

TAP
 WATER
 SUPPLY OKLAHOMA DEMAND
 IRRIGATION COMPREHENSIVE INDUSTRIAL
 DOMESTIC WATER PLAN MUNICIPAL
 ENERGY
 ABUNDANT
 ALLOCATION
 RELIABLE
 AGRICULTURE
 ENVIRONMENT
 RECREATION
 MANAGEMENT
 RESEARCH PROVIDERS
 EFFICIENCY QUALITY RECYCLE STREAM WATER
 AVAILABILITY REGIONAL LAKES RESERVOIRS COOPERATION
 PRIORITIES INFRASTRUCTURE STUDIES DEVELOP
 CONSERVATION drought quantify FUNDING AQUIFER
 STORAGE STREAMFLOW MONITORING NAVIGATION PERMITTING LAW
 EDUCATION INFORMATION RIVERS STREAMS
 TECHNOLOGY Data WATER FOR 2060 RECHARGE ECONOMY USE
 HYDROLOGY PLANNING INNOVATION SOUND POLICY PRECIPITATION

THE FUTURE ON TAP

A
 SAFE
 DEPENDABLE
 WATER
 SUPPLY
 FOR ALL
 OKLAHOMANS

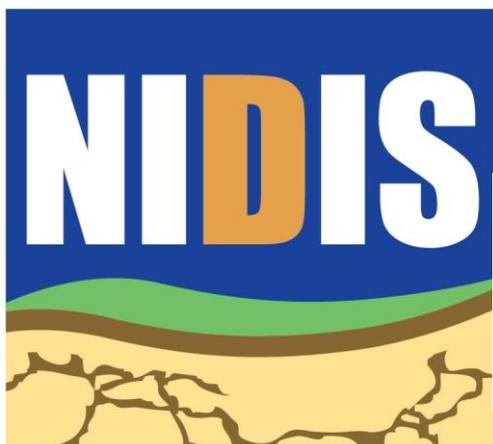
Water for 2060: Preparing for the Next Drought

Drought Outlook, Impacts, and Resources

Veva Deheza

Regional Drought Information Coordinator

NOAA - National Integrated Drought Information System



SCIPP

Southern Climate Impacts Planning Program



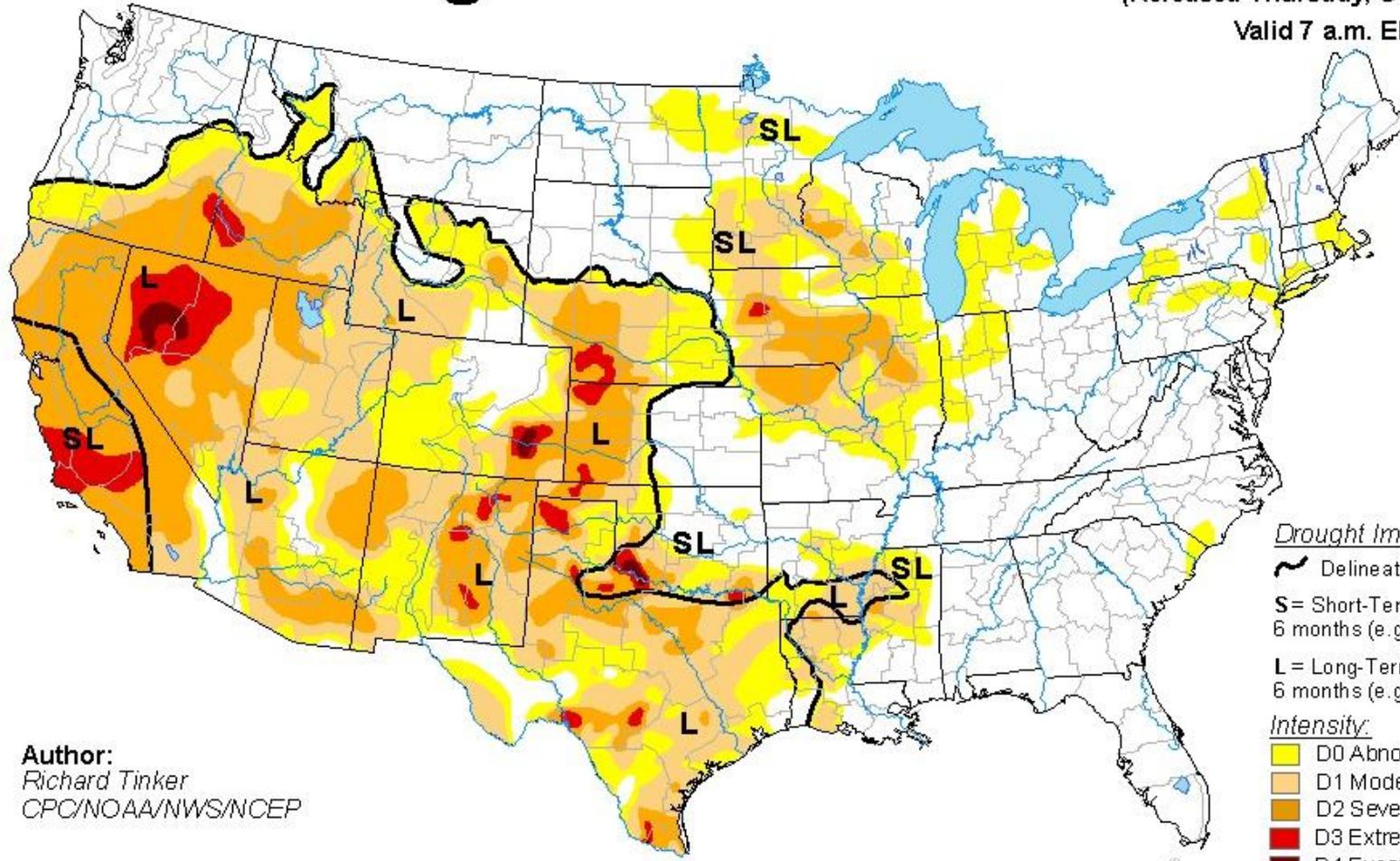
Outline

- Current Conditions and Seasonal Drought Outlook
- Oklahoma's Drought History
- Related concerns highlighted in the forthcoming National Climate Assessment Great Plains chapter*
 - Expected Climate Changes
- Drought Impacts
- Drought Monitoring & Preparedness Resources
- New Opportunities for Drought Research

* The NCA is not yet finalized; the information here is from the DRAFT released for public comment last winter.

U.S. Drought Monitor

October 15, 2013
(Released Thursday, Oct. 17, 2013)
Valid 7 a.m. EDT



Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

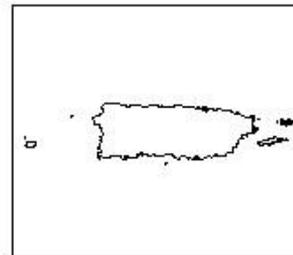
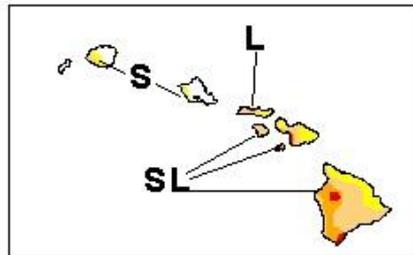
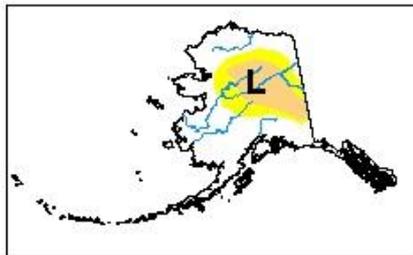
Drought Impact Types:

- 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/>

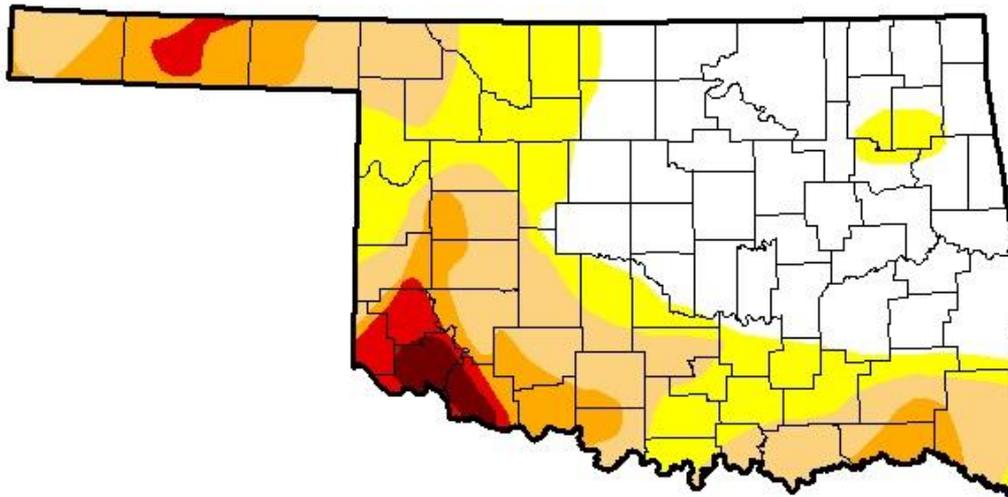
U.S. Drought Monitor

Oklahoma

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Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	41.83	58.17	36.85	14.90	4.42	1.45
Last Week <i>10/8/2013</i>	22.70	77.30	42.81	18.12	4.42	1.45
3 Months Ago <i>7/16/2013</i>	24.92	75.08	59.05	36.18	30.29	4.32
Start of Calendar Year <i>1/1/2013</i>	0.00	100.00	100.00	100.00	94.89	37.06
Start of Water Year <i>10/1/2013</i>	21.74	78.26	43.00	17.62	4.42	1.45
One Year Ago <i>10/16/2012</i>	0.00	100.00	100.00	99.43	66.75	27.13



Intensity:



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

Author:
 Richard Tinker
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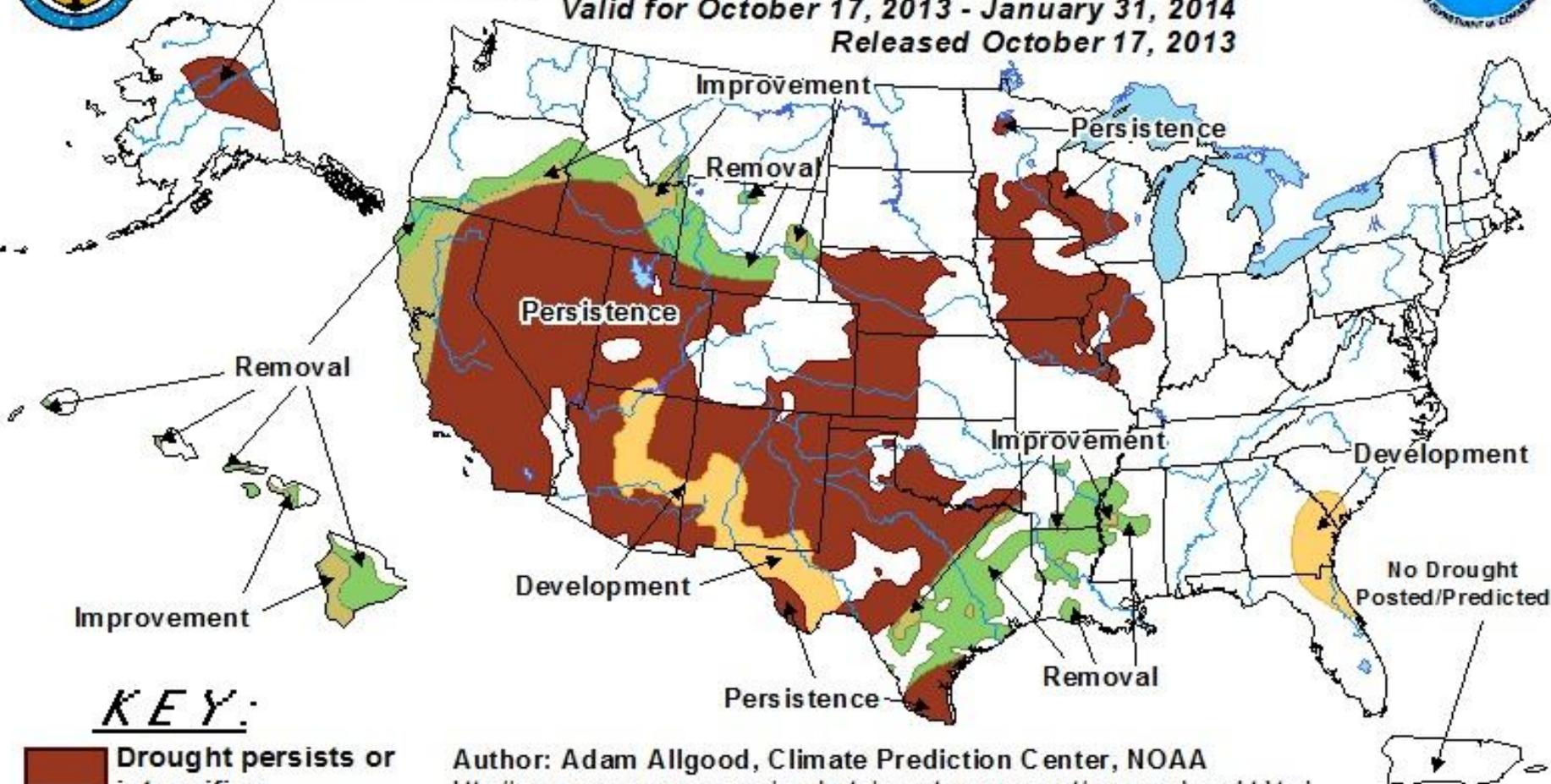
Persistence

U.S. Seasonal Drought Outlook

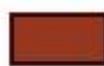
Drought Tendency During the Valid Period

Valid for October 17, 2013 - January 31, 2014

Released October 17, 2013



KEY:

-  Drought persists or intensifies
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

Author: Adam Allgood, Climate Prediction Center, NOAA

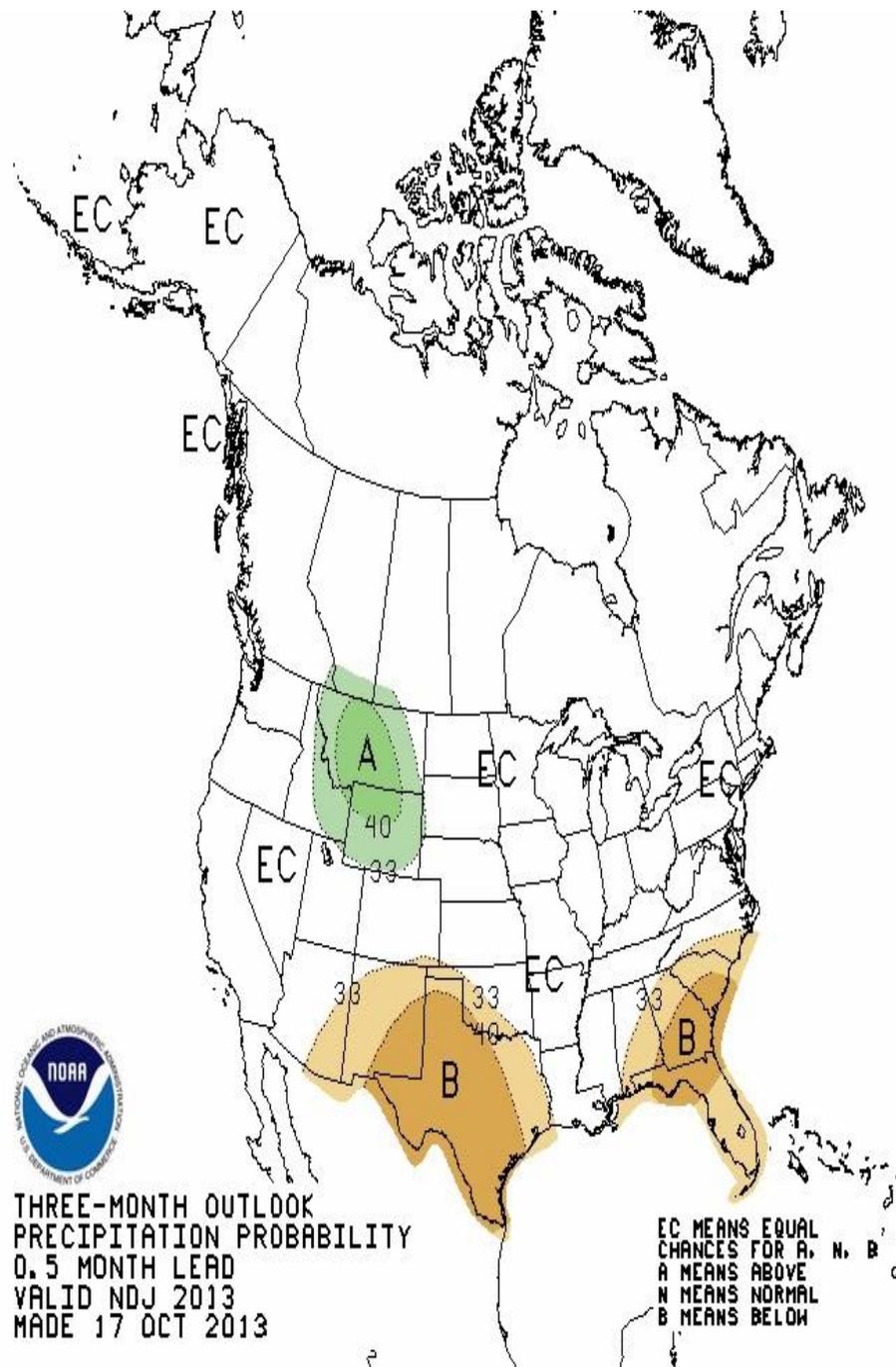
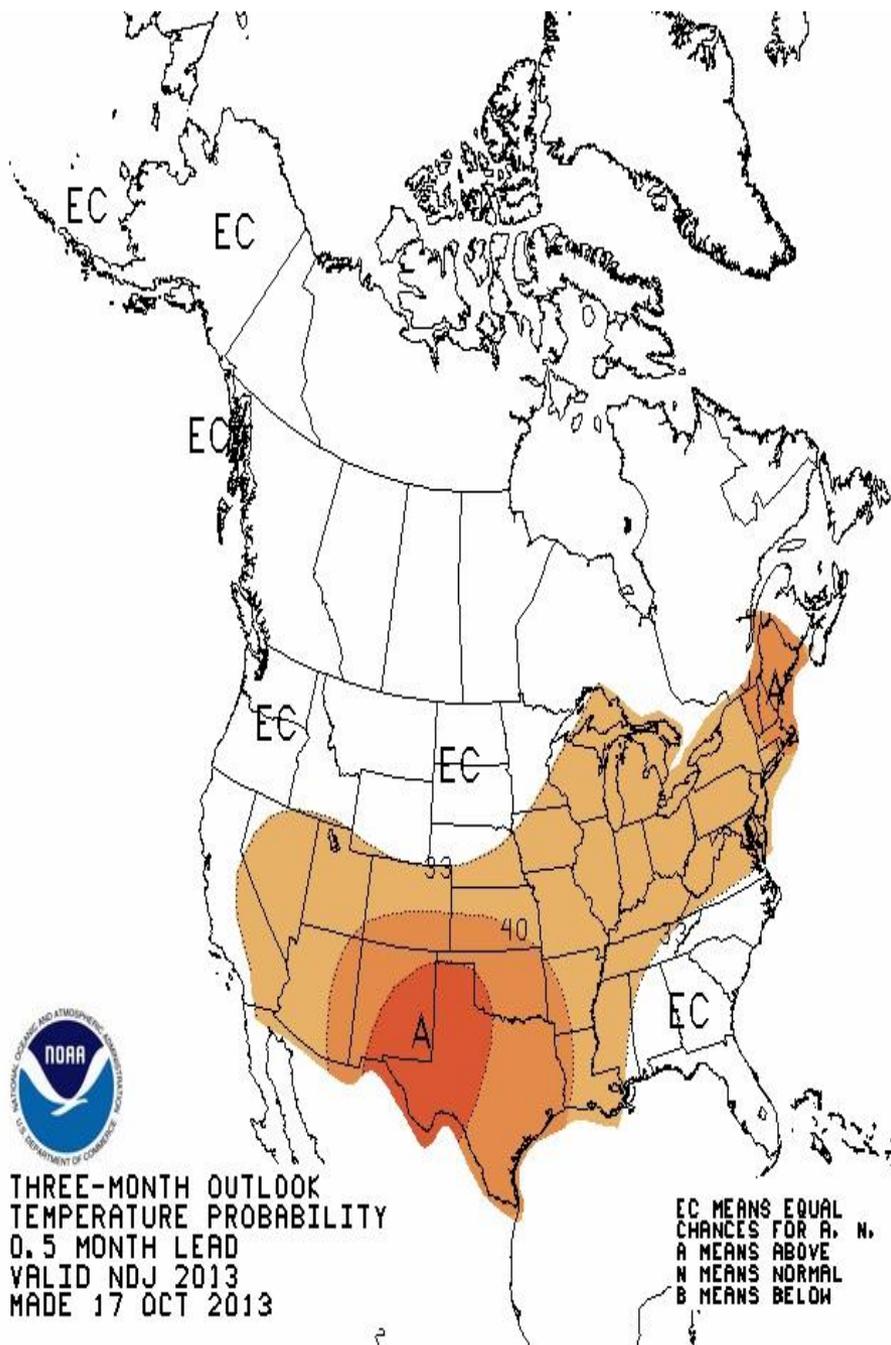
http://www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.html

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events – such as individual storms – cannot be accurately forecast more than a few days in advance. Use caution for applications – such as crops – that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity).

