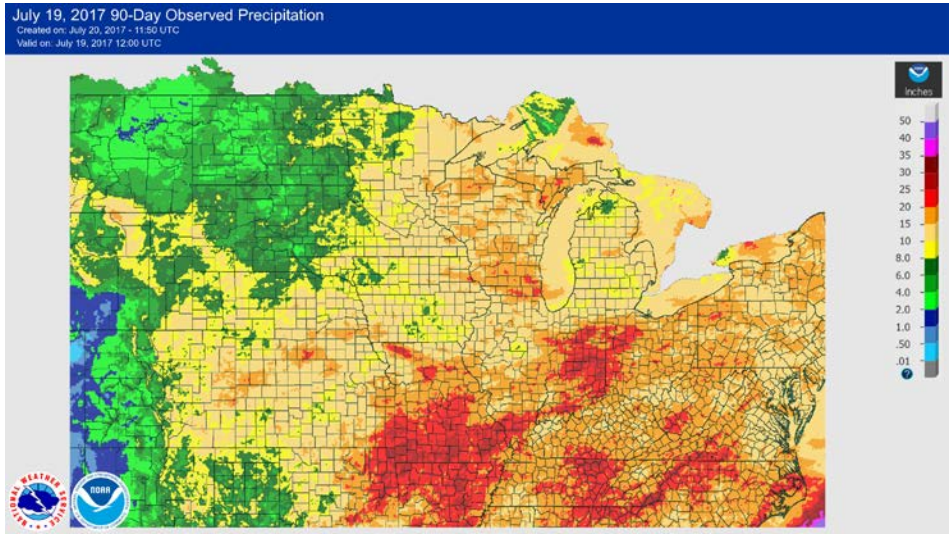


http://www.ncdc.noaa.gov/temp-and-precip/us-maps/

Most recent 30 and 90-day precipitation







http://water.weather.gov/precip/index.php

Impacts

Flooding following heavy rains, Saginaw Township, MI, June 24, 2017.
Photo courtesy of Tori Schneider, mlive.com.

Impacts

* Highly variable rainfall during the past several weeks has resulted in a wide range of impacts ranging from flooding across portions of the Great Lakes and Ohio Valley to severe drought in the northern Great Plains.

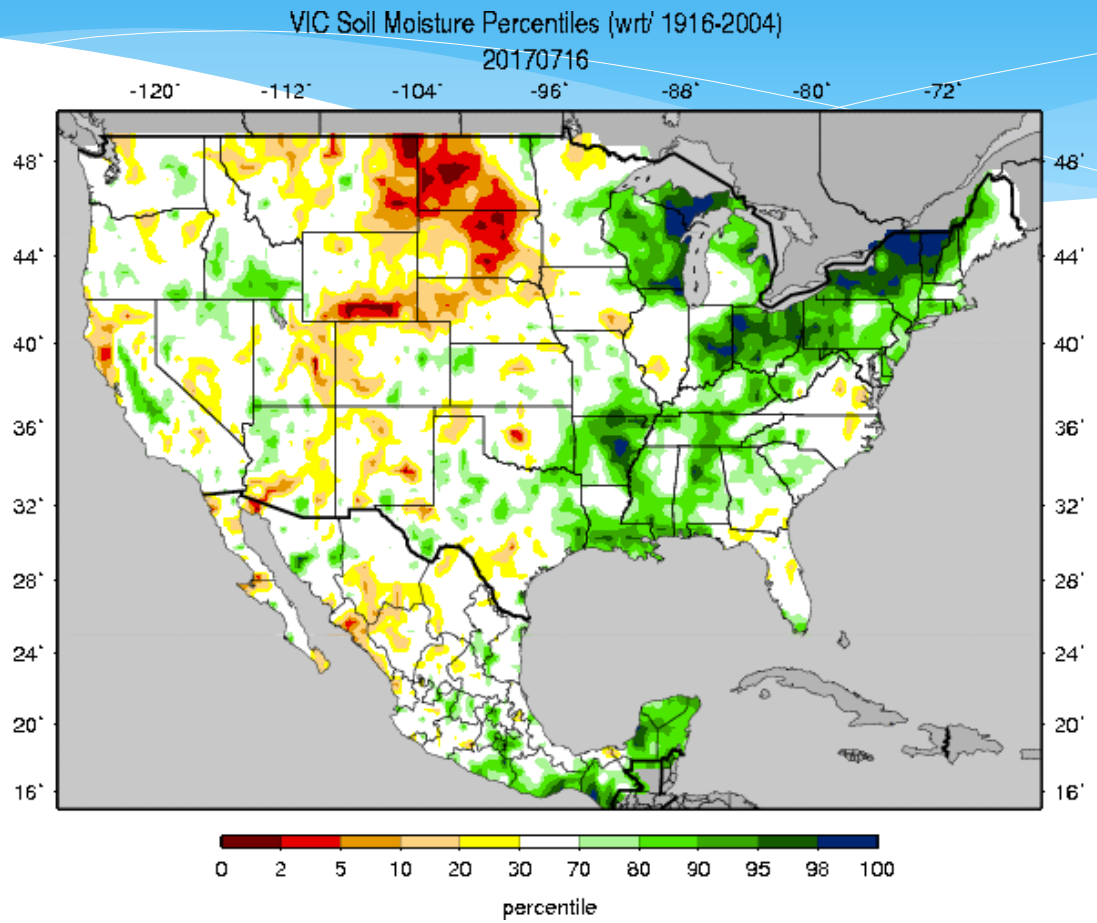
* Regional impacts involving heavy rains and flooding include:
  * Flash flooding and across sections of SE Wisconsin and NE Illinois, July 11 - July 12. Record crests on the Fox and Des Plaines Rivers. Six Flags Great America in Gurnee, IL was forced to close and Amtrak suspended service between Chicago and Milwaukee. Flash flooding claimed the life of a 6-year old boy in Galveston, IN.
  * Flooding near Buckeye Lake/Licking County in Central Ohio on July 14th. Many communities were inundated. The Blanchard River recorded its fifth highest crest on record in Findlay, Ohio on July 14.
  * Widespread flooding across sections of central Lower Michigan on the 24th of June (15.03" of precipitation for June at Mt. Pleasant, the second wettest month on record at that location).

* Agricultural impacts include:
  * Increasing levels of drought stress for annual and perennial crops and rangeland across much of the northern Great Plains.
  * Persistent heavy rains across eastern sections of the region led to flooding and prolonged fieldwork delays which necessitated replanting in some areas. Weed pressure is greater than normal.
  * The heavy rain also led to delays in forage and winter wheat harvest. In general, crop growth and development in wet areas has been slower than normal.

Soil Moisture

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

Soils in some central sections have dried out rapidly during the last few weeks.

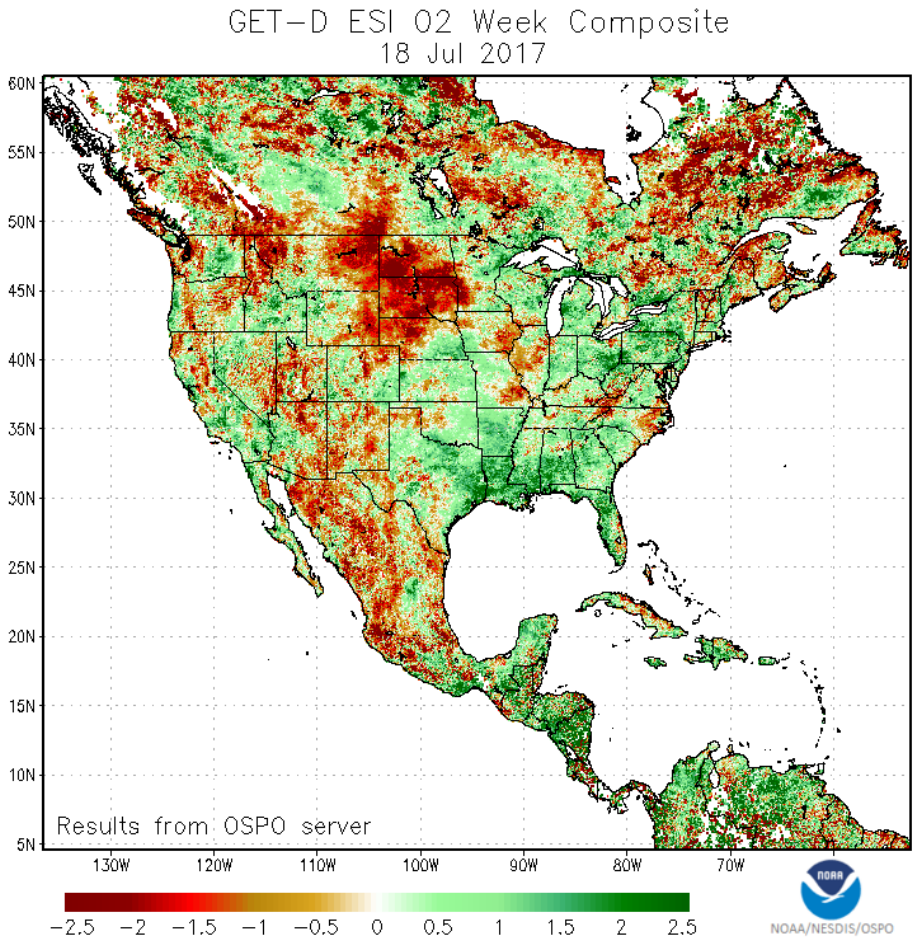


Soil Moisture Anomaly in millimeters

http://www.emc.ncep.noaa.gov/mmb/nldas/drought/

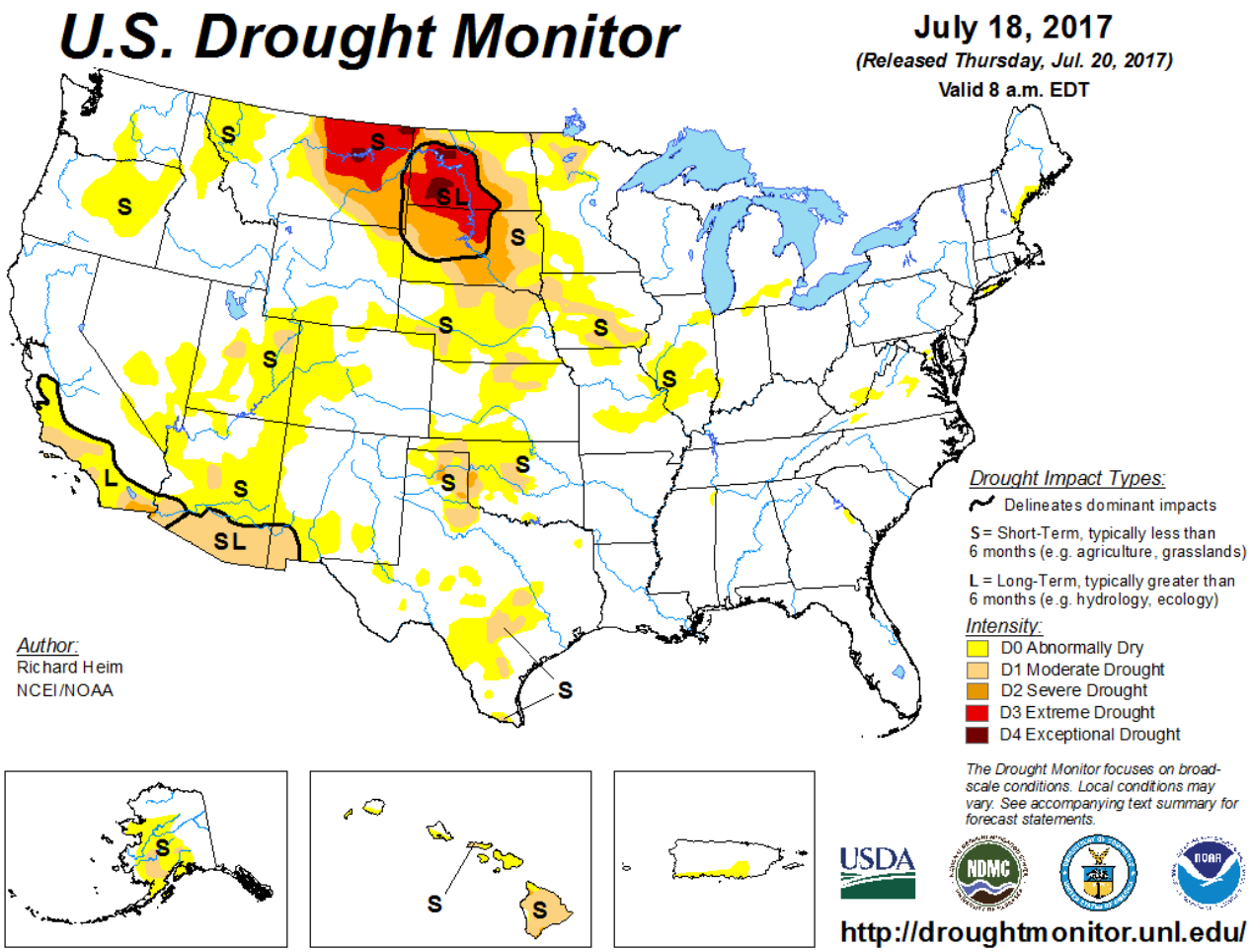
Evaporative Stress Index

General conditions: Low stress Great Lakes, Ohio Valley, high stress northern Great Plains. Increasing levels in central Corn Belt

