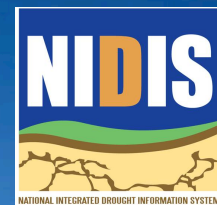
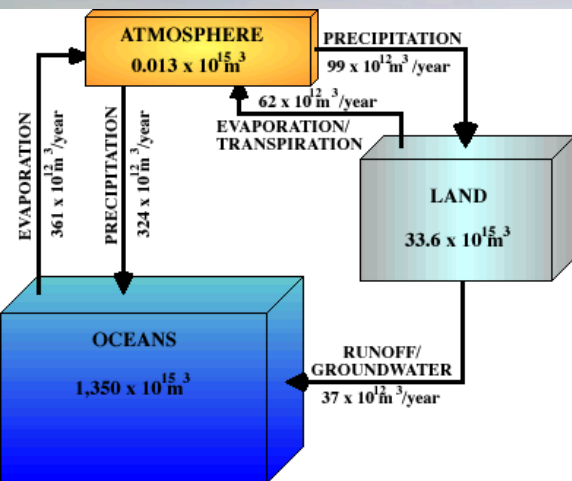




NIDIS: The Next Generation

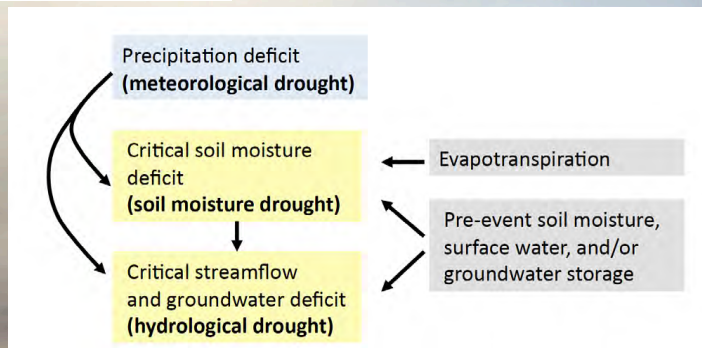
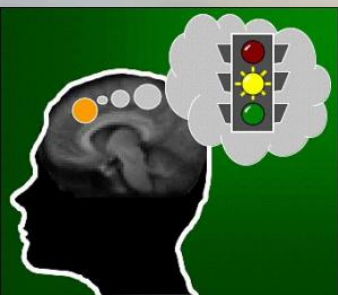


NDMC



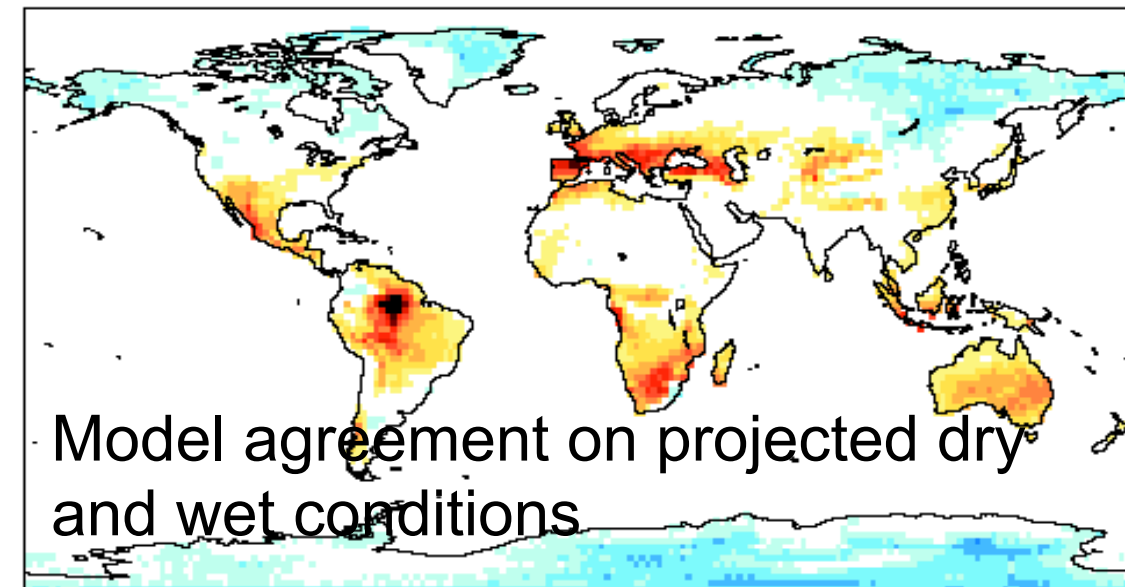
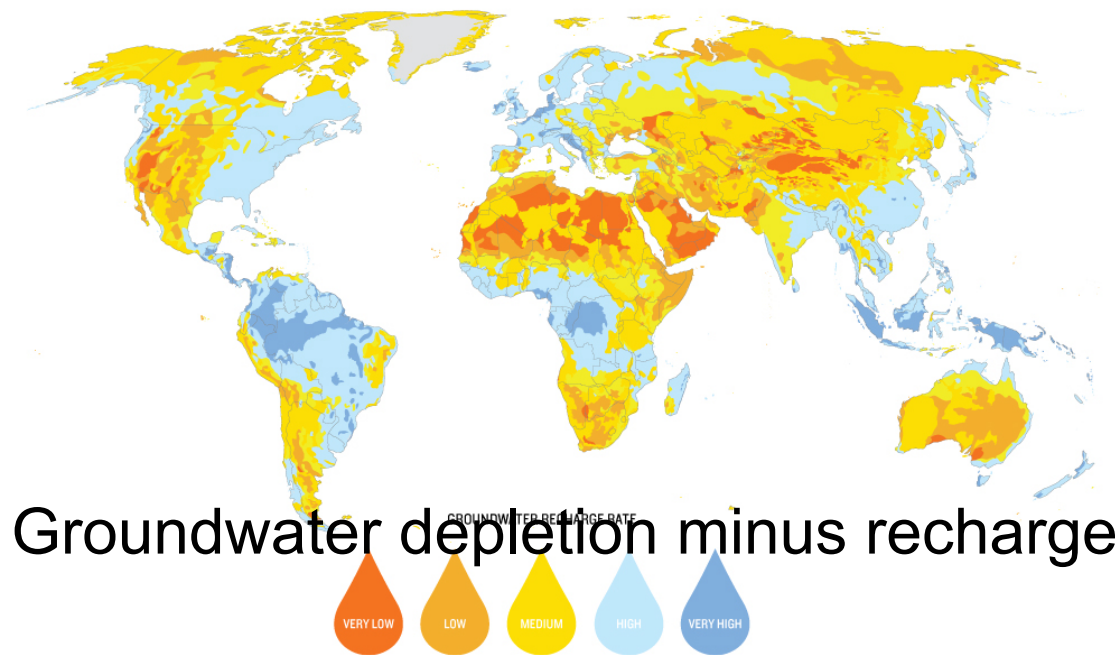
Roger S. Pulwarty
Director, National Integrated Drought
Information System, and
Senior Advisor for Climate (Acting)
NOAA/OAR

