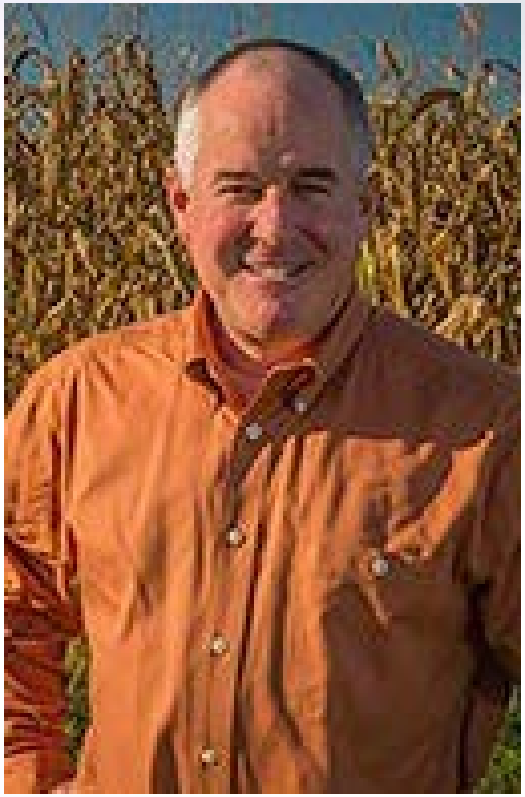
GOVERNOR'S AGRICULTURAL SUMMIT

Trade, the Farm Bill, and Beyond



Val Dolcini

Sara Wyant

Lynn Tjeerdsma

Protecting Our Most Precious Resource

Bill Northey
Iowa Secretary of Agriculture

What's the Weather Going to Be?

Dr. Dennis Todey

Dr. Darren Clabo

Eric Snodgrass

South Dakota's variable/changing climate – ag risks and issues

Dr. Dennis Todey
South Dakota State Climatologist
Assoc. Prof.
South Dakota State University
dennis.todey@sdstate.edu
605-688-5141

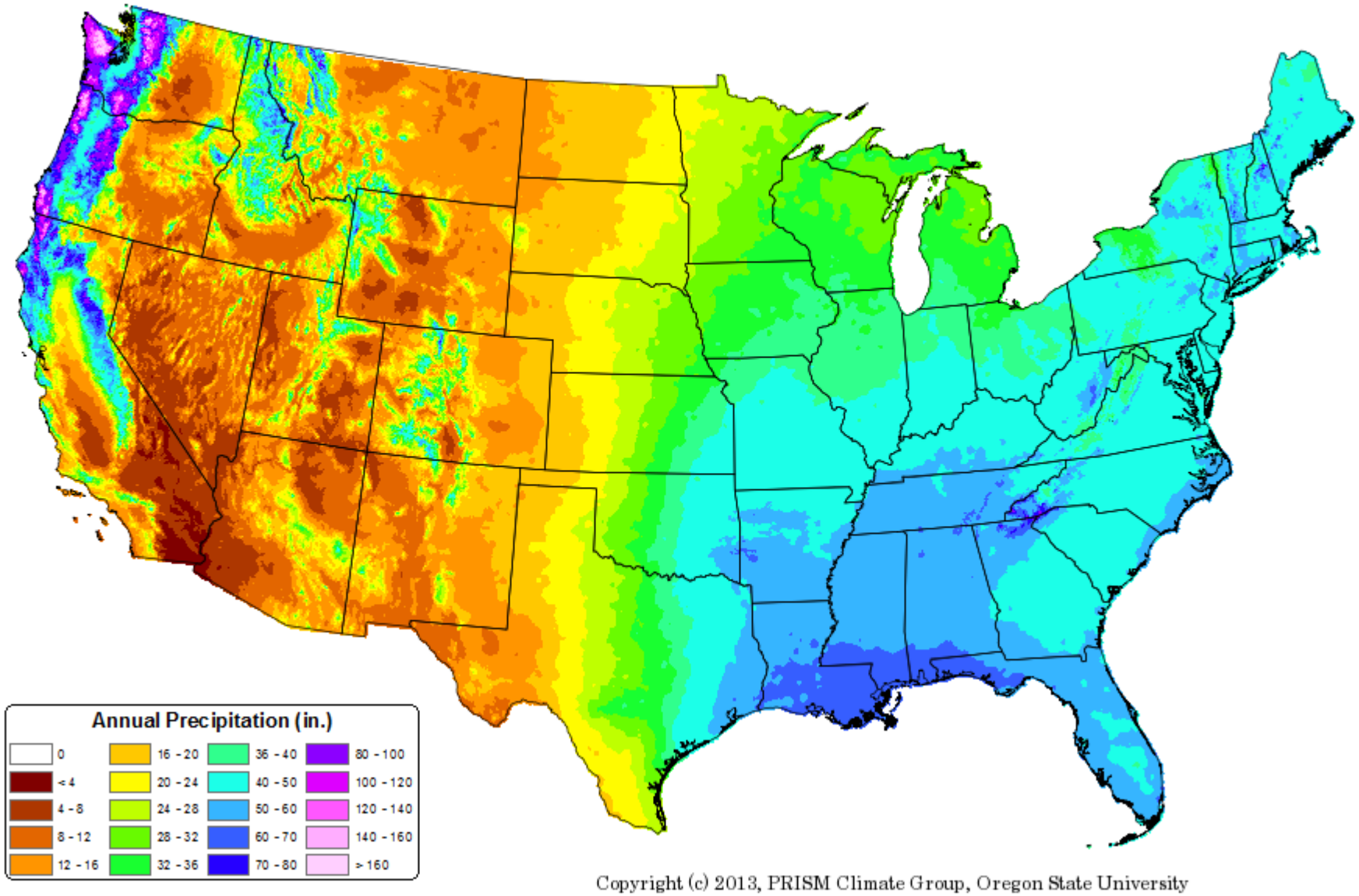
AASC
AMERICAN ASSOCIATION OF STATE CLIMATOLOGISTS

SOUTH DAKOTA Climate and Weather

Livin’ at the extremes

30-yr Normal Precipitation: Annual

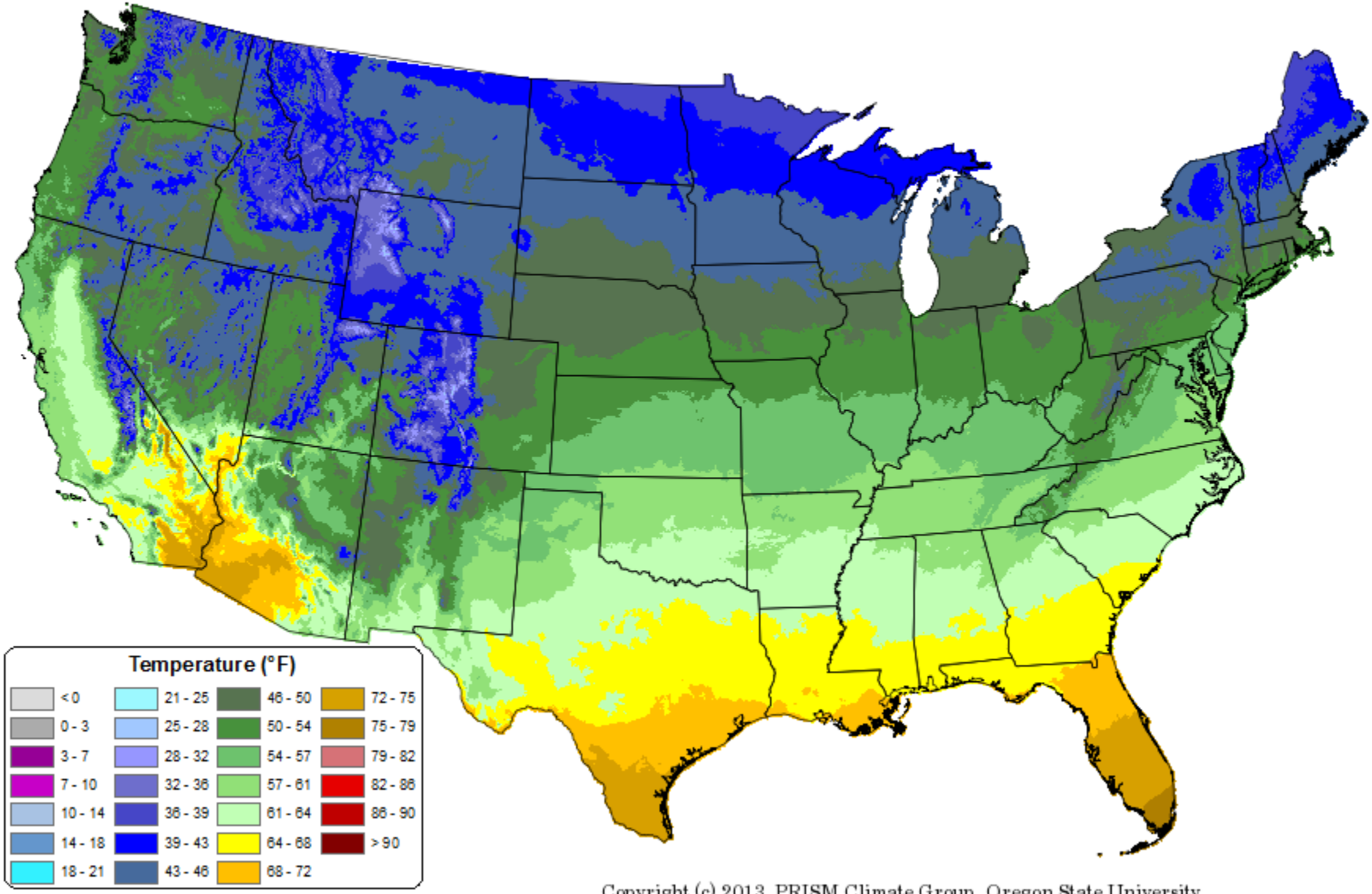
Period: 1981-2010



Copyright (c) 2013, PRISM Climate Group, Oregon State University

30-yr Normal Mean Temperature: Annual

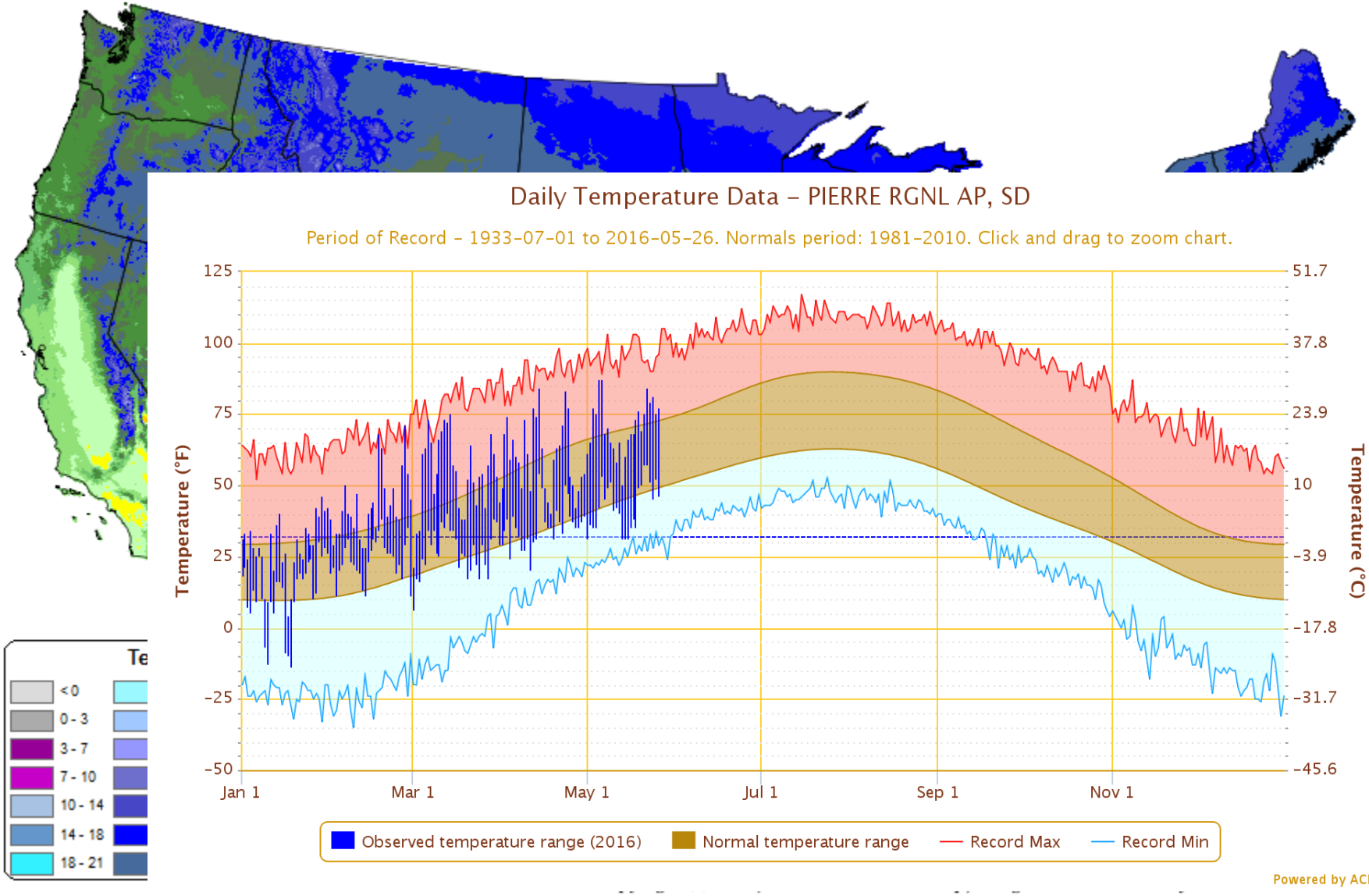
Period: 1981-2010



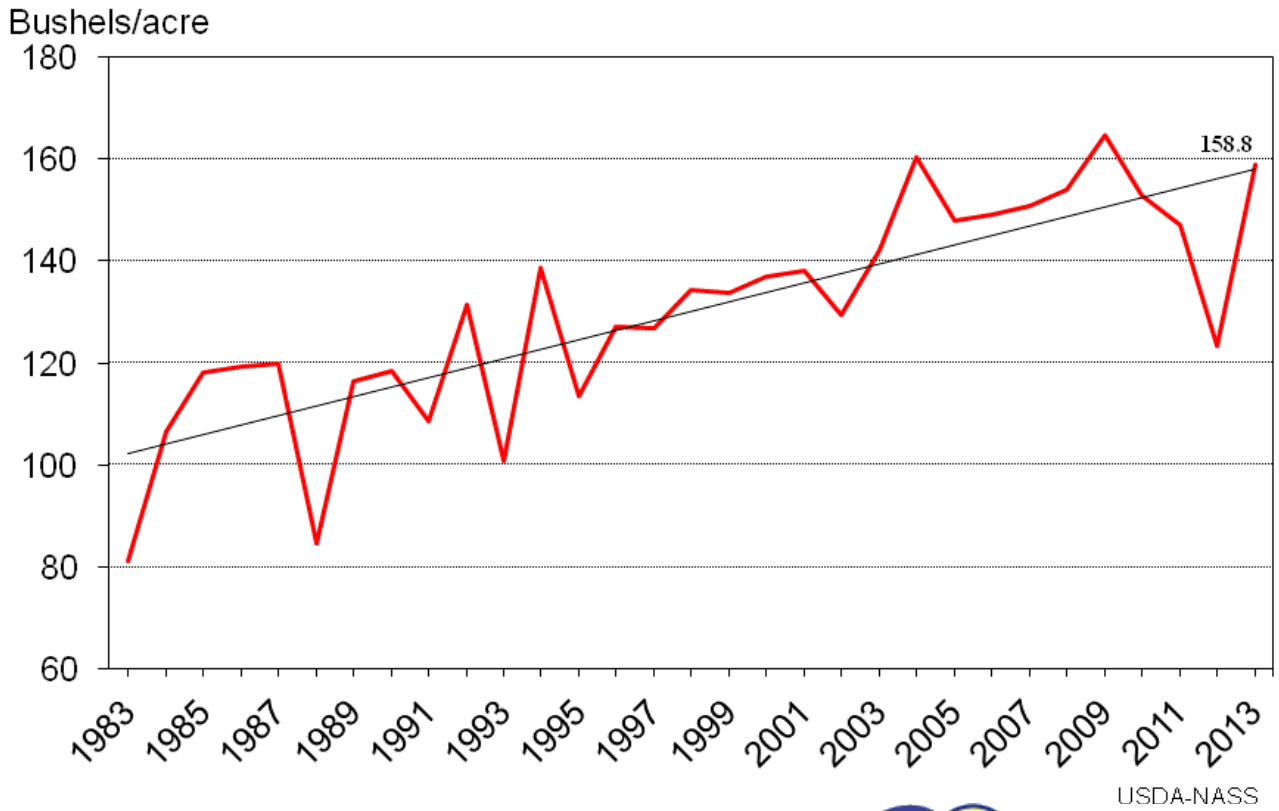
Copyright (c) 2013, PRISM Climate Group, Oregon State University

30-yr Normal Mean Temperature: Annual

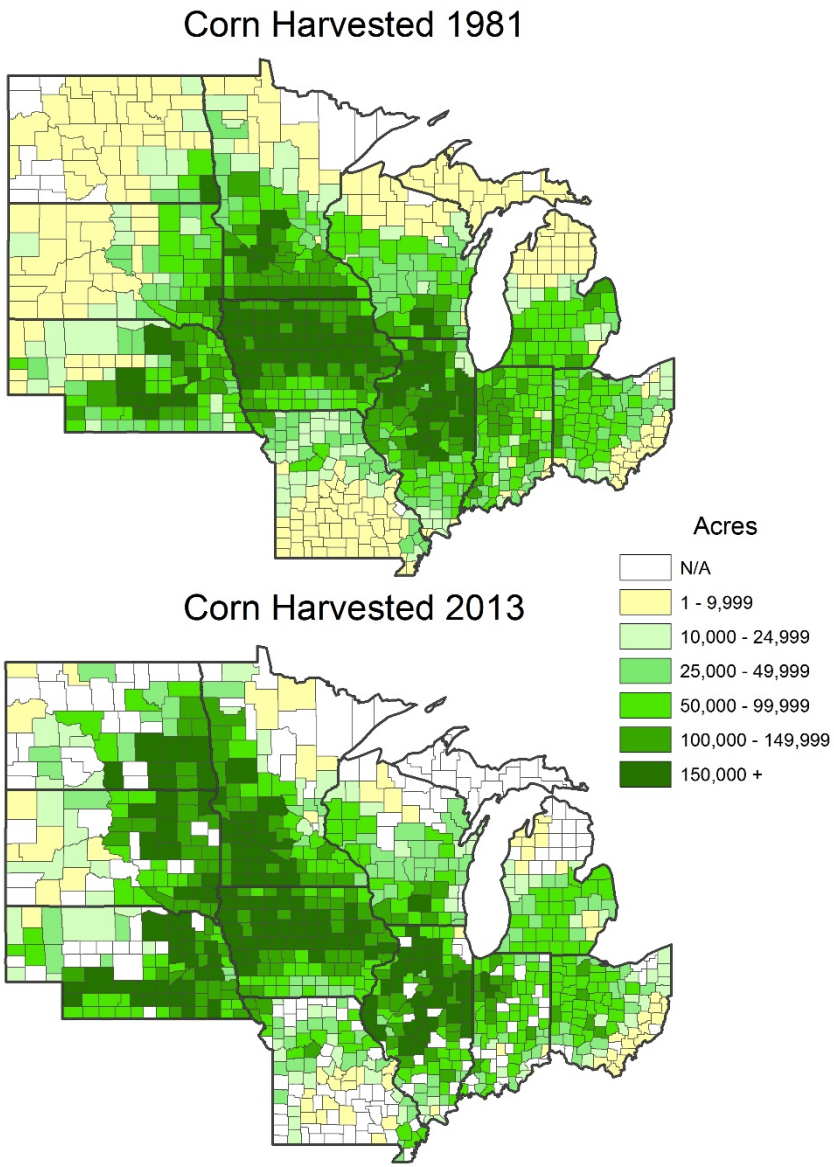
Period: 1981-2010



Climate Impacts Yields



SOUTH DAKOTA Climate and Weather

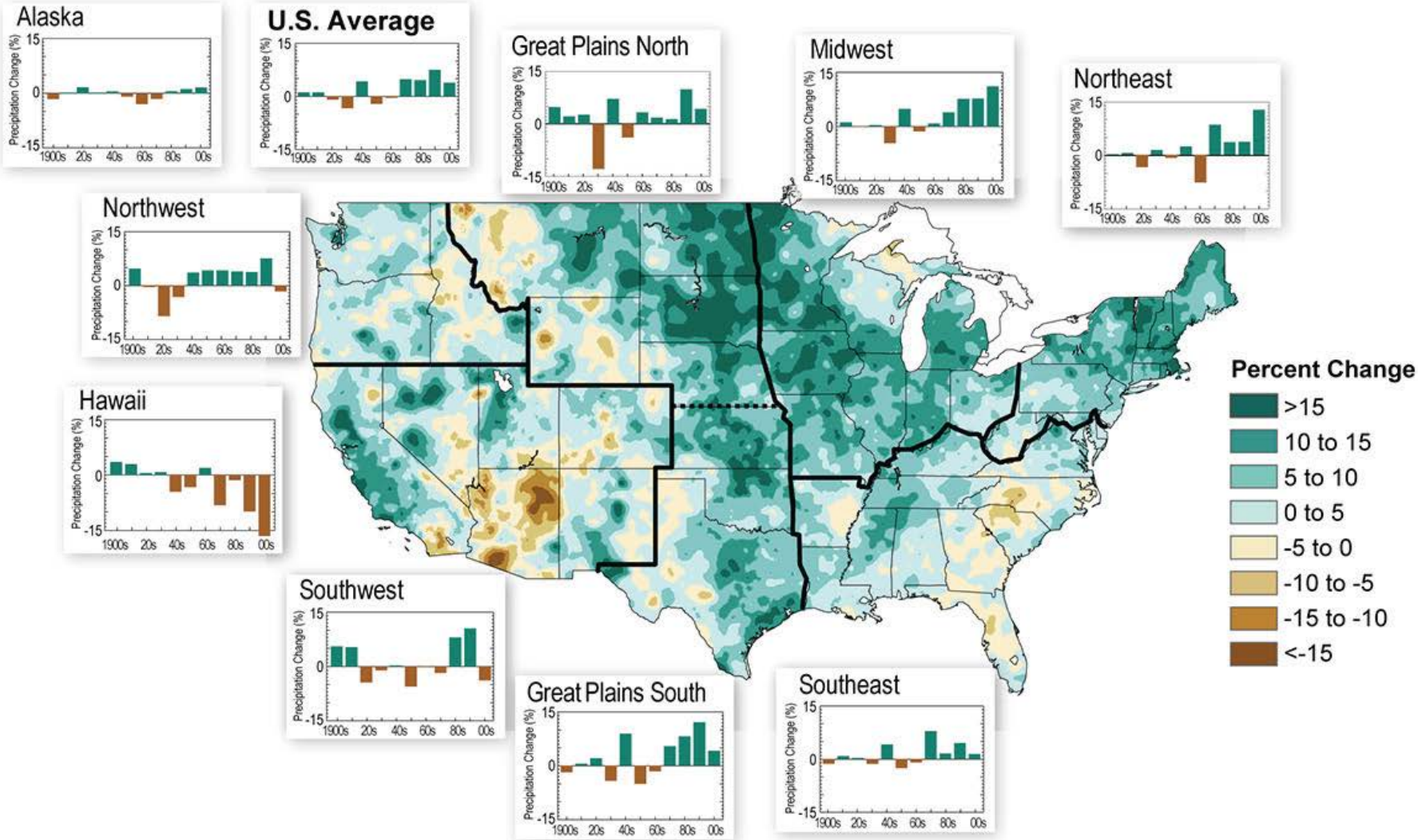

Corn Harvested 1981
Corn Harvested 2013
Acres
N/A
1 - 9,999
10,000 - 24,999
25,000 - 49,999
50,000 - 99,999
100,000 - 149,999
150,000 +