For weekly drought updates, see the latest U.S. Drought Monitor.

NOTE: The tan area areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain.

The Green areas imply drought removal by the end of the period (D0 or none)

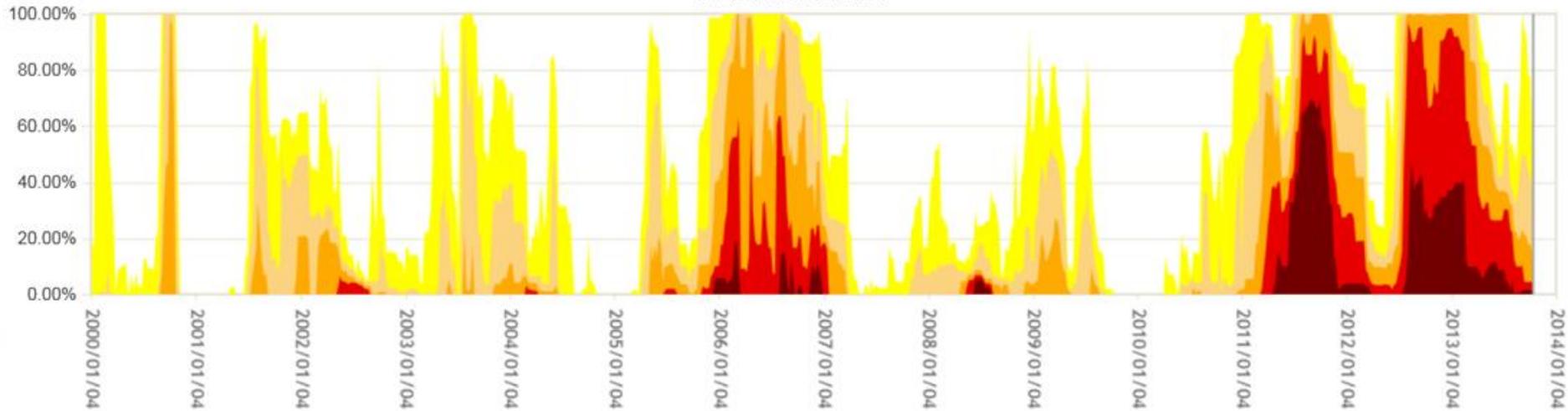


Statistics

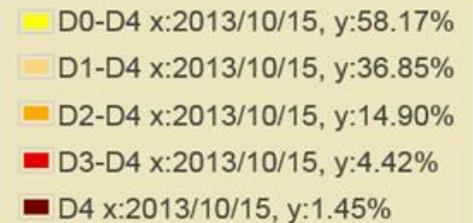
Time Series

Narrative

Oklahoma Percent Area



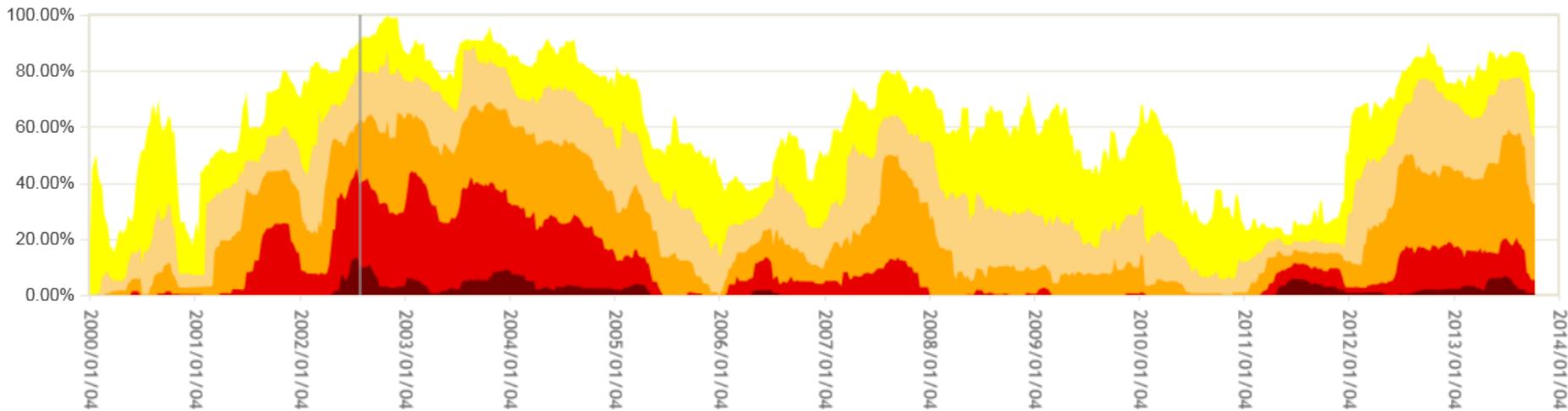
To zoom in, click and drag the cursor. To return to the full time series, double-click anywhere in the chart.



The National Drought Mitigation Center | 3310 Holdrege Street | P.O. Box 830988 | Lincoln, NE 68583-0988
phone: (402) 472-6707 | fax: (402) 472-2946 | [Contact Us](#)



West Percent Area



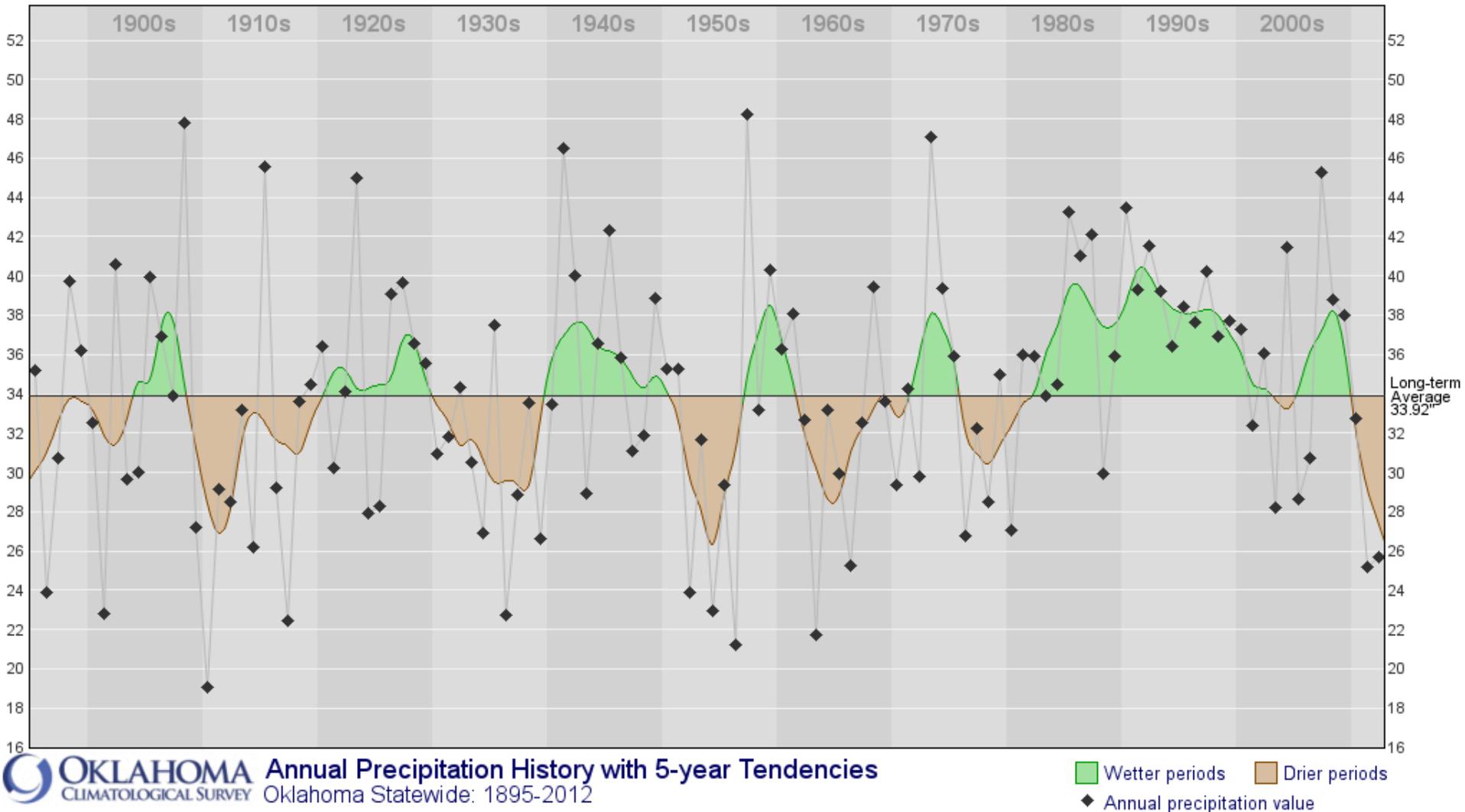
To zoom in, click and drag the cursor. To return to the full time series, double-click anywhere in the chart.

