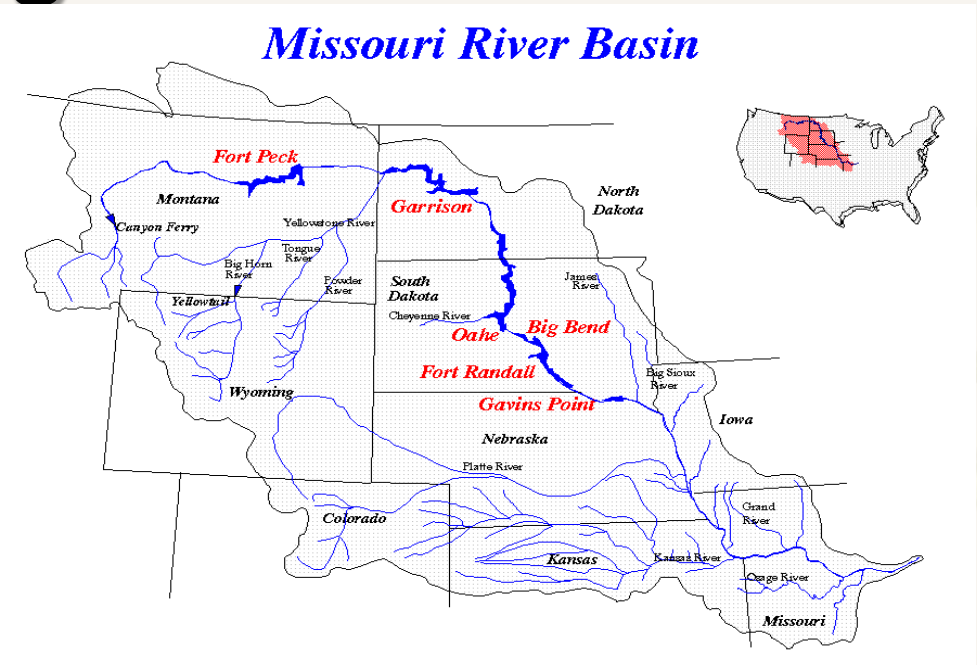
A Quick History Lesson on Drought in the Missouri Basin



Mark Svoboda, Climatologist
Monitoring Program Area Leader
National Drought Mitigation Center
University of Nebraska-Lincoln

NIDIS Missouri River Basin Regional Drought Early Warning System
Pilot Kick-Off, Nebraska City, NE, February 26-27, 2014

