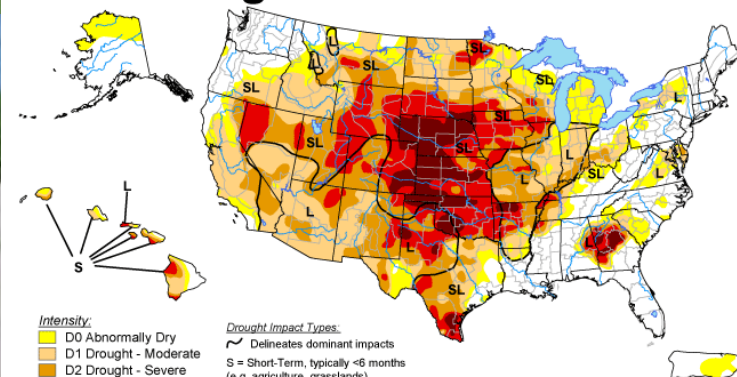


The U.S. Drought Monitor and tools from the National Drought Mitigation Center

Brian Fuchs, Climatologist
National Drought Mitigation Center
School of Natural Resources
University of Nebraska-Lincoln



U.S. Drought Monitor September 25, 2012 Valid 7 a.m. EDT



- Intensity:**
- D0 Abnormally Dry
 - D1 Drought - Moderate
 - D2 Drought - Severe
 - D3 Drought - Extreme
 - D4 Drought - Exceptional
- Drought Impact Types:**
- ~ Delineates dominant impacts
 - S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
 - L = Long-Term, typically >6 months (e.g. hydrology, ecology)

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

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



Released Thursday, September 27, 2012
Author: Anthony Artusa, NOAA/NWS/NCEP/CPD

What is Available from the National Drought Mitigation Center



The screenshot shows the homepage of the National Drought Mitigation Center website. At the top left is the logo with the text "National Drought Mitigation Center". To its right is a blue box containing the URL "drought.unl.edu". Further right is the date "Wednesday, October 28, 2015" and a search bar. Below this is a dark navigation bar with links: "About Us", "News & Outreach", "Drought Basics", "Monitoring Tools", "Planning", "Drought for Kids", "International", and "NDMC Photo Gallery". A large landscape image of a dry field and mountains is featured below the navigation bar, with the text "National Drought Mitigation Center" overlaid on the right side. Underneath the image is a "Home" link and a "Login" button. The main heading reads "Welcome to the National Drought Mitigation Center".

Quick Links

- [U.S. Department of Agriculture Disaster and Drought Assistance page](#)
- [Current info via the Drought Impact Reporter RSS feed](#)
- [Drought Headlines](#)
- [Recently updated state drought pages](#)
- [Comprehensive list of resources, by state, via a drill-down map](#)

NDMC News

Sept. 2015 Drought & Impact Summary: Southeast improves, South dries out and West stays dry
Oct 13, 2015

September brought improvements to the Southeast, but the South got drier. The long-term drought in the West continued unabated, but with a glimmer of hope based on the forecast for a mega-El Nino this winter. Western wildfires were particularly destructive and intense in September. Californians exceeded state-set conservation targets in September and the state unveiled a new system for tracking dry domestic wells. [Read the full report.](#)

Pause Slideshow

Overview

Drought is a normal part of climate...it will happen again. Fortunately, there are things you can do before, during, and after drought to reduce your risk. Ranchers are increasingly implementing new ways to better prepare for and respond to drought.

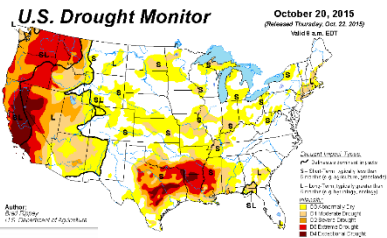
The information, strategies and resources on this site are designed to provide livestock producers in the **Great Plains region** with information on how to incorporate management strategies to reduce the threat drought poses to livestock and forage operations.

Managing Drought Risk on the Ranch: Great Plains Examples

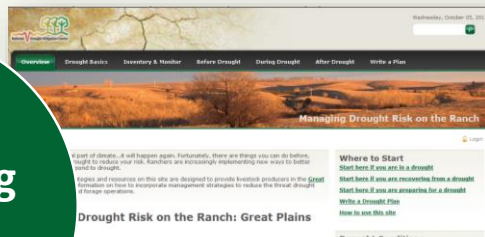
South Dakota	Nebraska	Kansas	Colorado
 Daybreak Ranch (Central)	 Tippets-Myers Ranch (Western Sandhills) Reed Hamilton Ranch (Sandhills) Shamrock Ranch (Southwestern)	 Alexander Ranch (South Central) Adams Ranch (North Central)	 Colorado Welch Ranch (Southern)
			 Texas Johnson Ranch (West Central)

Managing Drought Risk on the Ranch

Managing Drought Risk on the Ranch offers a comprehensive set of options for reducing risk before, during and after drought. In 2012 for at least 40 and in some cases more than 100 years.



Monitoring Tools



Drought-Ready Communities A Guide to Community Drought Preparedness

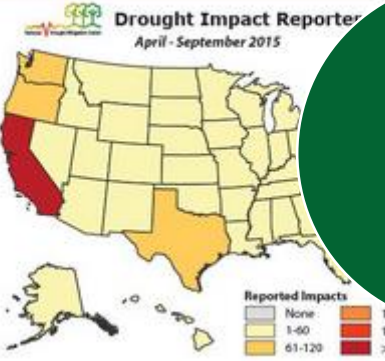


Planning Tools



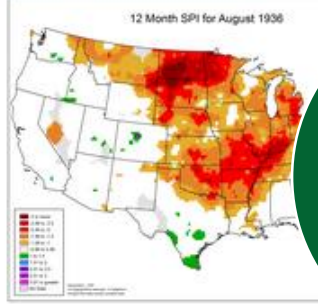
Drought Impact Archive

Drought Impact Reporter



Historical Drought Data

Drought Risk Atlas

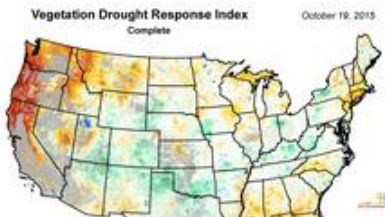


Outreach



Remote Sensing

VegDRI



United States Drought Monitor

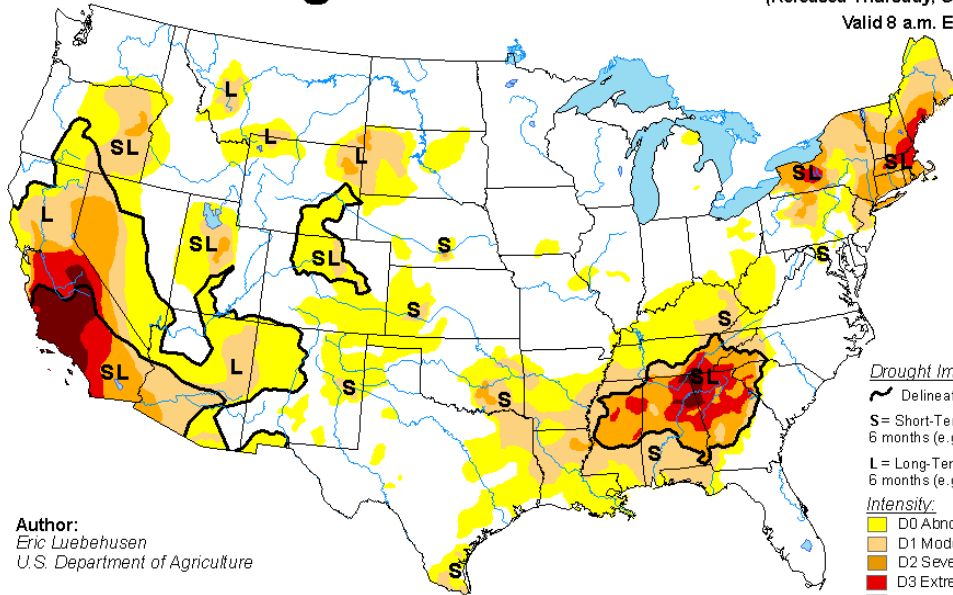
Home

droughtmonitor.unl.edu

Login

U.S. Drought Monitor

October 18, 2016
(Released Thursday, Oct. 20, 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 6 months (e.g. hydrology, ecology)

Intensity:

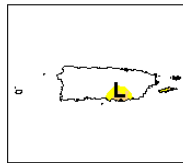
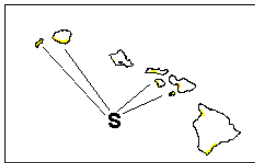
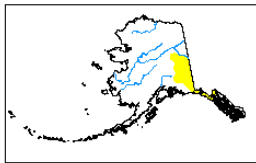
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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



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

Author:
Eric Luebehusen
U.S. Department of Agriculture



Current National Drought Summary

Summary

Dry weather dominated much of the country, favoring summer crop harvesting and winter wheat planting. However, topsoil moisture shortages hampered wheat emergence and establishment in a variety of regions, including portions of the Plains, lower Midwest, and interior Northwest. Meanwhile, significant short-term drought continued to grip the South, primarily from the southeastern Great Plains to the Mississippi Delta. In addition to concerns about recently planted winter wheat, Southern drought issues included stress on pastures and late-maturing summer crops: an elevated risk