CLIMATE CHANGES

Derived from

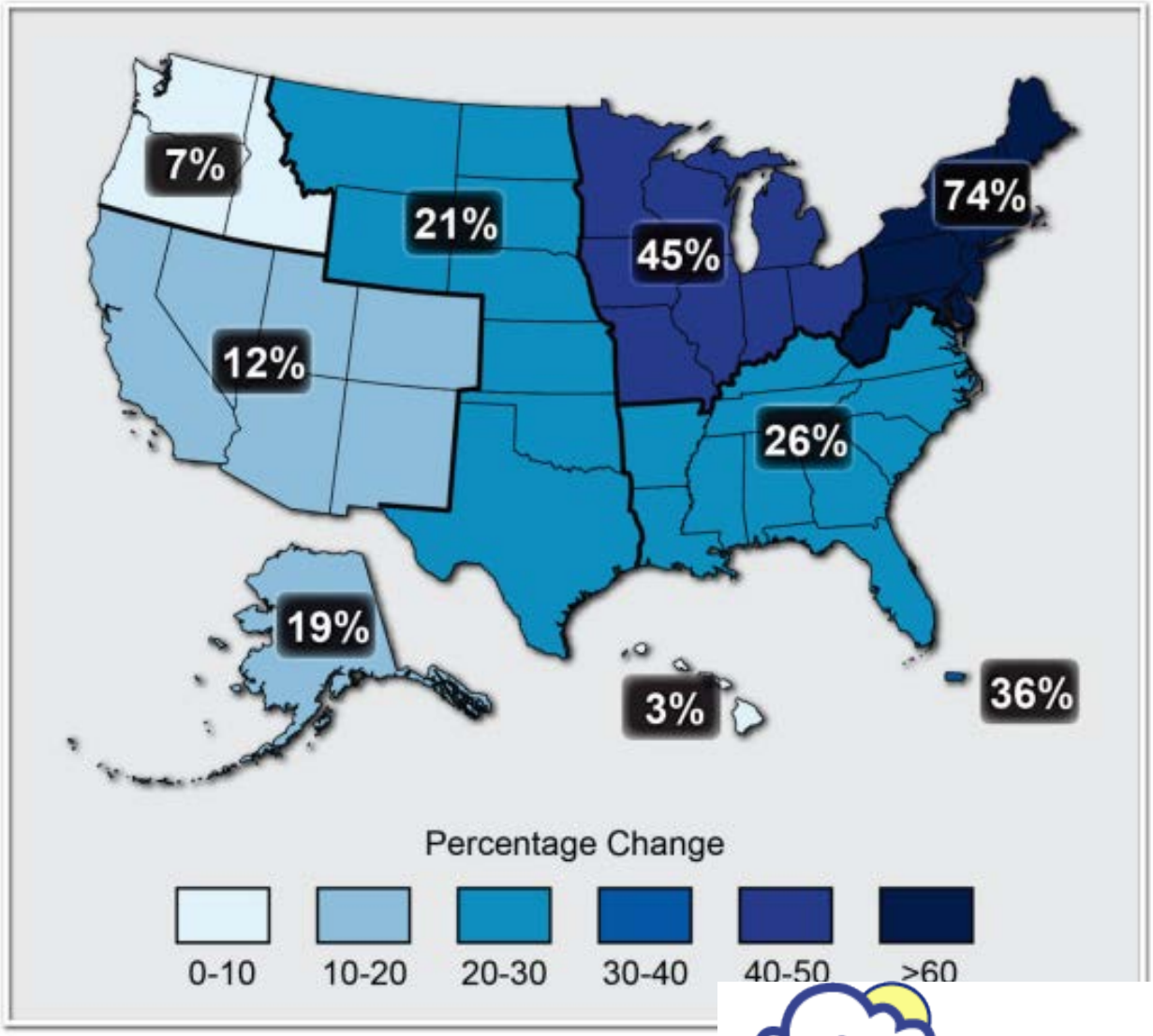
- http://nca2014.globalchange.gov/

Observed U.S. Precipitation Change



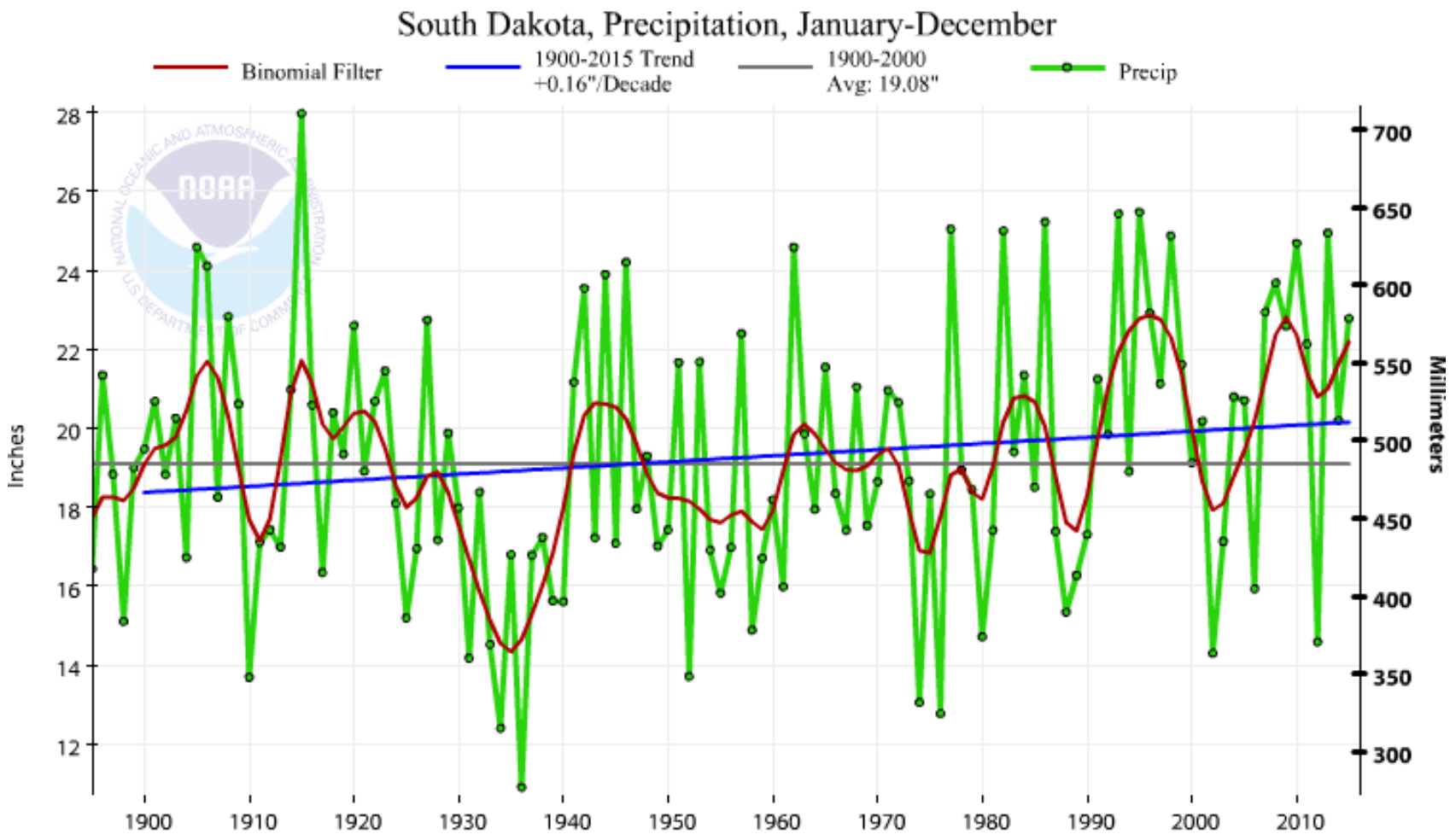
SOUTH DAKOTA Climate and Weather

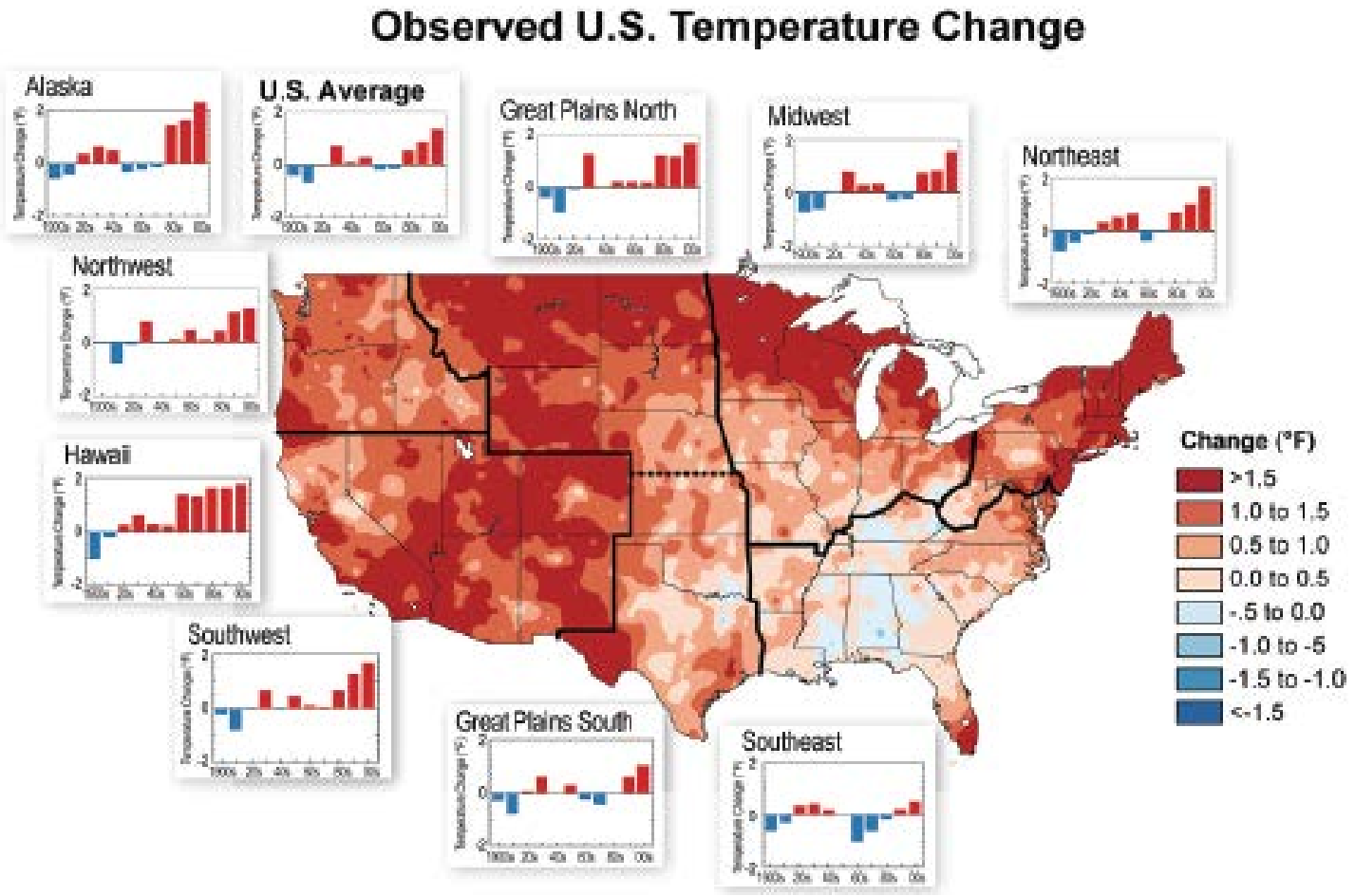
Percentage Change in Very Heavy Precipitation



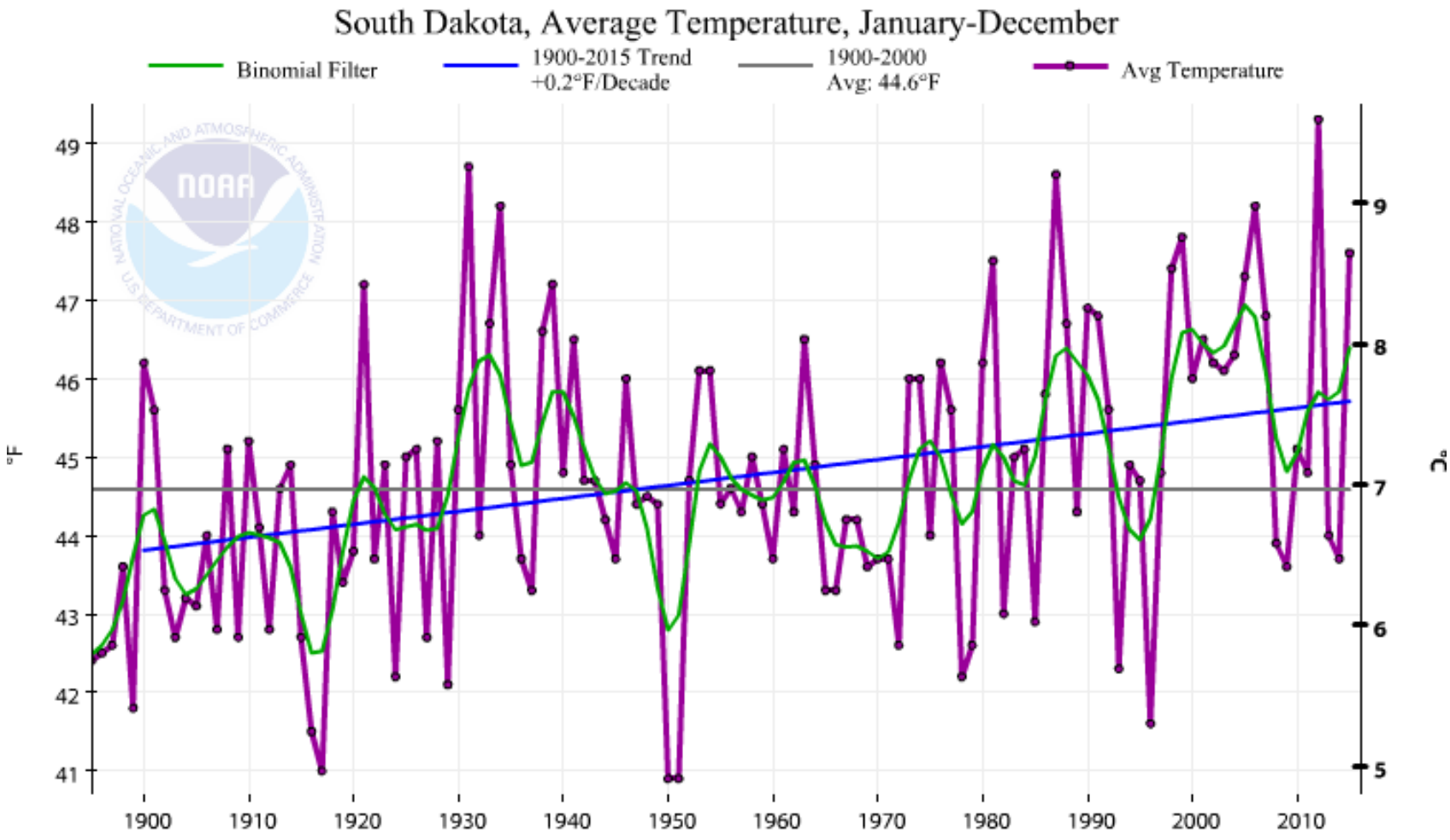
SOUTH DAKOTA Climate and Weather

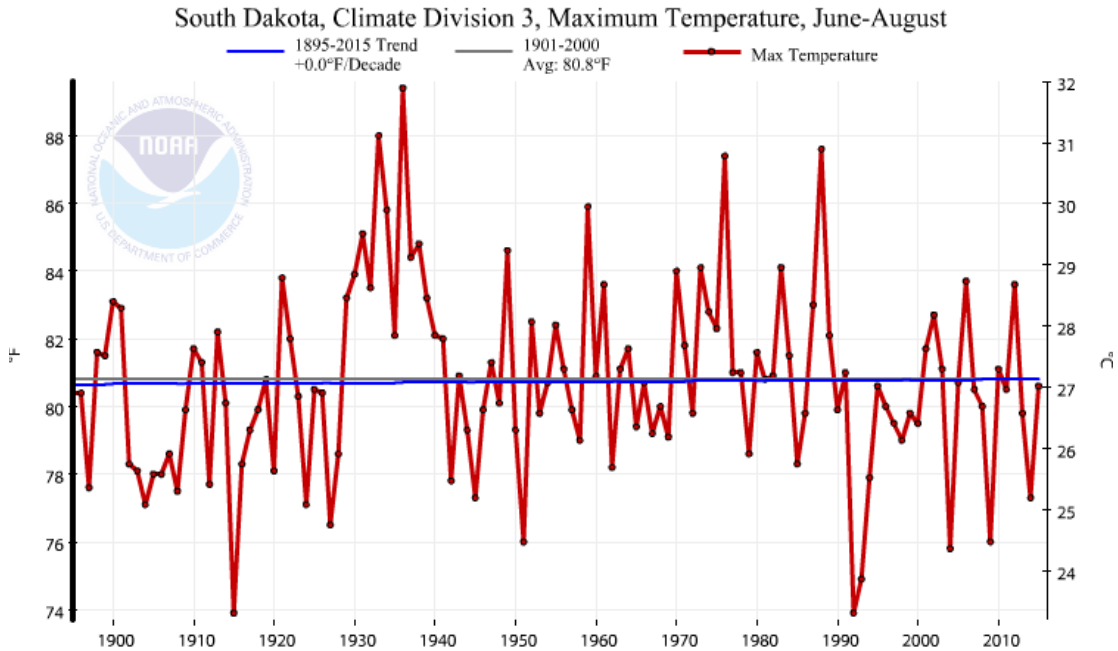
Draft: National Climate Assessment - ncadac.globalchange.gov

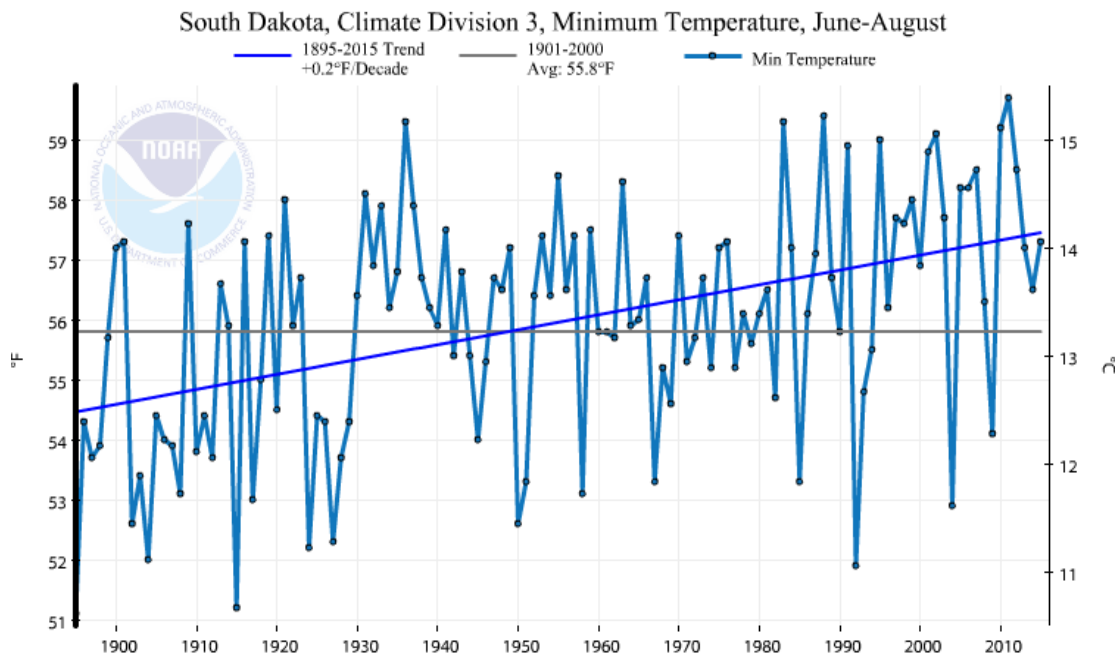

South Dakota, Precipitation, January-December
Binomial Filter
1900-2015 Trend
+0.16"/Decade
1900-2000
Avg: 19.08"
Precip
Inches
Millimeters
28
26
24
22
20
18
16
14
12
700
650
600
550
500
450
400
350
300
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

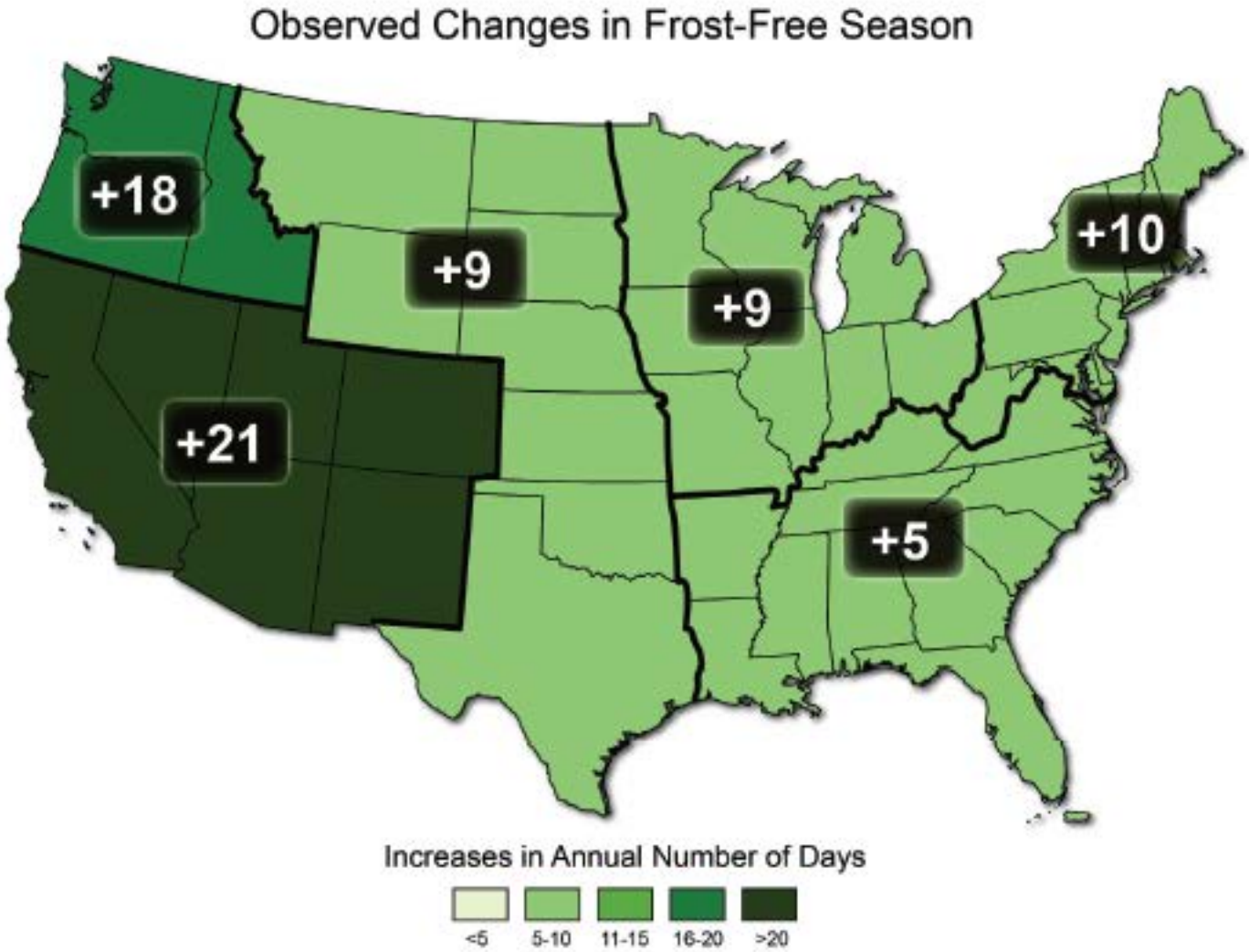


From National Climate Assessment


South Dakota, Average Temperature, January-December
Binomial Filter
1900-2015 Trend
+0.2°F/Decade
1900-2000
Avg: 44.6°F
Avg Temperature
°F
°C
49
48
47
46
45
44
43
42
41
9
8
7
6
5
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

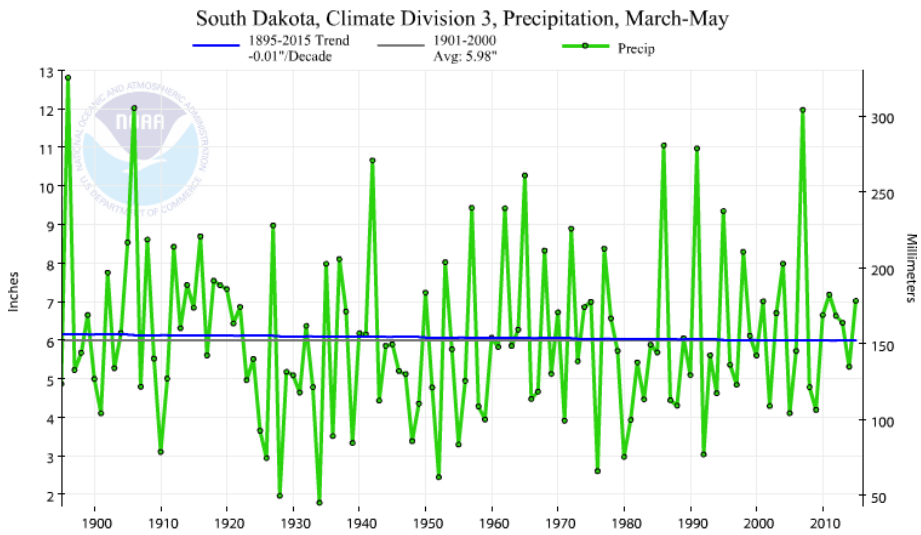

South Dakota, Climate Division 3, Maximum Temperature, June-August
1895-2015 Trend
+0.0°F/Decade
1901-2000
Avg: 80.8°F
Max Temperature
°F
°C
88
86
84
82
80
78
76
74
32
31
30
29
28
27
26
25
24
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

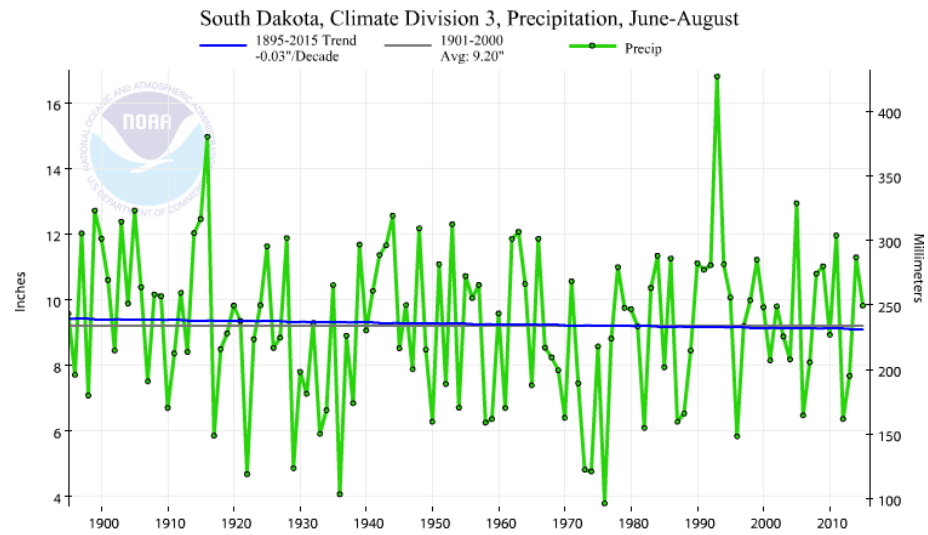

South Dakota, Climate Division 3, Minimum Temperature, June-August
1895-2015 Trend
+0.2°F/Decade
1901-2000
Avg: 55.8°F
Min Temperature
°F
°C
59
58
57
56
55
54
53
52
51
15
14
13
12
11
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

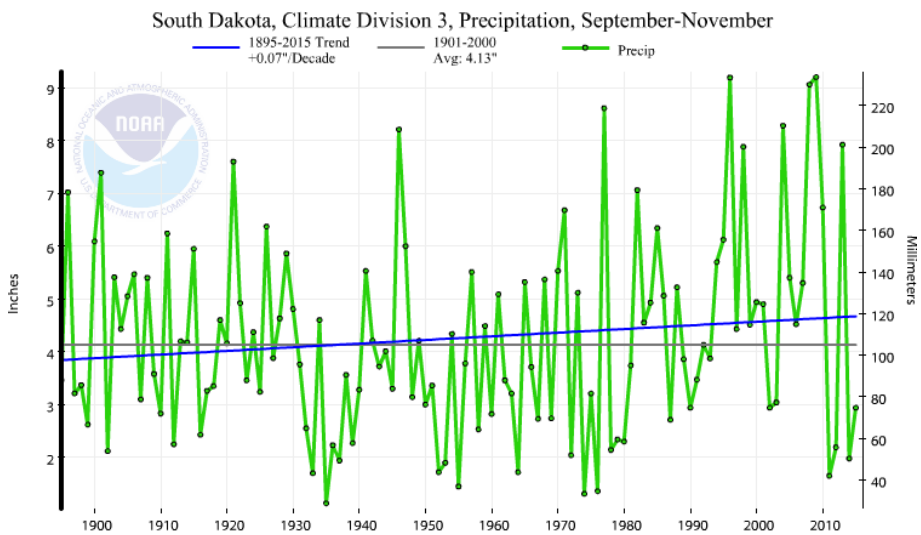

Observed Changes in Frost-Free Season
+18
+9
+9
+10
+21
+5
Increases in Annual Number of Days
<5
5-10
11-15
16-20
>20

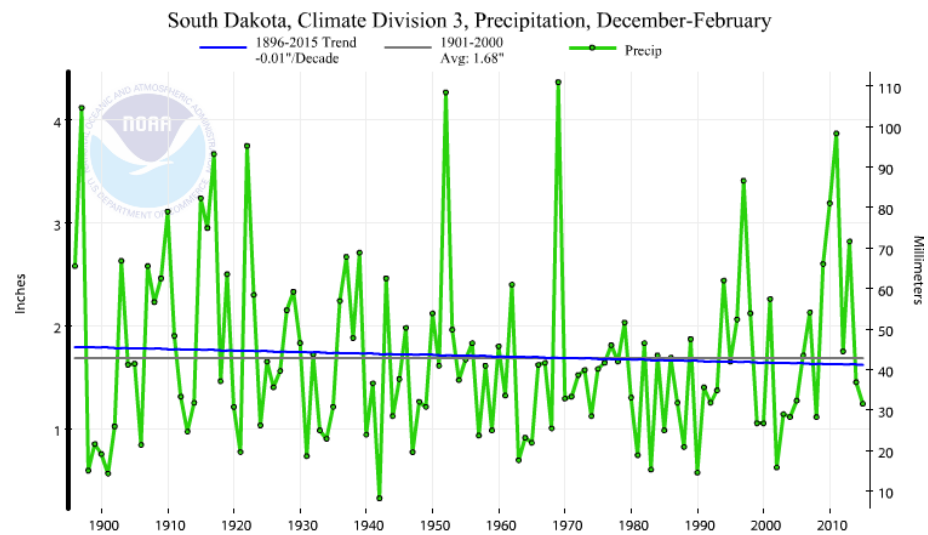
State and Regional T and P Trends

- http://www.ncdc.noaa.gov/cag/time-series/us
- Check out your locations
- Variabilities in seasons and trends
- Based on ~120 years of data









Seasonal Precipitation Trends SD

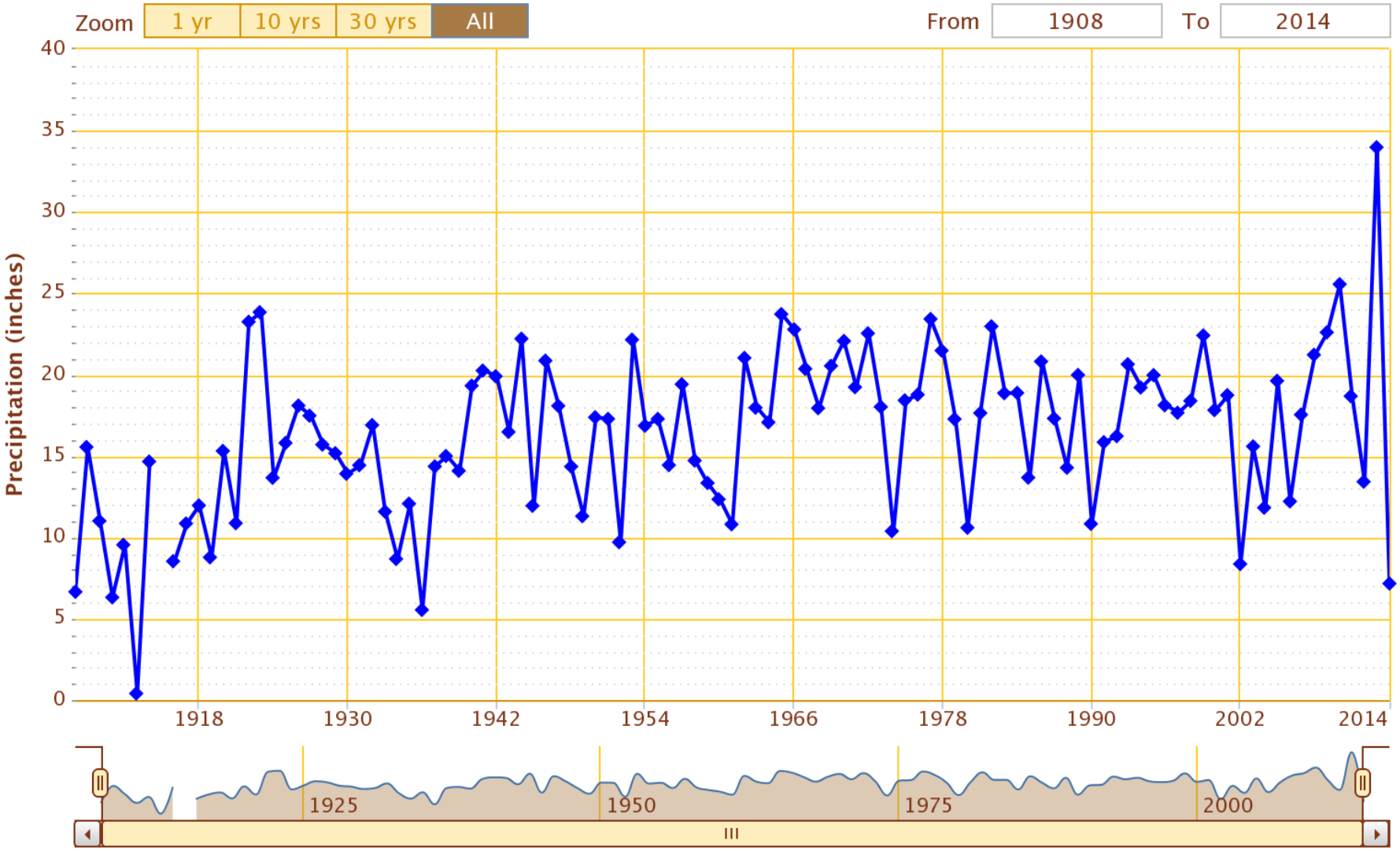
Bigger extremes

- Lemmon/Lead 2013 (near 50”)
- Canton/Sioux Falls 2014 (June 19.75”)
- Brookings 2010
- Iowa 2008
- 1993 everywhere…..