AND a lot of other people

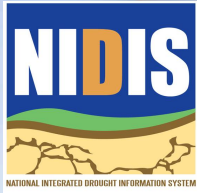


Drought indices

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

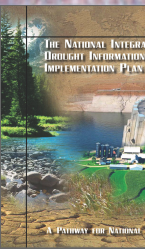


The NIDIS Act PL109-430



- (I) **Provide effective drought early warning systems:**
 - (a) collect and integrate key indicators of drought severity and impacts; and (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**

And do this in 6 years with no dedicated funds in the first two years.....good one :)



Regional Drought Early
Warning Systems

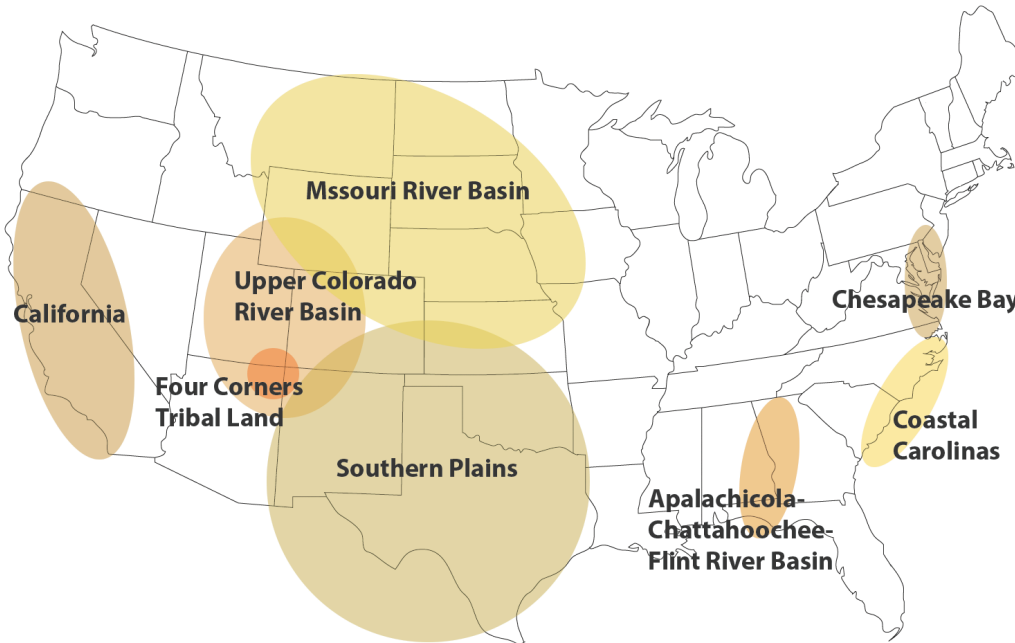
Applications

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

National Integrated
Drought Sciences and
Assessments (NIDISA)

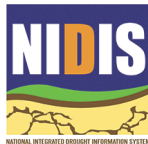
Modeling Analysis
Predictions and
Projections

Sectoral Appli
Research Pro
(SARP)



NATIONAL DROUGHT
INVESTIGATION CENTER
(NDMC)

Regional Climate
Centers
Climate Climatologists



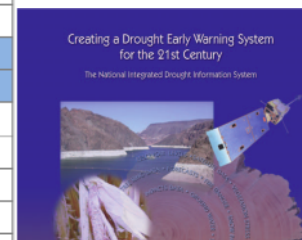
Identify socio-economic
effects of drought, data
and info needs of
resource managers and
policy/decision makers

Evaluate and transition drought
information products to
emergency response AND

Drought Preparedness and
risk management planning

Table 1. NIDIS Implementation Milestones (FY 2007-2012, by year)¹⁹

Activity	Milestone	07	08	09	10	11	12	13
1	Initial portal operational capability at drought.gov							
1	Advanced portal mapping capability with GIS tools							
1	Populate drought.gov website (portal, plans, reports, agency links)							
1	Operational portal communities and collaborations							
1	Enhance data management and distribution							
1	Portal extension to hemispheric and global domains							
2	Drought forecast regionalization studies							
2	Enhance soil moisture and temperature measurements							
2	Forecast verification and calibration to measurements							
3	Coordinate with CPO Program Managers/agencies on interdisciplinary research goals							
3	Inventory drought-related service (federal/state/private)							
3	Assess national status of drought early warning							
3	Inventory drought-related research (federal/state/private)							
3	Coordinate drought preparedness plans							
3	Planning for adaptation							
3	Institutionalize "Drought Coordinator" network							
3	Enhanced regional impacts research							
3	Implement adaptive management strategies							
4	Pilot study scoping and selection							
4	NPIT workshops: Define criteria and assess partner interest and capacity for pilots							
4	First Workshop: Assessment of Drought Early Warning System Status in the United States							
4	Pilot study implementation							
4	Initial early warning prototypes							
4	Pilot study assessment and follow-on work							
5	Establish NIDIS Program Office, governance structure, and final Program Implementation Team							
5	Establish regional sub-team leads within NPIT							
5	Establish initial agency/state rotational assignment to NIDIS Program							
5	Establish NIDIS Interdisciplinary Research Coordination Board							
5	Extend NIDIS to National Governors' Association and Inter-basin Watershed Commission							
5	Operational workshops to assess national drought monitoring and forecasting gaps							



PL109-430

\$\$

Reauth
Hearing

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?

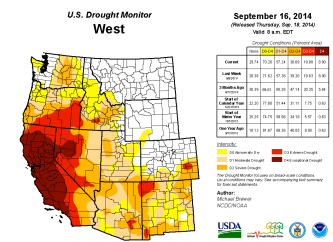
2012

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

2014



Pathways to Drought Monitoring and Predictability

Key Phenomena, variables

SST anomalies

Global-Scale Atmospheric Changes

Regional Forcing and land feedbacks

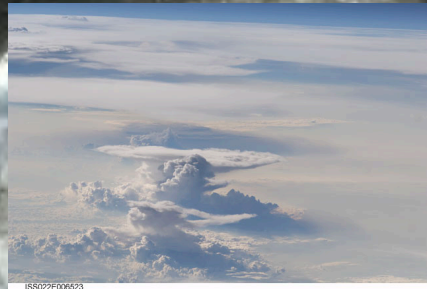
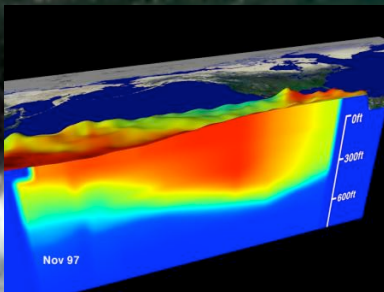
Local Impacts, Info needs

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

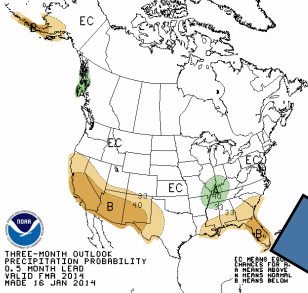
planetary waves, hydrological cycle, monsoons, Hadley Cell, Walker Circulation

