

The National Drought Mitigation Center

The US Drought Monitor and Drought Risk Atlas

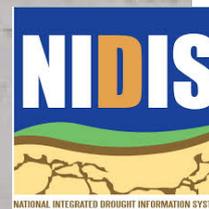
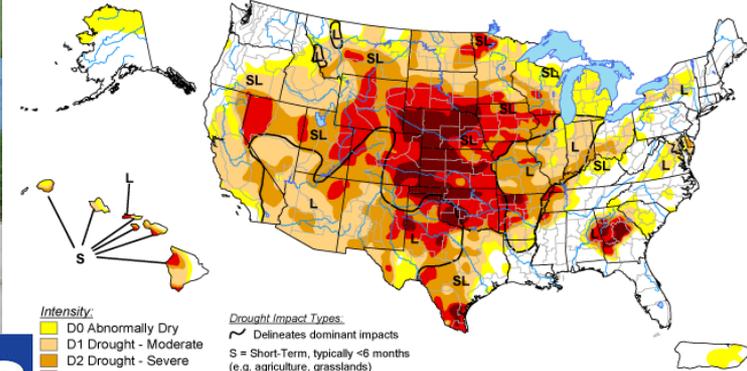
Brian Fuchs, Climatologist
National Drought Mitigation Center
School of Natural Resources
University of Nebraska-Lincoln



Drought Outlook and Assessment Forum

June 24, 2014
Wichita Falls, Texas

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



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

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

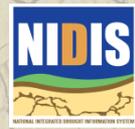


Released Thursday, September 27, 2012
Author: Anthony Artusa, NOAA/NWS/NCEP/CPC

THIS DROUGHT IS REALLY DOING A NUMBER ON YOUR HAYFIELD.

THIS IS CORN.

Cam CITIZEN
Cartoonists.com



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Lincoln



*The US Drought Monitor is only a
National Drought Mitigation Center
product*

FICTION!

National Drought Mitigation Center

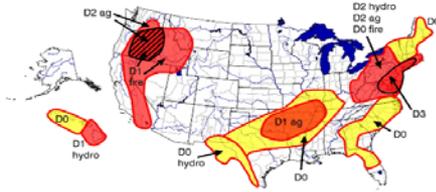


The U.S. Drought Monitor

Since 1999, **NOAA (CPC, NCDC, 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

- **Western Region Climate Center** on board 2008
- **11** authors in all
- No direct “line item” funding in any budget
- **Incorporate** relevant information and products from all entities (and levels of government) dealing with drought (Regional Climate Center’s, State Climatologists, federal/state agencies, etc.) (**~350+ experts**)

August 3, 1999
Experimental U.S. Drought Monitor



"Drought" means moisture shortages leading to damaged crops or pastures, high wildfire risk, or water shortages. The map is based on information from many sources, including both satellite and surface data, and it focuses on widespread drought. Local conditions may vary.

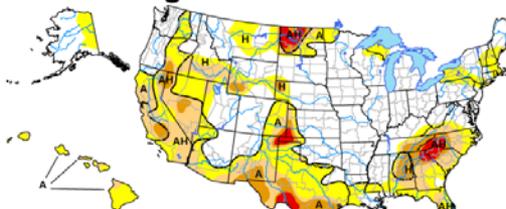
Yellow (D0) = Drought Watch Area (abnormally dry but not full drought status)
Red (D1-D4) = Current drought ranging in severity from standard (D1) to severe (D2-D3) to extreme (D4)
Cross-hatching (H) = Overlapping drought type areas

Drought type: Used when impacts differ
Ag = agricultural (crops, grasslands)
F = forestry (wildfire potential)
Hydro = hydrological (rivers, wells, reservoirs)

Plus (+) = Forecast to intensify
Minus (-) = Forecast to diminish



U.S. Drought Monitor June 10, 2008
Valid 8 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
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (wells)

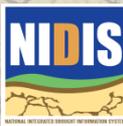
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>



Released Thursday, June 12, 2008

Author: Mark Svoboda, National Drought Mitigation Center



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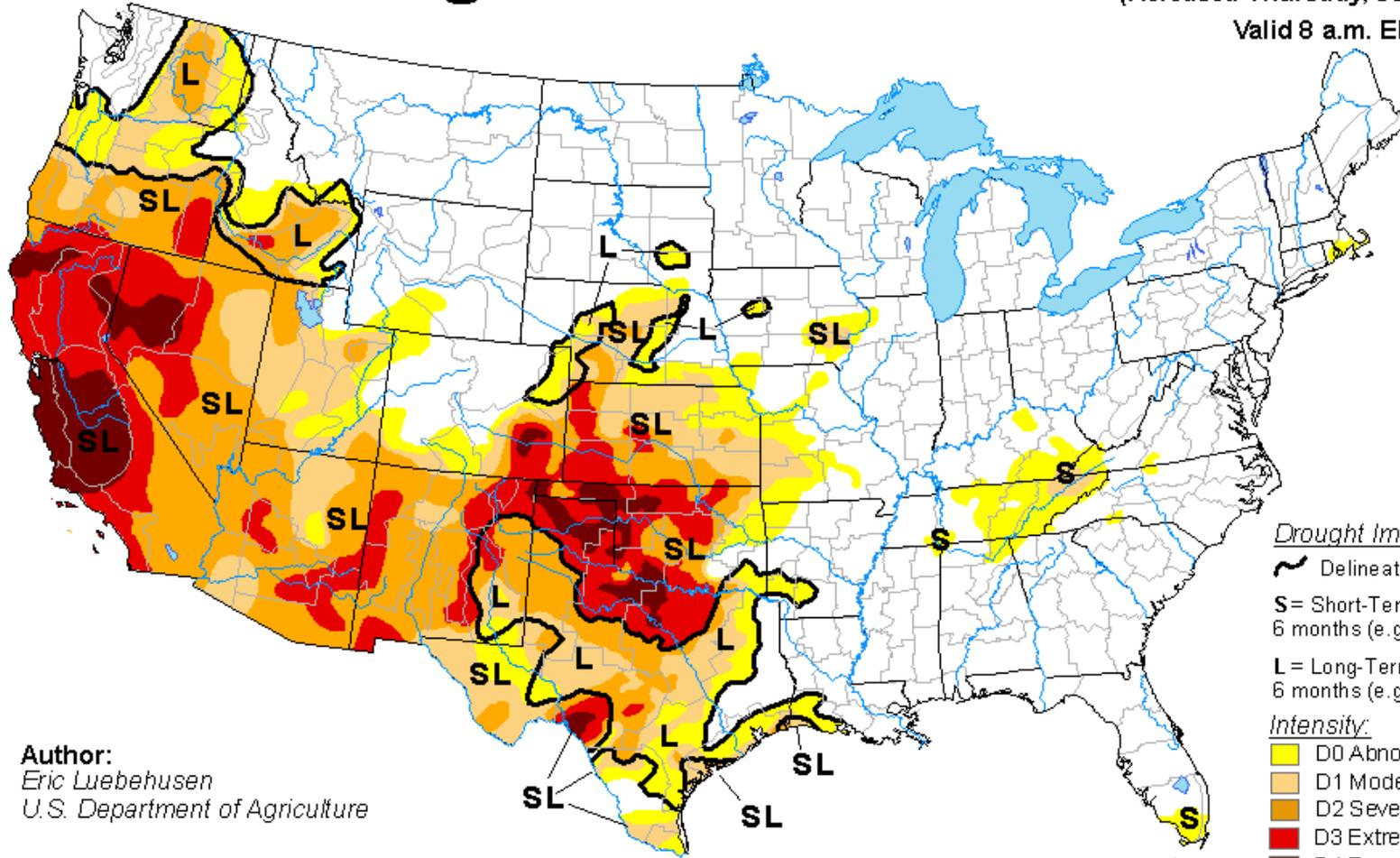