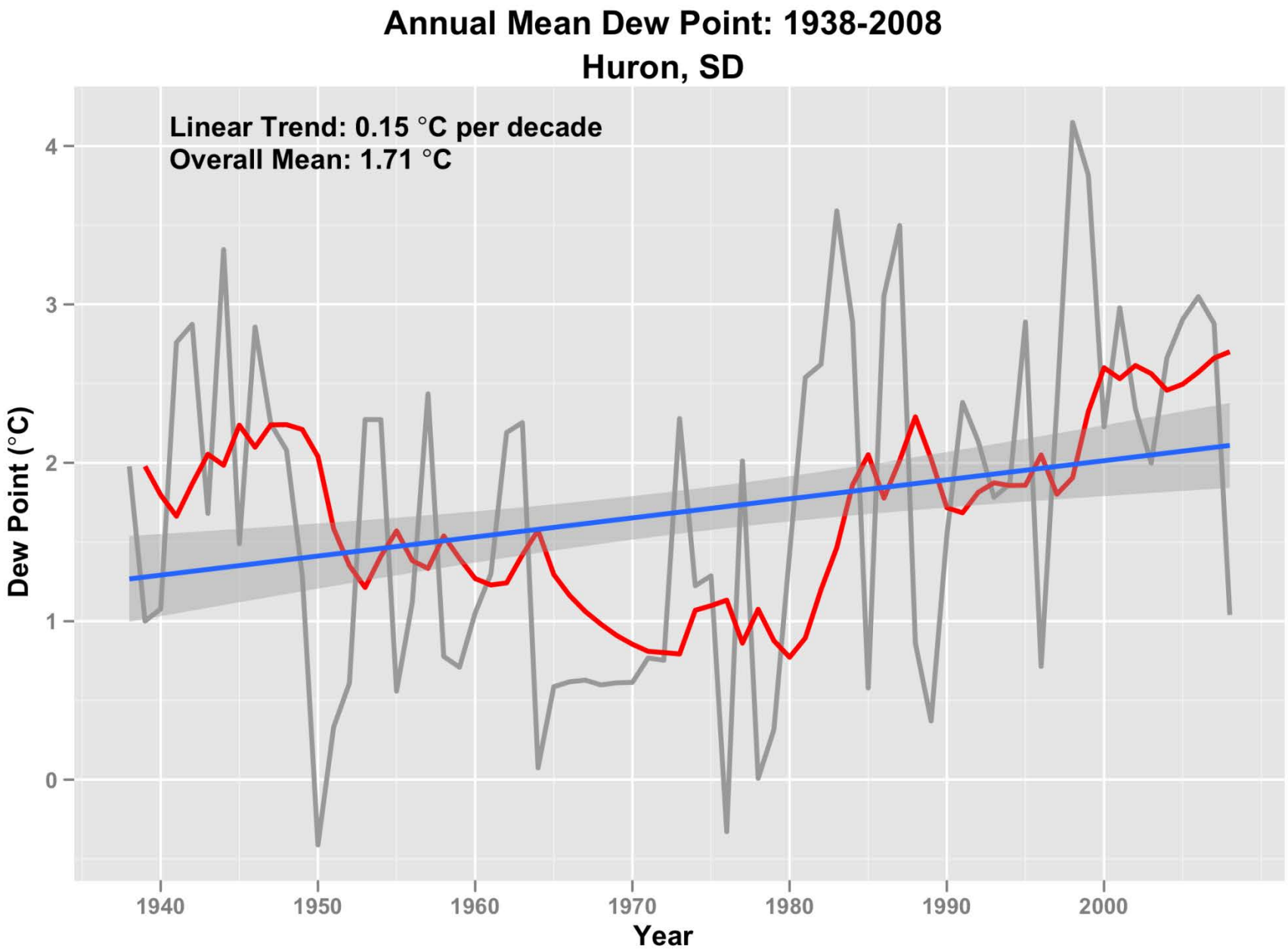
- Breaking records by large amounts

Total Precipitation – Jan through Dec – LEMMON, SD

Use navigation tools above and below chart to change displayed range

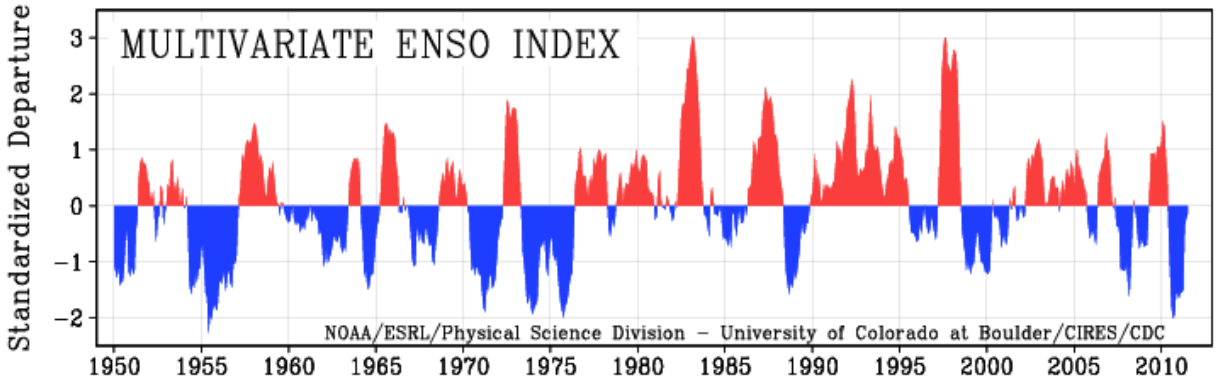


Powered by ACIS


Annual Mean Dew Point: 1938-2008
Huron, SD
Linear Trend: 0.15 °C per decade
Overall Mean: 1.71 °C
Dew Point (°C)
4
3
2
1
0
1940
1950
1960
1970
1980
1990
2000
Year

Climate

- **Climate Variability is not going away**
  - El Nino-Southern Oscillation (El Nino/La Nina cycle) will continue to be a factor on North American climate in the future
    - Although there is not a strong correlation for South Dakota
  - It is abnormal to be normal… even though the "normals" have changed, rarely are conditions ever normal
  - Cycles of wet and dry, hot and cold, will continue on interannual to decadal scales



http://www.esrl.noaa.gov/psd/enso/mei/

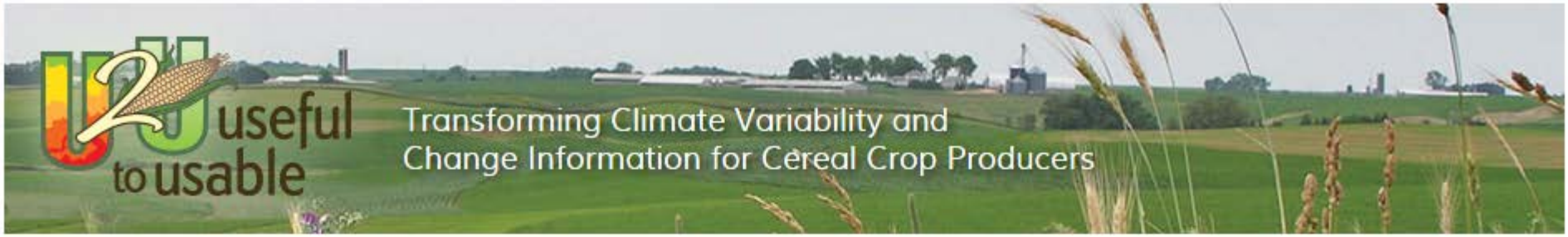
Climate Changes

- Wetter – bigger events
- Changing time of year precip – more in transition seasons (spring-fall)
- Longer growing season
- Increasing moisture content
- Warming (winter and minimum temperatures more prevalent)
- Precip extremes – bigger spring events

Climate Changes

- Wetter – bigger events (soil management)
- Changing time of year precip – more in transition seasons (spring-fall) (soil and water management)
- Longer growing season (hybrid changes)
- Increasing moisture content (disease issues)
- Warming (winter and minimum temperatures more prevalent) (disease-insect)
- Precip extremes – bigger spring events

Decision Dashboard

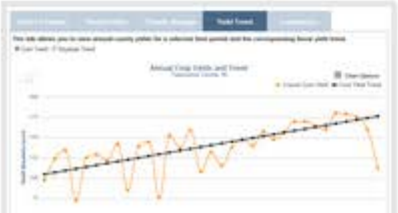


DECISION DASHBOARD | MEDIA CENTER | NEWSLETTER | ABOUT US

Decision Dashboard

U2U$_{DST}$ Suite | Other Decision Resources | Agro-Climate Reports | Weather/Climate Maps | Drought Info | Climate Outlooks | Helpful Links

U2U$_{DST}$ SUITE



AgClimate View$_{DST}$

A convenient way to access customized historical climate and crop yield data for the U.S. Corn Belt. View graphs of monthly temperature and precipitation,

Corn GDD$_{DST}$

Track real-time and historical GDD accumulations, assess spring and fall frost risk, and guide decisions related to planting, harvest, and seed selection.

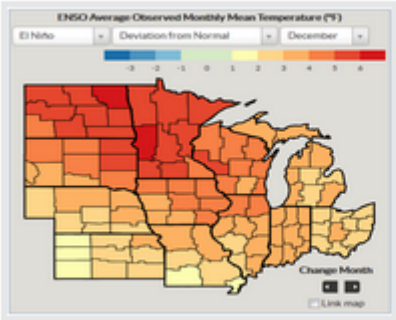
www.AgClimate4U.org

Decision Support Tools

U2U$_{DST}$ SUITE

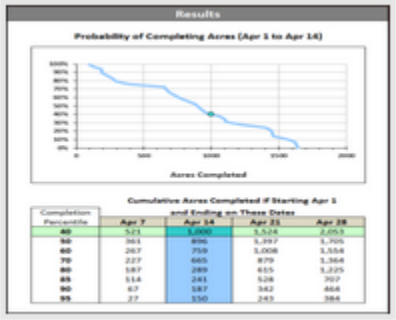
AgClimate View$_{DST}$

A convenient way to access customized historical climate and crop yield data for the U.S. Corn Belt. View graphs of monthly temperature and precipitation, plot corn and soybean yield trends, and compare climate and yields over the past 30 years.



Climate Patterns Viewer$_{DST}$

Discover how global climate patterns like the El Niño Southern Oscillation (ENSO) and Arctic Oscillation (AO) have historically affected local climate conditions and crop yields across the U.S. Corn Belt.

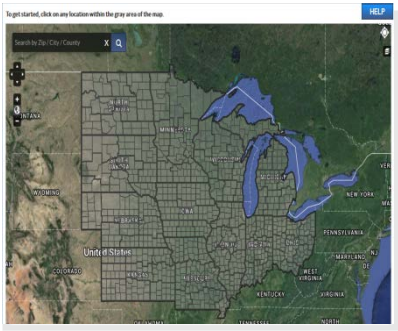


Probable Fieldwork Days$_{DST}$

This spreadsheet-based tool uses USDA data on Days Suitable for Fieldwork to determine the probability of completing in-field activities during a user-specified time period. This product is currently available for Illinois, Iowa, Kansas, and Missouri. (Hosted by the University of Missouri)

Corn GDD$_{DST}$

Track real-time and historical GDD accumulations, assess spring and fall frost risk, and guide decisions related to planting, harvest, and seed selection. This innovative tool integrates corn development stages with weather and climate data for location-specific decision support tailored specifically to agricultural production.



Corn Split N$_{DST}$ (NEW!)

Determine the feasibility and profitability of using post-planting nitrogen application for corn production. This product combines historical data on crop growth and fieldwork conditions with economic considerations to determine best/worst /average scenarios of successfully completing nitrogen applications within a user-specified time period.

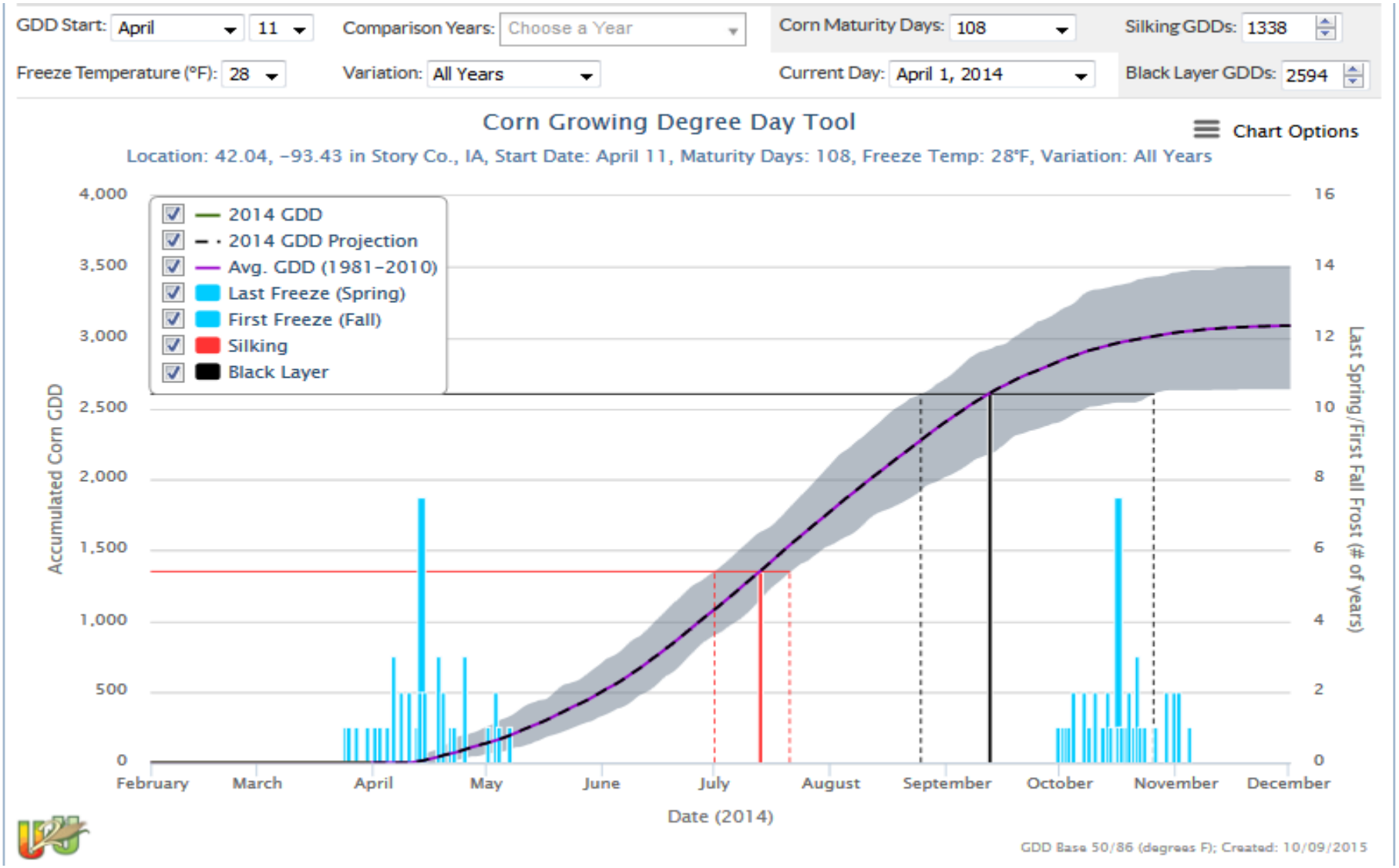
www.AgClimate4U.org

Corn Growing Degree Days

This tool puts current conditions into a 30-year historical perspective and offers trend projections through the end of the calendar year. Growing Degree Day (GDD) projections, combined with analysis of historical analog data, can help you make decisions about:

- Climate Risks – Identify the likelihood of reaching maturity before frosts/freezes.
- Activity Planning – Consider corn hybrid estimated physiological maturity requirements, along with GDD projections when making seed purchasing and other growing season decisions.
- Marketing – Look at historical and projected GDD when considering forward pricing and crop insurance purchases.

GDD Graph



www.AgClimate4U.org

Monthly Outlook Webinars

- State climatologists, regional climate centers, NOAA, NDMC, USDA cooperating on monthly drought outlook webinars

- Third Thursday of each month

  June 16, 2016

  You may sign up for the webinars here:

  http://drought.gov/

Questions?

- Dr. Dennis Todey
- South Dakota State Climatologist
- dennis.todey@sdstate.edu
- 605-688-5678
- http://climate.sdstate.edu
- Facebook: SDSUclimate
- Blog: http://www.sustainablecorn.org/blog/

Wildfire, Weather, and Agriculture

Assessing wildfire risk from a weather and climate perspective

Darren R. Clabo
South Dakota State Fire Meteorologist
South Dakota School of Mines and Technology

Climate and Wildfire

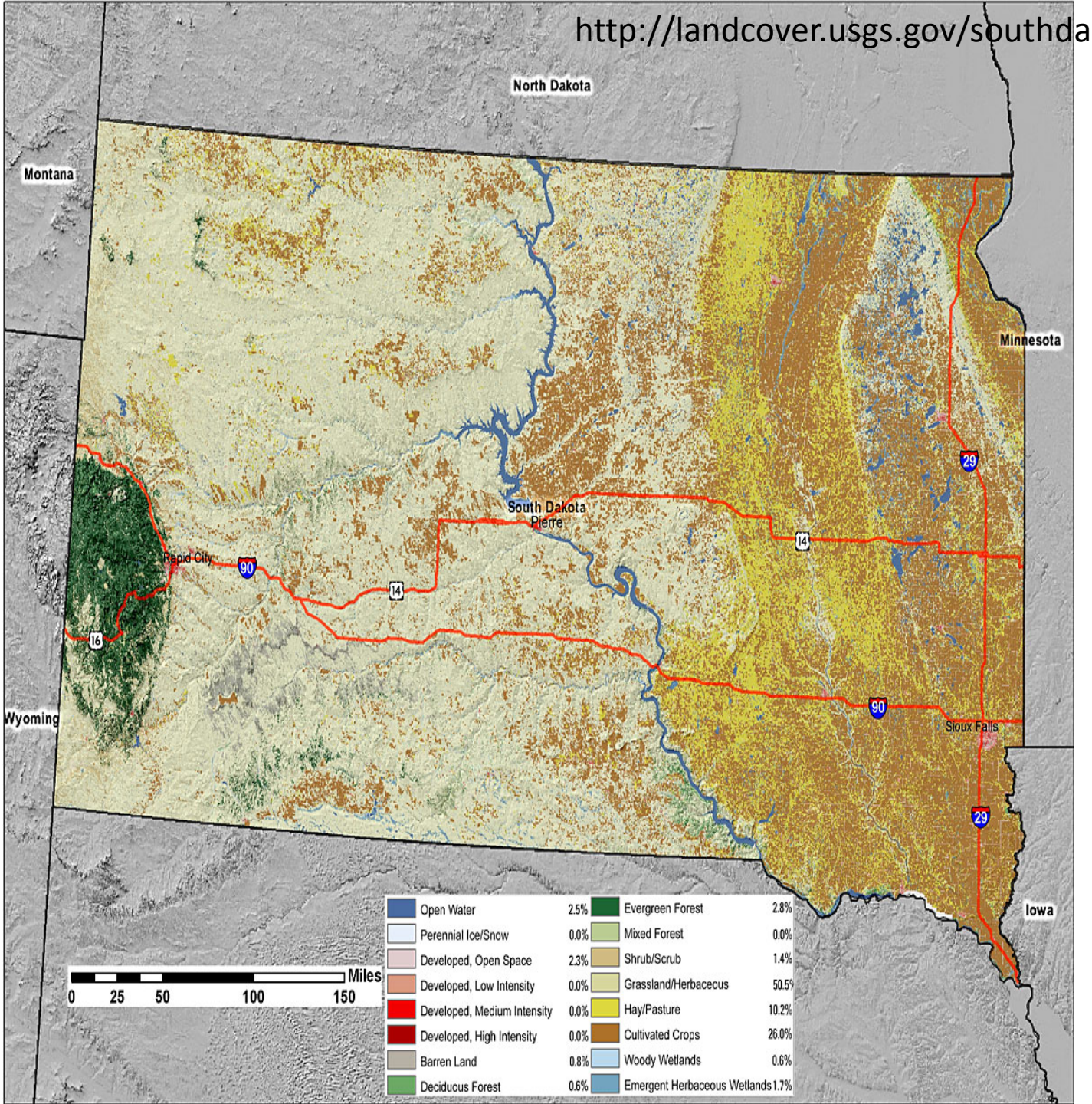
- Wildfire and climate are inherently linked
  - South Dakota has both forested ecosystems and mixed grass prairies
    - Both are adapted to fi
- Climate
  - Temperature
  - Precipitation
  - Drought
  - Fuels
  - Wildfires

Wildfire behavior overview

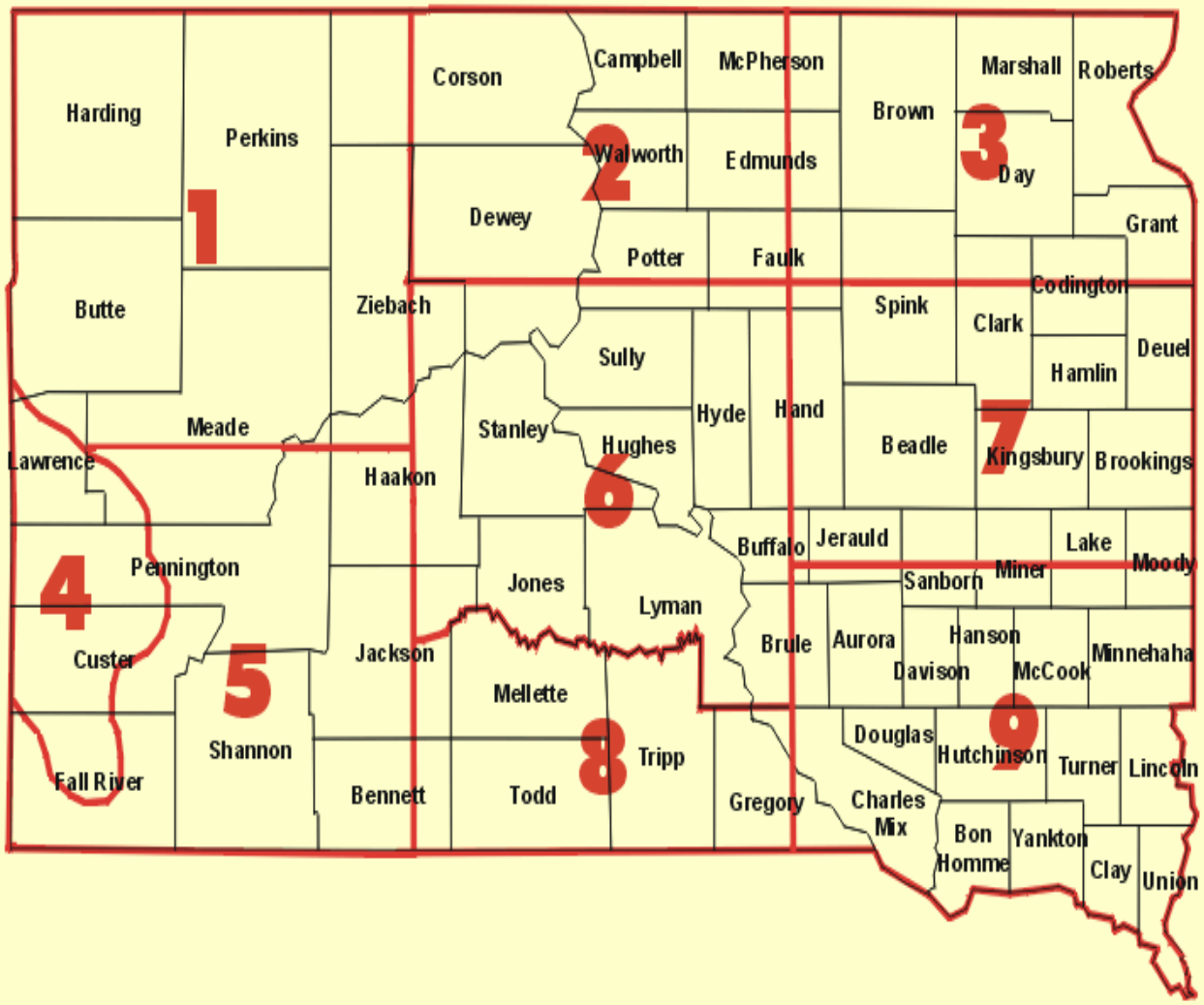
- Fuels
  - Fine fuels are the carrier of fire, i.e. grass, thatch, needle cast
  - Large fuels dictate intensity
  - Land cover constantly changing a
- Topography
  - Largely unchanging
- Weather
  - Climate
  - Day-to-day variability
  - Linkages with fuel

