Data needs of the US Drought Monitor related to the NWS COOP and CoCoRaHS Programs

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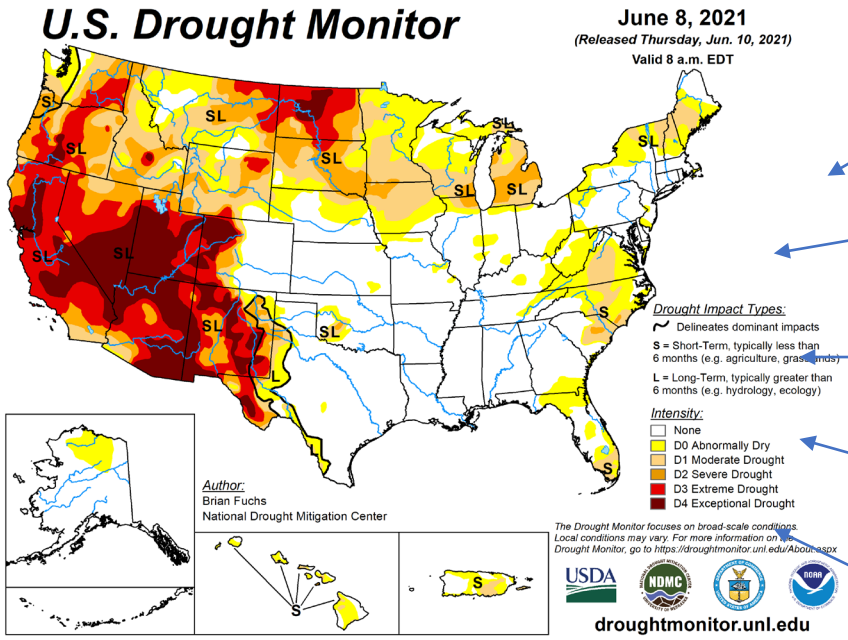
University of Nebraska-Lincoln

NDMC NATIONAL DROUGHT MITIGATION CENTER
UNIVERSITY OF NEBRASKA

WERA 1012 Meeting

May 17, 2022

Drought Machine



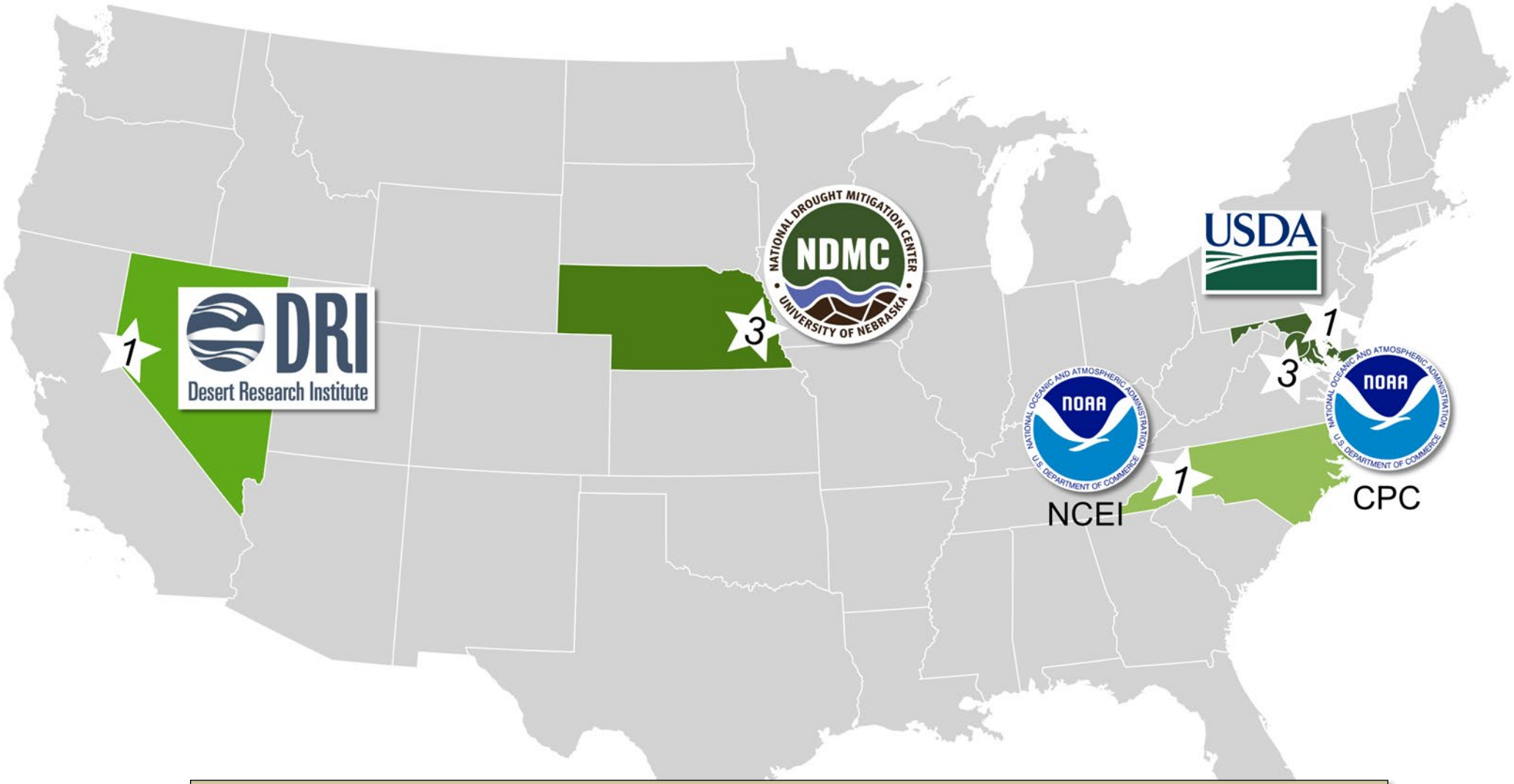
Data

Impacts

Feedback

Climate

Validation



Requirement: Authors must work at a regional or national "center", government or in academia/research

There are currently 9* authors, and all are volunteers

Drought Indices such as SPI/PDSI

Precipitation and Snow

Soil Moisture: both modeled and measured

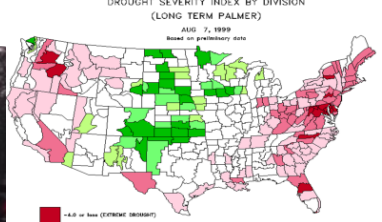
Most of the information analyzed each week falls into one of these categories.

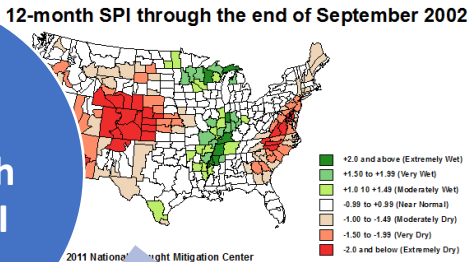
Authors now use roughly ***40-50 unique indicators*** while creating the U.S. Drought Monitor map, but not all areas are represented equally by all pieces of data.

