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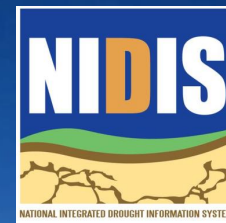
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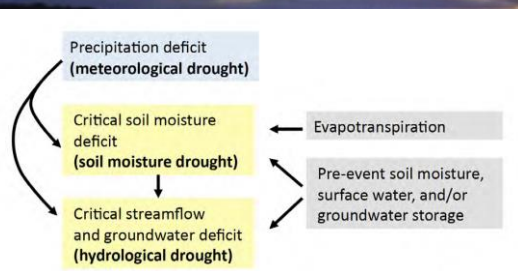


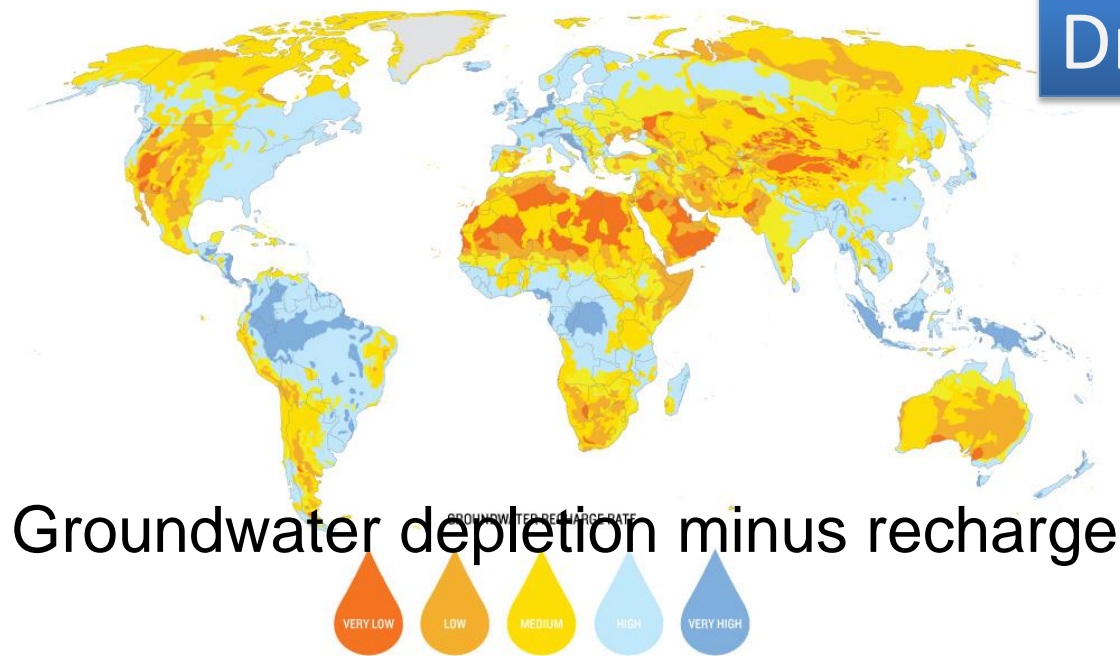
# The National Integrated Drought Information System:



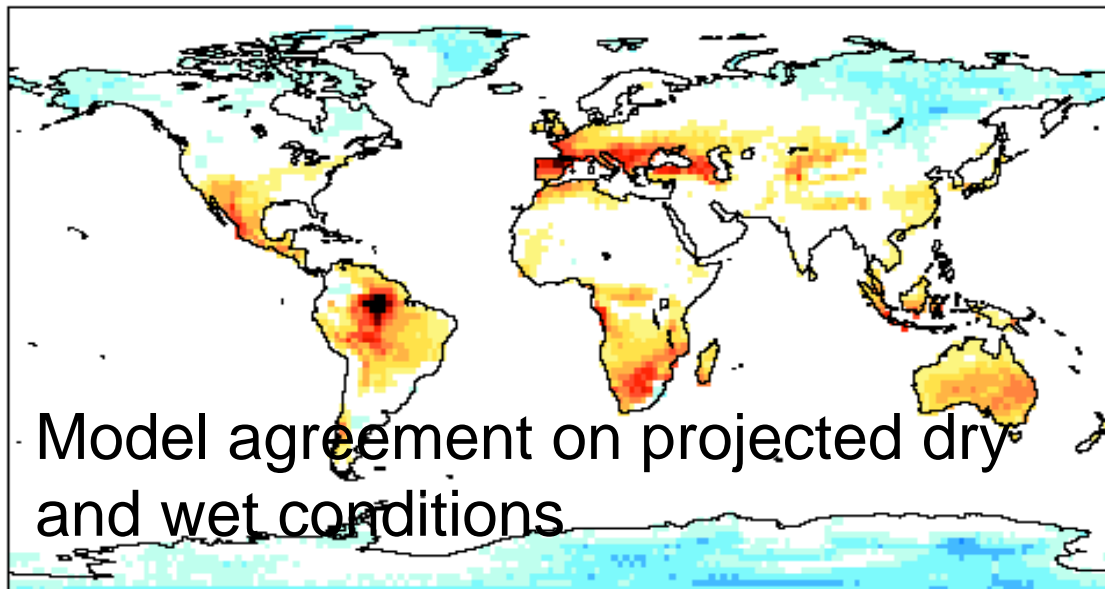
## Big data and bigger questions

Roger S. Pulwarty  
Senior Advisor for Climate and  
Director, NIDIS. NOAA  
AND a lot of other people-M. Strobel,  
M. Brusberg, J. Verdin, WGA/WSWC





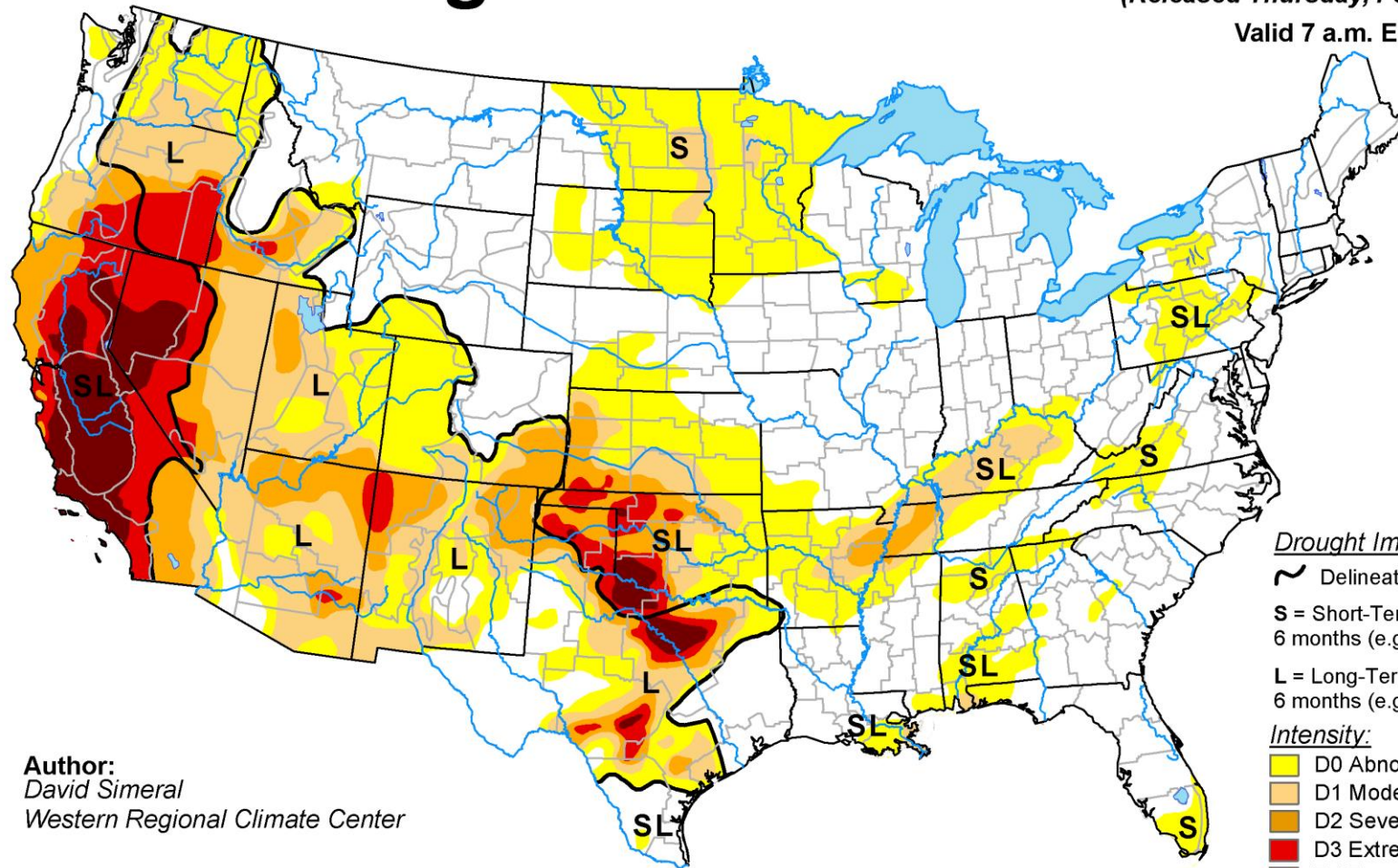
- Rainfall
- Rainfall plus potential evaporation
- Rainfall plus evaporation
- Land surface models: Soil moisture
- Land surface plus hydrology: Streamflow





# U.S. Drought Monitor

February 10, 2015  
(Released Thursday, Feb. 12, 2015)  
Valid 7 a.m. EST



**Author:**  
David Simeral  
Western Regional Climate Center

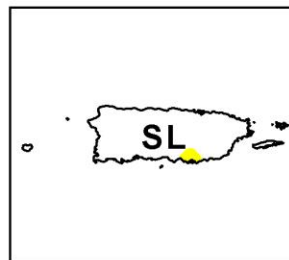
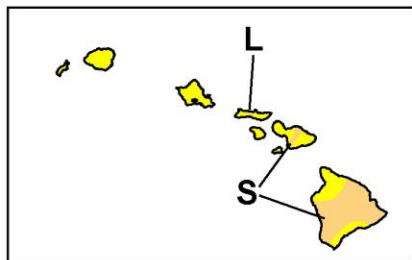
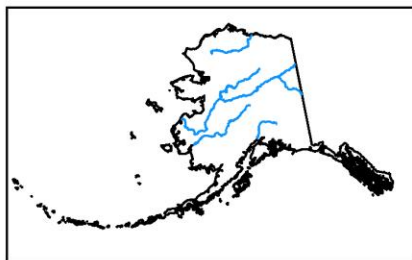
## Drought Impact Types:

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

## Intensity:

- Yellow: D0 Abnormally Dry
- Light Orange: D1 Moderate Drought
- Orange: D2 Severe Drought
- Red: D3 Extreme Drought
- Dark Red: D4 Exceptional Drought

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



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



# How did we get here? Status and antecedent conditions

2010

## Why has it been dry/drier than normal? Is this drought like others?

2011

## What are the impacts and where did they occur?

## What information is being provided and by whom?

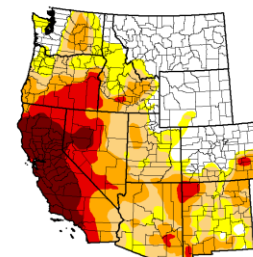
2012

## How bad might it get and how long will it last?

## How are we planning for this year and for longer-term risks and opportunities?

2013

September 2014



September 16, 2014  
(Released Thursday, Sep. 18, 2014)  
Valid 8 a.m. EDT

Drought Conditions (Percent area)					
	None	D0	D1	D2	D3
Current	25.1%	12.2%	17.2%	38.8%	8.7%
Last Week	25.1%	11.8%	17.2%	38.8%	8.7%
1 Month Ago	25.1%	11.8%	17.2%	38.8%	8.7%
3 Months Ago	25.1%	11.8%	17.2%	38.8%	8.7%
6 Months Ago	25.1%	11.8%	17.2%	38.8%	8.7%
1 Year Ago	25.1%	11.8%	17.2%	38.8%	8.7%
5 Year Avg	25.1%	11.8%	17.2%	38.8%	8.7%
10 Year Avg	25.1%	11.8%	17.2%	38.8%	8.7%

**Legend:**  
 D0: Moderate Drought  
 D1: Severe Drought  
 D2: Extreme Drought  
 D3: Very Extreme Drought  
 D4: Exceptional Drought

The Drought Monitor is based on the best available information. It is not a forecast and should not be used for legal or financial purposes.