Conveying the Message

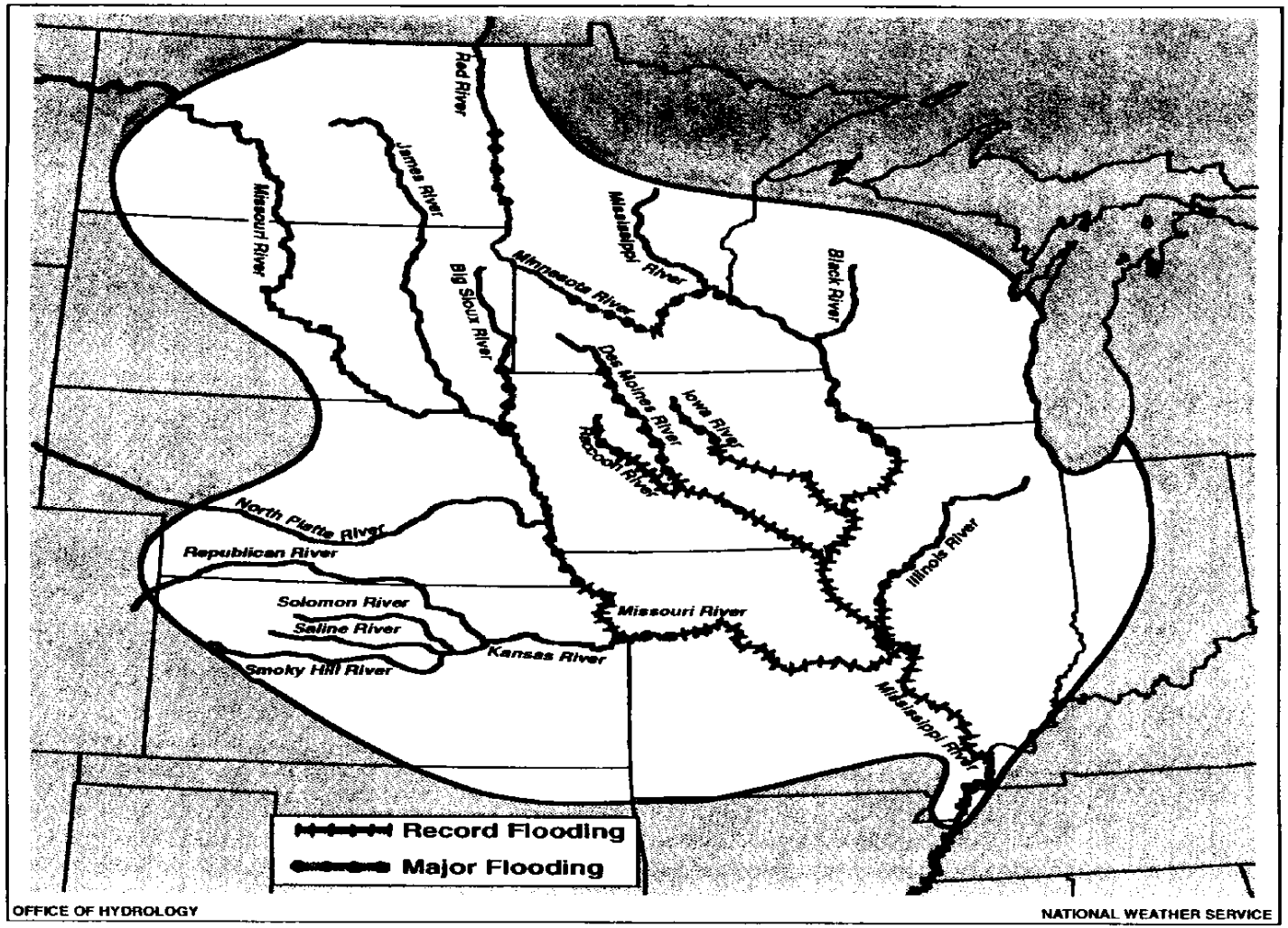
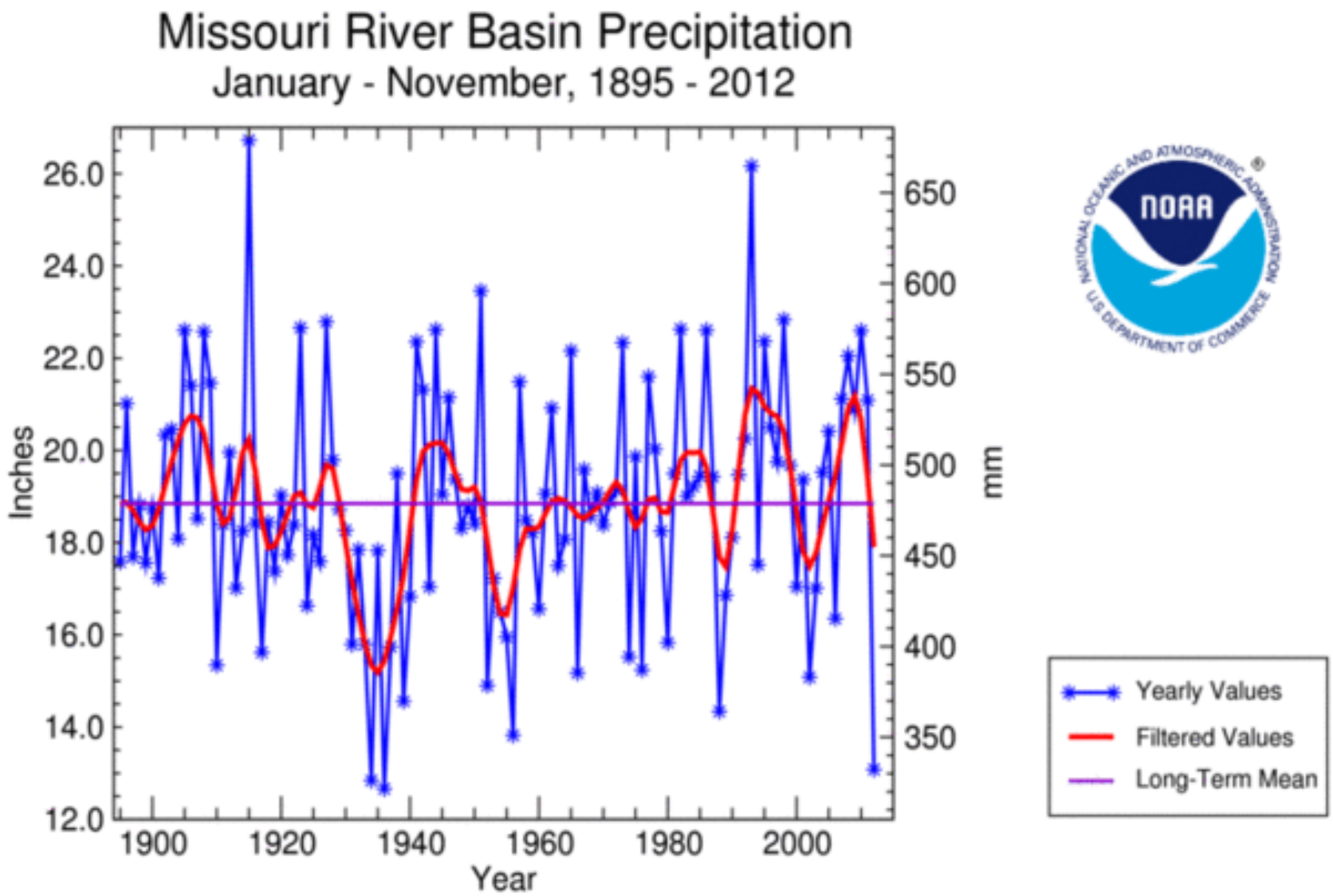
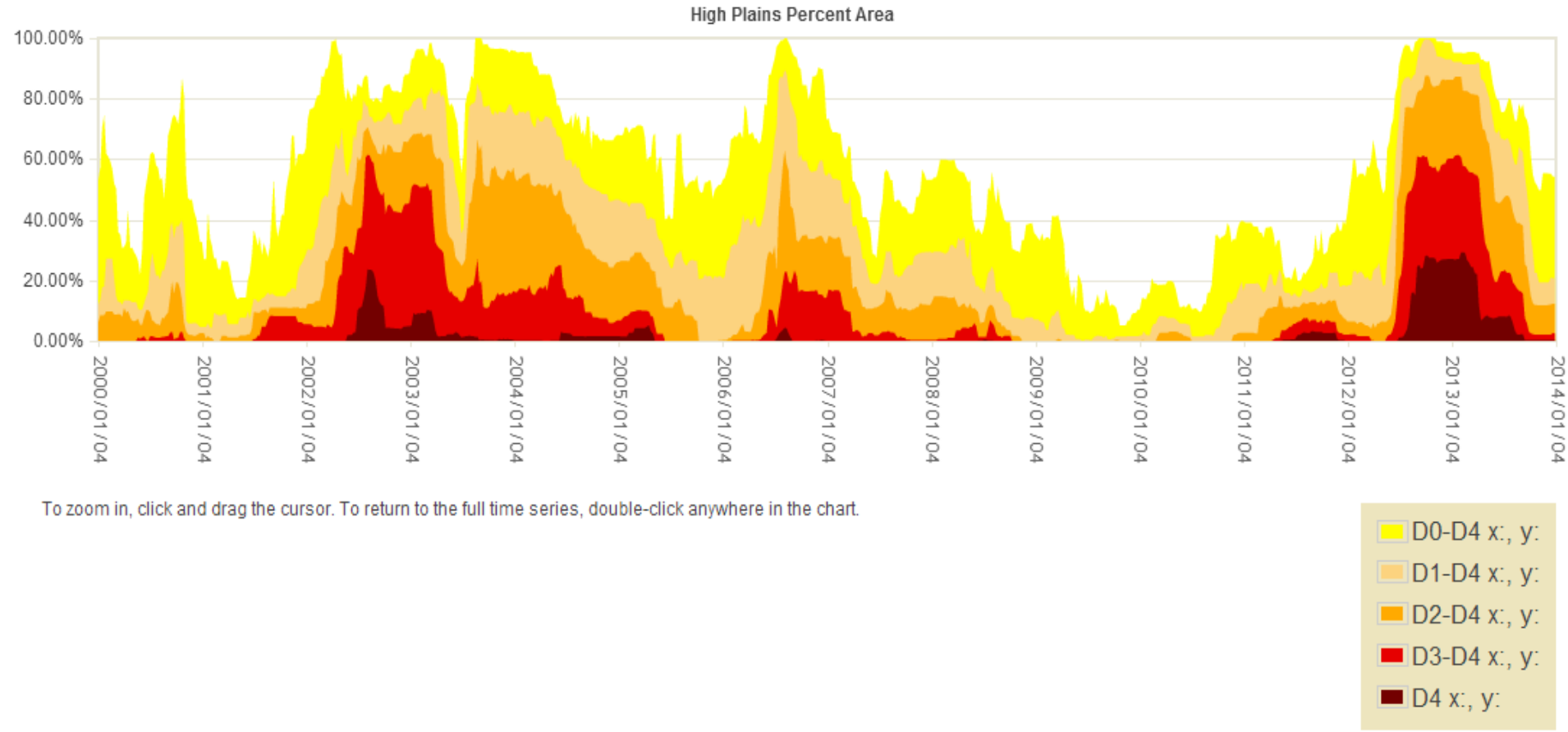


Fig. 5 Degree of flooding observed along various rivers throughout the Midwest during July and August 1993 (courtesy of the Office of Hydrology, US National Weather Service)