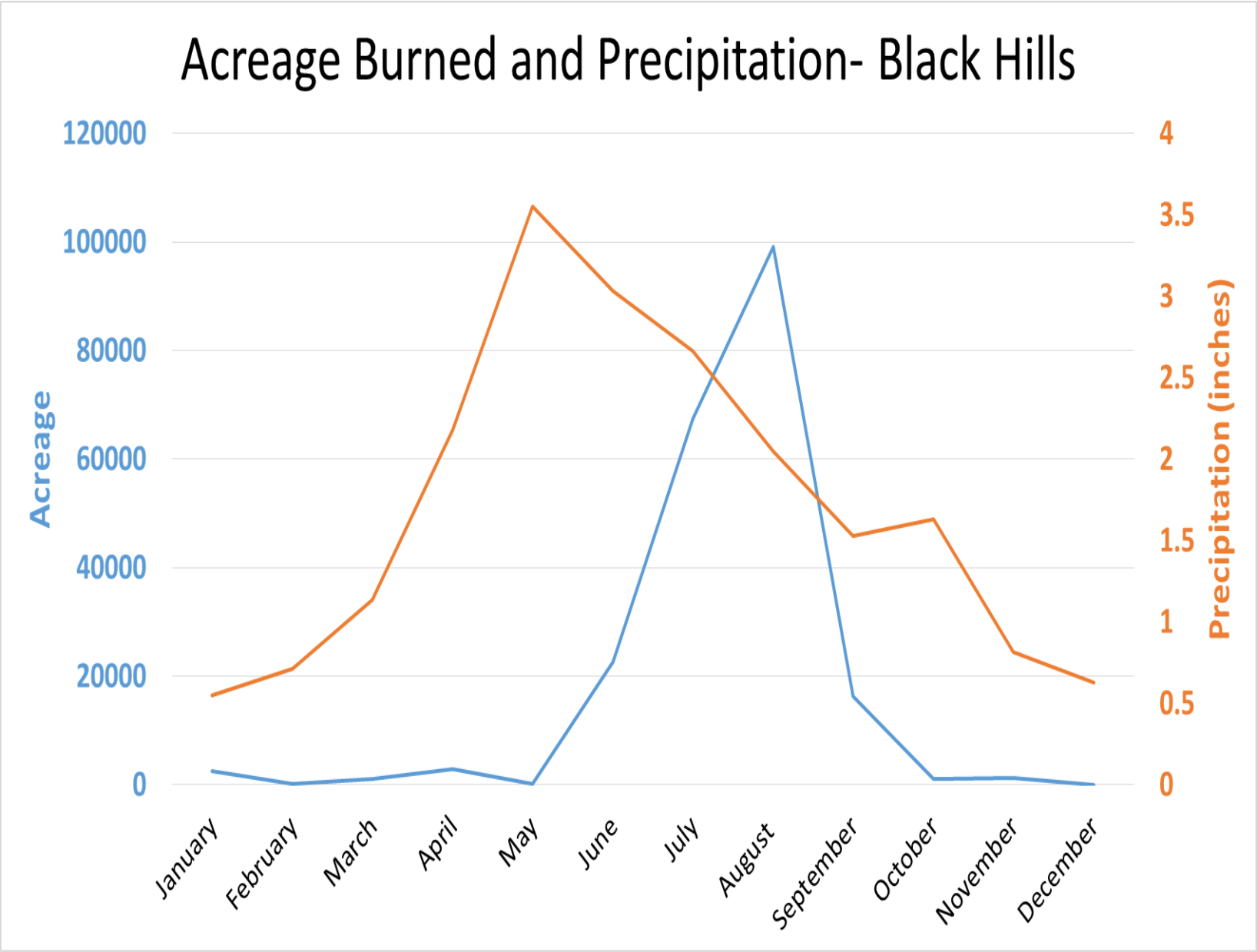
http://training.nwcg.gov/courses/s590/HTML/Fire%20Behavior%20Narratives/media/46.jpg