- D0-D4 x:2002/07/23, y:89.48%
- D1-D4 x:2002/07/23, y:79.32%
- D2-D4 x:2002/07/23, y:60.90%
- D3-D4 x:2002/07/23, y:45.26%
- D4 x:2002/07/23, y:13.63%

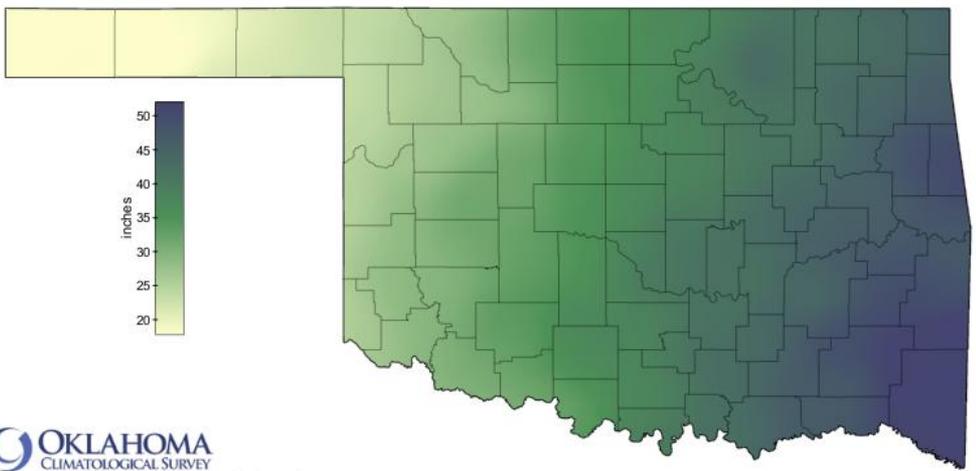
The National Drought Mitigation Center | 3310 Holdrege Street | P.O. Box 830988 | Lincoln, NE 68583-0988
 phone: [\(402\) 472-6707](tel:4024726707) | fax: (402) 472-2946 | [Contact Us](#)



Oklahoma's Drought History



Most Rainfall in Western Oklahoma is Evaporated

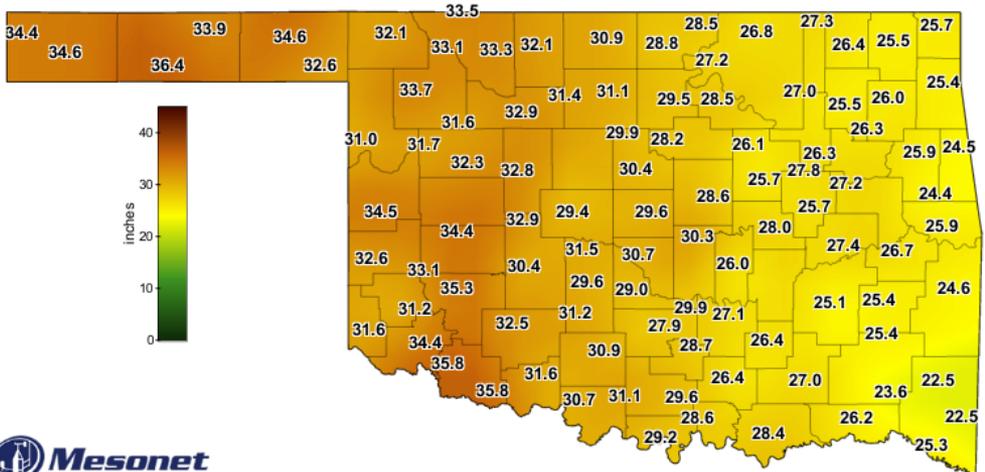


Normal Annual Precipitation,
1981-2010

OKLAHOMA
CLIMATOLOGICAL SURVEY
Normal Annual Precipitation

1981-2010
Calculated using normal data provided by NCDC. Created 3:48:35 PM September 27, 2012 CDT. © Copyright 2012

Total Evaporation, Summer
2003-2012



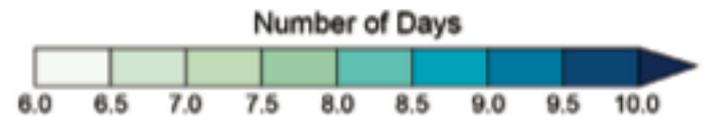
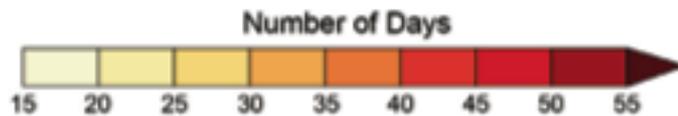
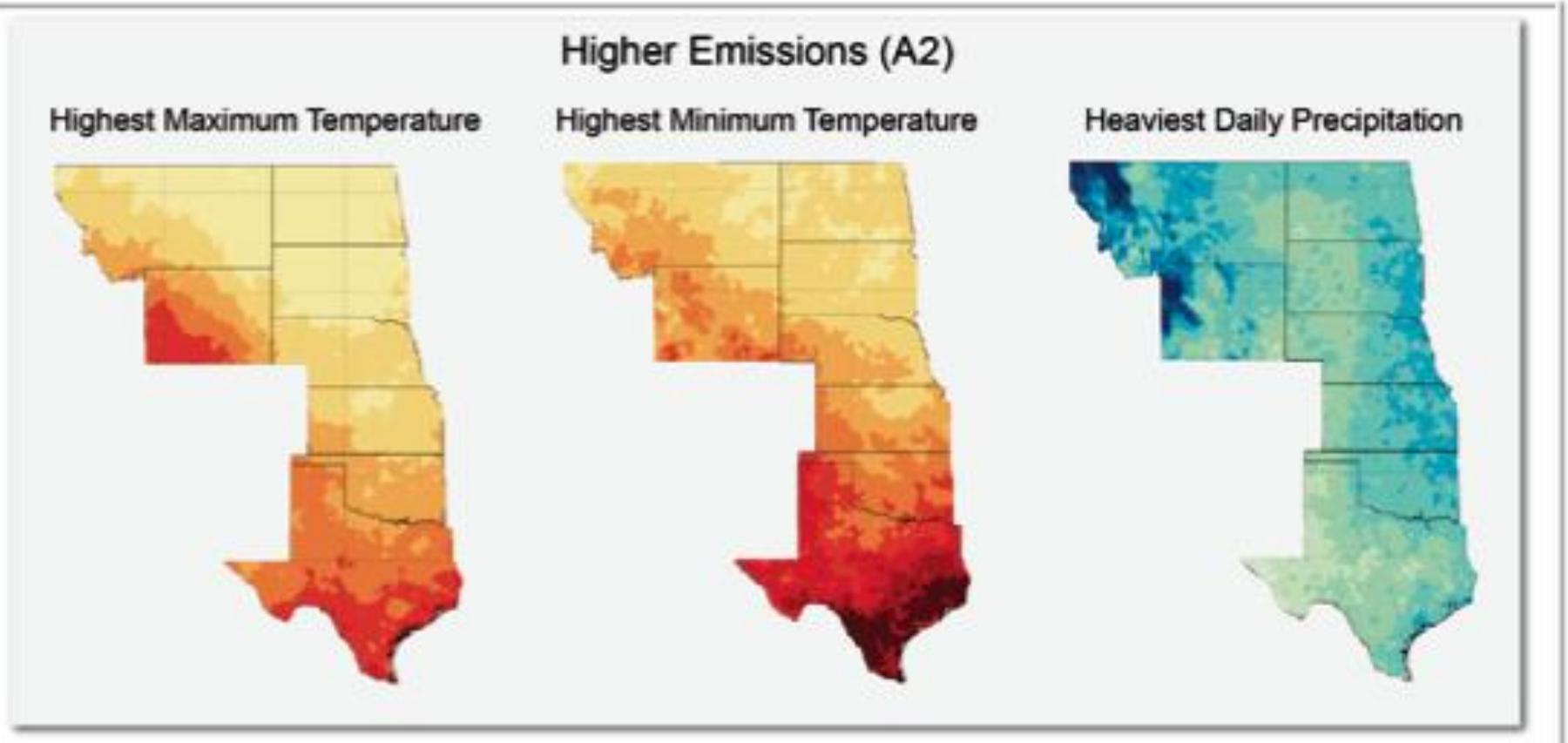
Mesonet
Total Evaporation

Summer 2003-2012
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Expected Climate Changes

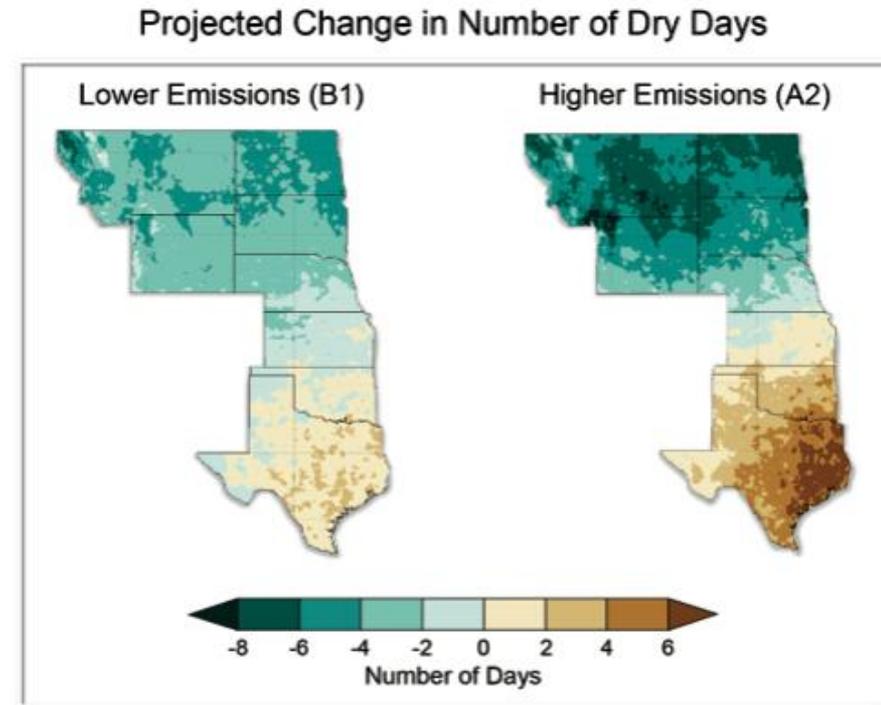
- Wetter in the northern Plains, drier in the southern Plains
- More frequent and intense droughts, severe rainfall events, heat waves
 - Driven by higher evapotranspiration rates
- What we see as a hot week now will become a hot month
 - Annual average of about 7 days over 102 degrees; projected to become 35-40 days by mid-century
- Frost-free season extended average 24 days by mid-century
 - More over-wintering pests
 - Shorter grazing time on winter wheat

Changes in extremes



Climate Change = More Dry Days

- “Current regional trends of a drier south and wetter north are projected to become more pronounced, compared to observed 1971 to 2000 averages”
 - National Climate Assessment (2013)