Author:  
 National Drought  
 Mitigation



# NIDIS 2014: Public Law 113-86

**“Today, I signed the National Integrated Drought Information System Reauthorization Act into law.....to help communities better prepare for droughts..., and prevent the worst impacts on families and businesses”**

**March 6, 2014. President Obama**



Barack Obama

**“develop and expand the Regional Drought Early Warning Information Systems”**

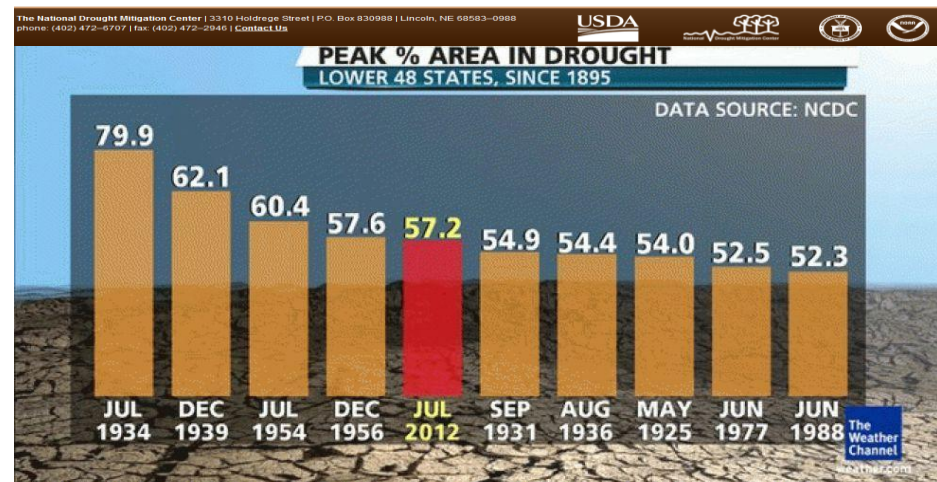
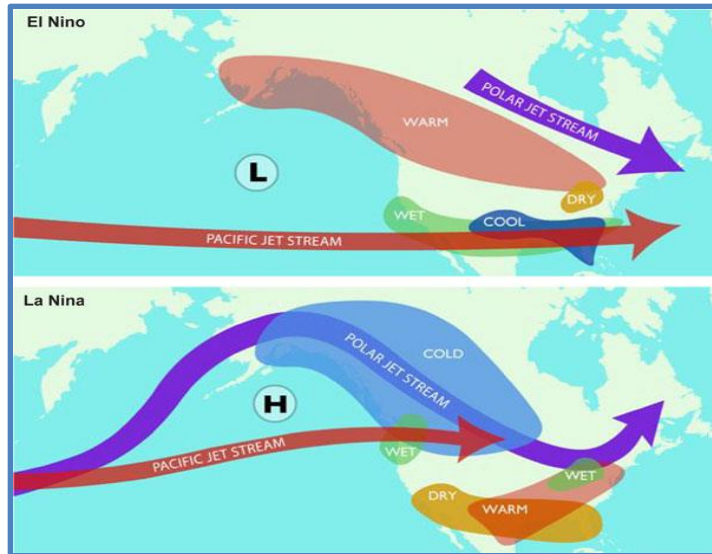
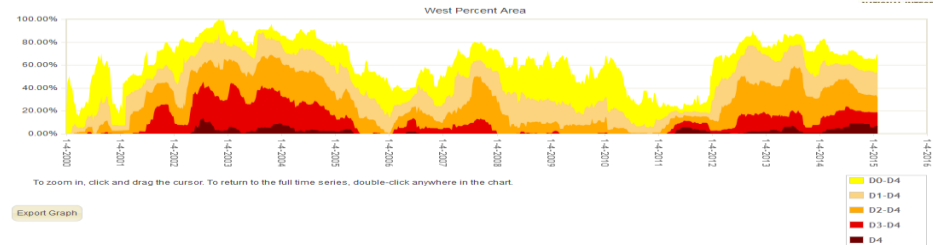
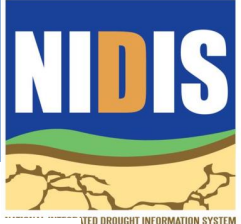
**May, 2014** <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-cjs.pdf>

United States Senate Committee on  
**AGRICULTURE  
NUTRITION  
& FORESTRY**

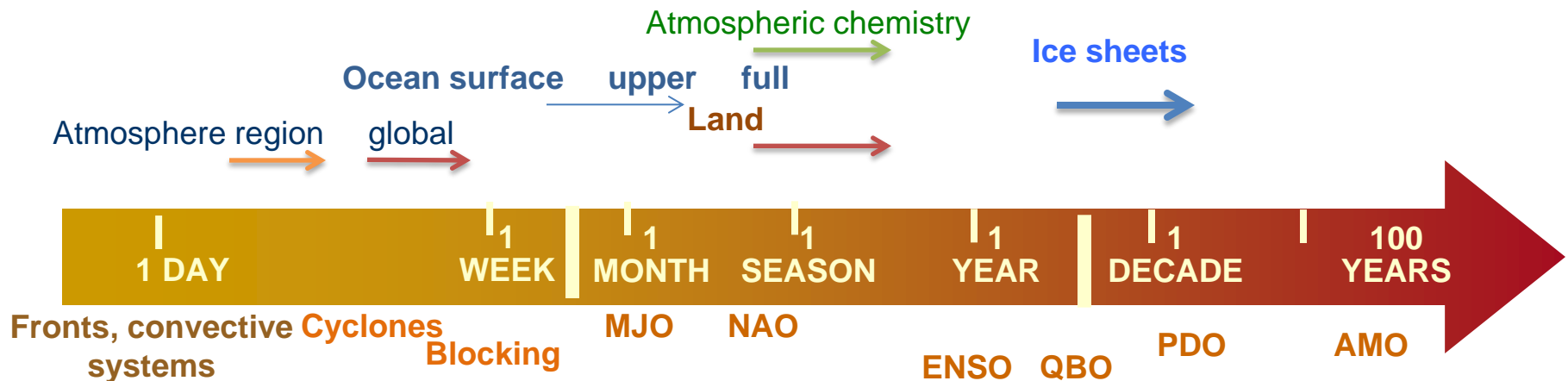




# Drought: Weather-climate continuum and Adaptation deficits



6





# Pathways to Drought Monitoring and Predictability

Key Phenomena, variables

Ocean  
Temp  
anomalies

Global-Scale  
Atmospheric  
Changes

Regional  
Forcing and  
land feedbacks

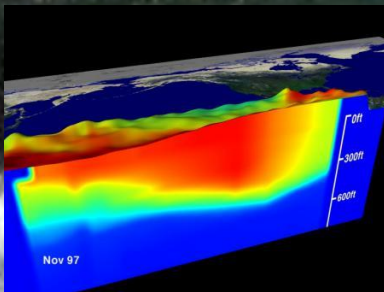
Local Impacts,  
Info needs

ENSO, PDO,  
AMO, warm pool  
variability,  
Global Warming,  
etc

planetary waves,  
hydrological cycle,  
monsoons,  
Hadley Cell,  
Walker  
Circulation

precipitation, soil  
moisture, snow, low  
level jets, dust,  
vegetation,  
land/atmosphere  
contrasts, changes  
in weather

soil moisture,  
stream flow,  
precipitation,  
ground water,  
lakes,  
reservoirs



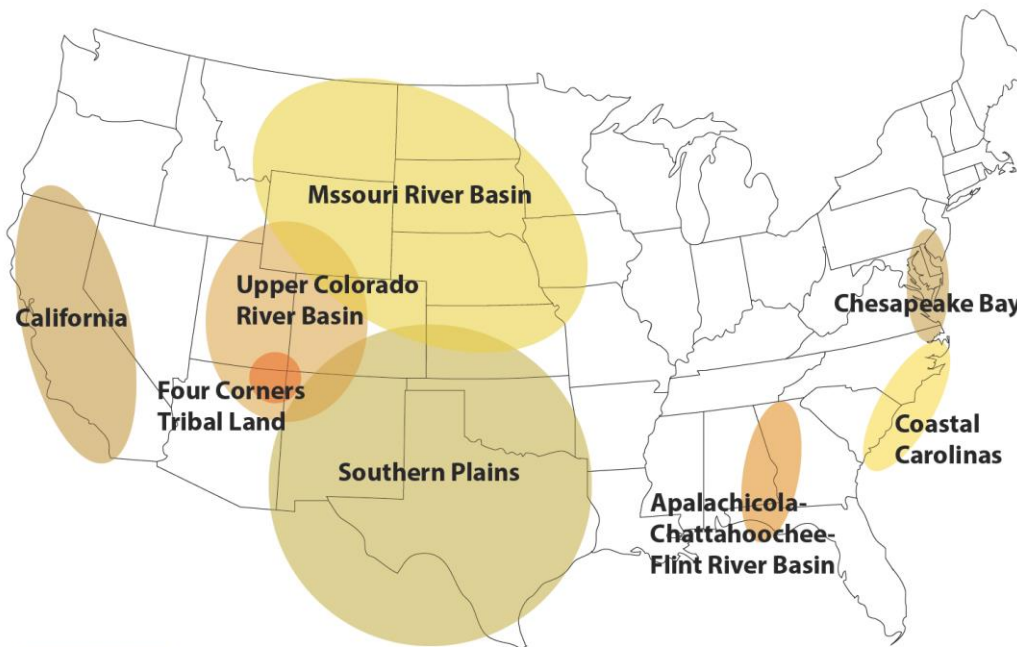
Regional Drought Early  
Warning Systems

## Applications

Support cross-regional  
efforts to assess user needs,  
test drought-focused  
decision support tools

National Integrated  
Drought Sciences and  
Assessments (NIDISA)

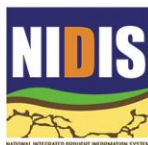
Sectoral Appli  
Research Pro  
(SARP)



Modeling Analysis  
Predictions and  
Projections

NATIONAL DROUGHT  
INVESTIGATION CENTER  
(NDMC)

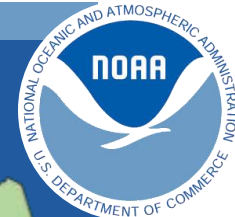
Regional Climate  
Centers  
State Climatologists



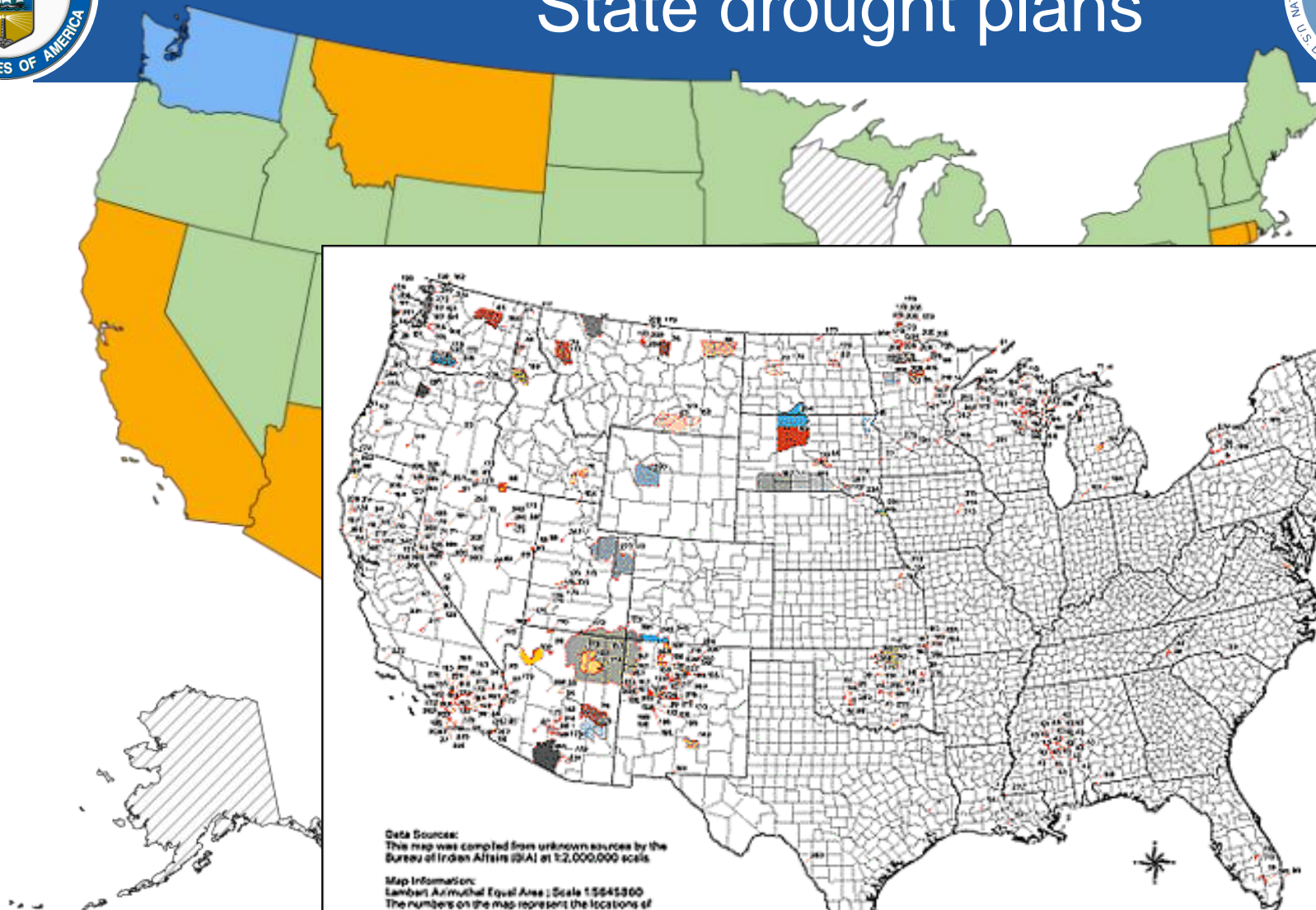
Identify socio-economic  
effects of drought, data  
and info needs of  
resource managers and  
policy/decision makers