- Great Plains
- Hawaii, Alaska and Puerto Rico
- Mid-South and Environs
- Midwestern and Great Lakes States
- Southeast
- The Northeast
- West
- Looking Ahead

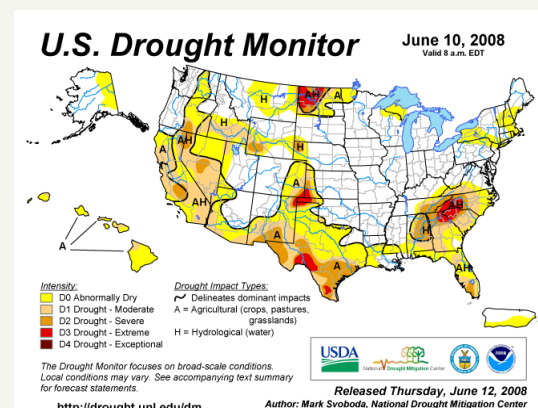
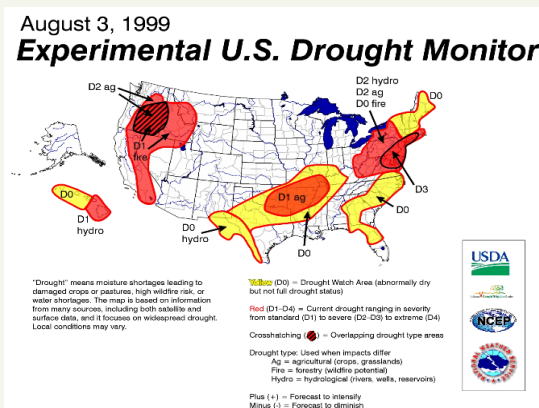
NOTE: To view regional drought conditions, click on map above. State maps can be accessed from regional maps.

The data cutoff for Drought Monitor maps is each Tuesday at 8 a.m. EDT. The maps, which are based on analysis of the data, are released each Thursday at 8:30 a.m. Eastern Time.

The U.S. Drought Monitor

Since 1999, **NOAA (CPC, NCEI, WRCC), USDA, and the NDMC** have produced a weekly composite drought map -- the **U.S. Drought Monitor** -- with input from numerous federal and non-federal agencies

- **12** authors in all
- **Western Region Climate Center** on board 2008
- **Incorporate** relevant information and products from all entities (and levels of government) dealing with drought (RCC's, SC's, federal/state agencies, etc.) **(380+ experts)**



U.S. Drought Monitor Objectives

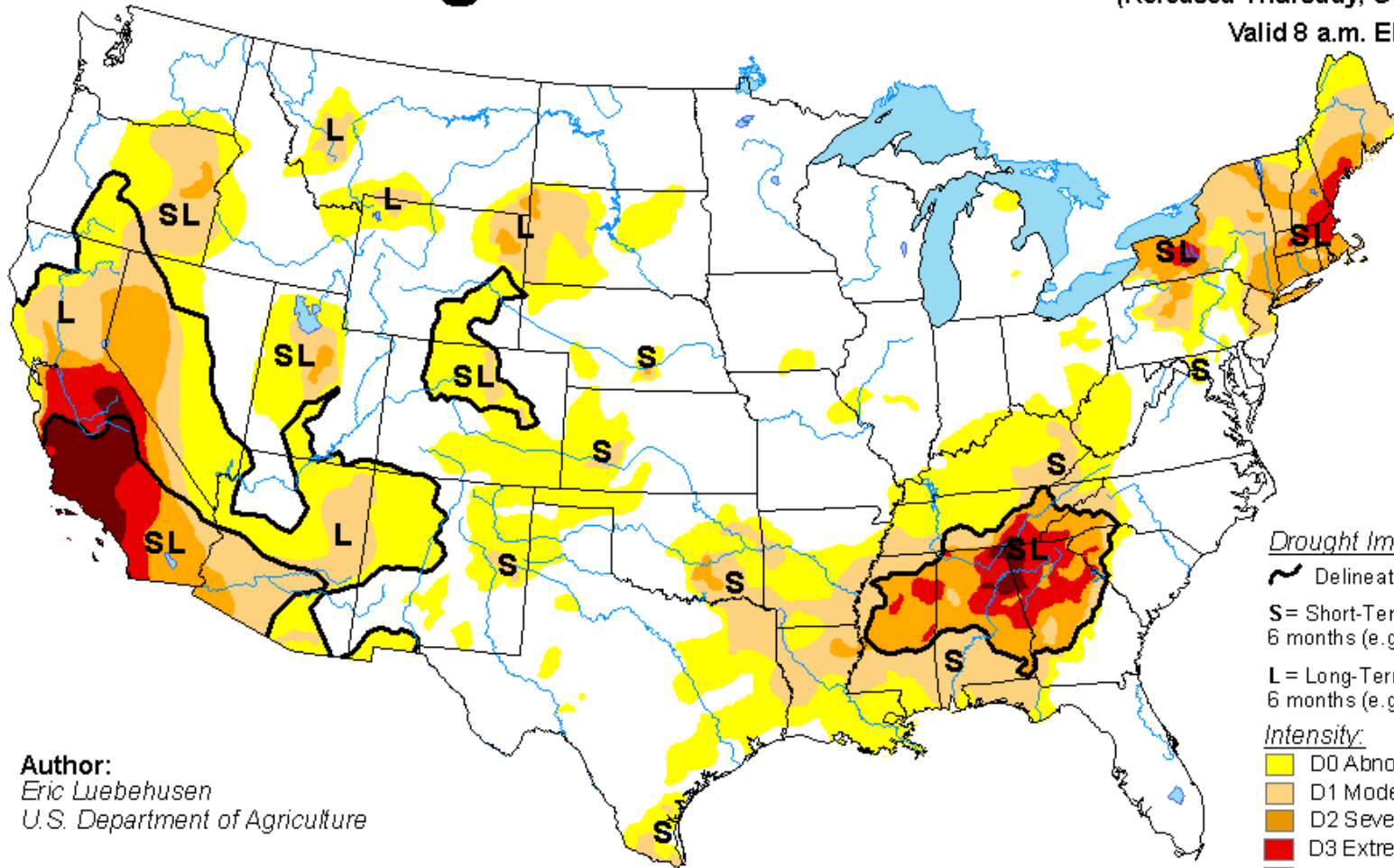


- Assessment of **current** conditions and **current** impacts
- The U.S. Drought Monitor is **NOT** a model
 - The map is made manually each week based off the previous map
- The U.S. Drought Monitor is **NOT** interpreting just precipitation
- The U.S. Drought Monitor is **NOT** a forecast or drought declaration
 - Can be used in this way though
- Identifying **impacts**
 - “**S**” short-term impacts, “**L**” long-term impacts or “**SL**” for a combination of both
- Incorporate **local expert** input
 - Accomplished via email and impact reports
- Authors try to be as **objective** as possible (using the percentiles methodology)
 - The data **must** support the depiction on the map
- “**Convergence of evidence**” approach

U.S. Drought Monitor

October 18, 2016
(Released Thursday, Oct. 20, 2016)

Valid 8 a.m. EDT



Author:
Eric Luebbehusen
U.S. Department of Agriculture

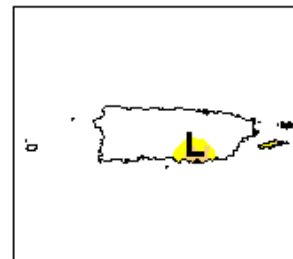
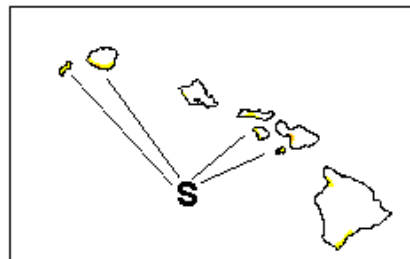
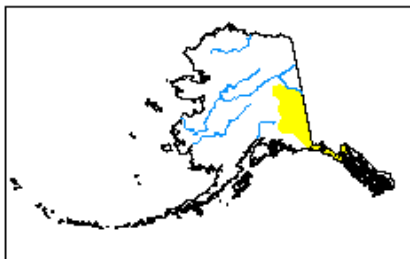
Drought Impact Types:

- ~ 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)

