

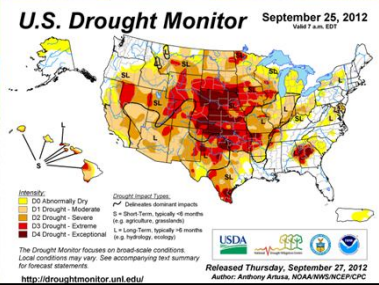


*The National Drought Mitigation Center
Building a Conduit to bring Science to Citizens*

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



International Conference on Data, Information and Knowledge for Water Governance in the Networked Society
June 9-11, 2014
Seville, Spain

U.S. Drought Monitor September 25, 2012
V067 7 a.m. EDT

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

Drought Impact Types:
 D0 D1 D2 D3 D4
 D0 D1 D2 D3 D4
 D0 D1 D2 D3 D4
 D0 D1 D2 D3 D4




The Drought Monitor focuses on immediate conditions. Local conditions may vary. See accompanying text summary for forecast assessments.

Released Thursday, September 27, 2012
Author: Anthony Arkin, NOAA/NWS/CI/DRMC

<http://droughtmonitor.unl.edu>

Outline

- ▶ Background: The National Drought Mitigation Center
- ▶ The United States Drought Monitor
- ▶ New Drought Risk Atlas for the U.S.
- ▶ Questions

Types of Rain Gages



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National Drought Mitigation Center

- ▶ Established in 1995
- ▶ Founder: Dr. Don Wilhite
- ▶ Current Director: Dr. Mike Hayes
- ▶ The NDMC is a *soft money*, grant funded organization
- ▶ Current staff: 16 people, tremendous diversity of expertise



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National Drought Mitigation Center

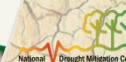
Mission: To lessen societal vulnerability to drought by promoting ***planning*** and the adoption of appropriate ***risk management*** techniques.



www.drought.unl.edu



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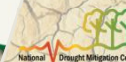
National Drought Mitigation Center

The NDMC is a ***critical National resource!***

- “***Go-to***” resource of drought-related information (example: 750 media contacts in 2012, over 1,000 in 2013)
- Drought monitoring (home of U.S. Drought Monitor and many other tools)
- “***Boundary organization***” that bridges the gap between ***science and stakeholders***
- Provides leadership at the state and national level on drought preparedness
- International reputation, international resource
- Only center in U.S. that focuses on drought



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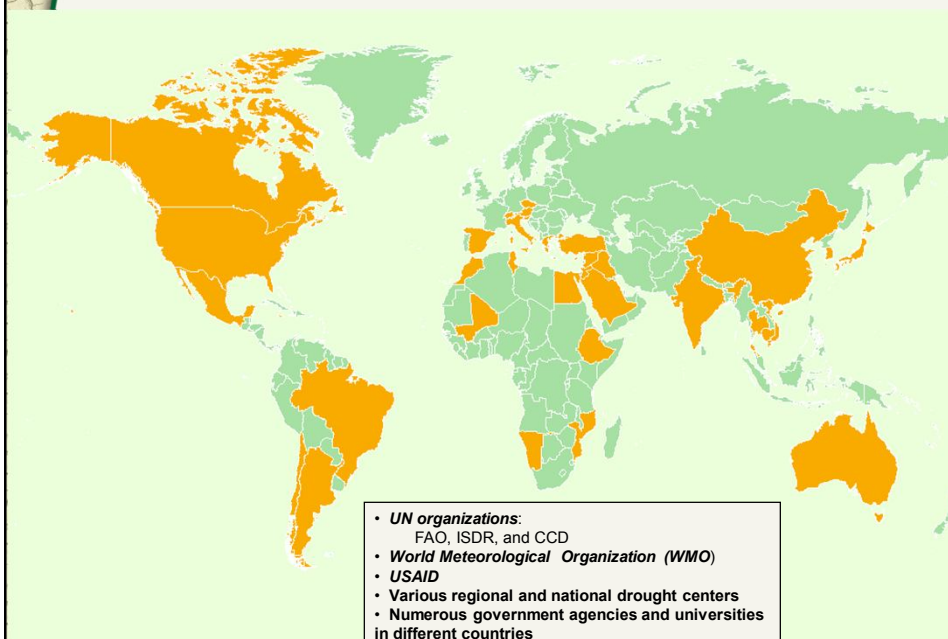
NDMC Program Objectives

- ▣ **Improve the science** of drought monitoring, planning, and mitigation
- ▣ Build **awareness** of drought and its **impacts** on society and the environment, and how human actions affect our **vulnerability** to drought
- ▣ Focus the attention of policy makers on the importance of **drought policy and planning** in the wise stewardship of natural resources
- ▣ Conduct and maintain operational tools, research, outreach and training

Bringing ALL information associated with Drought to the public via various means and techniques.