National Climatic Data Center / NESDIS / NOAA

Percent Area of High Plains in D1-D4, 2000-2013



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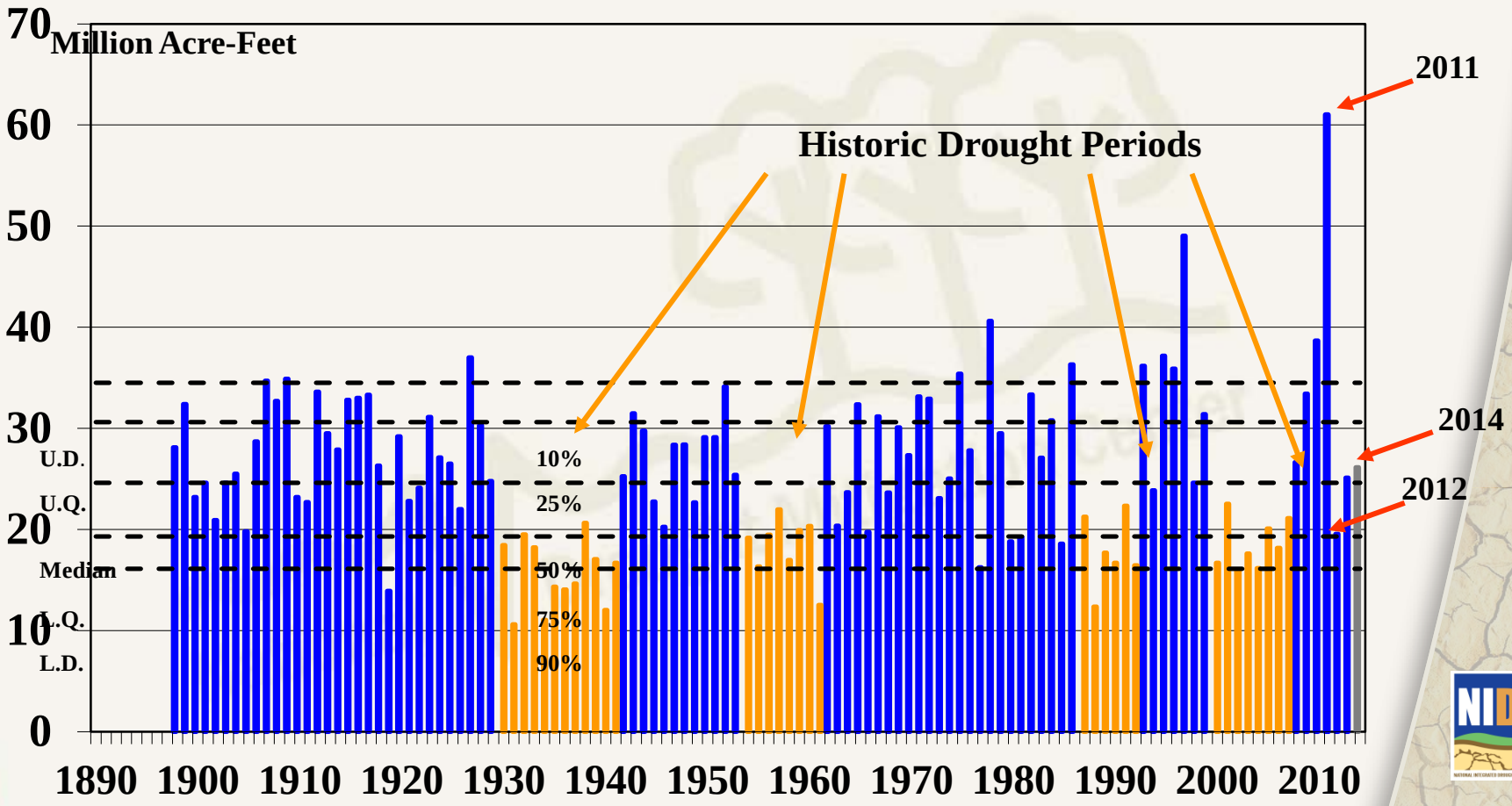
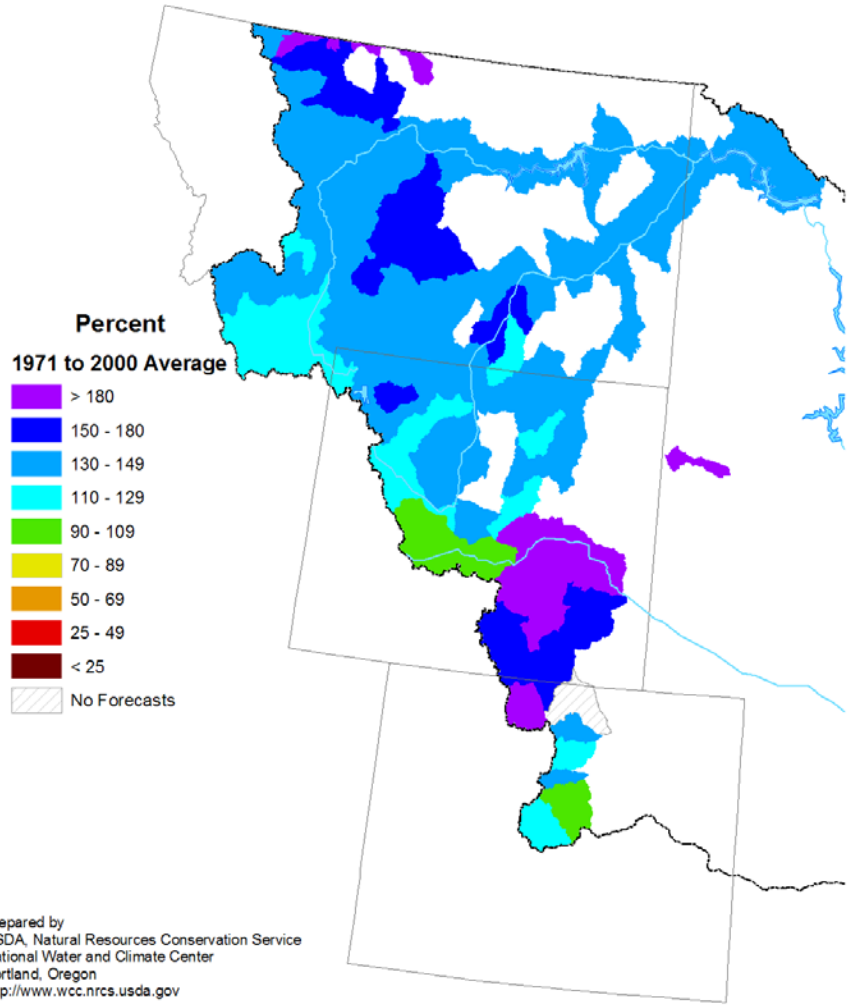
Missouri River Mainstem System
Annual Runoff above Sioux City, IA



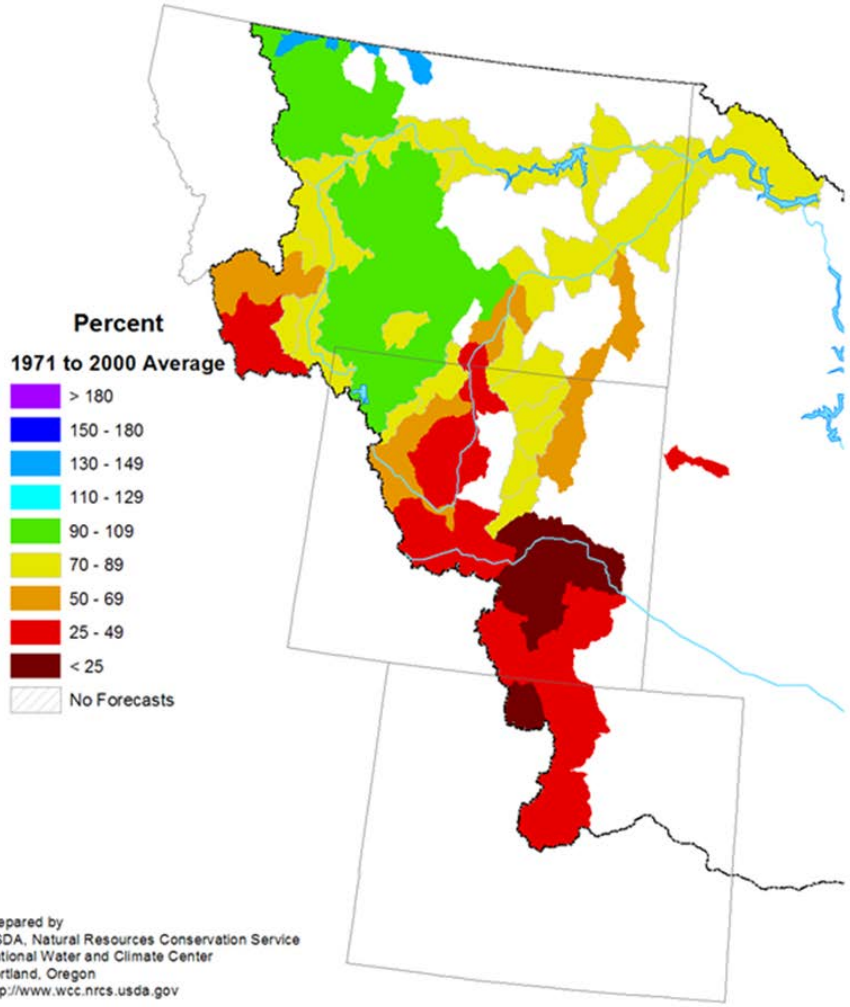
Time series of the annual Missouri River runoff (million acre-feet) above Sioux City, Iowa for 1898-2013. Regimes of persistent low flows, denoted by orange bars, denote hydrologic droughts within the basin. Horizontal line shows the historical median value.
(Data source : USACE)