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

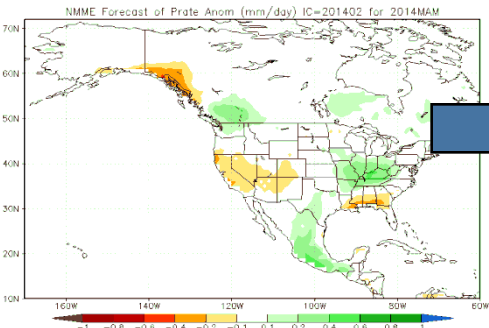
soil moisture, stream flow, precipitation, ground water, lakes, reservoirs



CPC Seasonal Outlook



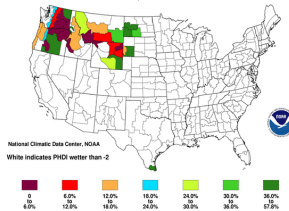
NMME



Palmer 4-mo Probabilities

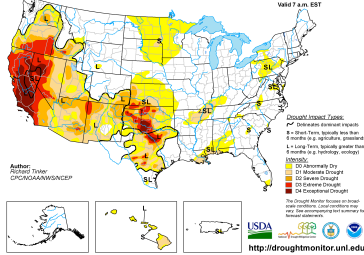
Probability of Precipitation Required to Ameliorate Current Drought Conditions in Four Months

April 2005



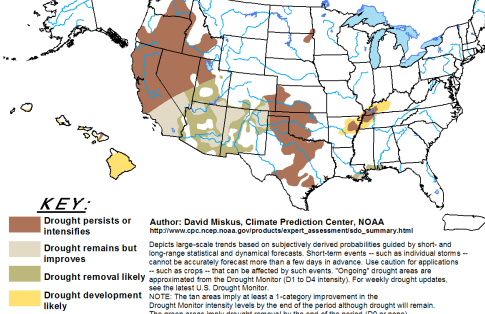
U.S. Drought Monitor

January 20, 2015
(Released Thursday, Jan. 22, 2015)

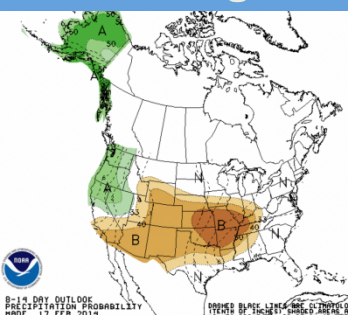


Valid for January 15 - April 30, 2015
Released January 15, 2015

Released January 15, 2015

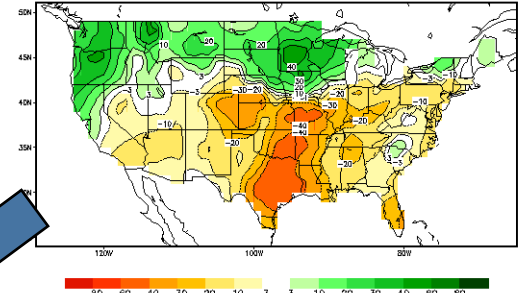


Medium-Range Fcst



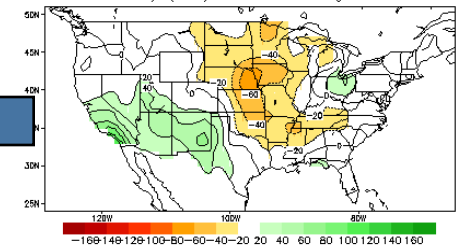
2-Wk Soil Moisture

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

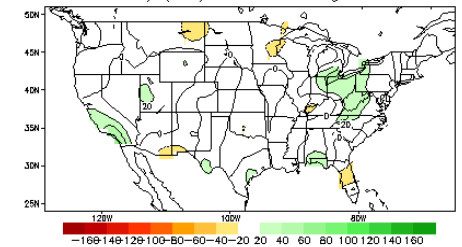


Constructed Analogue Soil Model

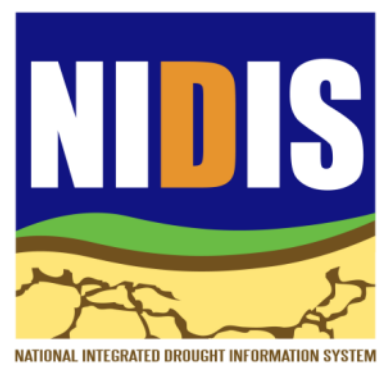
Lagged Averaged Soil Moisture Outlook for End of 2005
units: anomaly (mm), SM data ending at 20050508



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



Summer 2012



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. 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.

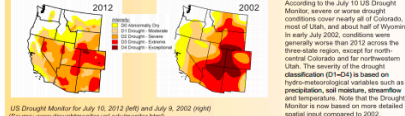
To register for more information, contact:

The 2012 Drought in Colorado, Utah and Wyoming

A July 2012 update from the Western Water Assessment and the National Integrated Drought Information System.

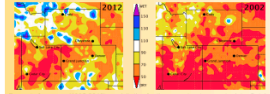
Under a second winter of La Niña, drought conditions emerged midway through the 2012 water year, with low snowpacks melting out early during a very dry and warm spring. Spring and early summer runoff over most of the region was well below average, with flows similar to 2002 and other historically drought years. Continued dry and hot conditions in June dried out vegetation and led to very large and intense wildfires in all three states, along with widespread rangeland, pasture, and dryland crop losses.

Drought Conditions as of early July



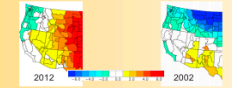
US Drought Monitor for July 10, 2012 (left) and July 6, 2002 (right). (Source: www.droughtmonitor.unh.edu/monitor.html).

Water Year Precipitation through June



Percent of average (1981-2010) precipitation for the current water year to date, October 2011–June 2012 (left), with October 2001–June 2002 (right) for comparison. (Source: NWS COOP and SNOTEL data, Gary Bales, NOAA ES&P, Physical Science Division).

Spring and Early Summer Temperatures



March-May temperatures in 2012 (left) were 2° to 7° F above normal across the 3-state region, much warmer than the same period in 2002 (right). (Source: NOAA ES&P, PDS Climate Analysis Branch, plotted from NOAA NCEP reanalysis data: <http://www.esrl.noaa.gov/psd/data/3-hourly/>).

For an expanded version of this overview, including additional graphics and text, see the Special Issue of the Western Water Assessment Intermountain West Climate Summary at www.colorado.edu/WWS/2012_July.html.

http://ccc.atmos.colostate.edu/drought_webinar_registration.php

Central Region Drought Outlook 20 September 2012

Jenniss Today
South Dakota State Climatologist
South Dakota State University
August, 2012
jis.today@sdsstate.edu
688-5141

Corn near Beresford, SD—9 Aug. 2012
Author photo



NIDIS - UPPER COLORADO BASIN PILOT PROJECT

Weekly Climate, Water & Drought Assessment

Managing Drought Risk on the Ranch

[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.