Evaluate and transition drought  
information products to  
emergency response AND

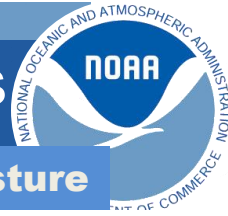
Drought Preparedness and  
risk management planning



# State drought plans

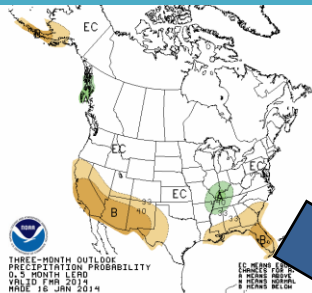




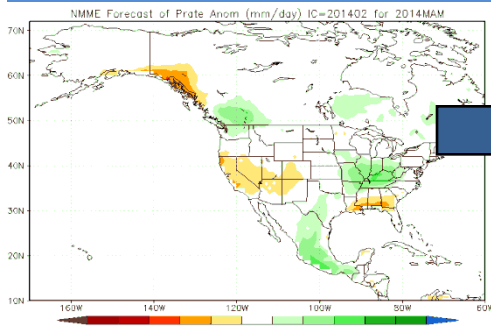


# Principal Monthly/Seasonal Drought Outlook Inputs

## CPC Seasonal Outlook

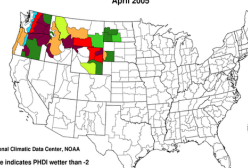


## NMME



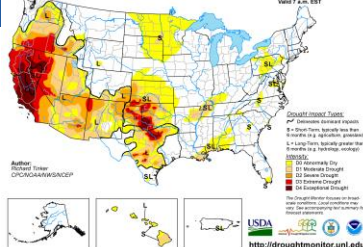
## Palmer 4-mo Probabilities

Probability of Precipitation Required to Ameliorate Current Drought Conditions in Four Months  
April 2005



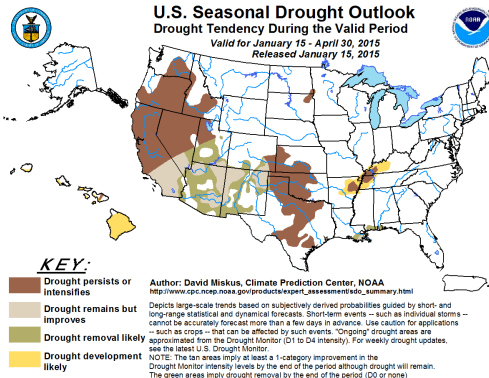
## U.S. Drought Monitor

January 20, 2015  
(Revised Thursday, Jan. 22, 2015)  
Valid 7 A.M. EST



## U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for January 15 - April 30, 2015  
Released January 15, 2015

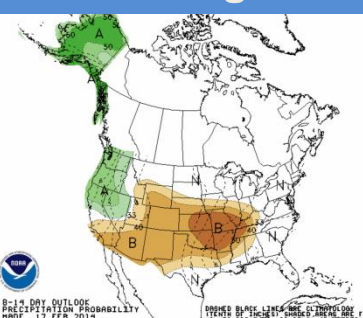


### KEY:

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

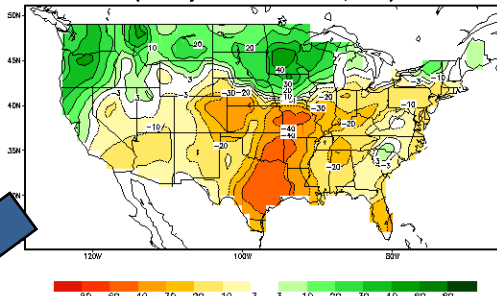
Author: David Miskus, Climate Prediction Center, NOAA  
<http://www.cpc.ncep.noaa.gov/products/forecast/assessment/summary.html>  
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events – such as individual 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 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).

## Medium-Range Fcst



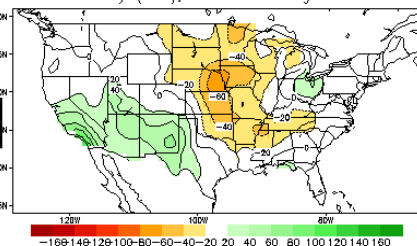
## 2-Wk Soil Moisture

SM Anomaly Change (mm)  
(Last day of WEEK2 – MAY 09, 2005)

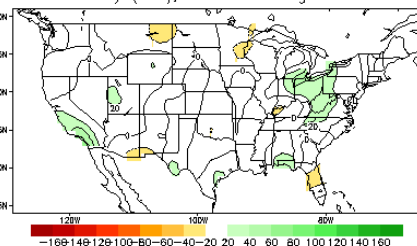


## Constructed Analogue Soil Model

Lagged Averaged Soil Moisture Outlook for End of 20050508  
units: anomaly (mm), SM data ending at 20050508



Lagged Averaged Soil Moisture Outlook for End of AUG2005  
units: anomaly (mm), SM data ending at 20050508



# Palmer Z-Index

January, 2015







## U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for January 15 - April 30, 2015

Released January 15, 2015

extreme  
drought

-2.75  
and  
below

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

Author: David Miskus, Climate Prediction Center, NOAA

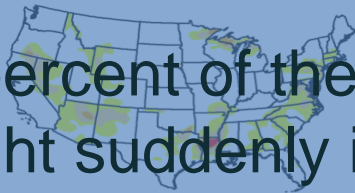
[http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/sdo\\_summary.html](http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.html)

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.

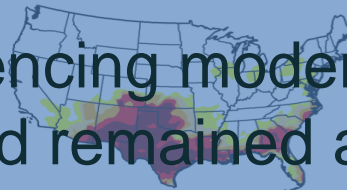
NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain. The green areas imply drought removal by the end of the period (D0 or none)

# The weather-climate continuum

The percent of the U.S. experiencing moderate to severe drought suddenly increased and remained at elevated levels during the first decade of the 21st Century

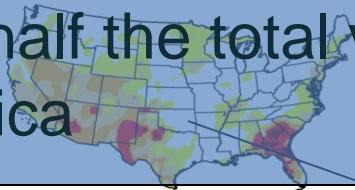


July 2010  
8% moderate to exceptional

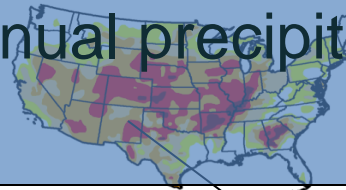


July 2011  
28% moderate to exceptional

Even a perfect SST prediction would “likely” capture much less than half the total variance in annual precipitation over North America



May 2012  
35% moderate to exceptional



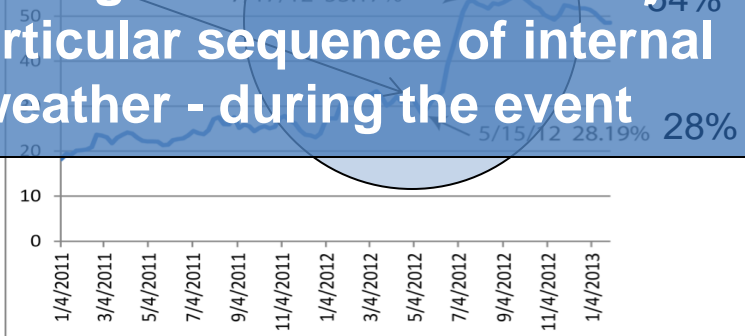
July 2012  
64% moderate to exceptional

Area (%) of the US (including Alaska, Hawaii and Puerto Rico) categorized as D1, D2, D3 or D4 on the US Drought Monitor

A complete explanation of these droughts must invoke not just the ocean forcing but also the particular sequence of internal atmospheric variability - weather - during the event



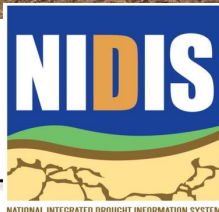
January 2013  
54% moderate to exceptional



**NOAA Drought Task Force**  
Narrative Team

Lead: M. Hoerling

Co-Leads: S. Schubert and K. Mo

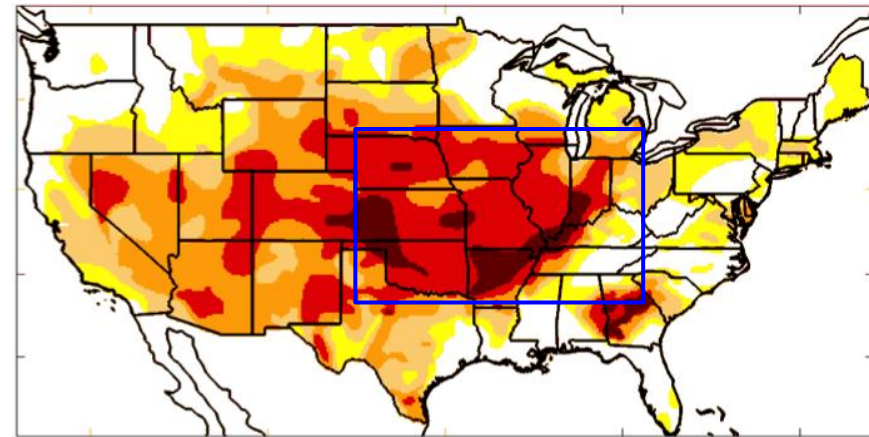


NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM



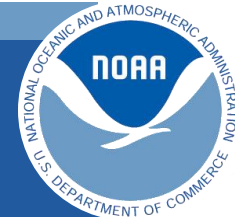
$$EDDI_j = \frac{\sum_{t=i}^j (ET_{0t} - \overline{ET_{0t}})}{\sigma_{\overline{ET_{0t}}}}$$

*USDM*



~~Do Droughts in the TN D3t deep in~~  
~~drought NY, PA, and OK, NE months after EDDI~~

- Due to land-atmosphere feedbacks, evaporative demand ( $E_0$ ) reflects surface moisture conditions, *often before ET does*,
  - responds positively to both flash droughts and sustained droughts.