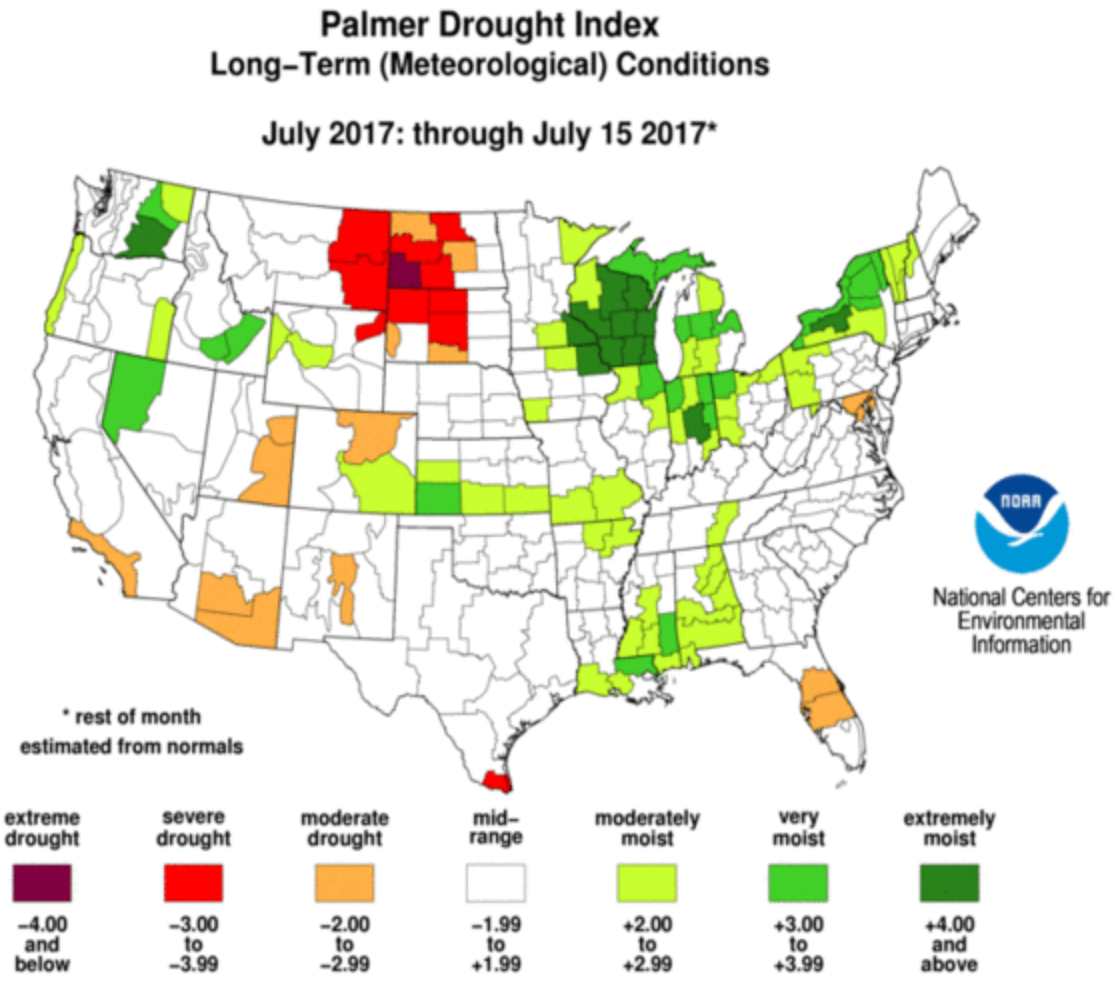


http://hrsl.arsusda.gov/drought/

US Drought Monitor

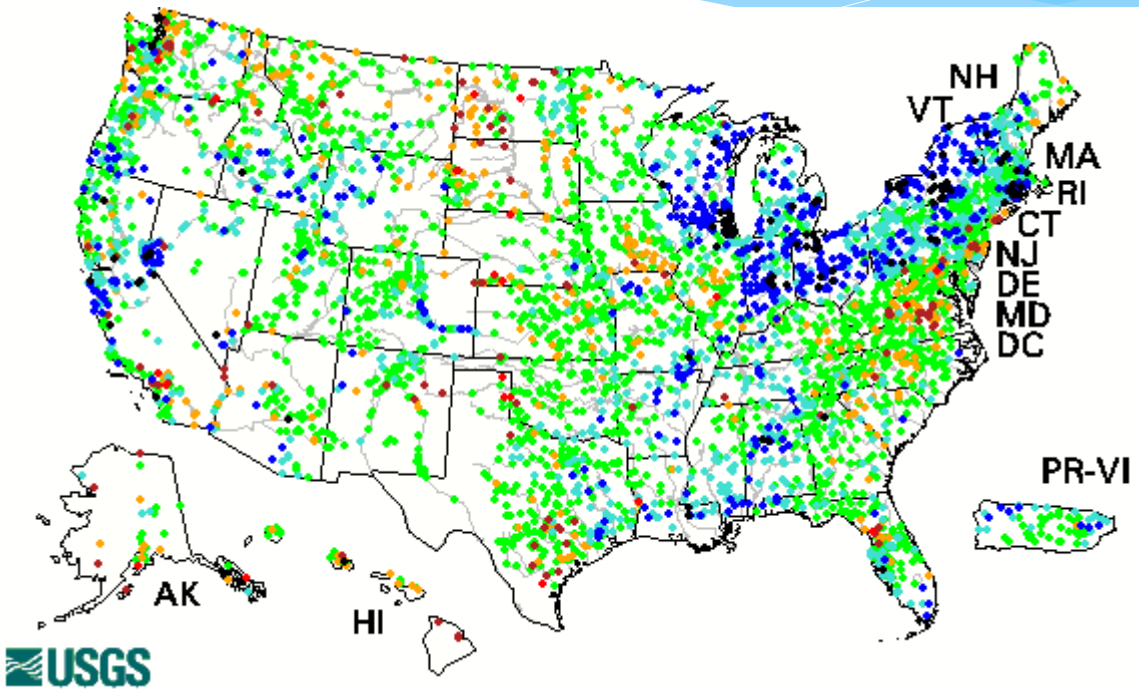


Palmer Drought Severity Index



http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

7-Day Average Streamflow

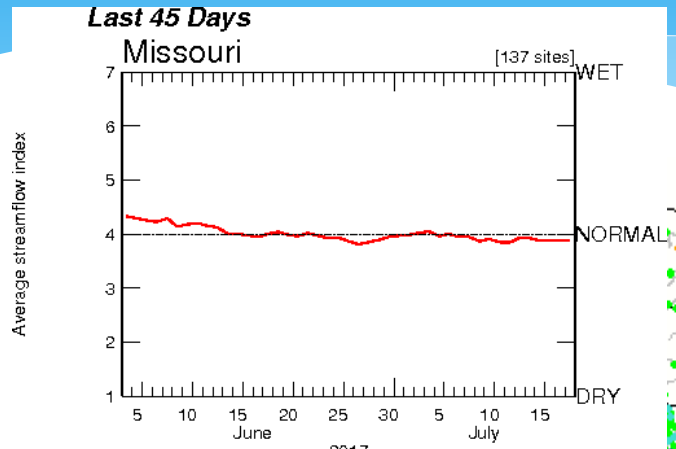


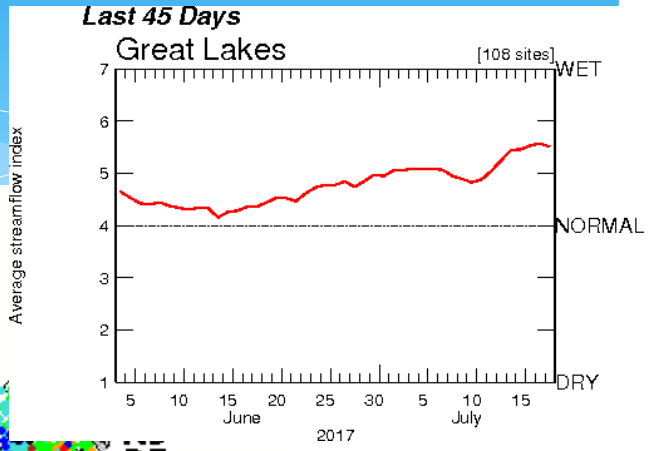
Tuesday, 18 July 2017
Streamflow above normal Great Lakes to below normal northern Great Plains

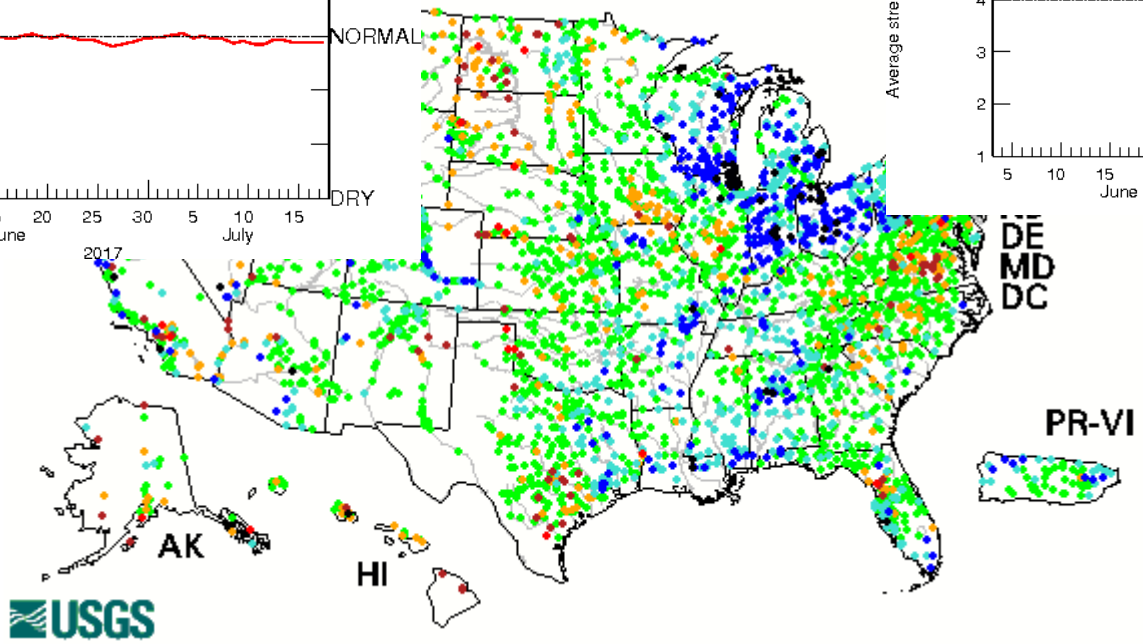
Explanation - Percentile classes						
Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	

http://waterwatch.usgs.gov/index.php?id=pa07d

7-Day Average Streamflow







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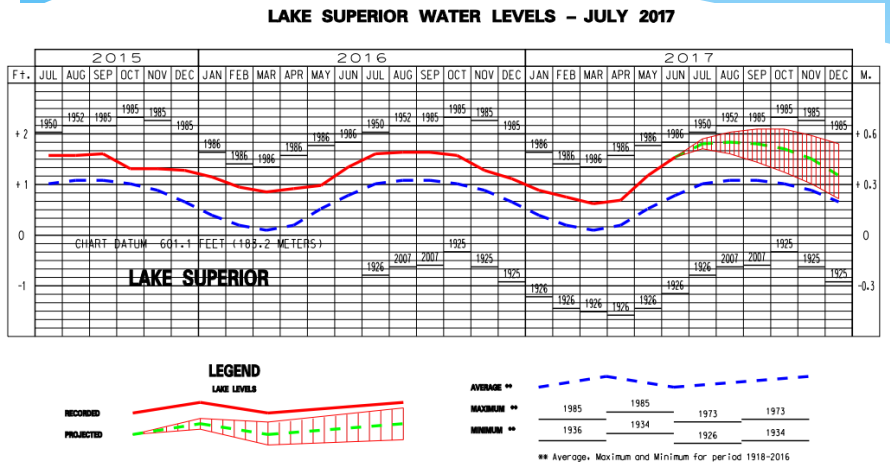
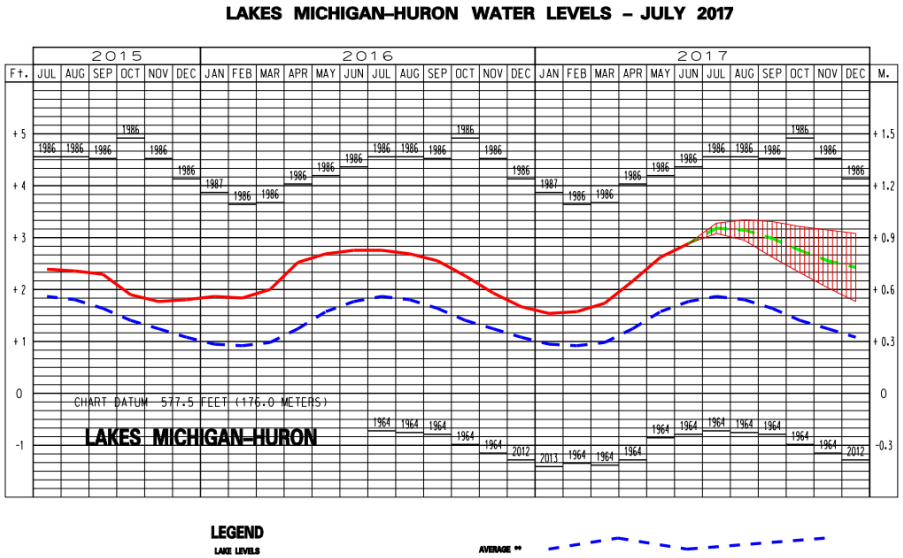
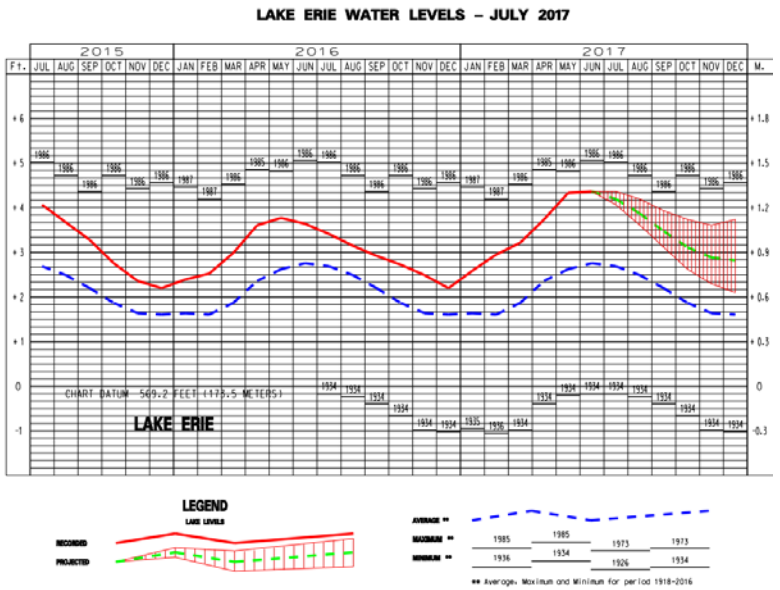
Great Lakes Water Levels



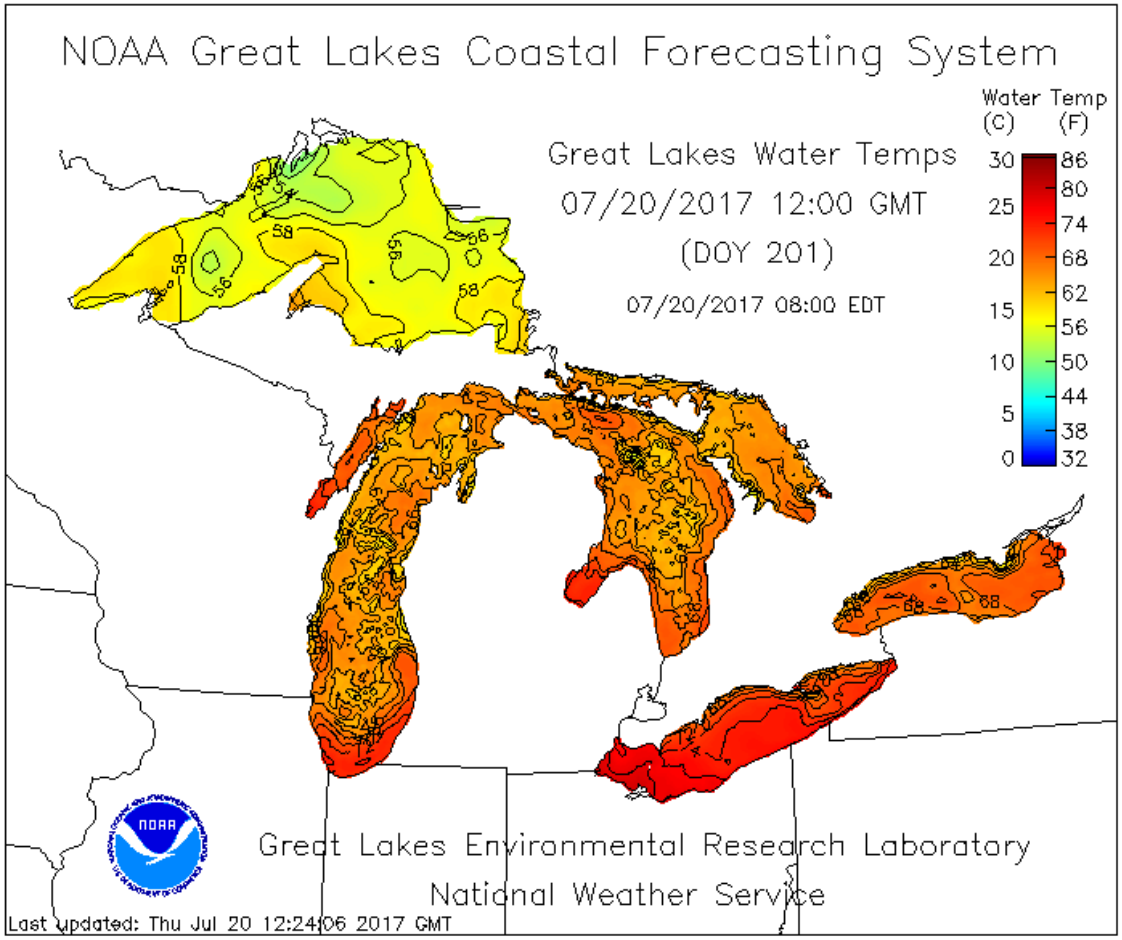


- Still well above long term normals



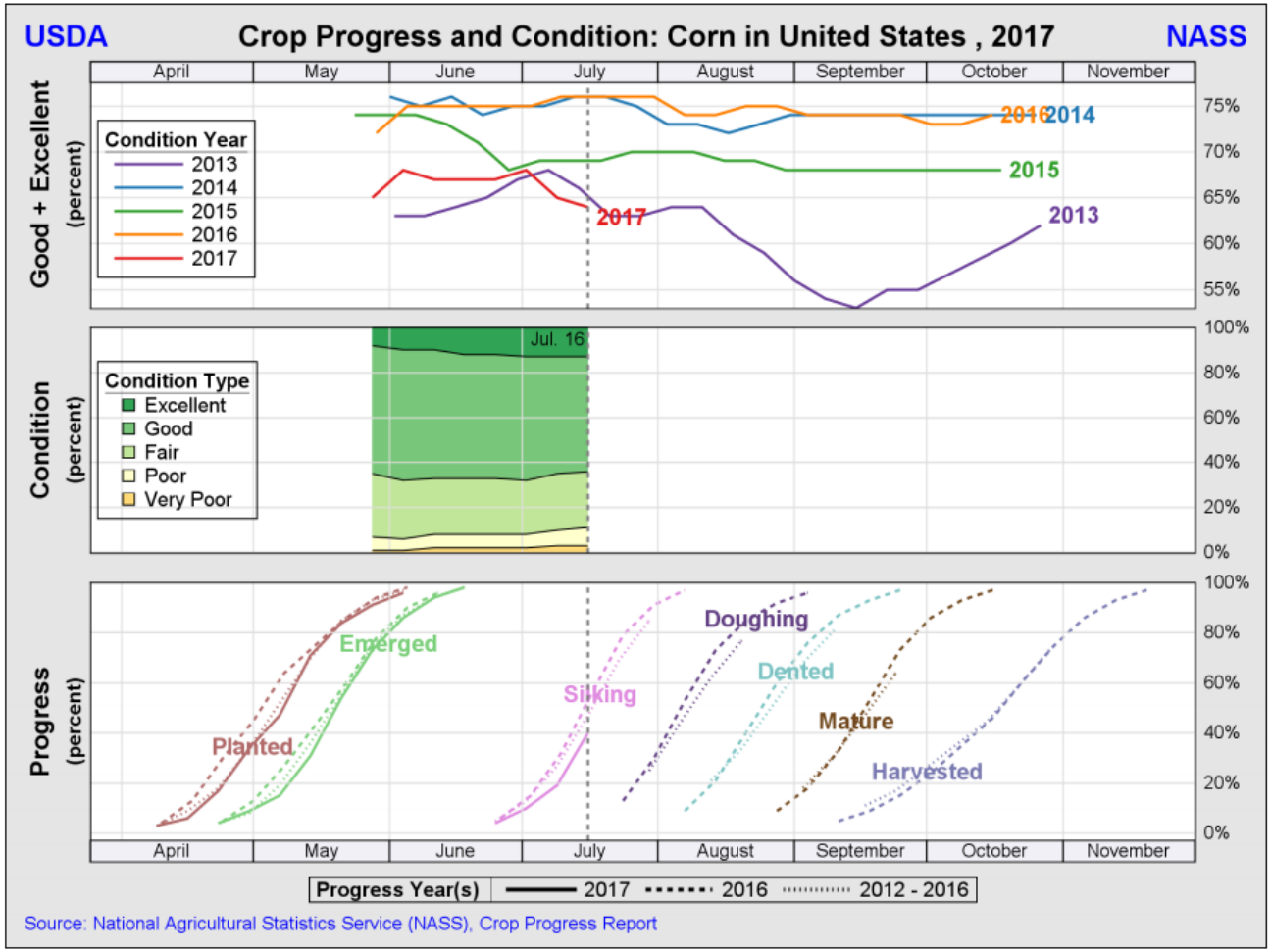
Source: http://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Water-Levels/Water-Level-Forecast/Monthly-Bulletin-of-Great-Lakes-Water-Levels/