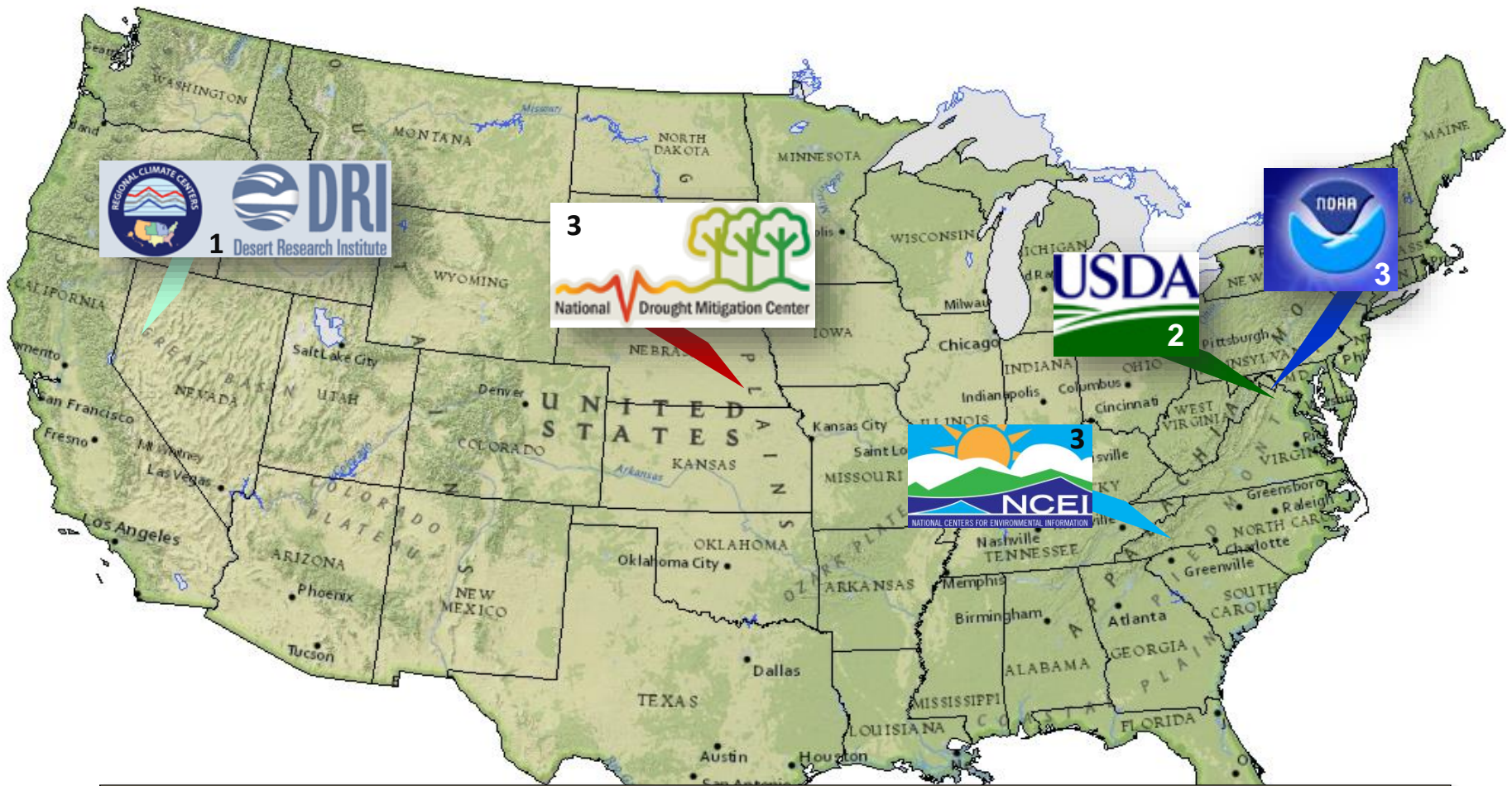
Intensity:

- Yellow: D0 Abnormally Dry
- Light Orange: D1 Moderate Drought
- Orange: D2 Severe Drought
- Red: D3 Extreme Drought
- Dark Red: 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/>



Requirement: Authors must work at a regional or national “center”, government or academia/research
There are currently 12 authors, and all are volunteers






Percentiles and the U.S. Drought Monitor

- **Advantages of percentiles:**

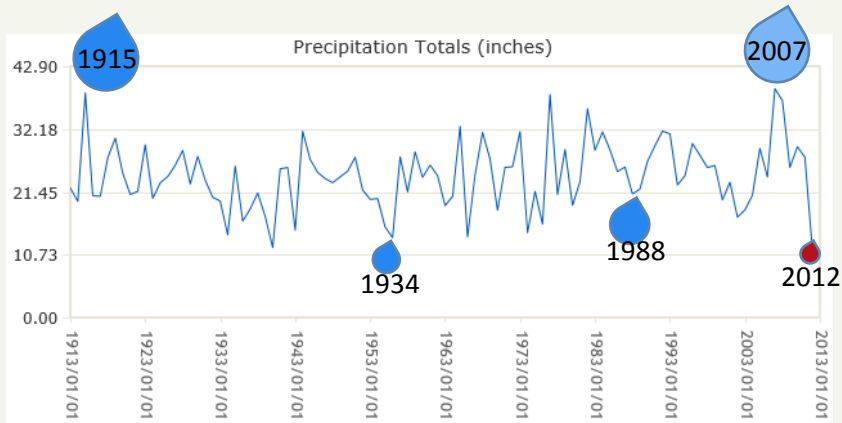
- Can be applied to any parameter

The drought categories are associated with historical occurrence/likelihood (percentile ranking)

It is not anecdotal or subjective, like “It’s really, really dry!!”or, “I don’t remember it ever being this dry, we have to be D4!!”

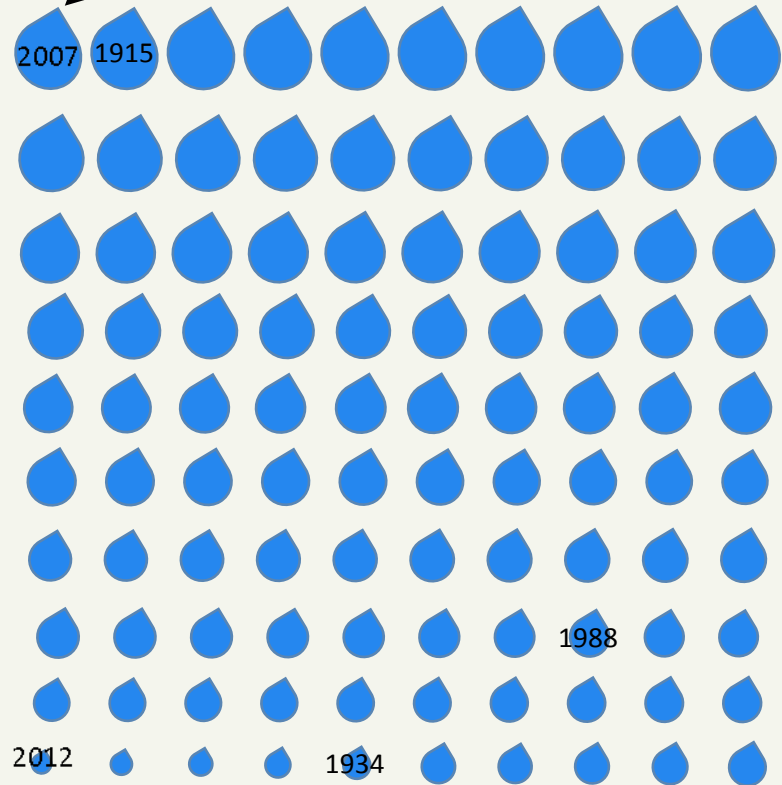
- D4: Exceptional Drought  (*1st-2nd* percentile)
- D3: Extreme Drought  (*3rd-5th* percentile)
- D2: Severe Drought  (*6th-10th* percentile)
- D1: Moderate Drought  (*11th-20th* percentile)
- D0: Abnormally Dry  (*21st-30th* percentile)

What are percentiles?



Percentiles are determined by ranking data from largest to smallest. Let's use 100 years of precipitation data from Grand Island, NE as an example.

Most Precipitation
2007: 39.08"



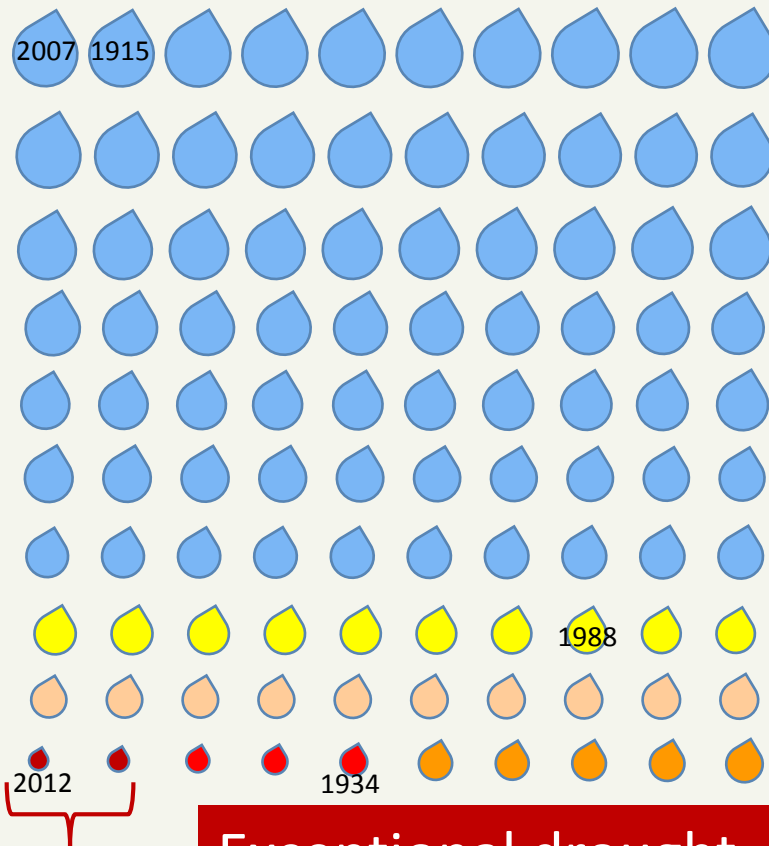
Least Precipitation
2012: 11.58"

What are percentiles?

Percentile

D0	Abnormally Dry	21-30
D1	Moderate Drought	11-20
D2	Severe Drought	6-10
D3	Extreme Drought	3 - 5
D4	Exceptional Drought	1 - 2

The U.S. Drought monitor categories are assigned based on where a given year's value falls in the ranking.



