

What is a Drought Early Warning System (DEWS)?

Alicia Marrs

Regional Drought Information Coordinator

**NOAA/National Integrated Drought
Information System**

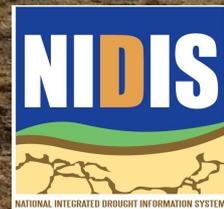


Photo courtesy of the Cimarron County (OK) Conservation District, January

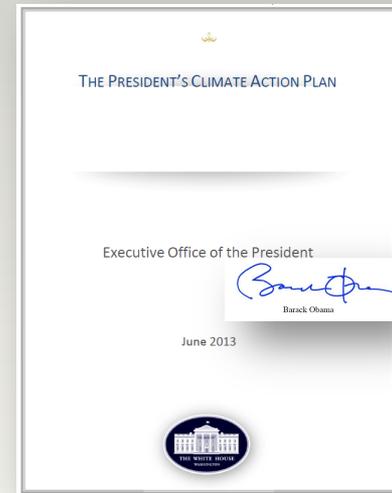
What is the National Integrated Drought Information System (NIDIS)?

Authorized in 2006

- **Why:**
 - Recognition that better informed and more timely drought-related decisions lead to reduced impacts and costs.
 - Key support from the Western Governor's Association (WGA)
- **Goal:** *“Enable the Nation to move from a reactive to a more proactive approach to managing drought risks and impacts”* PL 109-403

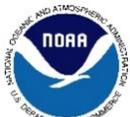
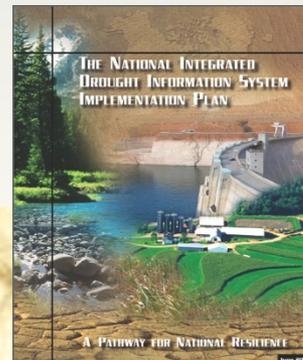
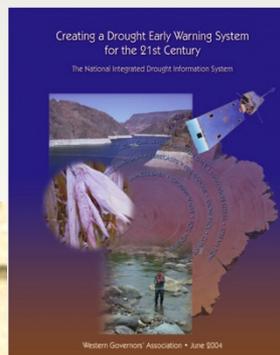
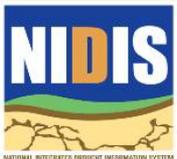
Reauthorized in 2014

- Authorizes the appropriation of funds (via NOAA) through FY2018
- Component of the President's Climate Action Plan
- Coincided with the creation of the National Drought Resiliency Partnership (NDPR)



Three tasks under the NIDIS Act (PL 109-430)

- (I) **Provide an effective drought early warning system:**
 - (a) collect and integrate key indicators of drought severity and impacts;
 - (b) produce timely information that reflect local, regional, and state differences
- (II) **Coordinate and integrate as practicable, Federal research in support of a drought early warning system**
- (III) **Build upon existing forecasting and assessment programs and partnerships**



What is Drought Early Warning?

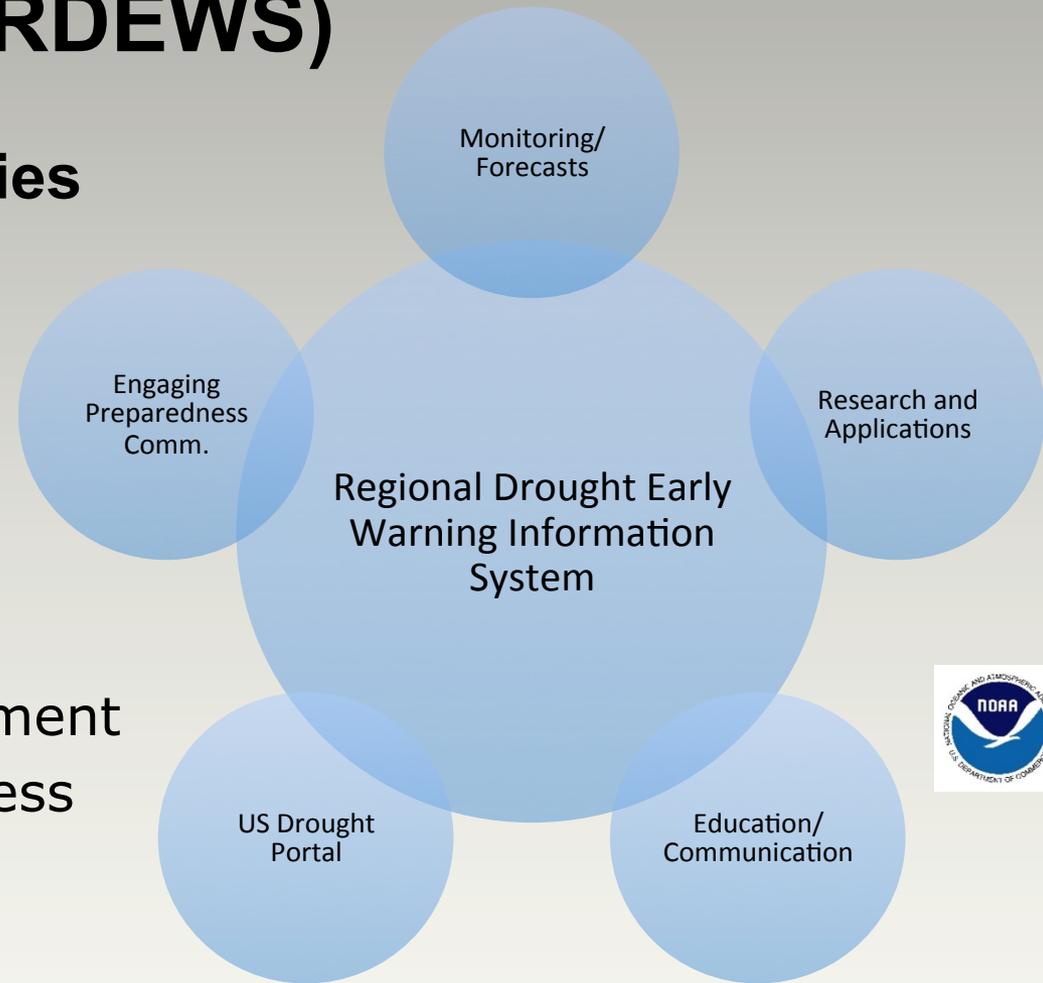
A provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response-ISDR

- **A practical tool for implementing timely and appropriate responses to droughts and famine in the form of food aid and other mitigation strategies**
- **Early warning involves forecasts based on climate projections and the area's drought history, possible outcomes of developing drought events, and answering questions about how long a drought might last and how severe it might be.**
- **Effective early warning systems should involve both technology and all interested parties in drought planning and response.**