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

Workshops and Webinars



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

If you are
would like
contact the
472-6781

[How to u](#)

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

2012 Managing Drought Risk on the Ranch A Planning Guide for Great Plains Ranchers



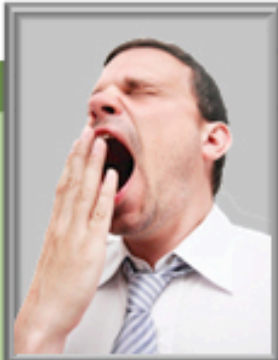
University of Nebraska - Lincoln
National Drought Mitigation
Center

Available Online at:
www.drought.unl.edu/ranchplan





RAIN



Apathy



DROUGHT

"Hydro-Illogical" Cycle



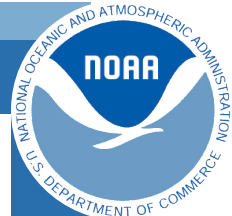
Panic



MORE DROUGHT



Concern



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

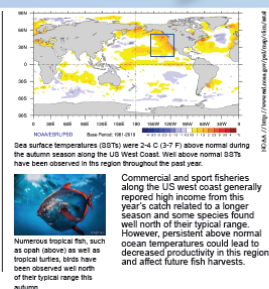


Quarterly Climate Impacts and Outlook

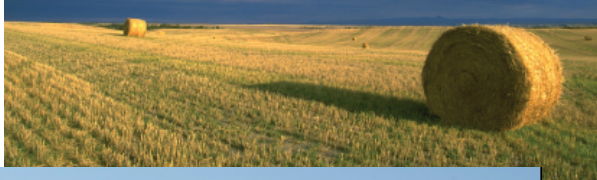
Nov 21 at 886,221 acre-ft, 42% of historical average capacity. This is among lowest storage amounts on record. Nearly all of CA's major reservoirs are below 50% average capacity; NV and eastern OR reservoirs low as well. Wells in rural CA communities continue to run dry; residents relying on bottled 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, hay, almonds. Due to drought, fewer and smaller grapes harvested in CA though grapes produced quality wines. Low water in wetland areas of CA, NV has impacted migration paths of ducks and other waterfowl. Bear encounters with humans more frequent than usual in Sierra Nevada and Oregon.

Fire
In September, the King Fire charred 97,000 acres in the Sierra Foothills west of Sacramento. The fire destroyed 68 structures and cost \$55 million to fight.



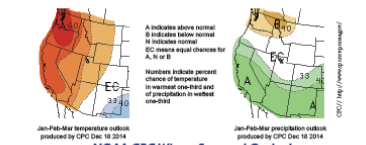
An Interpretation of the Origins of the 2012 Central Great Plains Drought



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 for Jan-Feb-Mar 2015



NOAA CPC Winter Seasonal Outlook
Above normal temperatures are projected for much of the West this fall with greatest departures from normal in Oregon and Washington. The precipitation forecast reflects the development of a weak to moderate El Niño with drier than normal conditions across the northern tier of the region and wetter than normal conditions in the Southwest.

NMME Precipitation Forecast
The National Multi-Model Ensemble (NMME) is an experiment to improve prediction by combining 8 different seasonal forecast models. Past performance shows low to moderate skill, at least equal to prior methods. The NMME for Jan-Mar shows an El Niño pattern as well with wetter than normal conditions across the Southwest, Great Basin, and California. Drier than normal conditions are projected across Washington, the Idaho panhandle, and western Montana as well as northern and western Oregon. The NMME is one input to the official seasonal outlooks shown above.

Contacts: Nina Oakley (nina.oakley@noaa.gov)
Carlee Brown (cbrown@noaa.gov)
Kelly Redmond (kelly.redmond@noaa.gov)

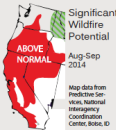
Western Region Partners

- Western Regional Climate Center - wrc.cimr.edu
- National Integrated Drought Information System (NIDIS) - drought.gov
- Western Governors' Association - wega.org
- Western States Water Council - westwater.org
- NOAA's Physical Sciences Division - psd.noaa.gov
- NOAA Climate Prediction Center - www.cpc.ncep.noaa.gov
- USDA/NRCS National Water and Climate Center - www.wcc.nrcs.usda.gov
- National Interagency Fire Center - www.nifc.gov
- DOI WaterSMART - www.usbr.gov/waterSMART
- NOAA's Western Regional Collaboration Team - www.regions.noaa.gov/western/western_region_learn.html
- Western Water Assessment - www.colorado.edu
- Climate Assessment for the Southwest - climateassessment.southwestclimate.org
- NWS River Forecast Centers - water.weather.gov/afrc/afrc.php
- NOAA Fisheries Service - www.nmfs.noaa.gov
- NWS Western Region - www.wr.noaa.gov
- State Climatologists - stateclimate.org
- National Climate Data Center (NCDC) - ncdc.noaa.gov

Western Region Quarterly Climate Impacts and Outlook // Nov. 2014
<http://drought.gov/drought/content/resources/reports>

Wildfire and the Drought

Drought can increase wildfire risk. Drying vegetation, affect electrical transmission lines and power infrastructure, dislodge river components through ash and runoff from burned and patches, and regionally degrade air quality. Fire danger in 2013 and 2014 reached record levels as the drought produced dry, highly flammable fuel loads. The 2013 Rim Fire near Yosemite National Park was the third largest area burned in state history and produced significant smoke impacts on



CNAP & Associates

The California National Assessment Program (CNAP) is a NOAA Regional Integrated Science and Assessment (RISA) program, led by climate researchers at the Scripps Institution of Oceanography at UC San Diego, the Desert Research Institute, UC Merced, and the U.S. Geological Survey. CNAP develops and provides climate information and forecasts for decision makers in the California Nevada region. We collaborate with a range of stakeholders from a variety of agencies, industries, and organizations.

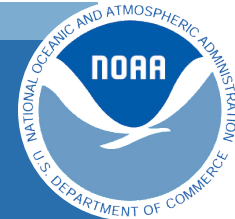
National Integrated Drought Information System (NIDIS)
NIDIS works with a variety of federal, state, tribal, and local partners to improve drought early warning, impacts assessments, and response.