U.S. Drought Monitor

June 17, 2014

(Released Thursday, Jun. 19, 2014)

Valid 8 a.m. EDT



Drought Impact Types:

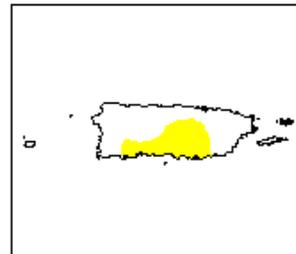
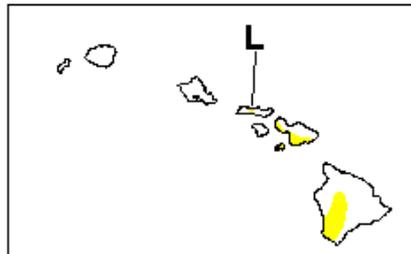
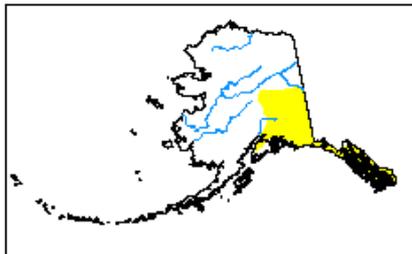
- ~ Delineates dominant impacts
- S= Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L= Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

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

Author:
Eric Luebehusen
U.S. Department of Agriculture

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



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

U.S. Drought Monitor Southern Plains

June 17, 2014
(Released Thursday, Jun. 19, 2014)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

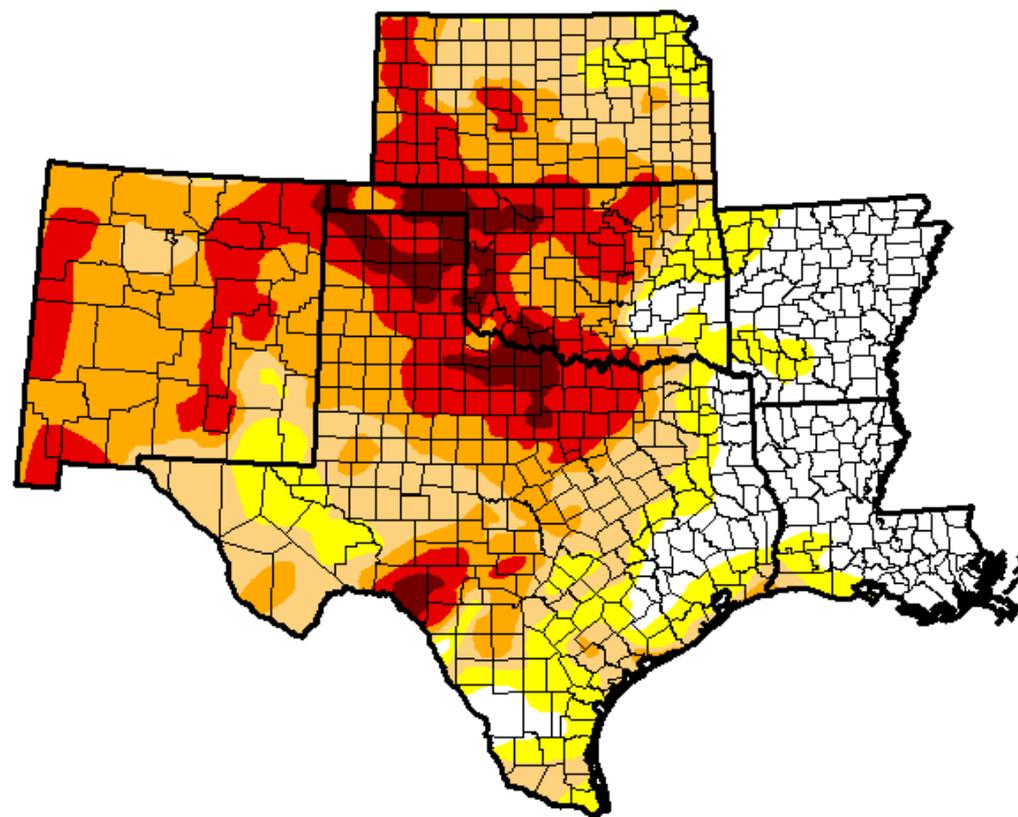
	None	D0	D1	D2	D3	D4
Current	18.77	13.46	20.30	24.94	18.14	4.39
Last Week 6/10/2014	19.06	12.74	18.16	24.93	20.37	4.74
3 Months Ago 3/18/2014	16.87	19.04	29.12	21.25	12.70	1.03
Start of Calendar Year 12/31/2013	32.51	24.77	21.28	17.02	3.83	0.59
Start of Water Year 10/1/2013	17.73	23.28	33.32	21.94	3.52	0.21
One Year Ago 6/18/2013	23.24	8.10	14.11	16.55	20.67	17.33

Intensity:

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

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

Author:
Eric Luebehusen
U.S. Department of Agriculture

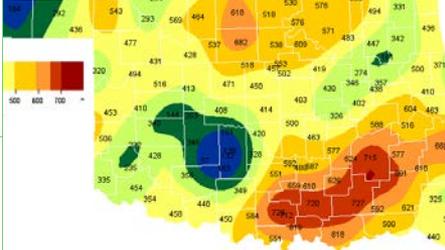
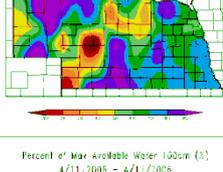
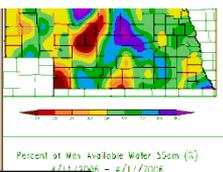
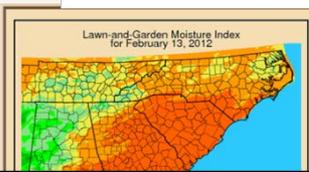
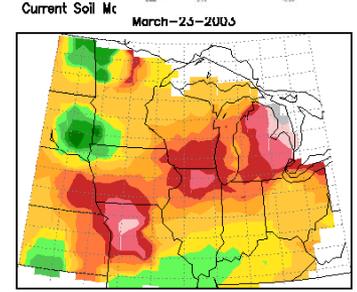
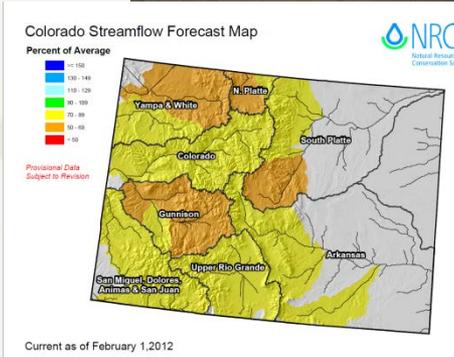
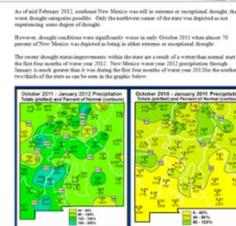
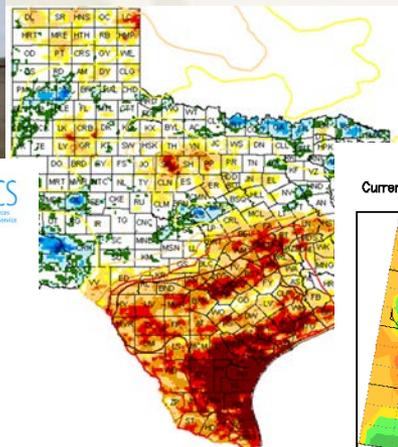


The Importance of Local Expert Input

▣ The U.S. Drought Monitor Team Relies on Field Observation Feedback from the Local Experts for Impacts Information & “Ground Truth”

○ *Listserver (350+ Participants: 2/3 Federal, 1/3 State/Univ.)*

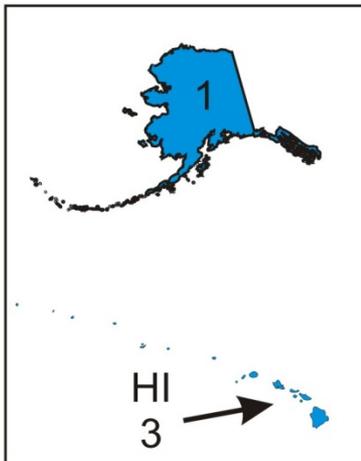
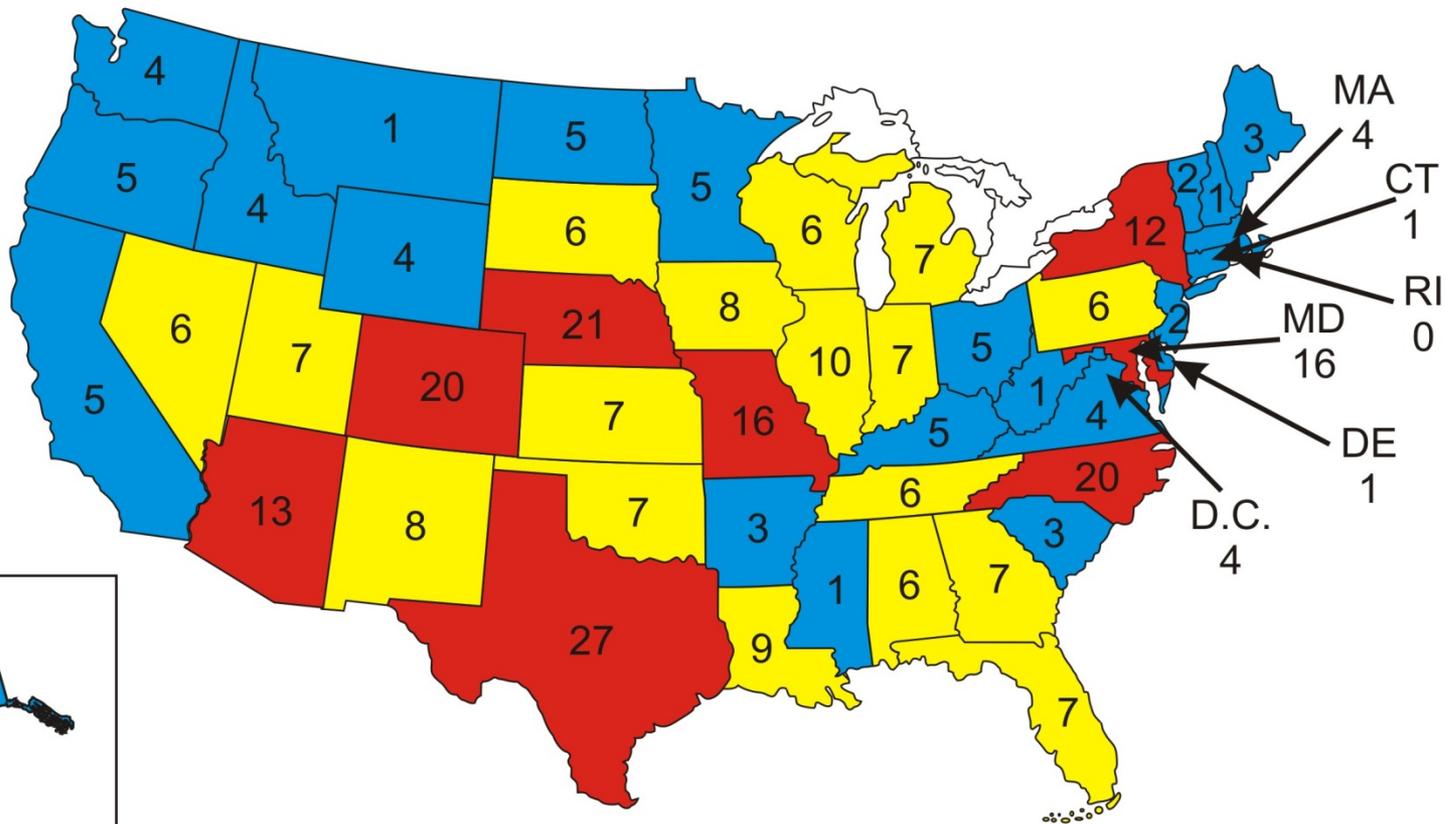
- Local NWS & USDA/NRCS Offices
- State Climate Offices
- State Drought Task Forces
- Regional Climate Centers



The primary means of communication with our “eyes in the field” is thru email; The email “Expert Group” is called the ***USDM Listserver***

USDM Listserve Subscribers

(as of November 1, 2013)



- 1-5 participants
- 6-10 participants
- 11+ participants

Total: 345 (does not include 1 participant from Canada)

*The Drought Monitor is a
forecast*

FICTION

*The Drought Monitor is a
drought declaration*

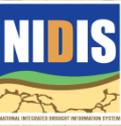
FICTION



Original Objectives



- ▶ “Fujita-like” scale
- ▶ **NOT** a forecast!
- ▶ **NOT** a drought declaration!
- ▶ Identify **impacts** (Short, Long, Both)
- ▶ Assessment of **current** conditions
- ▶ Incorporate **local expert** input
- ▶ Be as **objective** as possible

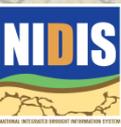


The Drought Monitor Concept

- ▶ A ***consolidation*** of indices and indicators into one comprehensive national drought map.