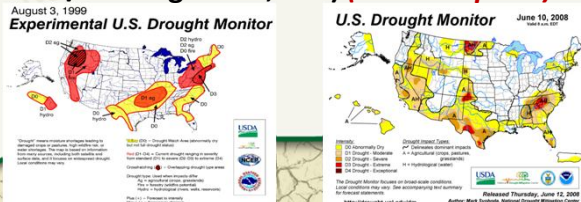
NDMC International Activities



The U.S. Drought Monitor

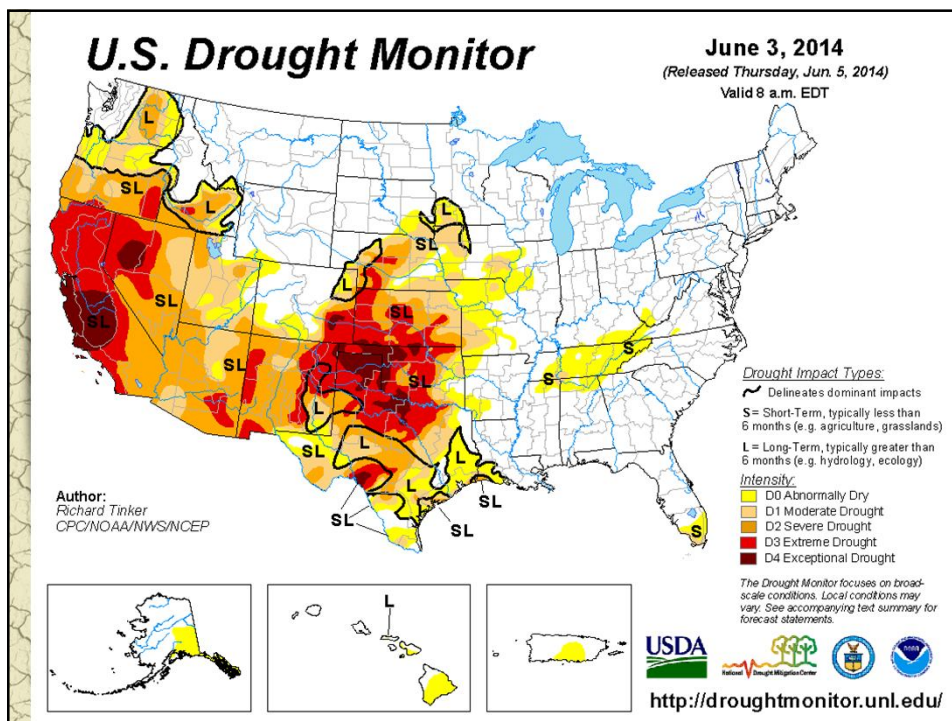
Since 1999, **NOAA (CPC, NCDC, WRCC), USDA, and the NDMC** have produced a weekly composite drought map -- the U.S. Drought Monitor -- with input from numerous federal and non-federal agencies

- **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**)



The 11 Drought Monitor Authors are located within various partnering agencies throughout the United States





NDMC's Role in the "Process"

- ▣ **2 of 11 authors:** Brian Fuchs and Mark Svoboda (Mike Hayes is a past author)
- ▣ **Hosting the USDM Listserver**
 - 350+ participants contributing each week
- ▣ **Dissemination of data/information** to stakeholders (media, govt. agencies, public etc)
 - Official Archive of all USDM related data and products
- ▣ **Hosting the USDM webpage and archive**
 - **~3.5M**+page views & **~2M**+visitors each year



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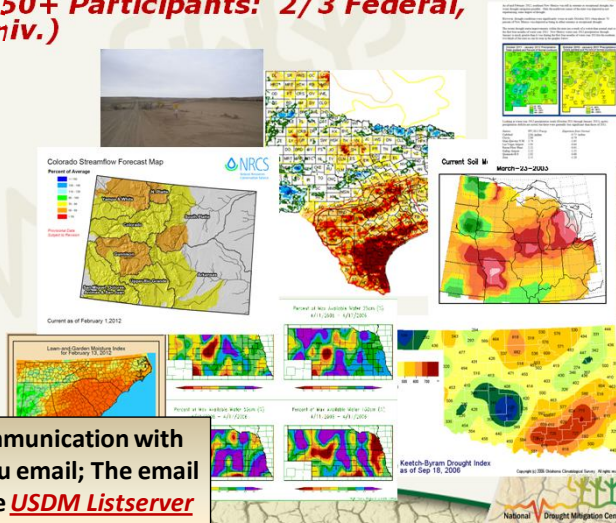


The Importance of Local Expert Input

▣ **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.)**

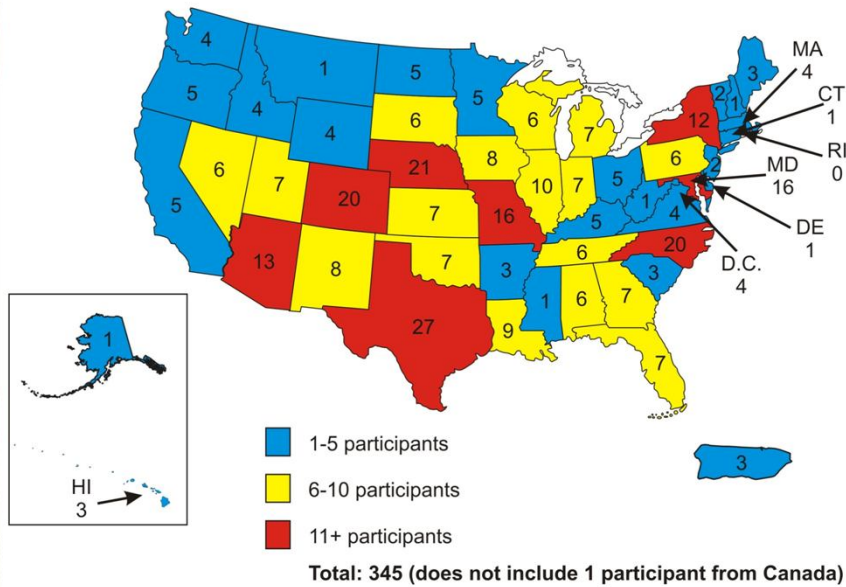
- Local NWS & USDA/NRCS Offices
- State Climate Offices
- State Drought Task Forces
- Regional Climate Centers