Causes and Predictability of the 2011-14 California Drought

ASSESSMENT REPORT



- RICHARD SEAGER
Lamont Doherty Earth Observatory of Columbia University
- MARTIN HOERLING
NOAA Earth System Research Laboratory
- SIEGFRIED SCHUBERT
HAILAN WANG
NASA Goddard Space Flight Center
- BRADFELD LYON,
International Research Institute for Climate and Society
- ARUN KUMAR
NOAA Climate Prediction Center
- JENNIFER NAKAMURA
NACMI HENDERSON
Lamont Doherty Earth Observatory of Columbia University



National Drought Forum

12-13 December, 2012 Hall of States Washington DC

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 this year’s drought and potential impacts for next year
- Technical assistance
- Ensure sustained support for monitoring streamgages and other data
- Outreach with impacted communities
- Conservation plans

Sponsors-multiple
(Keynotes-Sec Vilsack; Gov.
Brownback) MoU

December 12-13, 2012

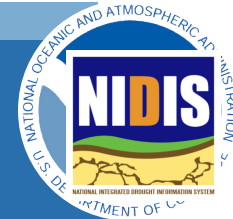
Washington, DC

National Drought Forum

Summary Report and Priority Actions

2012

Drought and U.S. Preparedness
in 2013 and Beyond



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, THERE Understanding and application management decisions, with availability, weather environmental,

II. Reference

Commerce and Agriculture enter 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:

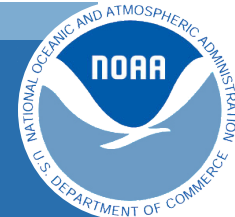
- Increased collaboration on the development and implementation of tools and products to improve the reliability and accuracy of drought monitoring, predictions and projections, including those products used in the production of the *U.S. Drought Monitor*.
- Improving accessibility, compatibility, and 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

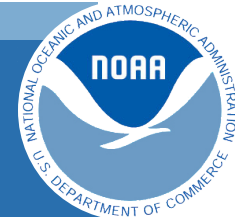
National Workshop Organized by NIDIS

- **Kansas City, Missouri - November 13-14, 2013**
- **Over sixty experts from across the country**
- **Federal, State, and University representatives**

Recommendations

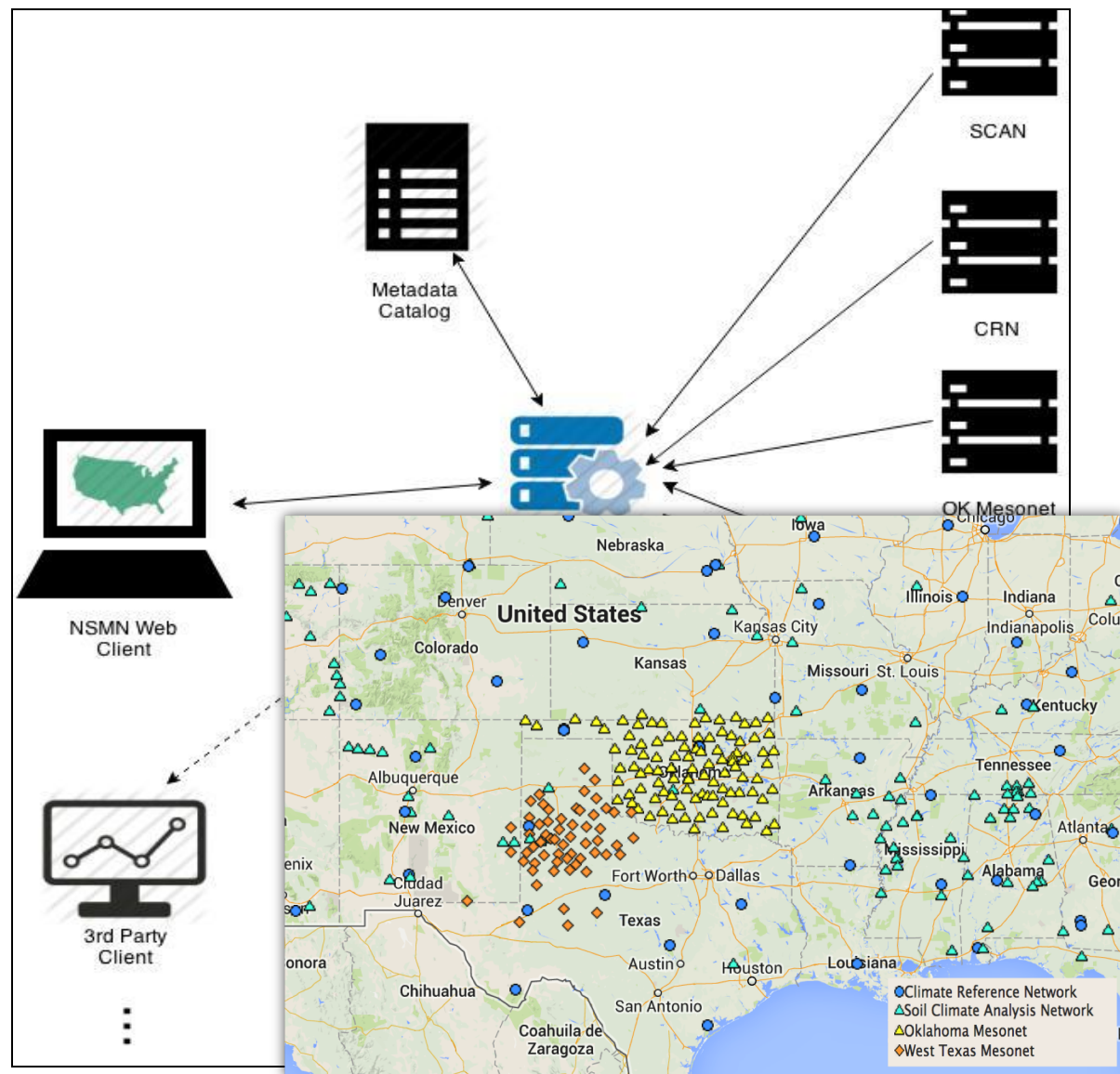
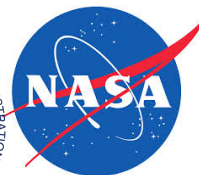
- **Form an Expert Working Group to articulate a Plan of Action**
- **Develop a sub-national pilot system**
- **Develop a nationwide “best available” product by blending data from disparate sources**