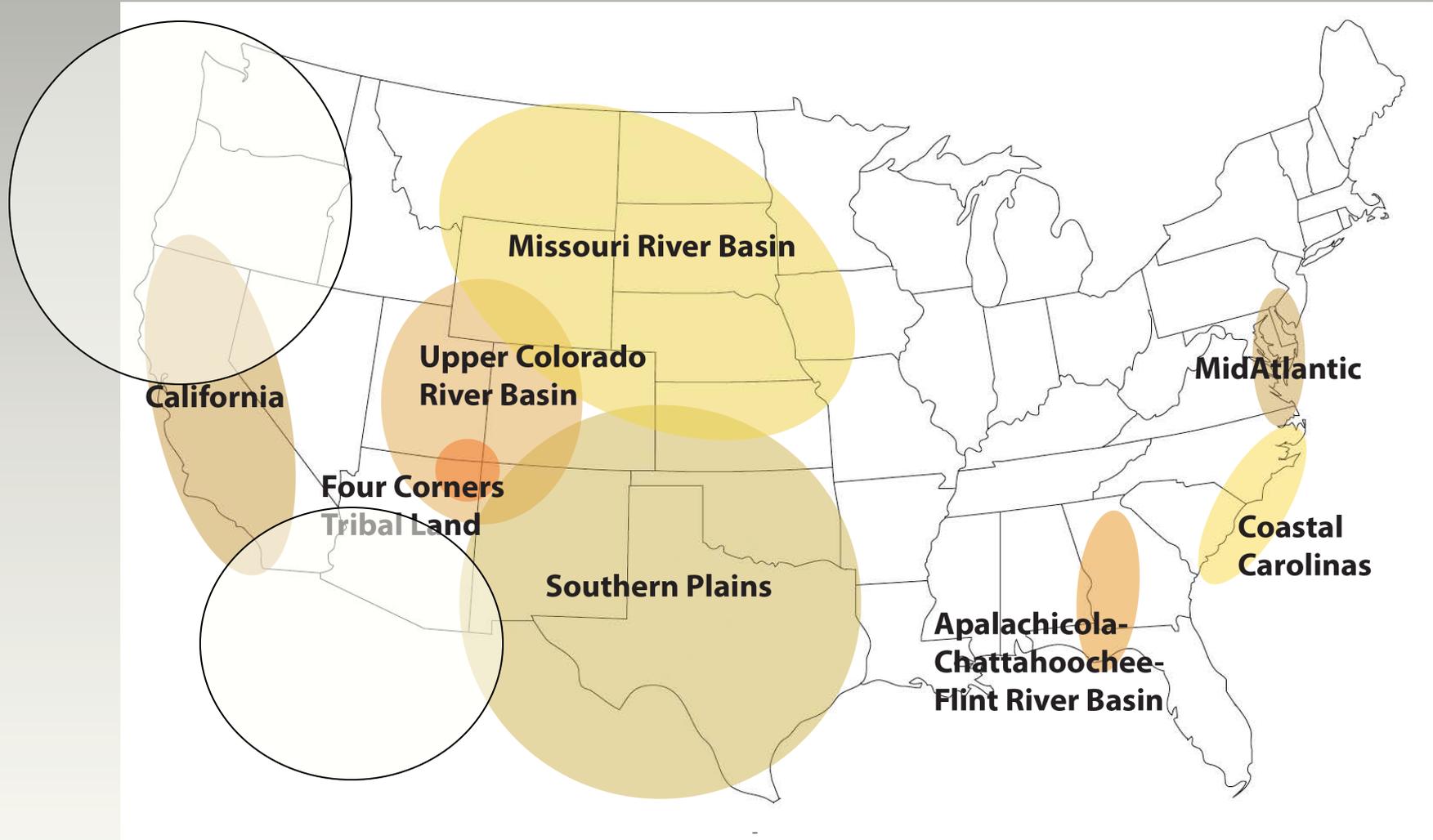
Regional Drought Early Warning Systems (RDEWS)

Working with communities and existing networks through:

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



Regional Drought Early Warning Systems



National Integrated Drought Information System (NIDIS)

Drought Early Warning

Upper Colorado RB

ACF RB

Southern Plains

California

Carolinas Coastal Ecosystems

Four Corners

Missouri RB

Pacific Northwest

Lower Colorado RB

Mid-Atlantic

Drought Research

Forecasting

Attribution

Drought information –
uses and improvements

Drought.gov

Tools & products

NIDIS activities & news

Reports and meeting
summaries

Regional and national
drought outlooks

Working Groups

Engaging Preparedness
Communities

Drought.gov

Integrated monitoring and
forecasting

Public awareness and
education

Interdisciplinary research
and applications

NIDIS Partnerships (Federal, States, Tribes, Private)

Monitoring & Forecasting

Drought and flood Impacts Assessments and Scenarios

Drought Early Warning Information Systems

Communication and Outreach

Engaging Preparedness & Adaptation



**Memorandum of Understanding
Between the Western Governors' Association
and the National Oceanic and Atmospheric Administration**



**WESTERN
GOVERNORS'
ASSOCIATION**

**Collaboration on Drought, Flooding, and Wildfire Preparedness:
Sharing Information and Building Resilience in Planning for Extreme Events**

*June 9, 2014
Colorado Springs, Colorado*

Objectives and Actions

- Investigate the interrelationship between drought and wildfire to identify data, information and analysis needs.
- Identify management strategies that may help Governors and decision-makers better address the impacts associated with these dual disasters.
- Explore ways to ensure the improved and sustained collection and sharing of:
 - Drought, flooding and extreme weather-related data
 - Impact statistics and information
- Potential focal areas may include:
 - soil moisture monitoring in the Missouri River Basin and water supply needs assessments,
 - snowpack monitoring in the Mountain West and coastal watersheds.

This aspect of the MOU calls for close coordination with other federal agencies that have monitoring and analysis responsibilities.