Great Lakes Temperatures



https://www.glerl.noaa.gov//res/glcfs/glcfs.php?lake=l&ext=swt&type=N&hr=00

Crop Progress and Condition: Corn



http://www.nass.usda.gov/Charts_and_Maps/Crop_Progress_&_Condition/2017/US_2017.pdf

Northern Great Plains Drought Update

Regional Drought Update

Upper Northern Plains
July 20, 2017

Adnan Akyuz, ND State Climatologist
North Dakota State University

NDSU NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

NDSU NORTH DAKOTA STATE UNIVERSITY FARGO

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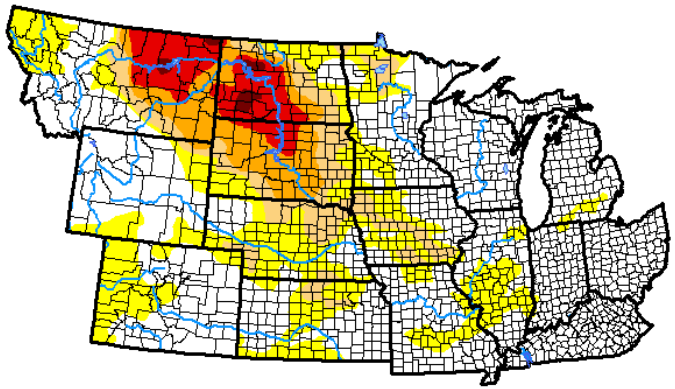
Drought Monitor

U.S. Drought Monitor

NWS Central Region



July 18, 2017

(Released Thursday, Jul. 20, 2017)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	56.99	43.01	19.77	12.07	6.01	0.58
Last Week *07-11-2017*	64.74	35.26	17.55	11.05	5.71	0.00
3 Months Ago *04-18-2017*	81.11	18.89	2.07	0.00	0.00	0.00
Start of Calendar Year *01-03-2017*	65.79	34.21	12.04	1.70	0.00	0.00
Start of Water Year *09-27-2016*	76.71	23.29	7.36	1.93	0.12	0.00
One Year Ago *07-19-2016*	69.65	30.35	9.23	1.86	0.85	0.00

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.

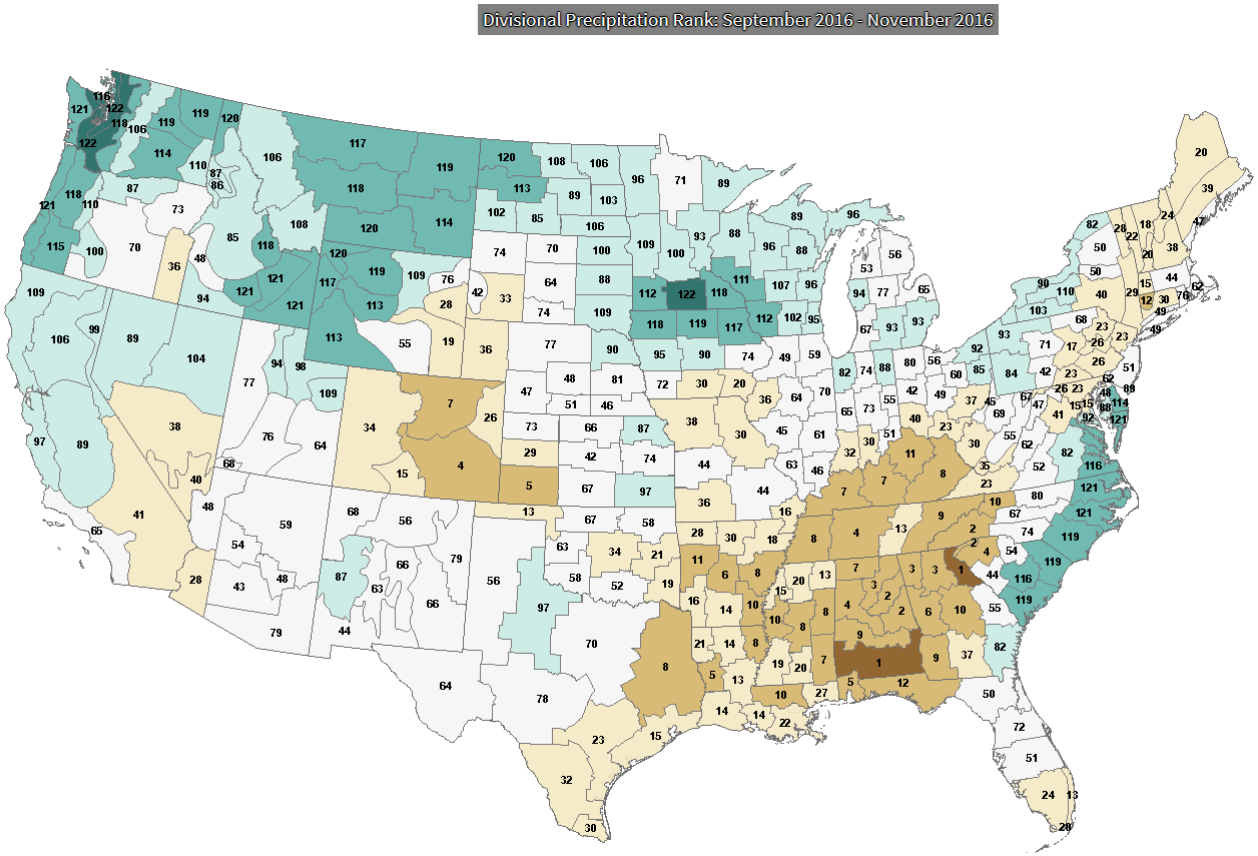
Author:

Richard Heim

NCEI/NOAA

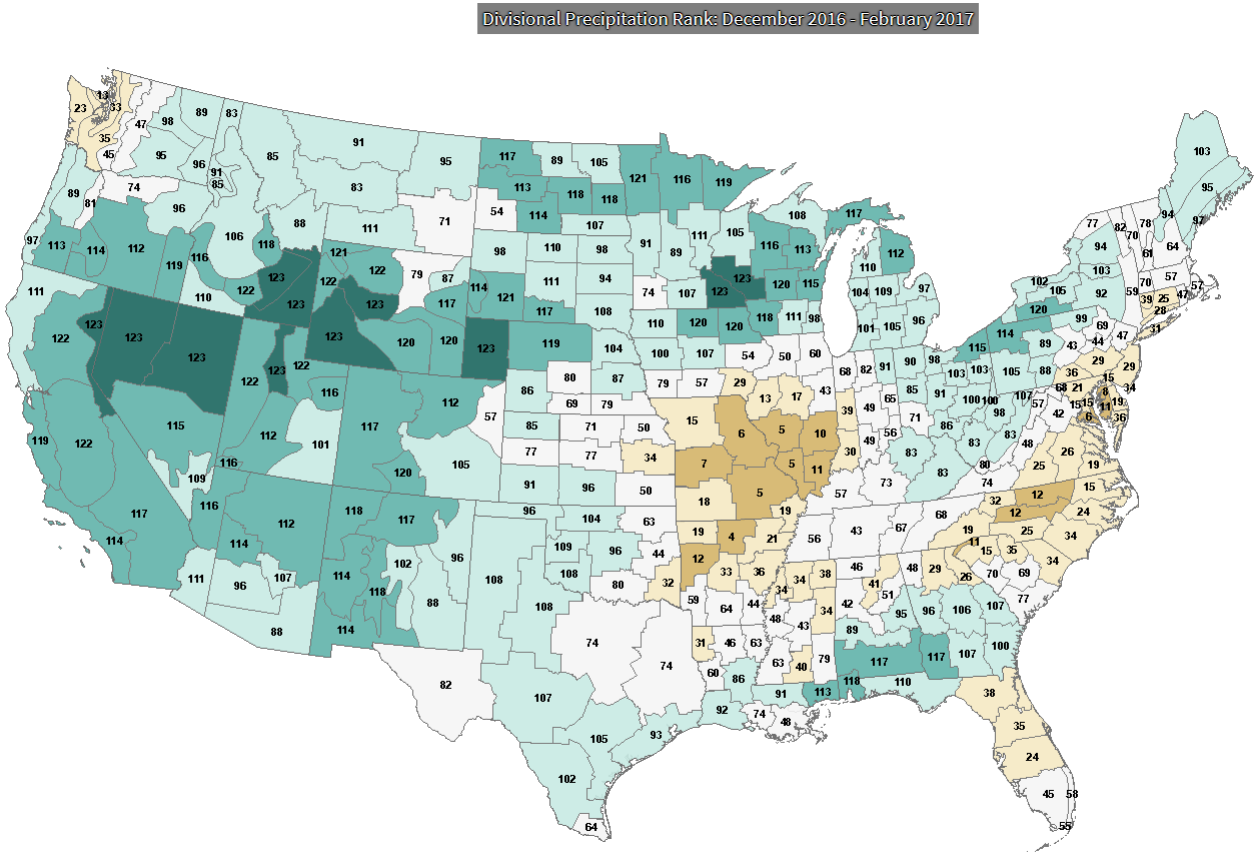
http://droughtmonitor.unl.edu/

How did we get here?
Fall 2016



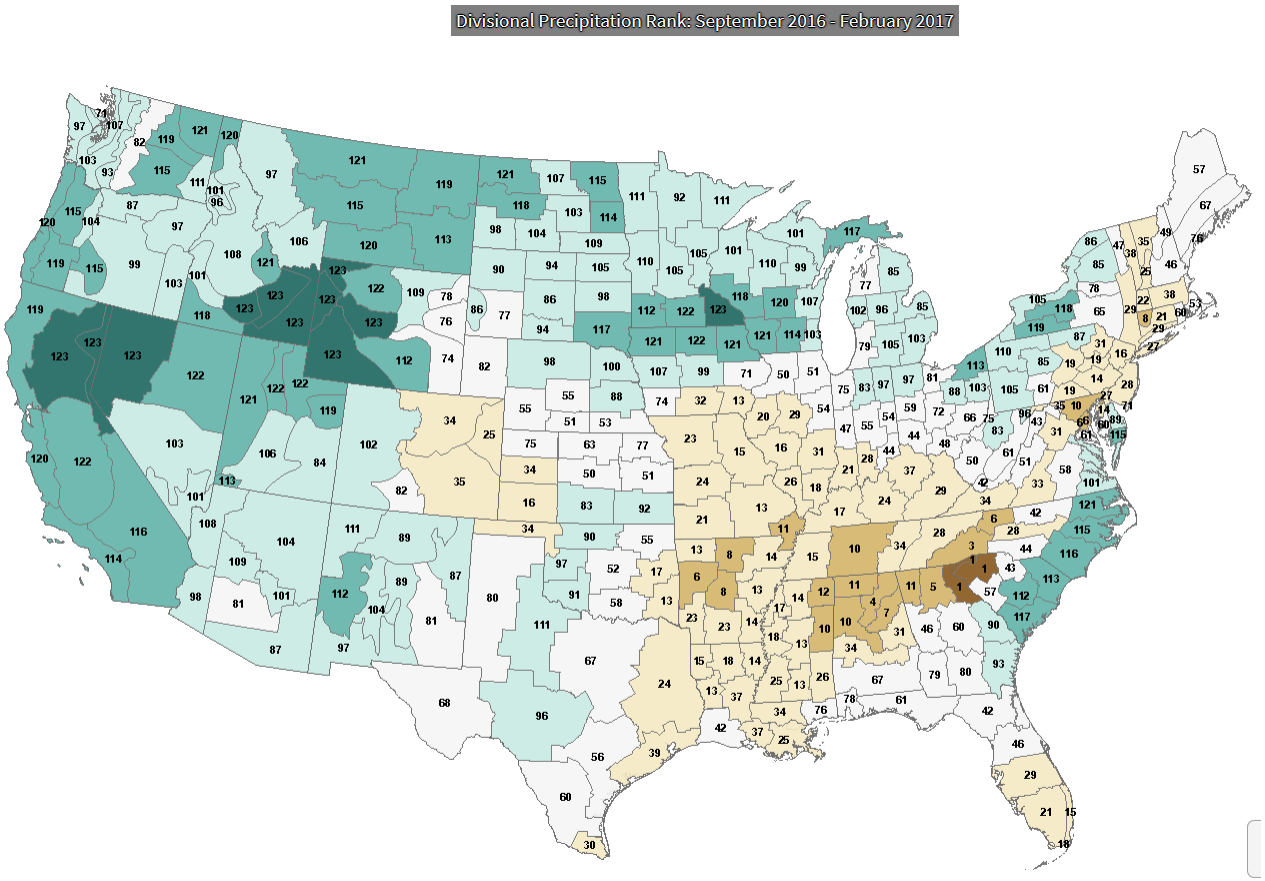
NOAA NCEI Climate At a Glance Map

How did we get here?
Winter 2016-17



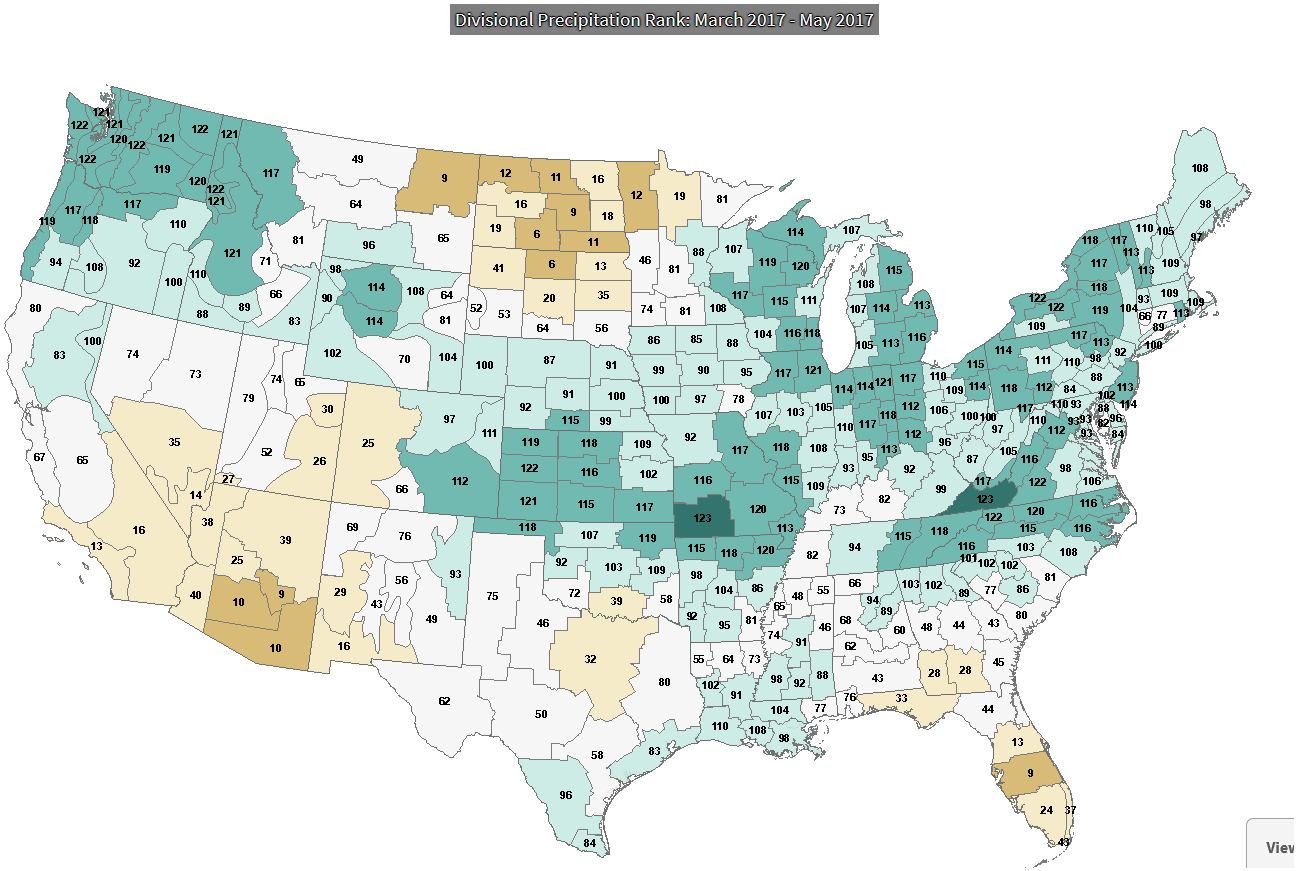
NOAA NCEI Climate At a Glance Map

How did we get here?
Fall + Winter



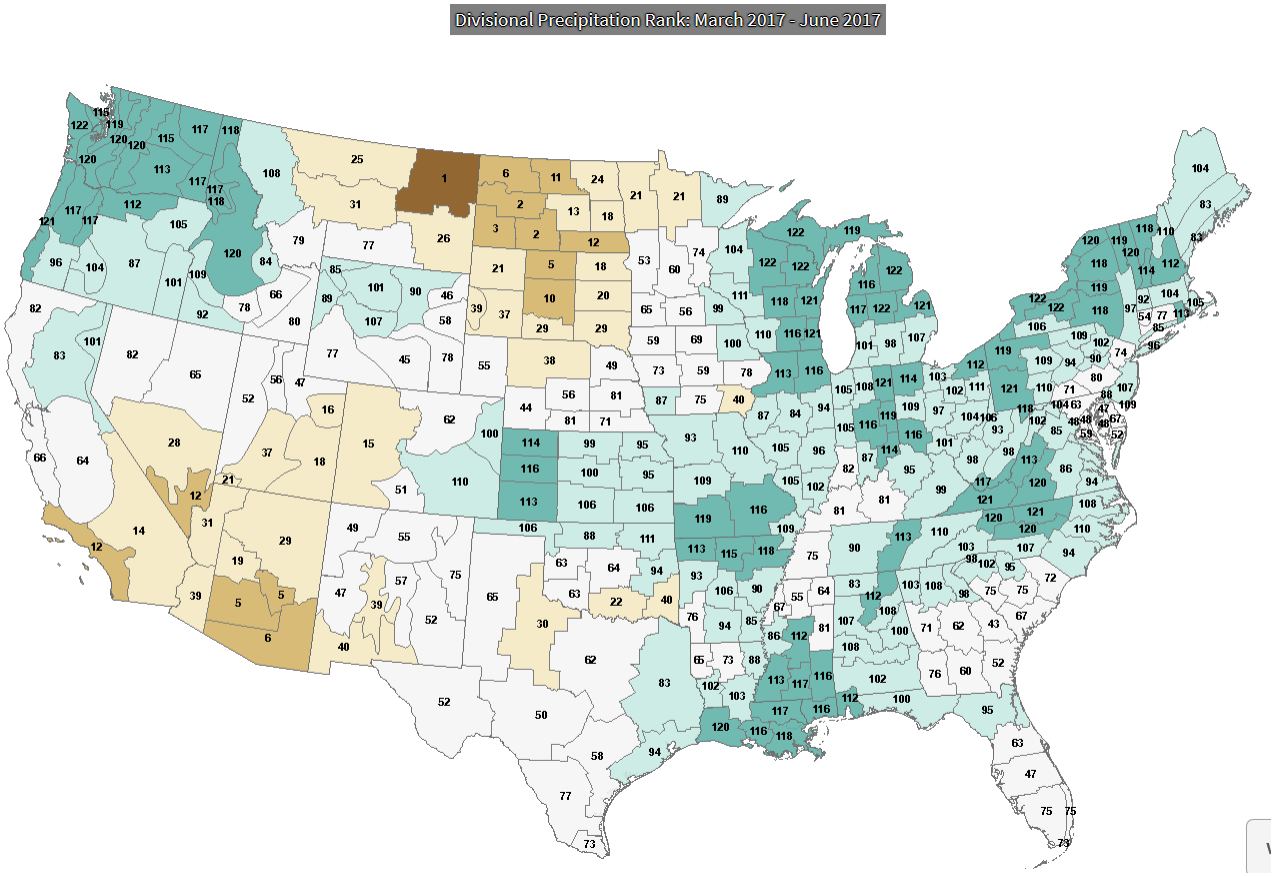
NOAA NCEI Climate At a Glance Map

How did we get here?
Spring 2017



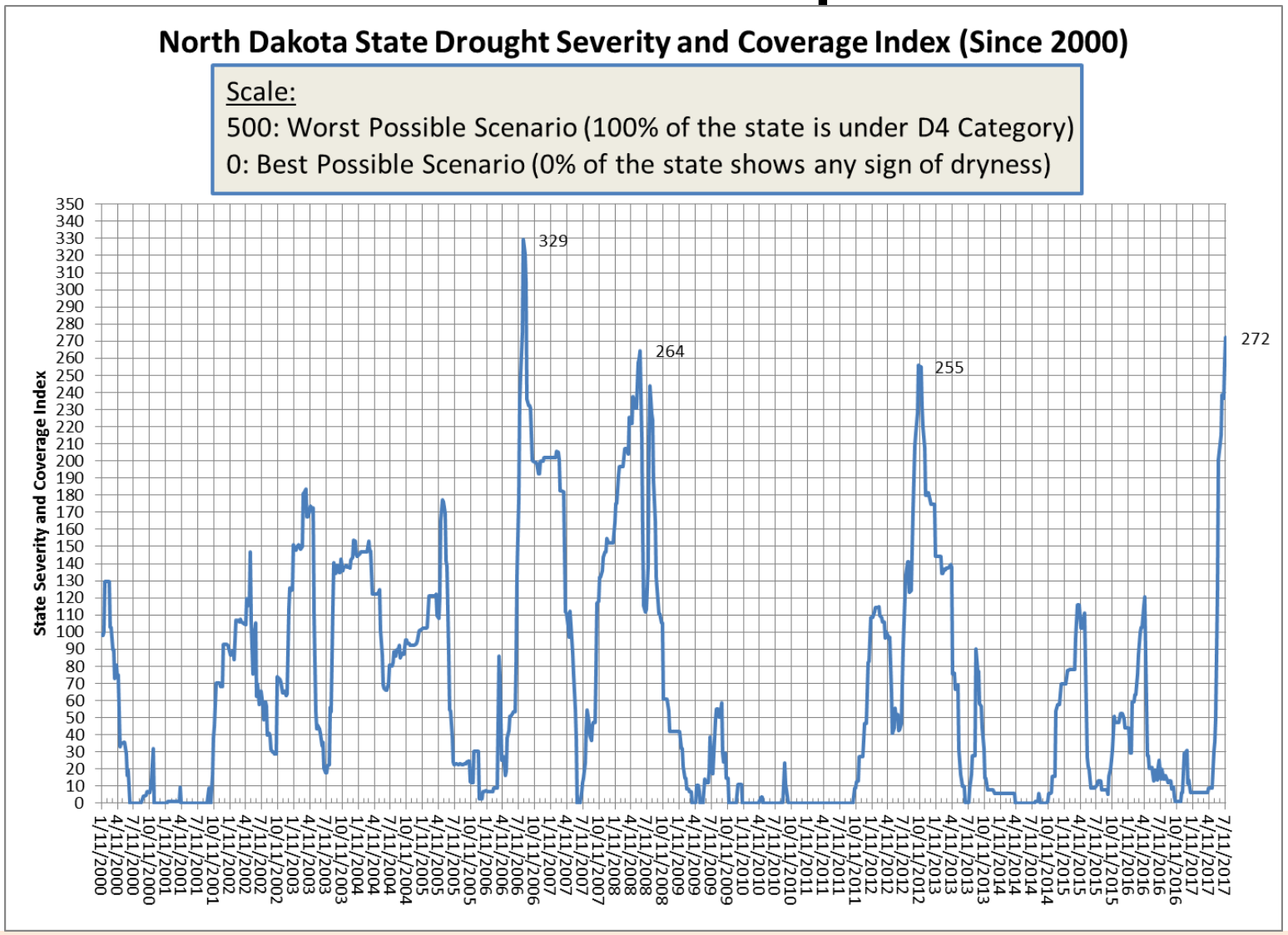
NOAA NCEI Climate At a Glance Map

How did we get here?
Spring + June



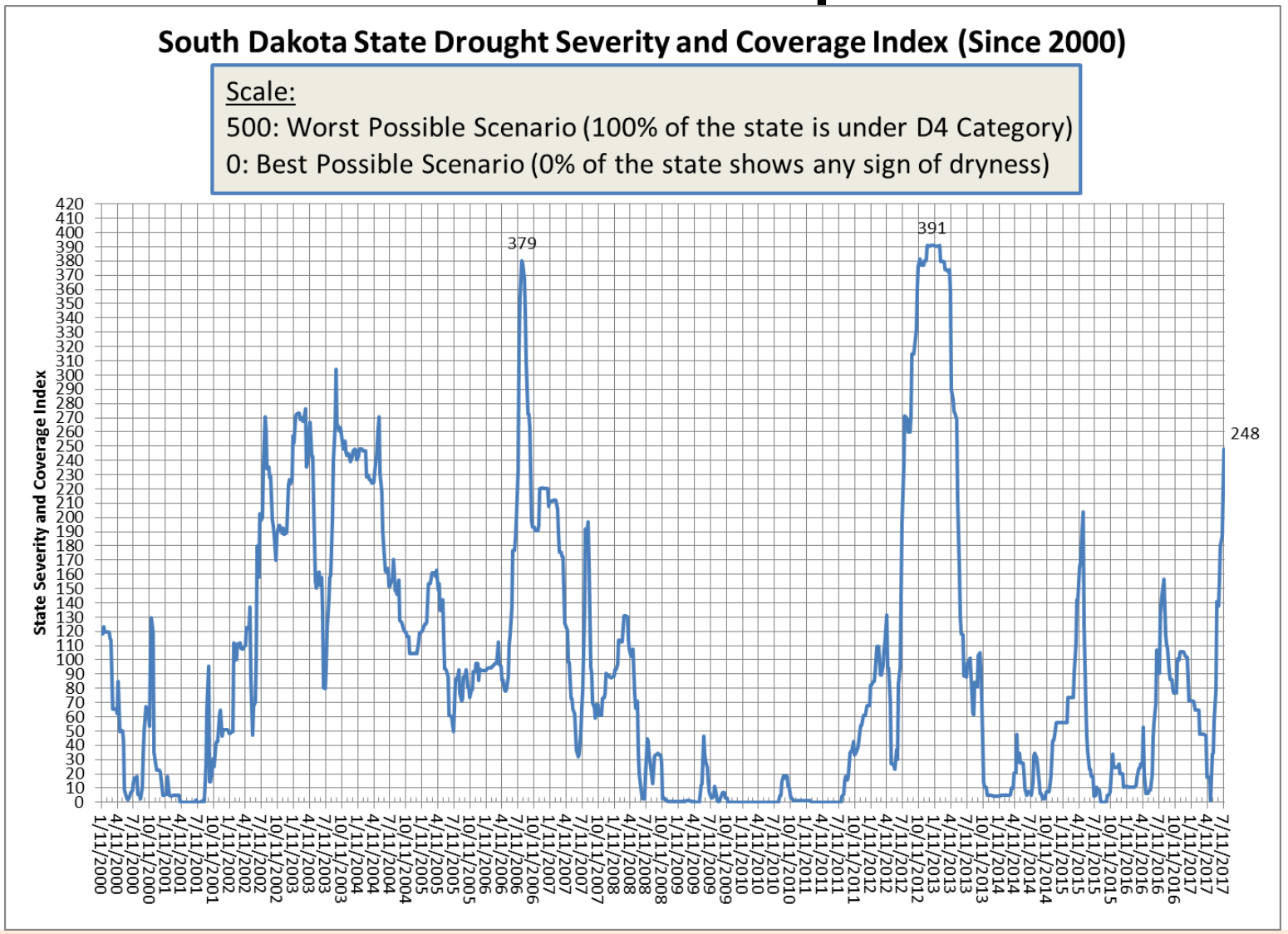
NOAA NCEI Climate At a Glance Map

Historical Perspective



*Drought Severity and Coverage Index = DOx1+D1x2+D2x3+D3x4+D4x5 (Akyüz, 2007)

Historical Perspective



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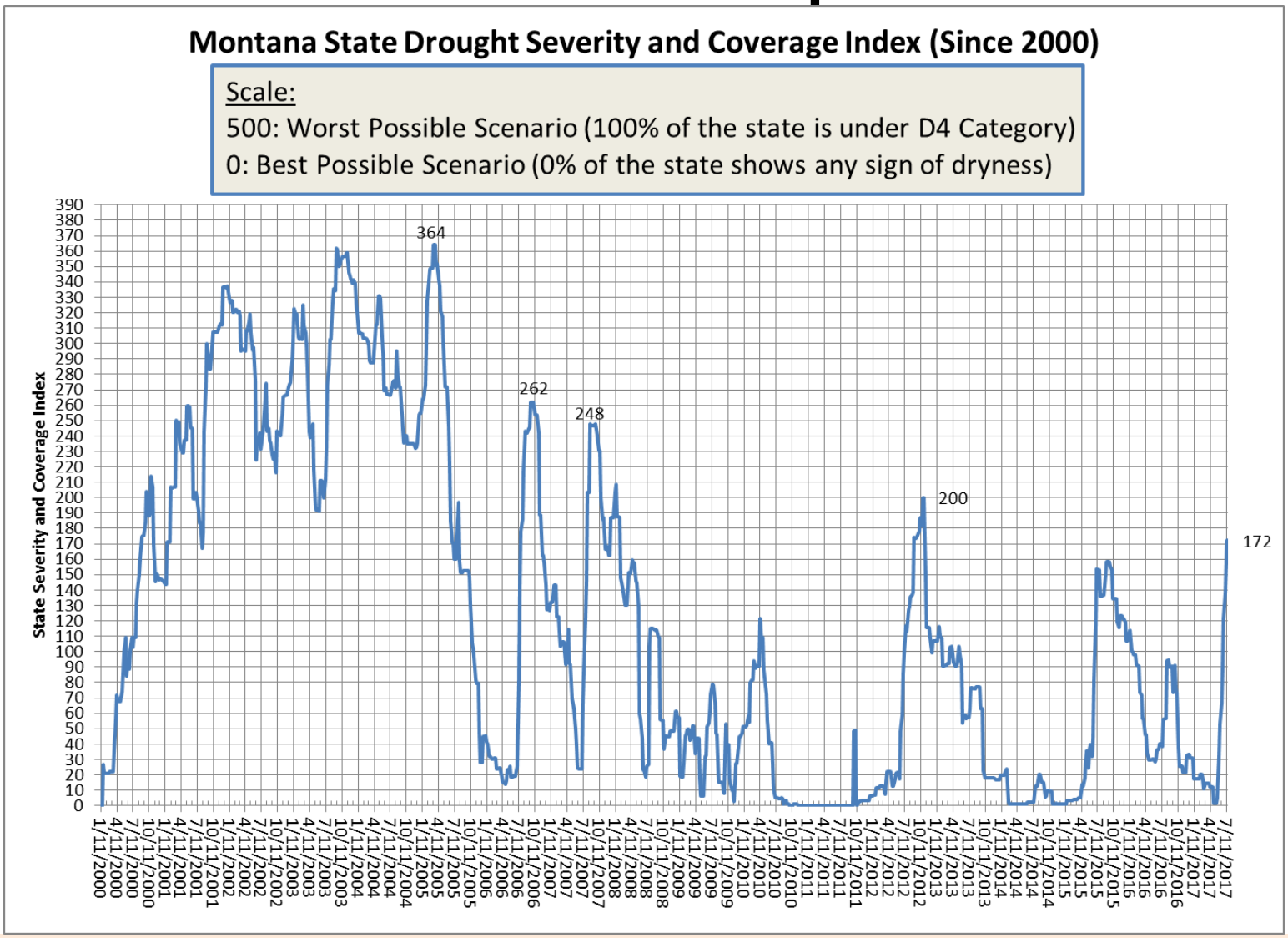
Historical Perspective



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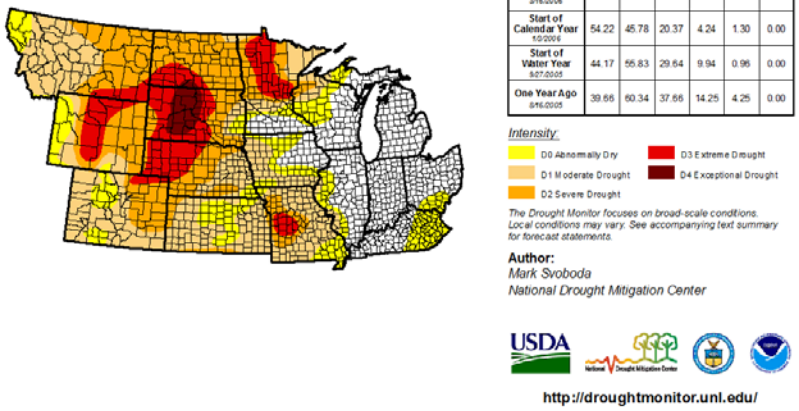
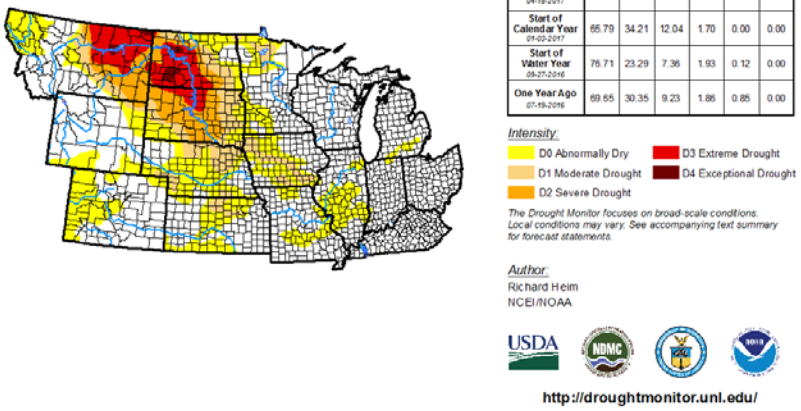
Drought Comparison