A "*Convergence of Evidence*" approach

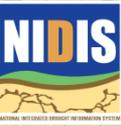
- ▶ Trying to capture these drought characteristics:
 - the drought's magnitude (duration + intensity)
 - spatial extent
 - probability of occurrence
 - Impacts
- ▶ Rates drought intensity by **percentile rankings**



The drought monitor categories (D0-D4) have a quantitative basis

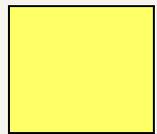
FACT

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U.S. Drought Monitor Map

Drought Intensity Categories



D0 **Abnormally Dry** (30%tile)



D1 Drought – **Moderate** (20%tile)



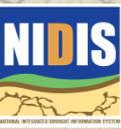
D2 Drought – **Severe** (10%tile)



D3 Drought – **Extreme** (5%tile)



D4 Drought – **Exceptional** (2%tile)

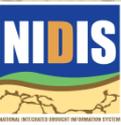


*The Drought Monitor depicts
both short- and long-term
drought*

FACT

*The Drought Monitor is
purely subjective*

FICTION



Open data sharing:

Very important to the process

Local Experts:

contributing data, knowledge, and impact information

Creating the map

openly with the data and methods available to anyone

Flexibility:

Being able to change as information changes

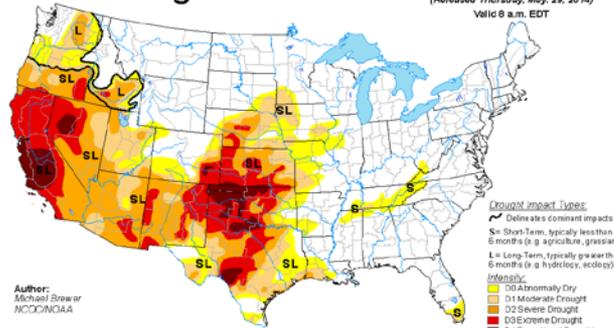
Listening:

to stakeholders and accommodating their needs

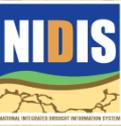
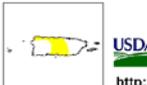
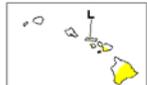
11 Authors with various expertise producing a weekly product

U.S. Drought Monitor

May 27, 2014
(Released Thursday, May 29, 2014)
Valid 6 a.m. EDT



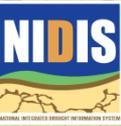
Author:
Michael Brown
NCCO/NOAA



*Precipitation is the
only indicator*

FICTION

National Drought Mitigation Center



Key Variables For Monitoring Drought

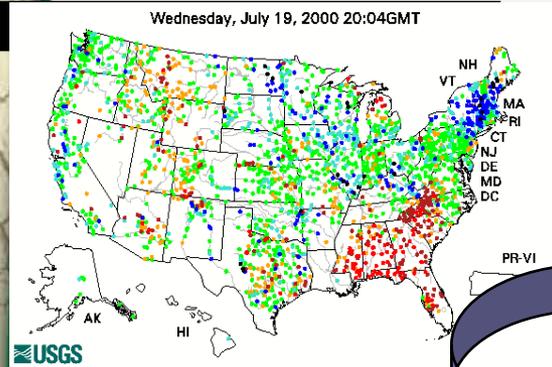


- ▶ climate data (precipitation, temperature, drought indices)
- ▶ soil moisture
- ▶ stream flow
- ▶ ground water
- ▶ reservoir and lake levels
- ▶ snow pack
- ▶ vegetation health/stress and fire danger
- ▶ Impact information
- ▶ Local feedback

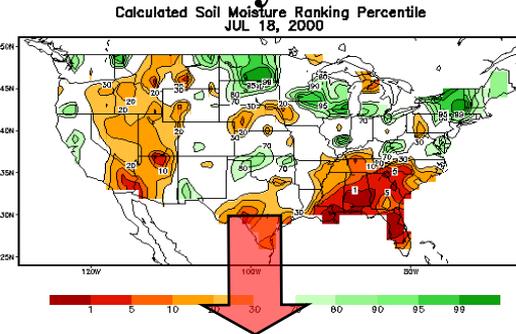


Principal Drought Monitor Inputs

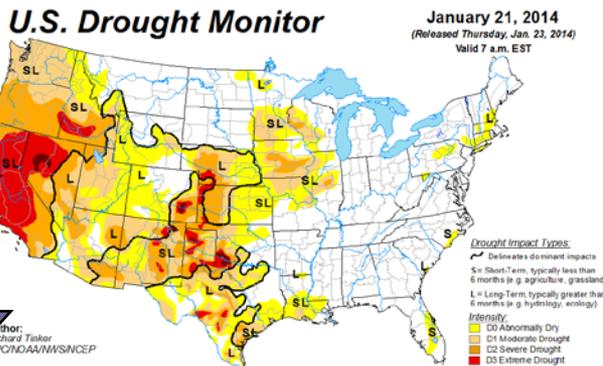
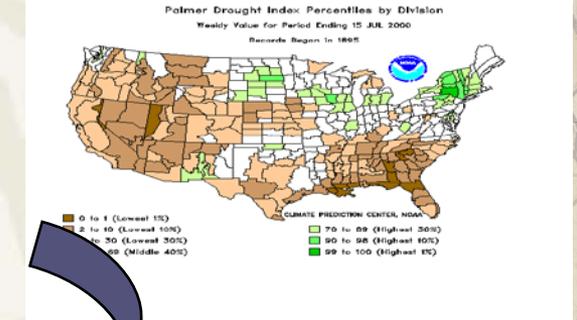
USGS Streamflow