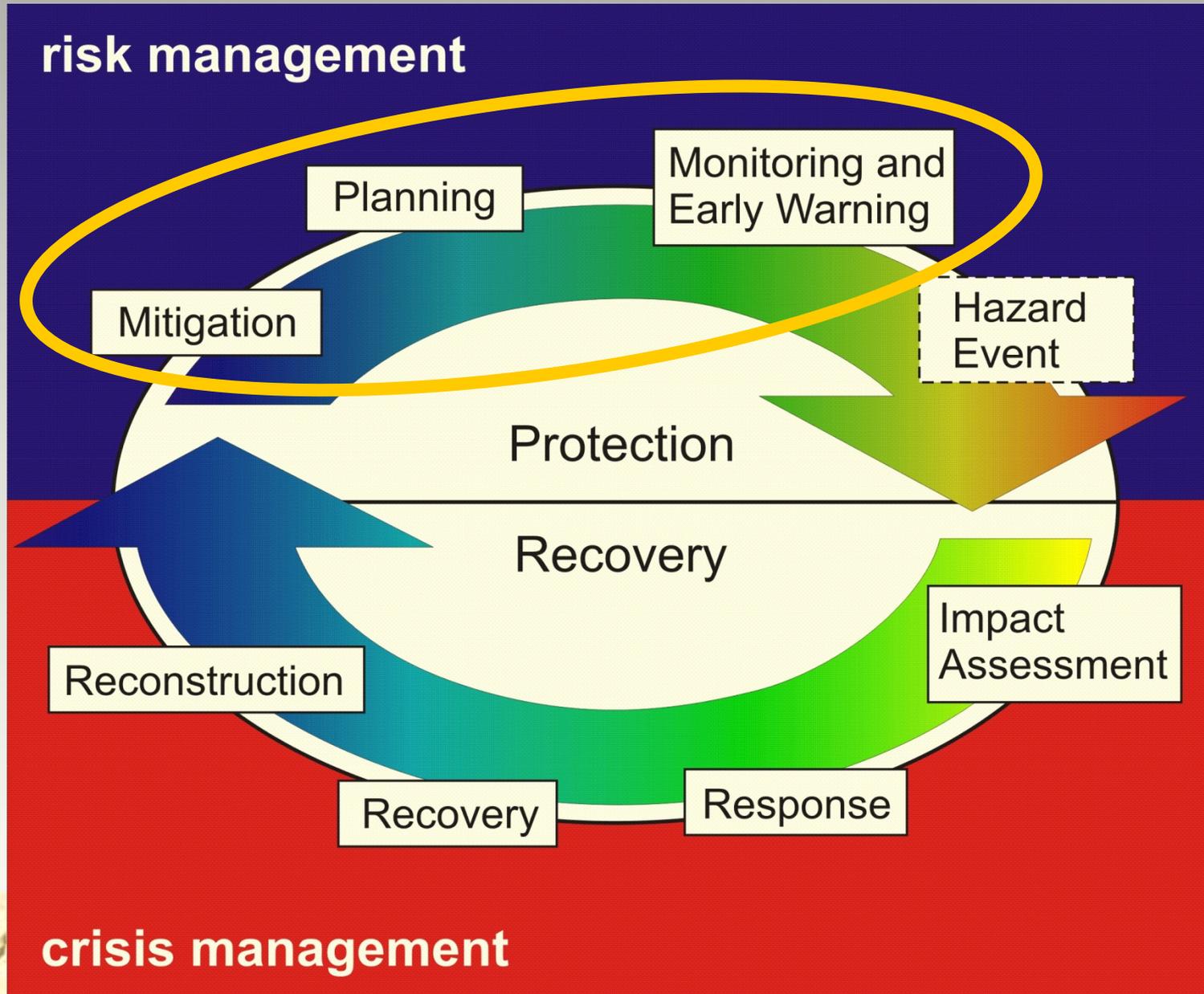
Drought Prediction

- Improved **prediction capabilities** drawing on expertise at national laboratories and centers and key academic partners
- Improved **satellite estimates of snow amount** for initialization (e.g., SWE)
- Improved **satellite estimates of soil moisture** for initialization (expect that from SMAP)
- Improved **predictions of temperature, precipitation, and other hydroclimate variables as well as extremes**
- Increased **climate model ensemble size and higher resolution** for better estimates of extremes (changes in the tails of the PDF)
- Understand the **role of extreme weather events** (drought busters and persistence of large scale circulation patterns) and climate variability

Forecasting Drought

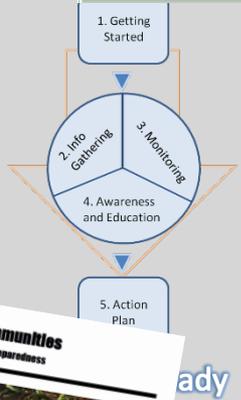
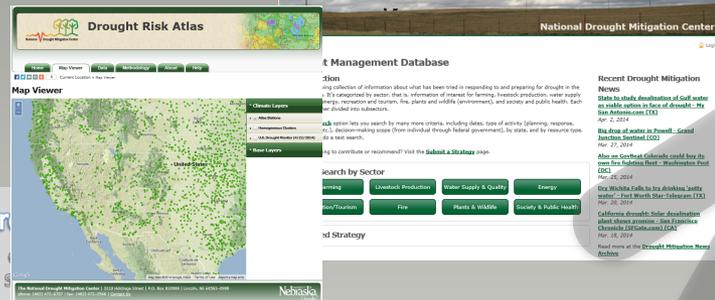
- Improve **reliability and skill of forecasts** including characterization uncertainty and opportunities for conditional skill (*conditioned on interannual and decadal variability*)
- Improve **forecasts of onset and termination** (dominant sources of skill and reliability from persistence of conditions and knowledge of antecedent conditions – *thus the critical role for monitoring*)
- **Objective and reproducible** NOAA Drought Outlook (*National MultiModel Ensemble, NMME*)
- Improved **identification and use of analog year information**
- Advances in **Land-Data Assimilation Systems (LDAS)**
- Enhanced **ENSO Plume Model Forecasts**
- Updated **Optimal Climate Normals** (Temperature & Precipitation)
- Experimental **Climate Divisions and Regional Forecasts**

The Cycle of Disaster Management



Planning Scales

- Planning at ***all scales***
- Planning should start local and involve the ***“locals”***
- Planning is a ***“living”*** process



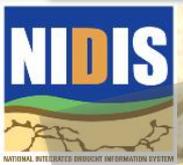
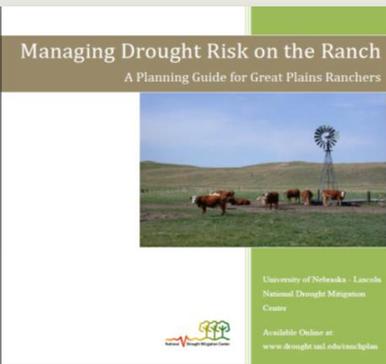
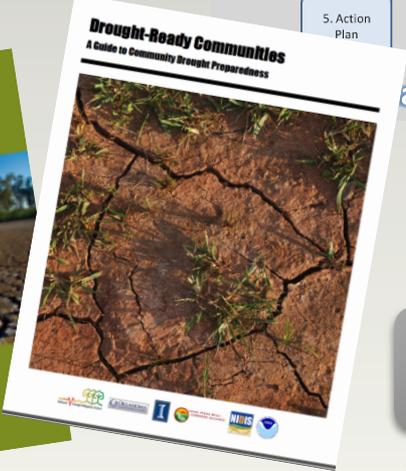
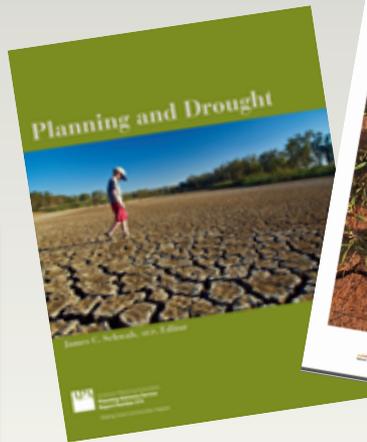
Nation