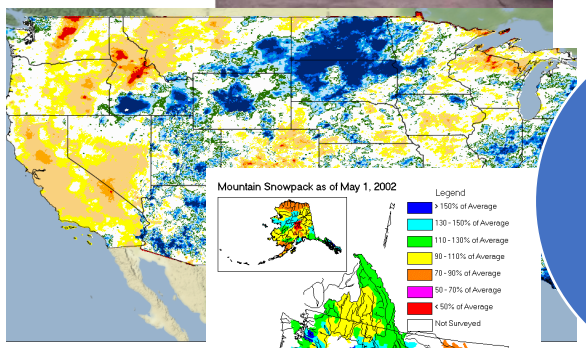
Expert Local Input and Impacts

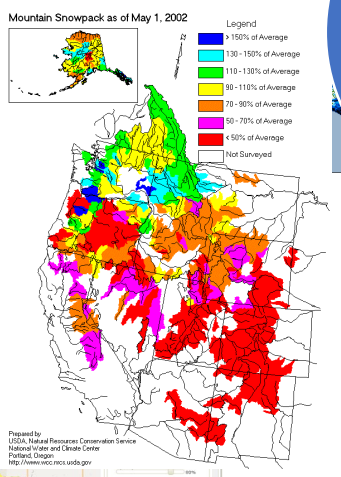
Streamflow, Reservoirs, and Wells

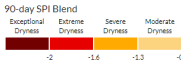
Remote Sensing

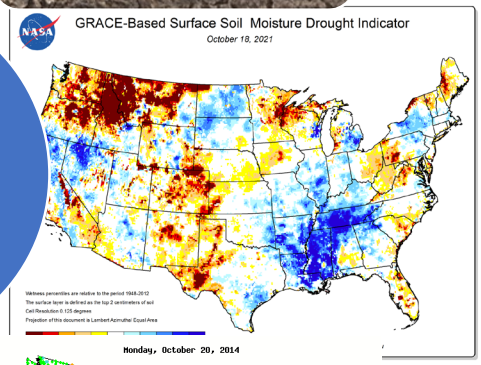


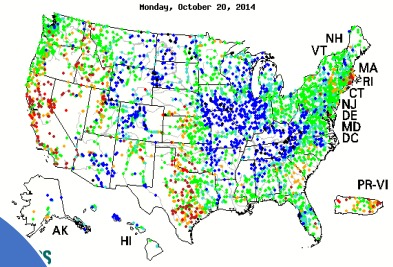


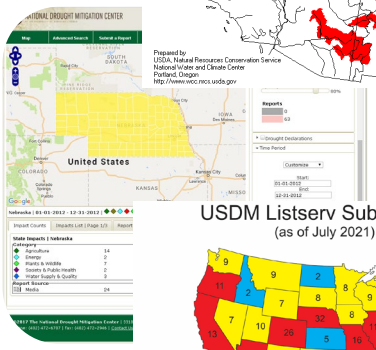


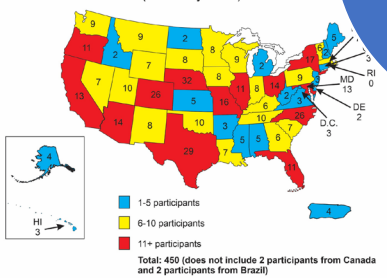


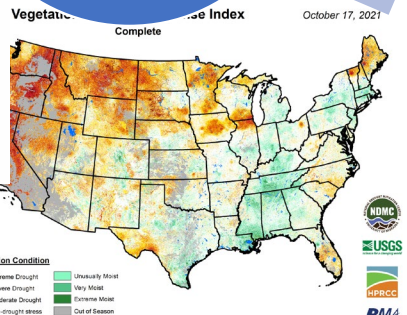


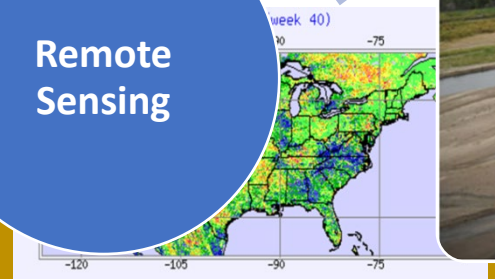


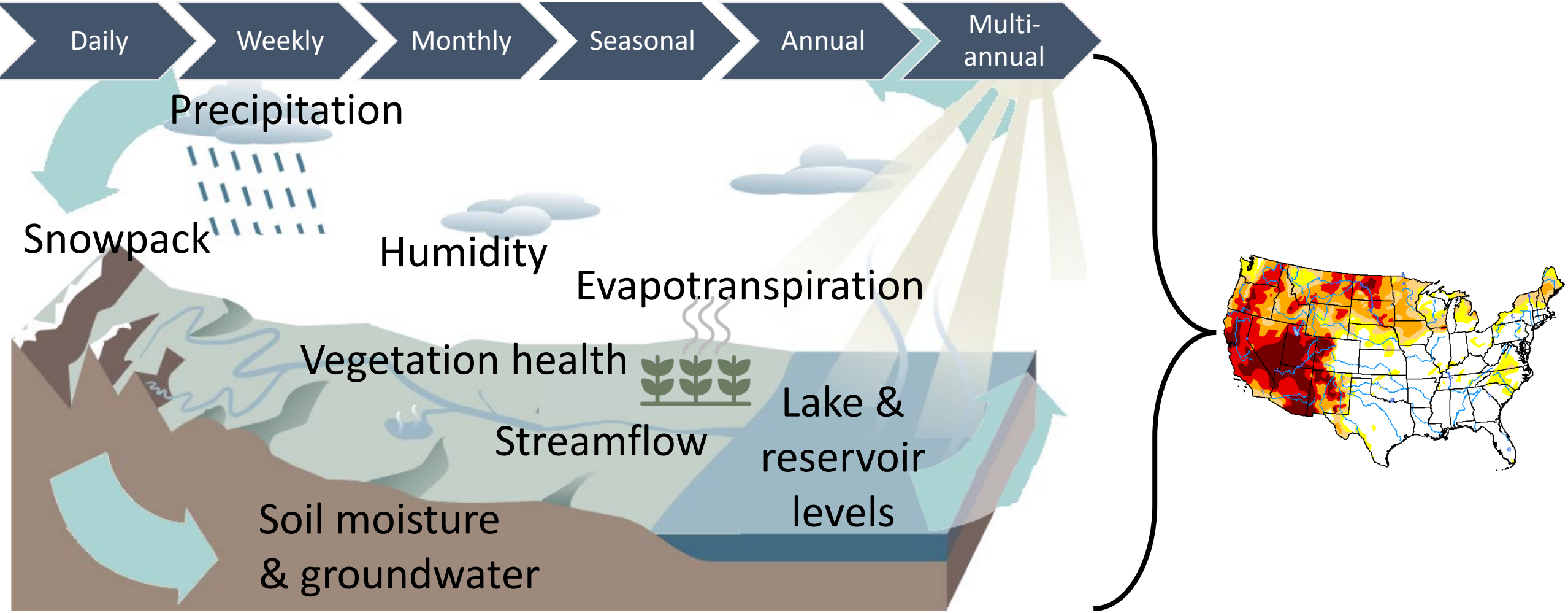












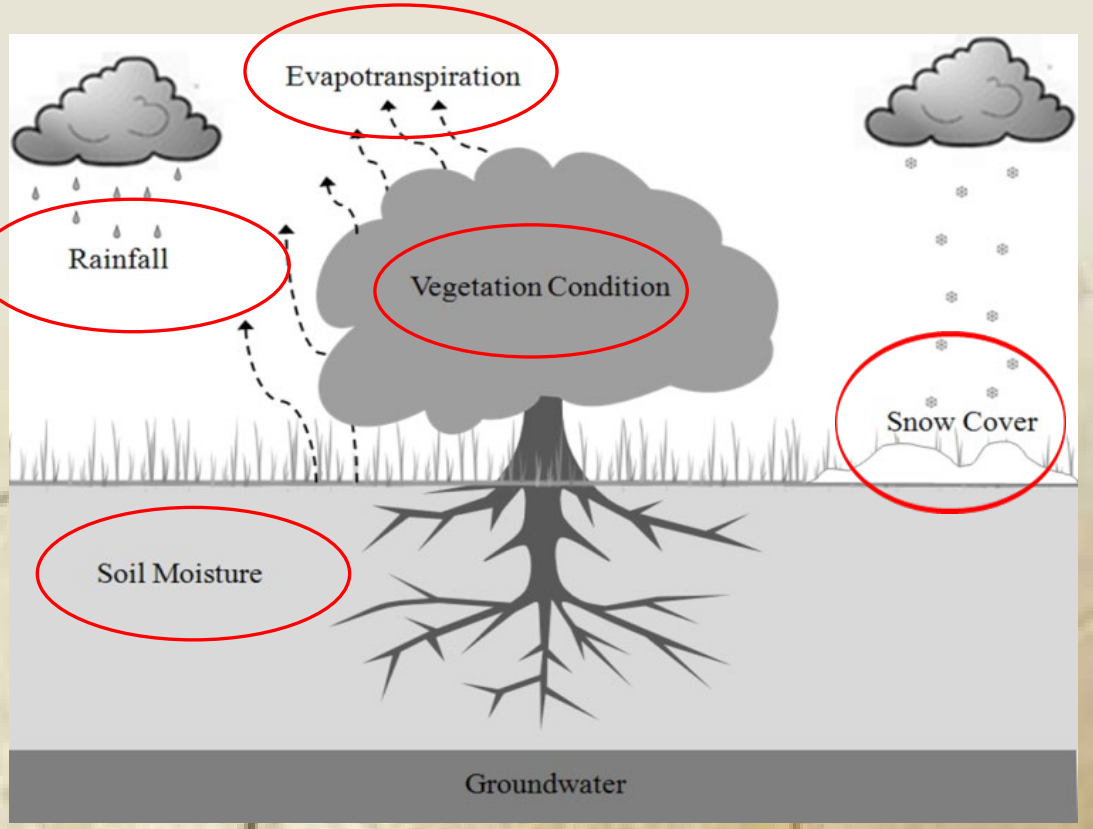
Map incorporates multiple types of data & multiple timescales