1 - 2 percentile

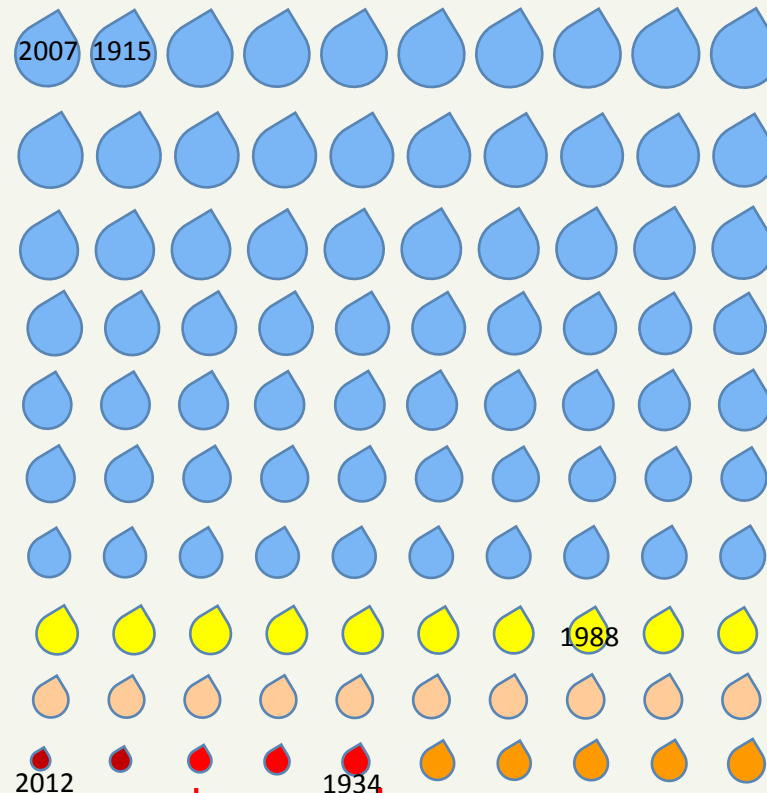
Exceptional drought corresponds to the lowest 2 values.

What are percentiles?

Percentile

D0	Abnormally Dry	21-30
D1	Moderate Drought	11-20
D2	Severe Drought	6-10
D3	Extreme Drought	3 - 5
D4	Exceptional Drought	1 - 2

The U.S. Drought monitor categories are assigned based on the percentile rankings.



Extreme drought occupies ranks 3 through 5.

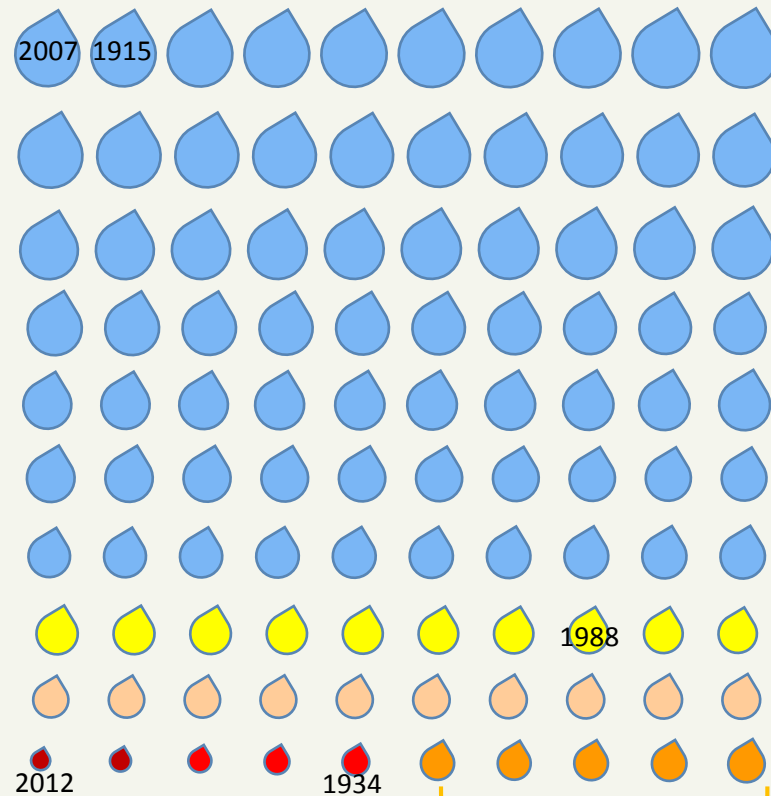
3 – 5 percentile

What are percentiles?

Percentile

	D0	Abnormally Dry	21-30
	D1	Moderate Drought	11-20
	D2	Severe Drought	6-10
	D3	Extreme Drought	3 - 5
	D4	Exceptional Drought	1 - 2

The U.S. Drought monitor categories are assigned based on the percentile rankings.



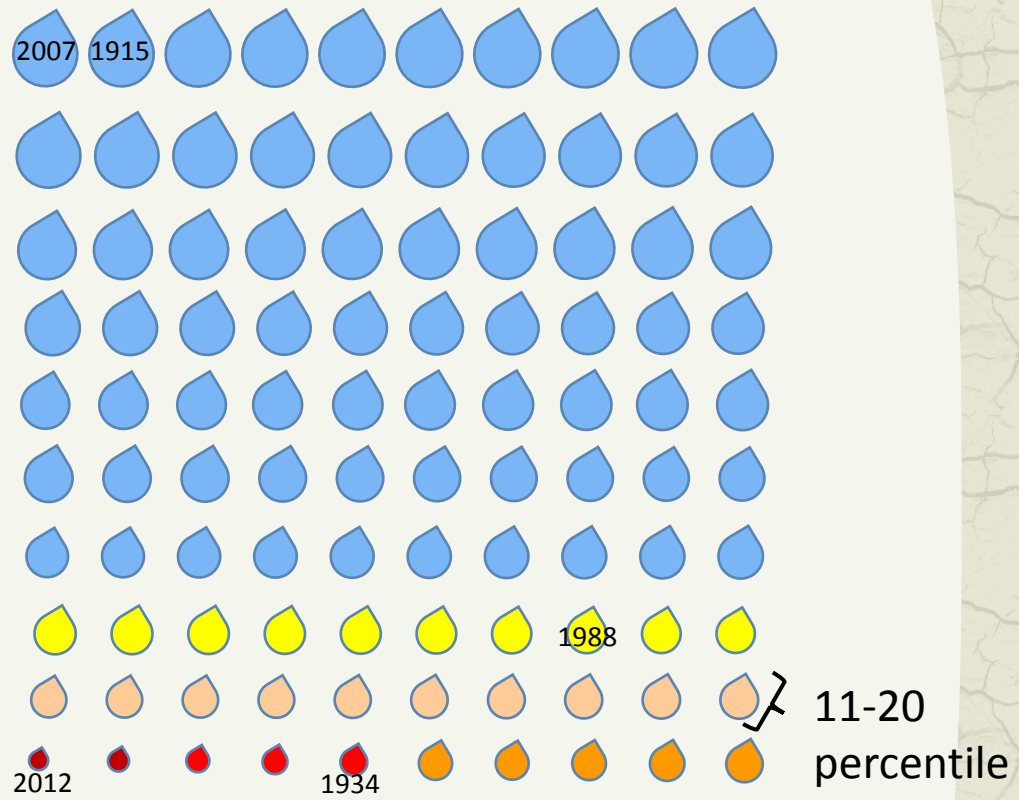
Severe drought occupies ranks 6 through 10.

What are percentiles?

Percentile

D0	Abnormally Dry	21-30
D1	Moderate Drought	11-20
D2	Severe Drought	6-10
D3	Extreme Drought	3 - 5
D4	Exceptional Drought	1 - 2

The U.S. Drought monitor categories are assigned based on the percentile rankings.



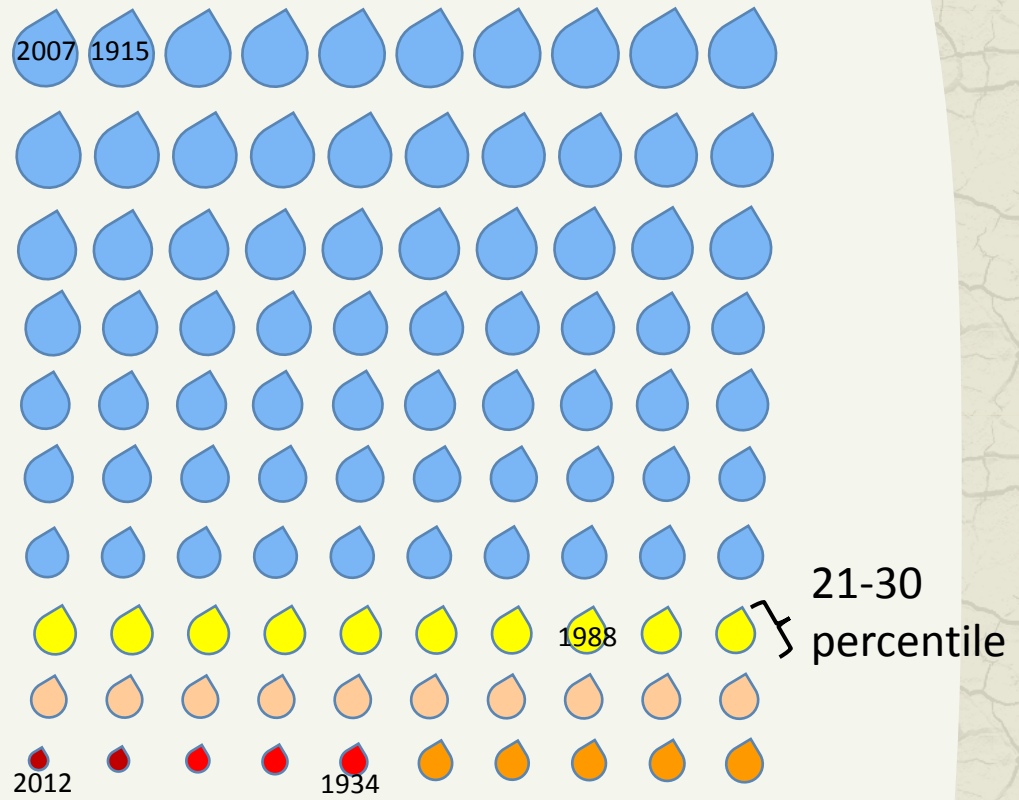
Moderate drought occupies ranks 11 through 20.