Missouri River Basin
Spring and Summer Streamflow Forecasts as of May 1, 2011



Prepared by
USDA, Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov

Missouri River Basin
Spring and Summer Streamflow Forecasts as of May 1, 2012



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USDA, Natural Resources Conservation Service
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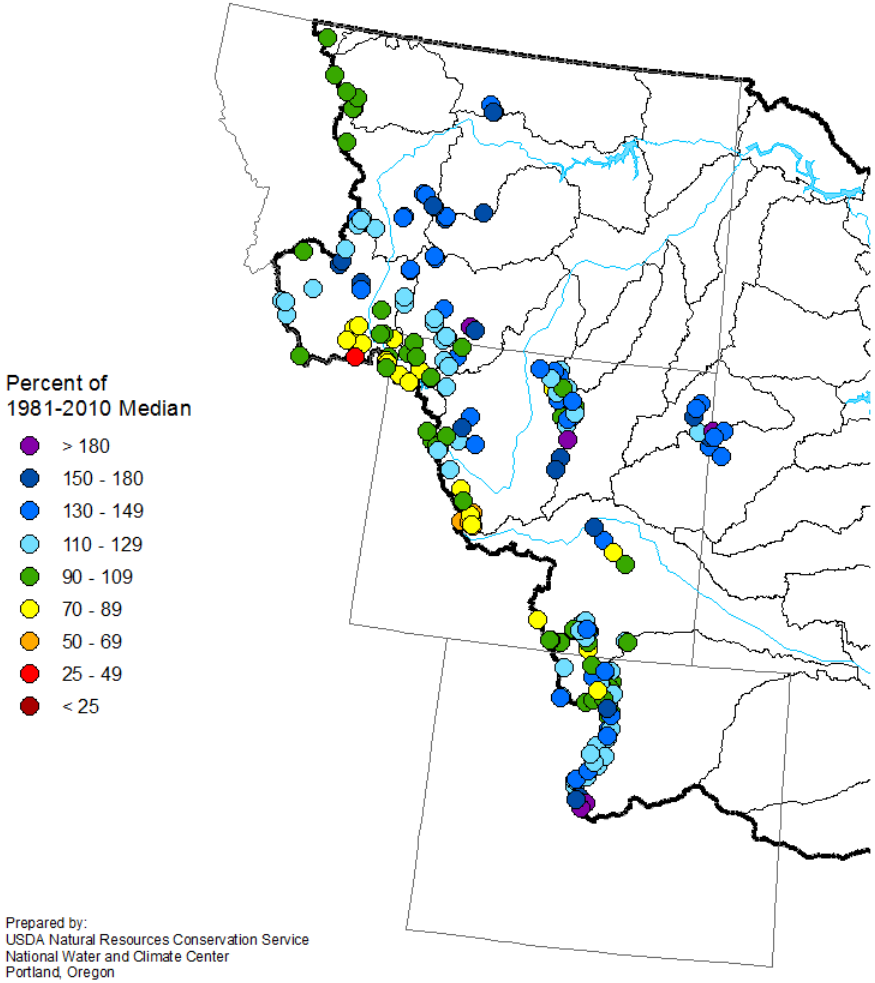
Portland, Oregon
http://www.wcc.nrcs.usda.gov

Missouri River Basin
Mountain Snowpack
as of February 1, 2014



Prepared by:
USDA Natural Resources Conservation Service
National Water and Climate Center
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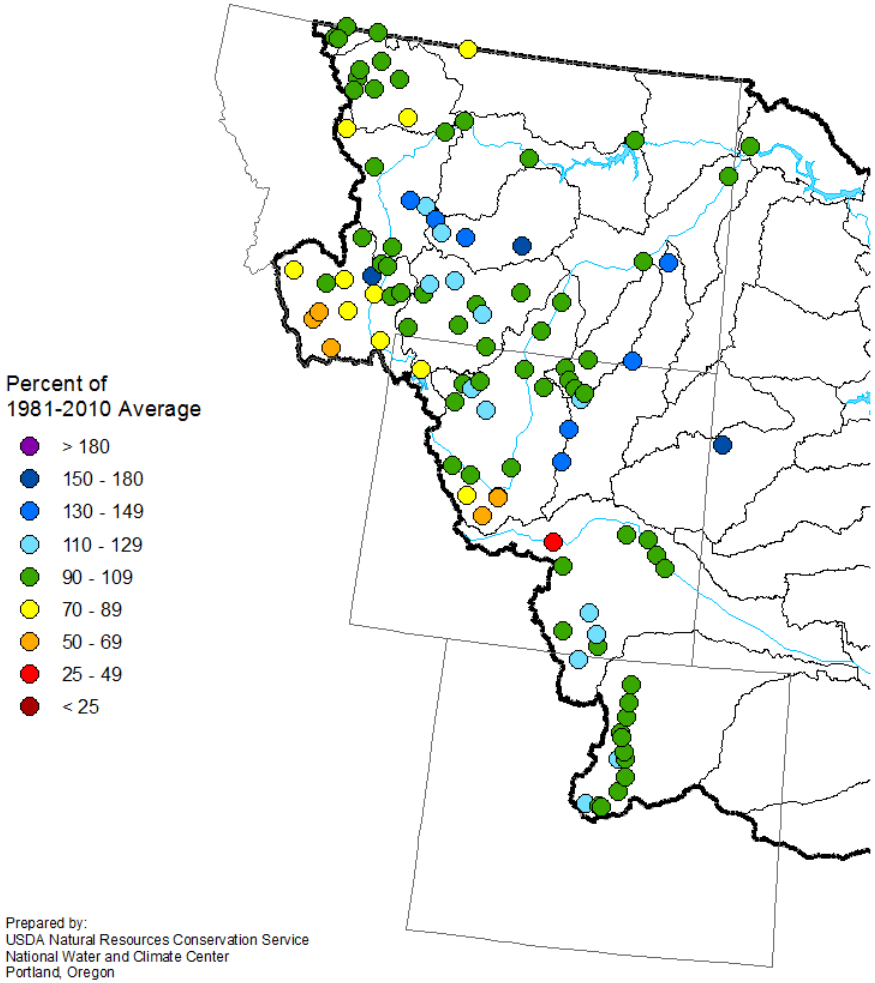
http://www.wcc.nrcs.usda.gov
Created: 7 Feb 2014 08:37