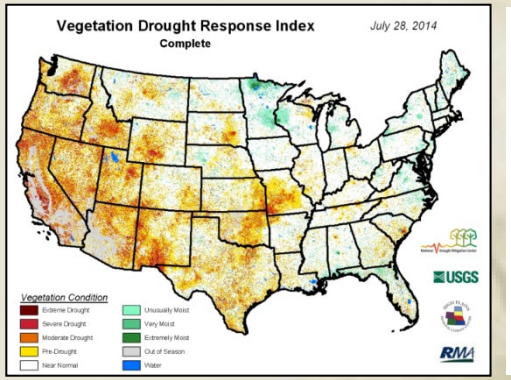
Emerging Satellite-based Observations and Products

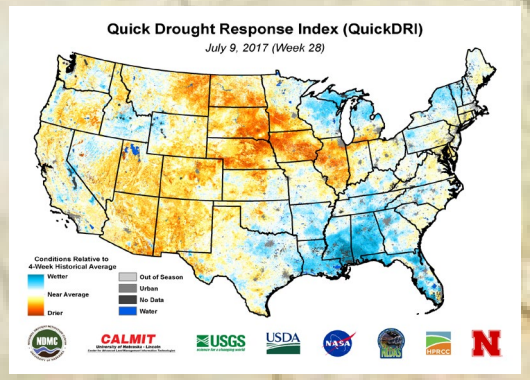
Over the past 10+ years, a number of satellite remote sensing-based tools and ***products characterizing different parts of the hydrologic cycle that influence drought conditions*** allowing new composite drought indicators to be developed.

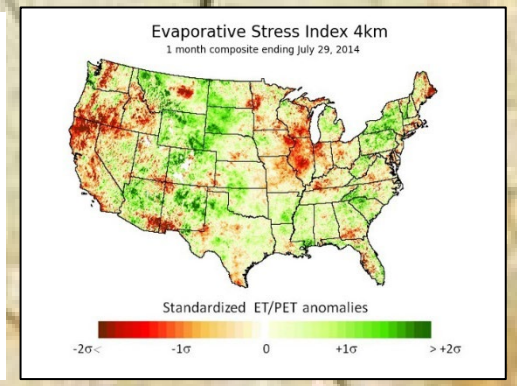
Examples

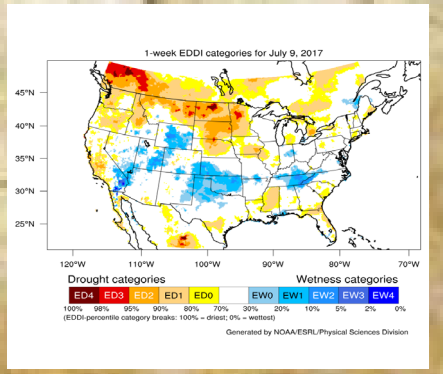
- Evaporative Stress Index (ESI)
- Quick Drought Response Index (QuickDRI)
- Evaporative Demand Drought Index (EDDI)
- GRACE soil moisture and groundwater anomalies
- Vegetation Drought Response Index (VegDRI)