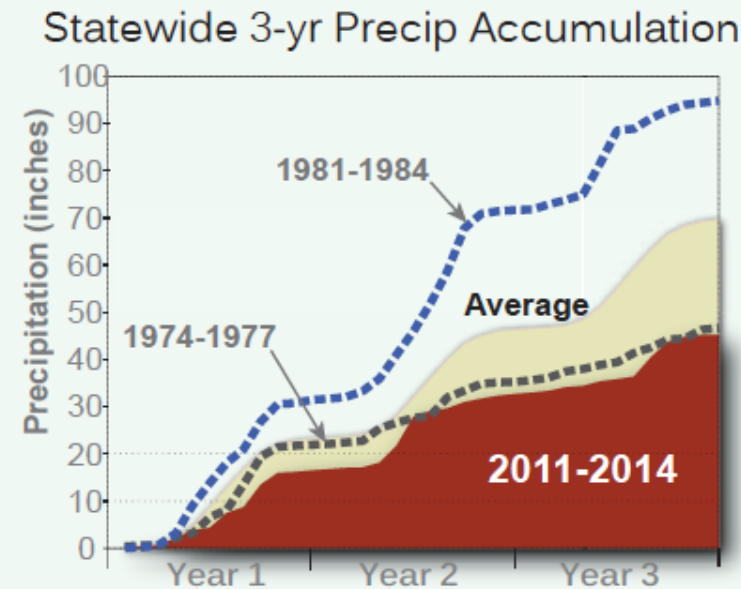
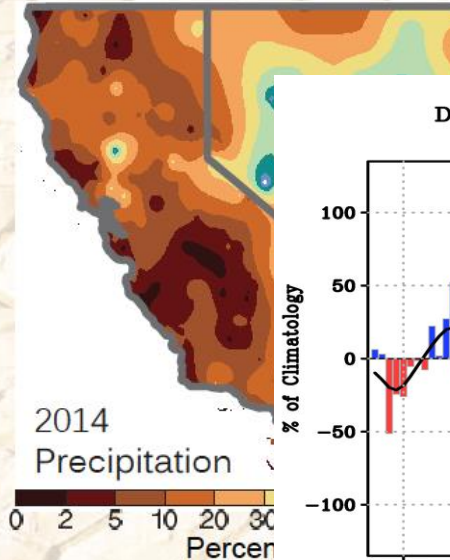
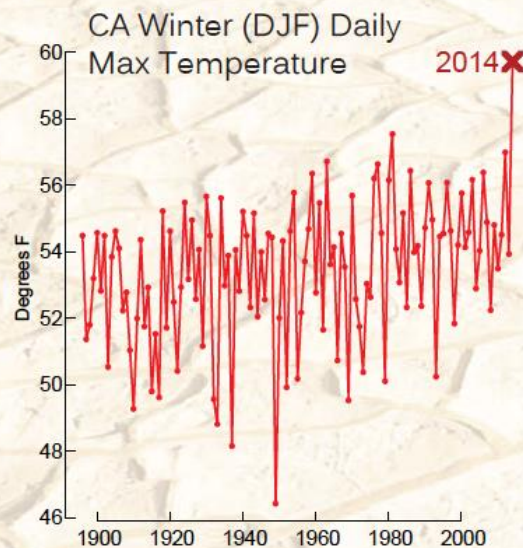
# NIDIS Drought-related Activities in California: A Few Examples

- **Causes and Predictability of the 2011-14 California Drought:**
- **Predicting Drought Amelioration: How Much Precipitation is Needed to End a Drought**
- **Within-season monitoring of Fallow Lands** (USDA, NIDIS/NASA, California DWR, others): Timely knowledge of the amount and spatial distribution of fallowing and irrigation
- **California Services Assessment** –assessing response and drought service capabilities in California to inform future actions

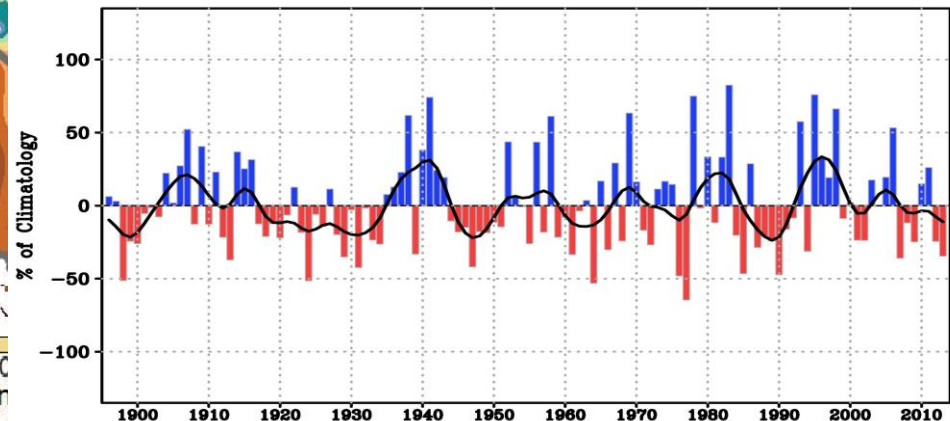
ASSESSMENT REPORT  
Causes and Predictability  
of the 2011-14  
California Drought



## The California Drought of 2014: Record Hot, Record Dry



Dec-Apr Precipitation Departures: 1896-2013



- Could “the” drought have been anticipated?
- Is the California drought a symptom of long-term climate change?

Drought Task Force



**MAPP**  
Modeling, Analysis,  
Predictions, and Projections

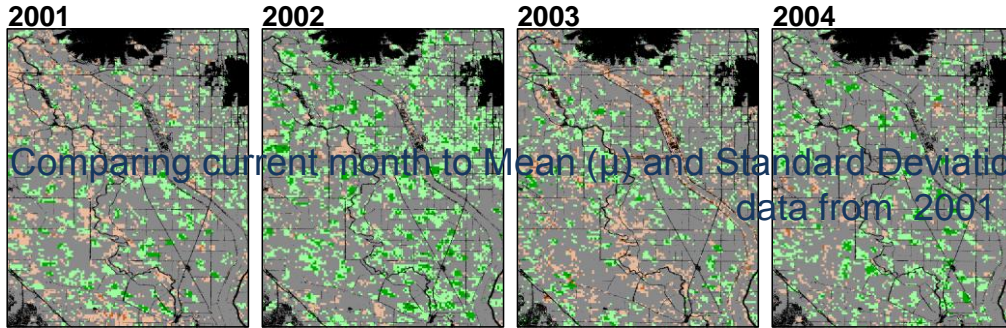




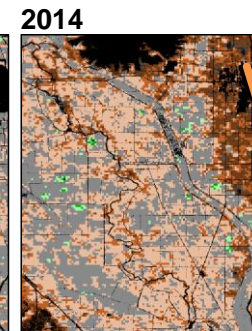
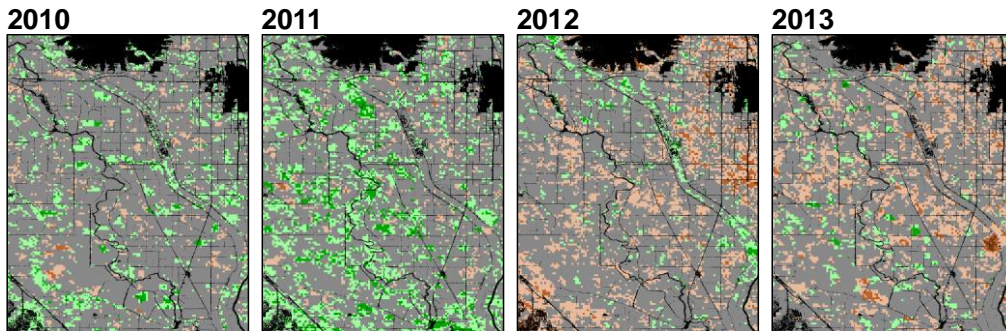
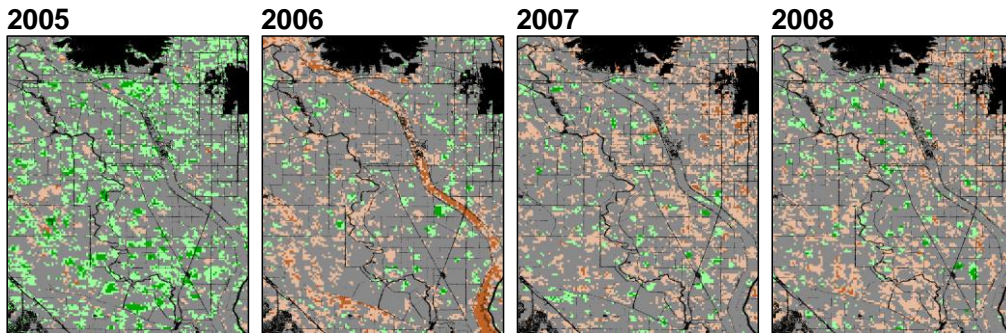
# Cropland Greenness in January

A 35% (400,000 acre) increase in fallowing was observed in 2014 relative to 2011, a year of normal water availability-state resources for county food banks

2001

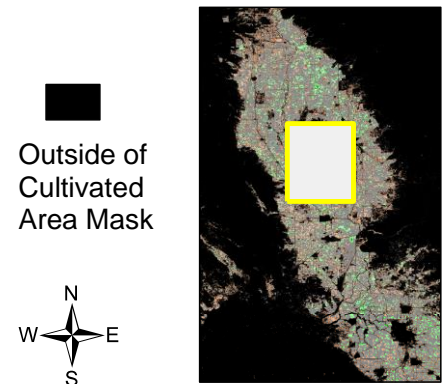
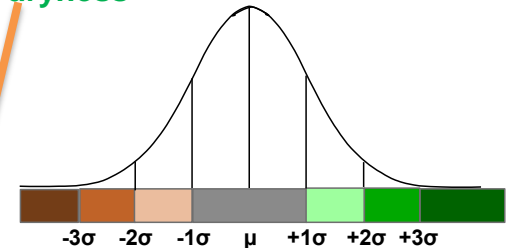
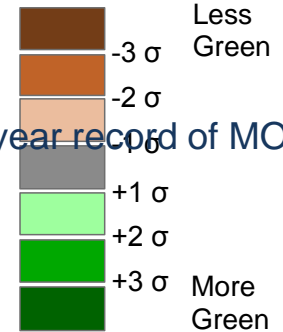


Comparing current month to Mean ( $\mu$ ) and Standard Deviation ( $\sigma$ ) for that month in the 13-year record of MODIS data from 2001 to 2013



January Greenness  
Deviation from  
13 year Average

2014 January  
showing extensive  
areas of dryness



50

Km

2014

150

Km

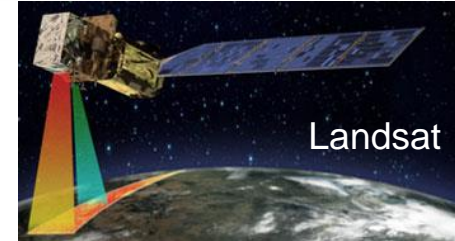


# Landsat and Drought Monitoring with

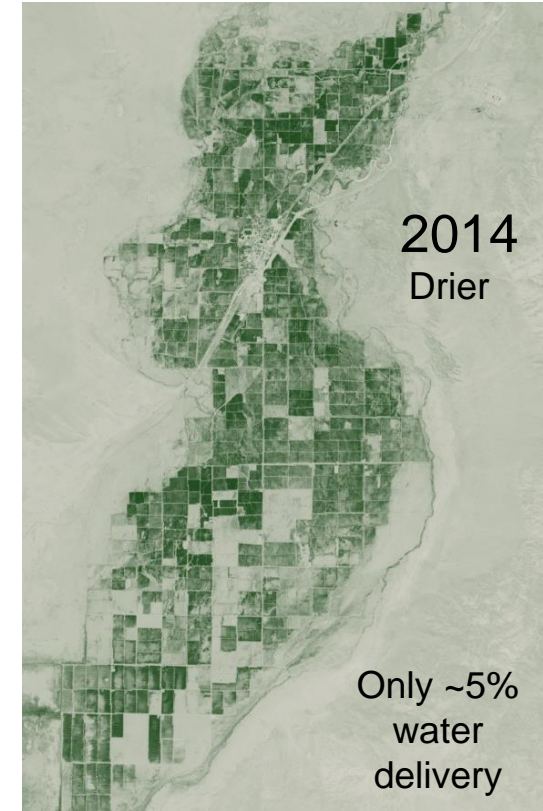
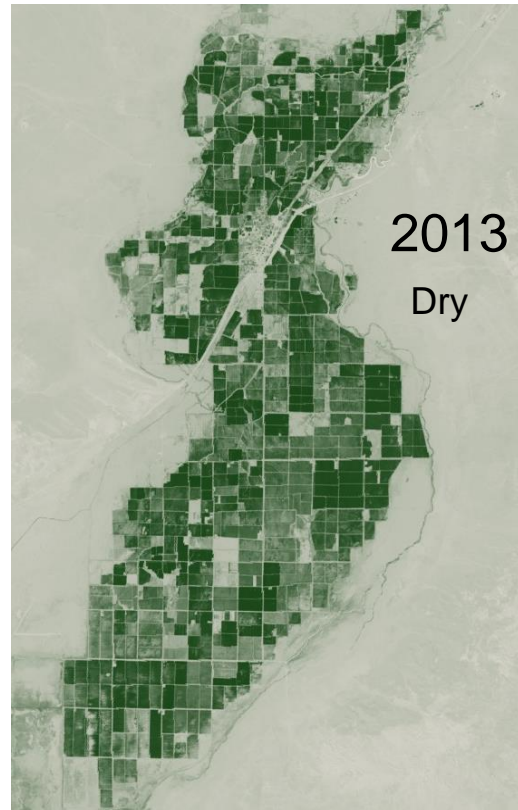