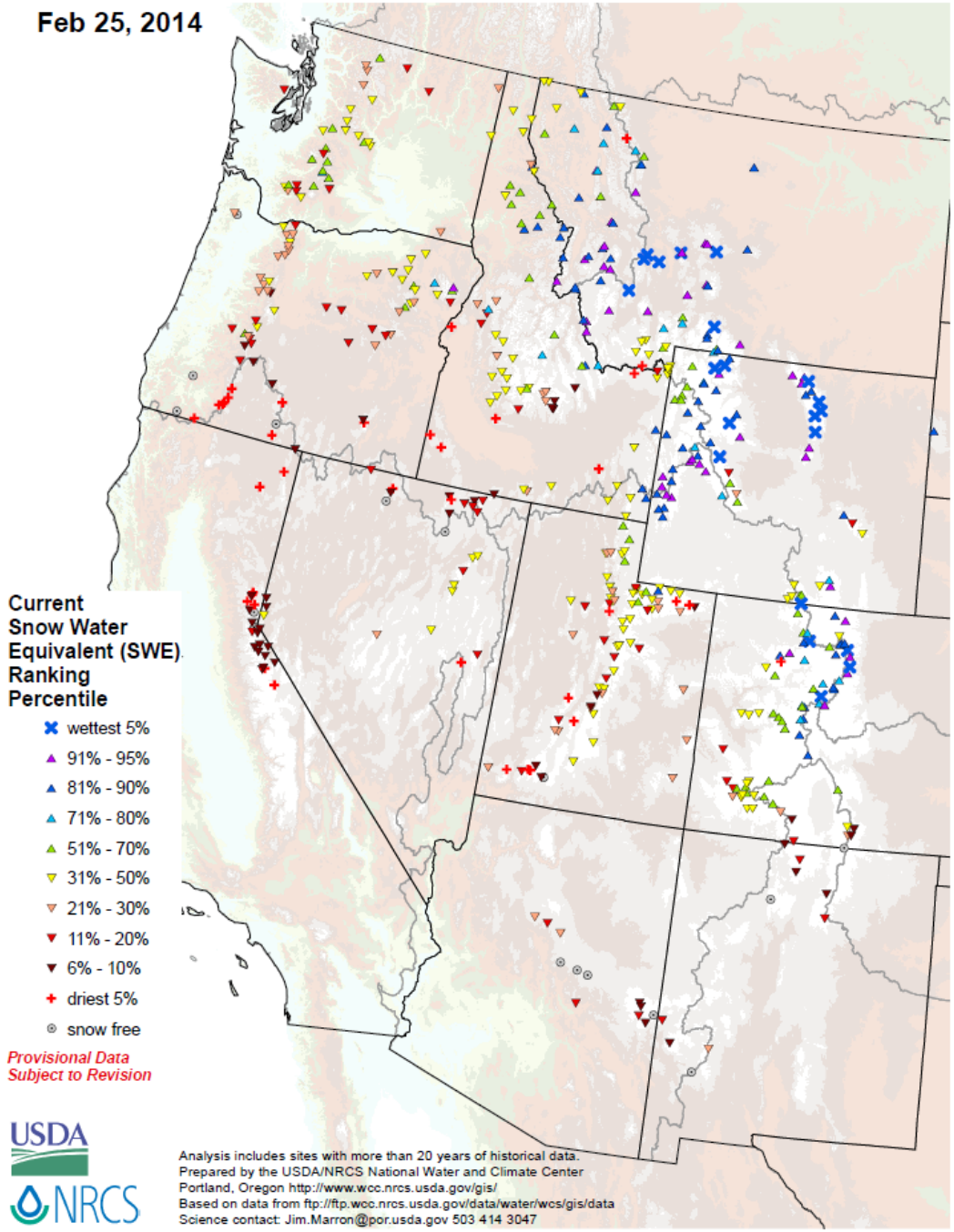
Missouri River Basin
Spring and Summer Streamflow Forecasts
as of February 1, 2014



Prepared by:
USDA Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov
Created: 11 Feb 2014 12:02

SNOTEL Current Snow Water Equivalent (SWE) Ranking Percentile

Feb 25, 2014



USDA NRCS

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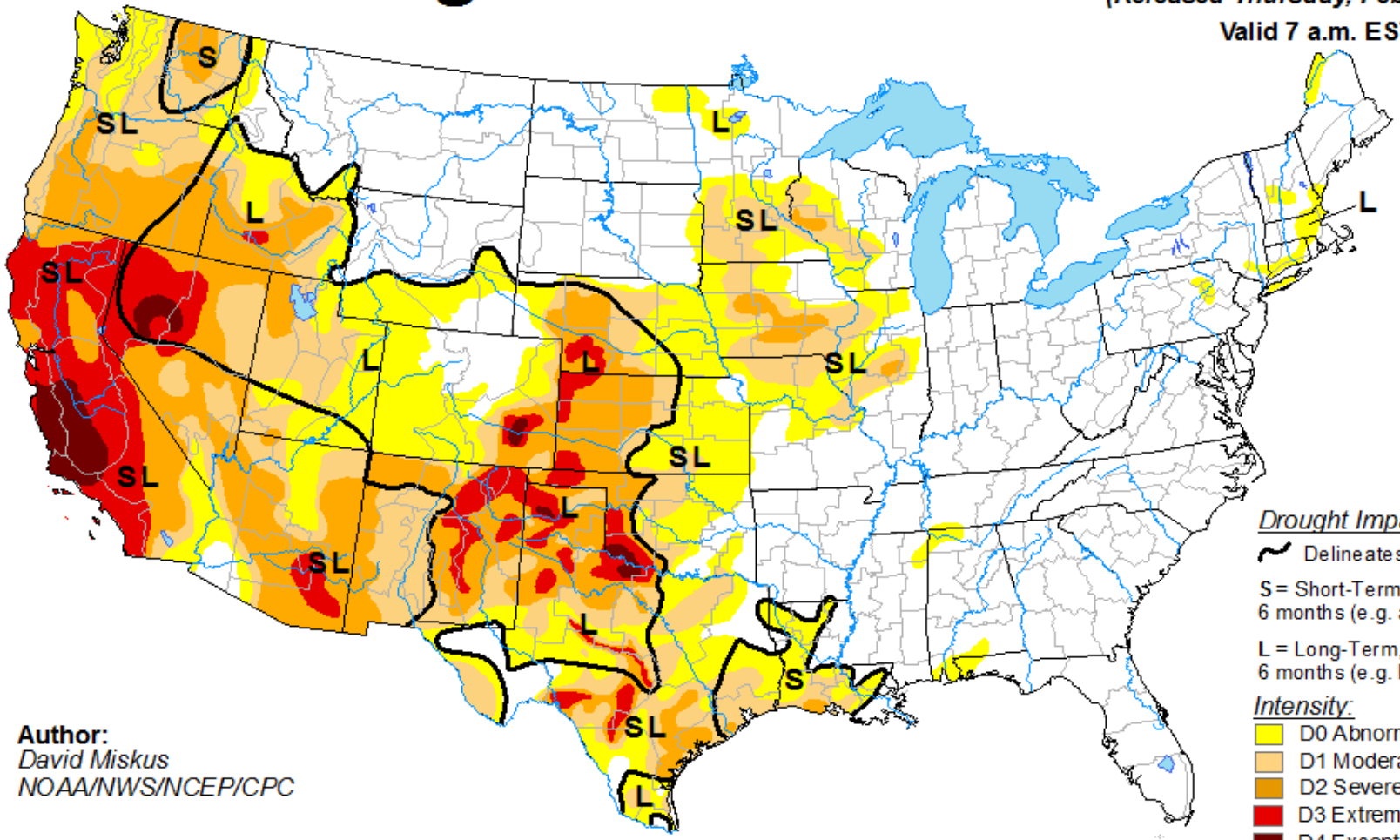
U.S. Drought Monitor