http://landcover.usgs.gov/southdakota.php

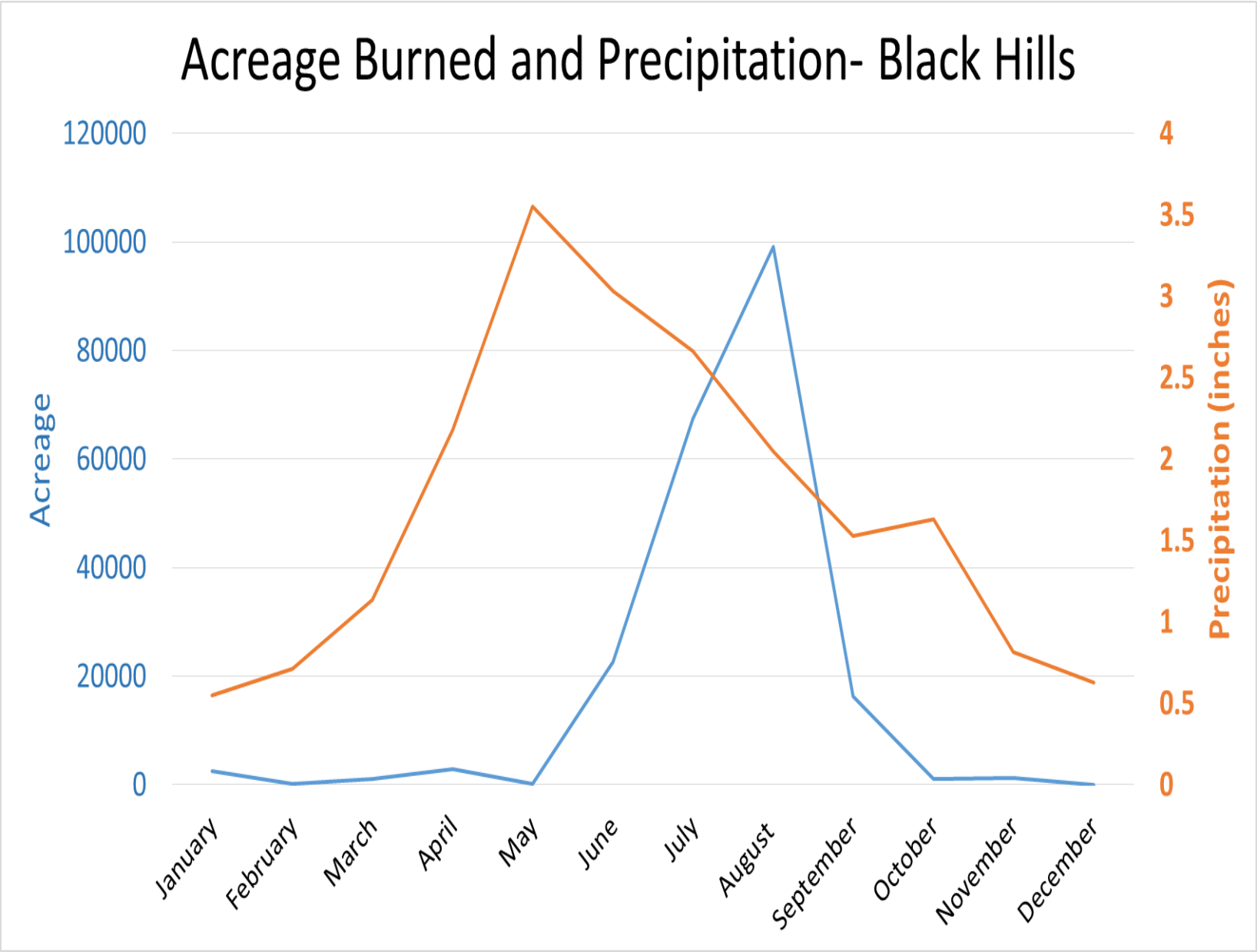


South Dakota

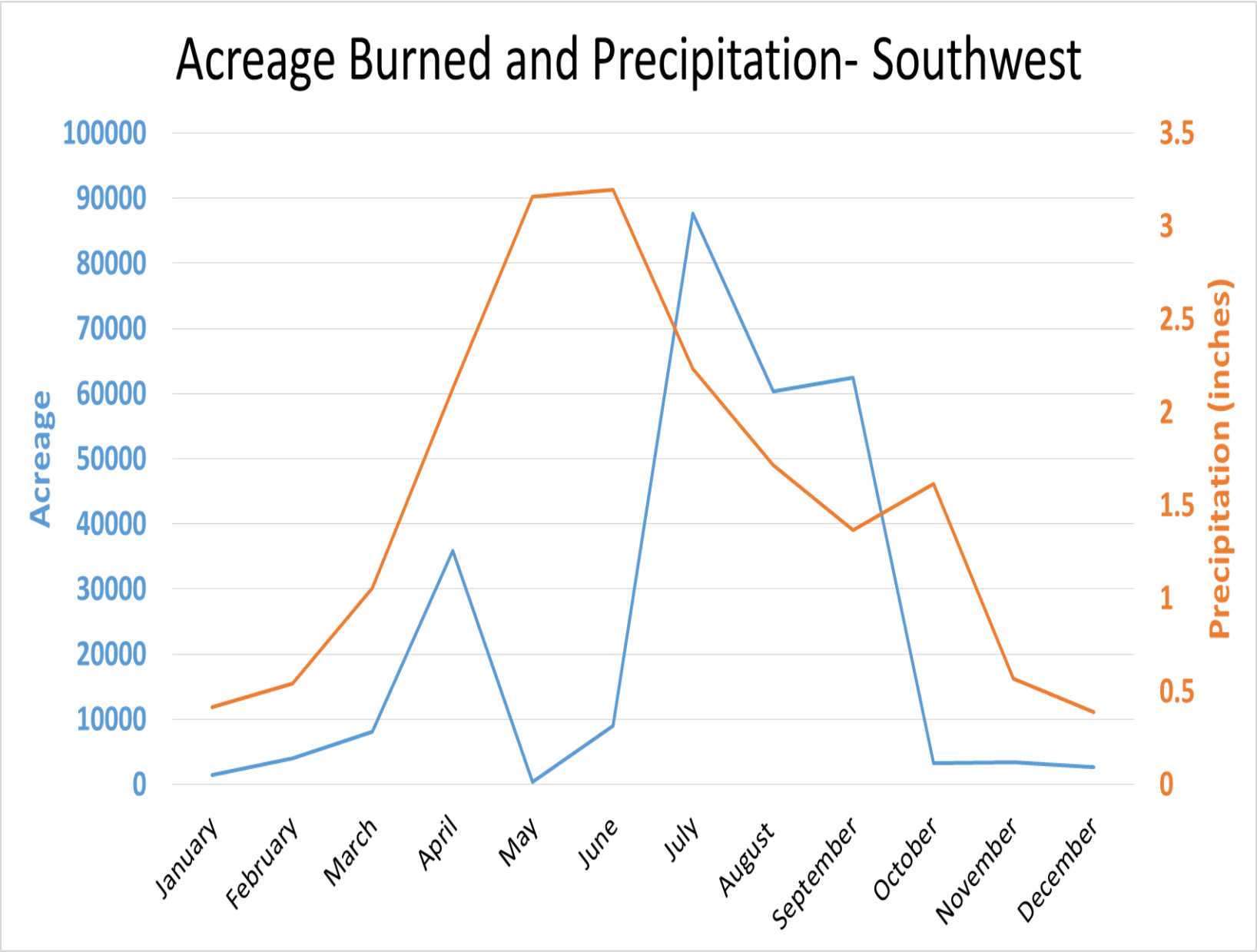




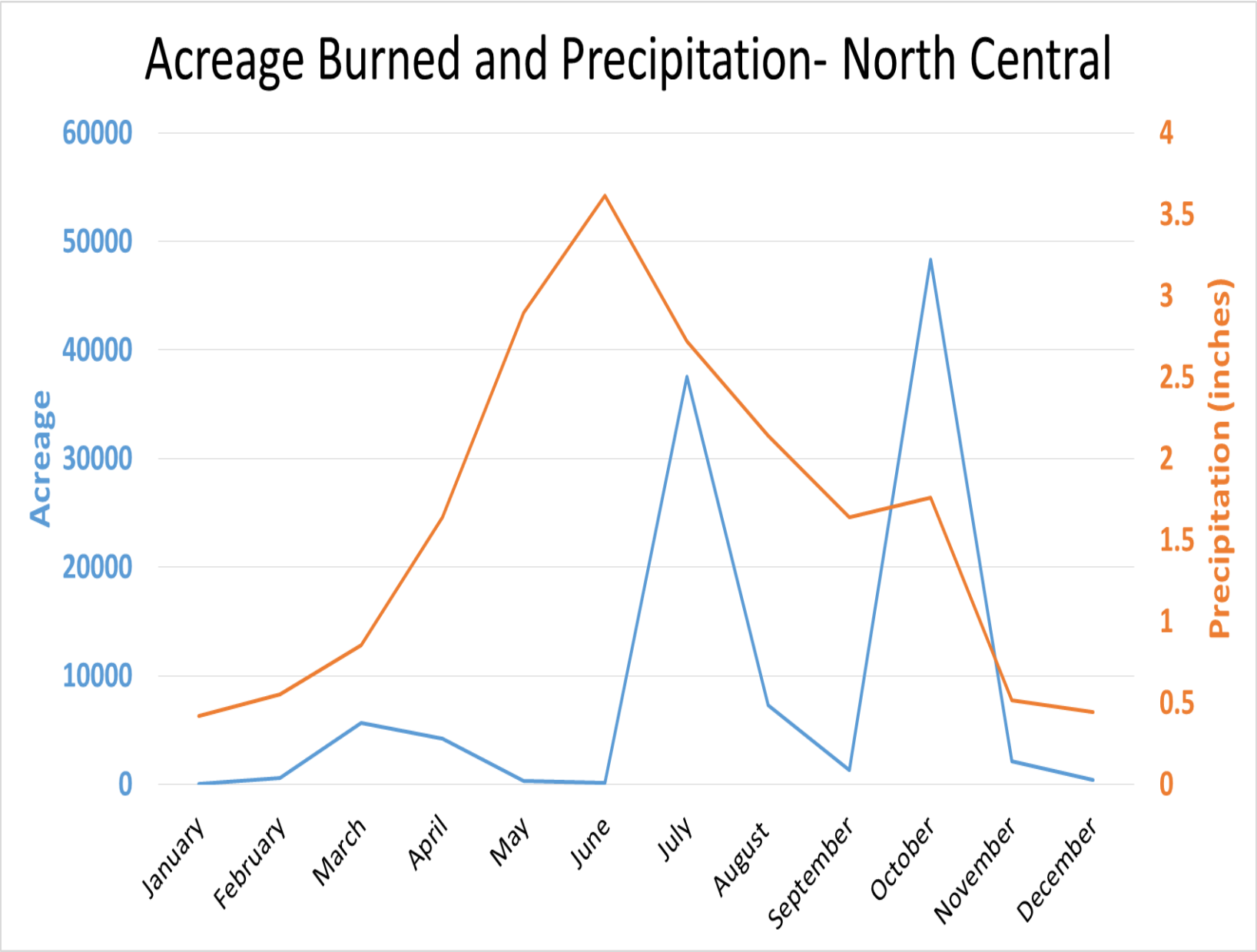
Data From 1998 - 2014



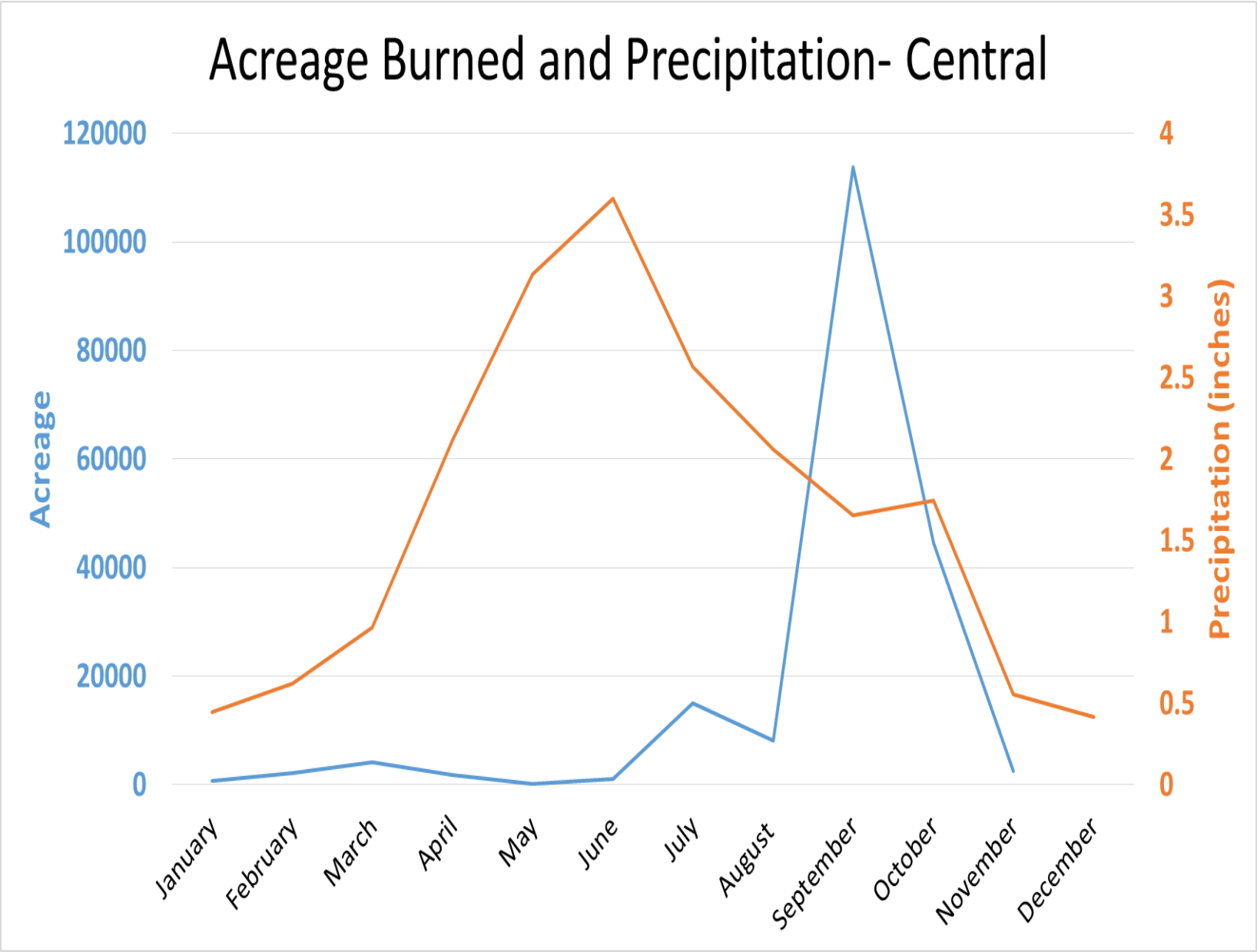
Data From 1998 - 2014



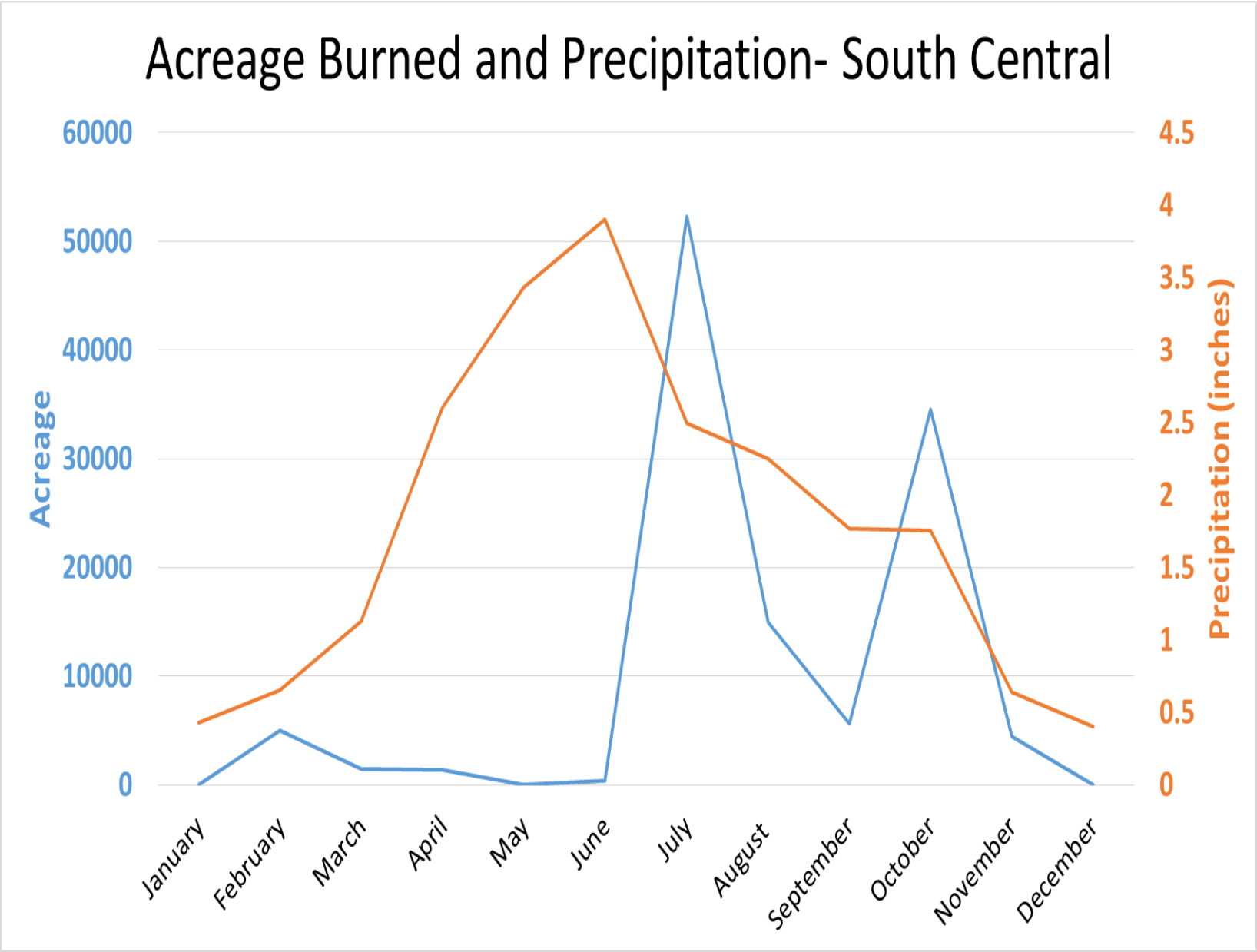
Data From 1998 - 2014



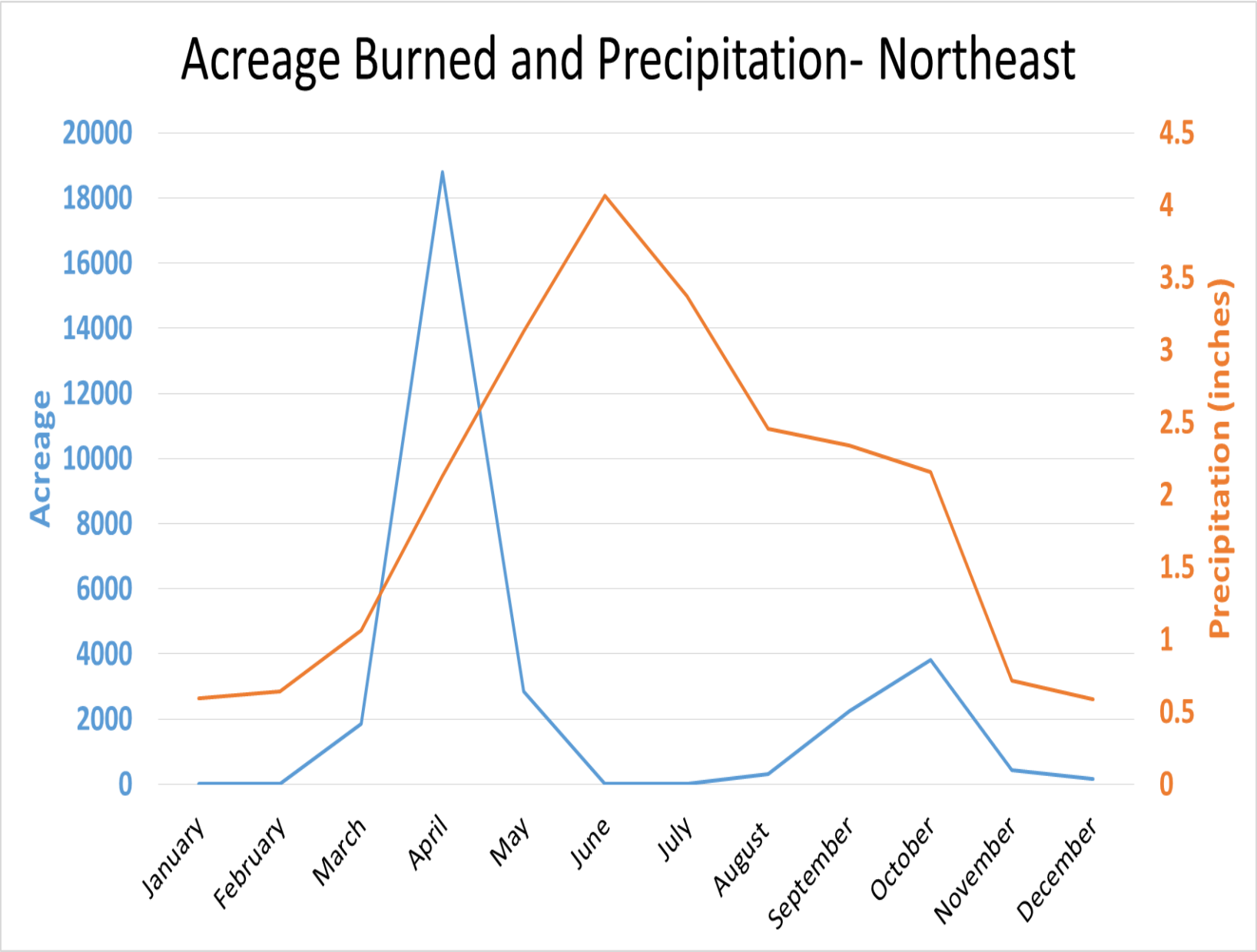
Data From 1998 - 2014



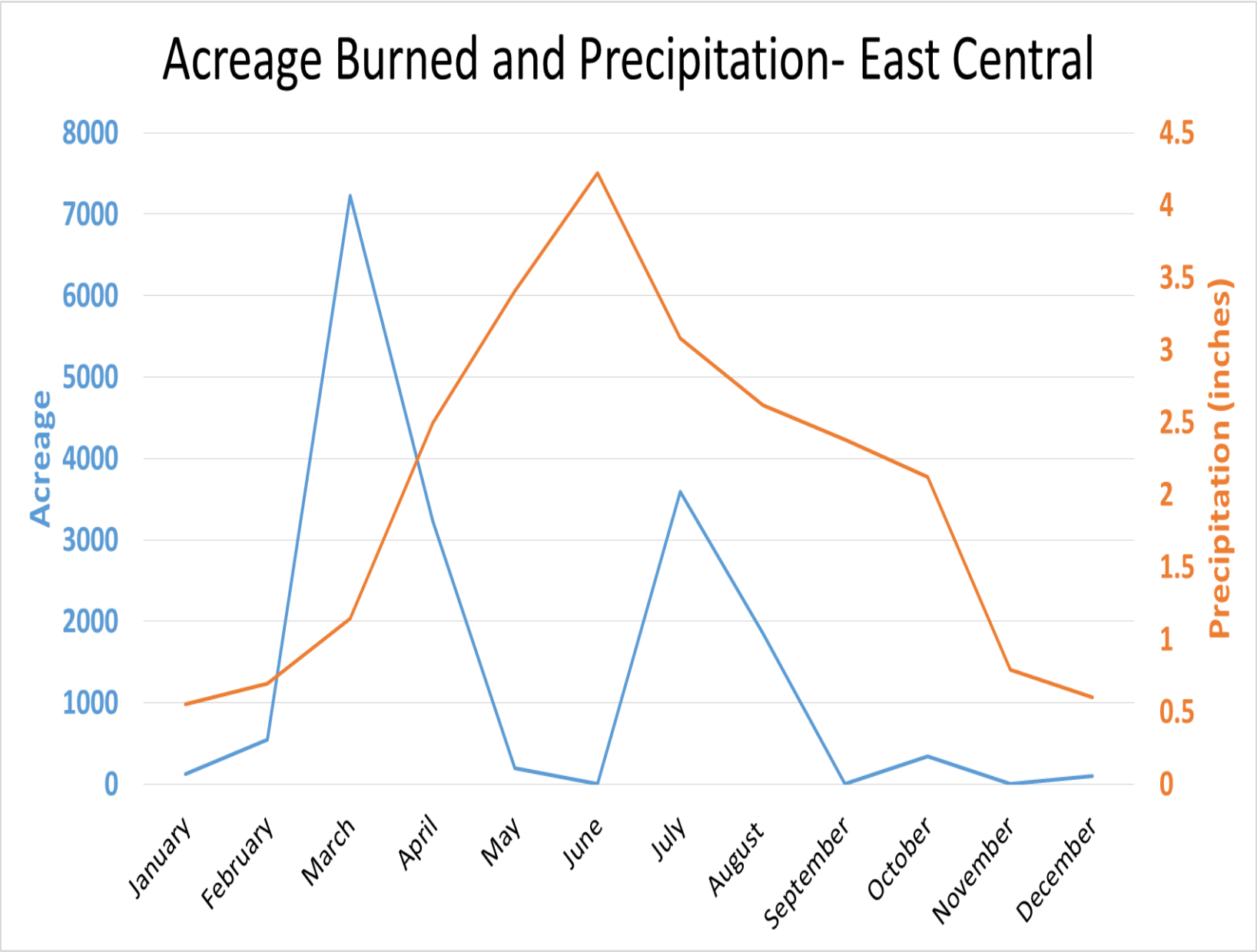
Data From 1998 - 2014



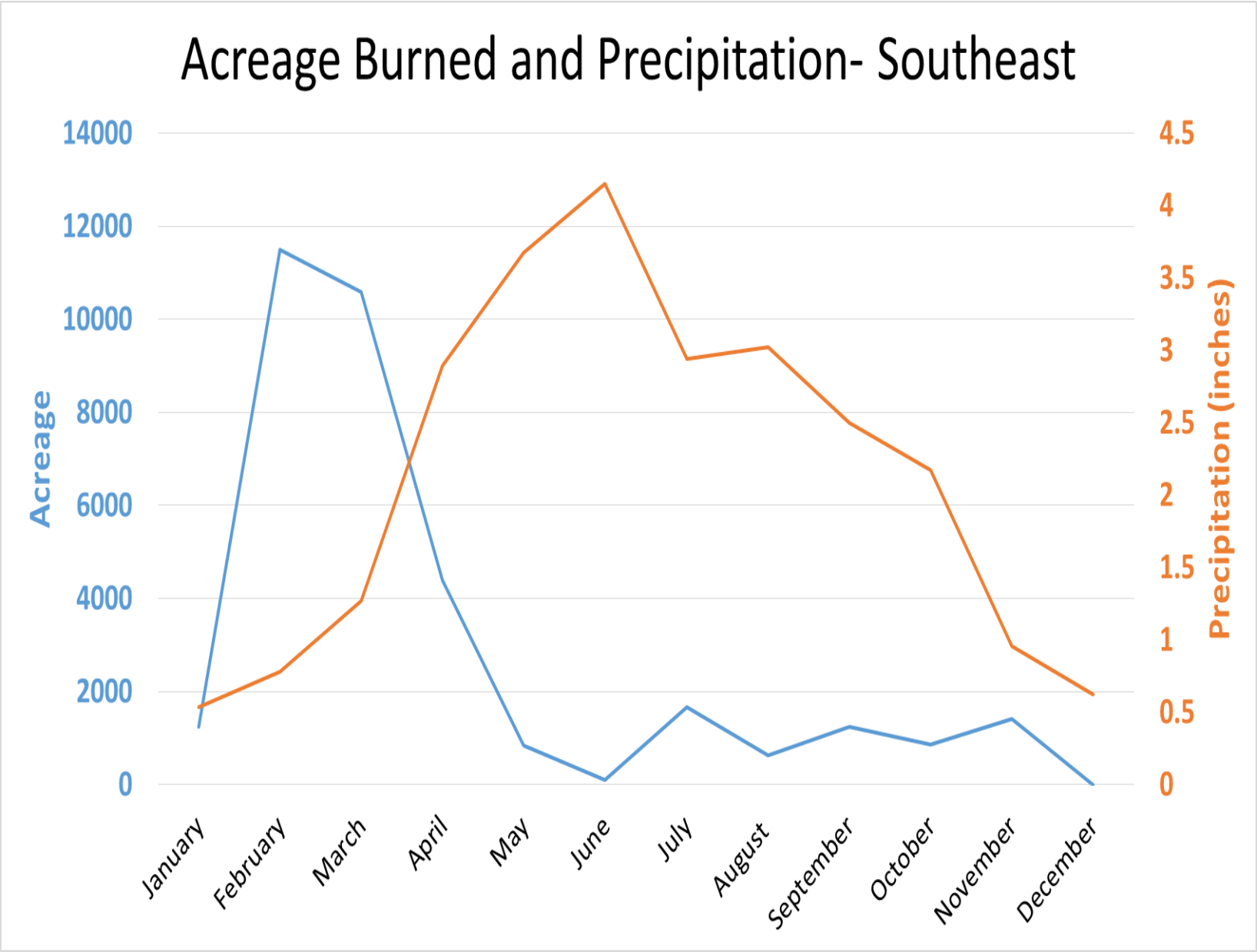
Data From 1998 - 2014



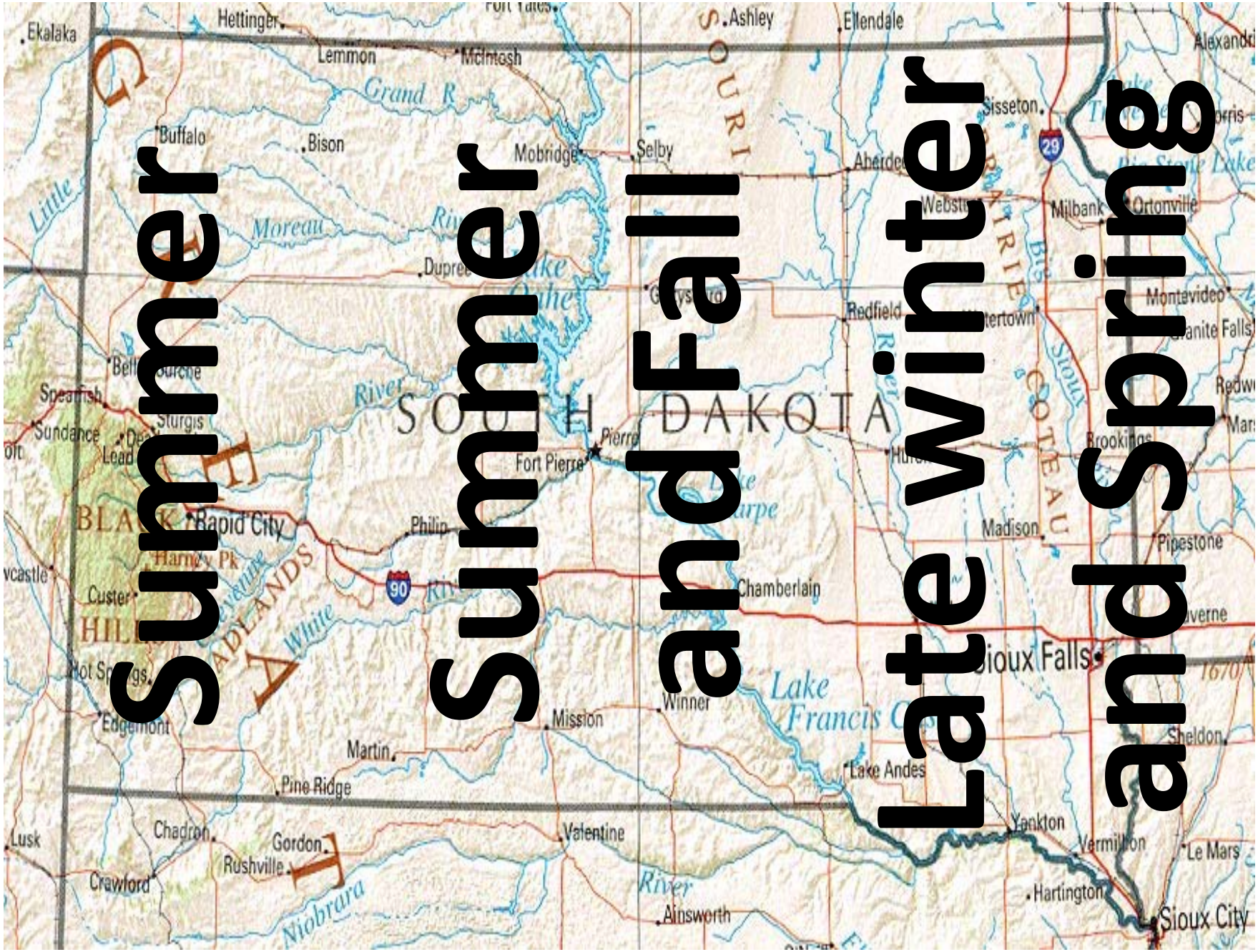
Data From 1998 - 2014



Data From 1998 - 2014



Data From 1998 - 2014

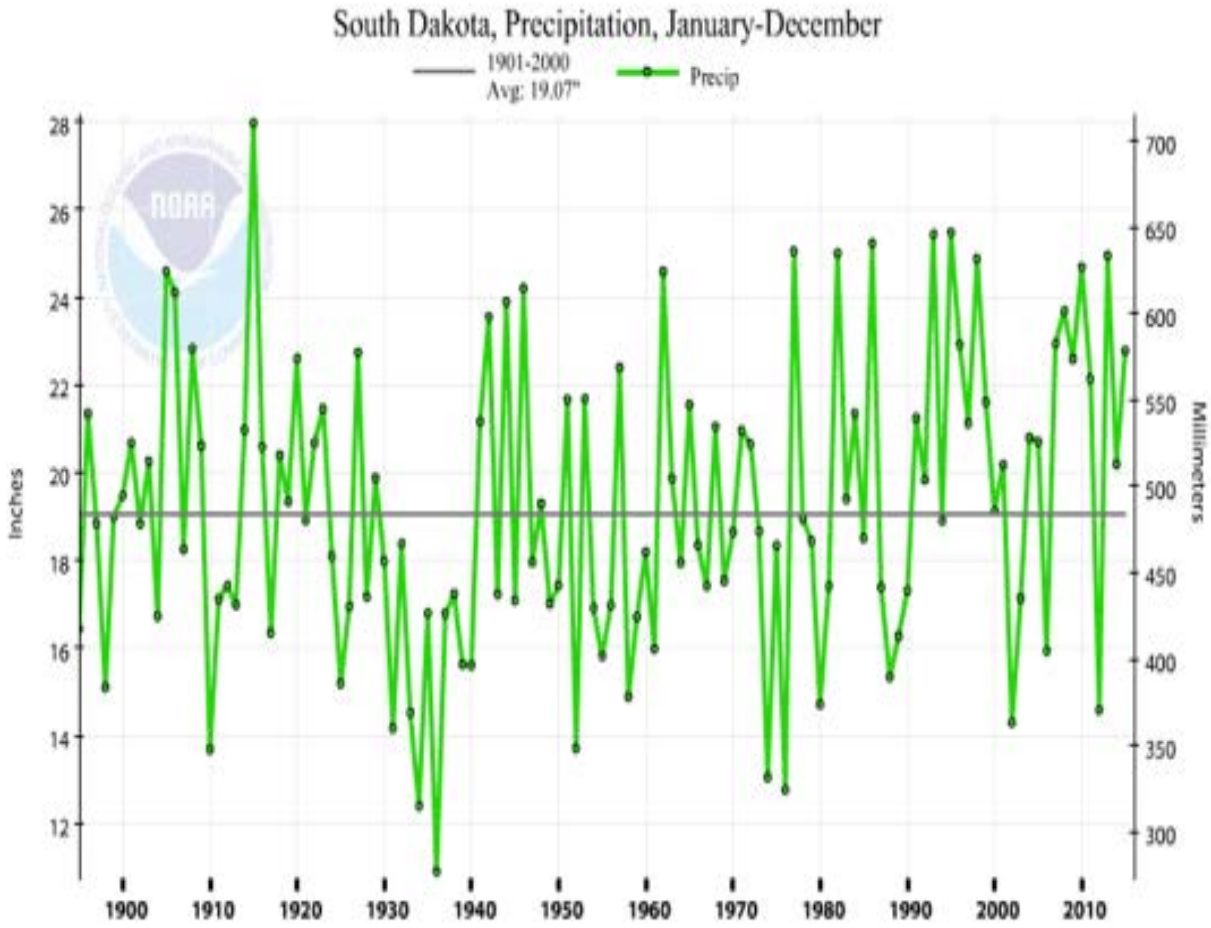


https://www.lib.utexas.edu/maps/us_2001/south_dak

Drivers of Fire Growth Across SD

- Black Hills
  - Drought, drought, dro
  - No drought, little fire
- Grasslands
  - Cured fuels and wind
  - Fall frontal passages
- Croplands
  - Post-snowmelt, pre-g
  - Spring frontal passage

Variability as a concern



Impacts of future climate

- Increase in precipitation and very heavy precipitation
  - Potential for more fine fuel growth/thicker thatch when cured
- Increase in temperatures
  - Likely an increase in “shoulder” season fire activity
  - More rain versus snow
  - More excessive heat
- Increase in temperature vs. increase in precipitation
  - More potential evapotranspiration leading to drier conditions

Contact

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605-394-1996

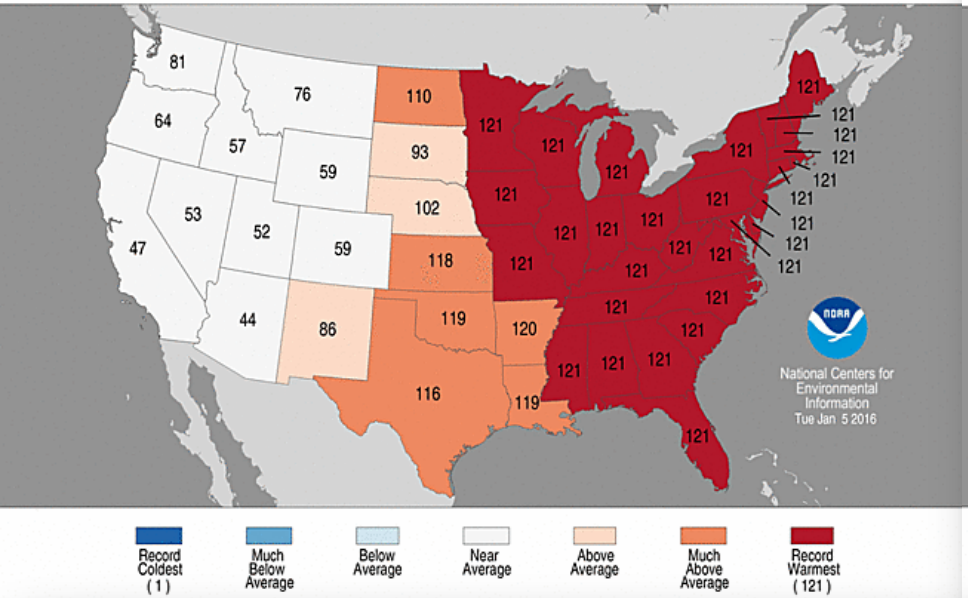
Twitter: @SDFireWeather

Forecasting Weather Risk in Agriculture

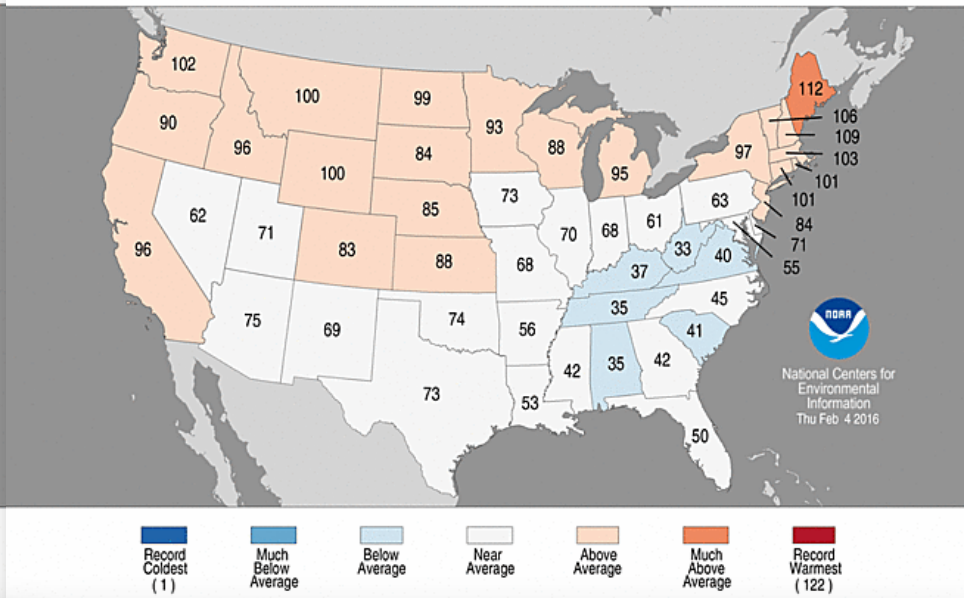
Eric Snodgrass
Director of Undergraduate Studies
Dept. of Atmospheric Science
University of Illinois
Co-Founder and Sr. Atmospheric Scientist at Agrible, Inc.

AGRIBLE

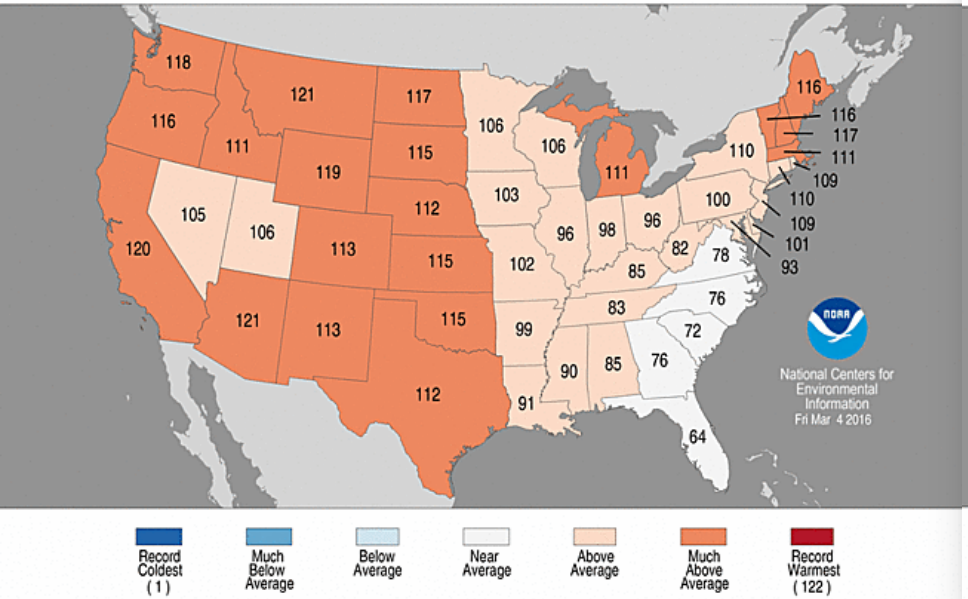
Statewide Average Temperature Ranks
December 2015
Period: 1895–2015



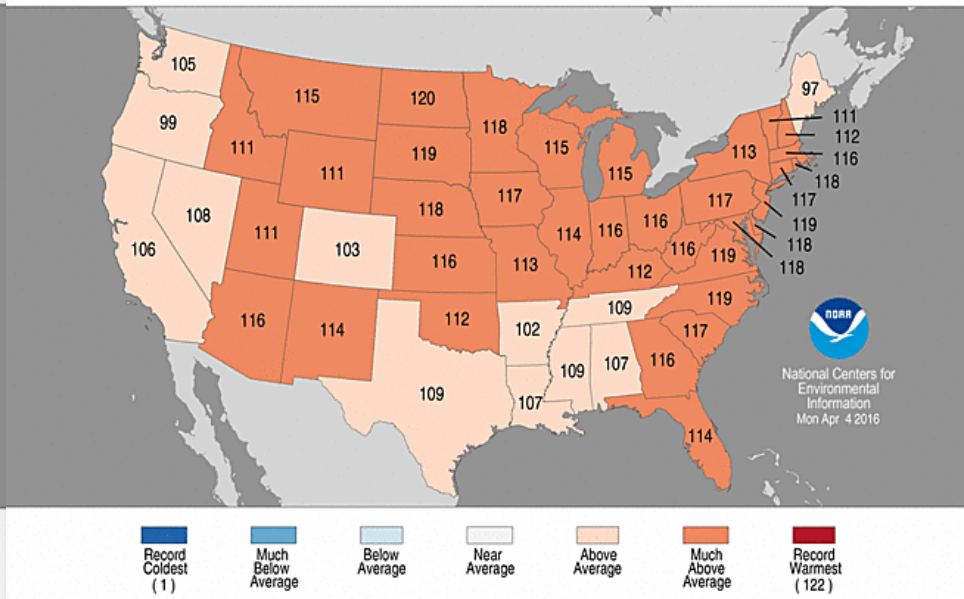
Statewide Average Temperature Ranks
January 2016
Period: 1895–2016

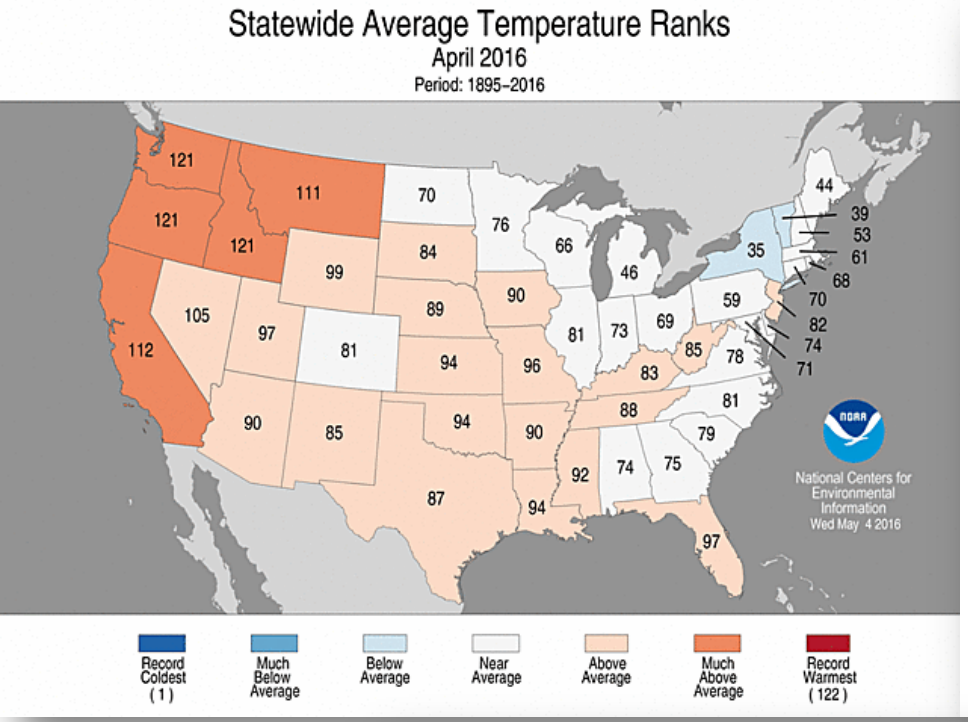


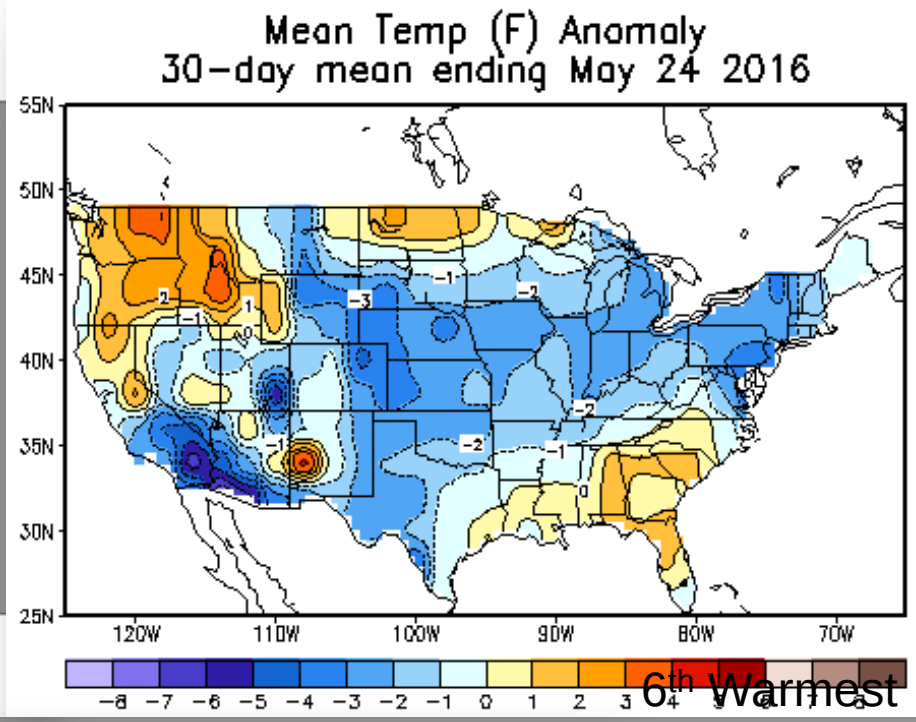
Statewide Average Temperature Ranks
February 2016
Period: 1895–2016



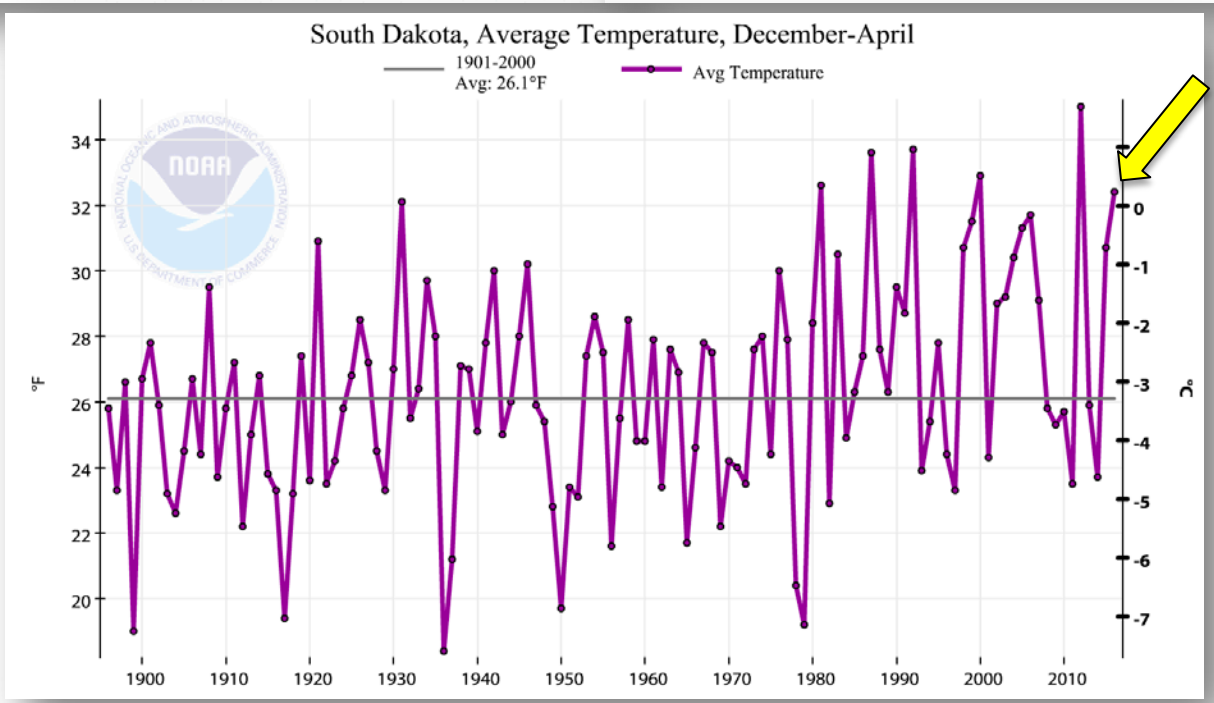
Statewide Average Temperature Ranks
March 2016
Period: 1895–2016