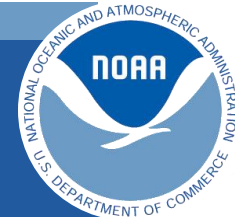
## Lovelock, Nevada – Humboldt River Basin

- No groundwater pumping for irrigation (too salty)
- Very little storage upstream
- Extremely sensitive to persistent hydrologic drought



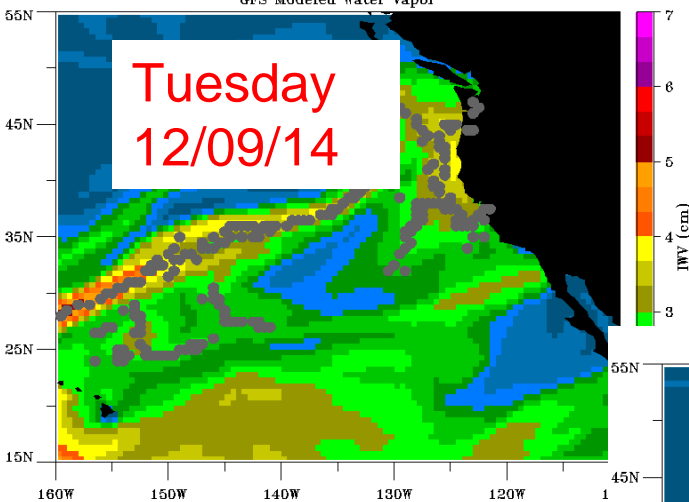
- Growing Season Crop Water Use (30m Pixels) – Computed using Google Earth Engine
- Google hosts the entire 40yr+ Landsat archive and provides parallel cloud computing





# Atmospheric Rivers (ARs)

20141204 120 Hour Forecast  
GFS Modeled Water Vapor

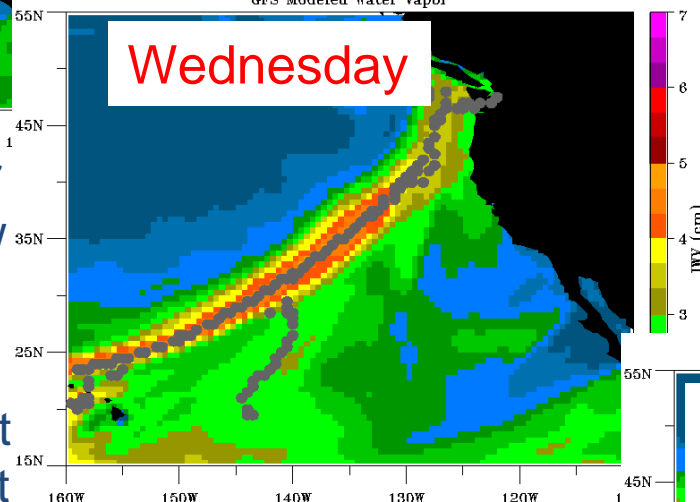


transport of water vapor  
at the boundary of a low  
pressure system

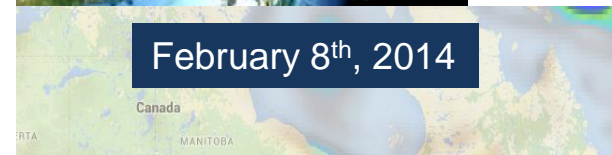


February 8th, 2015

20141204 144 Hour Forecast  
GFS Modeled Water Vapor

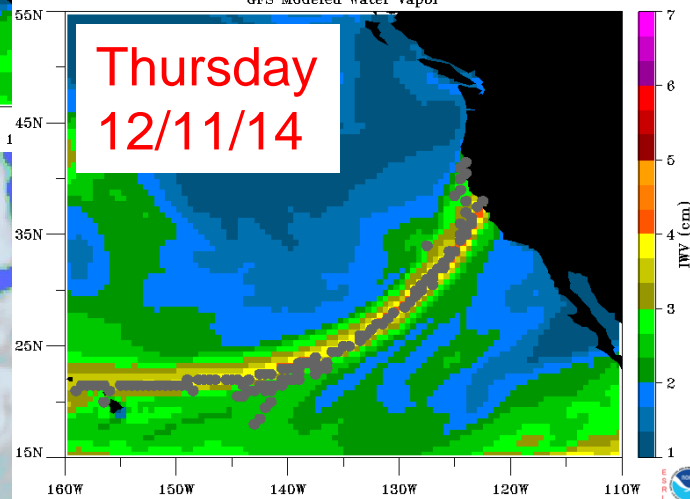


Wednesday

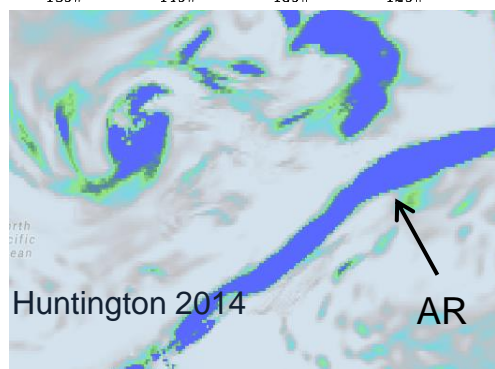


February 8th, 2014

20141204 168 Hour Forecast  
GFS Modeled Water Vapor



Thursday  
12/11/14



Huntington 2014

AR

- ~ 40-70% of the drought breaks in the west coast since 1950 are due to ARs
- Large & slow moving ARs can cause flooding



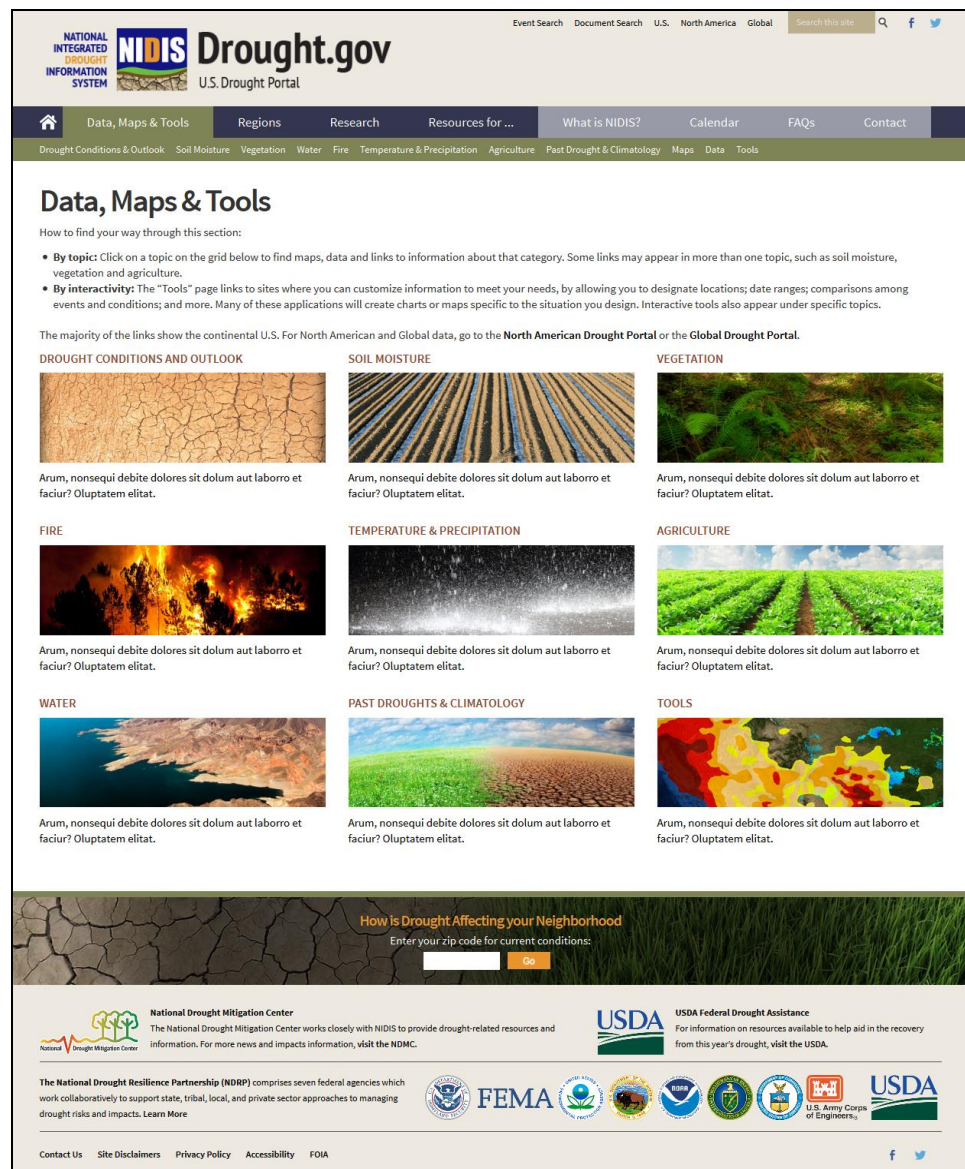
# Evolving drought.gov (The NIDIS U.S. Drought Portal)

Intuitive organization:

- Current Drought
- Drought Forecasts
- Drought Impacts

Maintain / expand access to tools:

- Drought ACIS
- Map Viewer
- Time series and pie charts
- Drought Risk Atlas
- Soil moisture viewer
- Drought management database



The screenshot shows the Drought.gov U.S. Drought Portal website. The header includes the NIDIS logo and navigation links for Event Search, Document Search, U.S., North America, Global, and a search bar. The main navigation bar lists categories: Data, Maps & Tools, Regions, Research, Resources for..., What is NIDIS?, Calendar, FAQs, and Contact. Below this, a secondary bar lists specific topics: Drought Conditions & Outlook, Soil Moisture, Vegetation, Water, Fire, Temperature & Precipitation, Agriculture, Past Drought & Climatology, Maps, Data, and Tools.

The main content area is titled "Data, Maps & Tools" and includes a sub-header "How to find your way through this section:". It lists two bullet points: "By topic" (click on a topic on the grid below to find maps, data and links to information about that category) and "By interactivity" (the "Tools" page links to sites where you can customize information to meet your needs). Below this, a grid of nine categories is displayed, each with a representative image and a placeholder text "Arum, nonsequi debite dolores sit dolum aut laboro et faciu? Oluptatem elitat.":

- DROUGHT CONDITIONS AND OUTLOOK** (Image: Cracked dry earth)
- SOIL MOISTURE** (Image: Tilled soil with blue lines)
- VEGETATION** (Image: Green forest)
- FIRE** (Image: Burning trees)
- TEMPERATURE & PRECIPITATION** (Image: Rain falling)
- AGRICULTURE** (Image: Green crops in a field)
- WATER** (Image: A body of water)
- PAST DROUGHTS & CLIMATOLOGY** (Image: A landscape with a green field and a brown field)
- TOOLS** (Image: A map with various colored regions)

At the bottom of the main content area, there is a section titled "How is Drought Affecting your Neighborhood?" with a text input field for "Enter your zip code for current conditions:" and a "Go" button.

The footer contains the National Drought Mitigation Center logo and text, the USDA Federal Drought Assistance logo and text, and the National Drought Resilience Partnership (NDRP) logo and text. It also includes a row of logos for FEMA, NOAA, and the U.S. Army Corps of Engineers, followed by a row of social media icons (Facebook, Twitter, YouTube, etc.) and a row of links (Contact Us, Site Disclaimers, Privacy Policy, Accessibility, FOIA).






**Drought Risk Atlas**

NDMC, NIDIS, SARP, USDA/RMA











United States

Tools to make it easier to move from regional to applicable state information.



**National Drought Mitigation Center**  
 The National Drought Mitigation Center works closely with NIDIS to provide drought-related resources and information. For more news and impacts information, visit the [NDMC](#).


**USDA Federal Drought Assistance**  
 For information on resources available to help aid in the recovery from this year's drought, visit the [USDA](#).