CPC Daily Soil Model

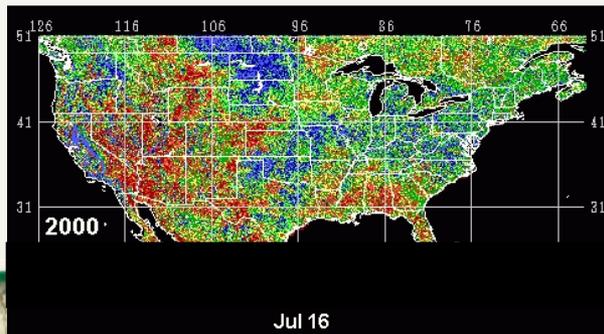
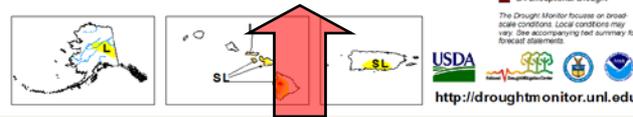
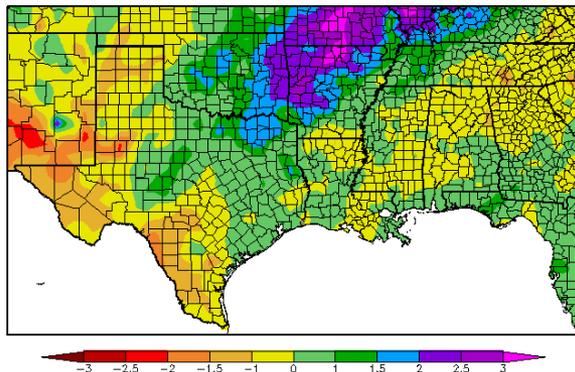


Palmer Drought Index



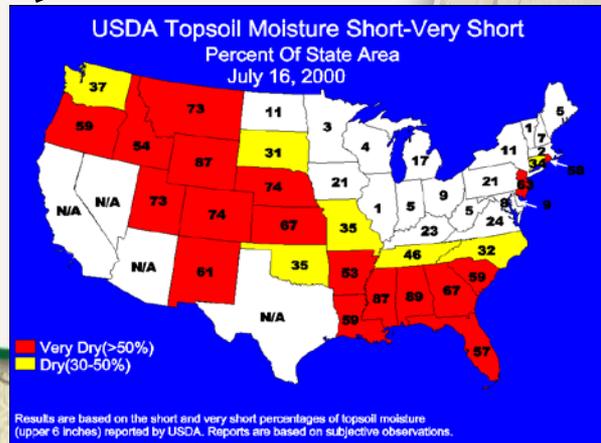
SPI Drought Index

90 Day SPI
1/16/2008 - 4/14/2008



Satellite Veg Health

USDA Soil Ratings



U.S. Drought Monitor

Integrates Key Drought Indicators:

- Palmer Drought Index
- SPI (1 month to 36 months)
- KBDI
- Modeled Soil Moisture
 - NLDAS
- 7-14 Day Avg. Streamflow
- Precipitation Anomalies

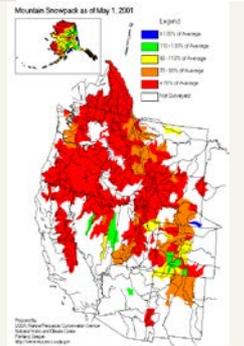
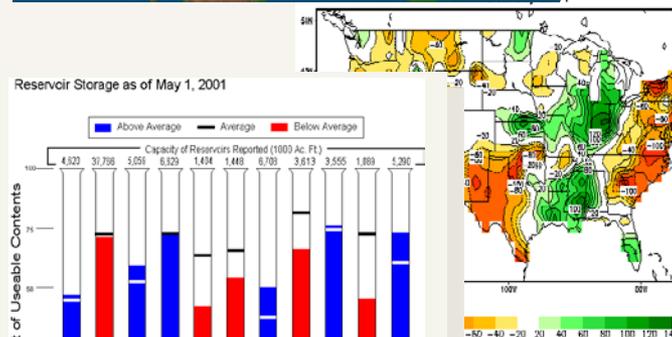
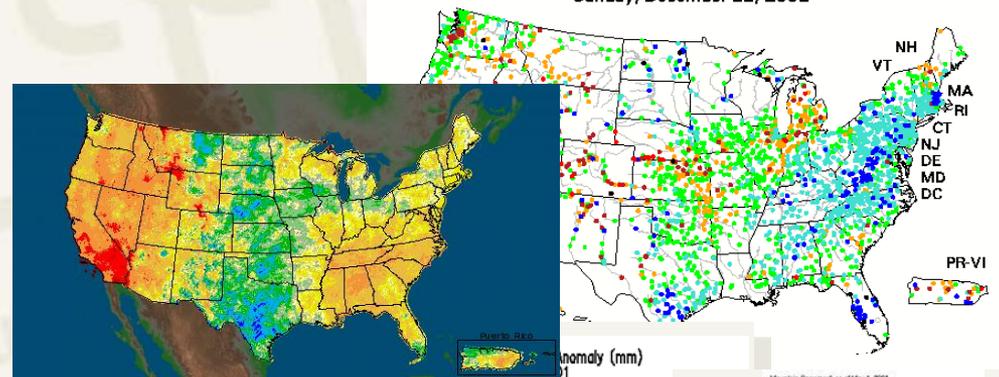
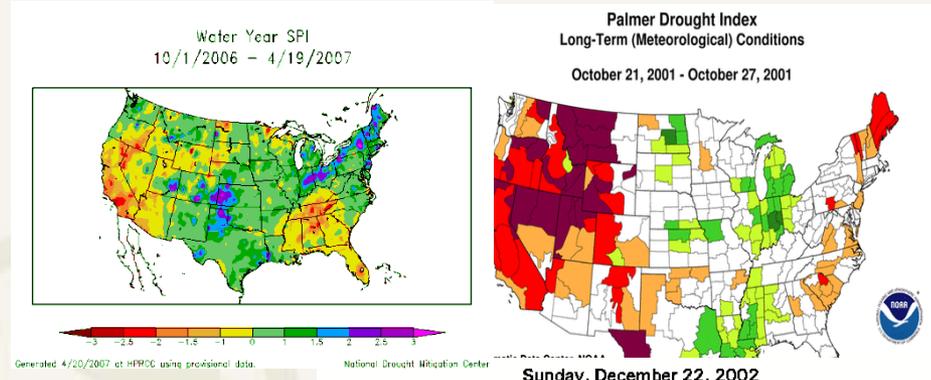
Growing Season:

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

In The West:

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

Created in ArcGIS



Drought Impact Information

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

NDMC Drought Impact Reporter

Map Advanced Search **Submit a Report** About the DIR Help

Refresh

Impacts & Reports Overlays

Impacts

Opacity 80%

Impacts

- 0
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 49

Reports

Time Period

Location

Categories

Report Types

All States | 05-04-2014 - 06-04-2014 | [Color Legend]