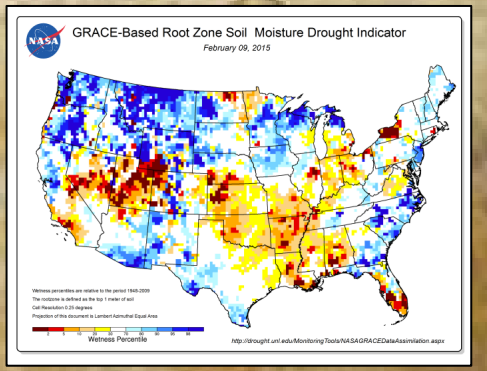






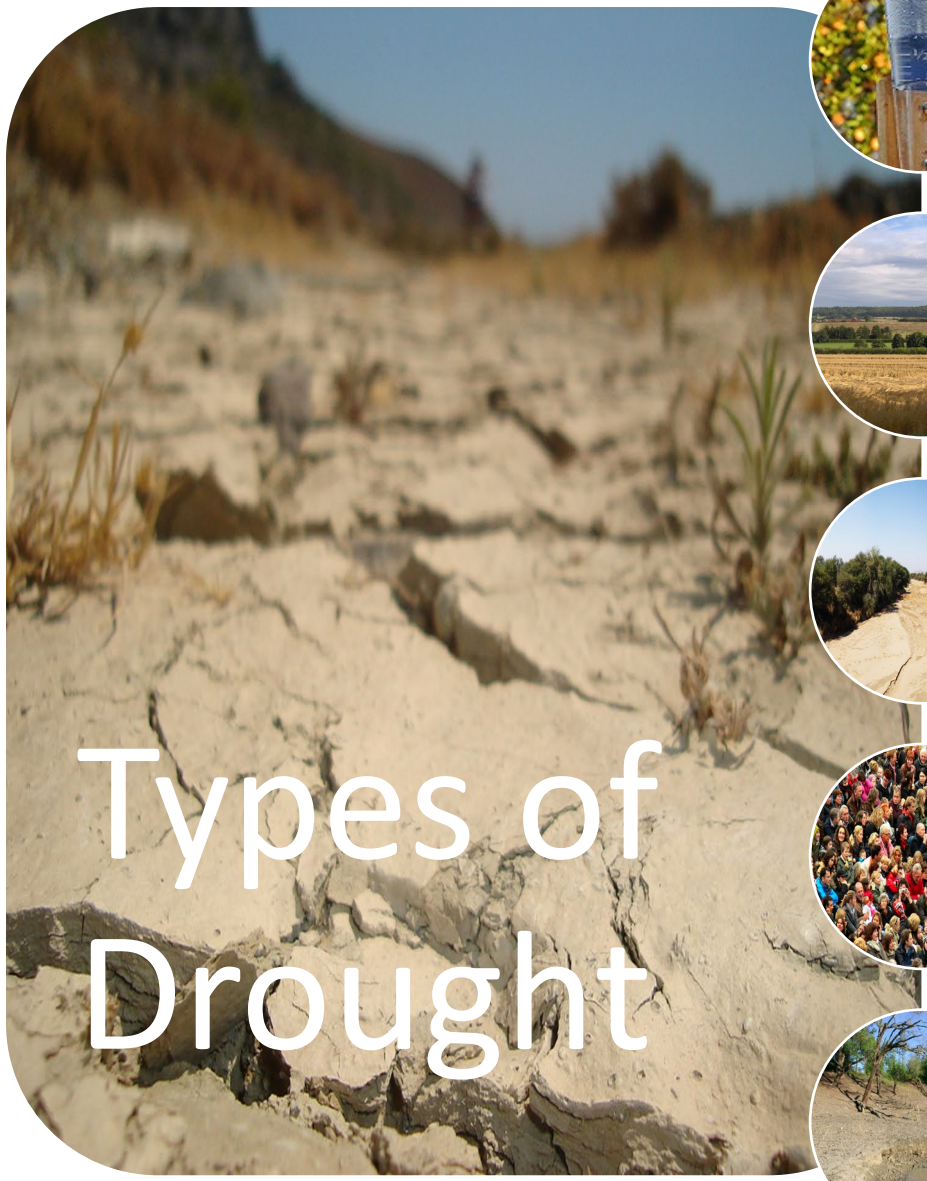






The USDM map is…

An attempt to represent **all** the different types of drought on one map



Meteorological

Agricultural

Hydrological

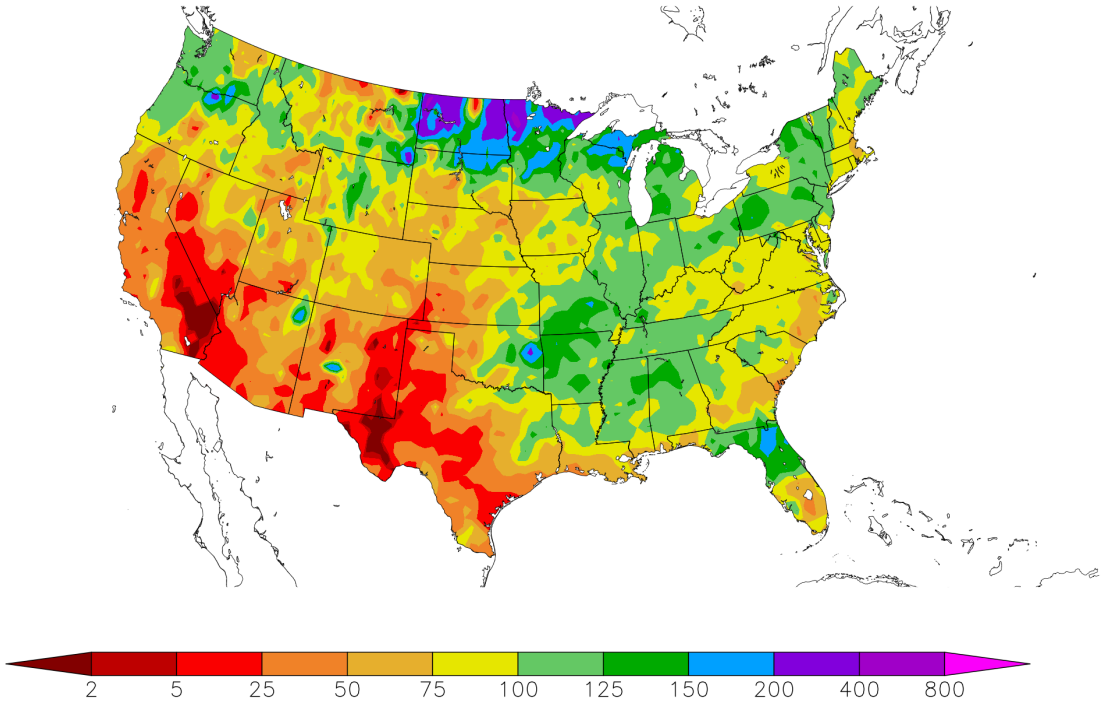
Socio-economic

Ecological

How the US Drought Monitor uses COOP and CoCoRaHS data

- **RCC's ACIS program**
  - Precipitation and Temperature Maps
  - SPI/SPEI Calculations
  - ACIS data grids feeding into the NDMC's Objective Blends

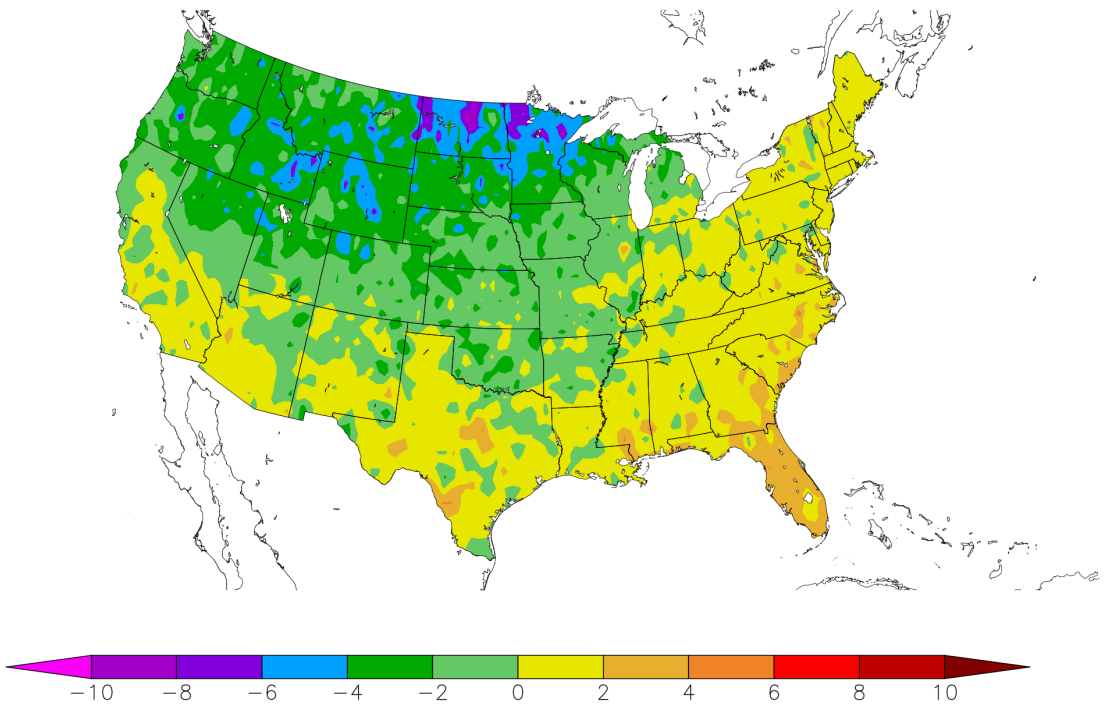
Percent of Normal Precipitation (%)
2/15/2022 – 5/15/2022



Generated 5/16/2022 at HPRCC using provisional data.