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)



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**



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U.S. Drought Monitor Map

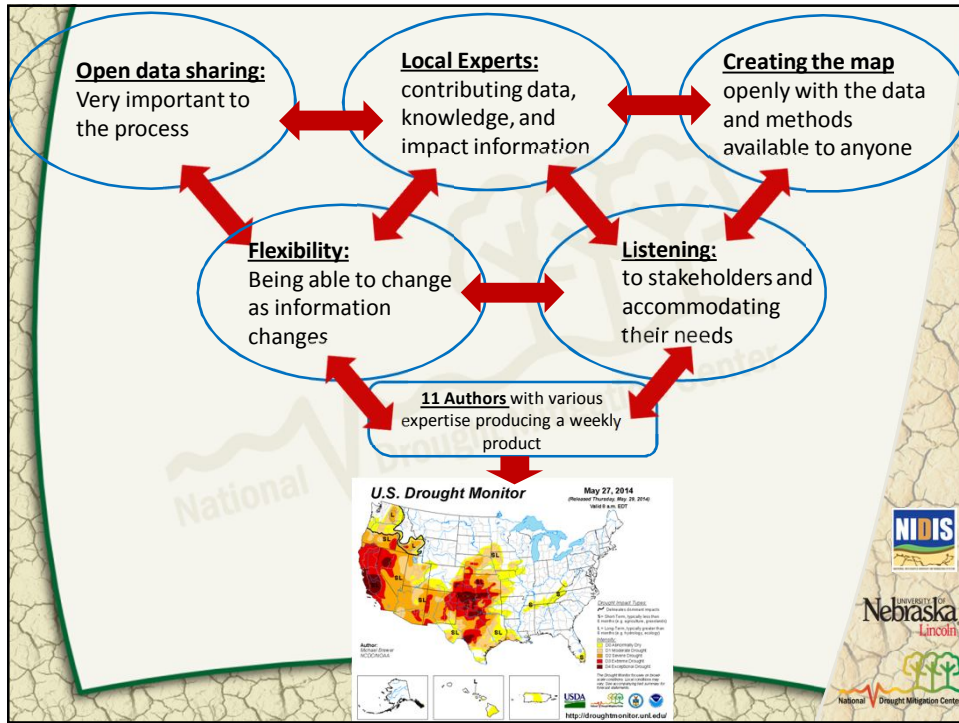
Drought Intensity Categories

- | | |
|---|--|
|  | 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) |



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Drought Impact Information

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

Total Impacts All States			
Category	Count	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		

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phone: (402) 472-6707 | fax: (402) 472-2946 | Contact Us

Logos: NIDIS, University of Nebraska Lincoln, National Drought Mitigation Center

Citizens Providing Impact Information

Impacts | California
06-04-2013 - 06-04-2014
Page 1 of 5

Duration: 12-03-2013 - 05-07-2014

Tuolumne County, California, water restrictions, can't water lawns, trees dying

Duration: 04-01-2014 - 05-07-2014

Affected Areas
Tuolumne County

Description
County wide utility district announced major cut backs of 40%. Residents can't water lawns this summer. Increased tree mortality in Stanislaus National Forest. CoCoRaHS Report from Station #Tuolumne City 2.0 N on 5/7/2014

Associated Reports
CoCoRaHS Report from Station #Tuolumne City 2.0 N on 5/7/2014

Midpines, California, trees dying, rancher forced to sell cattle due to reduced grass growth

Total Impacts | All States

Category	Count
Agriculture	144
Energy	5
Plants & Wildlife	151
Society & Public Health	29
Water Supply & Quality	83

Report Source

Media	4
CoCoRaHS	216

Citizens Providing Data

CoCoRaHS COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK
"Because every drop counts"