Impact Counts Impact List Report Counts Report List

Total Impacts | All States 131

Category					
	Agriculture	40		Business & Industry	5
	Energy	1		Fire	30
	Plants & Wildlife	35		Relief, Response & Restrictions	76
	Society & Public Health	21		Tourism & Recreation	6
	Water Supply & Quality	75			

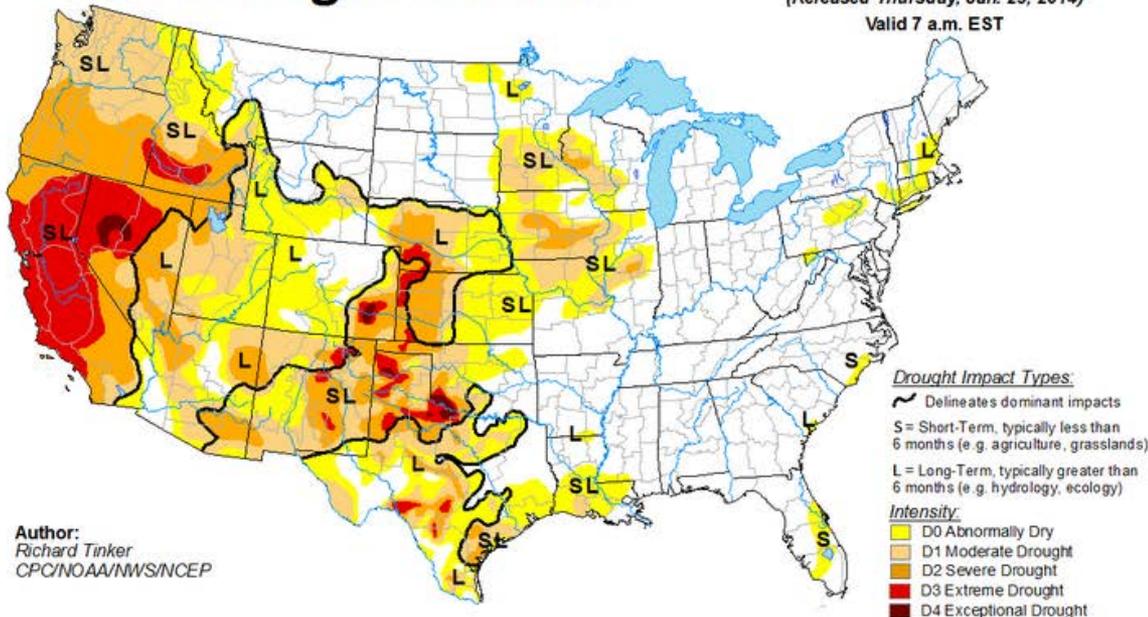
Report Source

United States Drought Monitor

Home

U.S. Drought Monitor

January 21, 2014
(Released Thursday, Jan. 23, 2014)
Valid 7 a.m. EST



Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

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



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

National Drought Summary for Jan 21, 2014

▼ Hawaii, Alaska, and Puerto Rico

Through most of the dry areas in Alaska, Puerto Rico, and Hawaii, light to locally moderate precipitation fell. A small area in south-central Puerto Rico reported more than one inch of rain. Dryness and drought classifications were unchanged.

▶ The Northeast

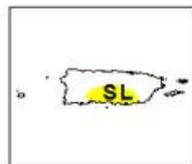
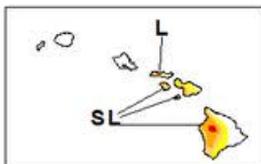
▶ The Rest of the Contiguous 48 States

▶ Looking Ahead

Author(s):

Richard Tinker, NOAA/NWS/NCEP/CPC

[View a printable narrative here.](#)



The National Drought Mitigation Center's Drought Risk Atlas

Brian Fuchs

Mark Svoboda

Chris Poulsen

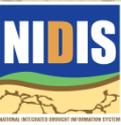
Jeff Nothwehr

National Drought Mitigation Center

School of Natural Resources

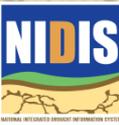
University of Nebraska-Lincoln

This work is funded under a grant from the Sectoral Applications Research Program (SARP) of the NOAA-Climate Program Office. Additional Funding was provided by the NIDIS Program Office and the USDA- Risk Management Service (RMA).



The Drought Risk Atlas will answer:

- ▶ How does the drought compare historically?
- ▶ 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 the last drought look like?