**The National Drought Resilience Partnership (NDRP)** comprises seven federal agencies which work collaboratively to support state, tribal, local, and private sector approaches to managing drought-risk and impacts. [Learn More](#)



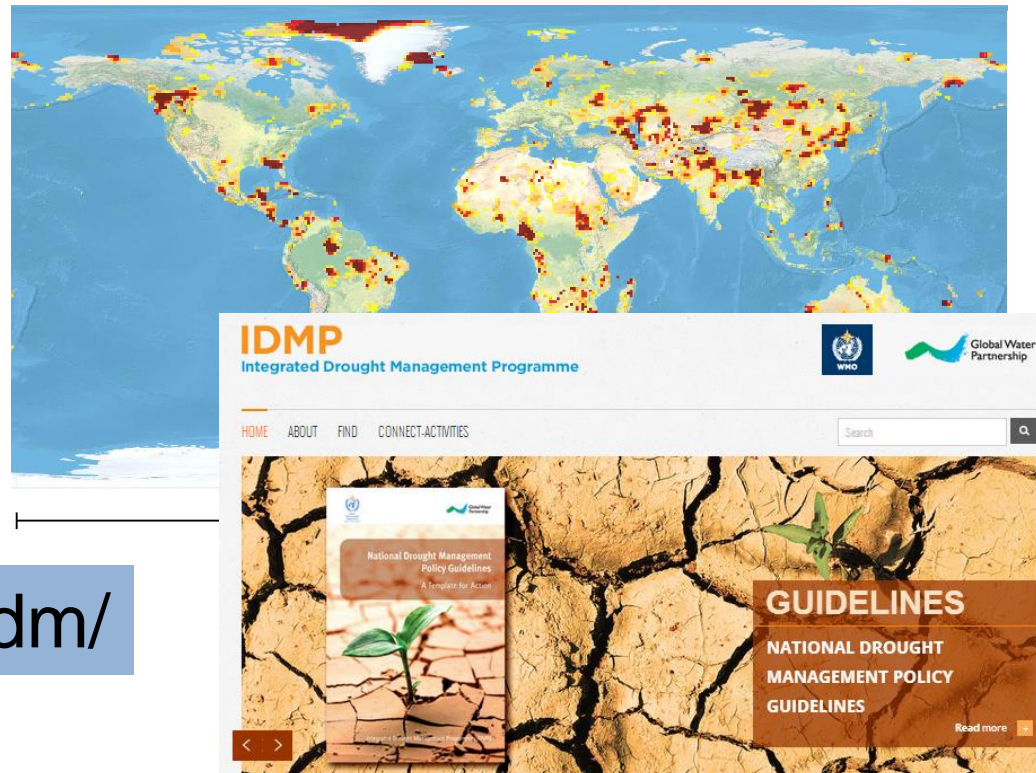
# Use NIDIS Drought Portal as IT Foundation for Clearinghouse for International Drought Information and Services



- ✓ Workshop on the Development of an Experimental Global Drought Information System (GDIS), 21-22 April 2010, Asheville, NC, USA
- ✓ 11-13 April 2012, Frascati, Italy, 10-12 December 2014 Pasadena CA

## Global Drought Monitor

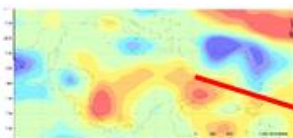
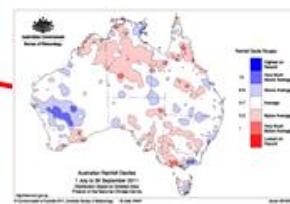
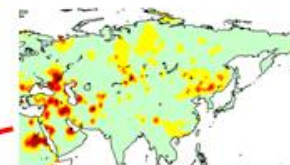
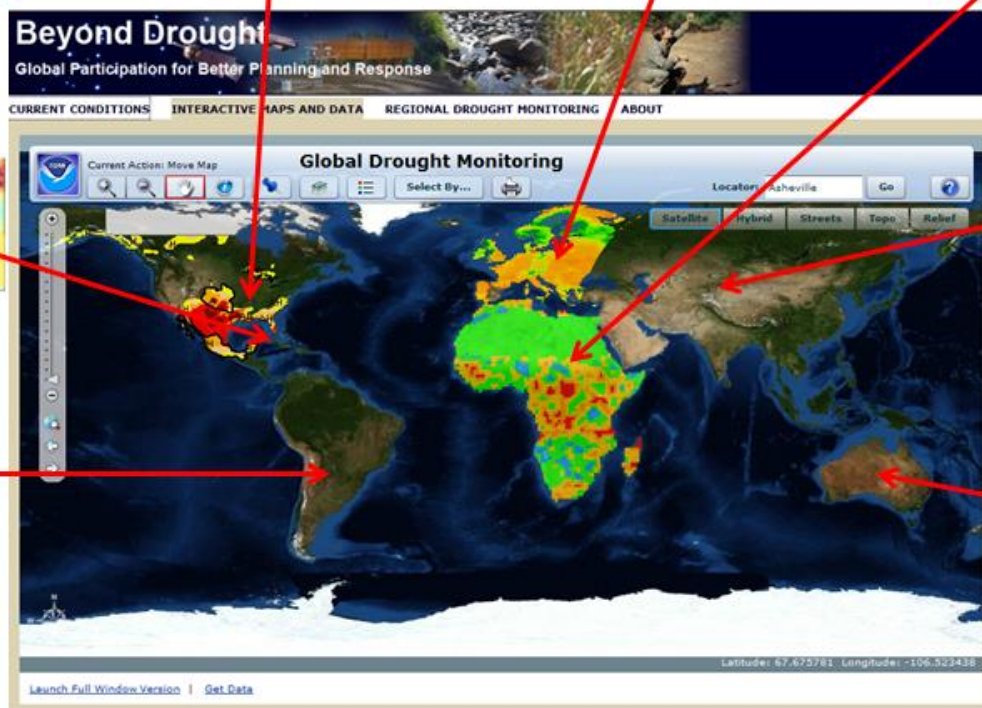
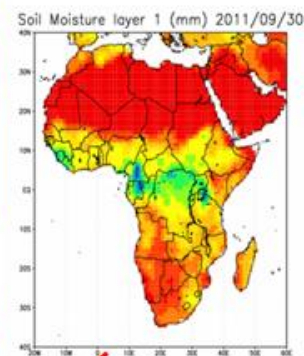
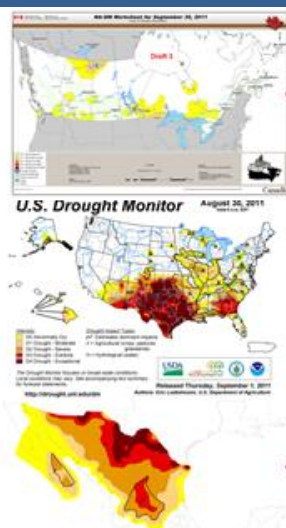
- ✓ With a web-services-based Clearinghouse foundation (Global Drought Monitoring web portal), a GDEWS is being constructed atop it by integrating continental and regional Drought Monitors & services.



<http://www.drought.gov/gdm/>



# Global Drought Monitoring Conceptual Framework – An Integration of Continental / Regional Drought Monitors





RAIN



Apathy



DROUGHT

# "Hydro-Illogical" Cycle



Panic

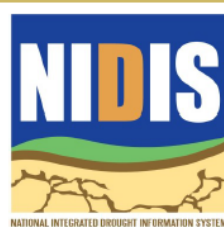


MORE DROUGHT



Concern





# NIDIS Drought Early Warning Pilot in the Apalachicola, Chattahoochee, and Flint River Basin: Evaluation of Activities and Outcomes

## Quarterly Climate Impacts and Outlook

### Regional Impacts for September-November 2014

**Drought, Flooding and Water Resources**  
Storage in northern California's Lake Oroville bottomed out Nov 21 at 898,221 acre-ft, 42% of historical average capacity. This is among lowest storage amounts on record.  
Nearly all of CA's major reservoirs are below 50% average capacity. NV and eastern OR reservoirs low as well.  
Wells in rural CA communities continue to run dry; residents relying on bottled or transported water. Tulare, San Mateo counties hardest hit.  
California passed groundwater management legislation, voters approved \$7.5B in water bonds. After 3+ years of drought, increased public and political attention.

#### Agriculture, Wildlife and Fisheries

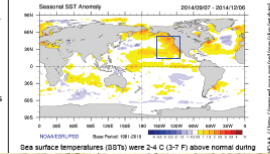
Increase in lemon and hay prices; production fell for rice, grapes, oranges, pistachios, etc.

Due to drought, fewer and smaller grapes produced overall.  
Low water in wetland areas of paths of ducks and other waterfowl.  
Bear encounters with humans in Sierra Nevada and Oregon.

#### Fire

In September, the King Fire of Sierra Foothills west of Sacramento structures and cost \$50 million.

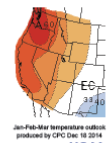
#### Exceptionally warm ocean temperatures off US West Coast



## From Too Much to Too Little:

How the central U.S. drought of 2012 evolved out of one of the most devastating floods on record in 2011

### Regional Outlook



**NOAA**  
Above normal temperatures at departures from normal in One the development of a weak to the northern tier of the region.

#### NMME Precipitation

The National Multi-Model Ensemble (NMME) is an experiment to improve performance by combining 8 different seasonal models. Past performance shows moderate skill, at least equi methods. The NMME for Jan-Feb 2015 shows a weak to the northern tier of the region. The NMME for Jan-Feb 2015 shows a weak to the northern tier of the region. The NMME for Jan-Feb 2015 shows a weak to the northern tier of the region.

Contacts: Nina Colley (Nina Colley@noaa.gov), Carole Brown (cbrown@noaa.gov), Kelly Redmond (Kelly.Redmond@noaa.gov)

## MANAGING DROUGHT IN THE SOUTHERN PLAINS

You are invited to join us in a 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 Thursday of each month at 11:00 A.M. Central Time. A shortened briefing will also be offered on the 4th Thursday. 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](mailto:scipp@mesonet.org). For each webinar, you will receive an e-mail with the link to access the webinar. Each webinar will last 45-60 minutes.

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>. A two-page summary will be produced and posted for each webinar. 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](mailto:scipp@mesonet.org)

#### Webinar Topics:

- La Niña
- Cattle & Livestock
- U.S. Drought Monitor
- Ecological Impacts
- Seasonal Forecasting
- Flash Drought
- Water Supply
- Wildfire
- Drought Ready Communities
- Agricultural Impacts



### ASSESSMENT REPORT

## Causes and Predictability of the 2011-14 California Drought

## An Interpretation of the Origins of the 2012 Central Great Plains Drought



## Assessment Report

### NOAA Drought Task Force Narrative Team

Lead: Martin Hoerling  
Co-Leads: Siegfried Schubert & Kingtse Mo

20 March 2013

# Weekly Climate, Water & Drought Assessment





## Managing Drought Risk on the Ranch

ADMINISTRATION

Overview Register Login

### Managing Drought Risk on the Ranch

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

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

#### Workshops and Webinars

### Managing Drought Risk on the Ranch Professional Development Webinar Series

10 am Central Time  
January - May, 2013  
Last Wednesday of each month

Each session will include a briefing on current drought status, followed by a session on a specific topic or tool related to drought planning.

**January 30:** Managing Drought Risk on the Ranch: The Planning Process  
Jerry Volesky, Range and Forage Specialist at the West Central Research and Extension Center, and Lynn Myers, Tippetts-Myers Ranch

**February 27:** Avoiding Analysis Paralysis: Monitoring and Setting Critical Dates for Decision Making During Drought  
Dwayne Rice, Rangeland Management Specialist, USDA-NRCS

[Download "Managing Drought Risk on the Ranch" Handbook](#)



If you are unable to download this document, you would like to receive a paper copy, please contact the NDMC at [ranchplan@unl.edu](mailto:ranchplan@unl.edu) 472-6781.