NOAA Regional Climate Centers

Departure from Normal Temperature (F)
2/15/2022 – 5/15/2022

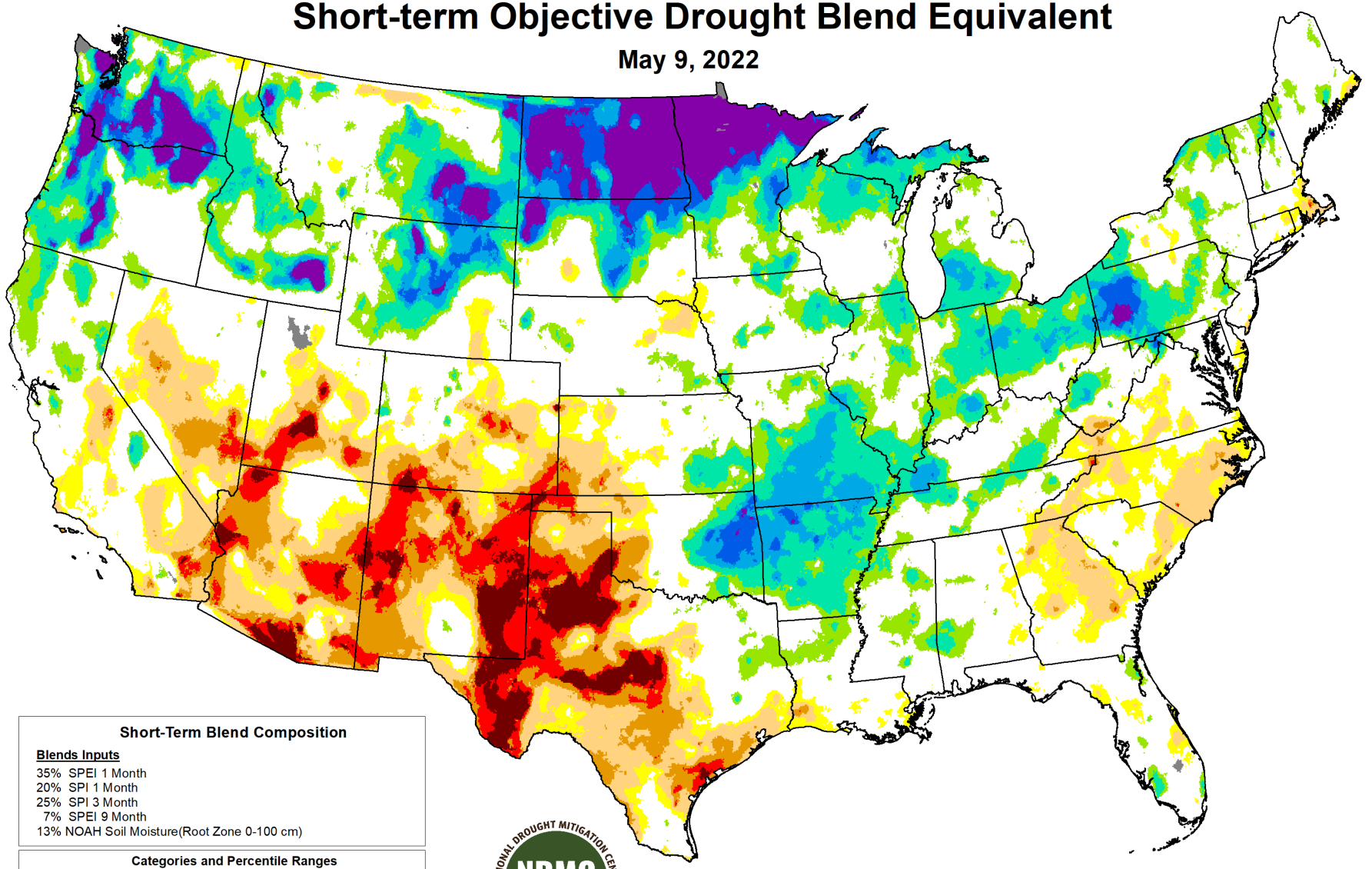


Generated 5/16/2022 at HPRCC using provisional data.

NOAA Regional Climate Centers

Short-term Objective Drought Blend Equivalent

May 9, 2022



Short-Term Blend Composition

Blends Inputs

35% SPEI 1 Month
20% SPI 1 Month
25% SPI 3 Month
7% SPEI 9 Month
13% NOAH Soil Moisture(Root Zone 0-100 cm)

Categories and Percentile Ranges

- D4 Exceptional Drought (0 < 2)
- D3 Extreme Drought (2 < 5)
- D2 Severe Drought (5 < 10)
- D1 Moderate Drought (10 < 20)
- D0 Abnormally Dry (20 < 30)
- Near Normal (30 < 70)
- Abnormally Wet (70 < 80)
- Moderately Wet (80 < 90)
- Severely Wet (90 < 95)
- Extremely Wet (95 < 98)
- Exceptionaly Wet (98 - 100)
- No Data

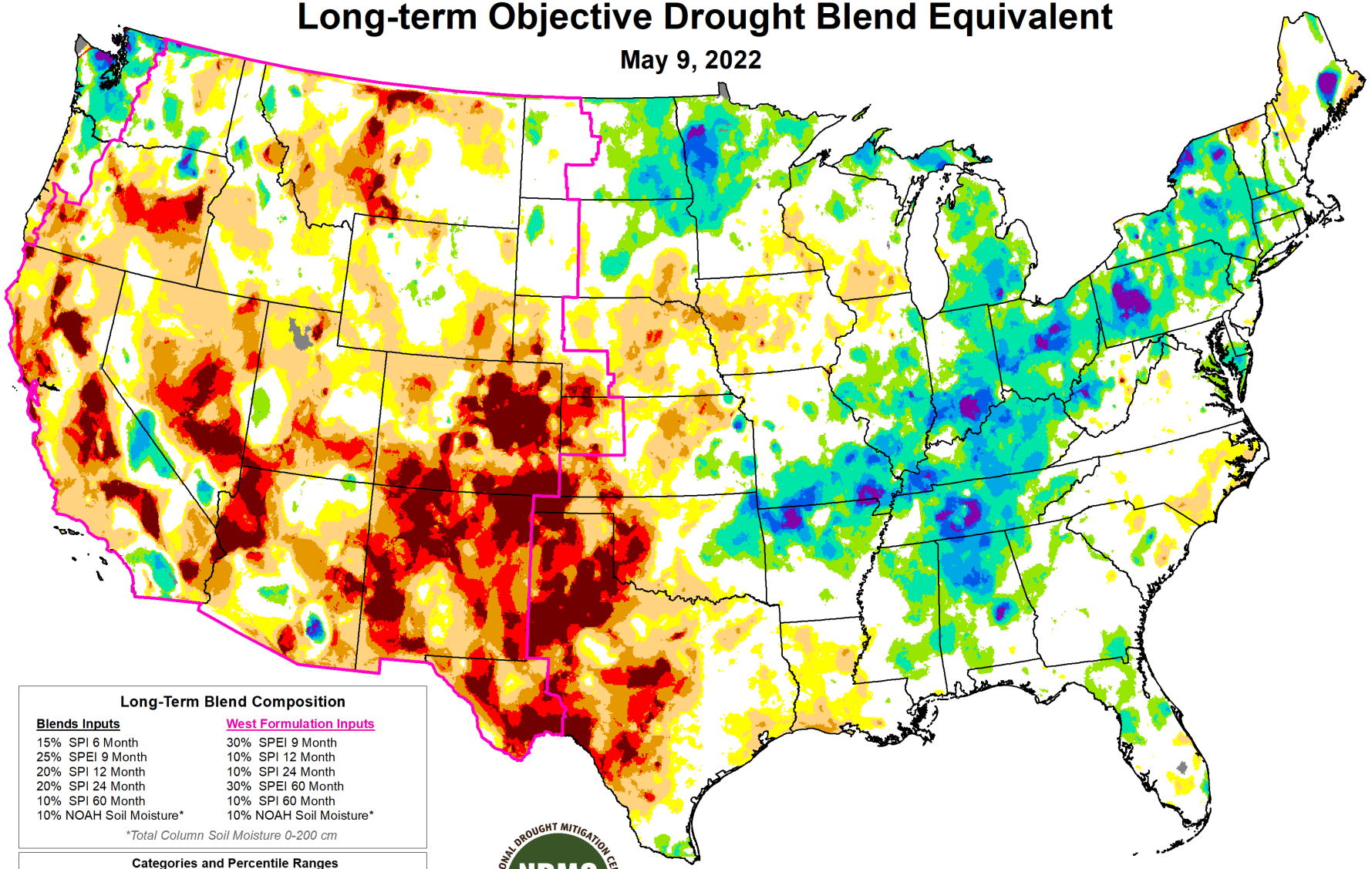
https://NDMCBlends.unl.edu/

USDA

ACIS Applied Climate Information System

Long-term Objective Drought Blend Equivalent

May 9, 2022



Long-Term Blend Composition

Blends Inputs	West Formulation Inputs
15% SPI 6 Month	30% SPEI 9 Month
25% SPEI 9 Month	10% SPI 12 Month
20% SPI 12 Month	10% SPI 24 Month
20% SPI 24 Month	30% SPEI 60 Month
10% SPI 60 Month	10% SPI 60 Month
10% NOAH Soil Moisture*	10% NOAH Soil Moisture*

**Total Column Soil Moisture 0-200 cm*

Categories and Percentile Ranges

D4 Exceptional Drought (0 < 2)	Abnormally Wet (70 < 80)
D3 Extreme Drought (2 < 5)	Moderately Wet (80 < 90)
D2 Severe Drought (5 < 10)	Severely Wet (90 < 95)
D1 Moderate Drought (10 < 20)	Extremely Wet (95 < 98)
D0 Abnormally Dry (20 < 30)	Exceptionaly Wet (98 - 100)
Near Normal (30 < 70)	No Data