Home | States | View Data | Maps | My Data Entry | Login

<http://www.cocorahs.org/>

Take the CoCoRaHS Spring Survey
"EVERY OPINION COUNTS!"
ONLINE: MAY - JUNE 2014

7,535 daily precipitation reports received today as of 6/4/2014 12:52 PM EDT

Daily Precipitation (inches x.xx)
USA
6/4/2014

Trace
0.00 - 0.24
0.25 - 0.49
0.50 - 0.99
1.00 - 1.99
2.00 - 3.99
4.00 - 8.00

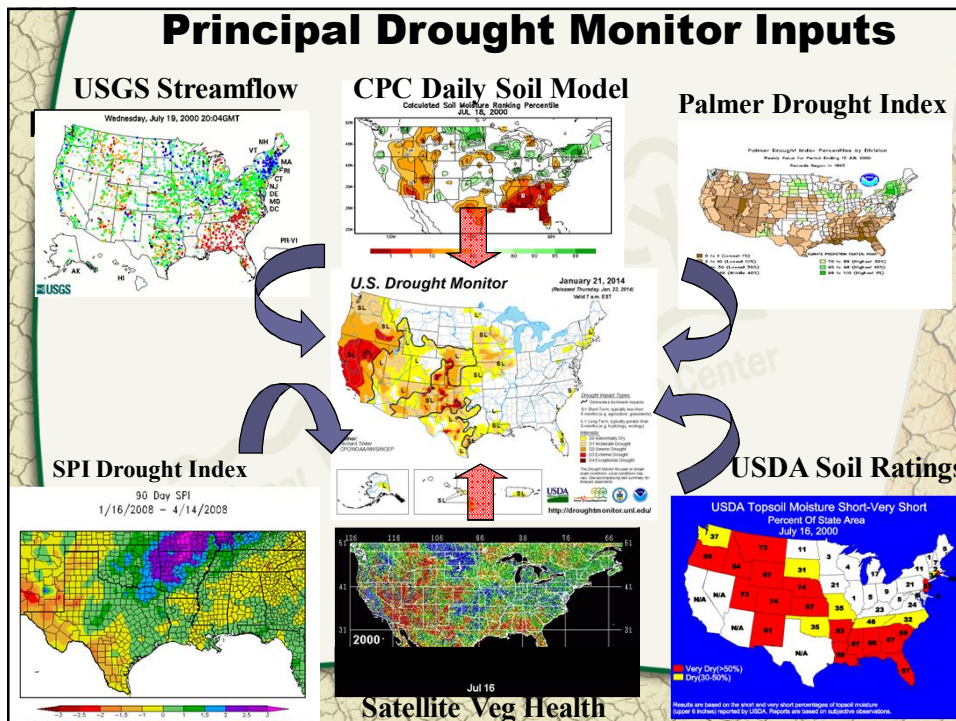
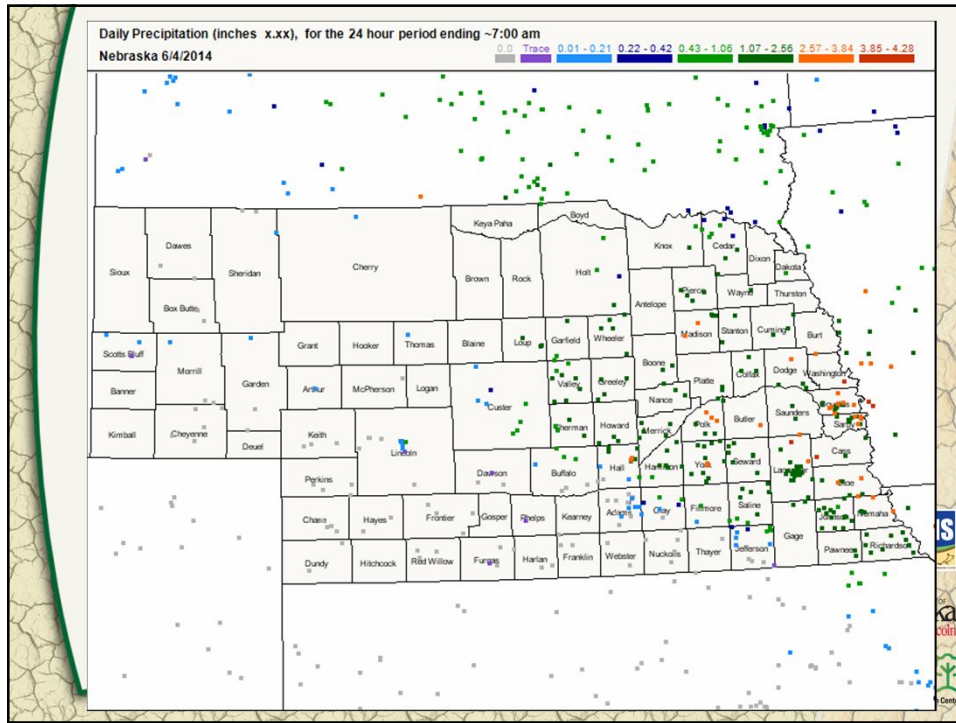
Things to know about...