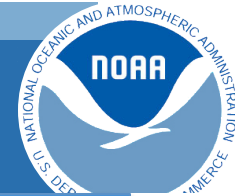




Pilot System Components

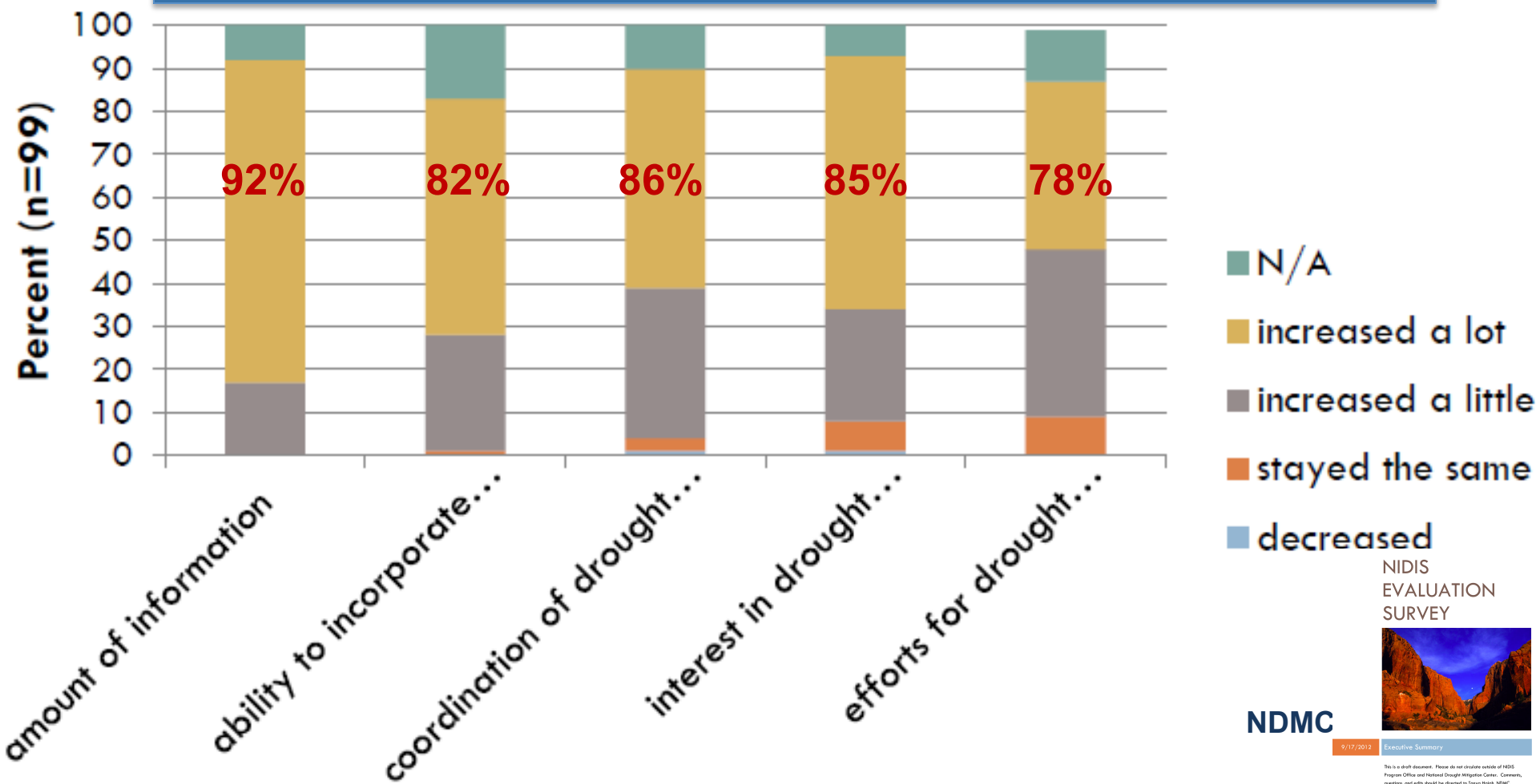
- CRN web service - [NCDC ArcServer](#)
- SCAN web service - [AWDB SOAP](#)
- OK Mesonet web service
- West TX Mesonet web service
- NLDAS web service
- [USGS Geo Data Portal](#)

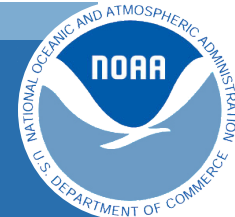




NIDIS Evaluation

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





Are we better off?

- The number of communities, and institutions with improved capacity to inform climate risk management:functioning regional information coordinators
- The number of staff in or working with institutions trained to develop and communicate local climate information and help reduce impacts
- The number of applied research projects that conduct and update climate drivers, impacts and risk assessments in at-risk regions
- The percentage of the regional population covered by adequate climate risk and early warning information systems





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

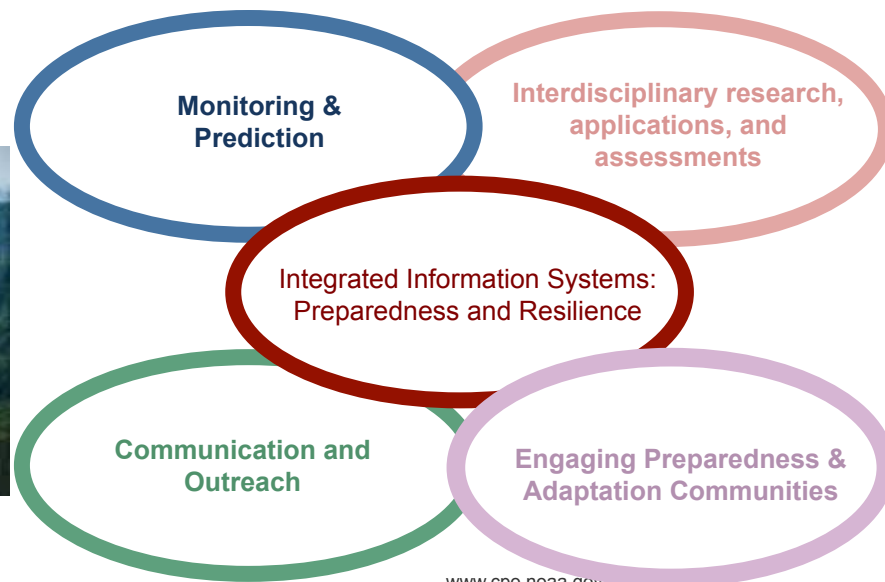


Barack Obama

“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**





Public Law 113–86
113th Congress

Opening Statement of Chairwoman Debbie Stabenow (D-Mich)
Drought, Fire and Freeze: The Economics of Disasters for America's Agricultural Producers
February 14, 2013

An Act

To reauthorize the National Integrated Drought Information System.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the “National Integrated Drought Information System Reauthorization Act of 2014”.



“(6) continue ongoing research and monitoring 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.”; and

“(C) an identification of research, monitoring, and forecasting needs to enhance the predictive capability of drought early warnings that include—

“(i) the length and severity of droughts;

“(ii) the contribution of weather events to reducing the severity or ending drought conditions; and

“(iii) regionally specific drought impacts.