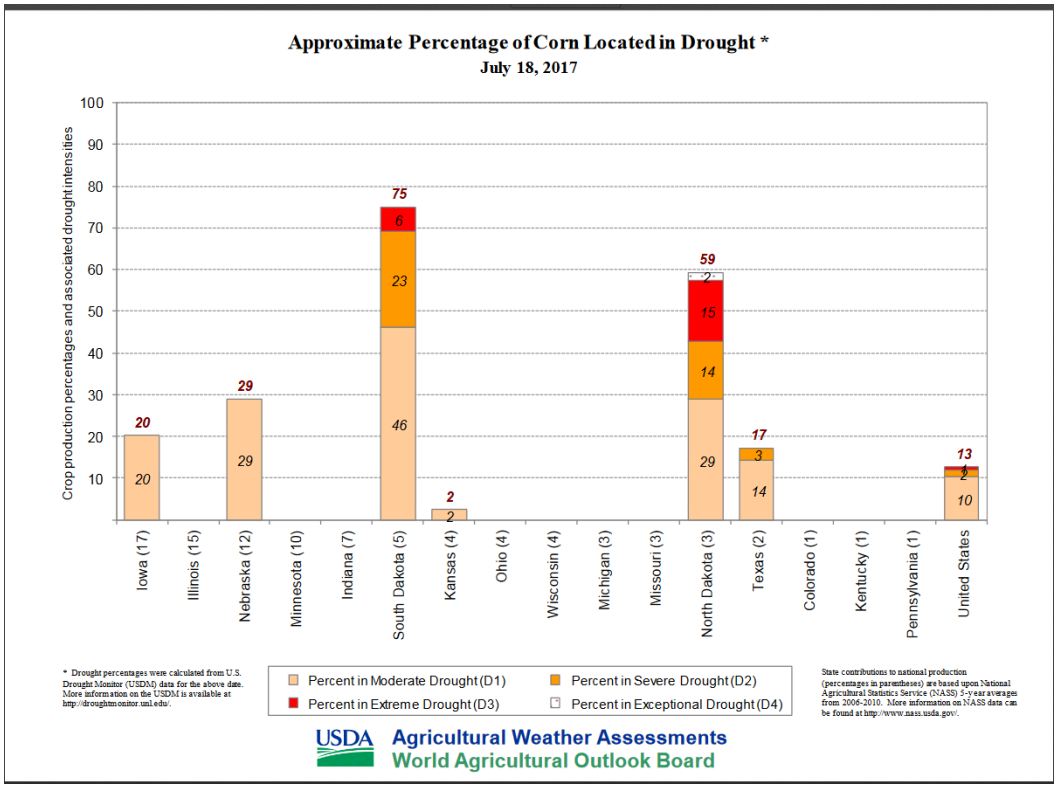
2006



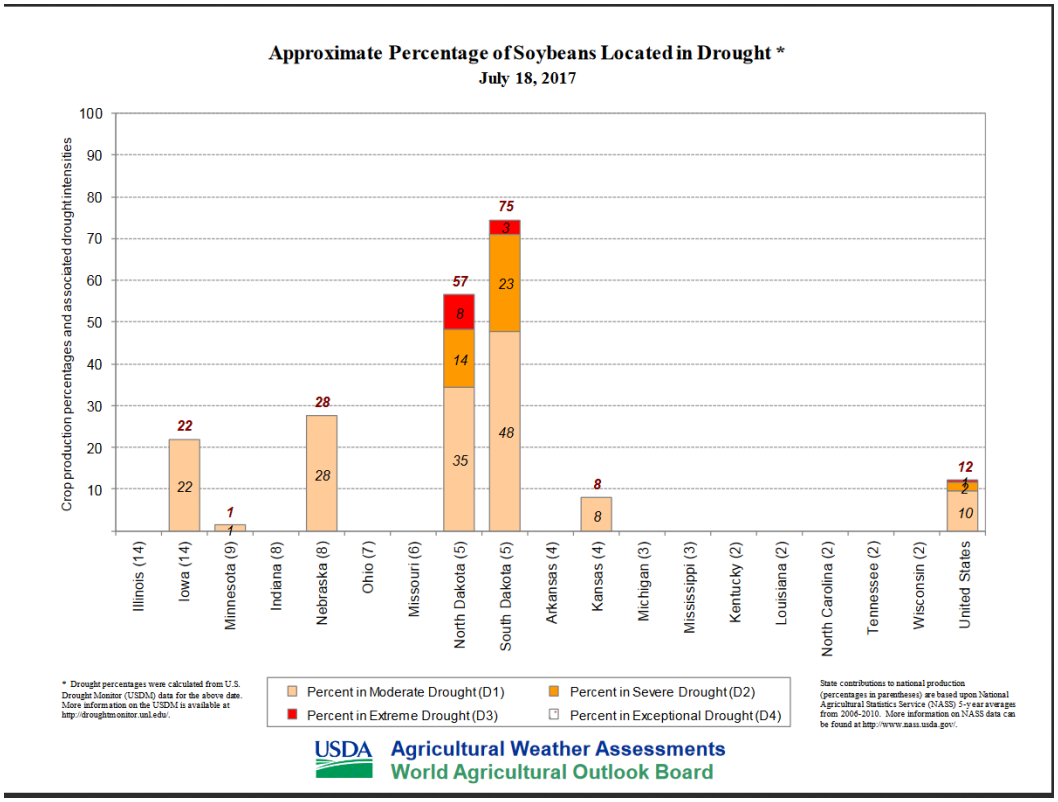
2017



Corn


Approximate Percentage of Corn Located in Drought *
July 18, 2017
Crop production percentages and associated drought intensities
100
90
80
70
60
50
40
30
20
10
20
20
29
29
75
46
23
6
2
2
59
29
14
15
2
17
14
3
13
10
2
1
Iowa (17)
Illinois (15)
Nebraska (12)
Minnesota (10)
Indiana (7)
South Dakota (5)
Kansas (4)
Ohio (4)
Wisconsin (4)
Michigan (3)
Missouri (3)
North Dakota (3)
Texas (2)
Colorado (1)
Kentucky (1)
Pennsylvania (1)
United States
* Drought percentages were calculated from U.S. Drought Monitor (USDM) data for the above date. More information on the USDM is available at http://droughtmonitor.unl.edu/.
Percent in Moderate Drought (D1)
Percent in Severe Drought (D2)
Percent in Extreme Drought (D3)
Percent in Exceptional Drought (D4)
State contributions to national production (percentages in parentheses) are based upon National Agricultural Statistics Service (NASS) 5-year averages from 2006-2010. More information on NASS data can be found at http://www.nass.usda.gov/.
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

Soybean


Approximate Percentage of Soybeans Located in Drought *
July 18, 2017
Crop production percentages and associated drought intensities
100
90
80
70
60
50
40
30
20
10
Illinois (14)
Iowa (14)
Minnesota (9)
Indiana (8)
Nebraska (8)
Ohio (7)
Missouri (6)
North Dakota (5)
South Dakota (5)
Arkansas (4)
Kansas (4)
Michigan (3)
Mississippi (3)
Kentucky (2)
Louisiana (2)
North Carolina (2)
Tennessee (2)
Wisconsin (2)
United States
22
22
1
1
28
28
57
8
14
35
75
3
23
48
8
8
12
1
2
10
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USDA
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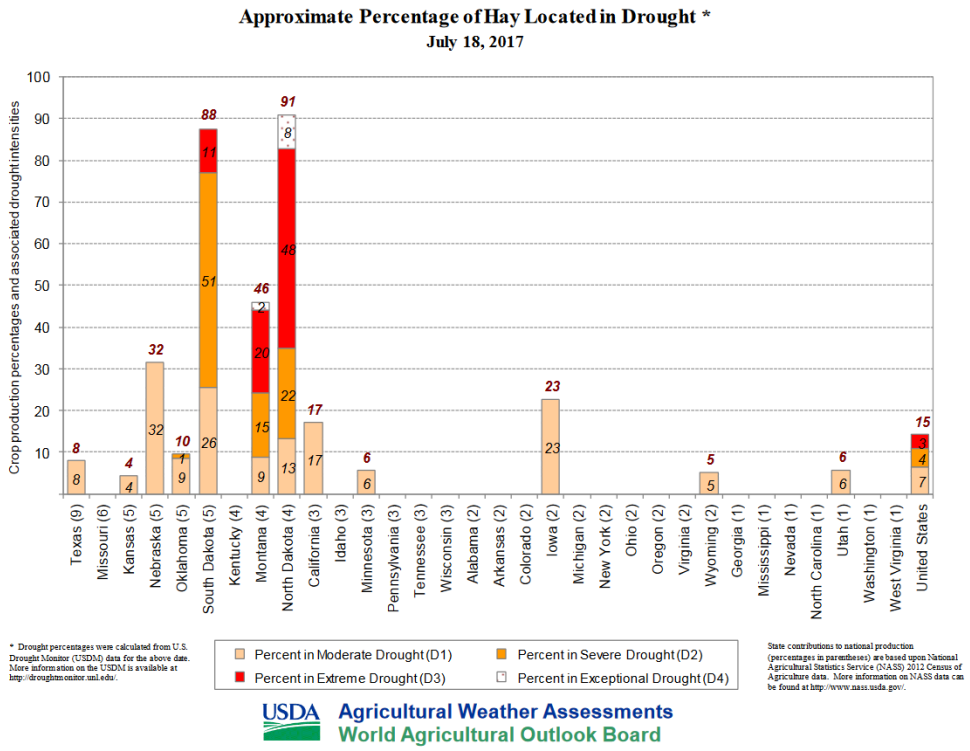
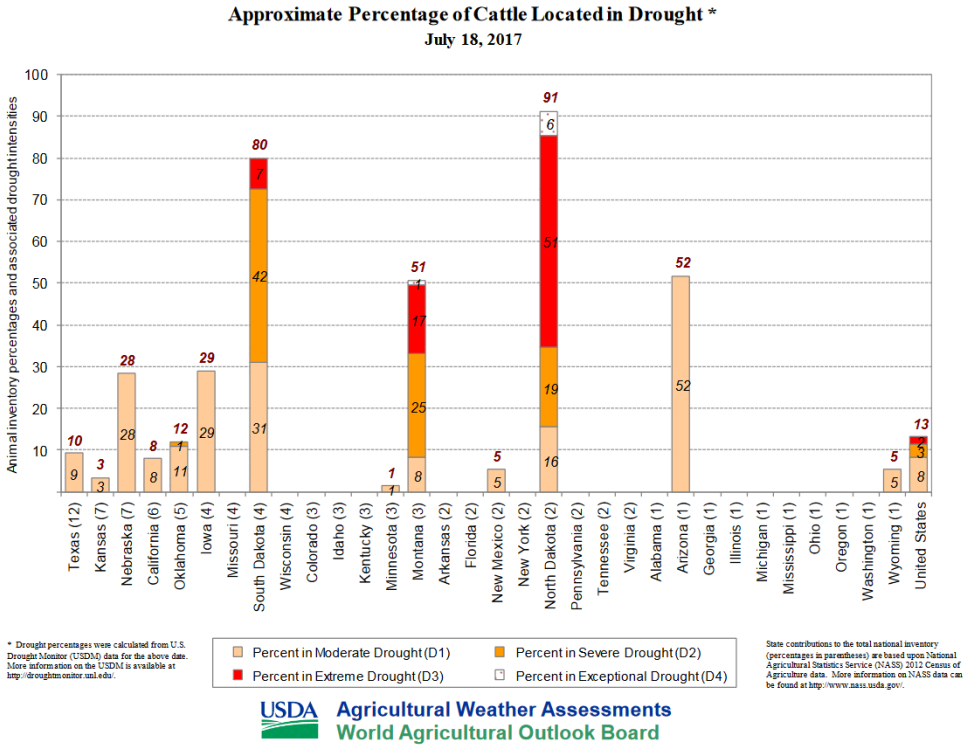
Hay

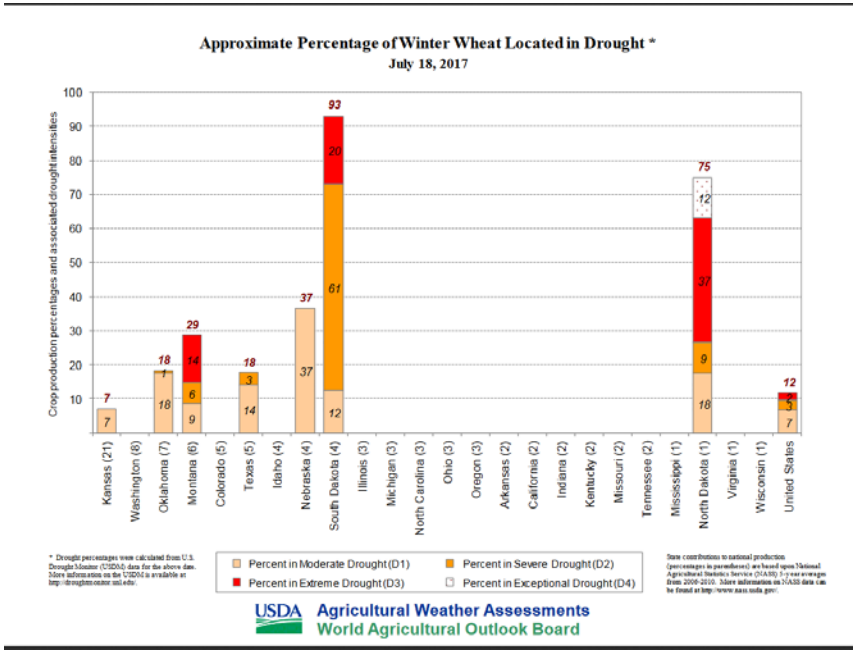

Approximate Percentage of Hay Located in Drought *
July 18, 2017
Crop production percentages and associated drought intensities
Texas (9)
Missouri (6)
Kansas (5)
Nebraska (5)
Oklahoma (5)
South Dakota (5)
Kentucky (4)
Montana (4)
North Dakota (4)
California (3)
Idaho (3)
Minnesota (3)
Pennsylvania (3)
Tennessee (3)
Wisconsin (3)
Alabama (2)
Arkansas (2)
Colorado (2)
Iowa (2)
Michigan (2)
New York (2)
Ohio (2)
Oregon (2)
Virginia (2)
Wyoming (2)
Georgia (1)
Mississippi (1)
Nevada (1)
North Carolina (1)
Utah (1)
Washington (1)
West Virginia (1)
United States
* Drought percentages were calculated from U.S. Drought Monitor (USDM) data for the above date. More information on the USDM is available at http://droughtmonitor.unl.edu/.
Percent in Moderate Drought (D1)
Percent in Severe Drought (D2)
Percent in Extreme Drought (D3)
Percent in Exceptional Drought (D4)
State contributions to national production (percentages in parentheses) are based upon National Agricultural Statistics Service (NASS) 2012 Census of Agriculture data. More information on NASS data can be found at http://www.nass.usda.gov/.
USDA Agricultural Weather Assessments
World Agricultural Outlook Board

Cattle

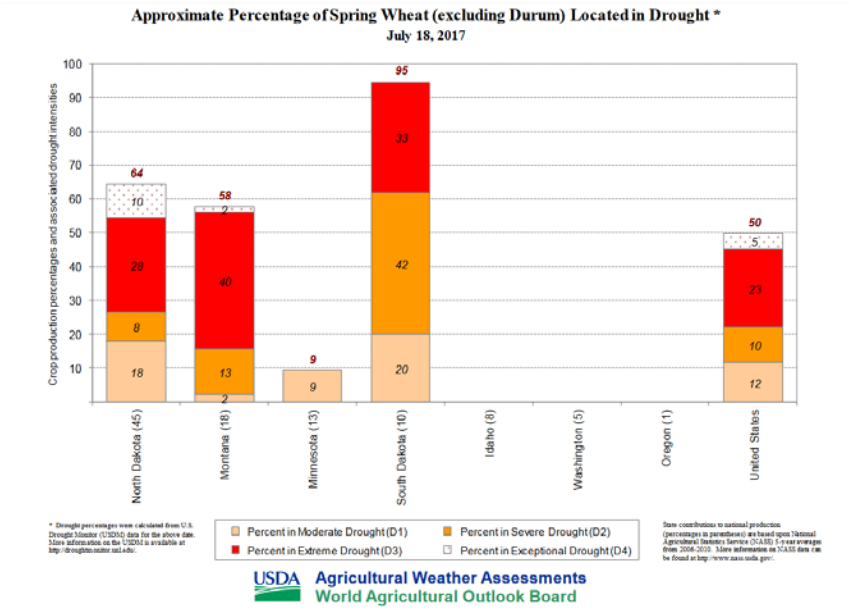

Approximate Percentage of Cattle Located in Drought *
July 18, 2017
Animal inventory percentages and associated drought intensities
Texas (12)
Kansas (7)
Nebraska (7)
California (6)
Oklahoma (5)
Iowa (4)
Missouri (4)
South Dakota (4)
Wisconsin (4)
Colorado (3)
Idaho (3)
Kentucky (3)
Minnesota (3)
Montana (3)
Arkansas (2)
Florida (2)
New Mexico (2)
New York (2)
North Dakota (2)
Pennsylvania (2)
Tennessee (2)
Virginia (2)
Alabama (1)
Arizona (1)
Georgia (1)
Illinois (1)
Michigan (1)
Mississippi (1)
Ohio (1)
Oregon (1)
Washington (1)
Wyoming (1)
United States
* Drought percentages were calculated from U.S. Drought Monitor (USDM) data for the above date. More information on the USDM is available at http://droughtmonitor.unl.edu/.
Percent in Moderate Drought (D1)
Percent in Severe Drought (D2)
Percent in Extreme Drought (D3)
Percent in Exceptional Drought (D4)
State contributions to the total national inventory (percentages in parentheses) are based upon National Agricultural Statistics Service (NASS) 2012 Census of Agriculture data. More information on NASS data can be found at http://www.nass.usda.gov/.
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