- Rain
- Hail
- Snow

CoCoRaHS WxTalk Webinar Series

Purchase an official CoCoRaHS® Rain Gauge
"The official CoCoRaHS Rain Gauge supplier"

WEATHERYOURWAY.COM
Fast, friendly service from a meteorologist and fellow CoCoRaHS Observer



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

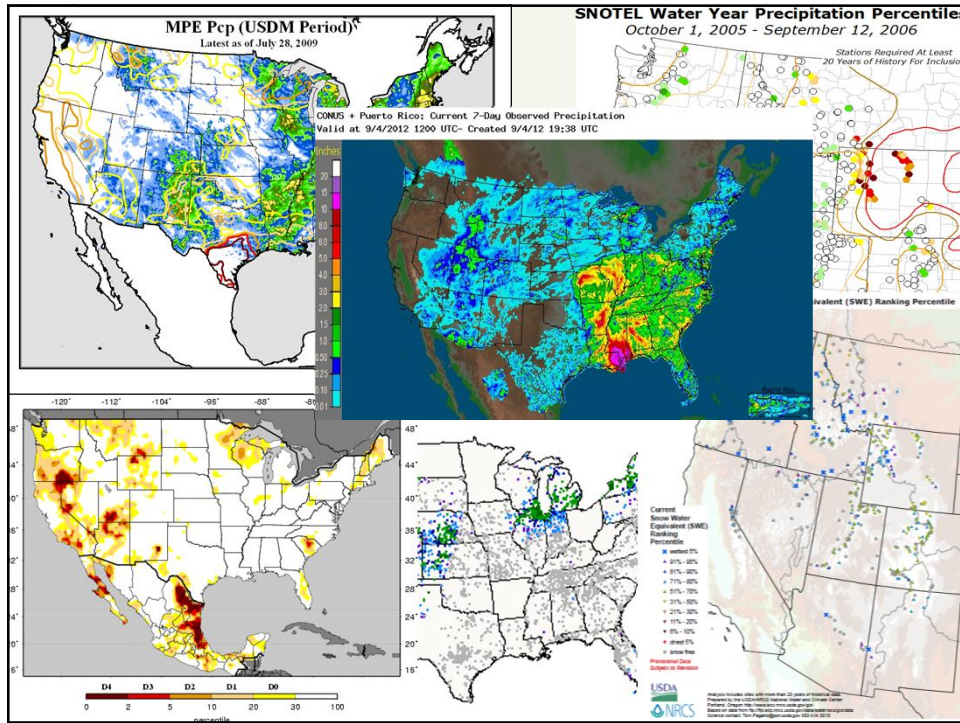
Created in ArcGIS

August 28, 2012 Drought Monitor & September 04, 2012 Streamflow Percentiles

August 28, 2012 Drought Monitor & Ensuing 6-Day Precipitation (*)

CPC 3-Month SPI
As of: Tuesday, September 11, 2012

2012 Vegetation Drought Response Index (VegDRI)



droughtmonitor.unl.edu

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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

USDA **NOAA** **NWS** **NCEP**

<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.](#)

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

US Drought Monitor Map Archive

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Data Archive
Current Conditions
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What's New
About USDM
FAQ
Links
Maps and Data Services

United States Drought Monitor

Home > Data Archive

U.S. Drought Monitor Data Archive

Contiguous U.S. Drought Severity

D0 - Abnormally Dry
 D1 Drought - Moderate

D2 Drought - Severe
 D3 Drought - Extreme

D4 Drought - Exceptional

January 21, 2014

January 22, 2013

US Drought Monitor Data Archive

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Maps And Data
Supplemental Info
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USDM News
Update Bookmarks

United States Drought Monitor

Home > Maps And Data > GIS Data

GIS Data Archive

Contact for GIS Data Requests

For more information regarding the Drought Monitor datasets, please contact Brian Fuchs at the NDMC via [e-mail](mailto:brian.fuchs@ndmc.gov)

For those individuals interested in obtaining DM data for a period of time longer than a few weeks, please [e-mail](mailto:brian.fuchs@ndmc.gov) your request to Brian Fuchs. Include the date range, for example 2005-2009, and the state or county names. We will make every effort to respond to your request as soon as possible.

All the data associated with the US Drought Monitor is available freely to the public.

Current Drought Monitor Files **Metadata**

Continued Shapefiles
KMZ
WMS

Shapefiles
KML Files
GML Files
OGC WMS Files
Excel Files
GML Colors

Please cite the Drought Monitor by including the National Drought Mitigation Center (NDMC), the U.S. Department of Agriculture (USDA) and the National Oceanic and Atmospheric Administration (NOAA).

Data

Download all Drought Monitor shapefiles for **2014**

Date	KMZ	Shapefiles	GML	WMS	Statistics
2014-06-03	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-05-27	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-05-20	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-05-13	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-05-06	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-04-29	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-04-22	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-04-15	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-04-08	KMZ	SHP Impacts	GML	WMS	U.S. State County
2014-04-01	KMZ	SHP Impacts	GML	WMS	U.S. State County