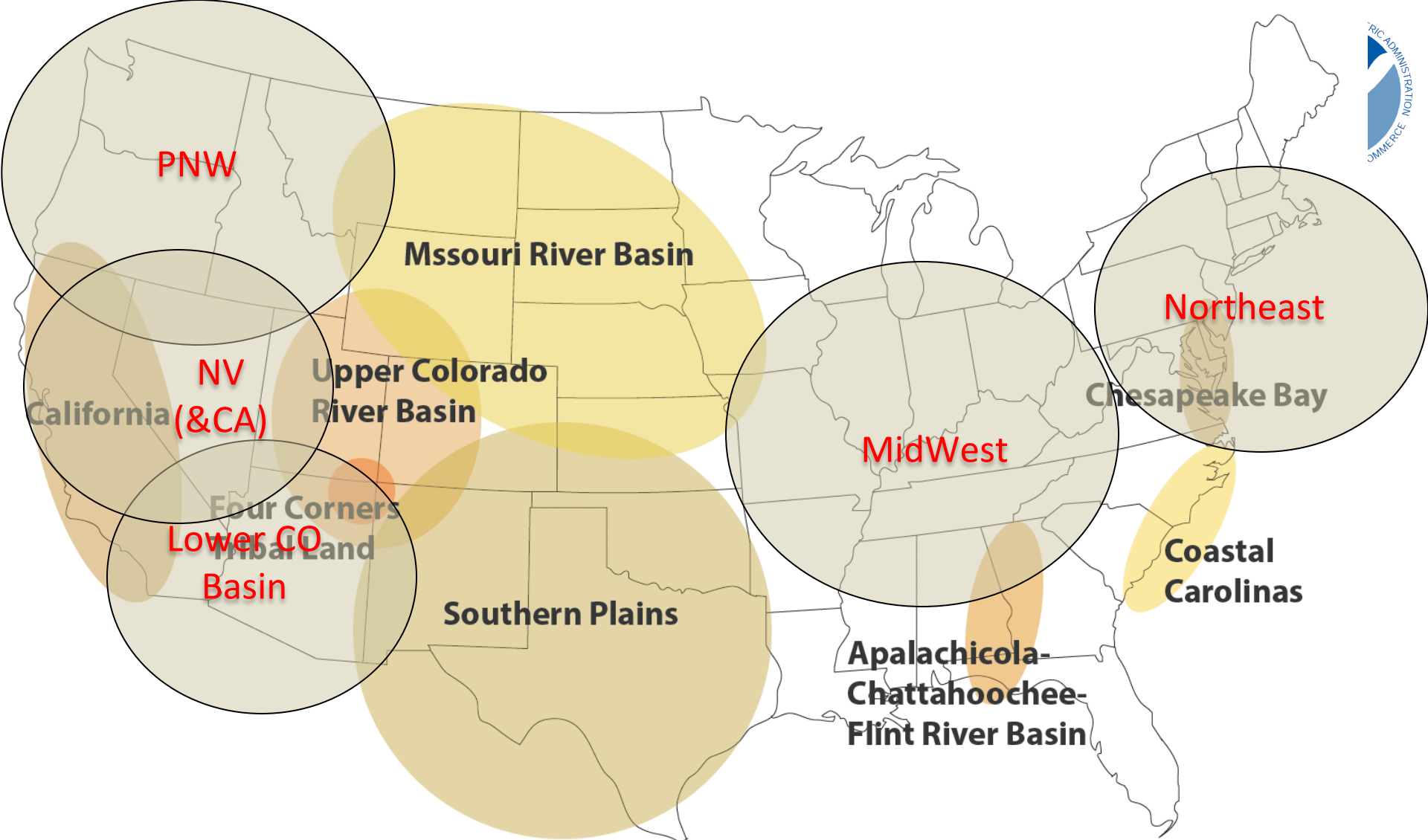


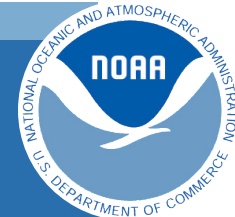
NIDIS Public Law 113-86

(5) build upon existing forecasting and assessment programs and partnerships-

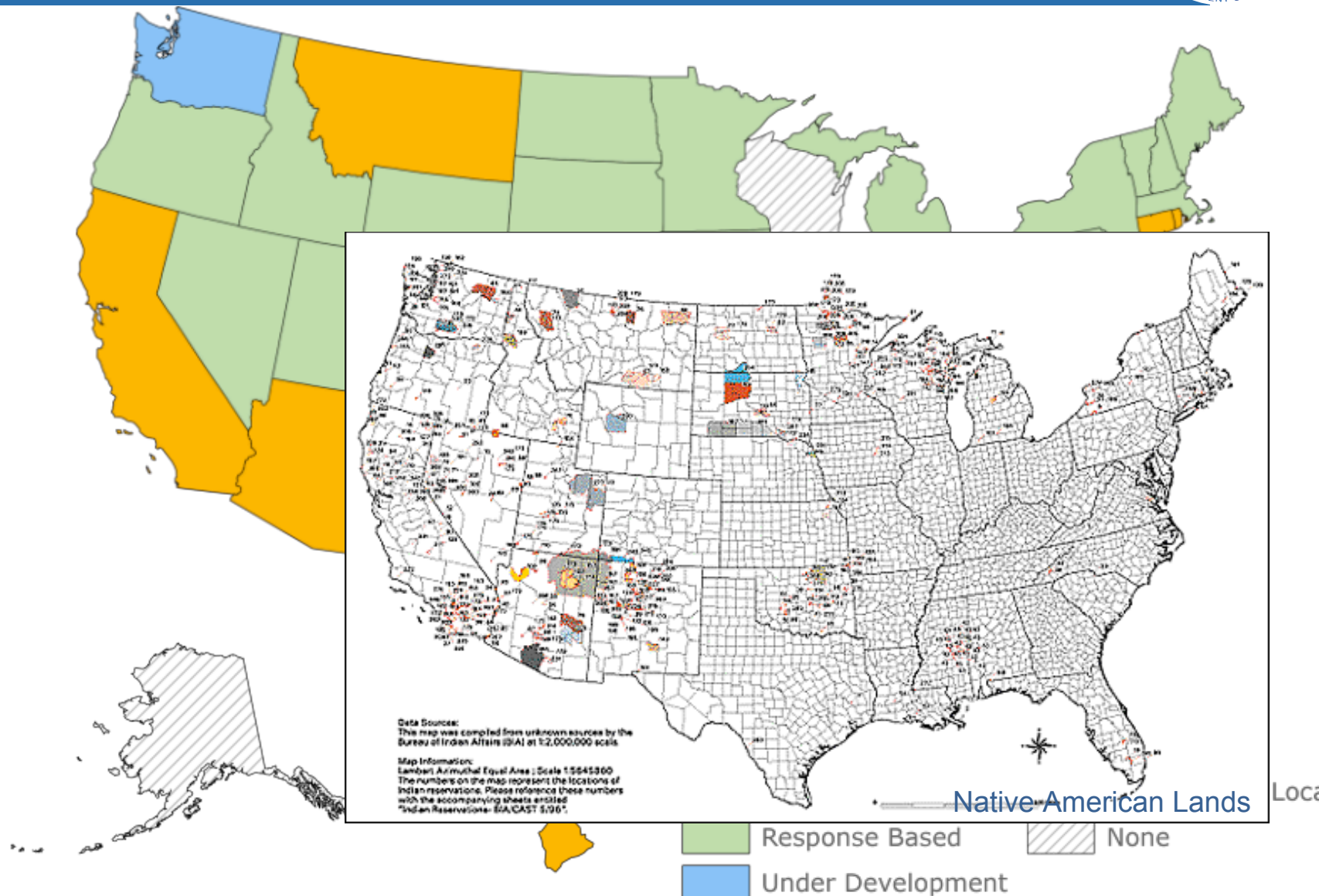
- including through the designation of one or more cooperative institutes to assist with NIDIS functions







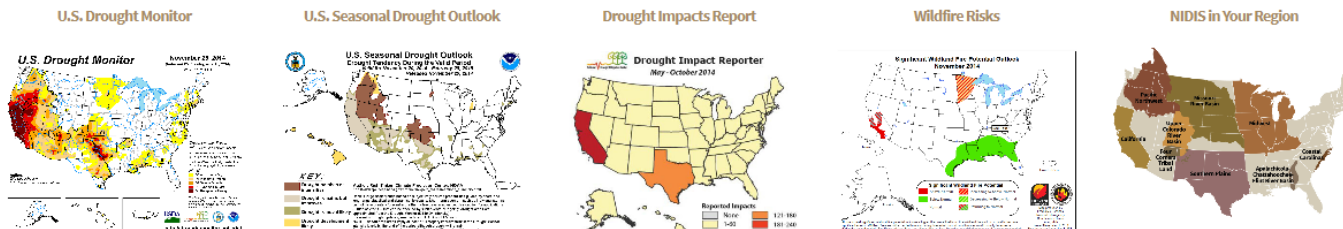
State drought plans





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

Where is the drought this week?