Basin

Tribal/
State

Community

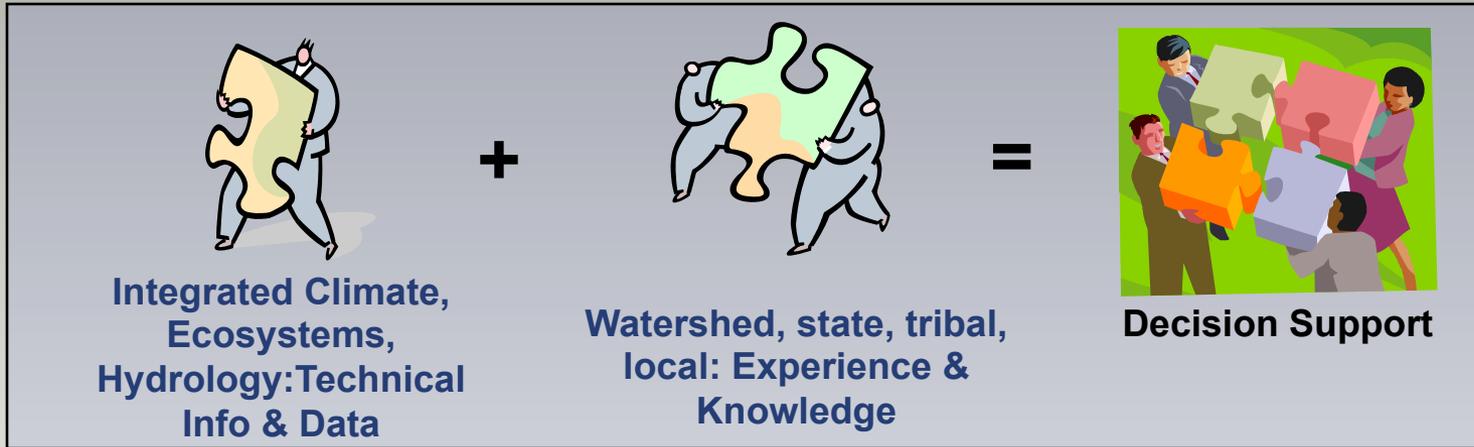
Individual



Components of Successful Drought Mitigation Planning

- Monitoring, early warning, and prediction
 - Foundation of a drought mitigation plan
 - **Indices/indicators linked to impacts and triggers**
- Risk and impact assessment
 - Who and what is at risk and why?
- Mitigation and response
 - Pro-active programs and actions to reduce risks
 - Response actions and programs during droughts

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

Case Study: Colorado

- Long-term planning process
 - Revised frequently since 1981
 - Now every 3 years
- Components
 - **Monitoring**
 - State Climatologist, etc...
 - NIDIS Upper Colorado River Basin
 - Vulnerability assessment
 - Response
 - Mitigation
 - Drought Planning Toolbox



Colorado's Drought Response Plan consists of 4 components:

- Monitoring
- Assessment
- Mitigation
- Response

The plan has the force and effect of law as promulgated by the Governor.

COLORADO DROUGHT MITIGATION AND RESPONSE PLAN



August 2013

Prepared Pursuant to
Disaster Mitigation Act 2000 & Section 409, PL 93-288

Prepared by
Colorado Water Conservation Board
Department of Natural Resources

In Cooperation with
The Department of Public Safety
Division of Homeland Security and Emergency Management
and the Drought Mitigation and Response Planning Committee

State of Colorado
Drought Mitigation and Response Plan
August 2013

i

Severity Indicators and Impacts (U.S. Drought Monitor, Colorado Modified Palmer Drought Index (CMPDI), SWSI, SPI)	Drought Phase and Response Summary	Actions to be Considered
<p><u>Drought Monitor</u> D2 Severe Drought D2 ranges: CMPDI or SWSI¹: -3.0 to -3.9 SPI²: -1.3 to -1.5 Indicator blend Percentile: 6-10</p> <p>Impacts: Crop or pasture losses likely; water shortages common; water restrictions likely to be imposed</p> <p><u>CMPDI</u> Less than -2.0 in any river basin or modified Palmer climate division</p> <p><u>SPI</u> Less than -1.0 (six month)</p>	<p>Phase 2 Drought Task Force and Impact Task Forces are activated; Potential Drought Emergency Declared</p>	<ul style="list-style-type: none"> • DTF Chairs prepare Governor's Memorandum of potential drought emergency based on recommendations from WATF. • Governor's Memorandum activates the Drought Task Force and necessary Impact Task Forces. • The DTF Chairs and CWCB meet with activated Impact Task Force chairs to outline Phase 2 activity. • Activated ITF's make an initial damage or impact assessment (physical and economic). • ITF's recommend opportunities for incident mitigation to minimize or limit potential impacts • Periodic reports are made by the ITF chairs to the DTF Chairs. • ITF chairs designate their respective department Public Information Officer (PIO) to interface with media for their relative area of concern and develop media messages. • Relevant state agencies undertake response and incident mitigation actions with their normal programs with available resources. • The DTF conducts a gap analysis identifying any unmet needs that cannot be handled through normal channels.

Drought Monitor

D3 Extreme Drought to
D4 Exceptional Drought

D 3 Ranges

CMPDSI or SWSI¹: -4.0 to -4.9

SPI²: -1.6 to -1.9

Indicator blend Percentile: 3-5

Impacts: Major crop/pasture losses;
widespread water shortages or
restrictions very likely to be imposed

D4 Ranges:

CMPDI or SWSI: -5.0

SPI*: -2.0 or less

Indicator blend Percentile: 0-2

Impacts: Exceptional and
widespread crop/pasture losses;
shortages of water in reservoirs,
streams, and wells creating water
emergencies

CMPDI

Lowest reading at -2.0 to -3.9 in any
river basin or modified Palmer
climate division