*The National Drought Mitigation Center's
Drought Risk Atlas*

Brian Fuchs
Mark Svoboda
Chris Poulsen
Jeff Nothwehr

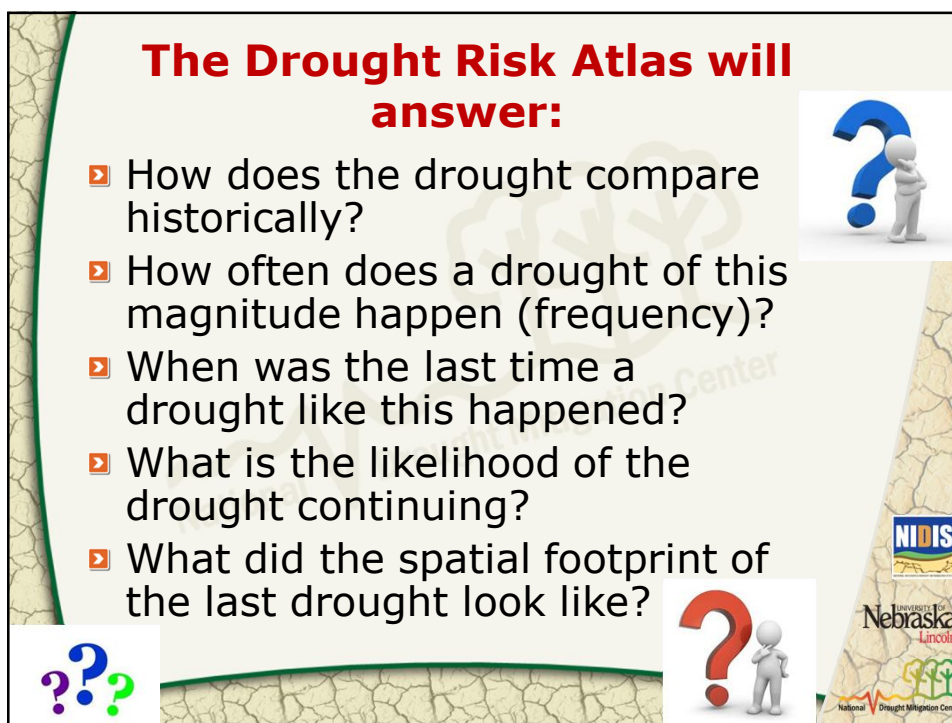
National Drought Mitigation Center
School of Natural Resources
University of Nebraska-Lincoln

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

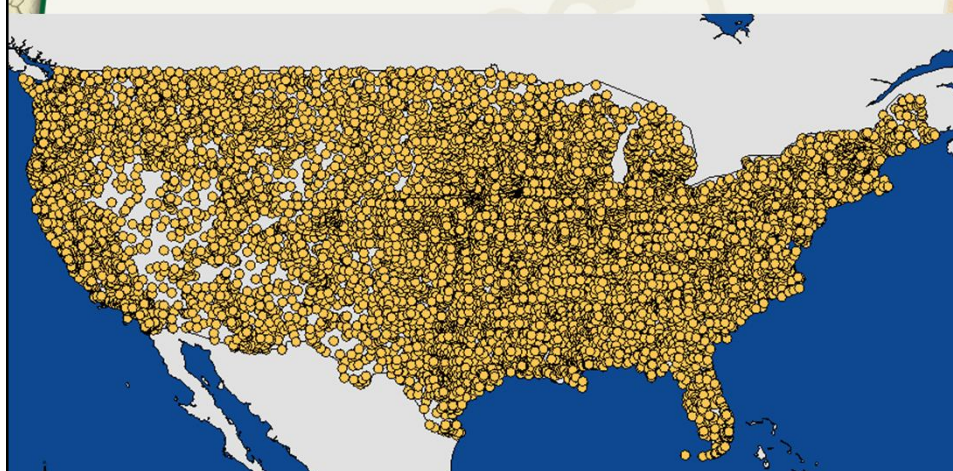
- ▣ Using the best, most complete, long-term weather stations from the COOP network.
- ▣ Calculating the climatology and various drought indices (SPI, SPEI, Deciles, PDSI, SC-PDSI, Drought Monitor) for each station.
- ▣ Providing the data for various time steps (weekly, monthly, annually)
- ▣ Gridded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



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Over 12,000 Cooperative Observing
Network Stations (COOP)



COOPERATIVE OBSERVERS' METEOROLOGICAL RECORD

Month of Feb, 1933; Station, HAGGREN; County, Cherokee
 State, Ill; Latitude, 32°37'; Longitude, 84°24'; Time used on this form, Station