What are percentiles?

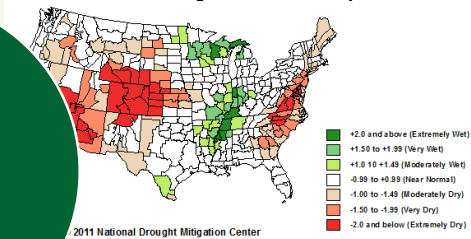
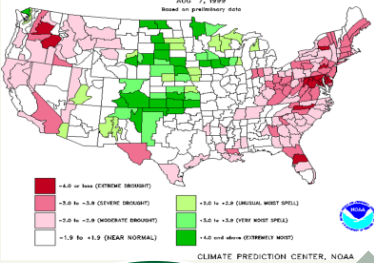
Percentile

D0	Abnormally Dry	21-30
D1	Moderate Drought	11-20
D2	Severe Drought	6-10
D3	Extreme Drought	3 - 5
D4	Exceptional Drought	1 - 2

The U.S. Drought monitor categories are assigned based on the percentile rankings.



Abnormally dry conditions occupy ranks 21 through 30.



Indices:
SPI/PDSI

Snow

Soil Moisture

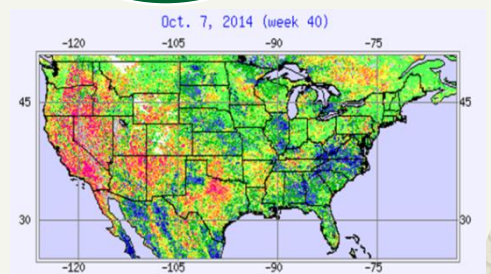
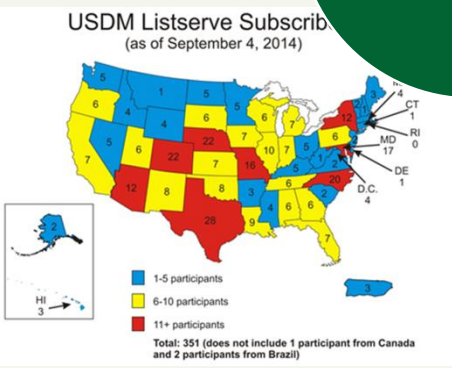
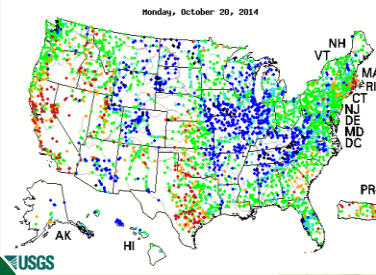
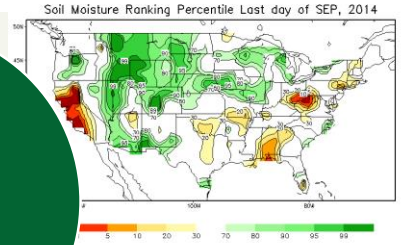
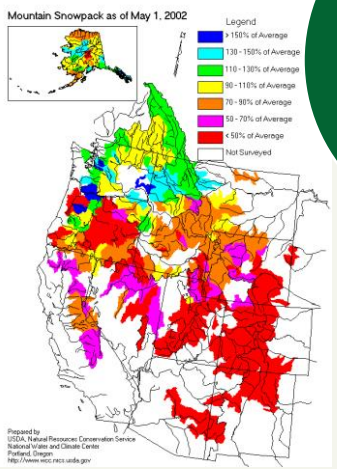
Most of the information analyzed each week falls into one of these categories.

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

Streamflow

Remote Sensing



Integrates Key Drought Indicators:

U.S. Drought Monitor



- Palmer Drought Index
- SPI
- SPEI
- KBDI
- Modeled Soil Moisture
 - NLDAS
- 7-14 Day Avg. Streamflow
- Precipitation Anomalies
- AHPS Precipitation
- Other data which are available

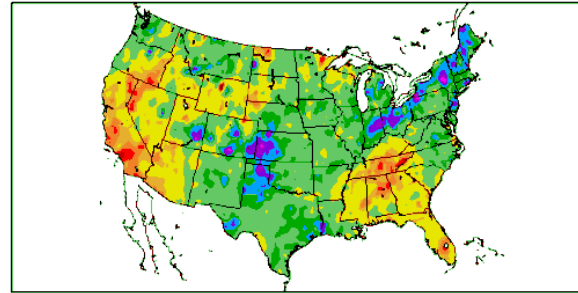
Growing Season:

- Crop Moisture Index
- Sat. Veg. Health Index
- VegDRI/ESI/etc.
- Soil Moisture
- Mesonets
- State/Regional data

In The West:

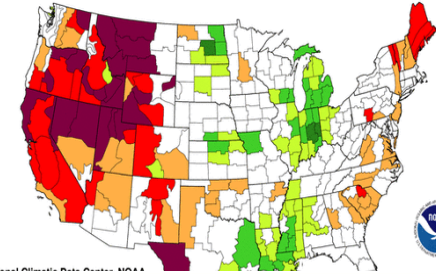
- SWSI
- Reservoir levels
- Snowpack (SNOTEL)
- SWE
- Streamflow

Water Year SPI
10/1/2006 - 4/19/2007

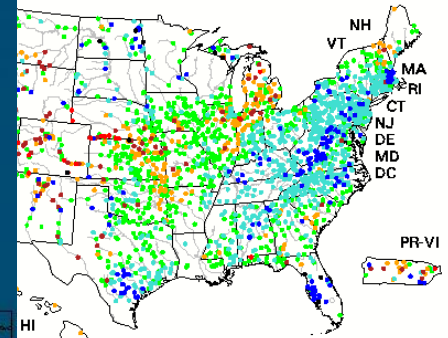
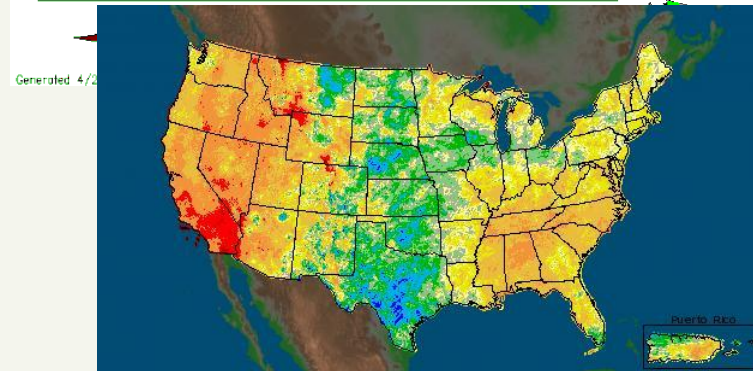