SPI

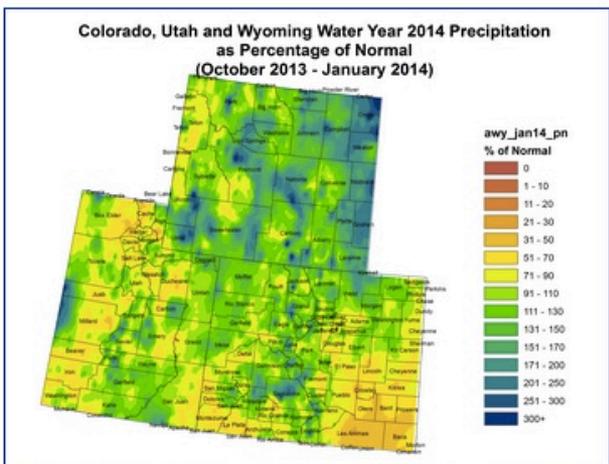
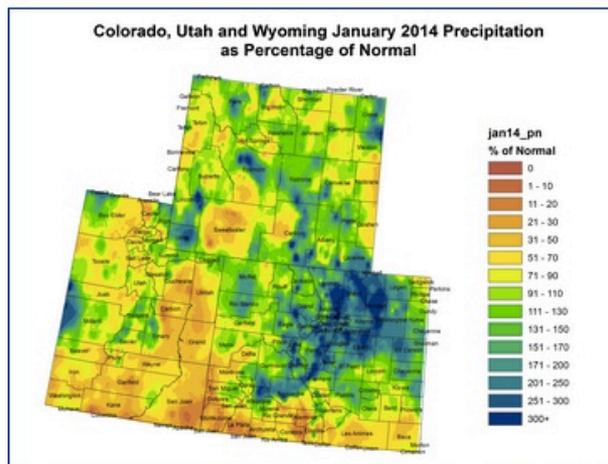
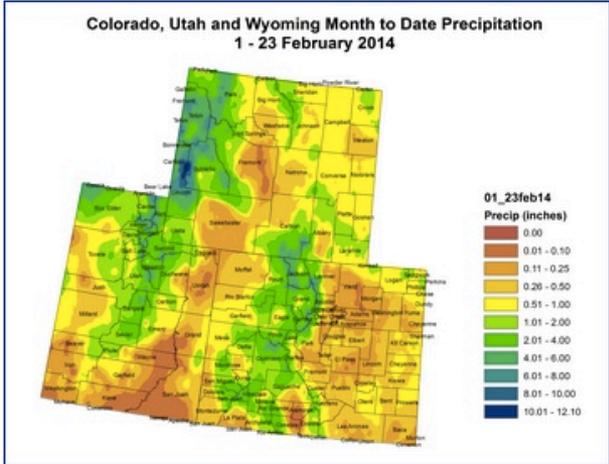
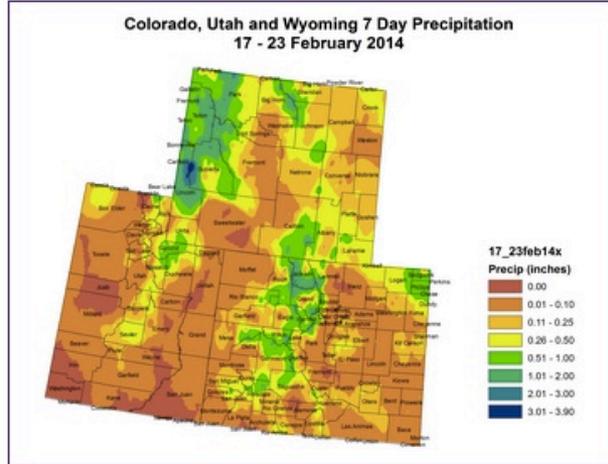
Less than -1.0 to -1.99 SPI (six
month)

Phase 3

Drought Emergency is
declared by
Proclamation of the
Governor.

- Governor's Memorandum updated to activate additional Impact Task Forces as necessary.
- Activated ITFs continue to assess, report, and recommend response measures and incident mitigation.
- Unmet needs are reported to the DTF Chairs.
- DTF Chairs determine the unmet needs that can be met by reallocation of existing resources. Those which cannot be forwarded to the Governor with recommendations to support a request for a Presidential Drought Declaration.
- Governor may request a Presidential Declaration.
- If approved, Federal-State Agreement establishes Colorado Office of Emergency Management Director as the State Coordinating Officer (SCO).
- Work with the Governor's office on long-term recovery operations

- Precipitation
- SNOTEL
- SPI
- Streamflow
- Surface Water
- Temperature
- Outlook
- USDM Discussion



The images above use daily precipitation statistics from NWS COOP, CoCoRaHS, and CoAgMet stations. From top to bottom, and left to right: most recent 7-days of accumulated precipitation in inches; current month-to-date accumulated precipitation in inches; last month's precipitation as a percent of average; water-year-to-date precipitation as a percent of average.

Summary Report: Colorado Drought Tournament

September 18, 2012



November 2012

Sponsors:

Colorado Water Conservation Board



National Integrated Drought Information System



Tournament Designers:

AMEC Environment and Infrastructure



Contributors:

National Drought Mitigation Center



Agriculture and Agri-Food Canada
Science and Technology Branch



Colorado Drought Mitigation & Response Plan

Update to the 2010 Plan
Meeting 3 – Mitigation Strategy Update
June 4, 2013



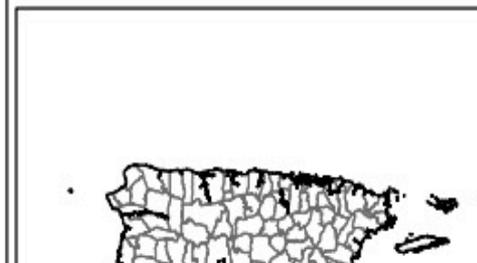
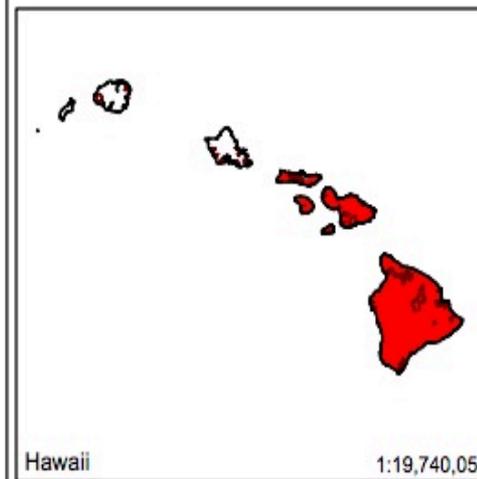
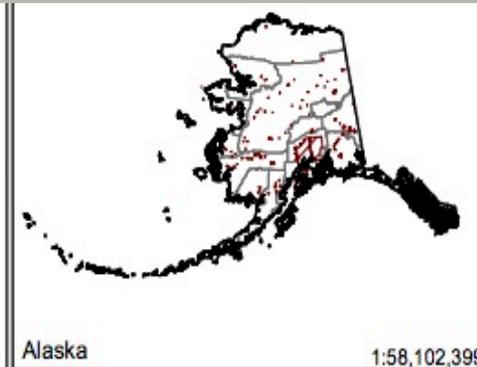
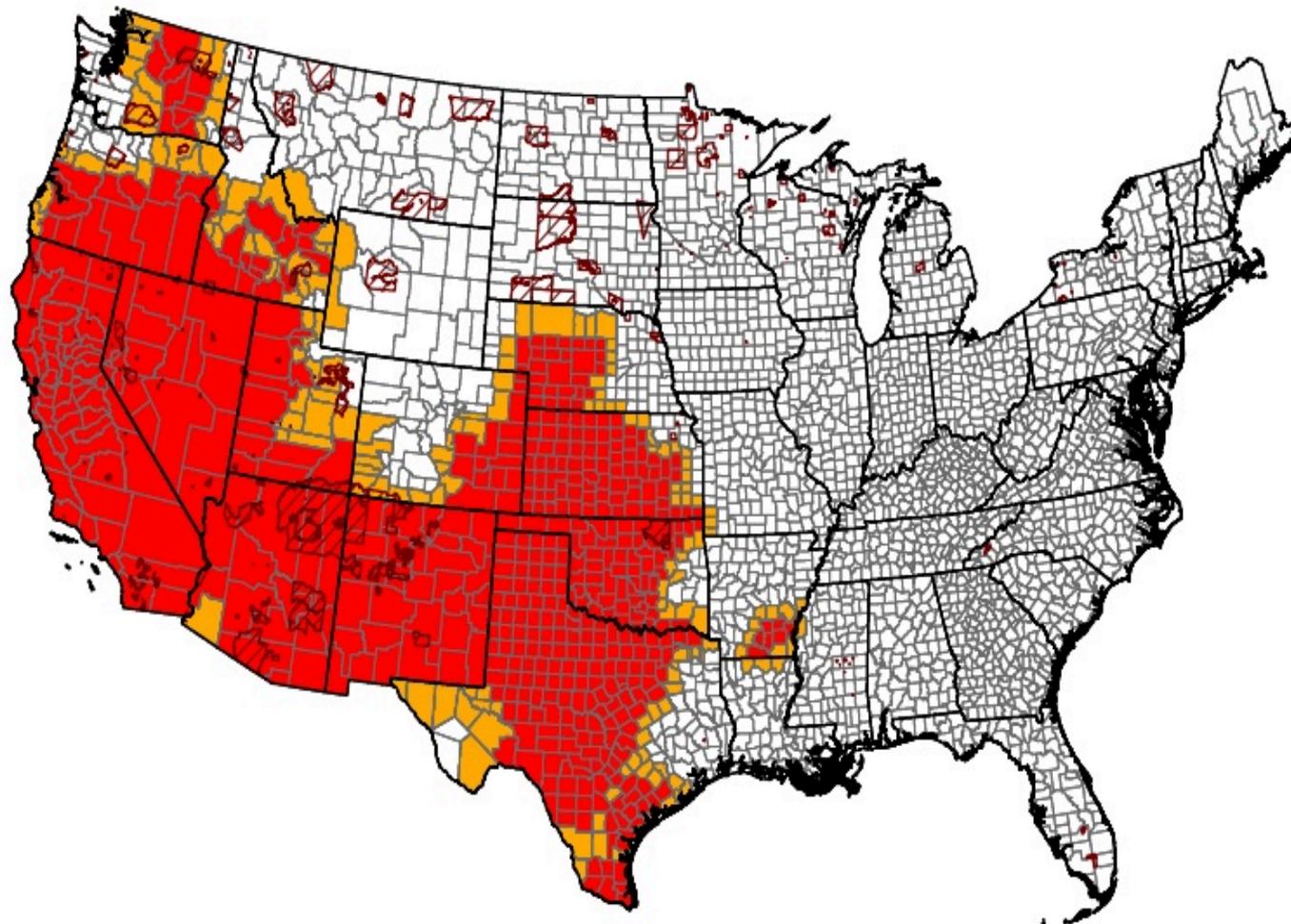
Jeff Brislawn,
Courtney Black
AMEC

Taryn Finnessey,
CWCB



2014 USDA Drought Designations

as of June 11, 2014



Secretarial Drought Designations for 2014

Disaster Incidents as of June 11, 2014

State Boundary

As of 2012 – Role of U.S. Drought Monitor in USDA Designation Procedure

- Streamlined by utilizing the US Drought Monitor as a tool to automatically trigger disaster areas
- Provides for nearly an automatic designation for any county in which drought conditions as rptd in the USDM meet a drought intensity of D2 (severe) for 8 consecutive weeks
- A county with a portion of area in a D3 (extreme) or higher at any time during growing season would be designated as disaster area

National Significant Wildland Fire Potential Outlook



Predictive Services
National Interagency Fire Center

Issued: June 1, 2014
Next Issuance: July 1, 2014



Outlook Period – June, July, and August through September 2014

Executive Summary

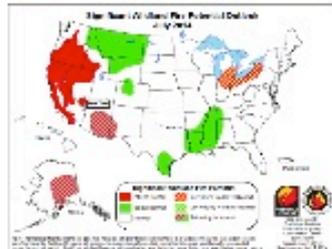
The June, July, and August through September 2014 significant wildland fire potential forecasts included in this outlook represent the cumulative forecasts of the eleven Geographic Area Predictive Services Units and the National Predictive Services Unit.



June

- Above normal fire potential will persist over much of California, southern Arizona, and southwestern New Mexico. Central Alaska and the southeast interior will also experience above normal fire potential. Portions of Northern California, Oregon and Nevada will increase to above normal fire potential as well.

- Below normal fire potential will continue for much of the eastern half of the U.S., with the notable exception of the Great Lakes, Northeast and south Atlantic states.



July

- Above normal fire potential will continue over most of California, Nevada and Oregon. Portions of Washington and Idaho will also experience above normal fire potential. Above normal fire potential will reduce to near normal conditions in Alaska and the Southwest. Fire potential will become above normal in the eastern Great Lakes states.

- Below normal fire potential will develop over northern Idaho, Montana and portions of Wyoming and Colorado. Portions of Texas and the southeast will also continue to see below normal fire potential.



August through September

- Above normal fire potential will remain over most of California, Nevada and Oregon. Portions of Washington and Idaho will also continue with above normal fire potential. Fire potential will expand to cover most of the Northeast.

- Below normal fire potential over the northern Rocky Mountains will return to normal, while portions of the south central U.S. remain lower.

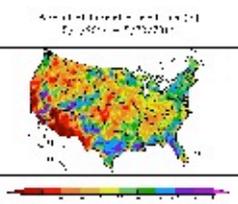
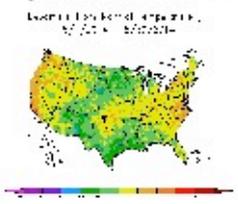
Past Weather and Drought

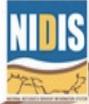
A series of troughs moved through the U.S. in May, producing a broad mix of weather to the nation throughout the month. Periods of showers, thunderstorms and heavy rain across parts of the central and southern Rockies, the Gulf Coast, and parts of New England caused river flooding associated with spring snow melt. Severe weather was scattered throughout the eastern two-thirds of the country. Small areas of the central and southern Sierras received locally heavy rain and snow.