DATE	TEMPERATURE			PRECIPITATION				CHARACTER OF WIND	MISCELLANEOUS PHENOMENA
	MAX. WIND	MIN. WIND	WIND	AMOUNT	DEPTH OF SNOW	DEPTH OF FOG	DEPTH OF RAIN		
1									
2	16	2	26				8.10	Clear	
3	17	2	22				11.10	Clear	
4	21	5	23				11.5	Clear	
5	23	3	32				11.10	Clear	
6	25	3	37				11.10	Cloudy	
7	20	3	38				8.10	Clear	
8	10	1	10				8.10	Cloudy	
9	34	-10	10				11.5	Cloudy	
10	12	-2	11				11	Clear	
11	7	5	5				11	Clear	
12	5	13	13				1.67	Clear	
13	13	18	18				11	Clear	
14	18	24	24				8.10	Cloudy	
15	20	35	35				8.10	Clear	
16	19	19	19				11	Clear	
17	18	24	24				8.5	Cloudy	
18	18	26	26				8.10	Clear	
19	22	34	34				3.10	Clear	
20	25	34	34				3.10	Cloudy	
21	20	30	30				11	Clear	
22	12	24	24				8	Clear	
23	24	25	25				8	Clear	
24	23	23	23				8	Clear	
25	22	28	28				8.5	Cloudy	
26	22	28	28				8.5	Cloudy	
27	25	31	31				8.5	Cloudy	
28	25	31	31				8.5	Cloudy	
29	25	31	31				8.5	Cloudy	
30	25	34	34				8.5	Cloudy	
31	25	34	34				8.5	Cloudy	
32	25	34	34				8.5	Cloudy	
33	25	34	34				8.5	Cloudy	
34	25	34	34				8.5	Cloudy	
35	25	34	34				8.5	Cloudy	
36	25	34	34				8.5	Cloudy	
37	25	34	34				8.5	Cloudy	
38	25	34	34				8.5	Cloudy	
39	25	34	34				8.5	Cloudy	
40	25	34	34				8.5	Cloudy	
41	25	34	34				8.5	Cloudy	
42	25	34	34				8.5	Cloudy	
43	25	34	34				8.5	Cloudy	
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45	25	34	34				8.5	Cloudy	
46	25	34	34				8.5	Cloudy	
47	25	34	34				8.5	Cloudy	
48	25	34	34				8.5	Cloudy	
49	25	34	34				8.5	Cloudy	
50	25	34	34				8.5	Cloudy	
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59	25	34	34				8.5	Cloudy	
60	25	34	34				8.5	Cloudy	
61	25	34	34				8.5	Cloudy	
62	25	34	34				8.5	Cloudy	
63	25	34	34				8.5	Cloudy	
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85	25	34	34				8.5	Cloudy	
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95	25	34	34				8.5	Cloudy	
96	25	34	34				8.5	Cloudy	
97	25	34	34				8.5	Cloudy	
98	25	34	34				8.5	Cloudy	
99	25	34	34				8.5	Cloudy	
100	25	34	34				8.5	Cloudy	

Mean maximum 55.6
 Mean minimum 17.6
 Mean 36.6
 Maximum 76 date 24
 Minimum -34 date 8
 Greatest daily range 54

PRECIPITATION
 Total 0.44 inches; greatest in 24 hours 0.18
 Date 25

SNOW
 Total snowfall 3.0 inches
 On ground 1st 0 inches
 At end of month 0 inches

NUMBER OF DAYS
 With .01 inch or more precipitation 3
 Clear 17; partly cloudy 6
 Cloudy 5


REMARKS:
W. B. Haggren, Cooperative Observer.

IN TRIPLICATE: See cover for instructions.


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



Ho

f b t w

Stations used in the Drought Risk Atlas

Welcome

Introduction

The idea of the atlas comes from the original work of the United States Army in the 1990s. The Climate Network was established in the 1940s to provide climate data for drought severity indices. The atlas uses this data to make better maps of drought risk. For the new atlas, we have added both the historical data and the most current data available for the entire United States.

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.

- 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%)

es.