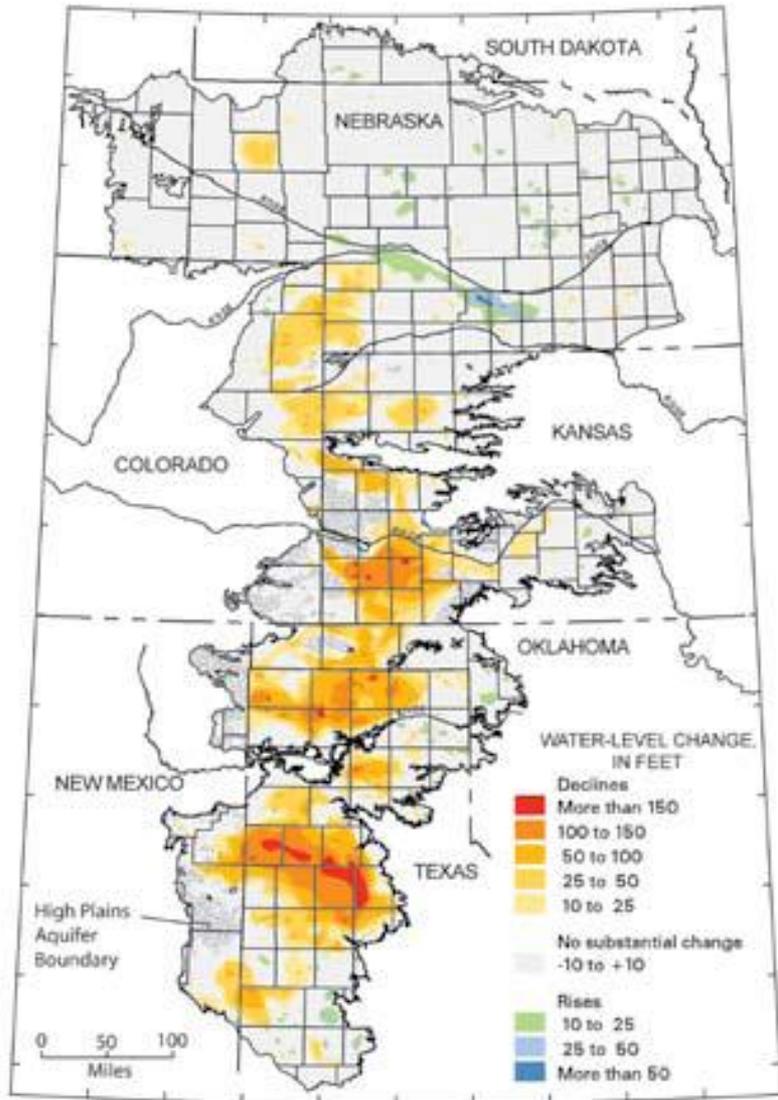


Projected change in number of consecutive days with precipitation less than 0.1 inch

Key Messages (Great Plains)

- Rising temperatures are leading to increased demand for water and energy. In parts of the region, this will constrain development, stress natural resources, and increase competition for water among communities, agriculture, energy production, and ecological needs.
- Changes to crop growth cycles due to warming winters and alterations in the timing and magnitude of rainfall events are already observed; as these trends continue, they will require new agriculture and livestock management practices.
- Landscape fragmentation is increasing, for example, in the context of energy development activities in the northern Great Plains. A highly fragmented landscape will hinder adaptation of species when climate change alters habitat composition and timing of plant development cycles.
- Communities that are already the most vulnerable to weather and climate extremes will be stressed even further by more frequent extreme events occurring within an already highly variable climate system.
- The magnitude of expected changes will exceed those experienced in the last century. Existing adaptation and planning efforts are inadequate to respond to these projected impacts.

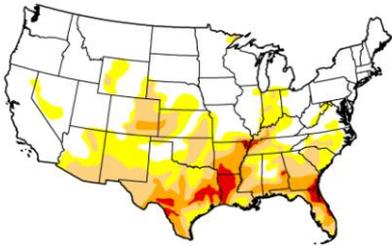
Challenges to Irrigation



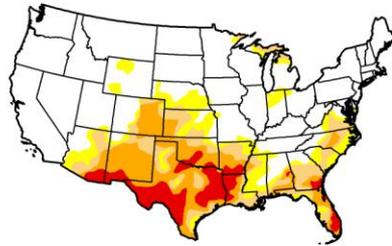
- Little recharge in southern part of High Plains Aquifer
- Irrigation becoming more costly
- Higher evaporation rates deplete surface water supplies
- More competition for water

The 2010 - ? Drought

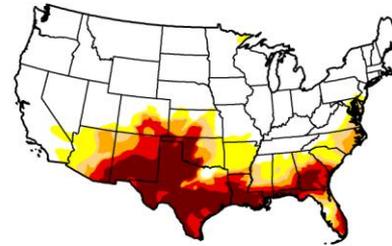
January 2011



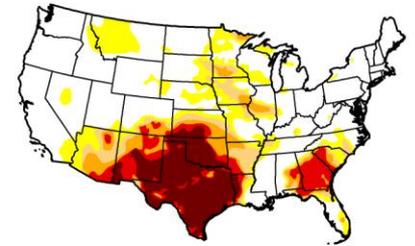
April 2011



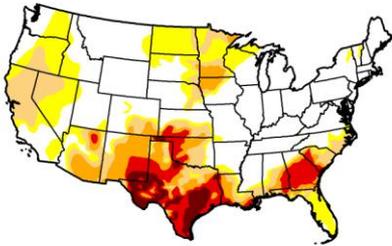
July 2011



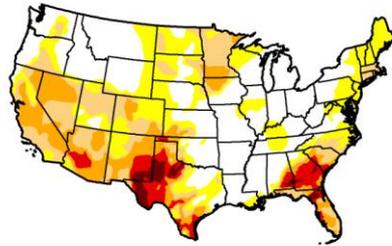
October 2011



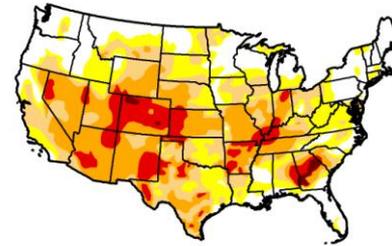
January 2012



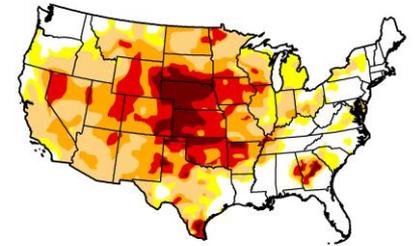
April 2012



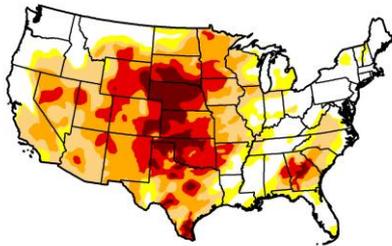
July 2012



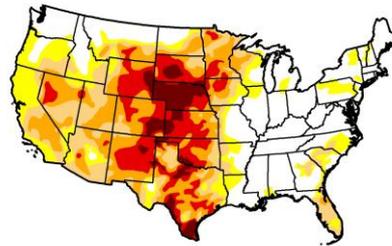
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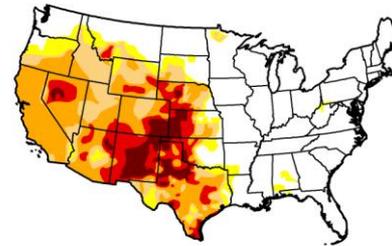
January 2013



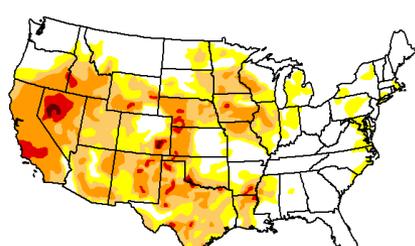
April 2013



July 2013



October 2013



2011 Southern Drought Impacts

- At least \$12B in crop and livestock losses
- Lowest cattle inventory in decades
- Record low water supply
- Most severe wildfires in Texas, New Mexico History
- Infrastructure: cracked pavement, foundations, water main breaks – 700 a day in Houston at peak
- 100-500 million trees killed (Texas Forest Service estimate)
- In Mexico, 2.5M people in 1,500 communities lacked drinking water

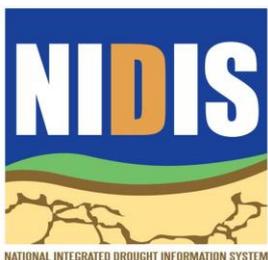
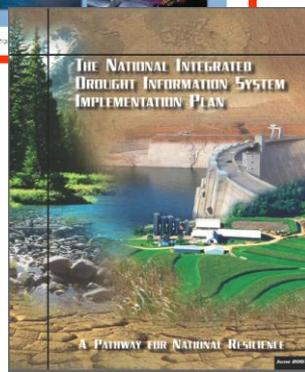
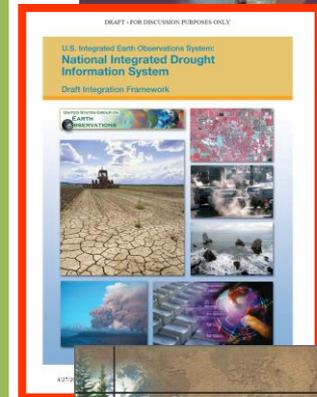
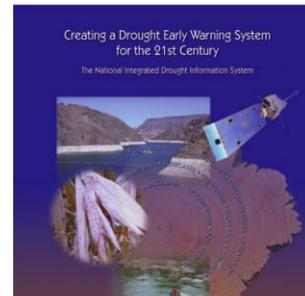
National Integrated Drought Information System

2000-2004 drought in the Colorado Basin

“No systematic collection and analysis of social, environmental, and economic data focused on the impacts of drought within the United States exists today” Western Governors Association 2004

The NIDIS Act of 2006 (Public Law 109-430)

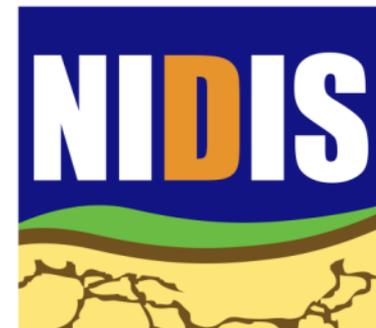
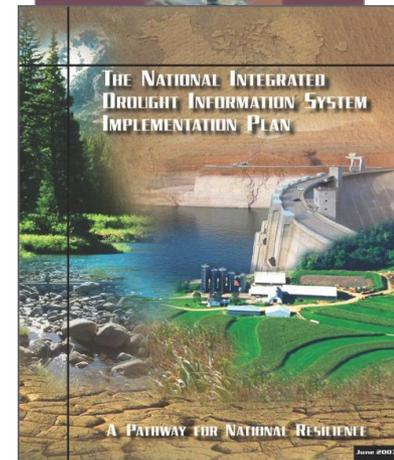
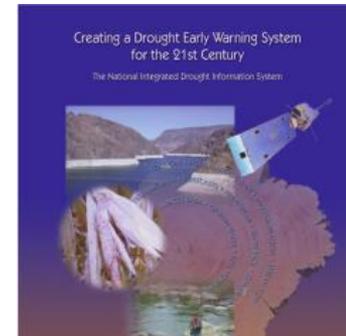
“Enable the Nation to move from a reactive to a more proactive approach to managing drought risks and impacts”



What Does NIDIS Do?