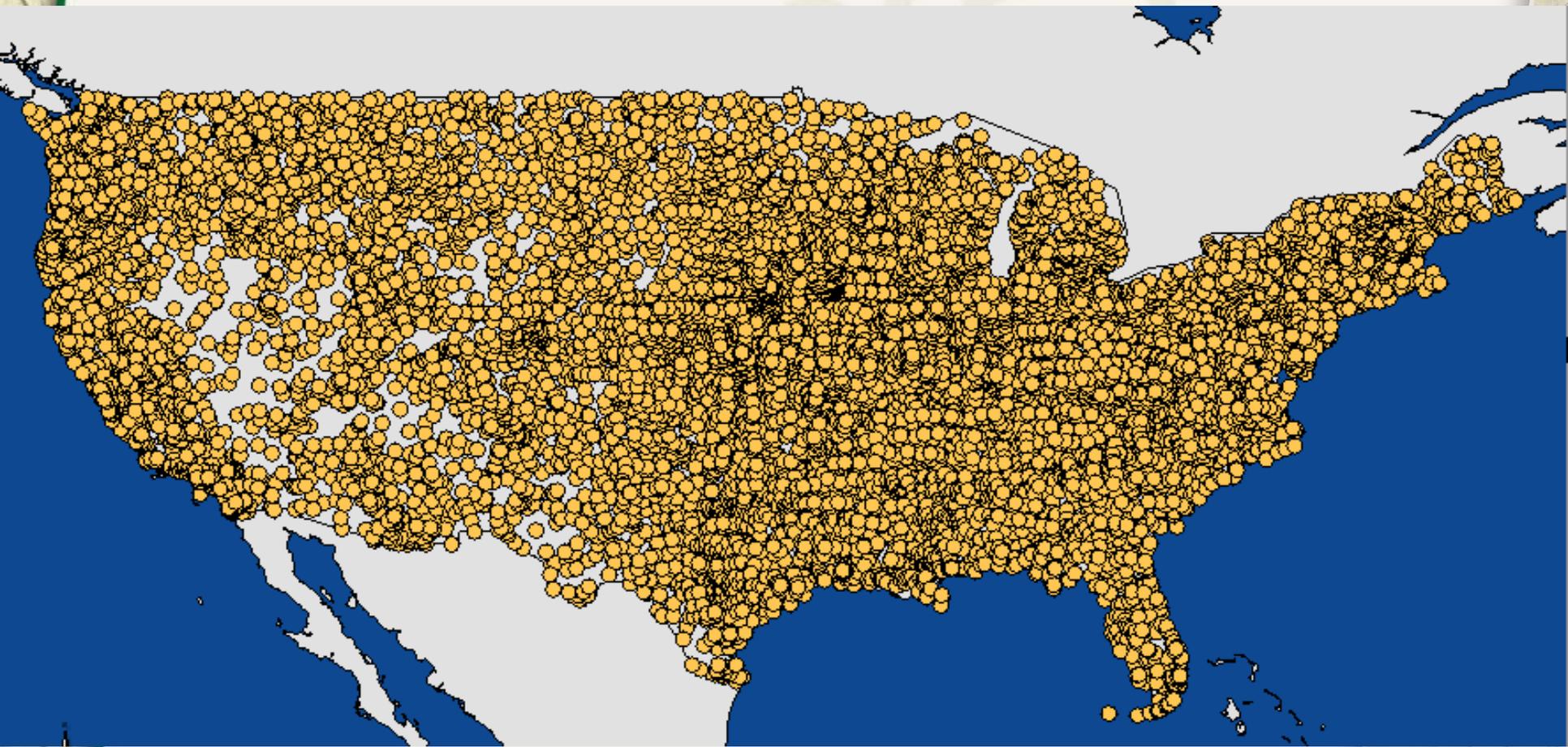


The Drought Risk Atlas Methodology

- ▶ Using the best, most complete, long-term weather stations from the COOP network.
- ▶ Calculating the climatology and various drought indices (SPI, SPEI, Deciles, PDSI, SC-PDSI, Drought Monitor) for each station.
- ▶ Providing the data for various time steps (weekly, monthly, annually)
- ▶ Gridded maps of each index for each aggregated timestep.

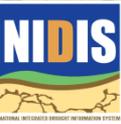


Over 12,000 Cooperative Observing Network Stations (COOP)



Data Criteria for the Drought Atlas

- ▶ Minimum of 40 years of data available at each station.
 - Most have longer periods of record.
- ▶ No more than 2 consecutive months of missing data at any time in the period of record.
- ▶ A unique start date was established for each station.





Drought Risk Atlas

droughtatlas.unl.edu



Stations used in the Drought Risk Atlas

- 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%)

Welco

Introd

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

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.

25.

t indices. Frequency
ation and index

ie drought indices

d and who was

Climate Data

Options Available for Each Station

Selected Atlas Station: 253395 (GRAND ISLAND AP)

Select New Station

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



253395: GRAND ISLAND AP

Latitude

40.961

Longitude

-98.314

Elevation (ft)

1840

State

Nebraska

County

Hall

Climate Division

5

Time Period

1/1/1908 - 12/31/2012

Years on Record

104

Precipitation Only

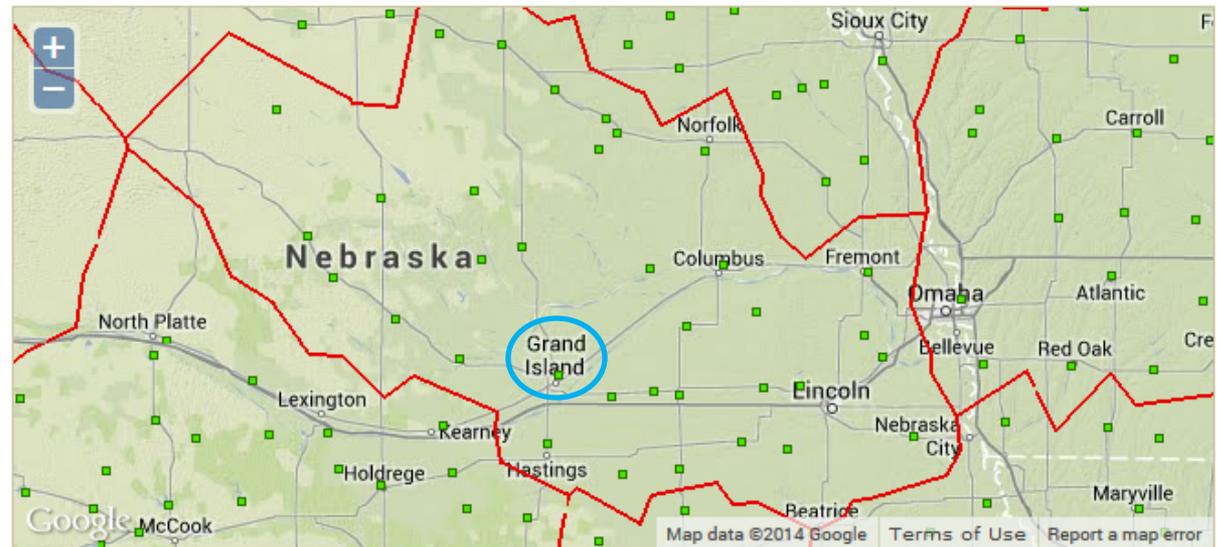
No

[Download Metadata](#)

The Atlas period of record can and will vary from the ACIS period of record. Stations may have had data periods that did not meet the criteria used in the Atlas. Those data periods are not included here. [More information](#)