t indices. Frequency

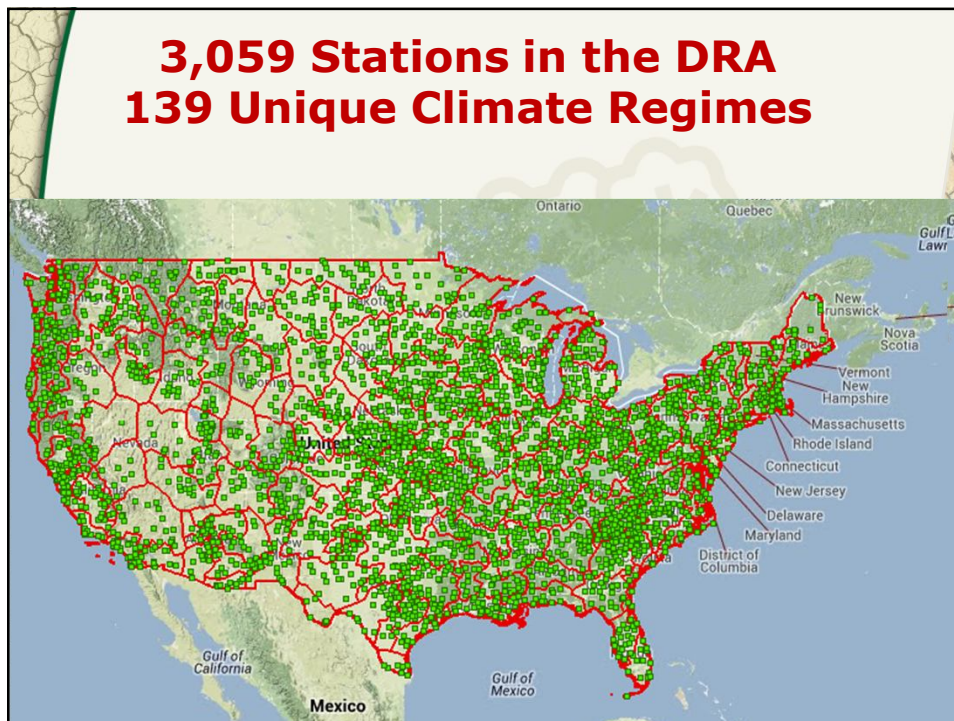
ation and index

ie drought indices

d and who was

Help

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



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

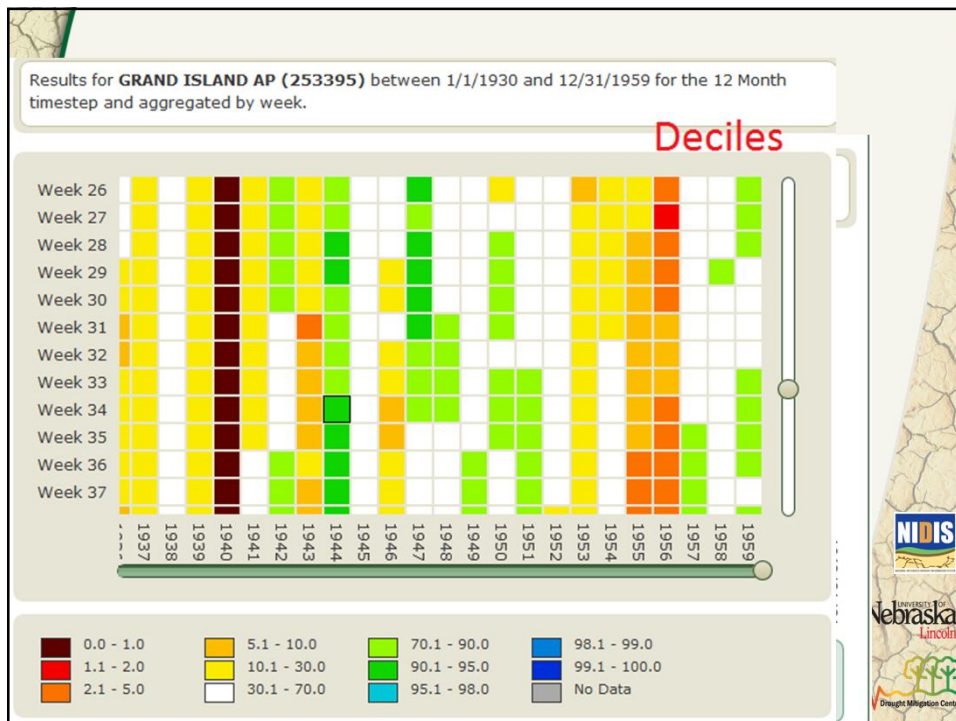
253065: FRIEND 3E

253175: GENEVA

253185: GENOA 2 W

253395: GRAND ISLAND AP

253425: GREELEY



Drought Periods

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

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

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.




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 **Compare Indices** Frequencies

Year

1956

Station start date: 1/1/1908

Index

SPI

SPEI

PDSI

Self-calibrated PDSI

Deciles

Timestep

12 Month

Add Index Clear All

Drought Index Comparisons for 253395 (GRAND ISLAND AP).

1956: SPI 12 -2.26 ✖

1956: SPEI 12 -1.89 ✖

1956: PDSI -6.48 ✖




1956: SC-PDSI -3.62 ✖

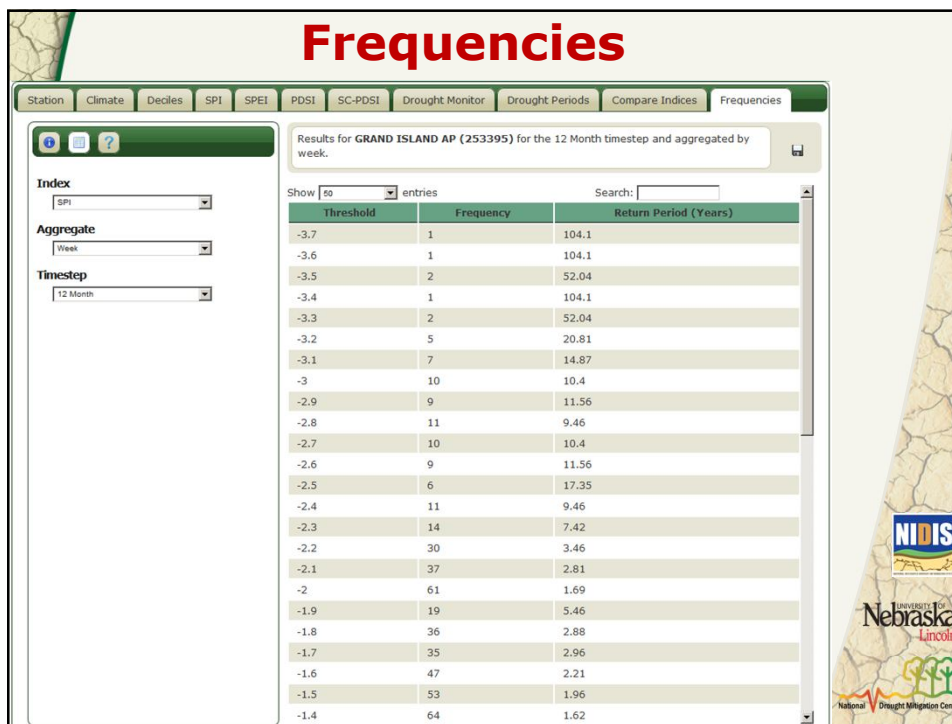
1956: DECILES 12 5.00 ✖

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.



The Drought Atlas: Bringing a great deal 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)

Any Questions ?



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