February 18, 2014

(Released Thursday, Feb. 20, 2014)

Valid 7 a.m. EST



Author:
David Miskus
NOAA/NWS/NCEP/CPC

Drought Impact Types:

Delineates dominant impacts

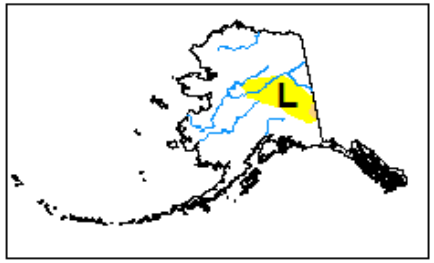
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

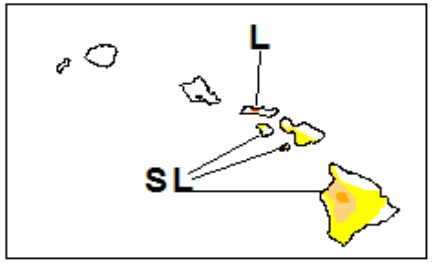
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

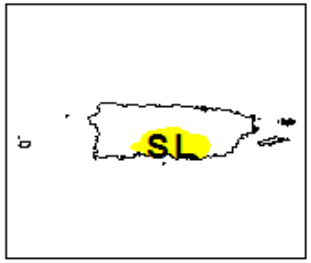
Intensity:

- 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/

What Questions Will the Drought Risk Atlas Help Answer?

- How does the drought compare historically?
- How often does a drought of this magnitude happen? (frequency/return periods)
- When was the last time a drought like this happened? (analogs)
- What did the spatial footprint of the last drought look like? (areal extent via maps)
- Expand drought planning horizons?
  - Would like to add paleo (tree rings) data in the future

Drought Risk Atlas (DRA):

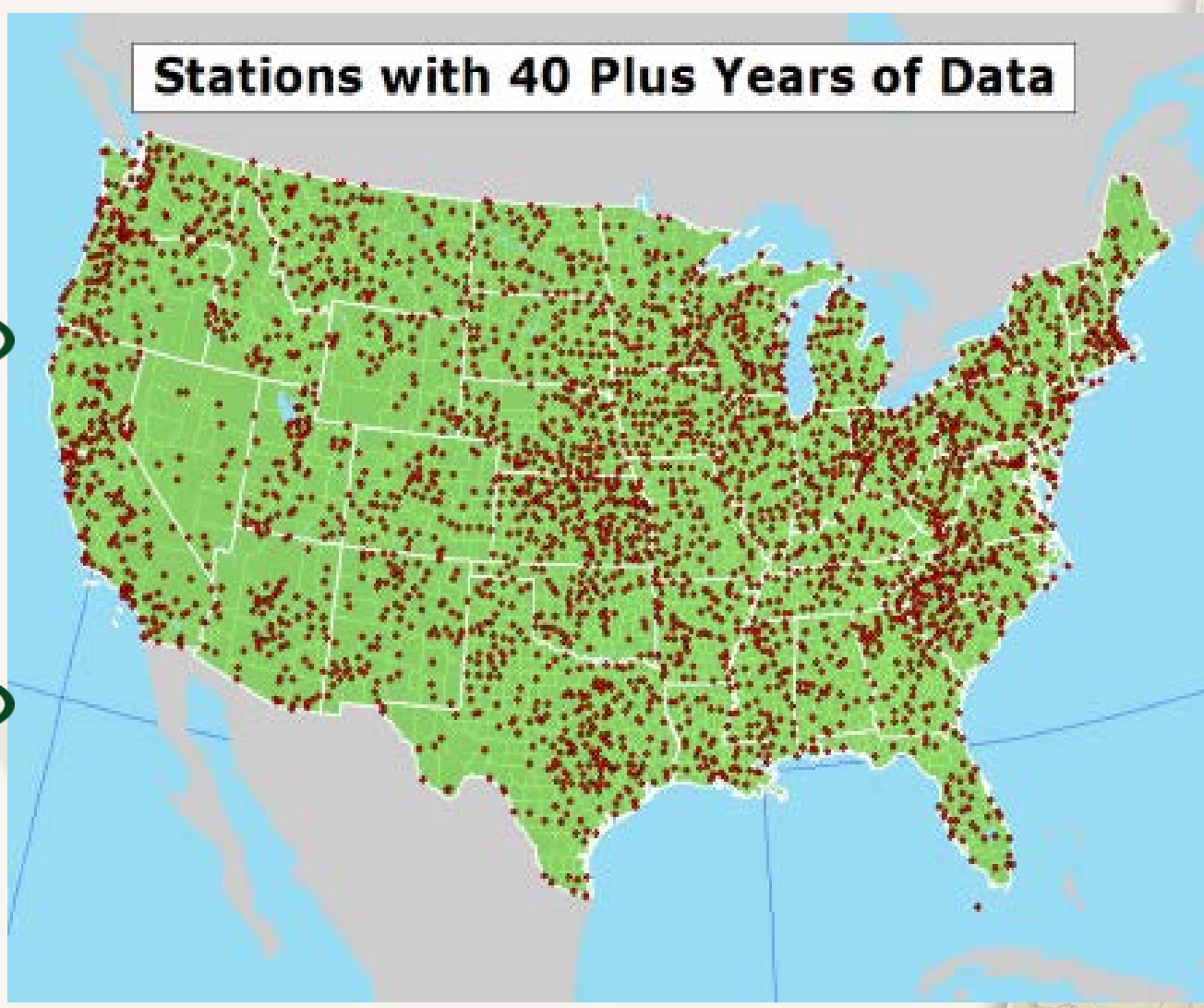
- Set to launch in **spring 2014**
- **~3000** stations archived
  - 139 clusters/regions developed and analyzed
  - SPI, SPEI, PDSI, sc-PDSI and Deciles **through 2012**
  - Weekly gridded maps back to early 1900s
- Created to answer questions about the **characteristics of drought**:
  - Frequency/return periods
  - Duration
  - Trends
  - Intensity
  - Spatial extent

Coming Soon!

Drought Risk Atlas Stations:

Here is the final breakdown of stations used in the DRA meeting all our criteria:

- **3059** stations with **40+ years of data**
- 2462 stations with 50+ years of data (81.04%)
- **1733** stations with **60+** years of data **(57.04%)**
- 1170 stations with 70+ years of data (38.51%)
- **827** stations with **80+** years of data **(27.22%)**
- 537 stations with 90+ years of data (17.68%)
- **349** stations with **100+** years of data **(11.50%)**



University of Nebraska Lincoln

National Drought Mitigation Center

Drought Risk Atlas

National Drought Mitigation Center

Home | Map Viewer | Data | Methodology | About | Help

0 Current Location » Data

Climate Data

Selected Atlas Station: **250435 (AUBURN 5 ESE)**

Select New Station

Station | Climate | Deciles | SPI | SPEI | PDSI | SC-PDSI | Drought Monitor | Drought Periods | Compare Indices | Frequencies