Similar Stations

Atlas Region



252805: EWING

253050: FREMONT

253065: FRIEND 3E

253175: GENEVA

253185: GENOA 2 W

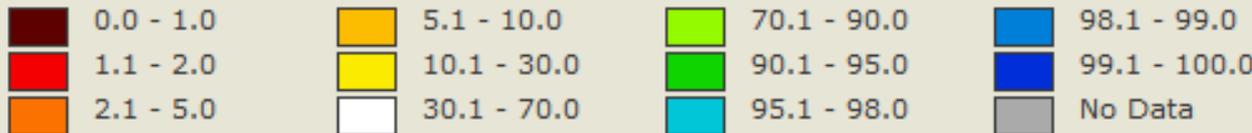
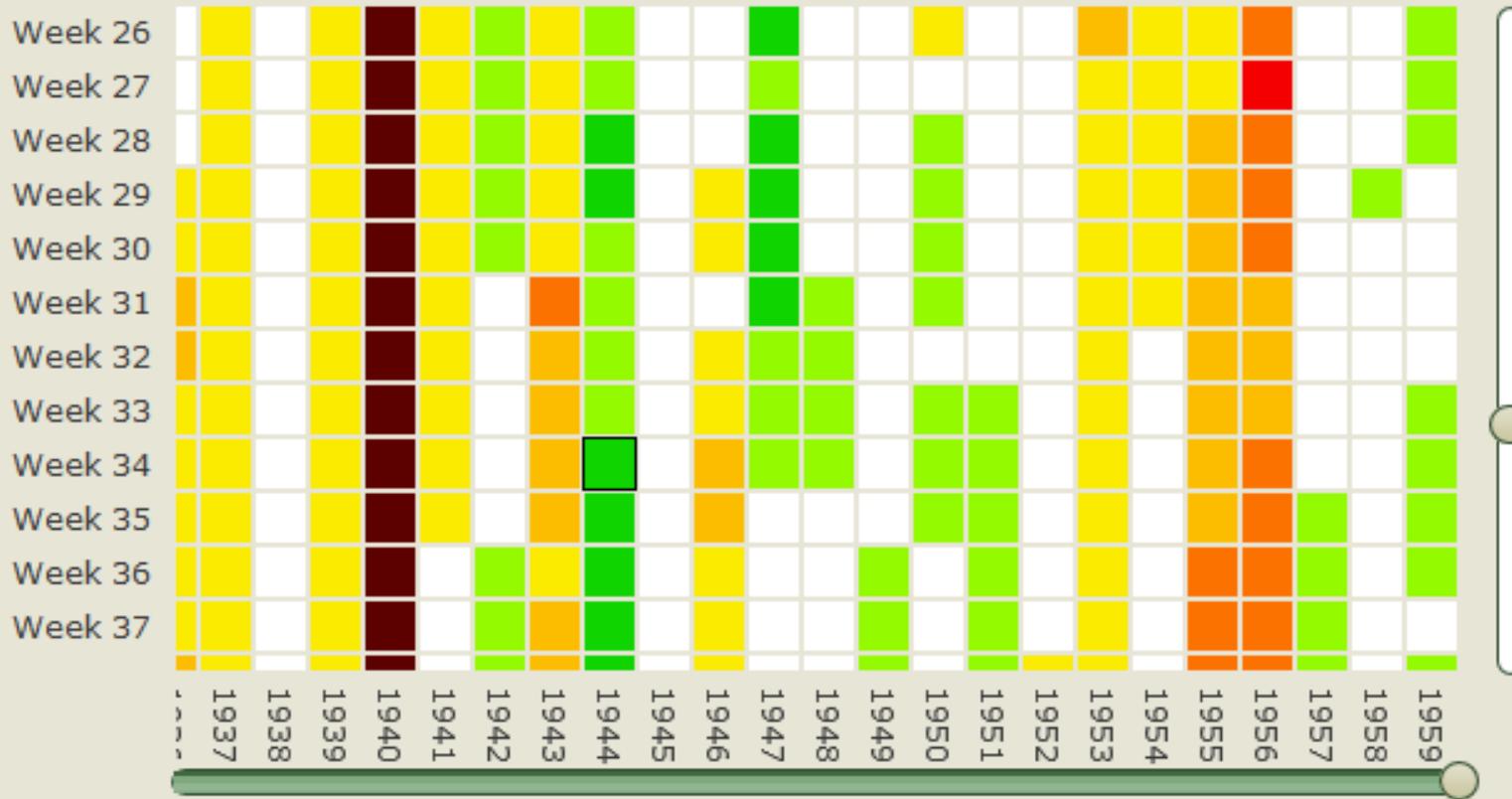
253395: GRAND ISLAND AP

253425: GREELEY

Various options for displaying and analyzing the various drought indices

Results for **GRAND ISLAND AP (253395)** between 1/1/1930 and 12/31/1959 for the 12 Month timestep and aggregated by week.

Deciles



Drought Periods

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

Results for **GRAND ISLAND AP (253395)** at the 12 Month timestep with a minimum drought class of -1 between 1/1/1950 and 12/31/1959.

Date

1/1/1950 to 12/31/1959

1950s

Station start date: 1/1/1908

Index

Select an index

- SPI
- SPEI
- PDSI
- Self-calibrated PDSI

Drought Classification

-1

Timestep

12 Month

Number of Droughts: 3

Longest Drought: 118 weeks

Average Duration: 63 weeks

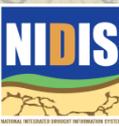
Time in Drought: 36.54%

Show 10 entries

Search:

Drought Start	Drought End	Duration (weeks)
5/21/1955	8/27/1957	118
6/18/1953	8/20/1954	61
4/23/1950	7/9/1950	11

Showing 1 to 3 of 3 entries



Compare Indices

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

Drought Index Comparisons for 253395 (GRAND ISLAND AP).

Year
1956
Station start date: 1/1/1908

Index

- SPI
- SPEI
- PDSI
- Self-calibrated PDSI
- Deciles

Timestep
12 Month

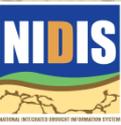
Add Index Clear All

◇ 1956: SPI 12		-2.26	✗
◇ 1956: SPEI 12		-1.89	✗
◇ 1956: PDSI		-6.48	✗
◇ 1956: SCPDSI		-3.62	✗
◇ 1956: DECILES 12		5.00	✗

Jul

Select up to six datasets for comparison. To remove a dataset from the comparison, click the Remove Dataset button. To clear all datasets from the comparison, click the Clear All button. The datasets can be reordered at any time by dragging the rows.

All data for the comparisons is aggregated by week. Drought Monitor data represents the county-level data for the selected station.



Frequencies

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

Results for **GRAND ISLAND AP (253395)** for the 12 Month timestep and aggregated by week.



Index

SPI

Aggregate

Week

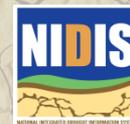
Timestep

12 Month

Show 50 entries

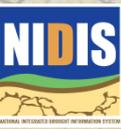
Search:

Threshold	Frequency	Return Period (Years)
-3.7	1	104.1
-3.6	1	104.1
-3.5	2	52.04
-3.4	1	104.1
-3.3	2	52.04
-3.2	5	20.81
-3.1	7	14.87
-3	10	10.4
-2.9	9	11.56
-2.8	11	9.46
-2.7	10	10.4
-2.6	9	11.56
-2.5	6	17.35
-2.4	11	9.46
-2.3	14	7.42
-2.2	30	3.46
-2.1	37	2.81
-2	61	1.69
-1.9	19	5.46
-1.8	36	2.88
-1.7	35	2.96
-1.6	47	2.21
-1.5	53	1.96
-1.4	64	1.62



The Drought Atlas: Bringing a great amount of **DATA** to the **Citizens**

- ▶ Over **1 Billion** Drought Index calculations currently in the Atlas
- ▶ Almost every location in the United States is 75 miles or less from a station
- ▶ Approximately **500,000** gridded maps of drought indices available on weekly/monthly time steps (coming soon, summer 2014)



Any Questions ?



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402-472-6775

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University of Nebraska-Lincoln**