NIDIS shall provide an effective drought early warning system that—

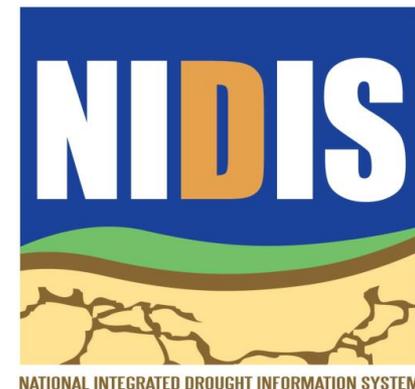
- *collects and integrates information* on the key indicators of drought in order *to make usable, reliable, and timely forecasts* of drought;
- provides such information, forecasts, and assessments on both national and regional levels;
- *communicates* drought forecasts, drought conditions, and drought impacts *on an ongoing basis to decision-makers*;

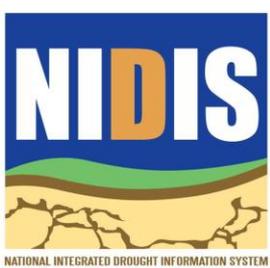


NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

NIDIS

- *provides timely data, information, and products that reflect local, regional, and State differences in drought conditions;*
- *coordinates, and integrates as practicable, Federal research in support of a drought early warning system;*
- *builds upon existing forecasting and assessment programs and partnerships; and*
- *continues ongoing research activities related to drought, including research activities relating to length, severity, and impacts of drought and the role of extreme weather events and climate variability in drought*





**Integrated
Monitoring and
Forecasting**

NRCS, USGS
River Forecast Center, BoR
Climate *Prediction* Center
USDA

NIDIS Technical
Working
Groups

**Interdisciplinary
Needs Assess.,
Research,
Applications**

Regional Integrated Sciences
and Assessments
Regional Climate Centers
NCAR

**Regional Drought
Early
Warning Systems**

**U.S.
Drought Portal**

NCDC
NDMC-NOAA, USGS, USDA,
USBoR

**Public Awareness
And Education**

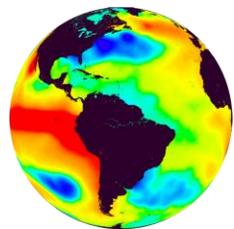
State Climatologists, NWS-
CSD
USDA Extension

**NIDIS
Implementation**

Over 50 Federal, state,
tribal and private
sector representatives
nationally

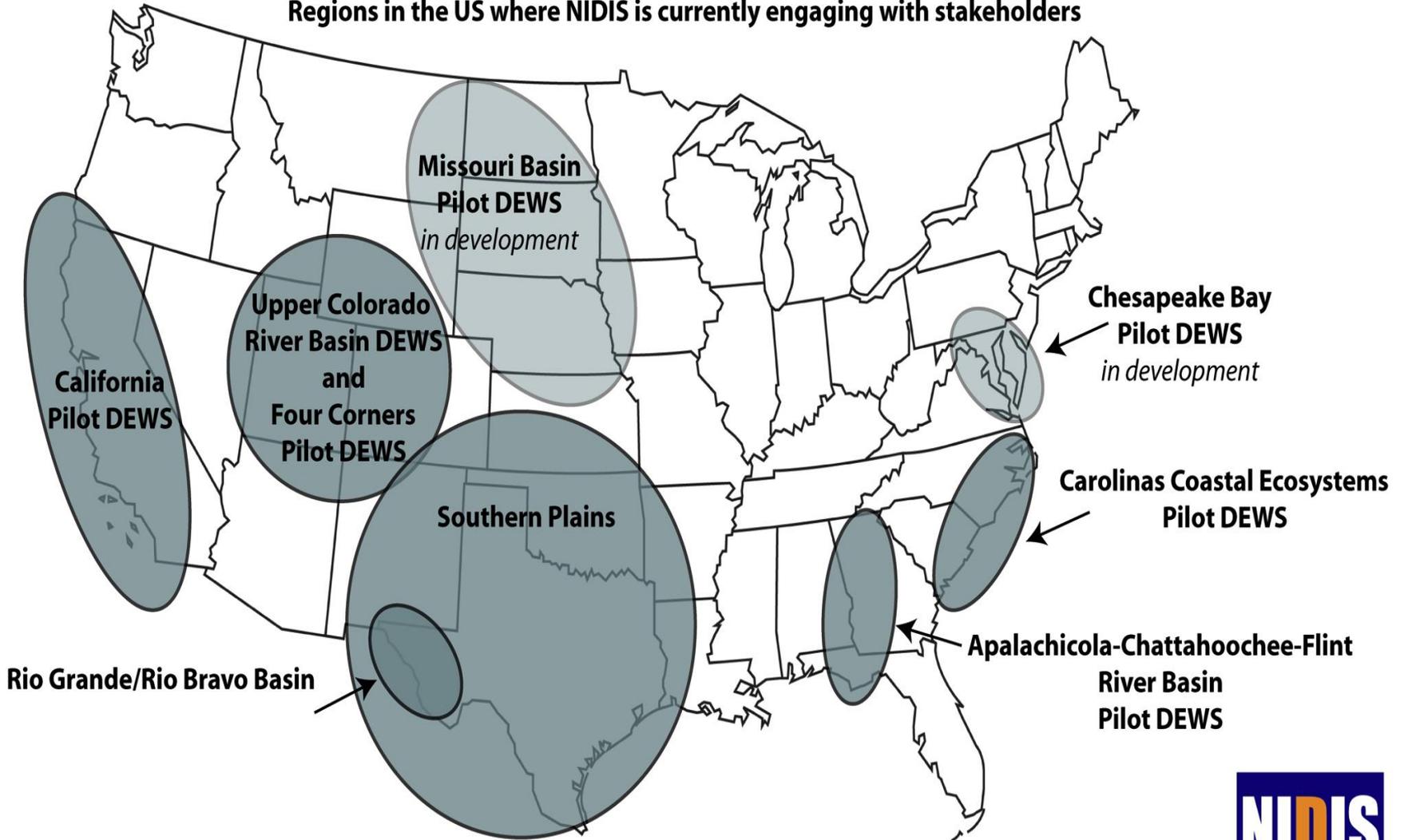
**Engaging
Preparedness
Communities**

NDMC
State and Tribal Offices,
RISAs
US BoR, USACE, Counties



National Integrated Drought Information System (NIDIS)

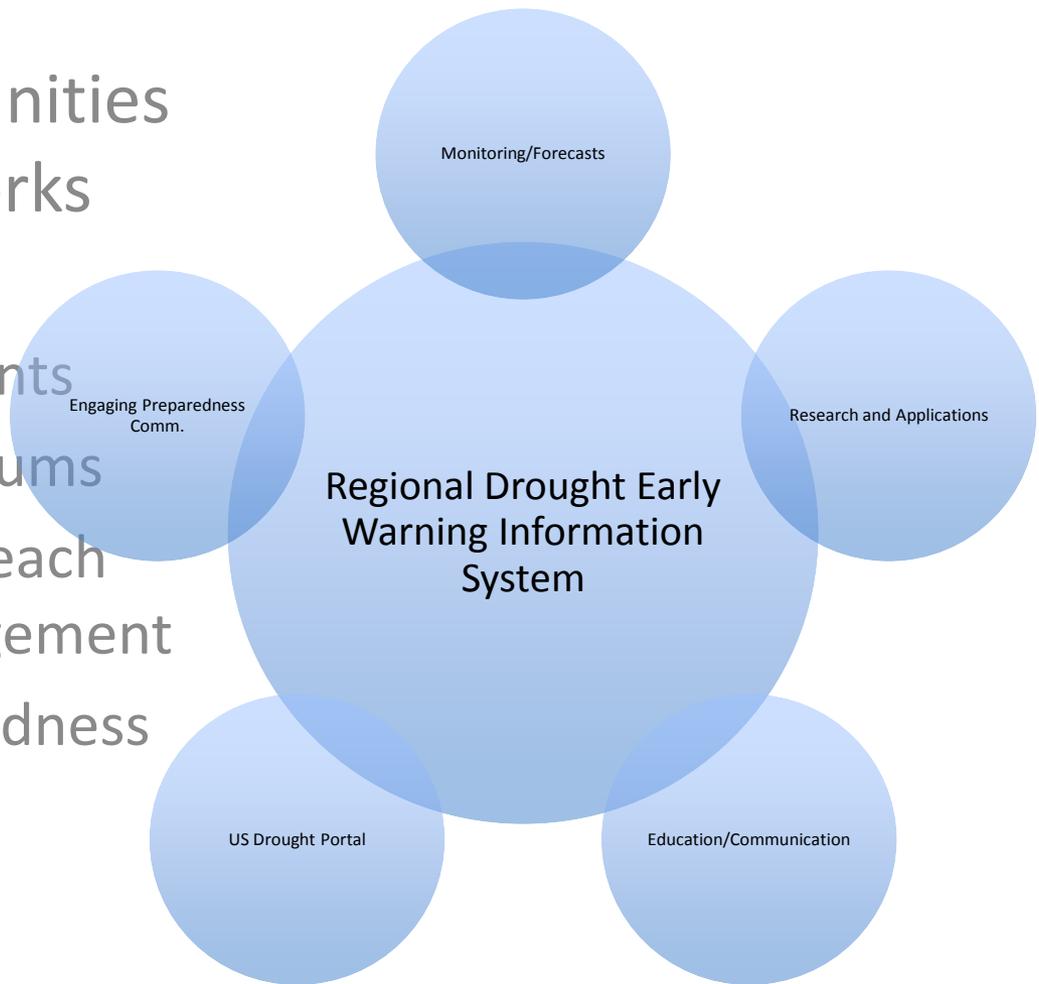
Regions in the US where NIDIS is currently engaging with stakeholders