[How to use this site](#)

**Drought Conditions**  
[U.S. Drought Monitor](#)

2012

## Managing Drought Risk on the Ranch

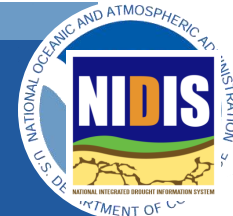
A Planning Guide for Great Plains Ranchers

- NDMC
- USDA-RMA
- USDA-SARE
- Cooperative Extension
- NIDIS



University of Nebraska - Lincoln  
National Drought Mitigation  
Center

Available Online at:  
[www.drought.unl.edu/ranchplan](http://www.drought.unl.edu/ranchplan)



# USDA / NOAA

## Memorandum of Understanding



### MEMORANDUM OF UNDERSTANDING BETWEEN THE U.S. Department of Commerce AND THE U.S. Department of Agriculture

#### I. General Information

WHEREAS, the U.S. Department of Commerce (Commerce) has responsibility for supporting and sustaining economic growth and development, and, through the National Oceanic and Atmospheric Administration (NOAA), monitoring, and climate extreme interest to agriculture of economies and

WHEREAS, the Federal Government and natural resource climate information impacts of weather agricultural production

WHEREAS, the tribal lands, the weather events temperature, and

NOW, THEREFORE, the Understanding and application management decisions, with availability, water environmental,

#### II. Reference

Commerce and Agriculture entities. This MOU supports coordination and

### SUBSIDIARY INTERAGENCY AGREEMENT BETWEEN THE U.S. Department of Commerce NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) and the U.S. DEPARTMENT OF AGRICULTURE (USDA)

Regarding Cooperation on the Successful Application of the  
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM (NIDIS)

#### I. General Information

This agreement is a subsidiary to the Interagency Agreement dated December 21, 2012, between the Department of Commerce and the Department of Agriculture, which provides for cooperation in efforts to advance the development, sharing, and application of weather, climate, economic, and demographic information for risk management with respect to agriculture, forestry, and other resource management decisions, with an emphasis on food and energy security, international trade, water availability, water management, and ecosystem protection in the face of changing environmental, economic, and social conditions.

#### II. Reference and Authorities

This agreement is executed pursuant to the provisions of 7 U.S.C. 2201 and 15 U.S.C. 313.

#### III. Purpose

The purpose of this subsidiary agreement is to establish a framework by which agencies within the Departments of Commerce and Agriculture can work together towards improving their capabilities to monitor and plan for drought, and support risk management strategies, with particular emphasis placed on serving the interests of the agricultural and forestry communities. This will be accomplished by fully using the existing infrastructure of both Departments through cooperative processes established in the development and implementation of the National Integrated Drought Information System (NIDIS), including opportunities to expand collaborative research and outreach activities addressing drought risk management and resilience. Particular activities addressed by this subsidiary agreement are:

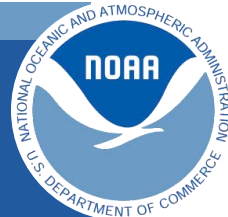
- Increased collaboration on the development and implementation of tools and products to improve the reliability and accuracy of drought monitoring, predictions and projections, including those products used in the production of the *U.S. Drought Monitor*;
- Improving accessibility, compatibility, and sharing of data, analysis, and expertise supporting the development of regional drought early warning systems;
- Establishment of a National Soil Moisture Monitoring Network, with emphasis on expansion into under-served regions, including tribal lands;
- Support of sciences and assessments for drought recovery and response;

- First signed in 1983;
- Renewed December 2012;
- Allows for development of cross-agency Subsidiary Agreements.

## Subsidiary Agreement: Cooperation on Drought

*“establish a framework by which agencies within the Departments of Commerce and Agriculture can work together towards improving their capabilities to monitor and plan for drought, and support risk management strategies, with particular emphasis placed on serving the interests of the agricultural and forestry communities.”*





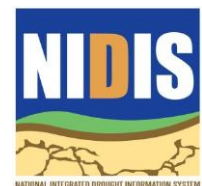
# Developing a Coordinated National Soil Moisture Network

## National Workshops -Recommendations

- Expert Working Group -Plan of Action
- Develop a sub-national pilot system
- Develop a nationwide “best available” product by blending data from disparate sources

### NIDIS complements the National Drought Resilience Partnership goals:

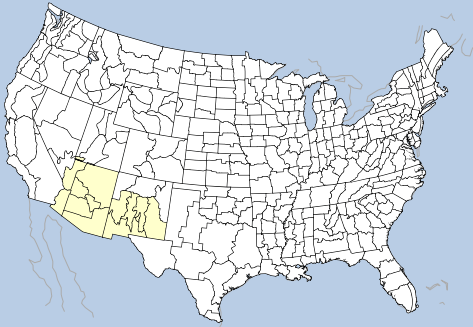
- integrates information on key indicators of drought and drought impacts
- Provides usable, reliable, and timely forecasts of drought drought and impacts



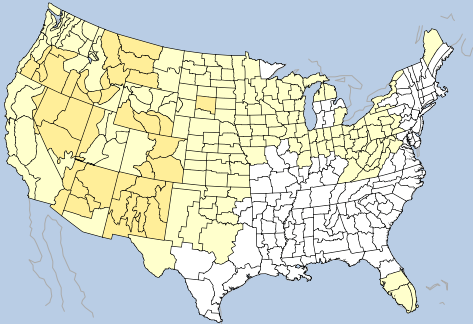


# Are Transitions to Semi-Permanent Drought Imminent?

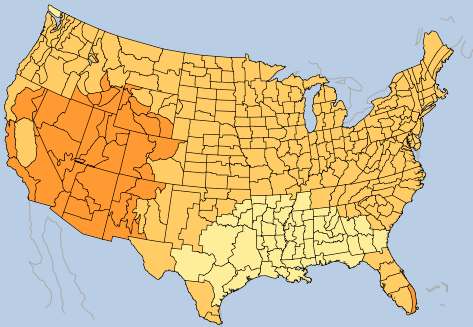
Precipitation



Soil Moisture

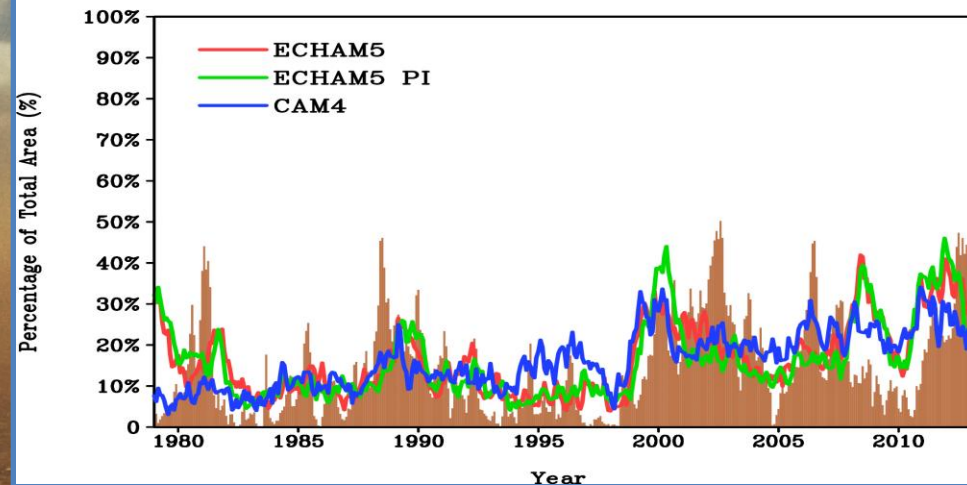


Temperature

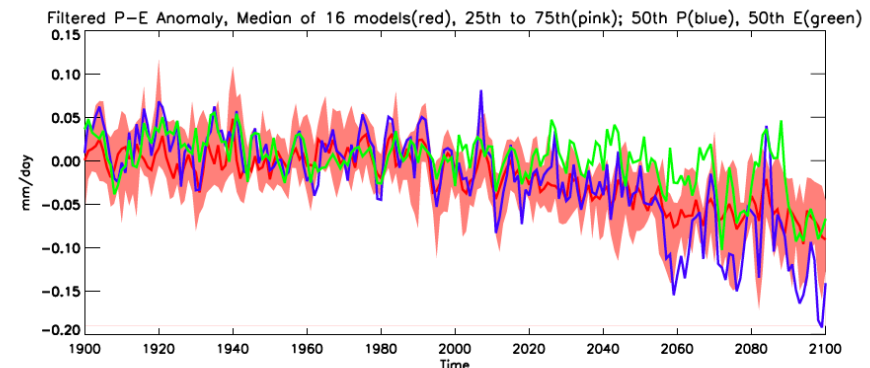


Effect of Long Term Global Ocean Warming and  
Radiative Forcing since 1880  
*ECHAM5 Historical Simulations*

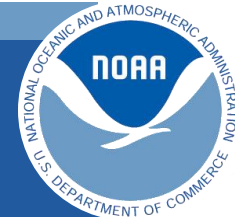
Percent Area of the Contiguous U.S.  
with Soil Moisture  $< -1\sigma$



$P$ ,  $E$  and  $P-E$  averaged across all of SW North America in  
the IPCC AR5 global climate model simulations and  
projections for 1900 to 2100



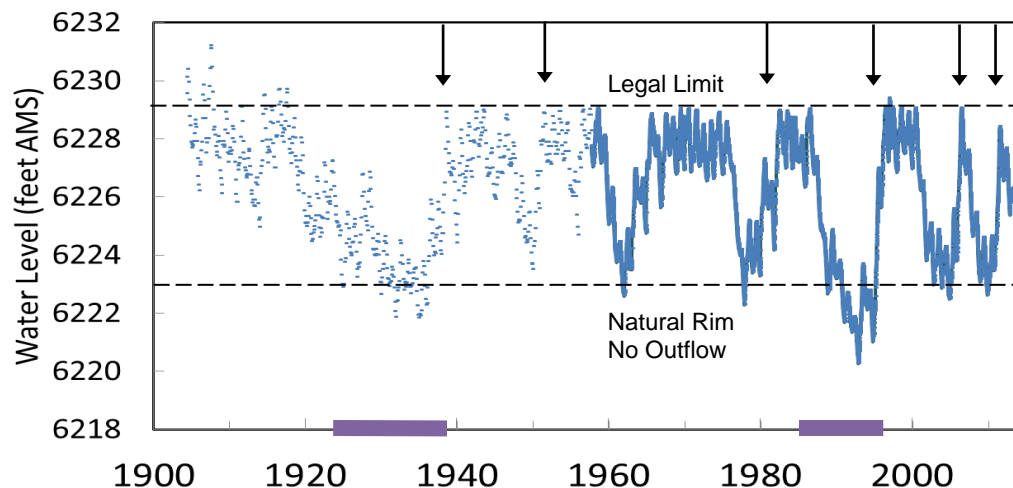
Ongoing transition to a drier climate driven by decreasing precipitation



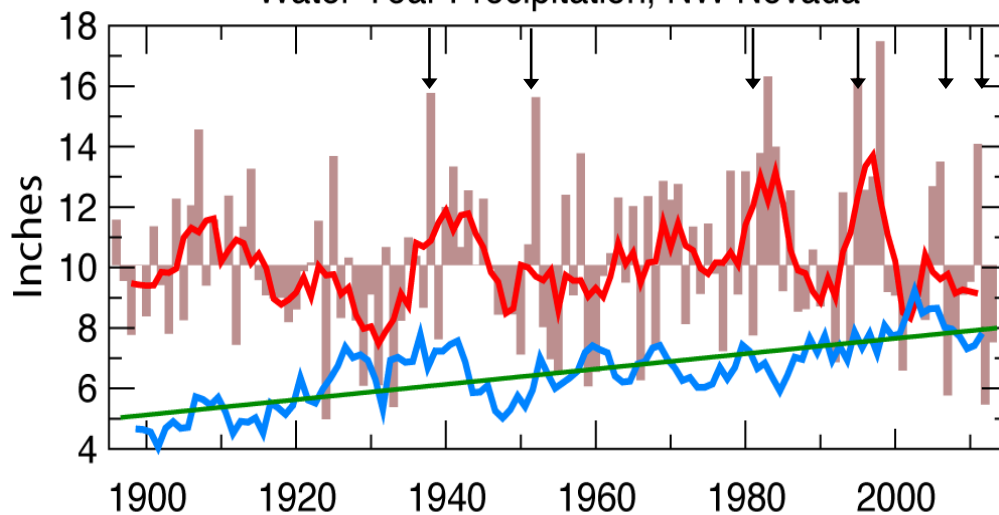
# Lake Tahoe Recent Drought History

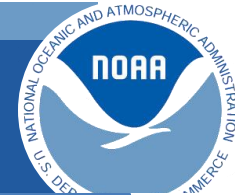
- Water levels in Lake Tahoe are good indicators of persistent hydrologic droughts
- Many years in a row of no outflow into Truckee River (30s & 90s)
- Lower water levels in the 90s than in 30s due to increased demands
- **One very wet winter can break a persistent drought in the region**
  - Need many very wet winters for reservoirs with large storage deficits (i.e. Lake Mead)