Palmer Drought Index
Long-Term (Meteorological) Conditions

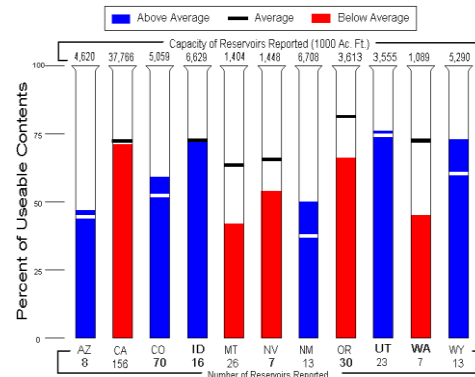
October 21, 2001 - October 27, 2001



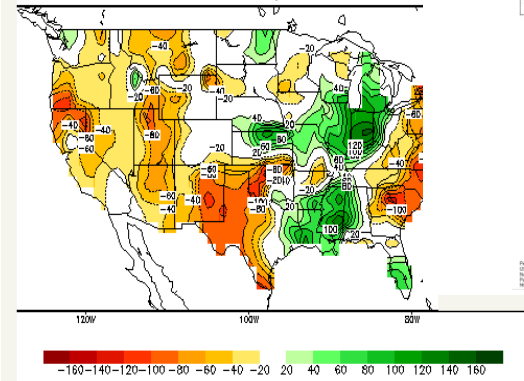
Sunday, December 22, 2002



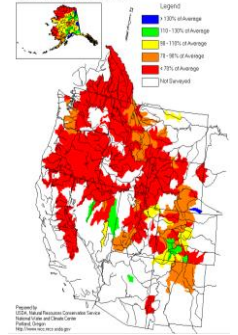
Reservoir Storage as of May 1, 2001



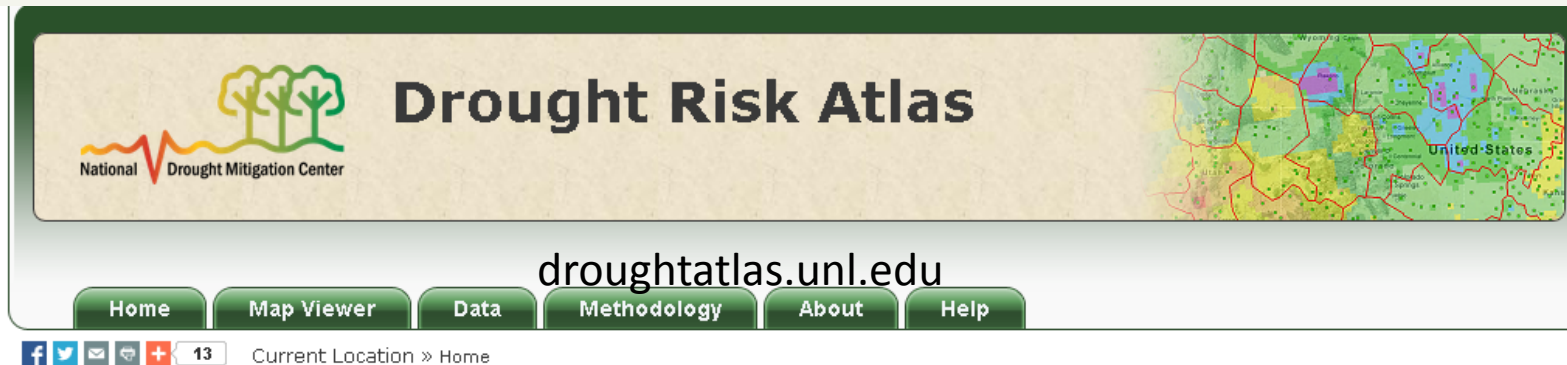
Calculated Soil Moisture Anomaly (mm)
OCT 31, 2001



Mountain Snowpack as of May 1, 2001



Drought Risk Atlas



The screenshot shows the top section of the website. On the left is the National Drought Mitigation Center logo, which consists of a stylized green tree and a red pulse line. To its right is the text "Drought Risk Atlas" in a large, dark font. Further right is a map of the United States with various regions highlighted in different colors (green, yellow, orange, red, purple). Below the map and logo is a navigation bar with buttons for "Home", "Map Viewer", "Data", "Methodology", "About", and "Help". Below the navigation bar is a social media sharing section with icons for Facebook, Twitter, Email, Print, and a plus sign for more options, followed by a "13" in a box and the text "Current Location » Home".

Welcome to the Drought Risk Atlas

Introduction

The idea of updating and expanding a national drought atlas was developed from the original Drought Atlas that was done in conjunction with the United States Army Corps of Engineers by Hoskings, Wallis and Guttman in the early 1990s. The original Drought Atlas consisted of those stations in the Historical Climate Network (HCN), numbering approximately 1,000 stations. The period of record at the time was limited, as many stations only had records from the 1940s to present, and these data points were put into their respective climate divisions. A monthly time step was used to calculate the Palmer Drought Severity Index (PDSI). The new Drought Risk Atlas brings precise climatological data down to spatial scales that would allow decision makers to use this tool to better understand drought in their respective region and to make better decisions.

For the new national Drought Risk Atlas, the idea was to expand the data both in the number of stations analyzed and the period of record to include the most complete long-term stations, some of which are not part of the HCN. Using a weekly time-step to calculate multiple drought indices at each station location, not on a climate division scale, allows for a more precise representation of drought histories. The Standardized Precipitation Index (SPI), Standardized Precipitation-Evapotranspiration Index (SPEI), Palmer Drought Severity Index (PDSI), Deciles, United States Drought Monitor and other climatological data are included in the new Drought Risk Atlas. Along with the climatological data, gridded maps created on a weekly time-step are available for the entire United States.

Map Viewer

View gridded datasets for the continental United States.

Data

Select a station and view data for a number of drought indices. Frequency statistics of drought thresholds, drought period information and index comparisons are also available.

Methodology

Learn about the criteria used to select the stations, the drought indices chosen, and more.

About

An overview of why the Drought Risk Atlas was created and who was involved.

Help

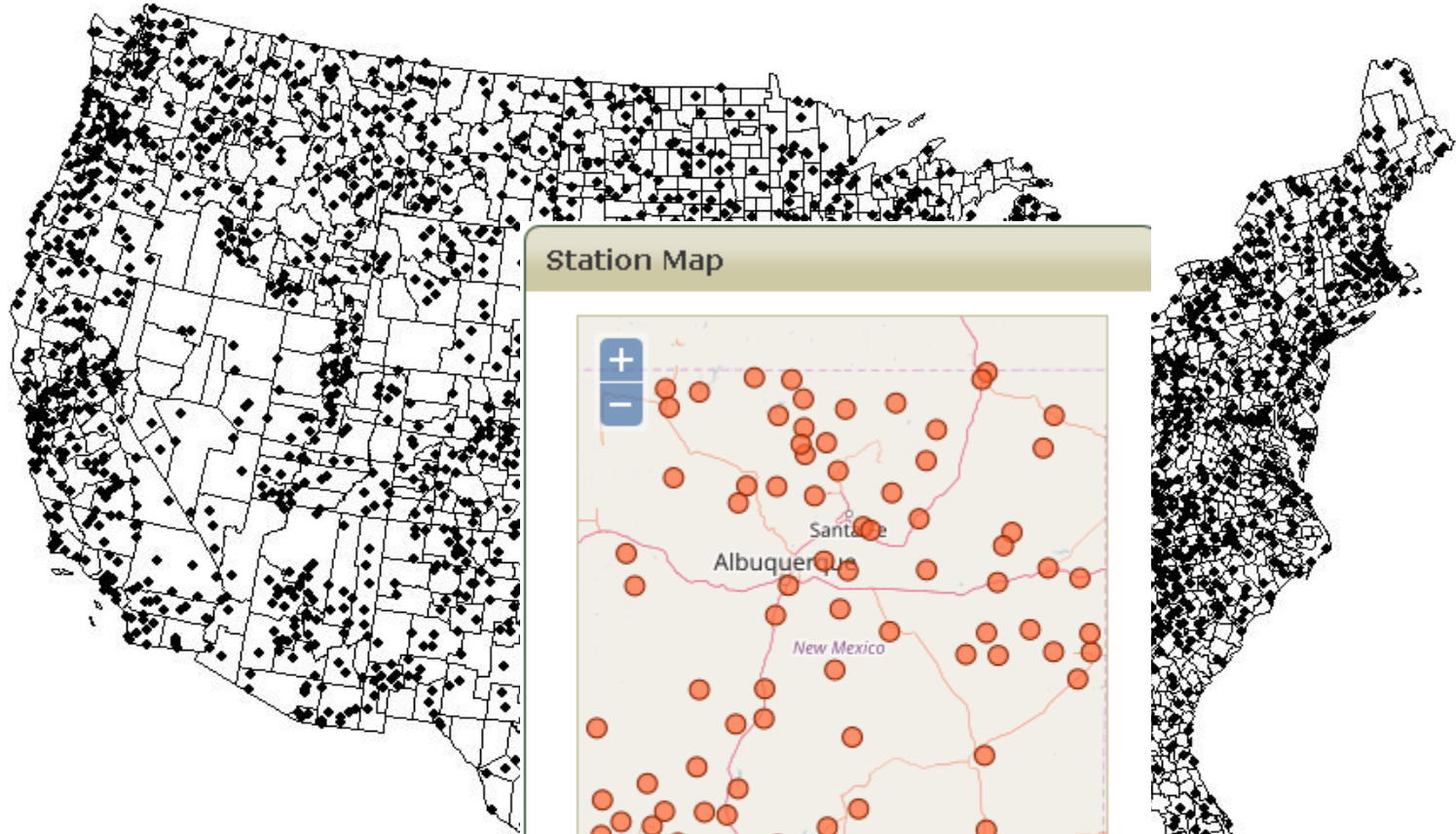
Instructions on how to use the various features and tools of the Drought Risk Atlas.

The Drought Risk Atlas will answer:

- How does the drought compare historical
- How often does a drought of this magnitude happen (frequency)?
- When was the last time a drought like this happened?
- What is the likelihood of the drought continuing?
- What did the spatial footprint of drought look like?



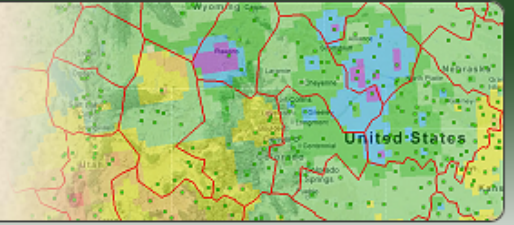
Stations with 40 Plus Years of Data



3059 Stations Total



Drought Risk Atlas



Stations used in the Drought Risk Atlas

Welco

Introd

The idea of... from the orig... States Army... 1990s. The... Climate Net... of record at... 1940s to pi... climate divis... Drought Sev... climatologica... to use this t... to make bet... For the new... both in the... the most co

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

HCN. Using a weekly time-step to calculate multiple drought indices at each station location, not on a climate division scale, allows for a more precise representation of drought histories. The Standardized Precipitation Index (SPI), Standardized Precipitation-Evapotranspiration Index (SPEI), Palmer Drought Severity Index (PDSI), Deciles, United States Drought Monitor and other climatological data are included in the new Drought Risk Atlas. Along with the climatological data, gridded maps created on a weekly time-step are available for the entire United States.