250435: AUBURN 5 ESE

Latitude
40.37

Longitude
-95.747

Elevation (ft)
930

State
NE

County
Nemaha

Climate Division
9

Time Period
1/1/1908 - 12/31/2012

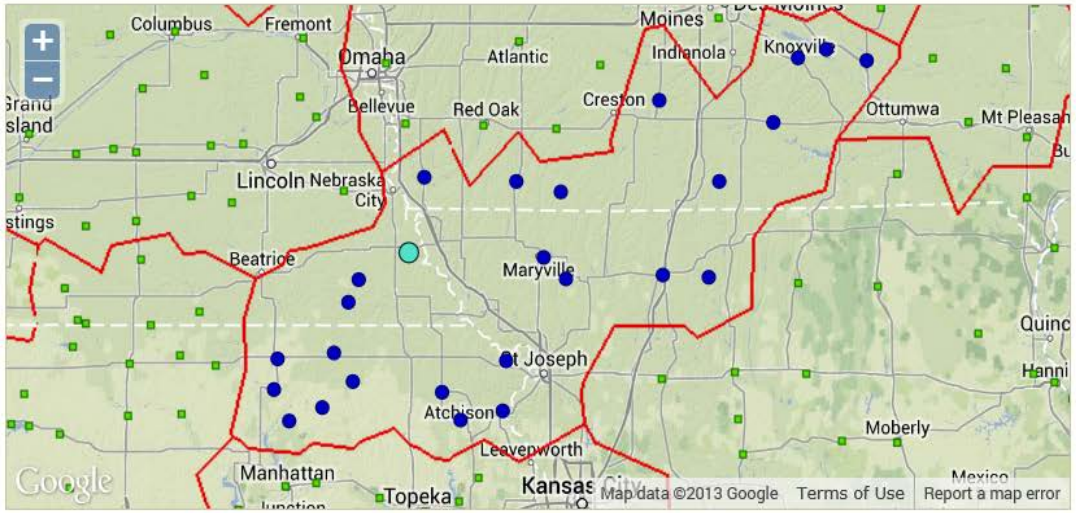
Years on Record
104

Percent Complete
95

Precipitation Only
No

Similar Stations

Atlas Region



Related Stations:

(Click to select)

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Select New Station

Station | Climate | Deciles | SPI | SPEI | PDSI | SC-PDSI | Drought Monitor | Drought Periods | Compare Indices | Frequencies

Date

1/1/1908 to 12/31/2012

Period of Record

Station start date: 1/1/1908

Aggregate

Month

Results for **AUBURN 5 ESE (250435)** between 1/1/1908 and 12/31/2012, aggregated by month.

Precipitation

Driest

Rank	Date	Total (in.)
1	3/1/1910	0.00
2	2/1/1917	0.00
3	11/1/1917	0.00
4	12/1/1946	0.00
5	2/1/1947	0.00
6	10/1/1952	0.00
7	1/1/1954	0.00
8	11/1/1954	0.00
9	11/1/1976	0.00
10	1/1/1981	0.00

Wettest

Rank	Date	Total (in.)
1	7/1/1993	19.96
2	9/1/1926	15.09
3	5/1/1908	14.27
4	7/1/1951	13.82
5	5/1/1996	13.52
6	7/1/1929	13.16
7	6/1/1917	12.60
8	6/1/1943	12.15
9	7/1/1915	11.94
10	8/1/1952	11.80

Temperature - Warmest

TMax

Rank	Date	Average (°F)
1	7/1/1934	102.93
2	7/1/1936	100.52
3	8/1/1913	98.84
4	8/1/1983	98.03
5	8/1/1947	97.34
6	8/1/1936	97.23

TMin

Rank	Date	Average (°F)
1	7/1/1934	73.37
2	7/1/1936	72.58
3	7/1/2011	72.32
4	7/1/1935	71.74
5	8/1/1947	71.67
6	7/1/1999	71.29

NIDIS

University of Nebraska Lincoln

Drought Mitigation Center

Climate Data

Selected Atlas Station: **250435 (AUBURN 5 ESE)**

Select New Station

Station | Climate | Deciles | SPI | SPEI | PDSI | SC-PDSI | Drought Monitor | Drought Periods | Compare Indices | Frequencies

Date

1/1/1908 to 12/31/2012

Period of Record

Station start date: 1/1/1908

Aggregate

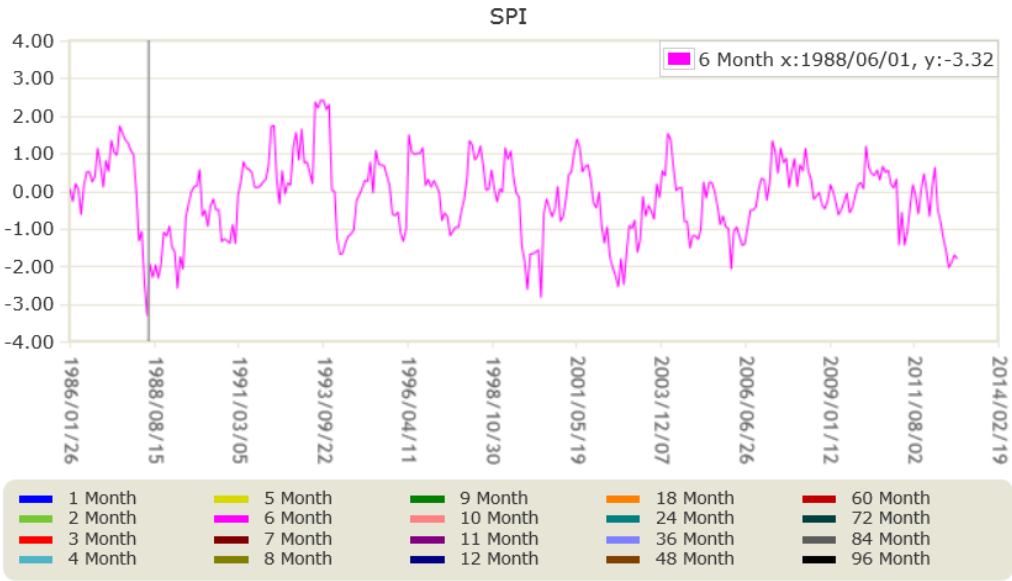
Month

Timestep

Select one or more timesteps to compare.