## Lake Tahoe Water Level



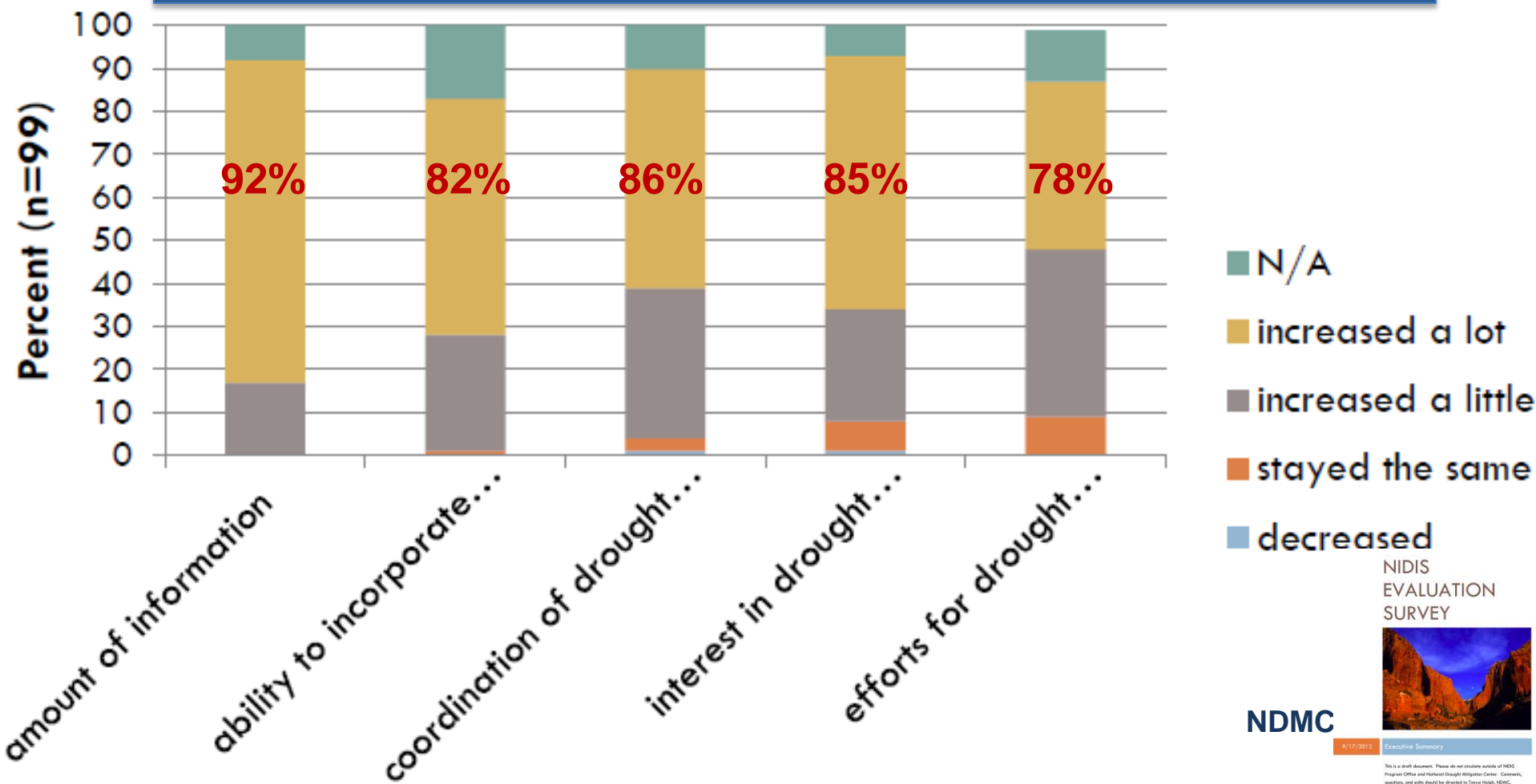
## Water Year Precipitation, NW Nevada





# NIDIS Evaluation

“Comparing readiness for drought before 2002 with now.....”



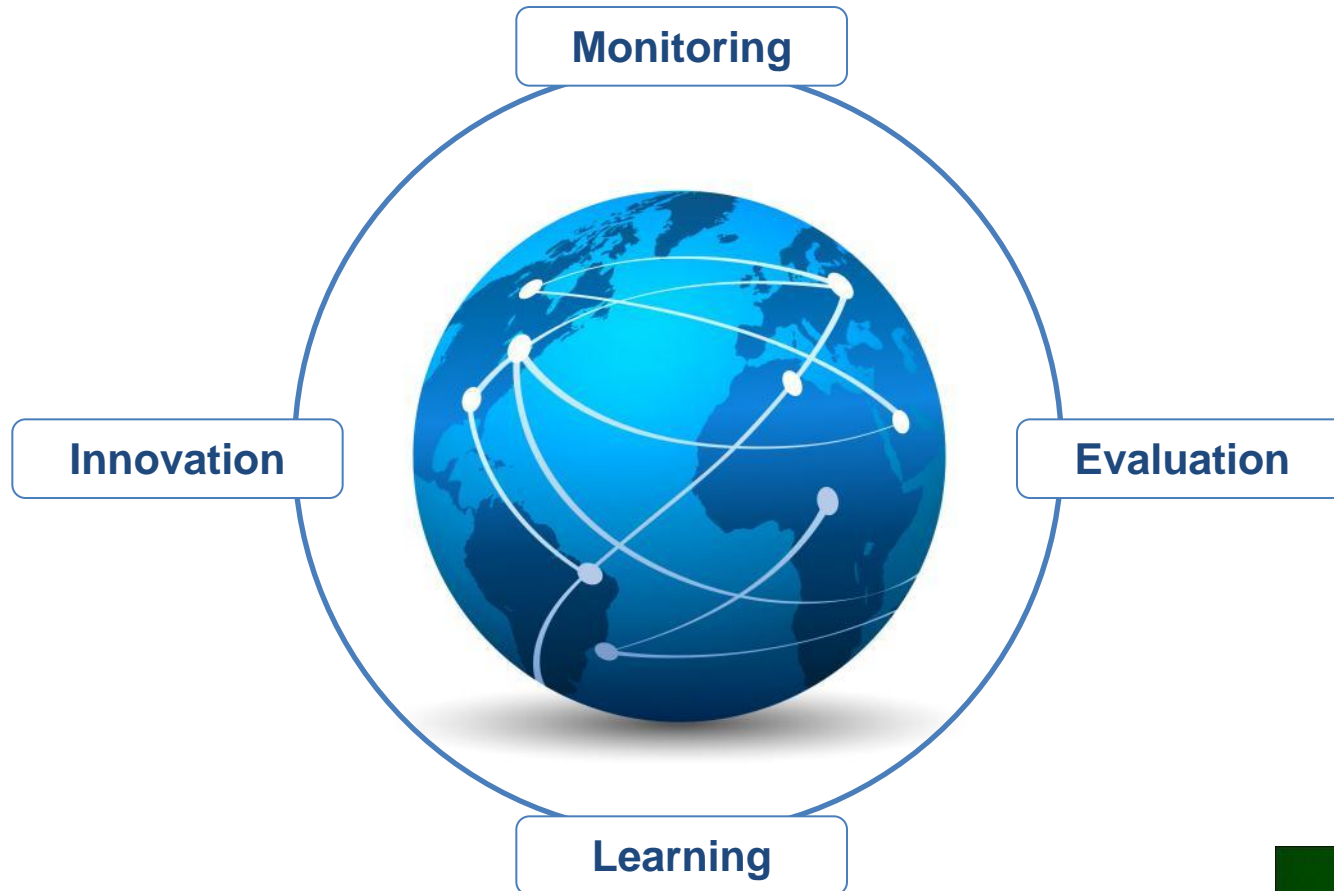
NDMC

8/17/2012 Executive Summary

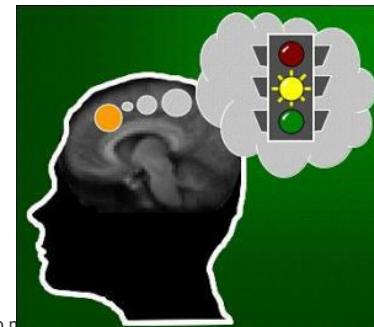
This is a draft document. Please do not circulate outside of NIDIS Program Office and National Drought Integration Center. Comments, questions, and edits should be directed to Teresa Hengg, NIDMC, [teresa.hengg@noaa.gov](mailto:teresa.hengg@noaa.gov), 402-473-6761.



# Focus on capacity and improving decisions-as well as “big data” (heterogeneity, scale, timeliness, complexity)



***How often should criteria for “robustness” be (re)considered?***





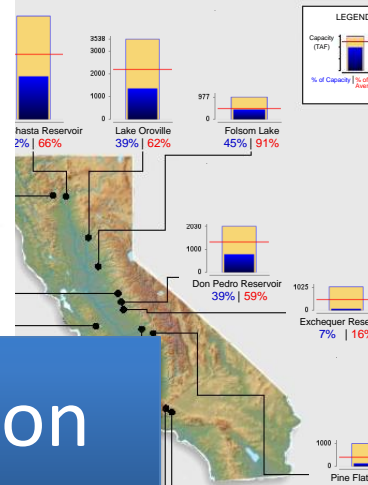
# Thank you!



## Reservoir Conditions

Ending At Midnight - January 5, 2014

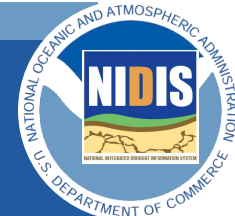
RESERVOIR CONDITIONS



NDMC

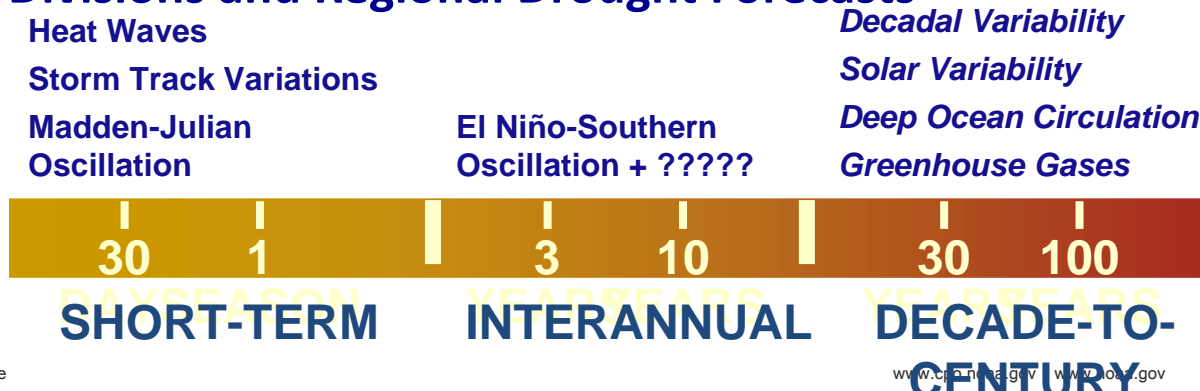


## Coordination



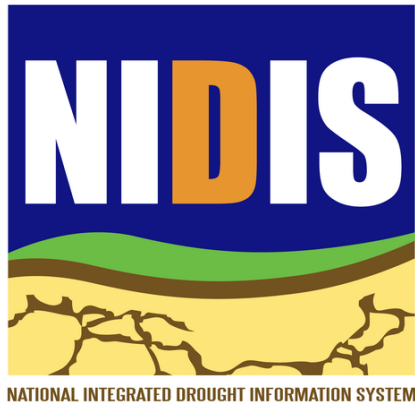
# Forecasting Tools Development-NIDIS CTB

- Updated Optimal Climate Normals (Temperature & Precipitation Trends)
- Improved Understanding of Drought and Ocean Conditions
- ENSO Plume Model Forecasts
- *Improved Understanding of Drought and Land Conditions*
- *Reliability Conditioned on Decadal Variability*
- *National MultiModel Ensemble (NMME)*
- Land-Data Assimilation System (LDAS)
- NOAA Drought Outlook
- Experimental Climate Divisions and Regional Drought Forecasts





# NIDIS complements the National Drought Resilience Partnership goals



## National Integrated Drought Information System: Public Law 109-430; reauthorized in 2014 PL 113-086

- integrates information on key indicators of drought and drought impacts
- Provides usable, reliable, and timely forecasts of drought drought and impacts
- Improve national coordination of soil moisture monitoring

Information sharing  
and collaboration  
across all levels of  
government to  
promote drought  
preparedness &  
planning