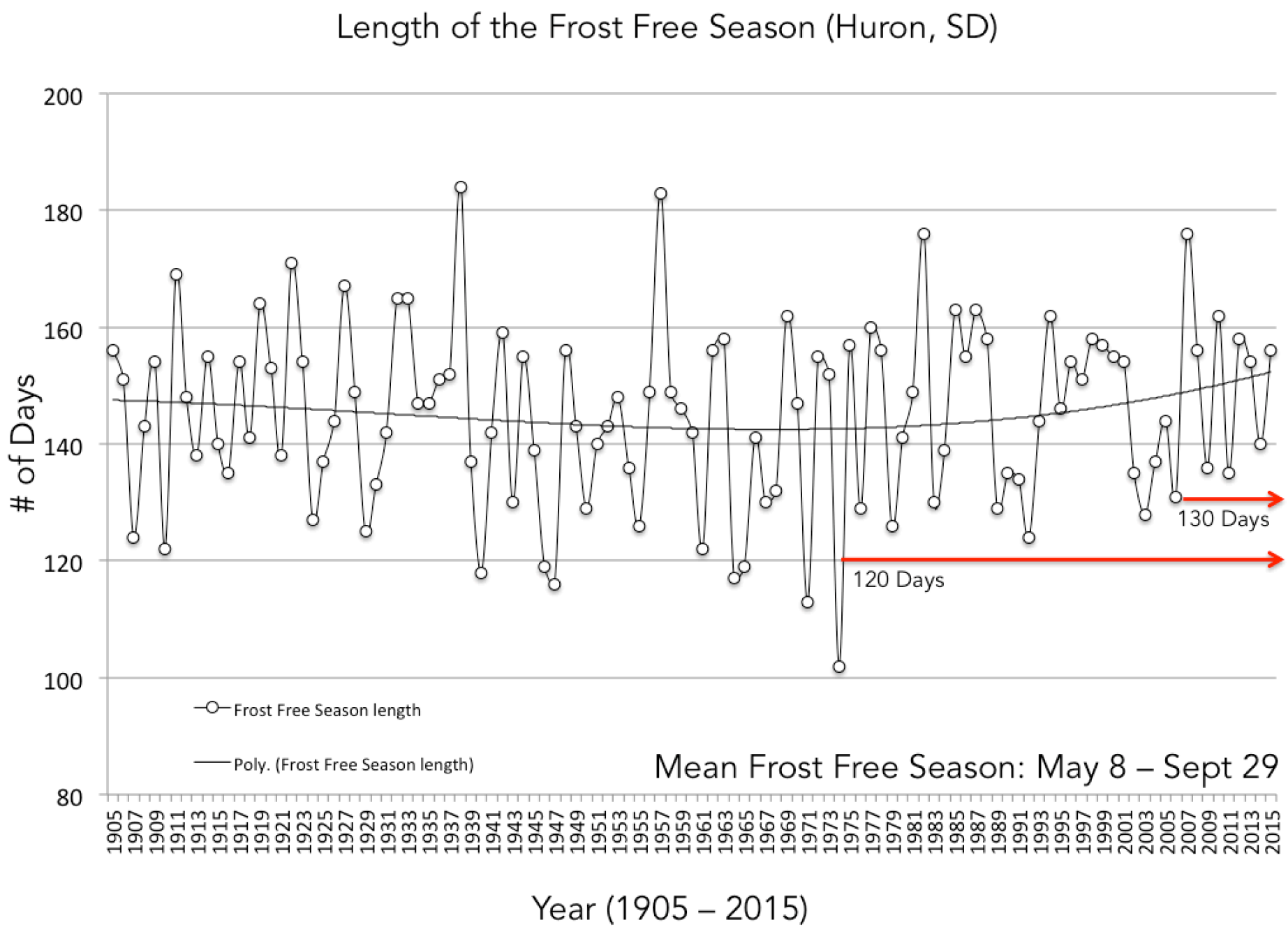




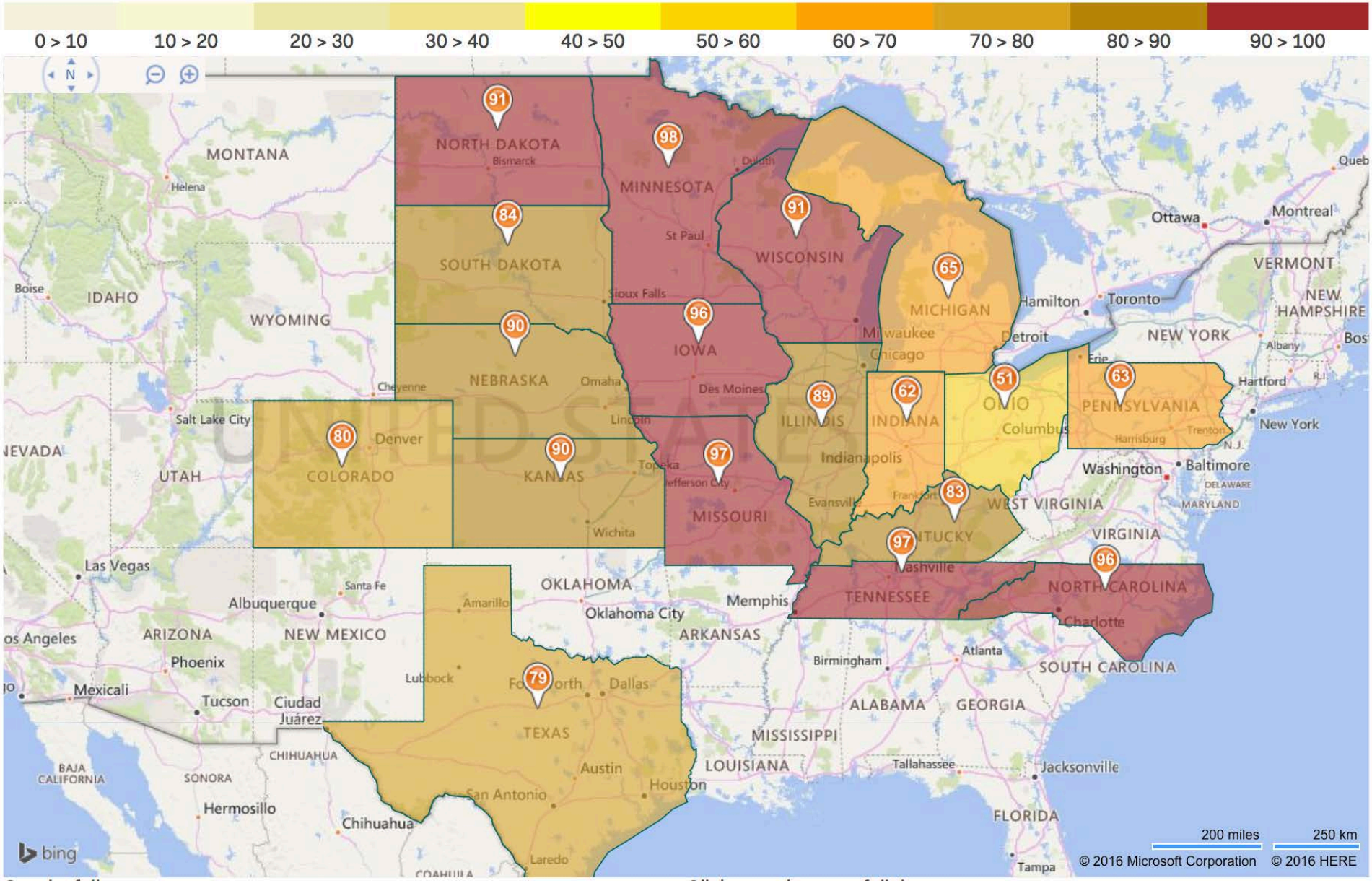


6th Warmest Dec-April on Record



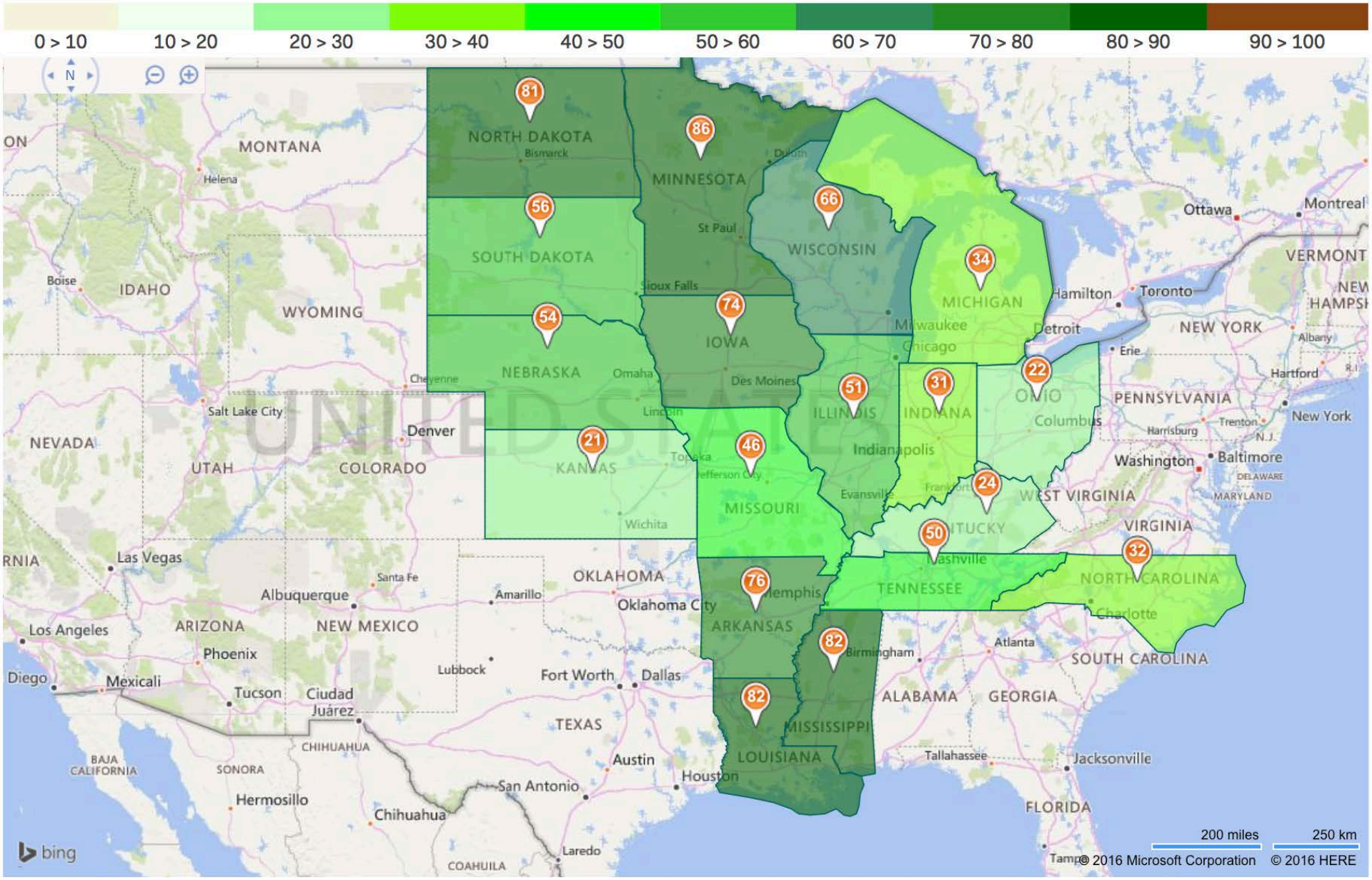

Length of the Frost Free Season (Huron, SD)
# of Days
200
180
160
140
120
100
80
130 Days
120 Days
Frost Free Season length
Poly. (Frost Free Season length)
Mean Frost Free Season: May 8 – Sept 29
1905 1907 1909 1911 1913 1915 1917 1919 1921 1923 1925 1927 1929 1931 1933 1935 1937 1939 1941 1943 1945 1947 1949 1951 1953 1955 1957 1959 1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Year (1905 – 2015)

Corn Planting Progress May 29, 2016

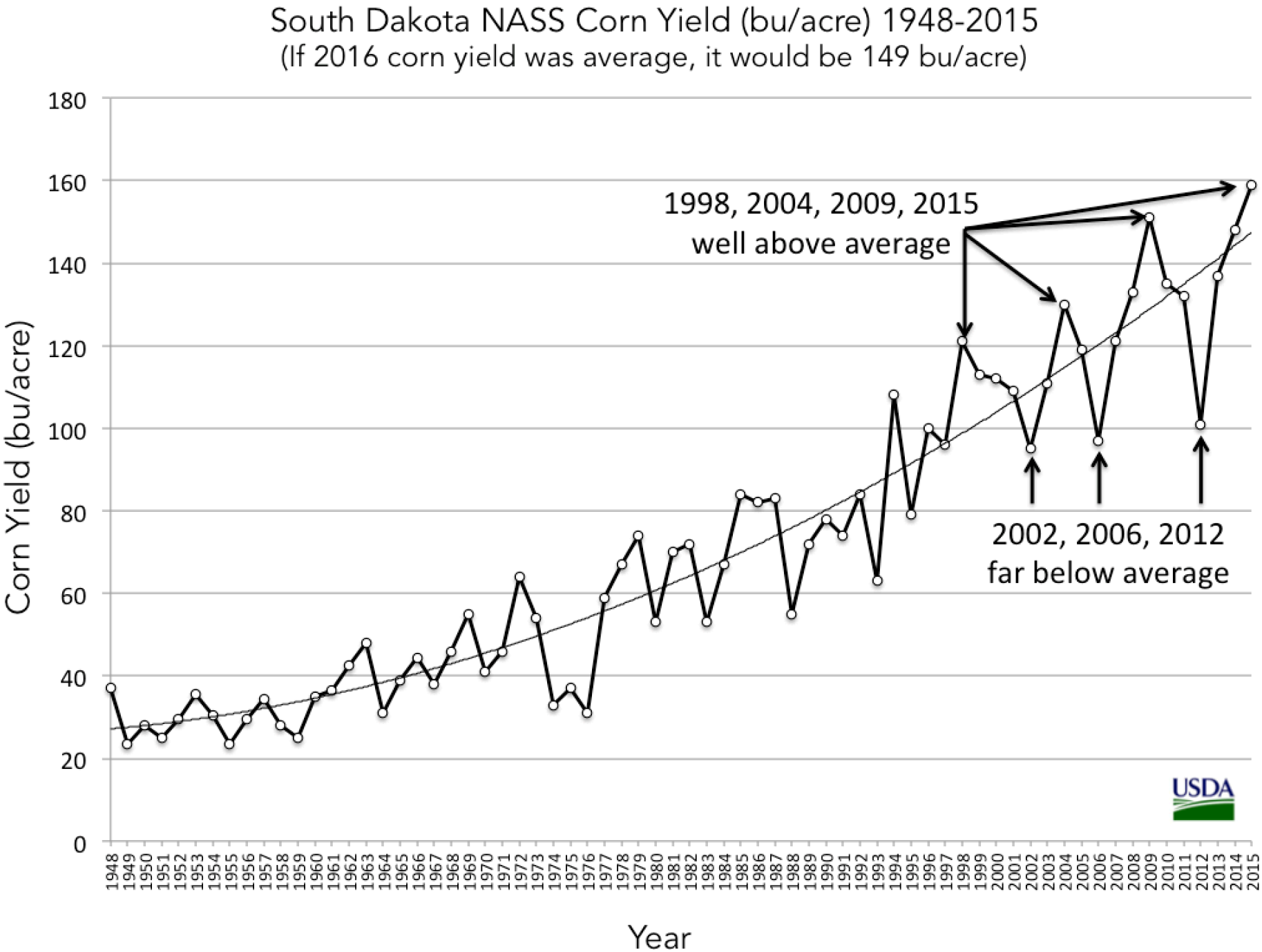


http://www.agweb.com/corn-planting-map/

Soybean Planting Progress May 29, 2016

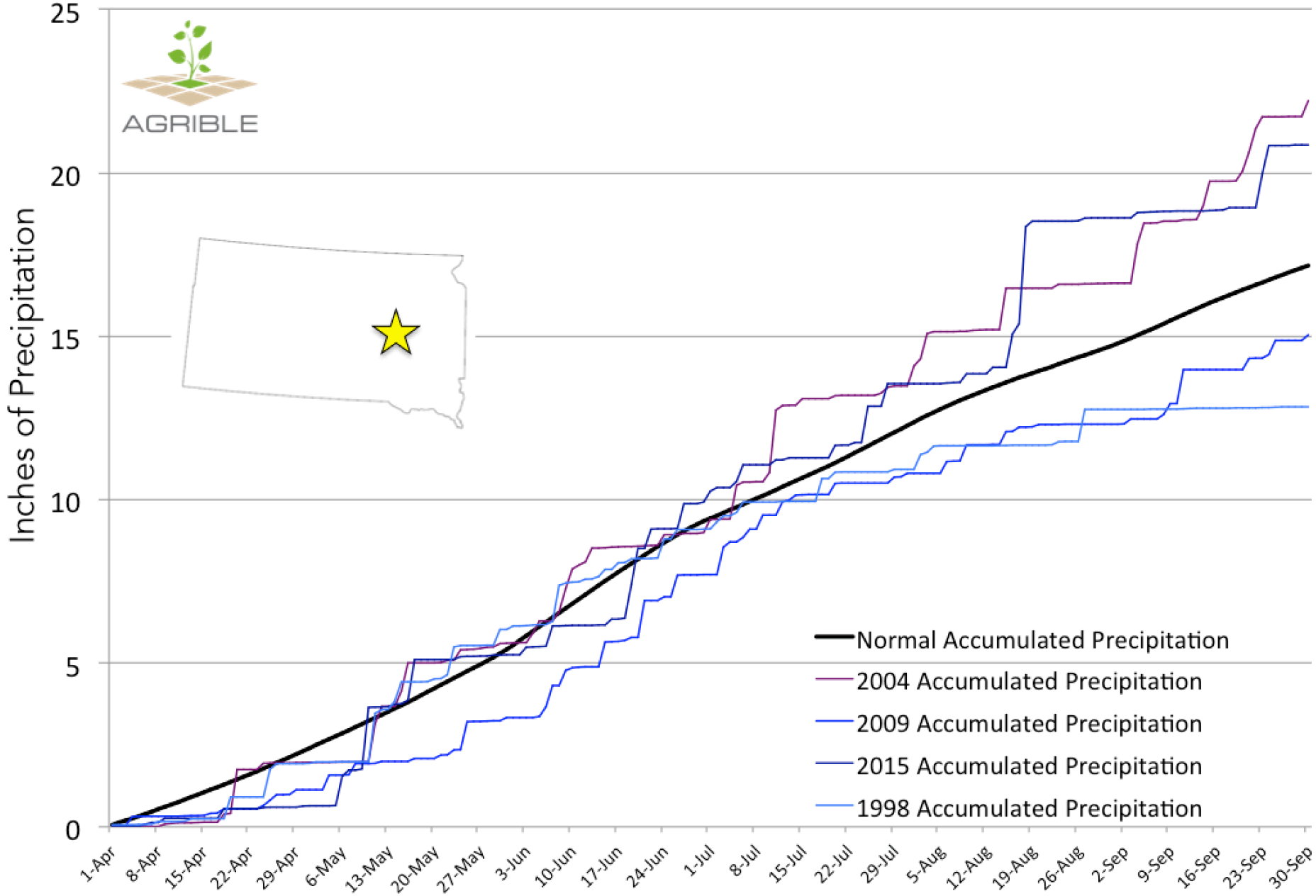


http://www.agweb.com/soybean-planting-map/


South Dakota NASS Corn Yield (bu/acre) 1948-2015
(If 2016 corn yield was average, it would be 149 bu/acre)
1998, 2004, 2009, 2015
well above average
2002, 2006, 2012
far below average
Corn Yield (bu/acre)
Year
USDA

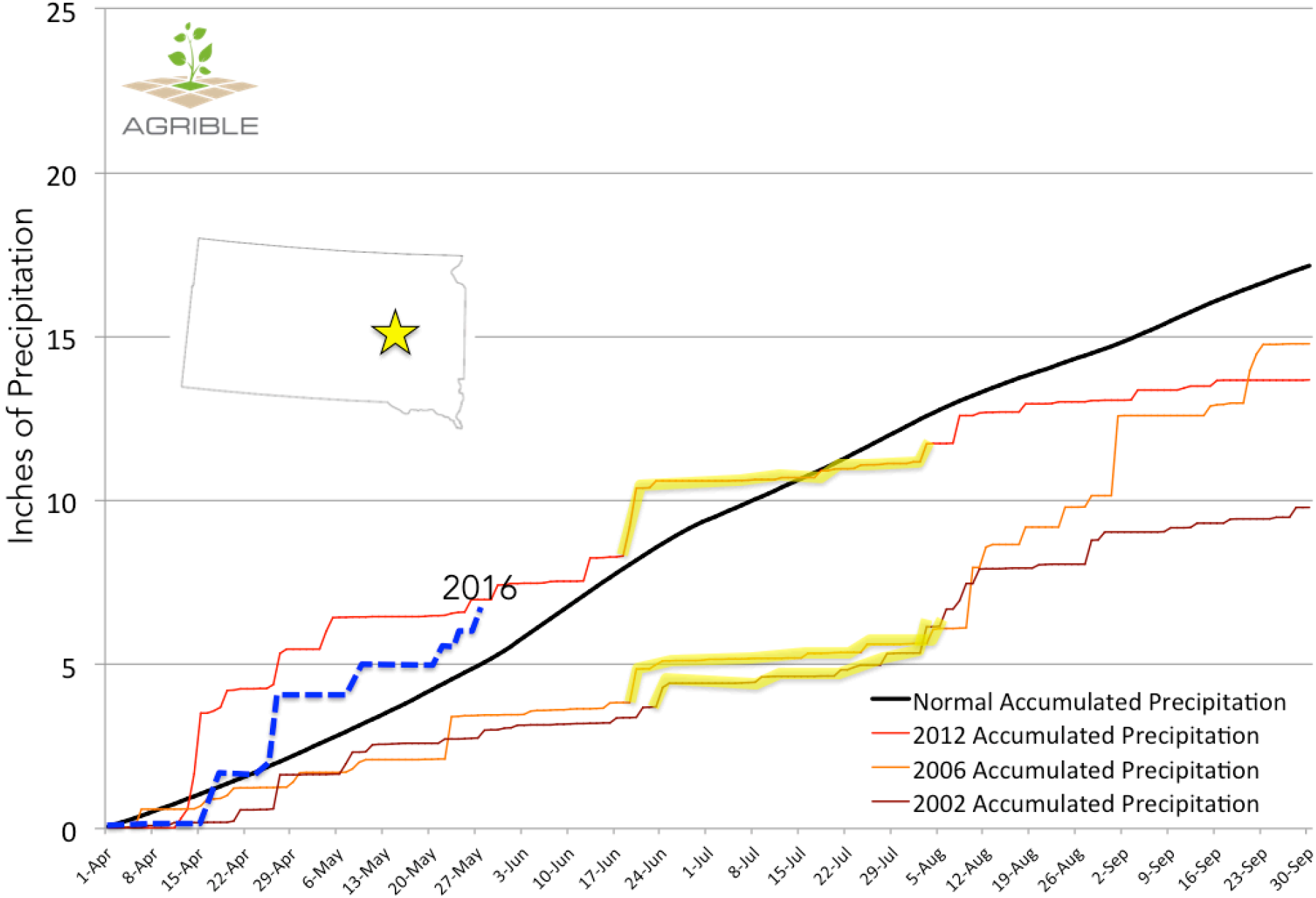
Accumulation of Precipitation (April 1 – Sept 30)

Top Yielding Years: 1998, 2004, 2009, 2015

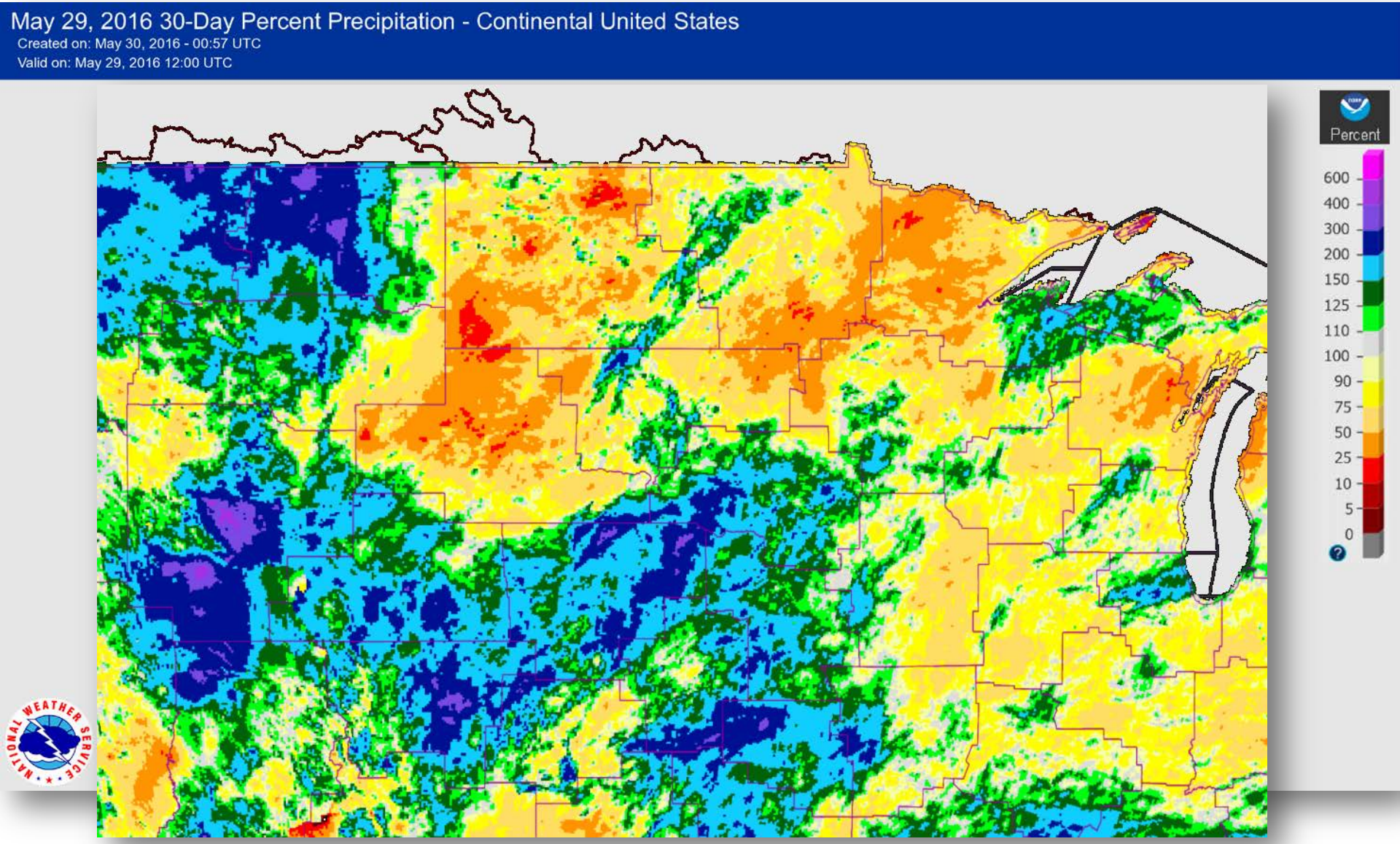


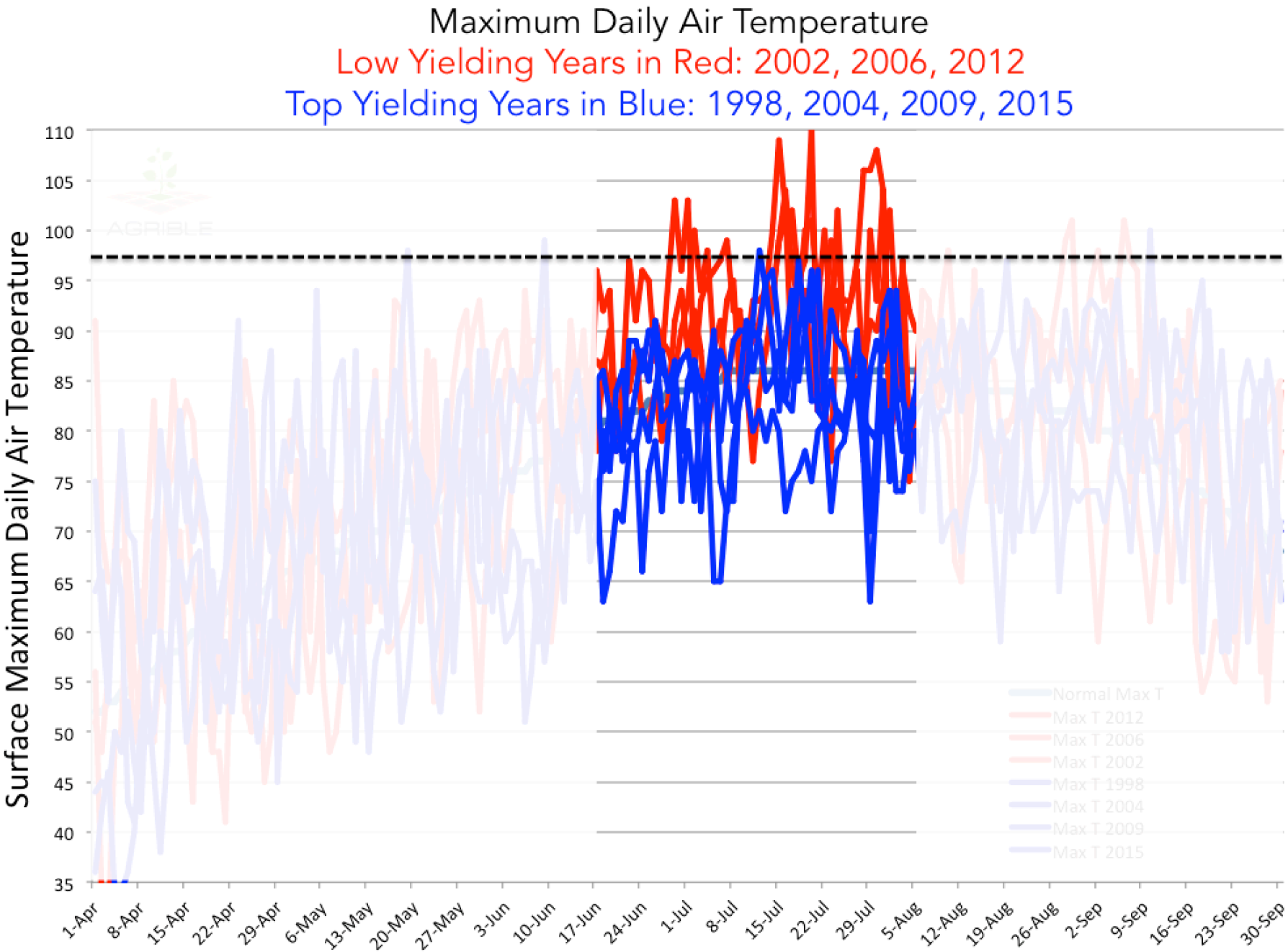
Accumulation of Precipitation (April 1 – Sept 30)