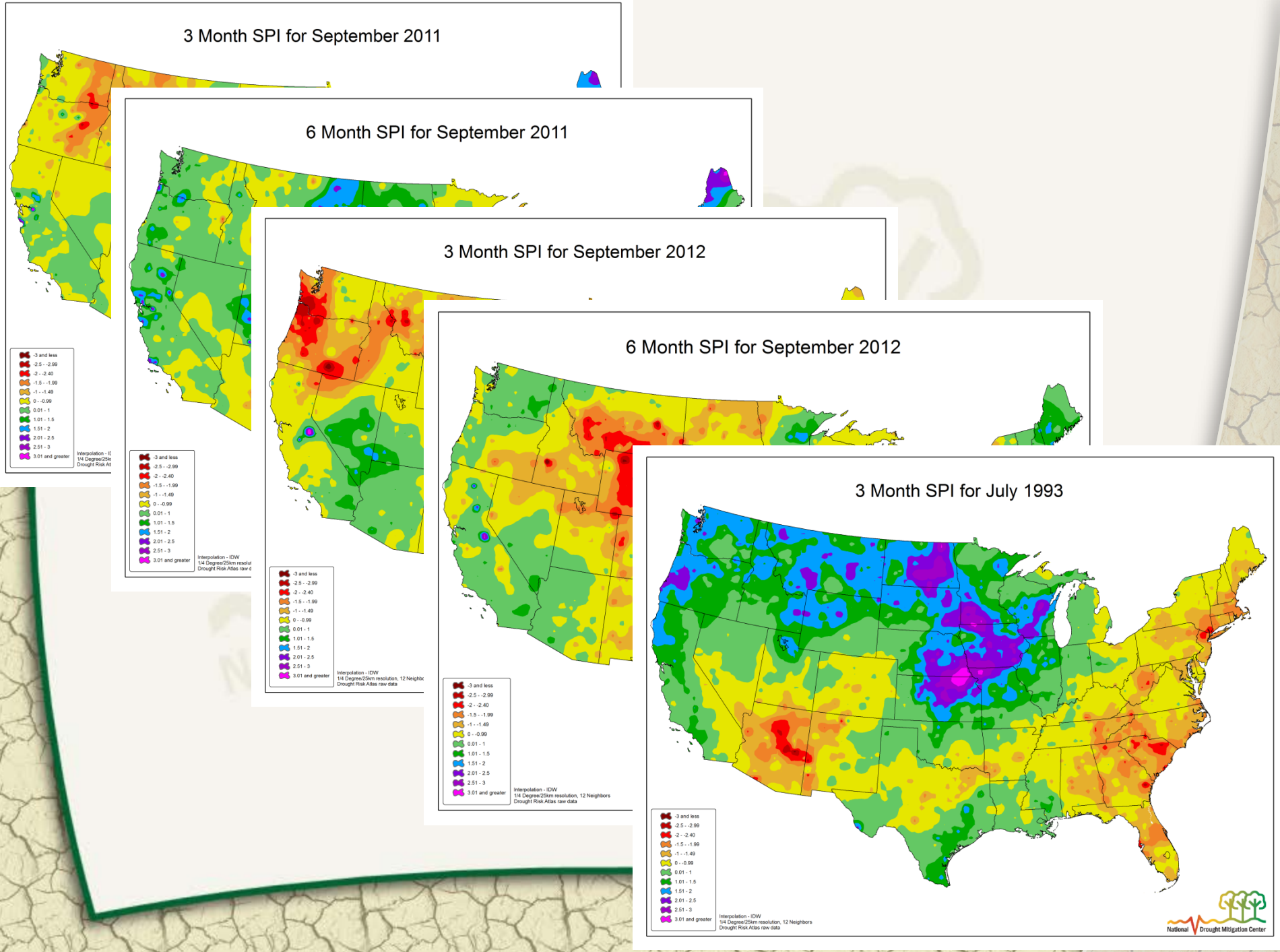
- 1 month
- 2 month
- 3 month
- 4 month
- 5 month
- 6 month
- 7 month
- 8 month
- 9 month
- 10 month
- 11 month
- 12 month
- 18 month
- 24 month
- 36 month
- 48 month
- 60 month
- 72 month
- 84 month
- 96 month

Results for **AUBURN 5 ESE (250435)** for the 6 Month timestep(s) between 1/1/1908 and 12/31/2012 and aggregated by month.



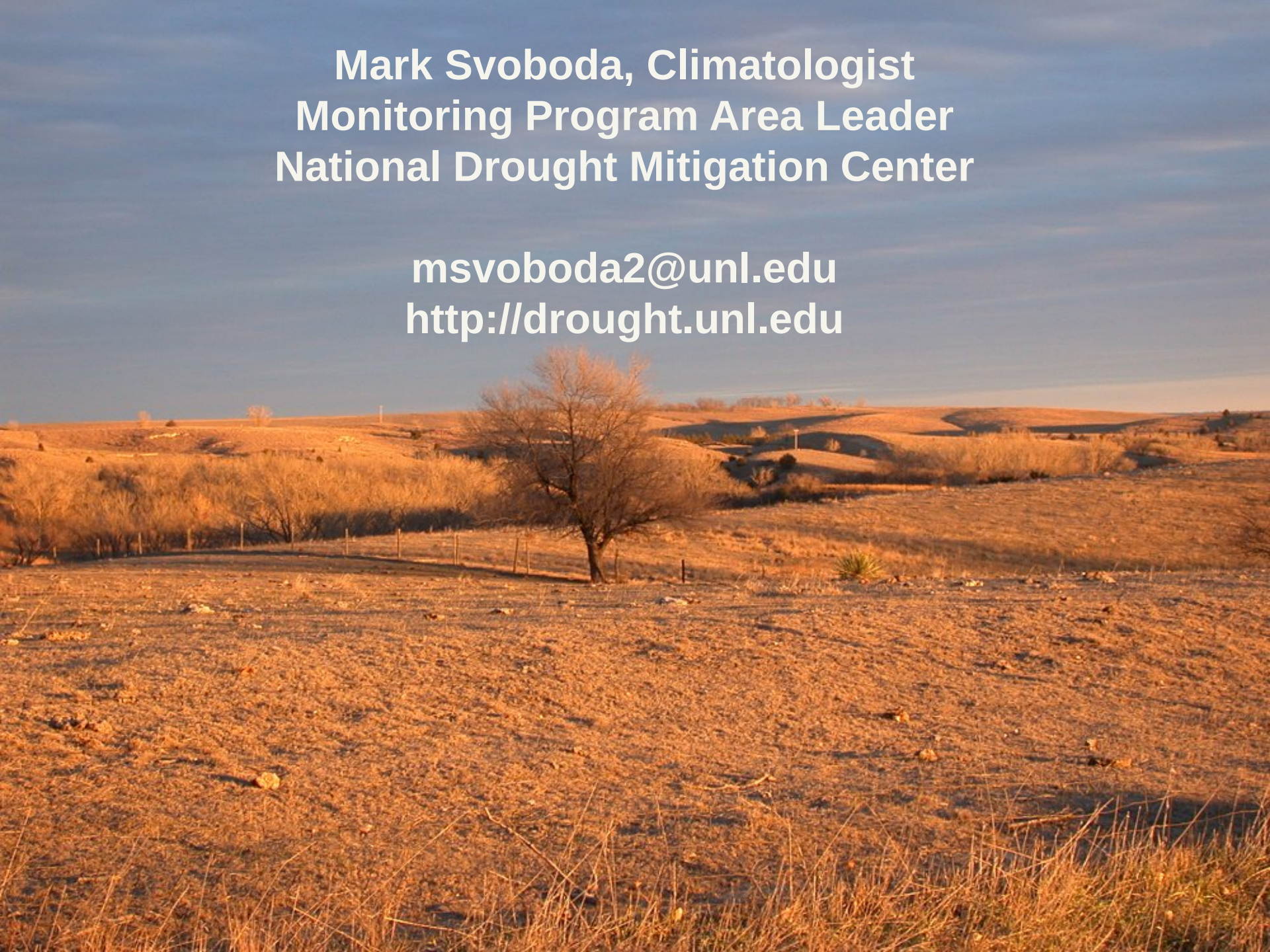
To zoom in on the chart, click and drag across the chart area. To return to the complete chart, double-click in the chart area.

72 month
84 month
96 month


3 Month SPI for September 2011
6 Month SPI for September 2011
3 Month SPI for September 2012
6 Month SPI for September 2012
3 Month SPI for July 1993
-3 and less
-2.5 - -2.99
-2 - -2.40
-1.5 - -1.99
-1 - -1.49
0 - -0.99
0.01 - 1
1.01 - 1.5
1.51 - 2
2.01 - 2.5
2.51 - 3
3.01 and greater
Interpolation - IDW
1/4 Degree/25km resolution, 12 Neighbors
Drought Risk Atlas raw data
National Drought Mitigation Center

A Few Additional Thoughts

- Drought is a **"normal"** part of the MO Basin climate cycle, which is a **"moving target"**
- Knowing your drought **"history"** is critical from both a monitoring and planning **perspective: What is the worse case scenario? (think zombie apocalypse!)**
- All droughts are ***LOCAL so let's start there!***
  - **Impact collection! No systematic guidelines, very little history to go on**
  - Optimal to **monitor at all scales** (local/regional/state/tribal/basin/national/global) (bottom-up or top-down or a combination of both)
  - **Plans at all levels** (local/basin/regional/national) rely on this operable/real-time monitoring information system and delivery
- The ***"I's"*** have it! **RDEWIS/NIDIS**
  - *Information, Integration and Impacts*



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