Wheat

Winter

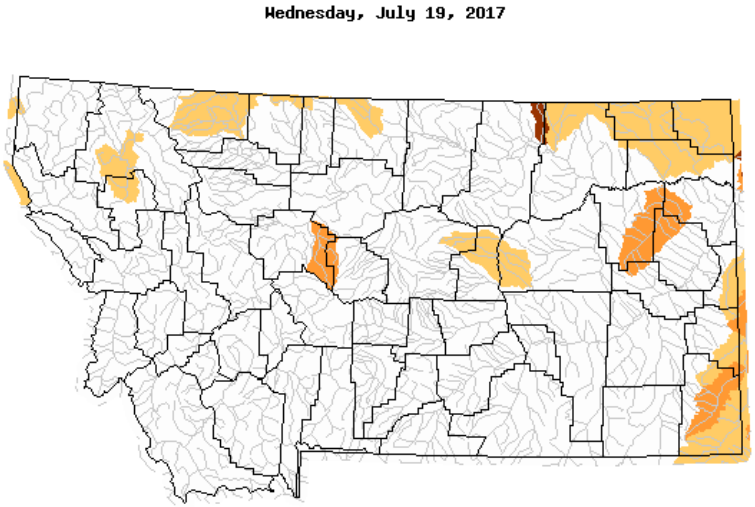


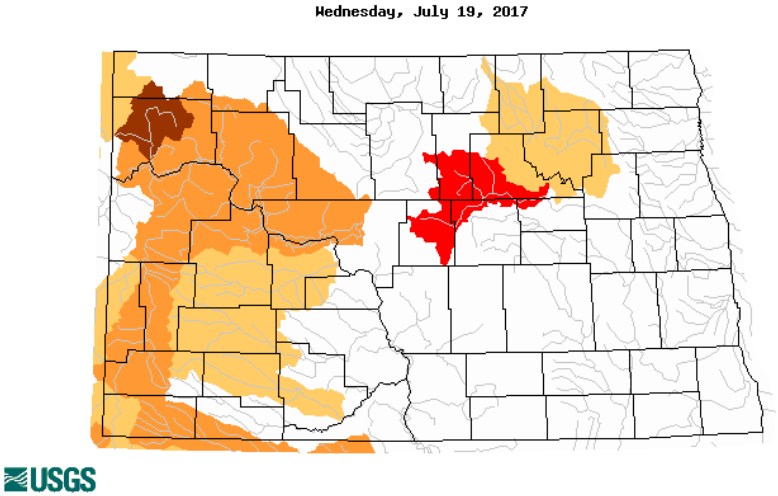
Spring

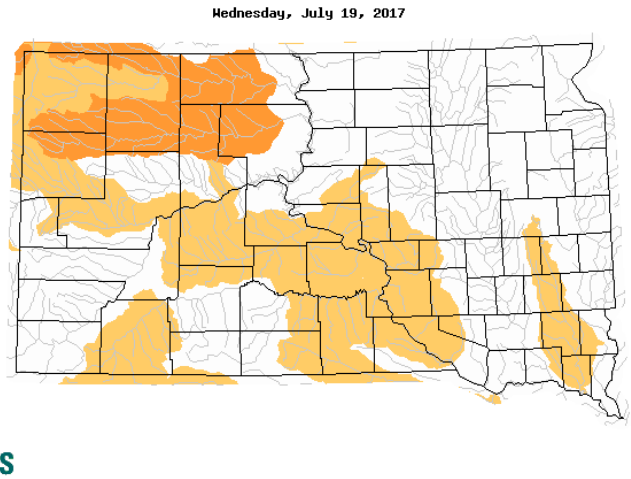


Streamflow

Below normal 7-day average streamflow compared to historical streamflow for the day of year



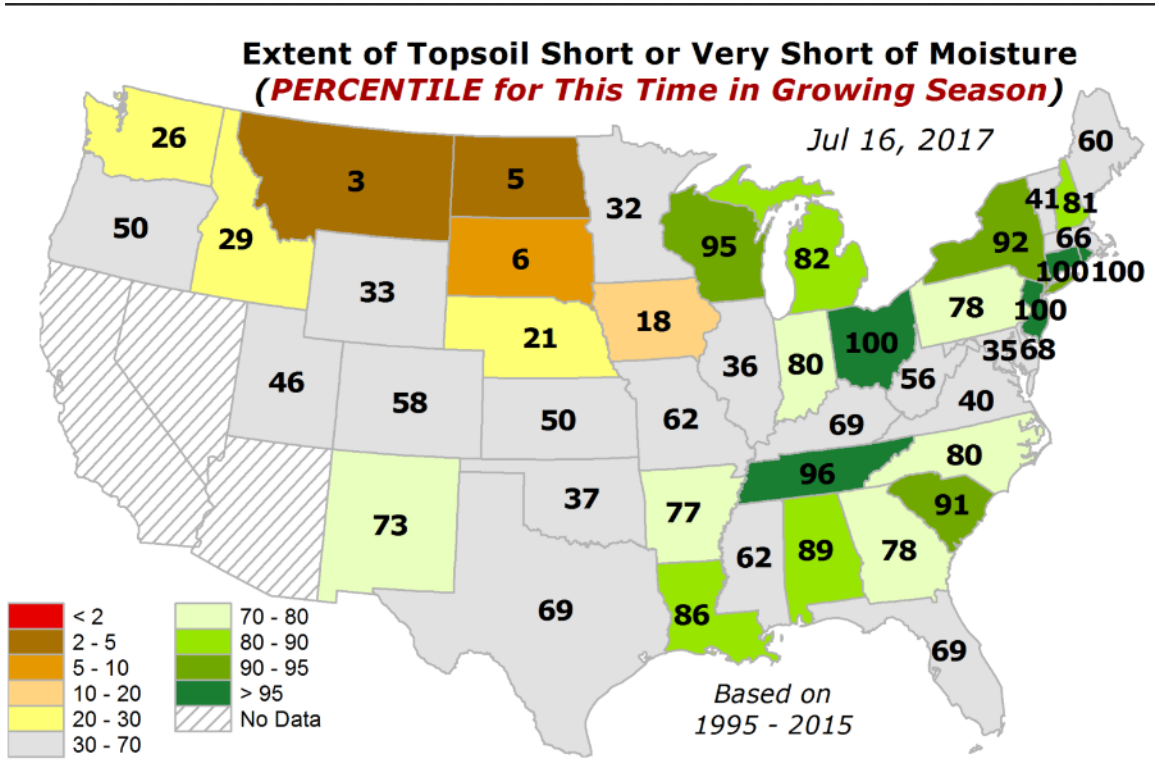


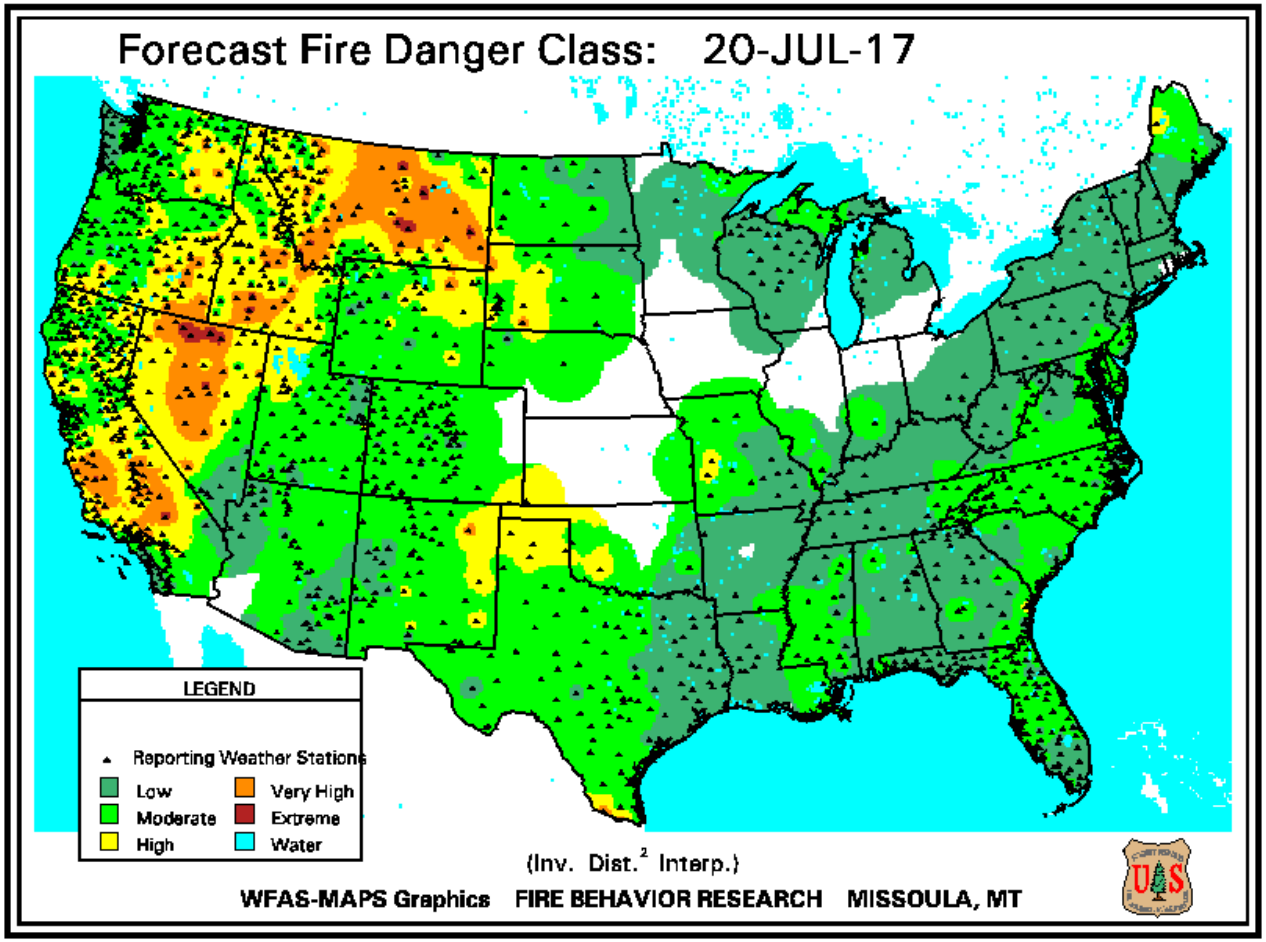


Explanation - Percentile classes				
Low	<=5	6-9	10-24	Insufficient data for a hydrologic region
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below normal	

https://waterwatch.usgs.gov/index.php?r=us&m=dryw

Soil Moisture





http://www.weather.gov/images/unr/operations/grassland.png

Concerns with fire in drought

- Fires go underground into root systems of grass, brush, and timber due to the lack of soil moisture (BIA).

Scenes in Drought Areas

Burned up zeroed out wheat field (Nicole Wardner, Sheridan Co., ND)

Between Fort Peck and Glasgow, MT (June 21, 2017-Mike Fransen, MT).

Scenes in Drought Areas

Tripp county, SD (Vicki Stuart).

Hay cutting (Photographed by a producer in Sheridan Co, ND. Sent by Nicole Wardner)

Drought Impact

- Expanding drought conditions throughout North Dakota mean that both **seed yields and quality may be affected**.
- When there is enough to small grains to harvest, it is being fed to cattle; however, this is presenting some health concerns for the livestock due to the nitrate accumulation in the plants (ND)
- Crop production to be down in Dakotas
  - ND
    - Spring wheat: 27% lower than 2016
    - Oat 30 % lower
    - Barley down 47 %
    - Durum wheat down 50%
    - Winter wheat down 74%.

Drought Impact (Cont)

- Crop production to be down in Dakotas
  - SD
    - Spring wheat: 32% lower than 2016
    - Oat 30 % lower
    - Winter wheat down 56%.
- The Rocky Boy's reservation, MT, has enough water to last about seven to 10 days.
- Dryland wheat short, being cut for forage in northwestern North Dakota.

Drought Impact (Cont)

- One ag related business estimates they will lose $30M and 58 employees. (MT)
- “Using past data and statistics that this producer keeps on his livestock, the **cows are losing 2.5 lbs of weight a day** due to not having quality feed.” (MT).
- “…serious impacts to crops and livestock, even worse than in the 88 drought.” (MT)
- “When the crop adjuster was out this spring he appraised the wheat crop at **35-40 bu. per acre**. Two weeks ago it was appraised at **2.4 bu. per acre**.” (Bowman Co., ND)
- Grasshoppers in the eastern counties are moving from grass to the crops/edges of fields to take advantage of green plants. (SD)
- Some offices have started to receive corn plant samples to test for nitrates, in anticipation of feeding to livestock. This is a sign that corn crop is not developing well and some are planning to cut for silage instead of wait for grain in the fall. (SD)

Drought Impact on Wheat Market (F. Olson, NDSU)

- North Dakota accounts for approximately 50 percent of the U.S. acreage and production of spring wheat.
- The drought conditions in North Dakota and eastern Montana have raised concerns about yield potential and the amount of spring wheat available in 2017.
- The spring wheat markets, both cash and futures markets, have responded with a rapid increase in prices. The Minneapolis Grain Exchange (MGEX) September futures market prices have increased from **$5.77 per bushel, on June 1**, to the recent high of **$7.75 per bushel, on July 19.**
- The weather forecasts are being watched very closely by the markets and will continue to create extremely volatile prices.

Drought Impact (Cont)

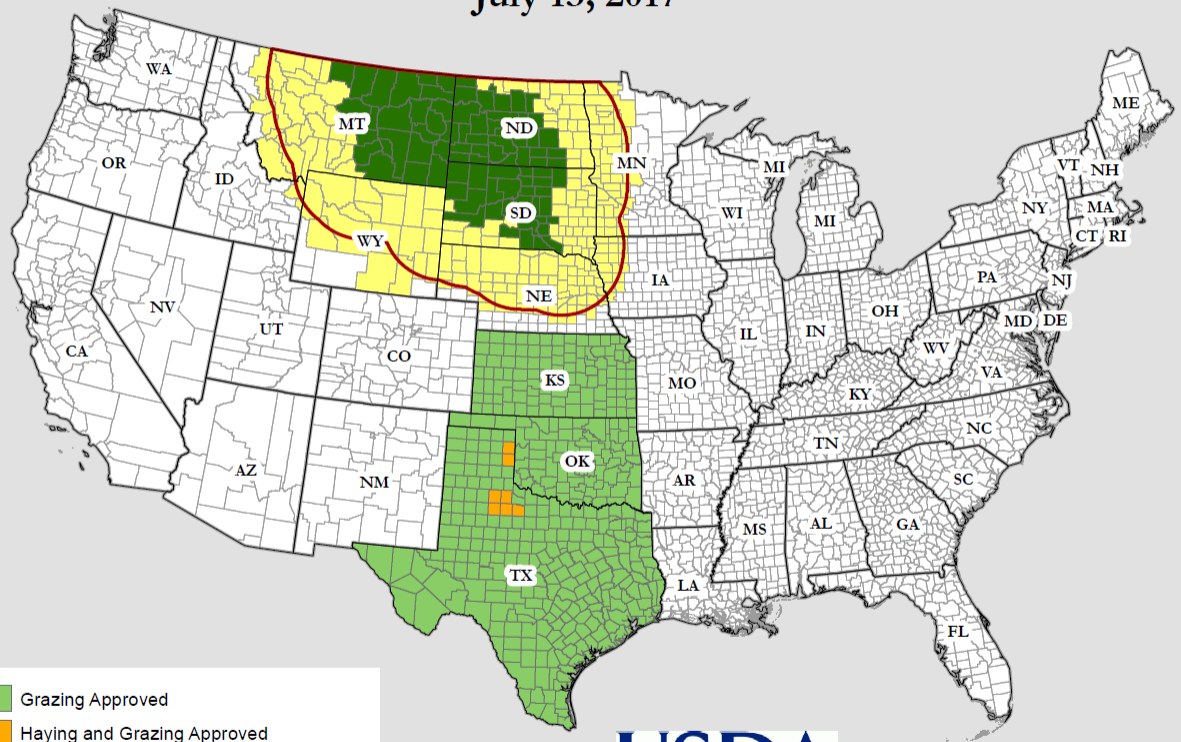
Toxic cyanobacteria (blue-green algae) poisonous to nearly all livestock, wildlife and humans.

https://www.ag.ndsu.edu/publications/livestock/cyanobacteria-poisoning-blue-green-algae

Drought Response

- N.D. governor waived restrictions to permit easier transport of water, hay, livestock.
- USDA gave authorization for early haying of CRP acres beginning on July 16 to help farmers and ranchers in the Dakotas and Montana enduring drought.
- In addition to the USDA FSA program, the ND Water Commission has enacted a water supply assistance program to help address immediate and long-term concerns.