Help

Instructions on how to use the various features and tools of the Drought Risk Atlas.

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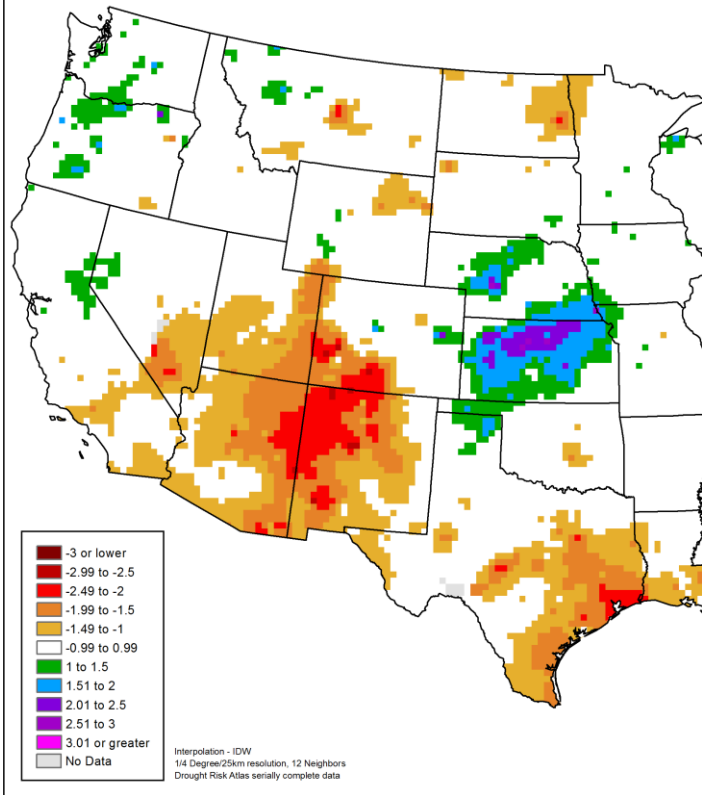
ie drought indices

d and who was

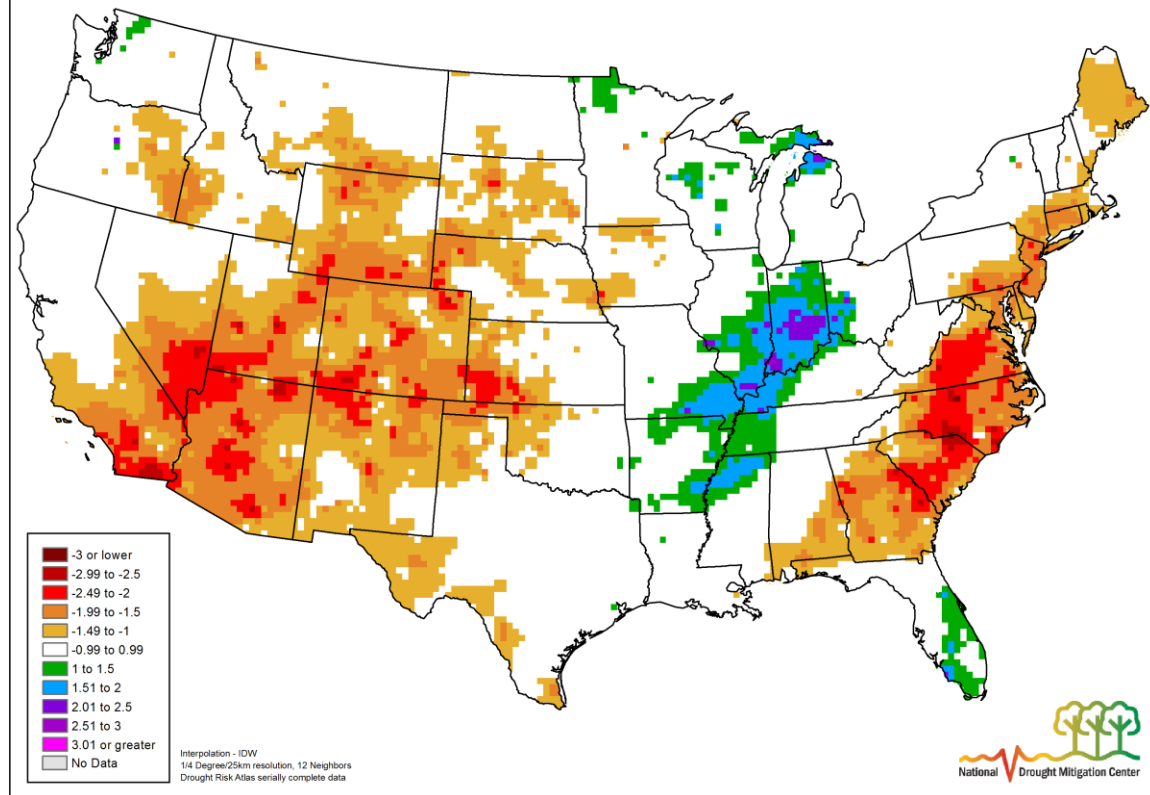
Comparing Drought Periods

How did drought look in 1951 vs 2002?

12 Month SPI for July 1951



12 Month SPI for June 2002



Climate Data

Selected Atlas Station: 291286 (CABALLO DAM)

Select New Station

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



Results for CABALLO DAM (291286) for the 12 Month timestep(s) between 9/1/1936 and 12/31/2012 and aggregated by month.

Date

1/1/1936 to 12/31/2012

Period of Record

Station start date: 9/1/1936

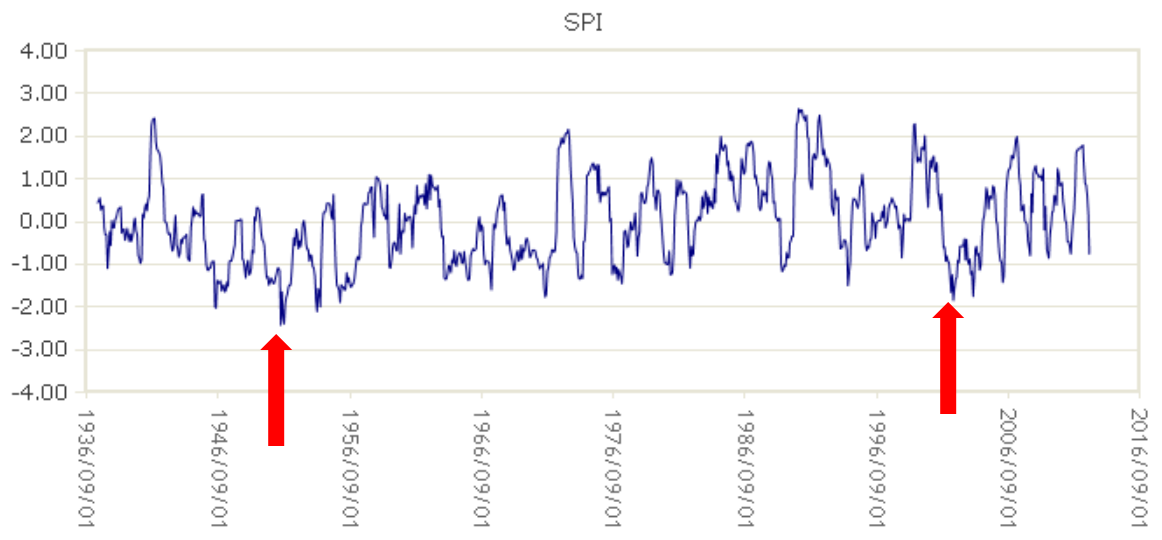
Aggregate

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



- 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.

Climate Data

Selected Atlas Station: 291286 (CABALLO DAM)

Select New Station



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



Results for **CABALLO DAM (291286)** for the 12 Month timestep(s) between 9/1/1936 and 12/31/2012 and aggregated by month.

Date

to

 Station start date: 9/1/1936

Aggregate

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

Show entries Search:

Month	12 Month
7/1/1951	-2.45
10/1/1951	-2.42
9/1/1951	-2.24
4/1/1954	-2.13
8/1/1946	-2.05
7/1/1954	-2.02
7/1/1946	-2.01
11/1/1951	-1.95
1/1/1956	-1.92
8/1/2002	-1.87
3/1/1954	-1.84
12/1/1951	-1.79
8/1/1971	-1.79
2/1/2004	-1.78
1/1/1952	-1.71
9/1/1971	-1.71
6/1/2002	-1.68
4/1/1947	-1.67
8/1/1951	-1.67
6/1/1954	-1.66
1/1/1947	-1.65
5/1/1947	-1.63
5/1/1956	-1.63
12/1/1955	-1.62



Climate Data

Selected Atlas Station: 291286 (CABALLO DAM)

Select New Station



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



Results for **CABALLO DAM (291286)** at the 12 Month timestep with a minimum drought class of -1.5 between 1/1/1936 and 12/31/2012.

Date

1/1/1936 to 12/31/2012

Period of Record

Station start date: 9/1/1936

Note: the drought period ends when the index returns to zero.