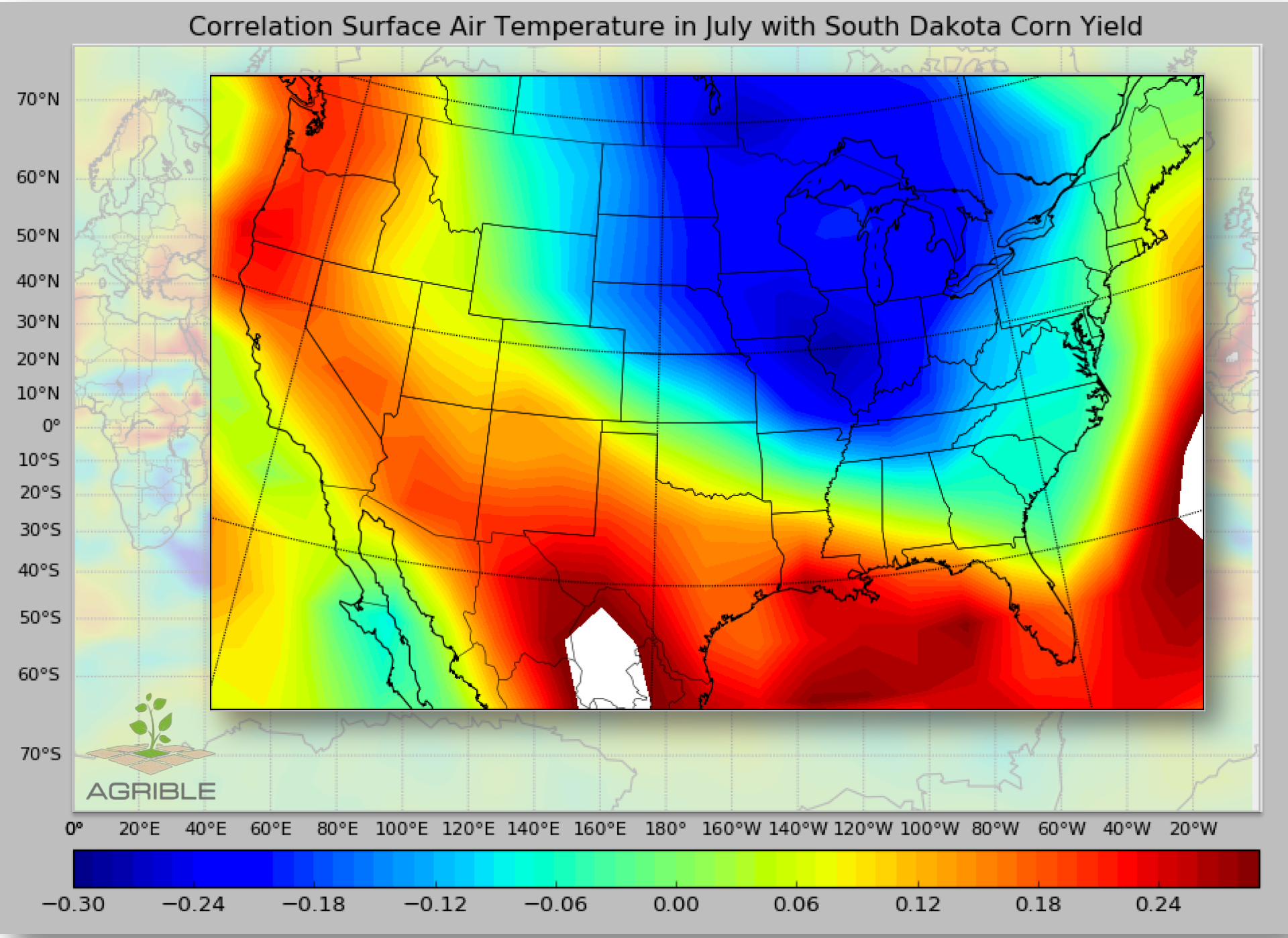
Low Yielding Years: 2002, 2006, 2012



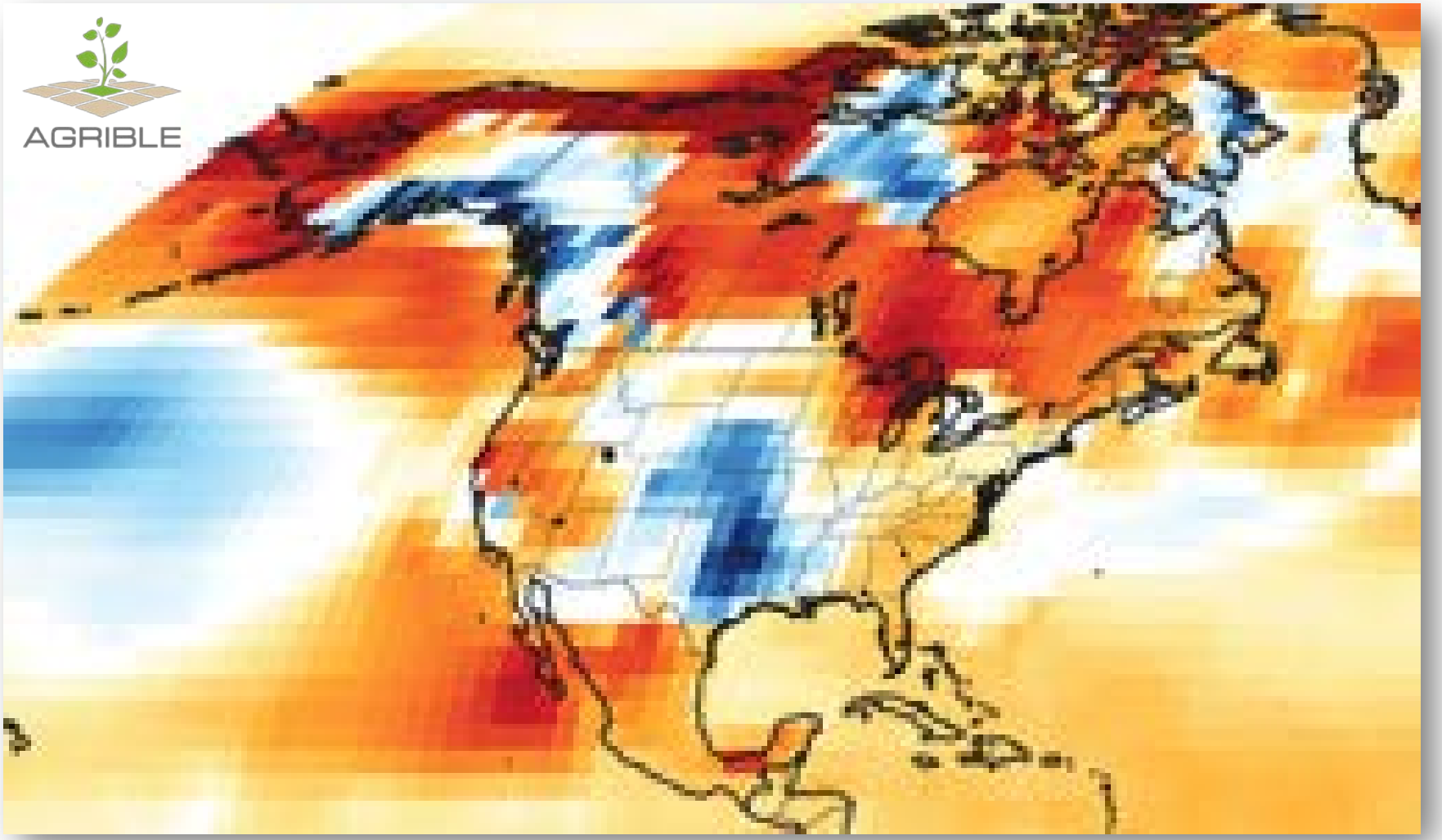
Last 30 days of Precipitation (% of Normal)




Maximum Daily Air Temperature
Low Yielding Years in Red: 2002, 2006, 2012
Top Yielding Years in Blue: 1998, 2004, 2009, 2015
Surface Maximum Daily Air Temperature
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
5-Aug
12-Aug
19-Aug
26-Aug
2-Sep
9-Sep
16-Sep
23-Sep
30-Sep
Normal Max T
Max T 2012
Max T 2006
Max T 2002
Max T 1998
Max T 2004
Max T 2009
Max T 2015

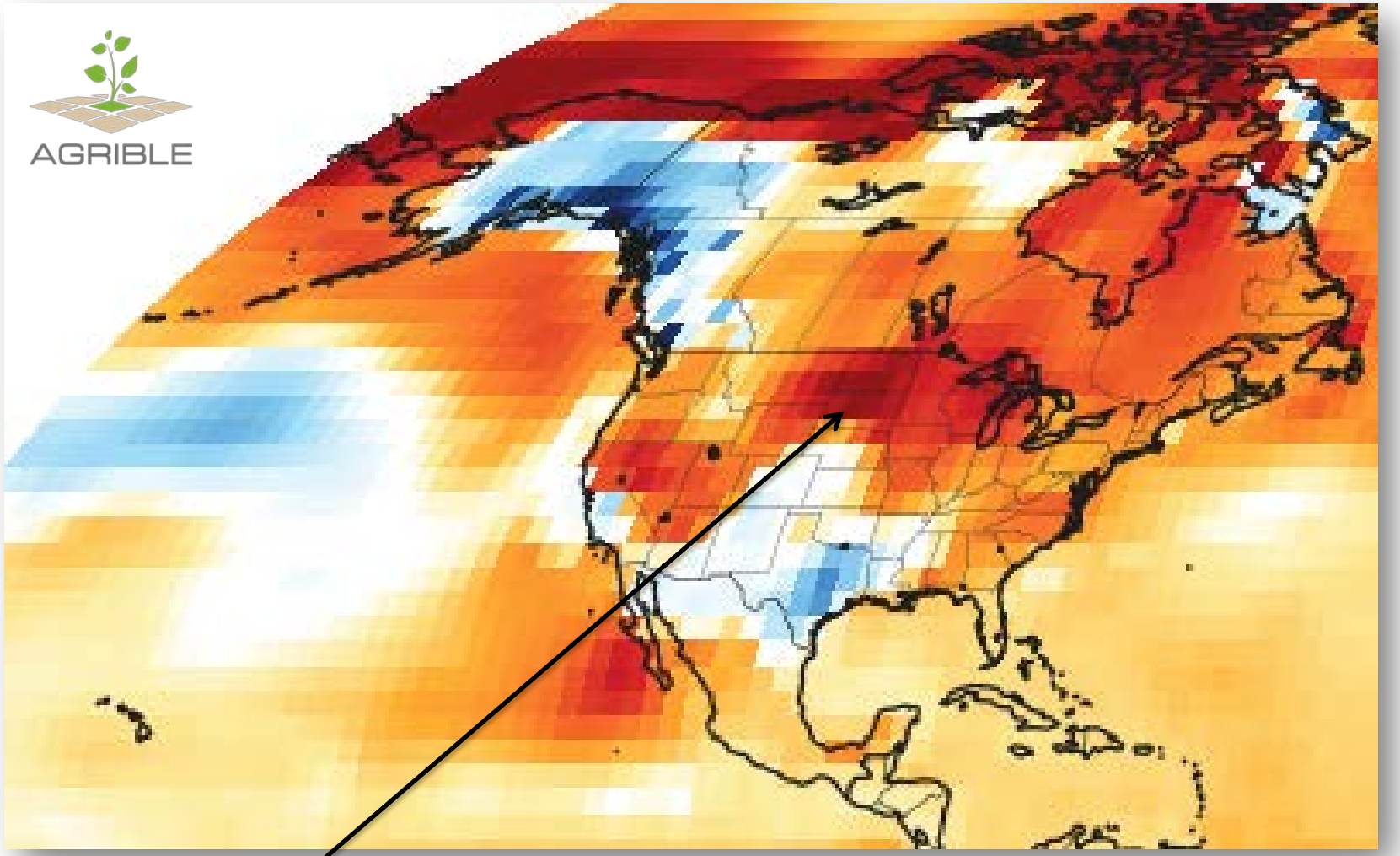

Correlation Surface Air Temperature in July with South Dakota Corn Yield
70°N
60°N
50°N
40°N
30°N
20°N
10°N
0°
10°S
20°S
30°S
40°S
50°S
60°S
70°S
0° 20°E 40°E 60°E 80°E 100°E 120°E 140°E 160°E 180° 160°W 140°W 120°W 100°W 80°W 60°W 40°W 20°W
−0.30 −0.24 −0.18 −0.12 −0.06 0.00 0.06 0.12 0.18 0.24
AGRIBLE

June, July and August Temperature Anomalies

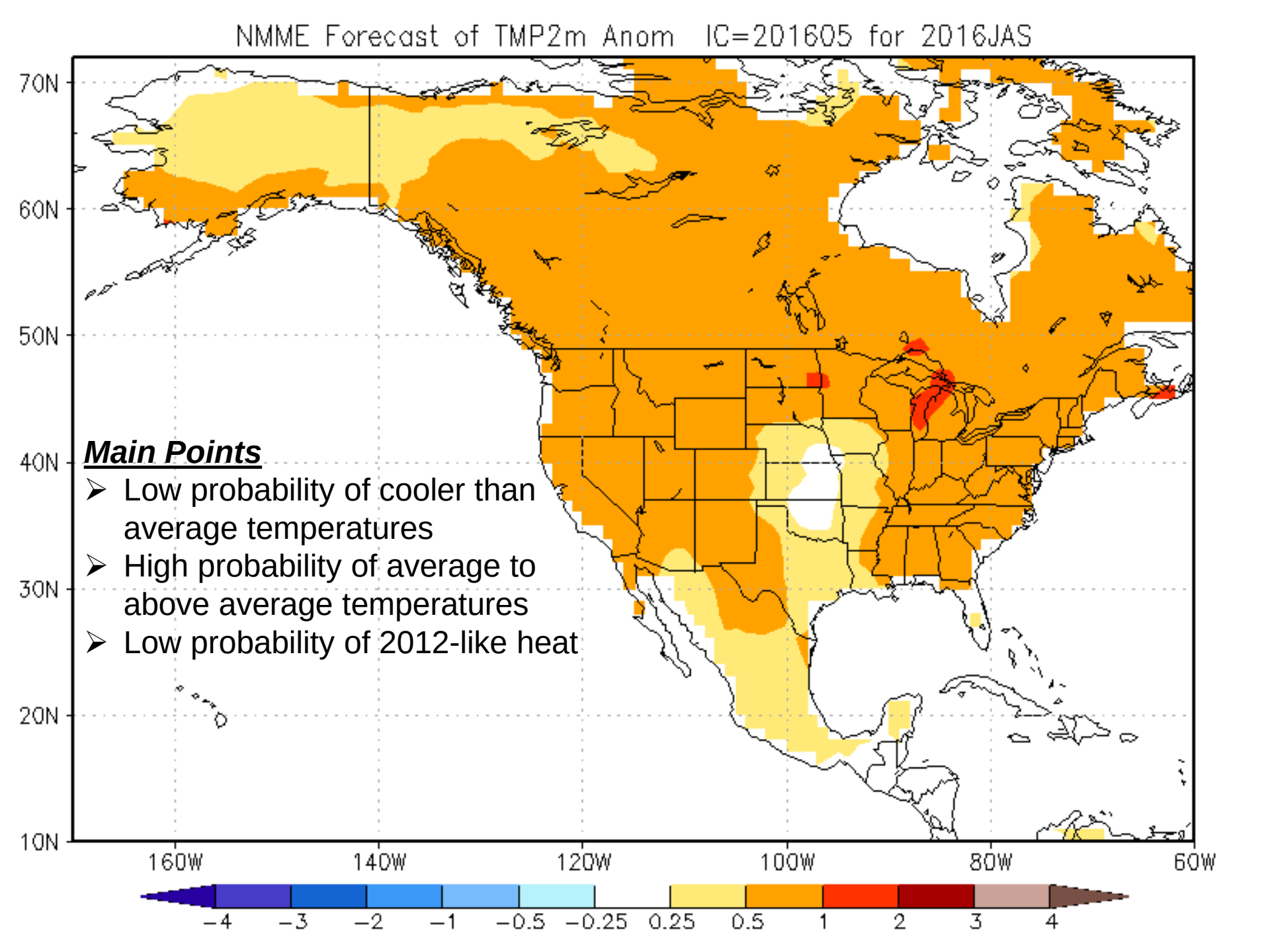


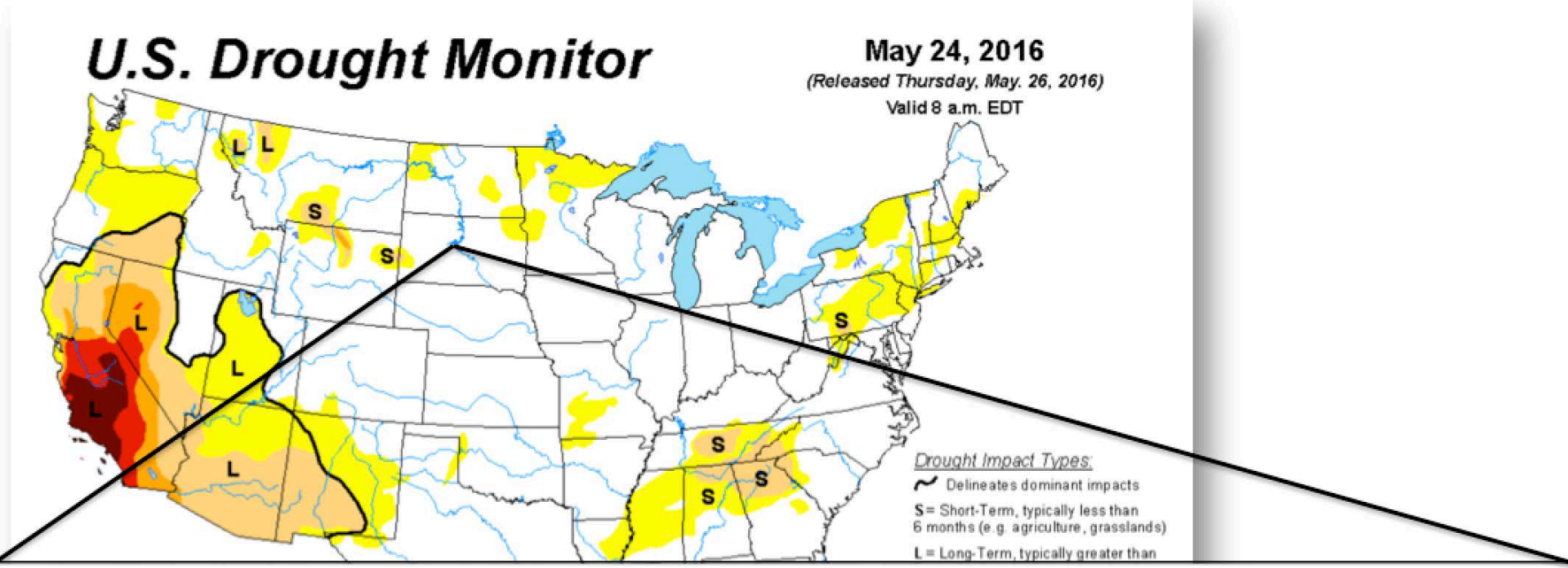
July 2016 Temperature Forecast
Agrible® Statistical Model = +0.05°F

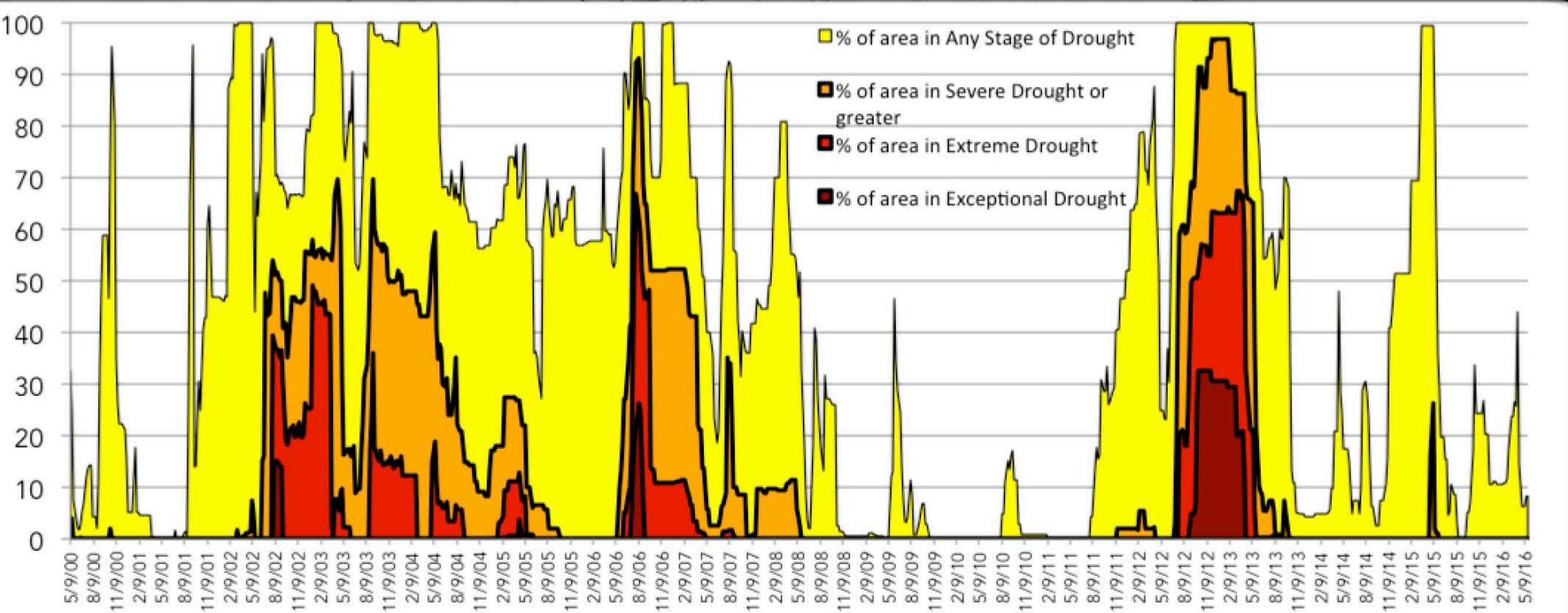
July, August and September Temperature Anomalies



Most of this will be later in the 3-month time period.


NMME Forecast of TMP2m Anom IC=201605 for 2016JAS
70N
60N
50N
40N
30N
20N
10N
160W
140W
120W
100W
80W
60W
−4
−3
−2
−1
−0.5
−0.25
0.25
0.5
1
2
3
4
Main Points
Low probability of cooler than average temperatures
High probability of average to above average temperatures
Low probability of 2012-like heat


U.S. Drought Monitor
May 24, 2016
(Released Thursday, May. 26, 2016)
Valid 8 a.m. EDT
Drought Impact Types:
Delineates dominant impacts
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
L = Long-Term, typically greater than