Counties Approved for CRP Emergency Haying and Grazing
July 13, 2017



Map created by DAFP/CEPD July 13, 2017

Drought Response (Cont)

- (ND) USDA is giving producers with FSA loans a 12-month exemption from a requirement that they have physical control of their livestock. That allows ranchers to send livestock to other feedlots to weather the drought in ND.
- FeedList open for donations to ranchers: https://www.ag.ndsu.edu/feedlist
- ND Hay Hotline Interactive Map: http://ndda.maps.arcgis.com/apps/webappviewer/index.html?id=d9266e1cc231463399c585d7f0a39893

Drought Response (Cont)

Secretarial Disaster Designations - 2017 Crop Year All Crop - Total Counties by State (updated 7/11/2017)		
State	Primary Counties	Contiguous Counties
ND	23	8
SD	8	10
MT	14	13

https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Disaster-Assist/Secretarials/2017-Secretarial-Disaster/ALL_CROP_CoList_CY2017.pdf

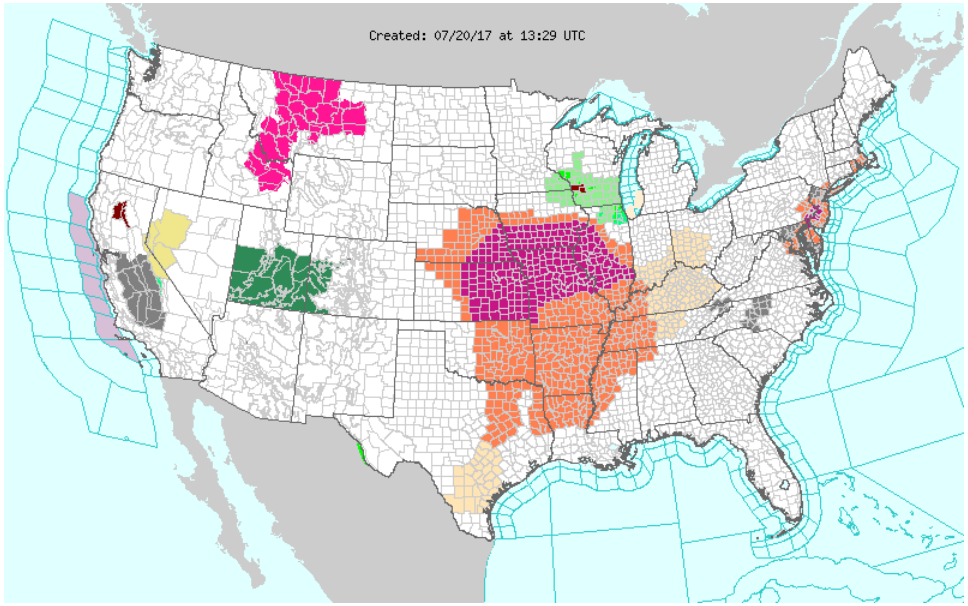
Back to Dr. Andresen

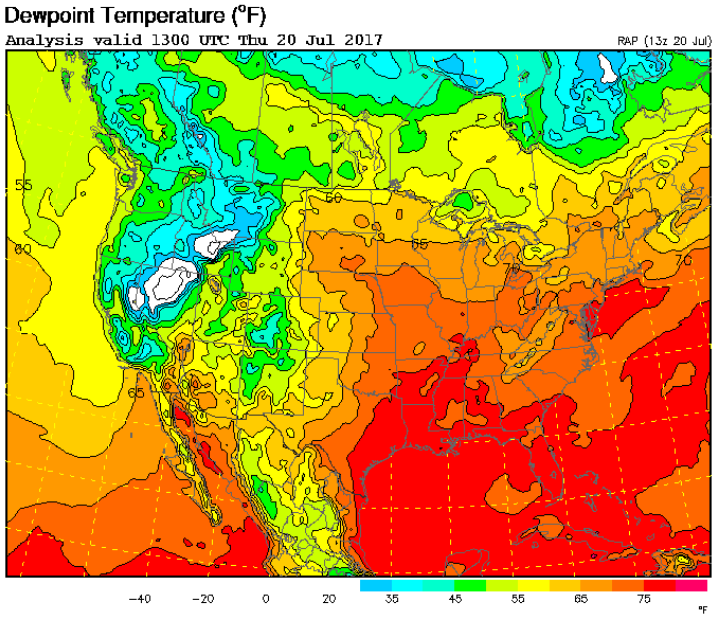
OUTLOOKS

Outlooks

Short Term Hazards

Thursday 20 July 2017

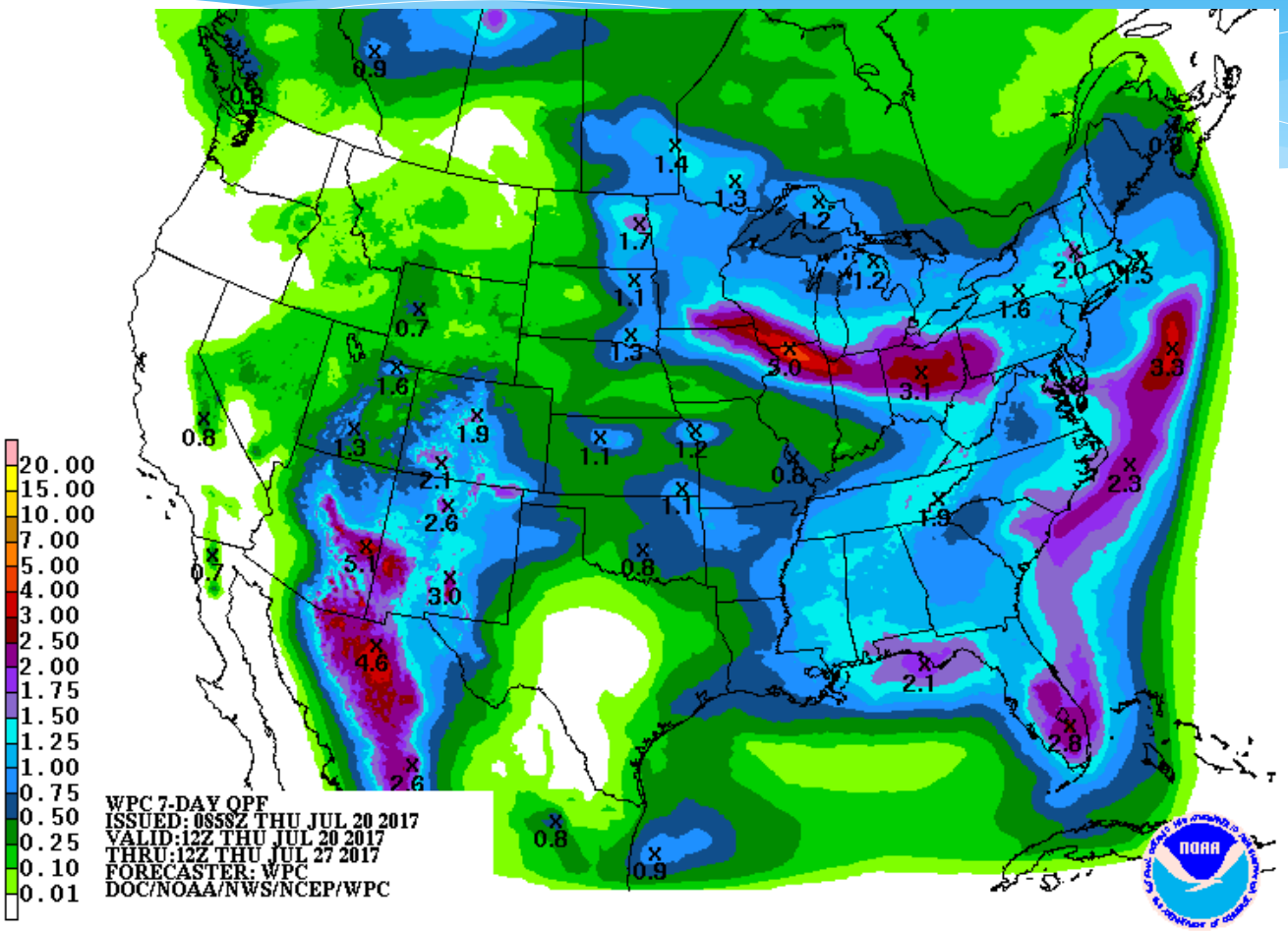




http://www.weather.gov/

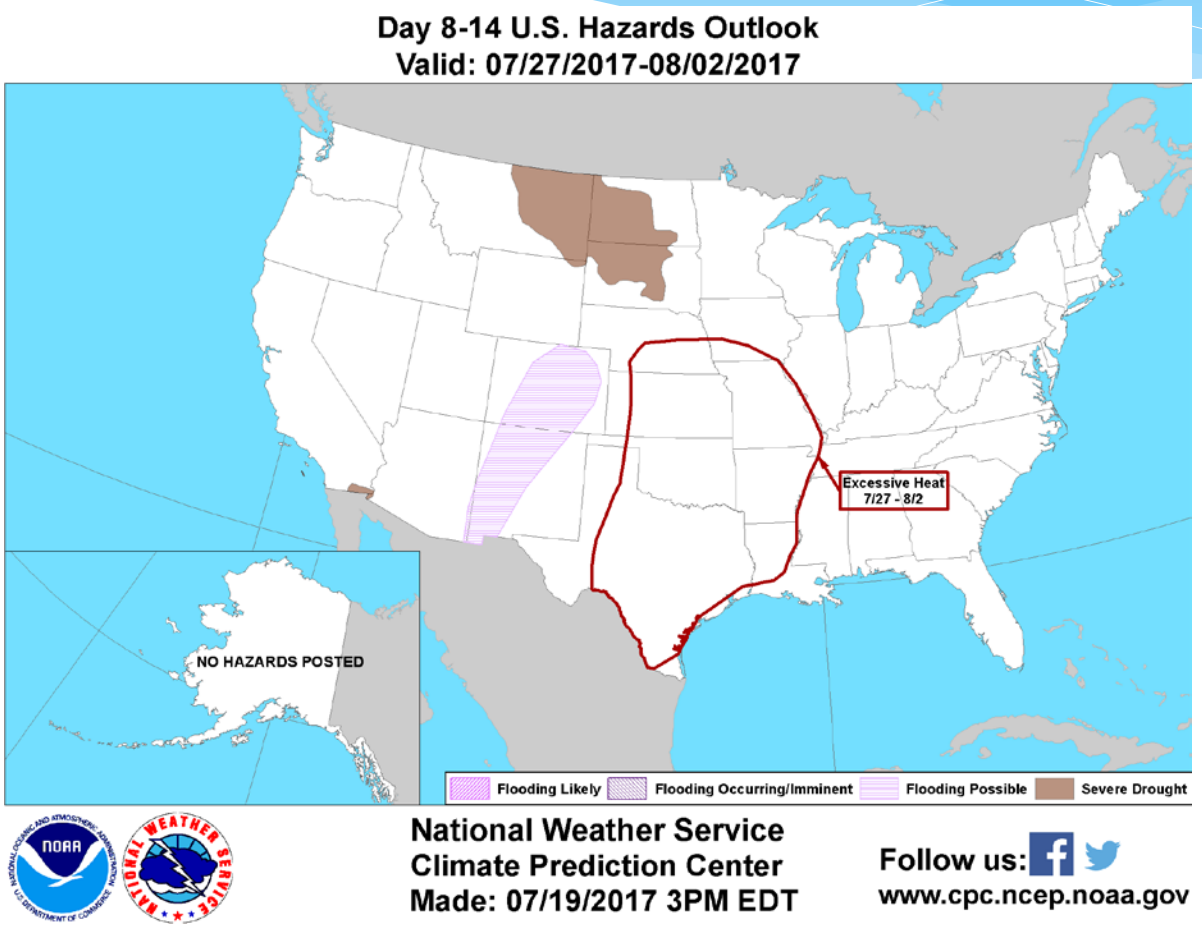
7-day Quantitative Precipitation Forecast

Valid: 7 AM Thu 20 July– 7 AM Thu 27 July 2017



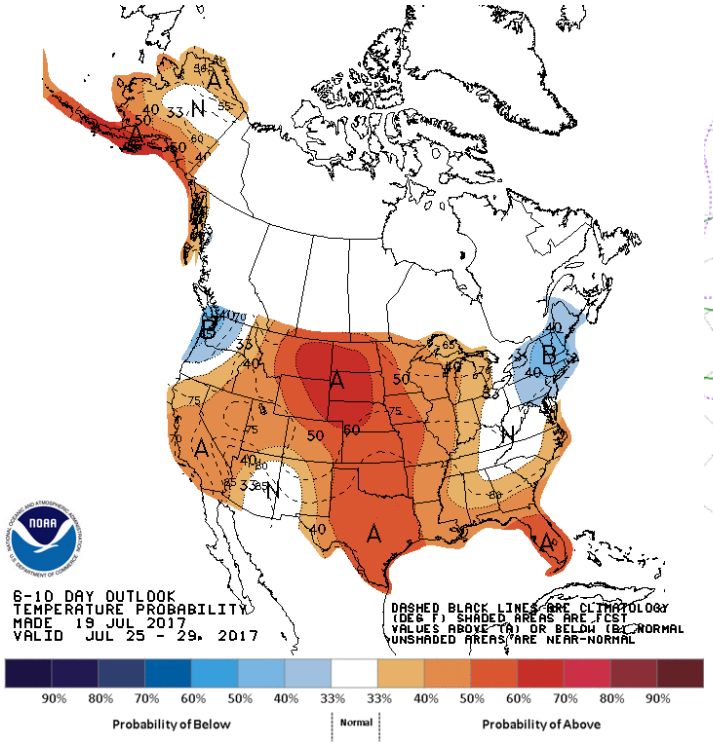
http://www.wpc.ncep.noaa.gov/qpf/day1-7.shtml

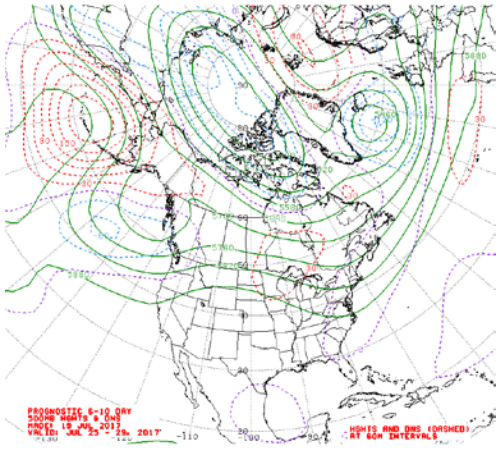
8-14 day Hazards Outlook

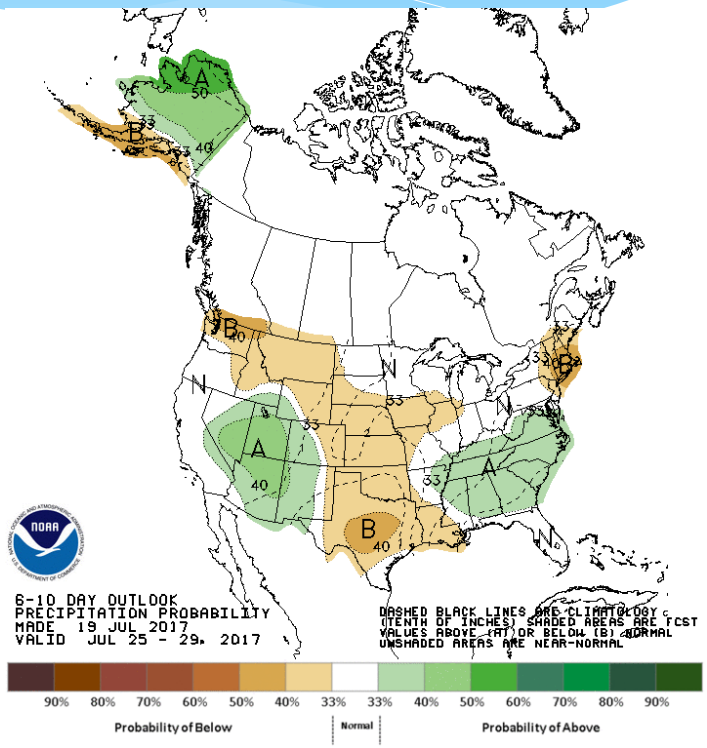


http://www.cpc.ncep.noaa.gov/products/predictions/threats/hazards_d8_14_contours.png