Index

Select an index

- SPI
- SPEI
- PDSI
- Self-calibrated PDSI

Drought Classification

-1.5

Timestep

12 Month

Number of Droughts: 15

Longest Drought: 149 weeks

Average Duration: 52 weeks

Time in Drought: 19.93%

Show 25 entries

Search:

Drought Start	Drought End	Duration (weeks)
6/25/2011	9/3/2011	10
5/7/2002	11/18/2004	132
7/30/1994	12/3/1994	18
7/16/1989	6/18/1990	48
7/30/1982	2/5/1983	27
1/15/1977	8/20/1977	31
4/16/1974	9/17/1974	22
7/9/1971	6/10/1972	48
5/28/1967	10/1/1967	18
8/13/1965	7/16/1966	48
12/3/1955	8/27/1957	90
1/29/1954	8/27/1954	30
6/11/1950	4/23/1953	149
12/9/1948	7/9/1949	30
6/4/1946	2/26/1948	90

Showing 1 to 15 of 15 entries



Climate Data

Selected Atlas Station: 291286 (CABALLO DAM)

Select New Station



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



Results for CABALLO DAM (291286) for the 12 Month timestep and aggregated by month.



Index

SPI

Aggregate

Month

Timestep

12 Month

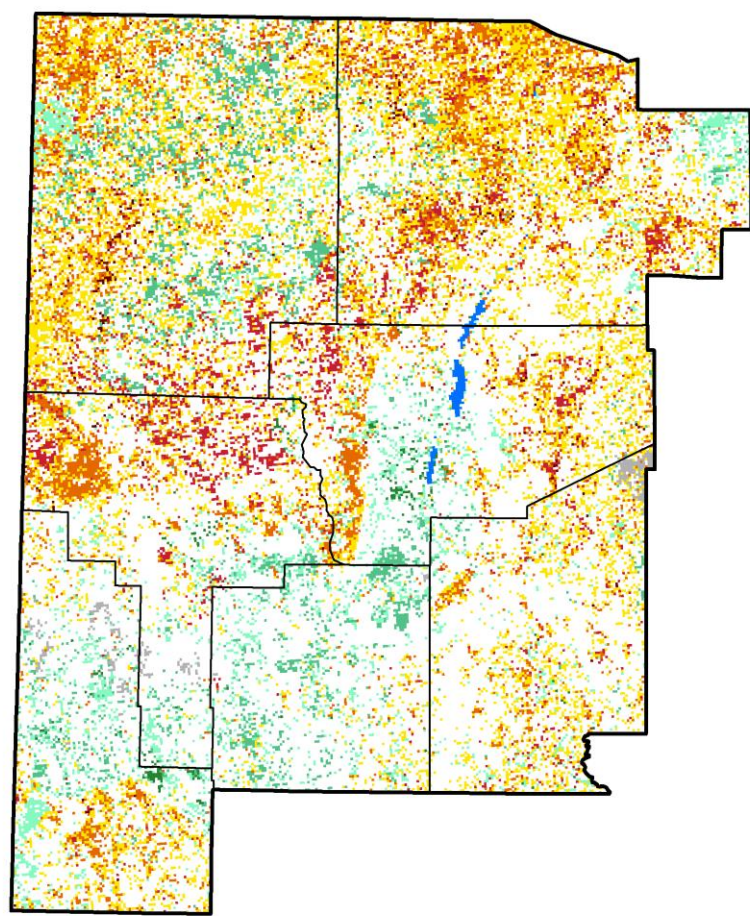
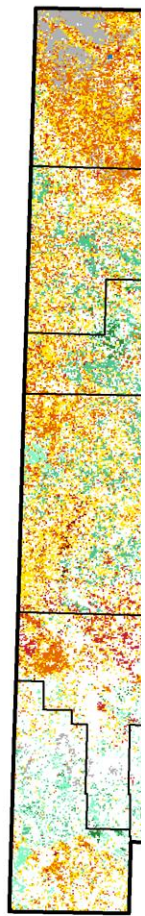
Threshold	Frequency	Return Period (Years)
-2.4	2	38.08
-2.2	1	76.25
-2.1	1	76.25
-2	4	19
-1.9	2	38.08
-1.8	4	19
-1.7	6	12.67
-1.6	15	5.08
-1.5	16	4.75
-1.4	18	4.17
-1.3	23	3.25
-1.2	20	3.75
-1.1	25	3
-1	39	1.92
-0.9	33	2.25
-0.8	35	2.17
-0.7	36	2.08
-0.6	31	2.42
-0.5	26	2.92
-0.4	30	2.5
-0.3	22	3.42
-0.2	27	2.75
-0.1	17	4.42
0	55	1.33
0.1	27	2.75

VegDri (Vegetation Drought Response Index)

Vegetati

Vegetation Drought Response Index
Complete: New Mexico, Region 4

October 23, 2016



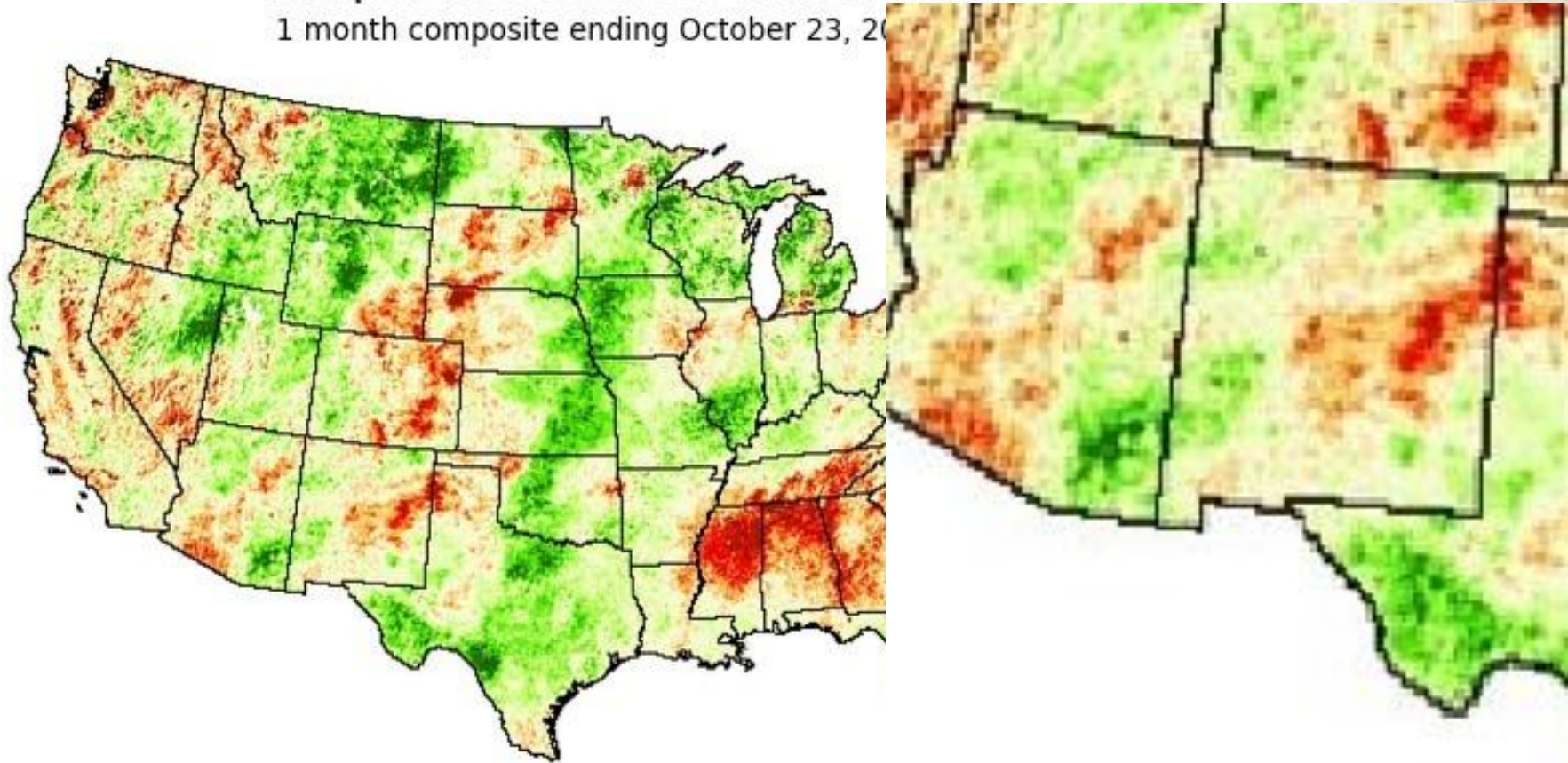
Vegetation Condition

-  Extreme Drought
-  Severe Drought
-  Moderate Drought
-  Pre-drought stress
-  Near Normal
-  Unusually Moist
-  Very Moist
-  Extreme Moist
-  Out of Season
-  Water

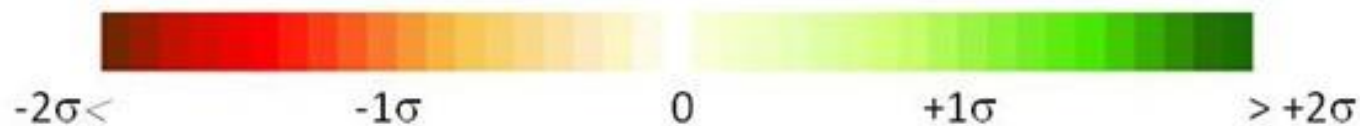
ESI (Evaporative Stress Index)

Evaporative Stress Index 4km

1 month composite ending October 23, 20



Standardized ET/PET anomalies



Any Questions ?



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402-472-6775

**National Drought Mitigation Center
School of Natural Resources
University of Nebraska-Lincoln**