Temperatures extremes were modest but were very clearly delineated across the country. Average temperatures were two to four degrees below normal for much of the interior portion of the country while the West Coast and the Mid-Atlantic region were two to four degrees above normal.

Drought remained severe to worse over most of the southwestern quarter of the nation with exceptional drought continuing in California, western Nevada, and a large portion of the southern Plains.

Left: Departure from Normal Temperature (top) and Percent of Normal Precipitation (bottom) (from High Plains Regional Climate Center); Right: U.S. Drought Monitor (top) and Drought Outlook (bottom) (from National Drought Mitigation Center and the Climate Prediction Center)





U.S. Drought Portal

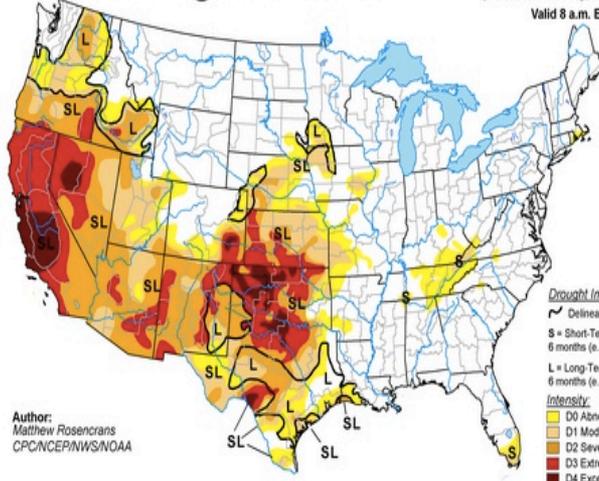
www.drought.gov

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- Products
- Tools
- Regional Programs
- Resources

U.S. Drought Monitor

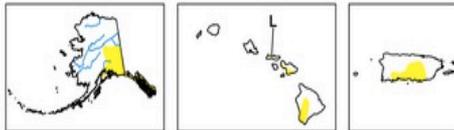
June 10, 2014
 (Released Thursday, Jun. 12, 2014)
 Valid 8 a.m. EDT



Author:
 Matthew Rosenzweig
 CPC/NCEP/IRWS/NOAA

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/>

- California Drought Forum: Wrapup, presentations and links
- Download the NIDIS newsletter
- NIDIS President Obama reauthorizes the National Integrated Drought Information System
- Drought Risk Atlas: New tool for comparing droughts then and now
- National Drought Resilience Partnership
- U.S. Drought Monitor**
- U.S. Seasonal Drought Outlook

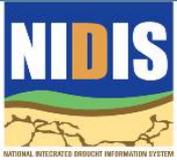
NIDIS Announcements

Midwest and Great Plains Drought Webinar Jul 17, 2014

Drought in the News

Heavy rain eased drought slightly in Plains

Local Drought Snapshot



National Drought Forum Goals

“To understand the extent of 2012 drought impacts and response in 2012, and help provide new information and coordination for improving the nations’ drought readiness for 2013 and in the future”

- **Increase public awareness of current drought and potential impacts for next year**
- **Technical assistance**
- **Ensure sustained support for monitoring - stream gages and other data**
- **Outreach with impacted communities**
- **Conservation plans**

December 12-13, 2012

Washington, DC

DRAFT

National Drought Forum

Summary Report and Priority Actions



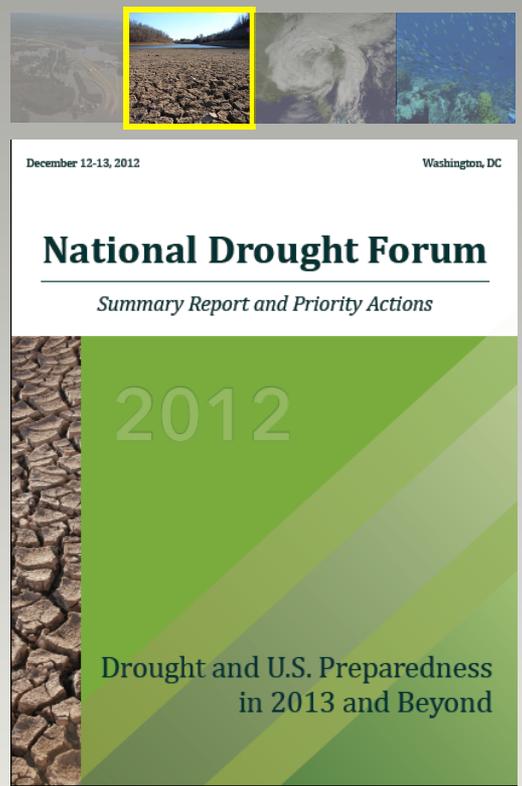
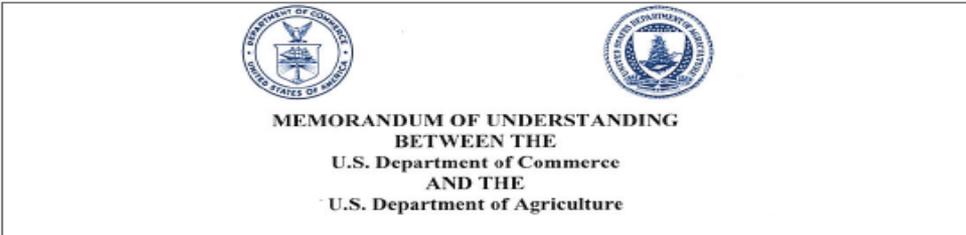
Informing Decisions

National Governors Association Meeting 24-27 February, 2013 Repeat-February 2014

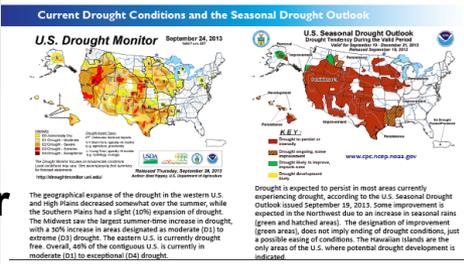


“making sure science is on the table when decisions are made” (J. Lubchenco)

MOU Between DOC and USDA



National Drought Outlook September 30, 2013



September 2013



Informing Decisions - Regional

- NIDIS, along with our partners, provides drought information tailored to stakeholder needs...
 - Regional drought assessments and outlooks (in-person and webinars)
 - Sector-specific workshops
 - Engaging Preparedness Communities webinars

National Drought Outlook September 30, 2013

Current Drought Conditions and the Seasonal Drought Outlook

U.S. Drought Monitor September 25, 2013

U.S. Seasonal Drought Outlook

The geographical extent of the drought in the western U.S. and High Plains decreased somewhat over the summer, while the Southern Plains had a slight (20%) expansion of drought. The Midwest saw the largest summer time increase in drought, with a 20% increase in areas designated as moderate (D2) to extreme (D3) drought. The eastern U.S. is currently drought free. Overall, 46% of the contiguous U.S. is currently in moderate (D2) to extreme (D3) drought.