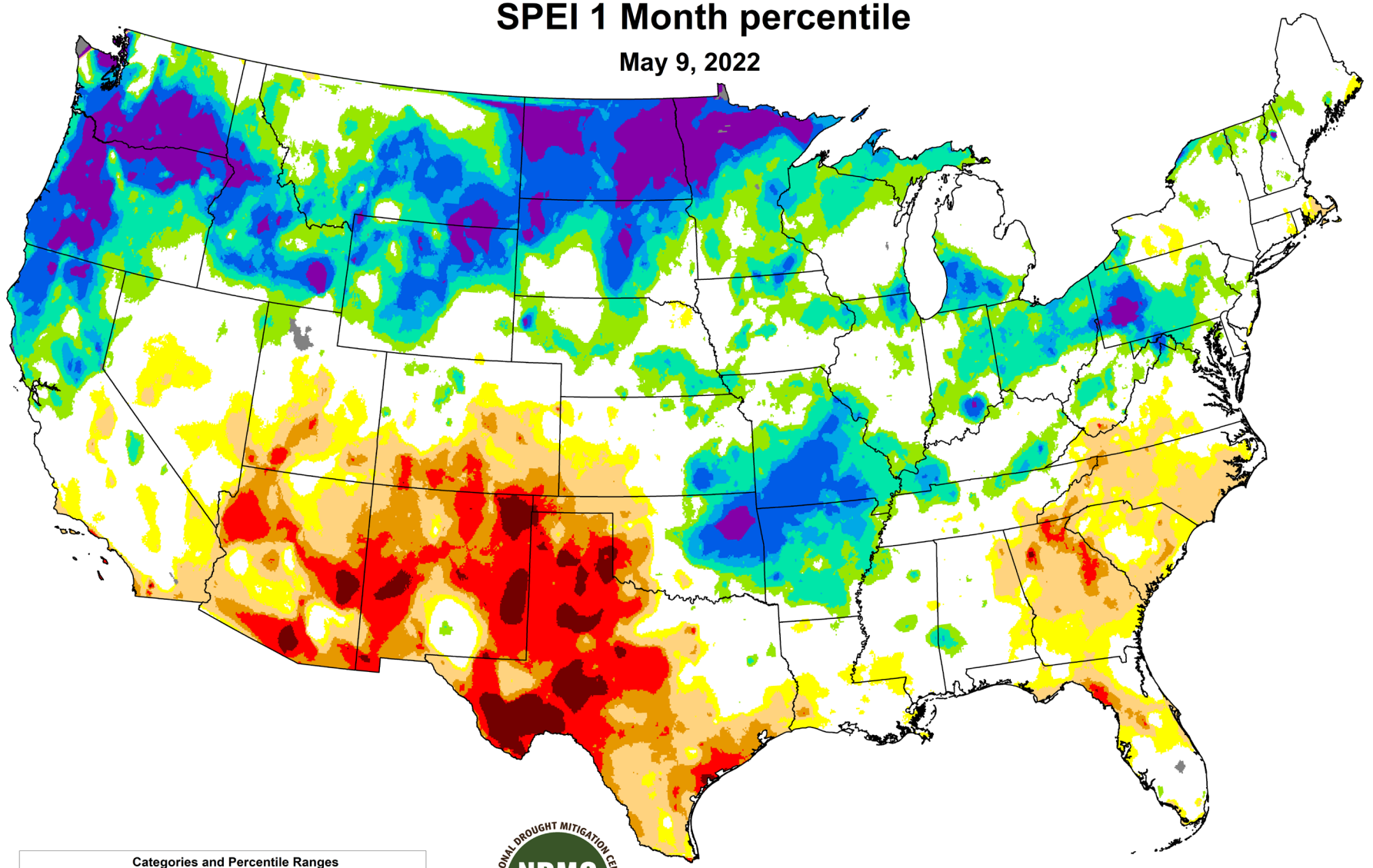
https://NDMCBlends.unl.edu/

USDA

ACIS Applied Climate Information System

SPEI 1 Month percentile

May 9, 2022



Categories and Percentile Ranges

- D4 Exceptional Drought (0 < 2)
- D3 Extreme Drought (2 < 5)
- D2 Severe Drought (5 < 10)
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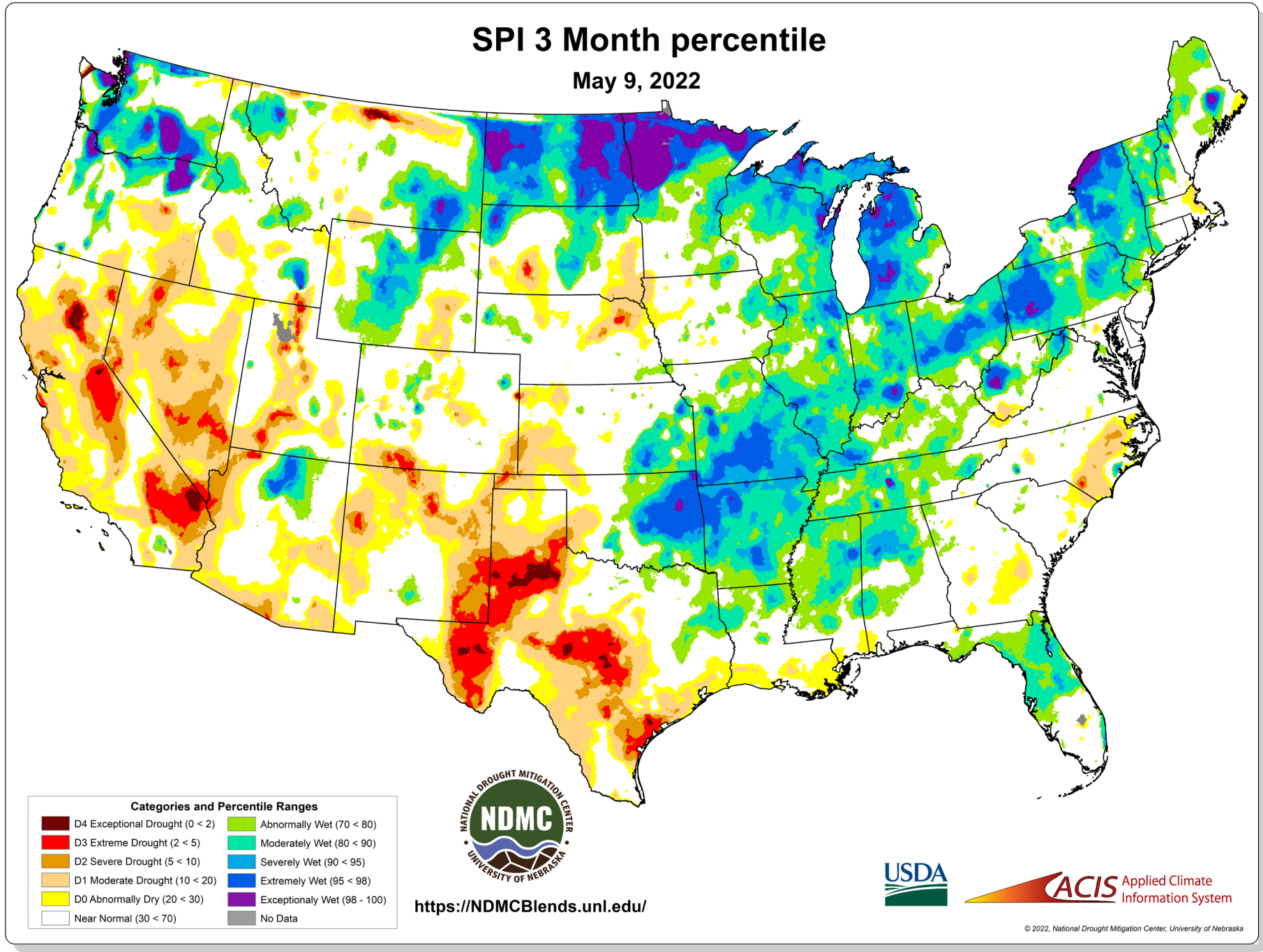
- Moderately Wet (80 < 90)
- Severely Wet (90 < 95)
- Extremely Wet (95 < 98)
- Exceptionaly Wet (98 - 100)
- No Data