Regional Drought Early Warning Information Systems

Working with communities and existing networks through:

- Drought assessments
- Climate outlook forums
- Education and outreach webinars – risk management
- Engaging the preparedness community



Water Resources: Federal Partnerships (States, Tribes, Urban, other)

Monitoring & Forecasting



Drought and Flood Impacts Assessments and Scenarios



Information Systems in support of Adaptation

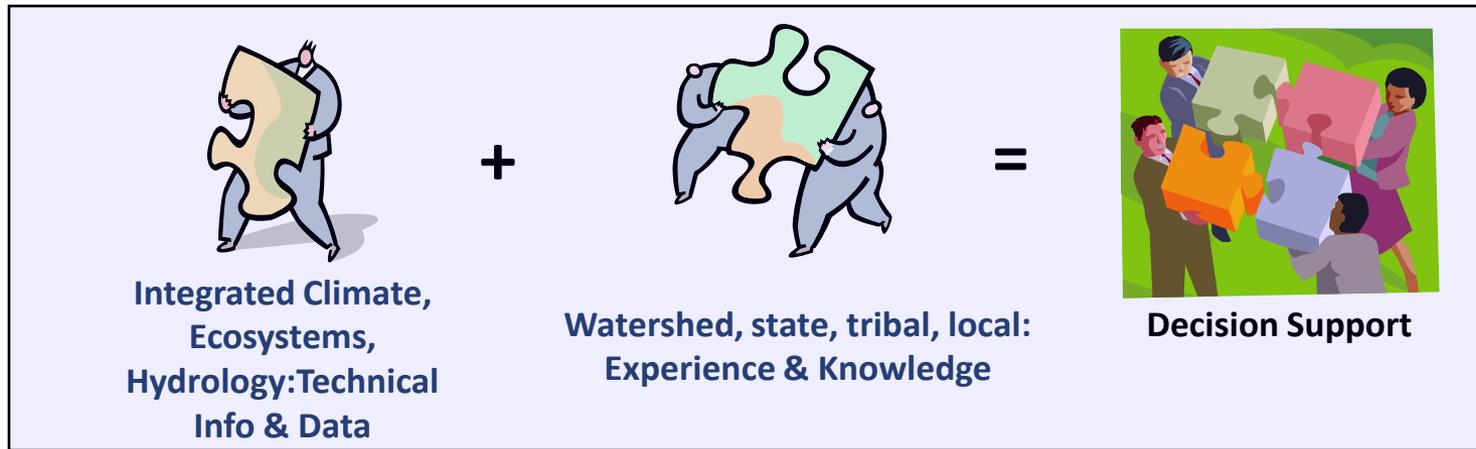
Communication and Outreach



Engaging Preparedness & Adaptation



Moving Beyond Impact Assessments (and Reports)



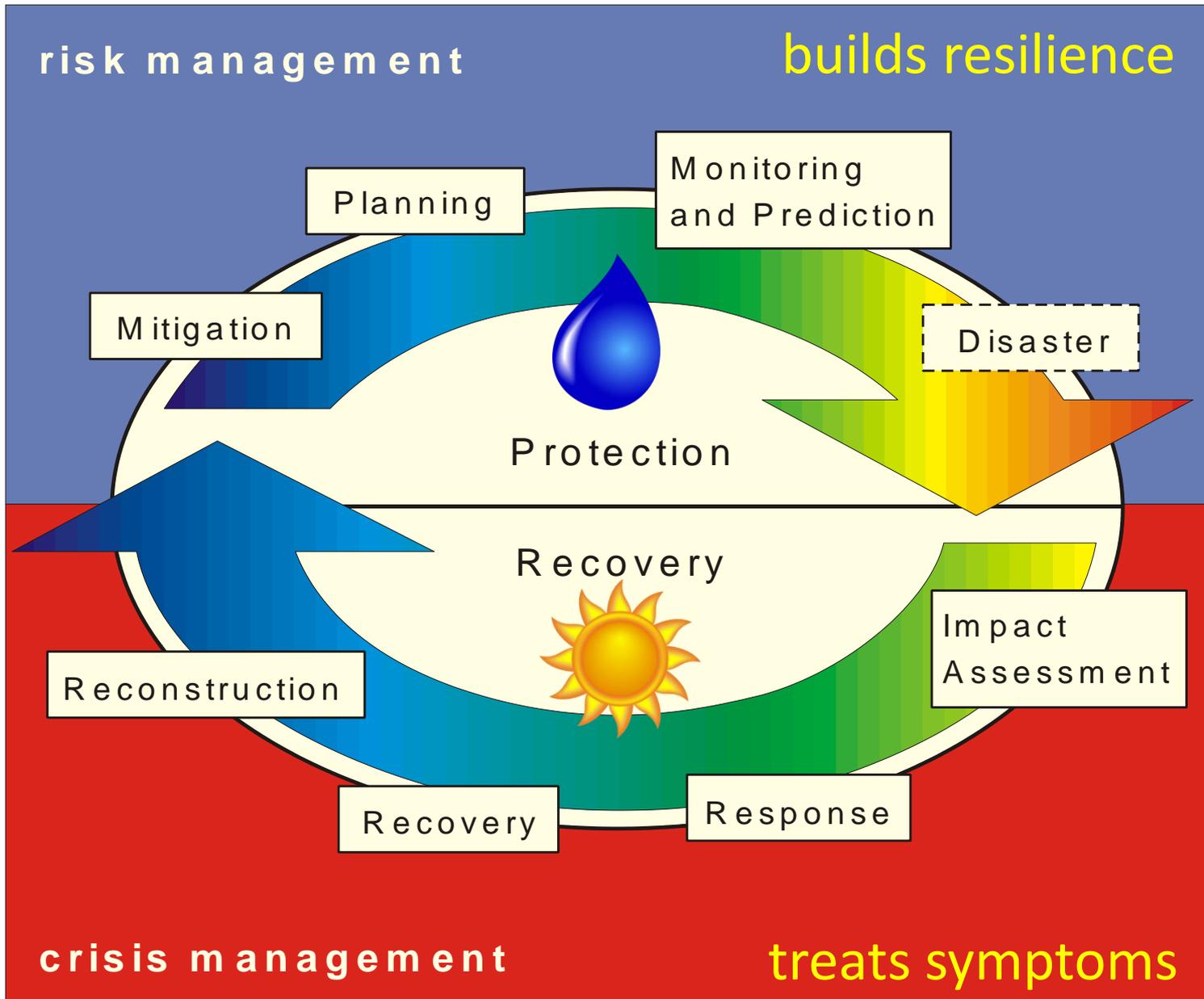
**Climate information:
Needs, usability, evaluation**

**Entry points for proactive
Planning-triggers and indicators**



**Enabling adaptation:
Best available drought risk
& water supply information
Input to drought planning,
preparedness and adaptation**

The Cycle of Disaster Management



Engagement: Drought Mitigation and Planning

- Partnered with NOAA, NIDIS, NDMC, CLIMAS, AASC
- Hosted forums, workshops, and webinars
- Held over 28 drought briefings - available on SCIPP's website and YouTube (over 1,800 views on YouTube)
- Promote planning and preparation
- Conducting research into how extended drought has impacted lives and economy



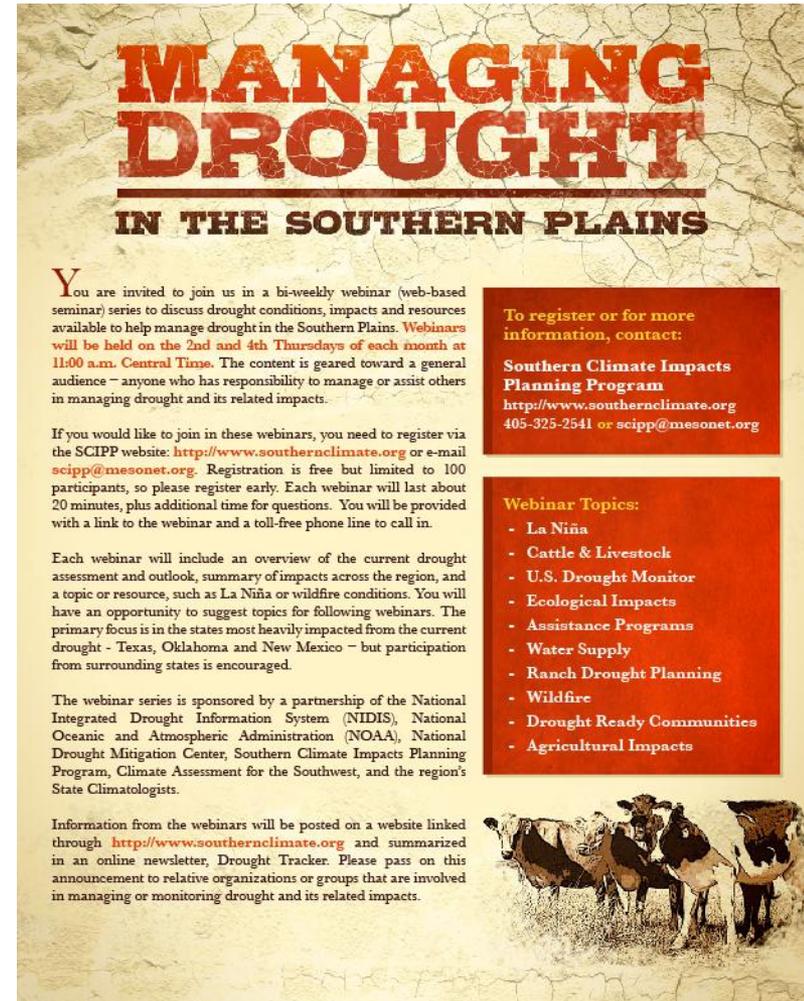
Outlook & Assessment Forums

- In-person meetings (Austin, Fort Worth, Lubbock, Abilene, Goodwell)
- Evolution, current conditions & outlooks
- Panel discussions of impacts & management strategies
- Outcomes:
 - Improved communication
 - More guidance on product interpretation
 - Explanation of causes



Webinar Series

- Bi-weekly (now monthly)
- Overview of regional drought conditions and outlook
 - led by the Drought Monitor authors
- Discussion Topic
 - Mix of technical and sector-specific information
 - Presenters from multiple states, organizations
- Comments & Updates from State Climatologists
- Recordings posted on YouTube



MANAGING DROUGHT
IN THE SOUTHERN PLAINS

You are invited to join us in a bi-weekly webinar (web-based seminar) series to discuss drought conditions, impacts and resources available to help manage drought in the Southern Plains. Webinars will be held on the 2nd and 4th Thursdays of each month at 11:00 a.m. Central Time. The content is geared toward a general audience – anyone who has responsibility to manage or assist others in managing drought and its related impacts.