% of area in Any Stage of Drought
% of area in Severe Drought or greater
% of area in Extreme Drought
% of area in Exceptional Drought
100
90
80
70
60
50
40
30
20
10
0
5/9/00
8/9/00
11/9/00
2/9/01
5/9/01
8/9/01
11/9/01
2/9/02
5/9/02
8/9/02
11/9/02
2/9/03
5/9/03
8/9/03
11/9/03
2/9/04
5/9/04
8/9/04
11/9/04
2/9/05
5/9/05
8/9/05
11/9/05
2/9/06
5/9/06
8/9/06
11/9/06
2/9/07
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8/9/07
11/9/07
2/9/08
5/9/08
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11/9/13
2/9/14
5/9/14
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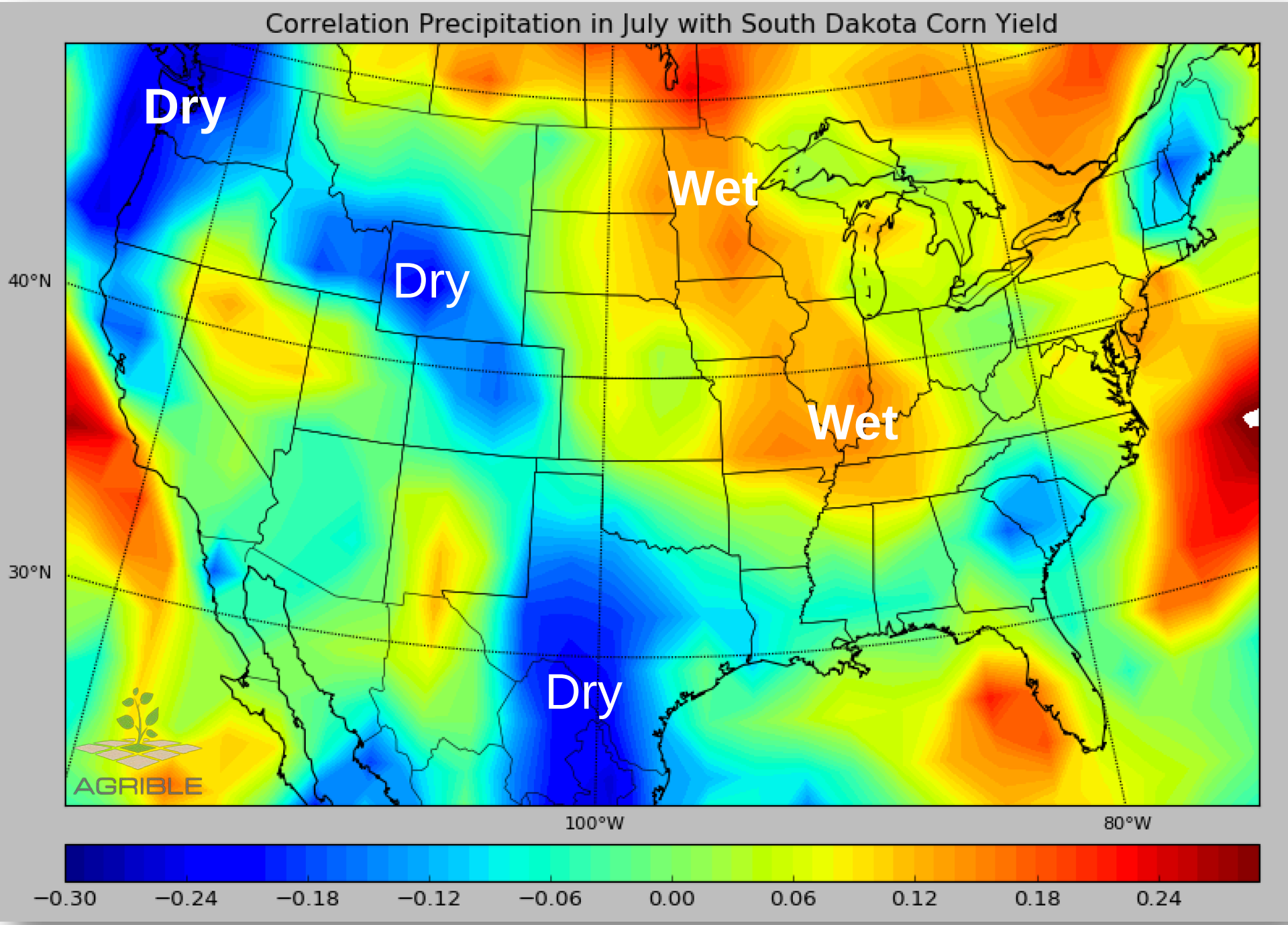
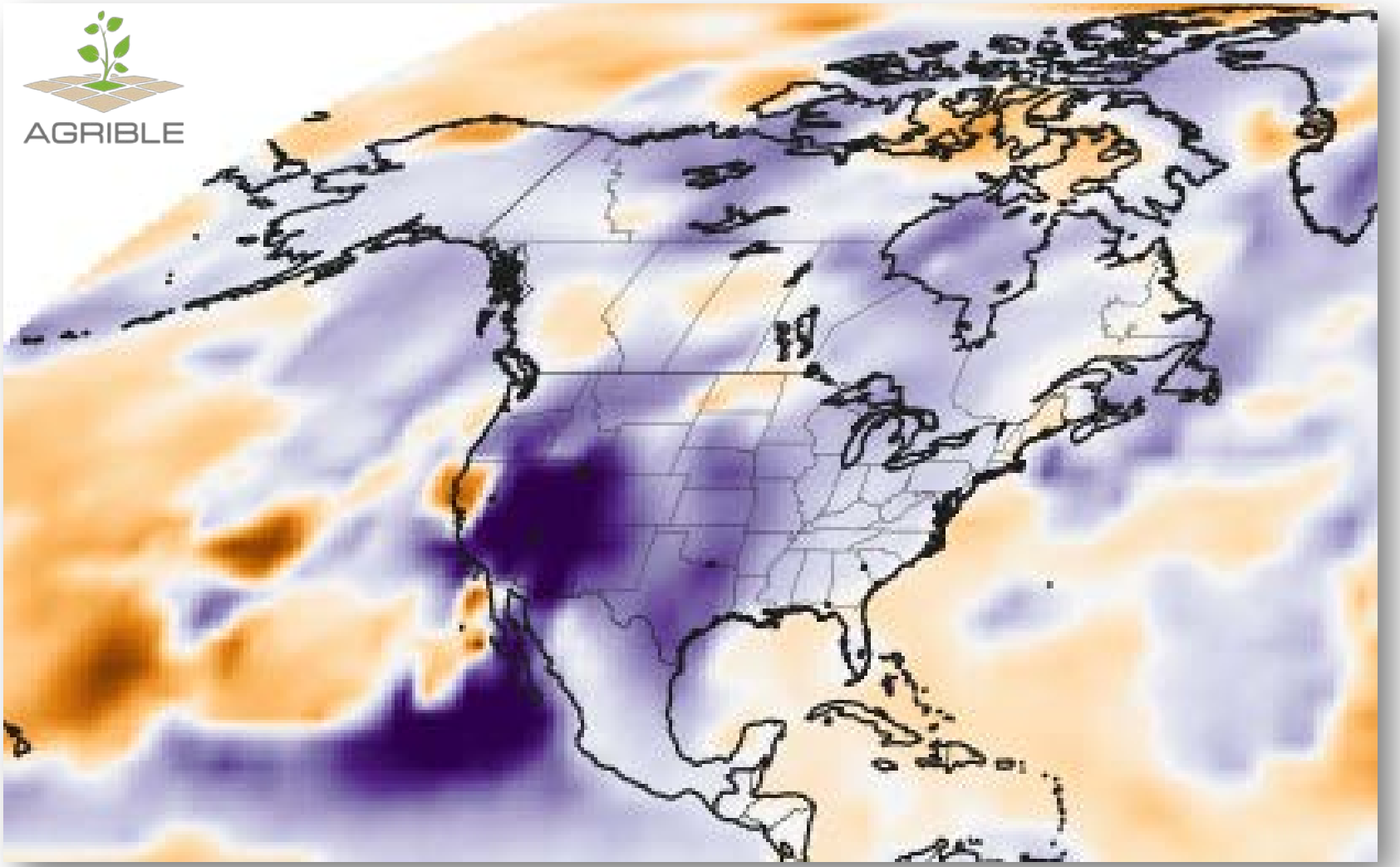
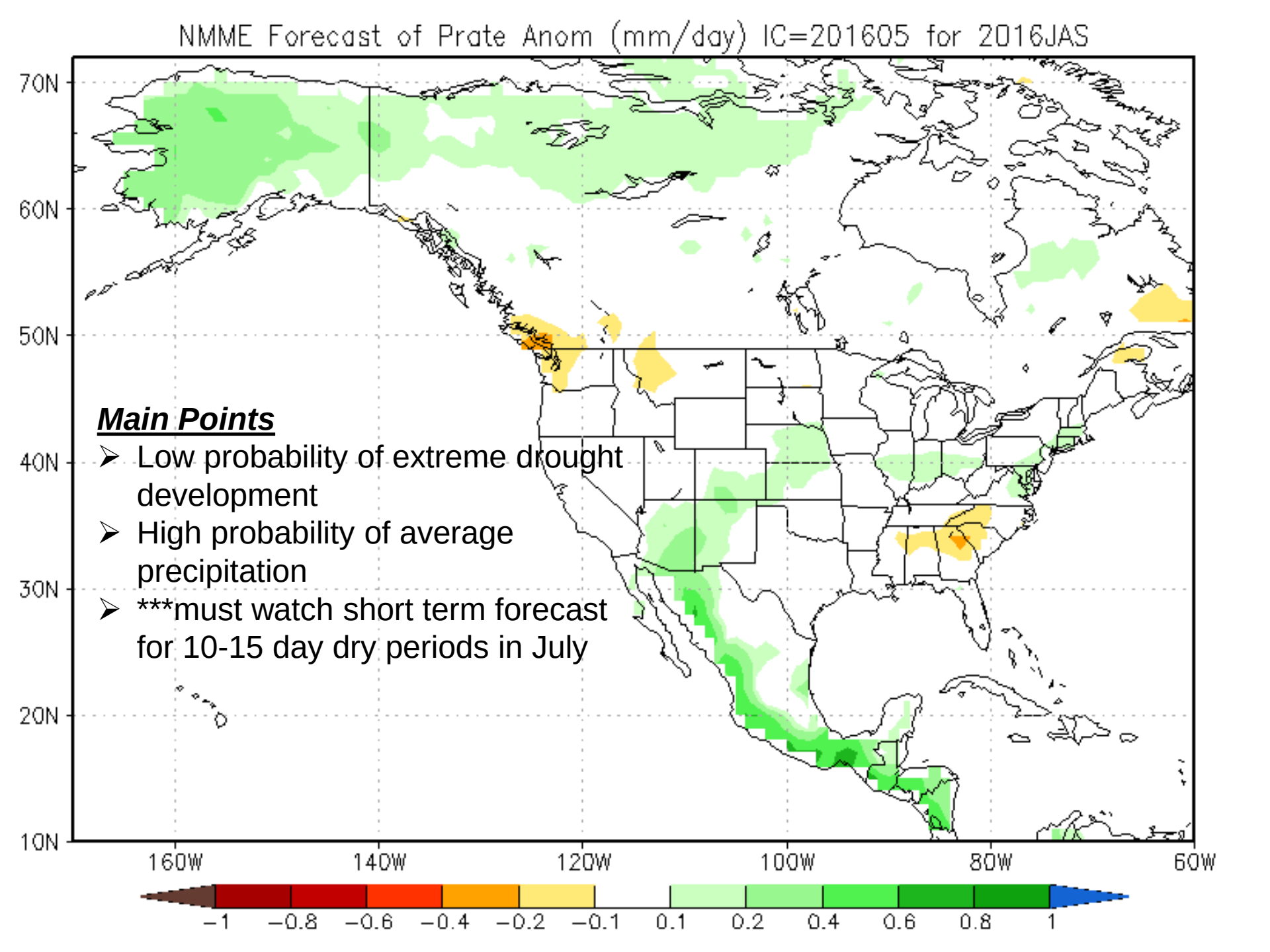
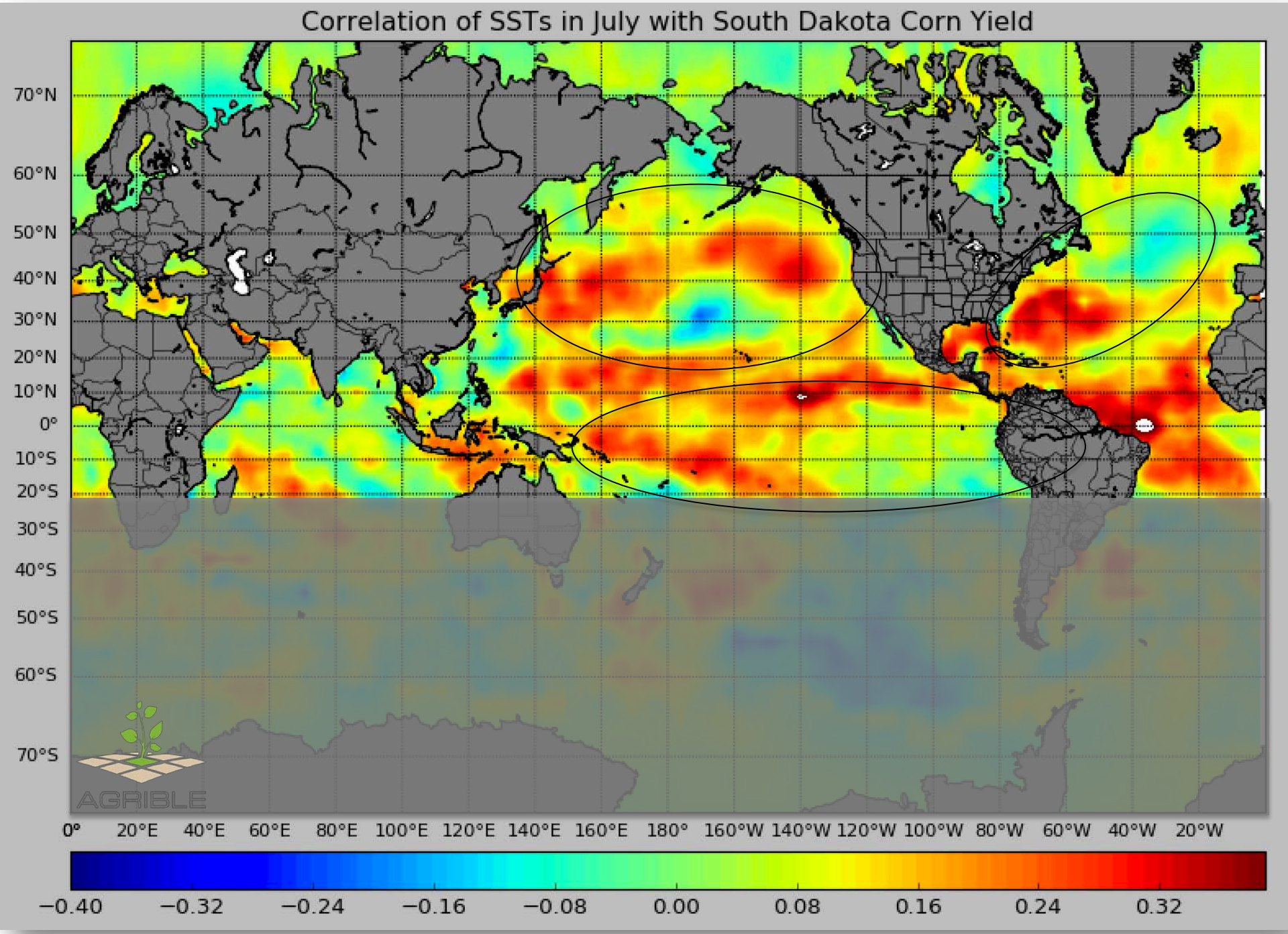
8/9/15
11/9/15
2/9/16
5/9/16

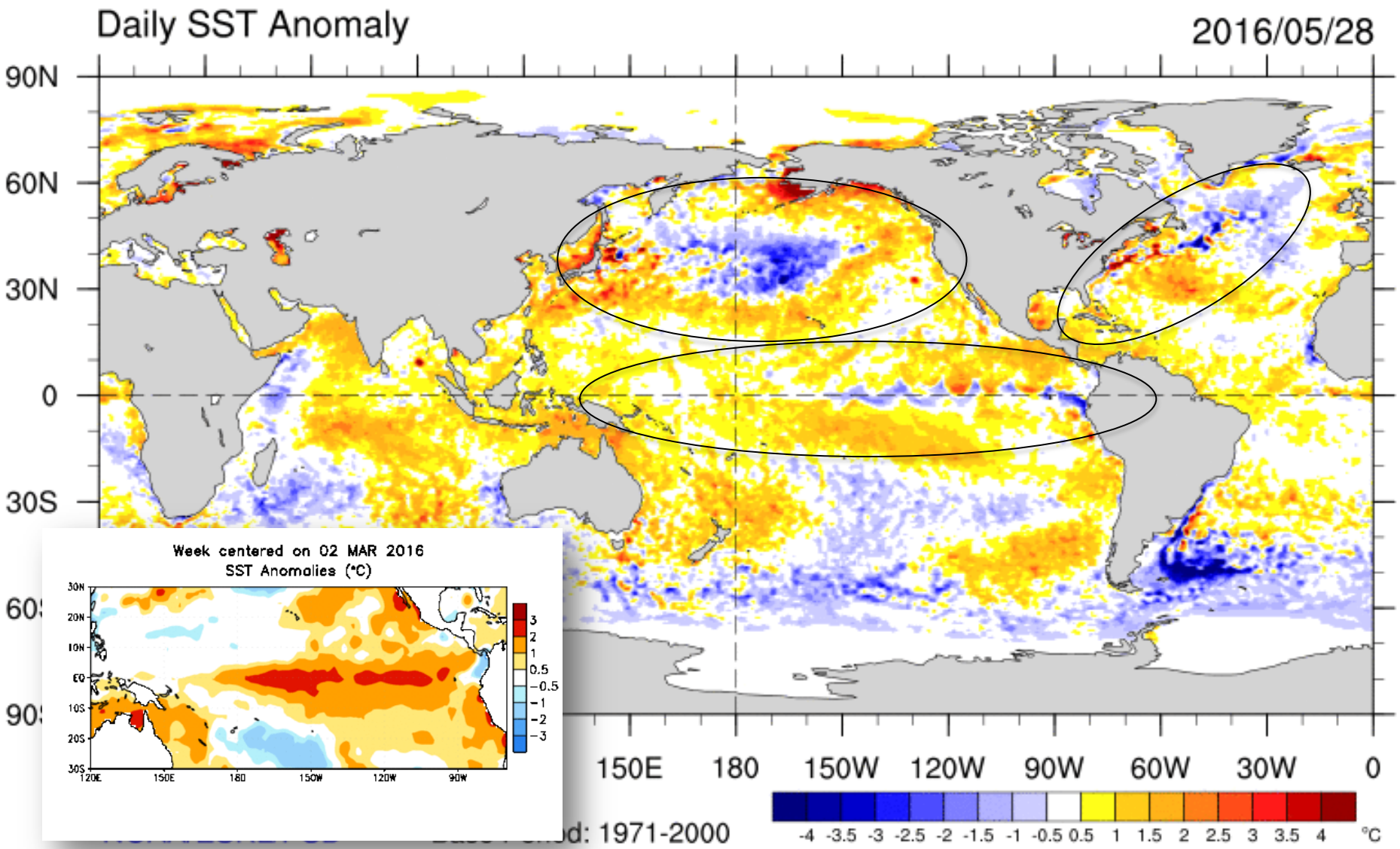

Correlation Precipitation in July with South Dakota Corn Yield
Dry
Dry
Wet
Wet
Dry
40°N
30°N
100°W
80°W
AGRIBLE
−0.30
−0.24
−0.18
−0.12
−0.06
0.00
0.06
0.12
0.18
0.24

July, August and September Precipitation Anomalies



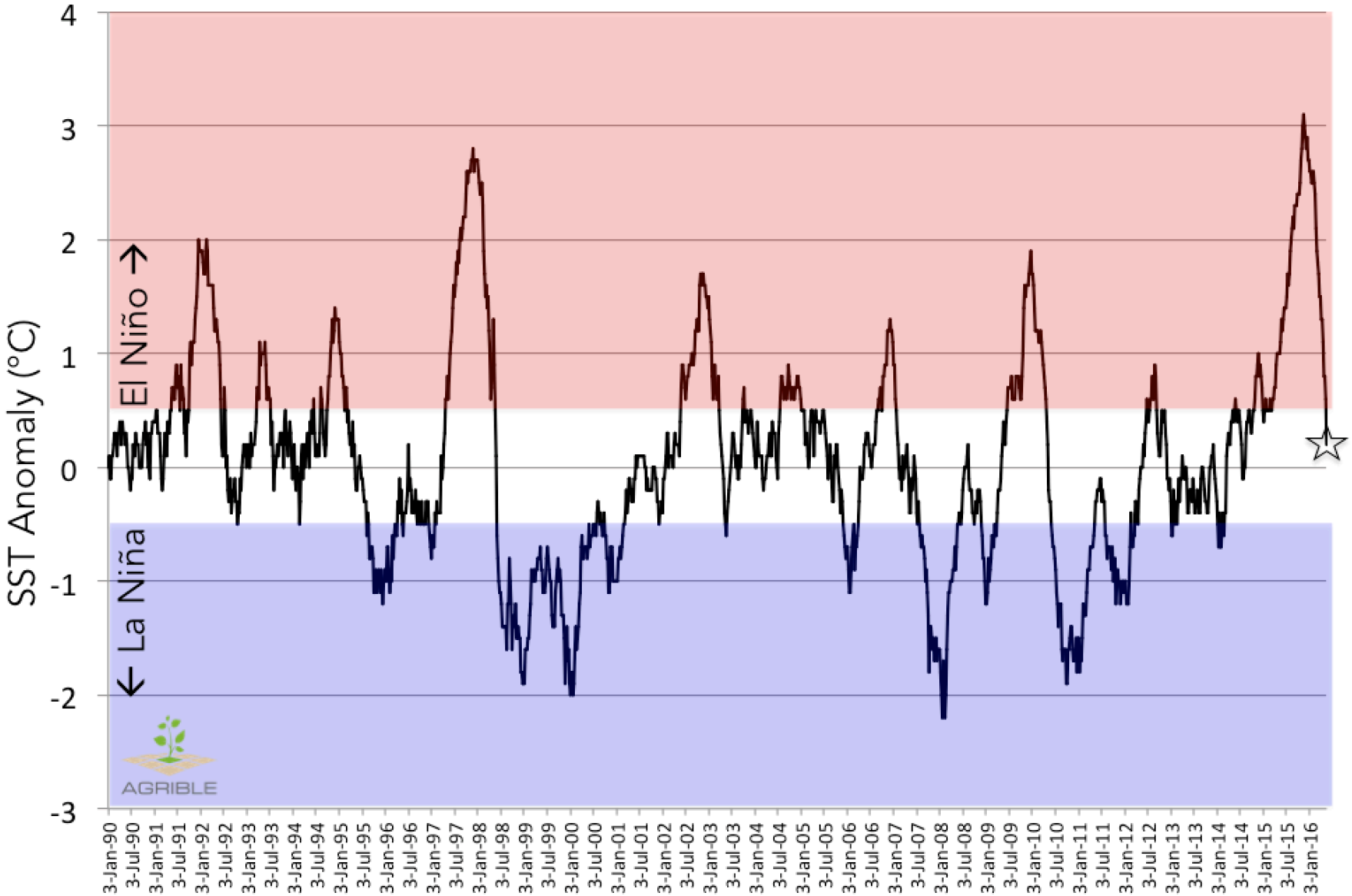

NMME Forecast of Prate Anom (mm/day) IC=201605 for 2016JAS
70N
60N
50N
40N
30N
20N
10N
160W
140W
120W
100W
80W
60W
−1
−0.8
−0.6
−0.4
−0.2
−0.1
0.1
0.2
0.4
0.6
0.8
1
Main Points
Low probability of extreme drought development
High probability of average precipitation
***must watch short term forecast for 10-15 day dry periods in July

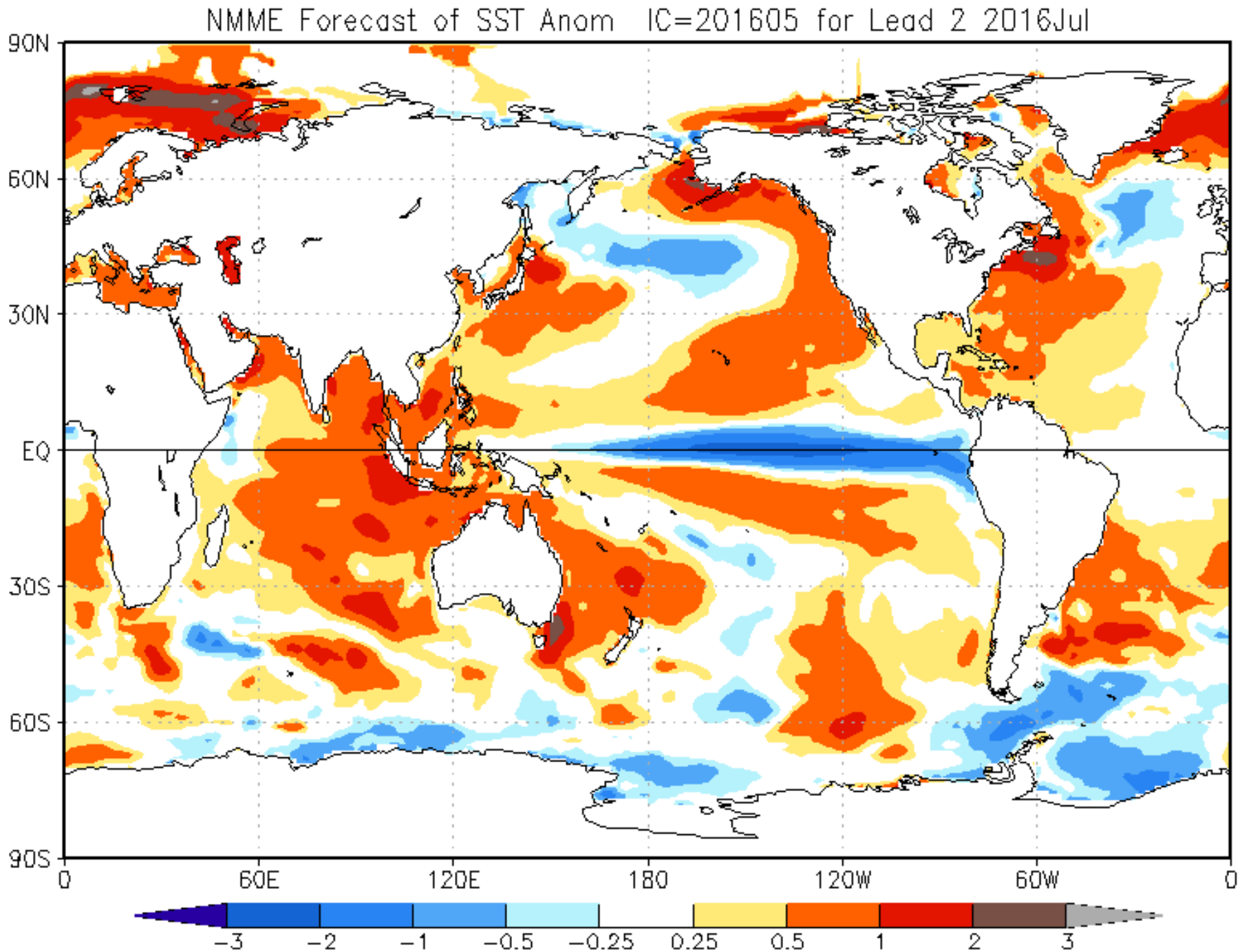

Correlation of SSTs in July with South Dakota Corn Yield
70°N
60°N
50°N
40°N
30°N
20°N
10°N
0°
10°S
20°S
30°S
40°S
50°S
60°S
70°S
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
180°
160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
−0.40
−0.32
−0.24
−0.16
−0.08
0.00
0.08
0.16
0.24
0.32
AGRIBLE



http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_update/sstaanim.gif
http://www.esrl.noaa.gov/psd/map/clim/sst.shtml

Niño Region3.4 Sea Surface Temperature Anomaly (Jan 1990 – May 2016)

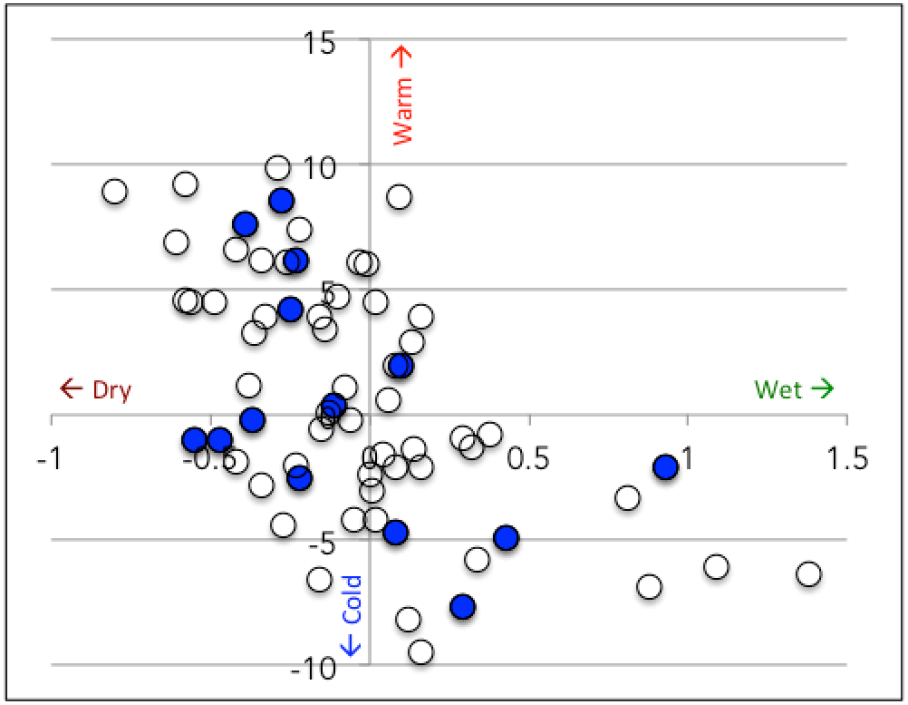


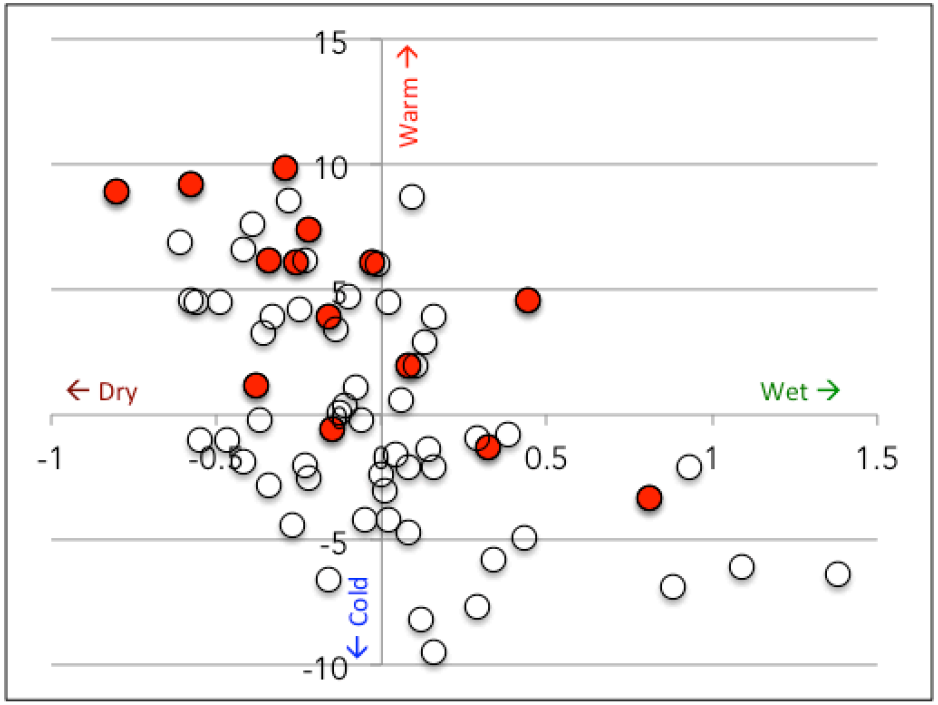

NMME Forecast of SST Anom IC=201605 for Lead 2 2016Jul
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
−3
−2
−1
−0.5
−0.25
0.25
0.5
1
2
3

Temperature and Precipitation Pairs December-January (1950-2016)

Blue Dots = La Niña Winters

Red Dots = El Niño Winters





High probability that La Niña will persist through winter 2016.

Implications → Winter 2016-17 will likely return to normal temperatures (potentially colder than normal)

Producers: Conservation and Stewardship

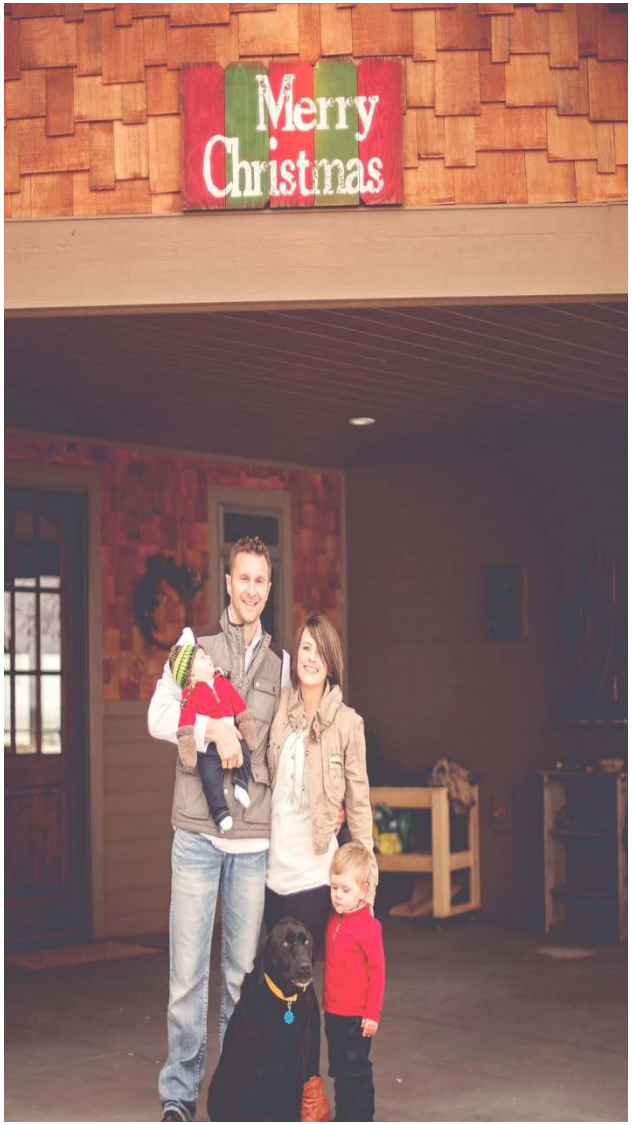
Louis Nigg

John Moes

Mark Rilling

Nigg Farms

Since 1910


Merry
Christmas

Nigg
FARMS
since 1910
Sisseton, SD

MY DAD
FEEDS
YOUR DAD

- ***Follow Me on Twitter***

  - ***Twitter @LouieDN***

Subsurface Irrigation

Mark Rilling

WOLFE MAN
7000

CAT

FEATHERLITE STL

S185

S185
Bobcat

ROUTINE BASEBALL

Fresh
WATERMELONS
CAUTION

2017 Governor's Agricultural Summit

Aberdeen, SD
July 12-13