https://NDMCBlends.unl.edu/

USDA

ACIS Applied Climate Information System


SPI 3 Month percentile
May 9, 2022
Categories and Percentile Ranges
D4 Exceptional Drought (0 < 2)
D3 Extreme Drought (2 < 5)
D2 Severe Drought (5 < 10)
D1 Moderate Drought (10 < 20)
D0 Abnormally Dry (20 < 30)
Near Normal (30 < 70)
Abnormally Wet (70 < 80)
Moderately Wet (80 < 90)
Severely Wet (90 < 95)
Extremely Wet (95 < 98)
Exceptionaly Wet (98 - 100)
No Data
https://NDMCBlends.unl.edu/
ACIS Applied Climate Information System
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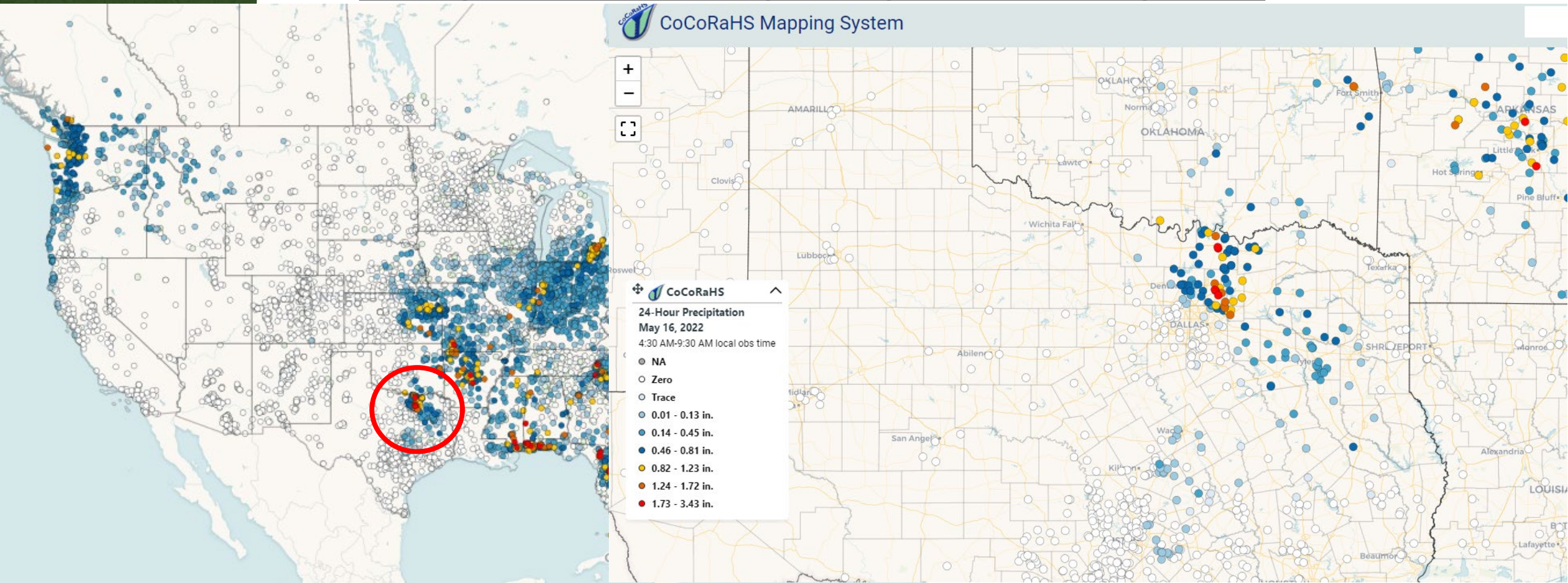
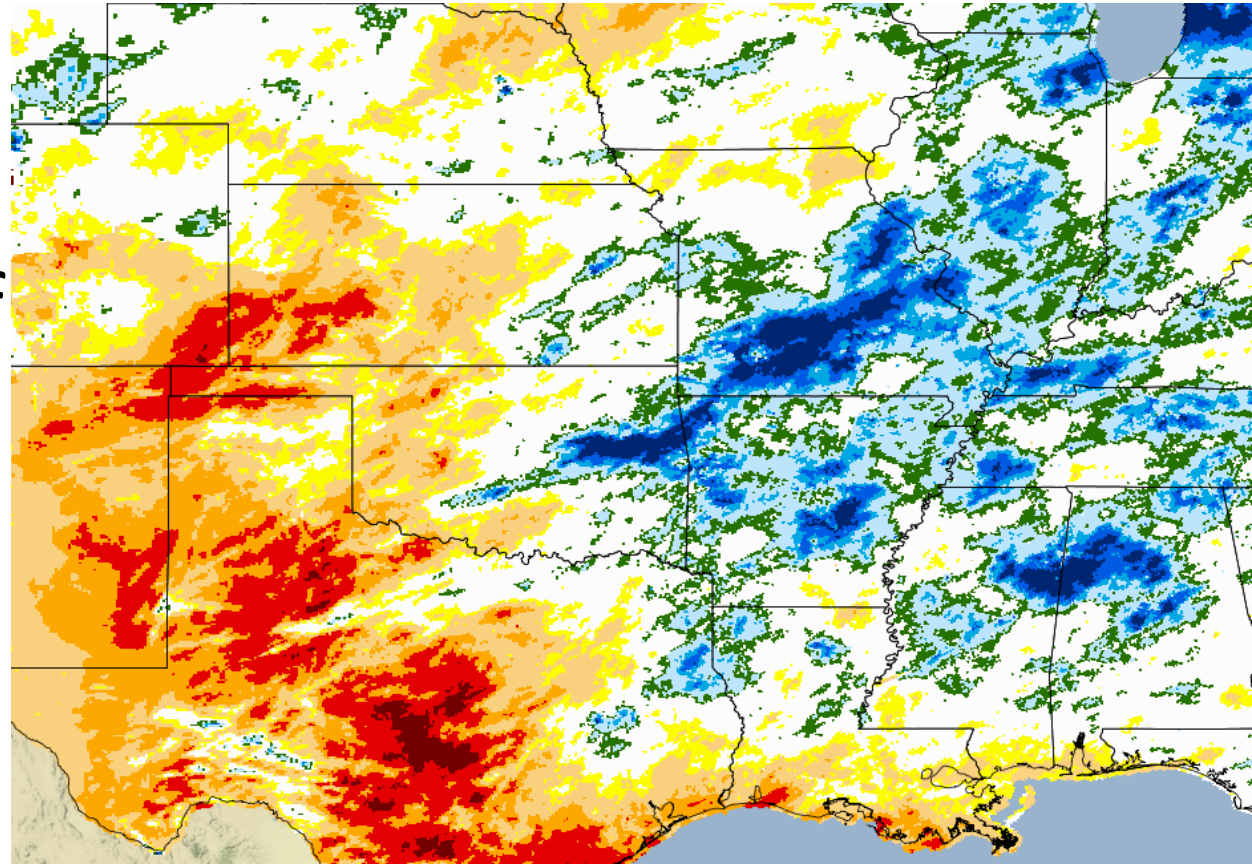
How the US Drought Monitor uses COOP and CoCoRaHS data

- **Daily CoCoRaHS precipitation reports**



How the US Drought Monitor uses COOP and CoCoRaHS data

- **<u>NWS AHPS program</u>**
  - Precipitation estimates
  - SPI/SPEI gridded products based off AHPS estimates



How the US Drought Monitor uses COOP and CoCoRaHS data

- **<u>NDMC's Drought Risk Atlas (DRA)</u>**
  - Archive of historical drought indices based off the best/most complete COOP sites
  - Weekly gridded maps for each index

droughtatlas.unl.edu/Data/Climate.aspx

s Bookmarks Imported

Drought Risk Atlas

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

Home > Data > Climate

Climate

Selected Atlas Station: **none selected**

Use one of the options to select a station.

Close [x]

Search

Select a state.

Alabama

Search by State

Enter part of a station name, or station ID.

Name or ID

Search by Name or ID

Enter a latitude and longitude (in decimal degrees) or click on the map.

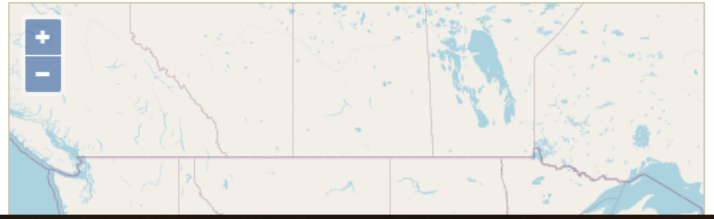
Lat.

Lon.