Temperature and Precipitation Outlook 25 – 29 July 2017

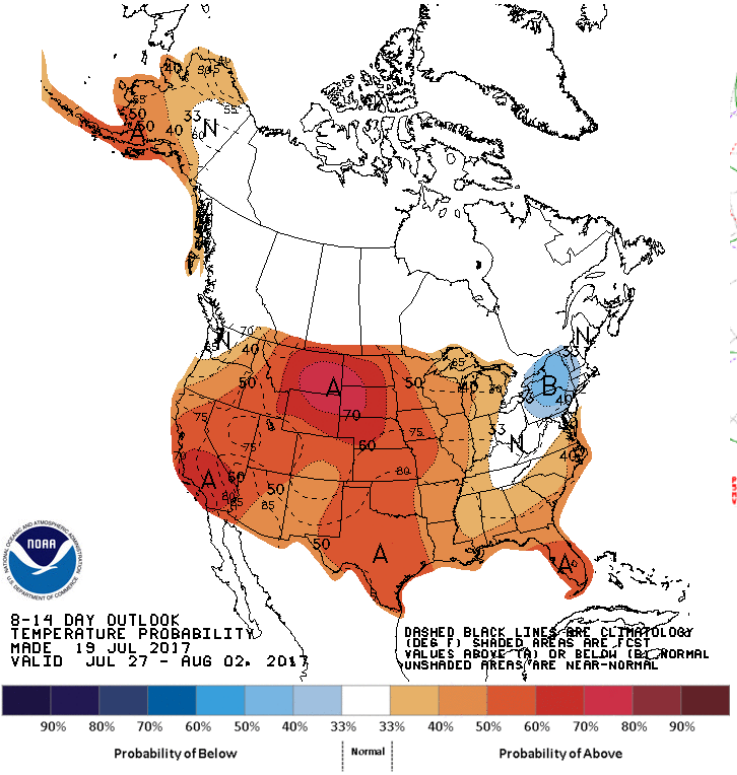


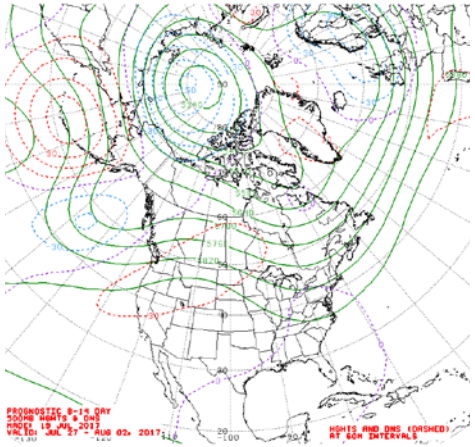


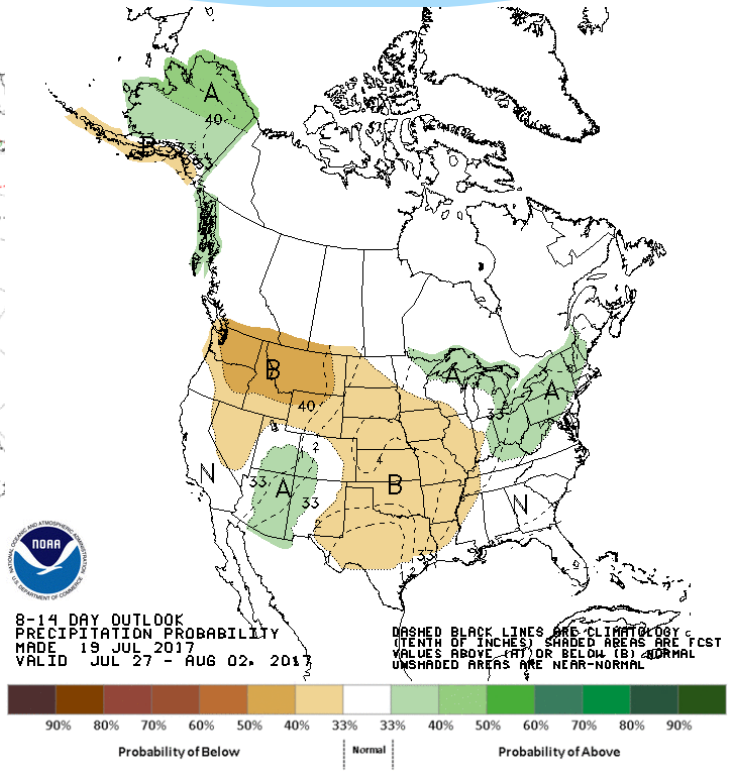


http://www.cpc.ncep.noaa.gov/products/predictions/610day/index.php

Temperature and Precipitation Outlook
27 July – 2 August 2017



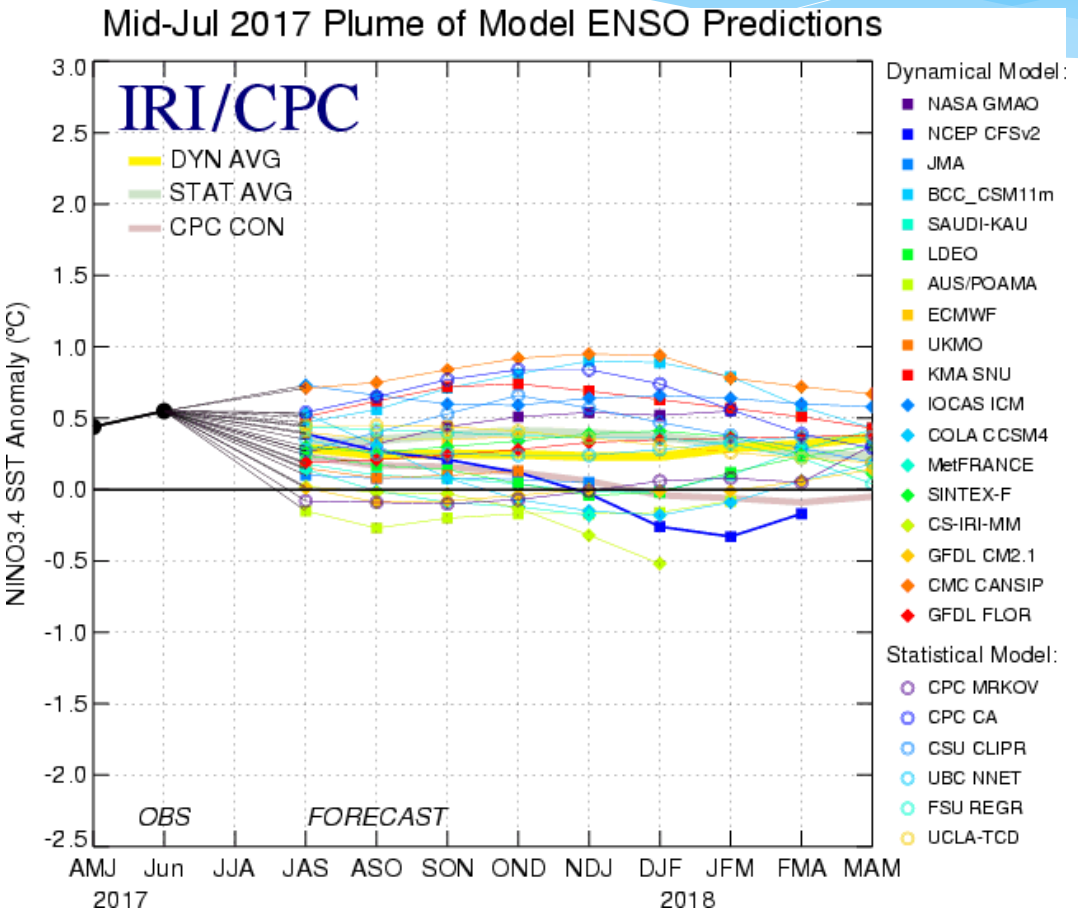




http://www.cpc.ncep.noaa.gov/products/predictions/814day/index.php

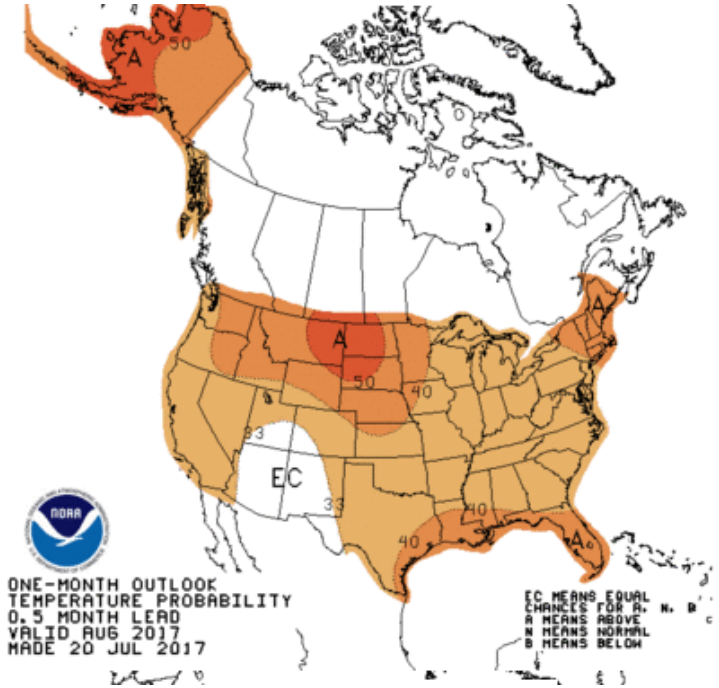
ENSO Outlook

ENSO neutral conditions expected through winter 2017/2018

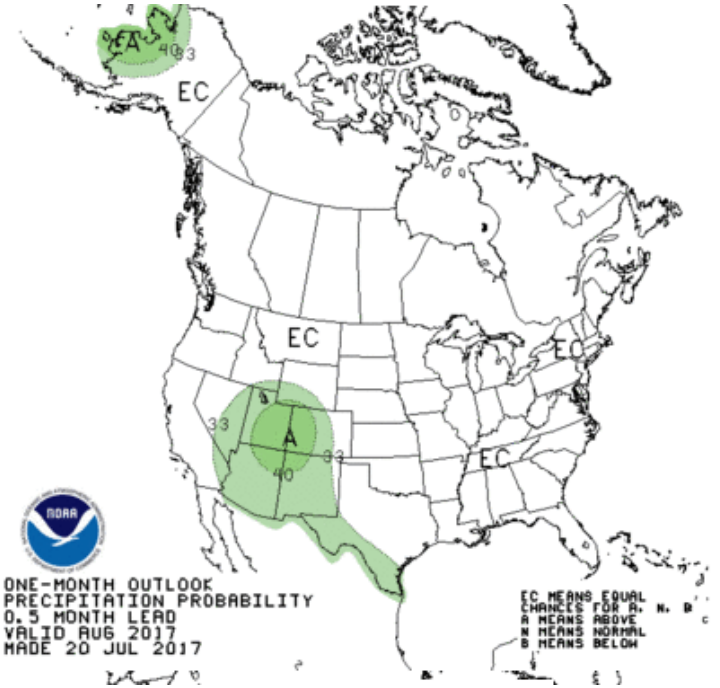


http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Temperature and Precipitation Outlook
August 2017



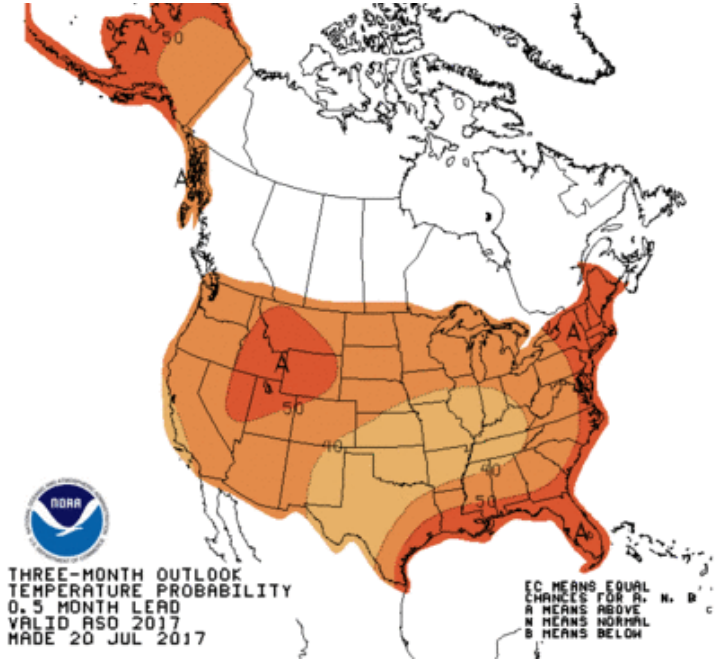
Temperature



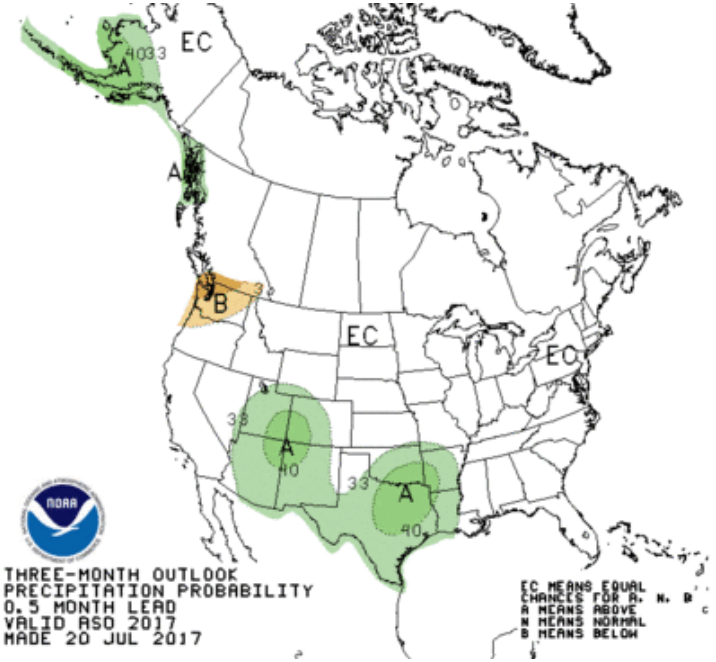
Precipitation

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

Temperature and Precipitation Outlook
August-October 2017



Temperature



Precipitation

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

Summary

* Highly variable rainfall during the past several weeks has resulted in a wide range of current conditions ranging from excessive wetness and flooding across portions of the Great Lakes and Ohio Valley to severe drought in the northern Great Plains. Crop conditions also vary widely across the region.
* Temperatures during the past several weeks have ranged from below normal across eastern sections to above normal in the west.
* Short and medium range forecast guidance suggest continued warmer than normal temperatures and below normal rainfall for much of the region, which would exacerbate drought-related problems in western sections.
* Neutral ENSO conditions are expected through the winter of 2017/2018.
* Long lead outlooks call for warmer than normal mean temperatures to persist into the upcoming fall season. Precipitation totals are generally projected to remain in the Equal Chances category.

Further Information - Partners

* Today's and Past Recorded Presentations at :
* *http://mrcc.isws.illinois.edu/webinars.htm*
  http://www.hprcc.unl.edu
- NOAA's National Centers for Environmental Information: www.ncdc.noaa.gov
  - Monthly climate reports (U.S. & Global): www.ncdc.noaa.gov/sotc/
- NOAA's Climate Prediction Center: www.cpc.ncep.noaa.gov
- Climate Portal: www.climate.gov
- U.S. Drought Portal: 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:
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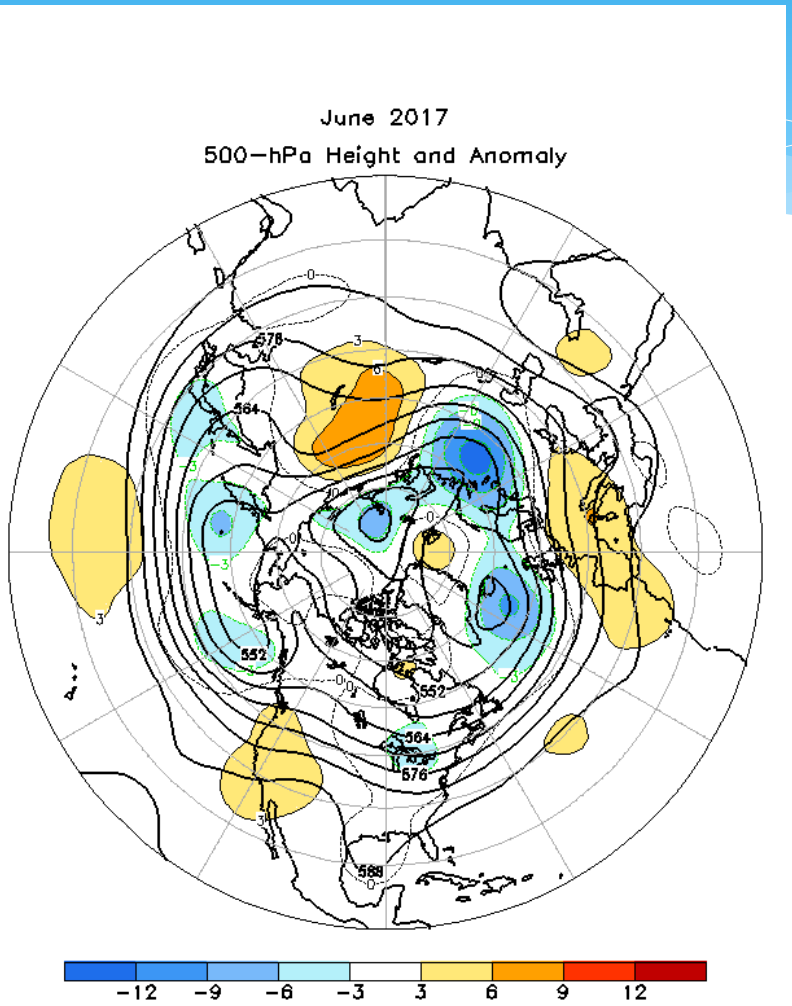
  * Adnan Akyüz: adnan.akyuz@ndsu.edu , 701-231-6577
  * Doug Kluck: doug.kluck@noaa.gov, 816-994-3008
  * Mike Timlin: mtimlin@illinois.edu; 217-333-8506
  * Natalie Umphlett: numphlett2@unl.edu ; 402 472-6764
  * Brian Fuchs: bfuchs2@unl.edu 402 472-6775

  * **Weather:**
  * crhroc@noaa.gov

Mean Mid-Tropospheric Air Flow June 2017

The mean upper air pattern featured a ridge across the western NA with a trough across the east. This resulted in:

1) Warmer and Drier than normal weather across the western half of the USA, and
2) above-average precipitation in the southeast



http://www.ncdc.noaa.gov/temp-and-precip/us-maps/