If you would like to join in these webinars, you need to register via the SCIPP website: <http://www.southernclimate.org> or e-mail scipp@mesonet.org. Registration is free but limited to 100 participants, so please register early. Each webinar will last about 20 minutes, plus additional time for questions. You will be provided with a link to the webinar and a toll-free phone line to call in.

Each webinar will include an overview of the current drought assessment and outlook, summary of impacts across the region, and a topic or resource, such as La Niña or wildfire conditions. You will have an opportunity to suggest topics for following webinars. The primary focus is in the states most heavily impacted from the current drought - Texas, Oklahoma and New Mexico - but participation from surrounding states is encouraged.

The webinar series is sponsored by a partnership of the National Integrated Drought Information System (NIDIS), National Oceanic and Atmospheric Administration (NOAA), National Drought Mitigation Center, Southern Climate Impacts Planning Program, Climate Assessment for the Southwest, and the region's State Climatologists.

Information from the webinars will be posted on a website linked through <http://www.southernclimate.org> and summarized in an online newsletter, Drought Tracker. Please pass on this announcement to relative organizations or groups that are involved in managing or monitoring drought and its related impacts.

To register or for more information, contact:
Southern Climate Impacts Planning Program
<http://www.southernclimate.org>
405-325-2541 or scipp@mesonet.org

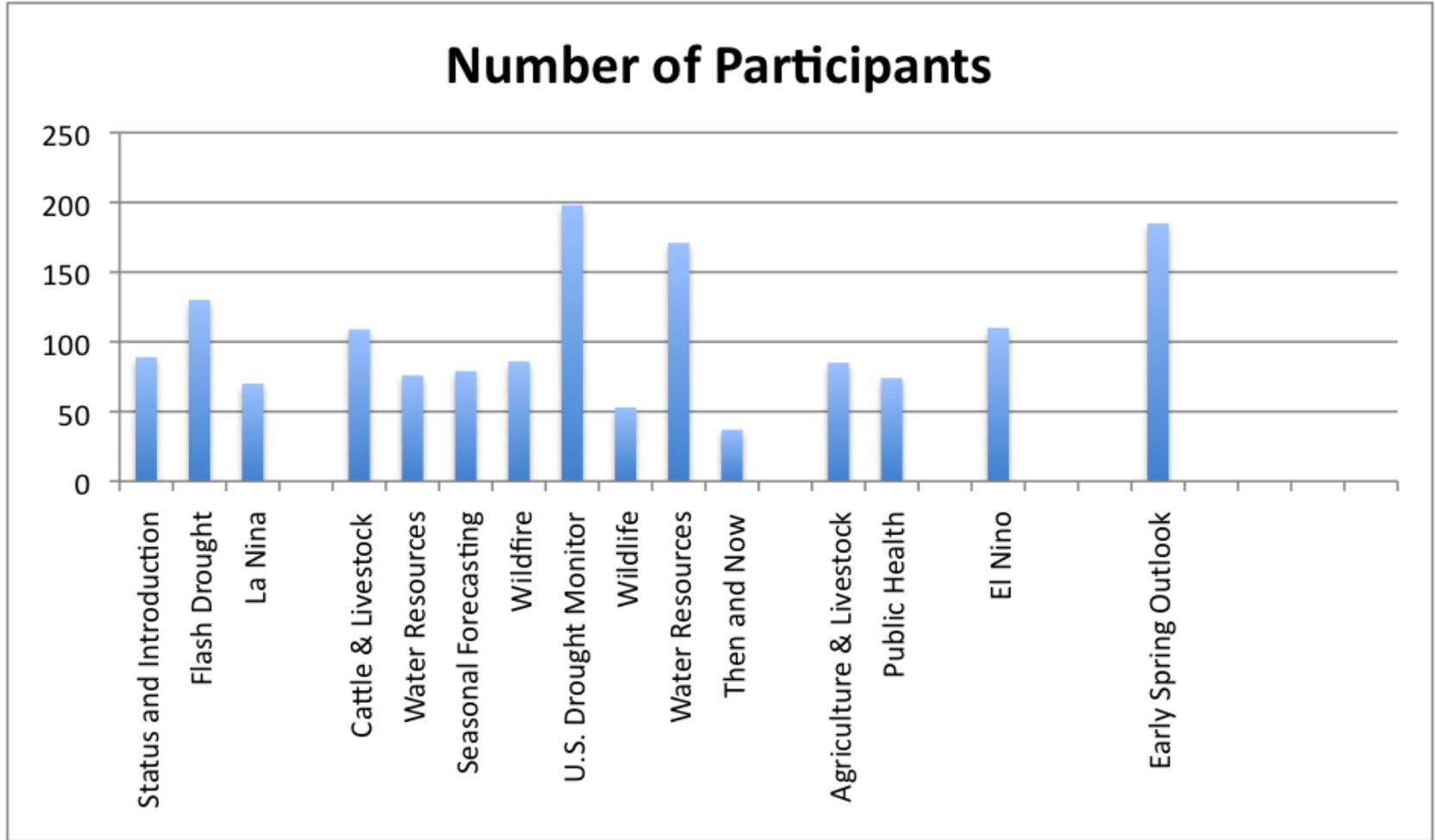
Webinar Topics:

- La Niña
- Cattle & Livestock
- U.S. Drought Monitor
- Ecological Impacts
- Assistance Programs
- Water Supply
- Ranch Drought Planning
- Wildfire
- Drought Ready Communities
- Agricultural Impacts



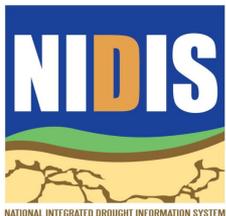
<http://www.southernclimate.org>

Webinar Attendance



U.S. Drought Portal - www.drought.gov

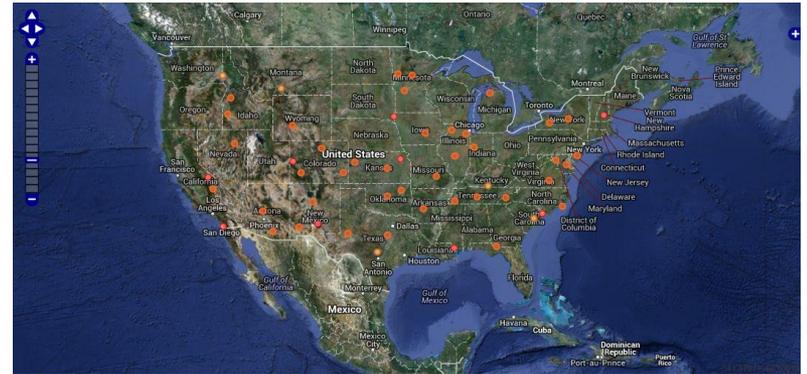
- Provide early warning about emerging and anticipated droughts
- Provide information about risk and impact of droughts to different agencies and stakeholders
- Provide information about past droughts for comparison and to understand current conditions
- Explain how to plan for and manage the impacts of droughts



New Opportunities for Drought Research

Field Photos Weekends

- “Pictures of Drought”
- Understanding comparison between indicators and impacts
- Photos taken nationally at about the same time, mostly through the CoCoRaHS network of volunteer citizen scientists / weather observers
- Photos archived at the Earth Observations and Modeling Facility
<http://www.eomf.ou.edu/photos/cocorahsmay13/>



Drought Impact Assessments

- Look at drought impacts in a single county (Tillman County, OK)
- Assess changes to economy, social, psychological, ecological
- Look at secondary and tertiary impacts
 - How are household finances affected?
 - What decisions are delayed?
 - What is the economic impact of custom harvesters spending less time in a community?
 - What non-economic losses are there?



GOLDEN PROMISE

Will wheat deliver?

FAVOR — As the yardstick sank in a crack at David Gammill's powder-dry wheat field, the farmer's heart plummeted, as well. The wooden measuring stick went 20 inches into the southern Oklahoma earth. Behind Gammill, his son, Josh, was at the helm of a John Deere 9500 combine. In a good year, that 30-foot header on the machine would be gathering 40 bushels per acre, David Gammill said. This time, they hope it'll make 15 bushels. Wheat harvest has started in Oklahoma. And

[SEE WHEAT PAGE 12A](#)



Bryan Painter
bpainter@osj.com

COLUMNIST

PHOTO BY DAVID MCDANIEL, THE OKLAHOMAN

"We thought that first field we cut would only make five bushels, and we got 15. This should be about the same. Right now, with all the crop has been through, we feel fortunate to get that much."

DAVID GAMMILL, FARMER

Social Impacts of Long-Term Drought

- Dust Bowl II
- Look at social changes in the area around the OK & TX Panhandles
- What have we learned from history?
- How are people coping today?

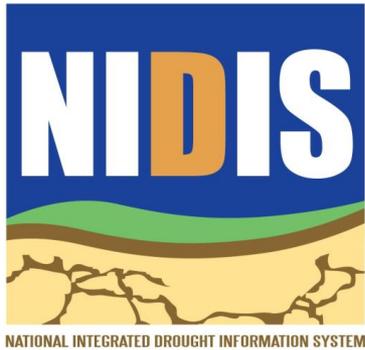


Pictures from near Lamar, CO
May 2013

Are We Better Off?

- The number of states and other institutions with improved capacity to inform risk management and reduce exposure to drought and flood risks
- The number of staff in or working with those institutions trained to develop and communicate local drought information and help reduce impacts
- The number of research projects that conduct and update drought impacts and user needs assessments in drought-sensitive parts of the US
- The percentage of the U.S. population covered by adequate drought risk and early warning information systems

Thank You



Roger Pulwarty
Veva Deheza
NOAA – NIDIS
roger.pulwarty@noaa.gov
veva.deheza@noaa.gov

Mark Shafer
SCIPP
mshafer@mesonet.org



Mark Svoboda
NDMC
msvoboda2@unl.edu