Search Radius 25 (miles)

Search by Location

Station Map

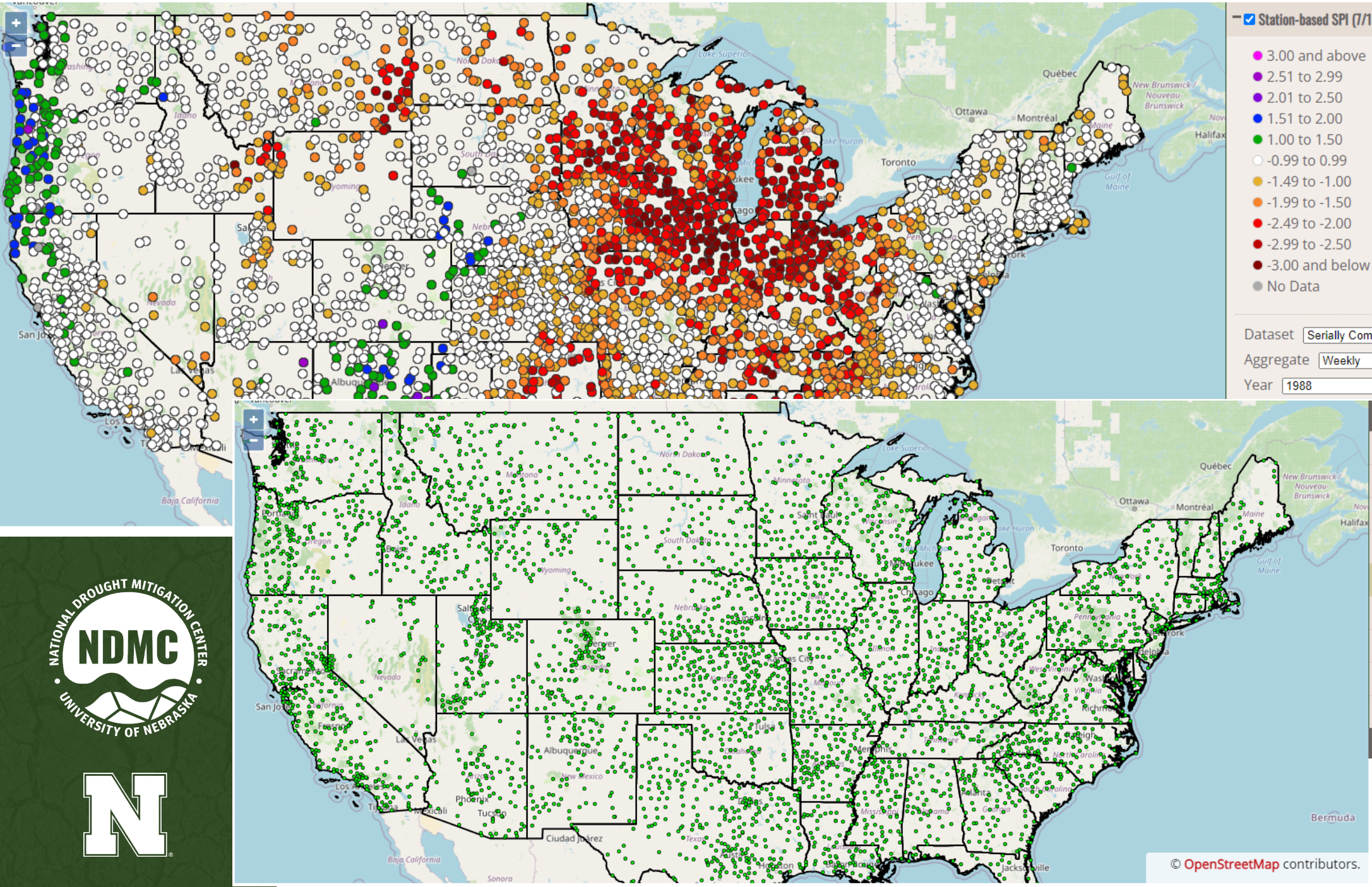


Dataset

Serially Complete

See the notes on the climate datasets.

Station List


Station-based SPI (7/15/1988; 3 Month)
3.00 and above
2.51 to 2.99
2.01 to 2.50
1.51 to 2.00
1.00 to 1.50
-0.99 to 0.99
-1.49 to -1.00
-1.99 to -1.50
-2.49 to -2.00
-2.99 to -2.50
-3.00 and below
No Data
Dataset Serially Complete
Aggregate Weekly
Year 1988
Climate Layers
Atlas Stations (4617 total)
Homogeneous Clusters
U.S. Drought Monitor (12/28/2017)
Gridded SPI (12/23/2012; 1 Month)
Station-based SPI (7/15/1988; 3 Month)
Station-based SPEI (12/24/2017; 1 Month)
Station-based PDSI (12/1/2017)
Station-based Deciles (12/24/2017; 1 Month)
Station Trend
Base Layers
NATIONAL DROUGHT MITIGATION CENTER
NDMC
UNIVERSITY OF NEBRASKA
© OpenStreetMap contributors.

Date

1/1/1908 to 12/31/2017 Period of Record

Station start date: 1/1/1908

Aggregate

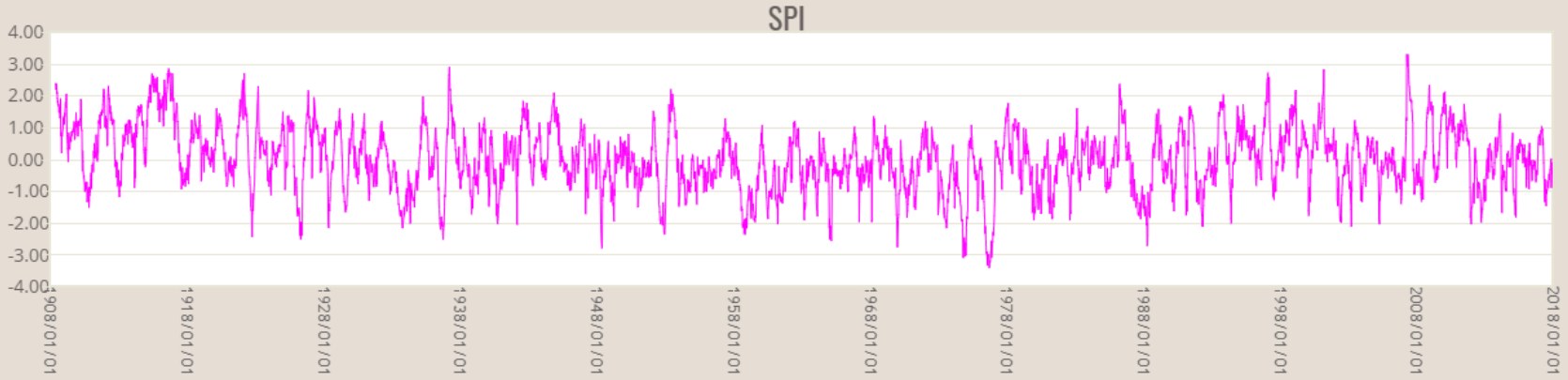
Week

Timestep

Select one or more timesteps to compare.

- [ ] 1 month
- [ ] 2 month
- [ ] 3 month
- [ ] 4 month
- [ ] 5 month
- [x] 6 month
- [ ] 7 month
- [ ] 8 month
- [ ] 9 month
- [ ] 10 month
- [ ] 11 month
- [ ] 12 month
- [ ] 18 month
- [ ] 24 month

Results for **ABERDEEN RGNL AP (390020)** for the 6 Month timestep(s) between 1/1/1908 and 12/31/2017 and aggregated by week.



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

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.

Export Graph

UNIVERSITY OF NEBRASKA

Final thoughts……

- The NWS COOP network is a key cog in the USDM system.
- CoCoRaHS data helps to fill in data gaps and validate other products.
- Legacy stations in the COOP network are invaluable to the drought and climate communities
- More data, more data, more data ! The more daily observed and reported data, the better (preaching to the choir, I know)
- If a legacy station is shutting down, it should be a priority to get replaced somehow.
- CoCoRaHS Condition Monitoring Reports help validate other physical indicators
- Continue with the Data Stewardship team
- Zero values being recorded are so important !

Thank You!
Questions?

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