Drought is expected to persist in most areas currently experiencing drought, according to the U.S. Seasonal Drought Outlook issued September 25, 2013. Some improvement is expected in the Northwest due to an increase in seasonal rains (green areas), does not imply ending of drought conditions, just a possible easing of conditions. The Hawaiian Islands are the only areas of the U.S. where potential drought development is indicated.

Temperature and Precipitation Outlooks and Vegetation Status

Western states are expected to experience above-normal temperatures, along with the New England states, the North Slope of Alaska and the Alaska Peninsula. "EC" indicates temperatures have equal chances of being below normal, normal or above normal.

Mountain, northern Idaho and western Washington States are anticipated to have above-normal precipitation. The rest of the country is designated as "NC" which means precipitation amounts have equal chances of being below normal, normal or above normal.

Agicultural drought impacts are typically few in the fall in the growing season (due to a close). Long term dryness continues to affect several States, and vegetation in many areas of the U.S. For example, this map shows moderate to extreme drought conditions across large swaths of the western and southern U.S. The far northern Plains and many regions of the eastern U.S. are greener than average for this time of year. (Map: <http://www.waterwatch.usgs.gov>)

Source: Use freely (see Acknowledgments) www.waterwatch.usgs.gov

Lake Lanier Inflows

Chattahoochee near Cornelia (02331600)

USGS WaterWatch

Chestatee near Dahlonega (02333500)

USGS WaterWatch

Explanation - Percentile classes				
0-10	10-24	25-75	75-90	95-100
Very below normal	Below normal	Normal	Above normal	Much above normal

<http://waterwatch.usgs.gov>

Managing Extreme and Extended Drought on the Farm and Ranch

January 9, 2014
8 a.m.-5 p.m.
4H Building
Garden City, Kansas

This one day workshop will feature information for ranchers and irrigated crop producers who are dealing with long-term choices associated with declining aquifer levels. Hear from experts in the field on planning for drought. The workshop is free and open to the public.

Morning

- Current Status of Drought in the High Plains
- Long-Lead Climate Outlook and the Role of La Niña in High Plains Drought
- Long Term Management of the Ogallala Aquifer
- Can You Plan for Drought?

Afternoon

Ranching Session

- Managing Risk on the Ranch
- Precipitation and Pasture Growth
- Long Term Effects of Drought and Planning for Recovery
- Producer Experiences Implementing the Drought Plan
- Adaptive Management for an Uncertain Climate

Irrigation Session

- Managing Limited Irrigation
- Irrigation Efficiencies
- Programs for Irrigators
- Financial Considerations
- Producer Experiences

Register by January 3 at: <http://go.unl.edu/68tg> or 402-472-6776

Lunch will be provided for \$10. Please pay at the door.

For more information: www.drought.unl.edu/ranchplan

Drought Impacts WEBINAR SERIES

Please join us for a free monthly webinar series exploring current research and applications on drought impacts. Understanding impacts helps planners, decision makers and resource managers reduce vulnerability to future droughts.

Presented by the Engaging Preparedness Communities working group of the National Integrated Drought Information System.

The webinars, which continue Jan. 8, are on Wednesdays, at 1 p.m. Central time. Each includes:

- a focus on a specific effort to document drought impacts and the use of this information in decision-making
- discussion of NIDIS' role in the emerging Impacts Community of Practice
- a chance to ask questions via chat
- other interactive elements.

Please register for the webinar on Jan. 8: <http://www.unl.edu/68tg>

Next: The Missing Piece and Field of Dreams <http://www.unl.edu/68tg/2013/01/08/>

Next: Karsten Lackstrom, Carolina Integrated Sciences & Assessments (CISA), provided an overview of drought impacts held in Tucson in March. Alison Meadow, Southwest Climate Science Center at the University of Arizona's Institute for the Environment, presented an overview of her assessment of Arizona DroughtWatch, a drought impacts collection program, which has been published in "Field of Dreams or Dream Team?" in the Bulletin of the American Meteorological Society.

Next: Colorado Water Conservation Board's Approach to Impacts Assessment

Next: The above referenced content of Taryn Finnesser, Colorado Water Conservation Board, talked about how the State of Colorado has incorporated impacts and vulnerability assessment into its drought preparedness and how that information has helped to shape mitigation actions and recommendations for current and future drought planning efforts. Jim Schweitz with the American Planning Association also presented a quick update on their Planning Advisory Services (PAS) related to drought and best practices in planning.

Next: Upcoming: Citizen Science Observation Networks

Karsten Lackstrom will describe CISA's project to cultivate a network of drought impact observers in the Coastal Carolinas. CISA is recruiting volunteers for the Collaborative Community Rain, Hail and Snow Network (CoCoRaHS) and providing special training on coastal impacts. We will also hear from Henry Hedges of CoCoRaHS, which has been providing its precipitation observers with the chance to submit drought impacts to the National Drought Mitigation Center's (NDMIC) Drought Impact Reporter (DIR) since 2010. Kelly Helm Smith of the NDMIC will provide a brief overview of the DIR's citizen science function. Please register now: <http://go.unl.edu/68tg>

Save the dates for more EPC webinars:
Feb. 12 and March 12
1pm Central

NEW DROUGHT RESILIENCE PARTNERSHIP



FEMA



US Army Corps
of Engineers®



Nov 15, 2013 - As part of the President's Climate Action Plan, the Administration is launching a National Drought Resilience Partnership (the Partnership). The Partnership will make it easier for communities to access the drought assistance they need by promoting strong partnership and information sharing at all levels of government. It will also build on existing efforts to provide States, Tribes and local communities risk-informed decision making tools for drought preparedness planning. The Partnership aims to align Federal drought polices across the government and help communities manage the impact of drought by linking information (monitoring, forecasts, outlooks, and early warnings) with drought preparedness and long-term resilience strategies in critical sectors such as agriculture, municipal water systems, energy, recreation, tourism and transportation.

PRESS RELEASE

MORE INFORMATION

CONTACT:

Email Us

202-564-8086

NDRP Goals

The National Drought Resilience Partnership (NDRP) is dedicated to helping communities better prepare for future droughts and to reducing the impact of drought events on livelihoods and the economy. Through coordinated action, federal agencies provide efficient, effective service to communities.

NDRP's goal is to make it easier to access Federal drought resources by **linking information such as monitoring, forecasts, outlooks, and early warnings with longer-term drought resilience strategies** in critical sectors such as agriculture, municipal water systems, energy, recreation, tourism and manufacturing.

Questions?

Contact information:

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Photo courtesy Gary McManus, Beaver County, Oklahoma, May 2014