The major weather system that affected much of the nation's midsection last week left abundant precipitation this week from the mid-Atlantic up into New England. Hurricane Ana lost strength as it approached Hawaii and Tropical Storm Ana passed south of the Hawaiian Island dumping up to 10 inches of rain in its path.

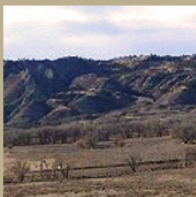
As of October 21, 2014, drought (D1-D4) is impacting:

24.90%

of the area of U.S. and 29.80% of the lower 48 states.

74.2 million

people in the U.S. and 74.1 million people in the lower 48 states.



Featured News 3

Hicta nonemporerum
quiaspitiis exerovita di
officiam, ex exeriandes res
dolutem poratus, omnis
nonseri inihici ut aliquia sitae
modis endam, voliest

[Learn More](#)



Featured News 2

Hicta nonemporerum
quiaspitiis exerovita di
officiam, ex exeriandes res
dolutem poratus, omnis
nonseri inihici ut aliquia sitae
modis endam, voliest

[Learn More](#)

525,985	73,046,566	58,873,940	38,255
889,297	73,807,143	58,302,044	38,095
847,995	72,294,857	53,596,327	38,574
428,515	70,048,750	55,449,084	40,842
528,380	70,980,004	56,289,724	39,885
263,947	70,511,805	56,708,053	40,885
138,887	68,844,370	56,304,022	40,793
135,809	73,309,317	58,801,940	42,037
140,245	72,387,815	60,336,269	40,473
810,731	72,387,238	60,445,777	40,383
255,383	73,555,040	59,536,547	39,645
847,347	73,708,801	60,862,582	40,855
218,895	75,722,013	63,704,077	40,734

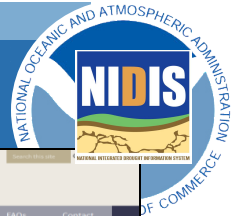
Featured News 1

Hicta nonemporerum
quiaspitiis exerovita di
officiam, ex exeriandes res
dolutem poratus, omnis
nonseri inihici ut aliquia sitae
modis endam, voliest

[Learn More](#)

Landing Page:

- Side-by side monitoring & prediction maps with updated weekly summary below
- News Features



Evolving drought.gov

Improved regional maps and information while retaining the same great content.

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

DEWS Early Warning Systems

Find out about NIDIS activities at the regional level. These RDEWS pilot projects will inform the development of the national Drought Early Warning System.

Select a DEWS section

Regional & State Drought Information



Drought in the News

- Committee says all of SC in early drought | November 21, 2014
- Feinstein pulls plug on California water bill | November 20, 2014
- Jamaica Economy is Rebounding From Contraction, Wynter Says | November 19, 2014
- Limits end on most California stream diversions | November 19, 2014
- Citing drought, LCRA seeks to curb Highland Lake releases in 2015 | November 19, 2014
- San Juan Capistrano officials seek solutions to water shortage | November 19, 2014
- California droughts could leave B.C. high and dry on food | November 18, 2014
- Drought blamed for bear activity | November 18, 2014
- Dry Central California town gets portable showers | November 18, 2014
- Marin San Farms to close San Francisco facility | November 17, 2014
- A world without chocolate? Confection giants sound the alarm | November 17, 2014
- Sacramento's salmon run in full swing, but drought still a worry | November 16, 2014
- Lake-level watching is new tourism fad | November 16, 2014
- Turkey Production Down, Wholesale Prices Up | November 15, 2014
- WILDFIRES: Threat should be dropping this time of year - but isn't | November 15, 2014

Recent & Upcoming Events

- Midwest and Great Plains Drought Webinar | December 18, 2014
 - Midwest and Great Plains Drought Webinar | November 20, 2014
 - Ranching and California Drought - A Workshop and Webcast | November 7, 2014
- View Full Calendar of Events and Announcements

Webinars

- Num ium esequi ut assi qui quosam que recta consend untus, ium dolorum eos et quantus doluptate scab id eaquibus et faccae laudi ut ea qui.
- Managing Drought in the Southern Plains
 - Upper Colorado River Basin Climate, Water and Drought Assessment
 - Appalachicola-Chattahoochee-Flint River Basin Drought Assessment
 - Midwest and Great Plains Drought Update

Learn More and Find Upcoming Webinars

MORE... Visit the NIDIS website for more headlines about drought.



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.



Missouri River Basin
For the week ending September 23, drought stayed nearly constant over the Missouri Basin, with only a slight decrease in abnormal dryness (D0) from last week.

Drought Monitor

October 21, 2014
(Released Thursday, Oct. 23, 2014)
Valid @ a.m. EDT

	None	D0	D1	D2	D3	D4
Current	88.15	8.44	4.75	5.29	0.36	0.00
Last Week	88.03	9.96	4.75	5.29	0.36	0.00
3 Months Avg	68.33	10.79	12.29	6.39	2.02	0.19
Start of Calendar Year	45.79	33.60	6.32	9.84	2.14	0.30
Start of Water Year	79.99	8.86	6.17	5.12	0.86	0.00
One Year Ago	47.57	30.03	10.58	9.75	1.75	0.30

Drought Conditions (Percent Area)

%Area for High Plains
(As of 11-25-2014)
Info Source: National Drought Mitigation Center

Drought Time Series

Drought Information Statements

How is Drought Affecting your Neighborhood?
Enter your zip code for current conditions.

DEWS Early Warning Systems
Find out about NIDIS activities at the regional level. These RDEWS pilot projects will inform the development of the national Drought Early Warning System.

REGIONAL & STATE DROUGHT INFORMATION

High Plains
Regional Overview
CO KA ND NE SD WY

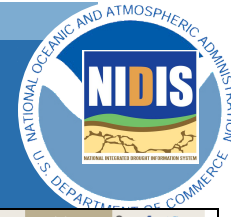
Midwest
Regional Overview
IA IL IN KY MI MN MO OH WI

Northeast
Regional Overview
CT DE MA MD ME NH NJ NY RI VT WV

South
Regional Overview
AR LA MS OK TN TX

Southeast
Regional Overview
AL GA FL NC SC VA

West
Regional Overview
AZ CA CO ID MT NM NV OR UT WA WY



Evolving drought.gov

Intuitive organization:

- Current Drought
- Drought Forecasts
- Drought Impacts

Maintain / expand access to tools:

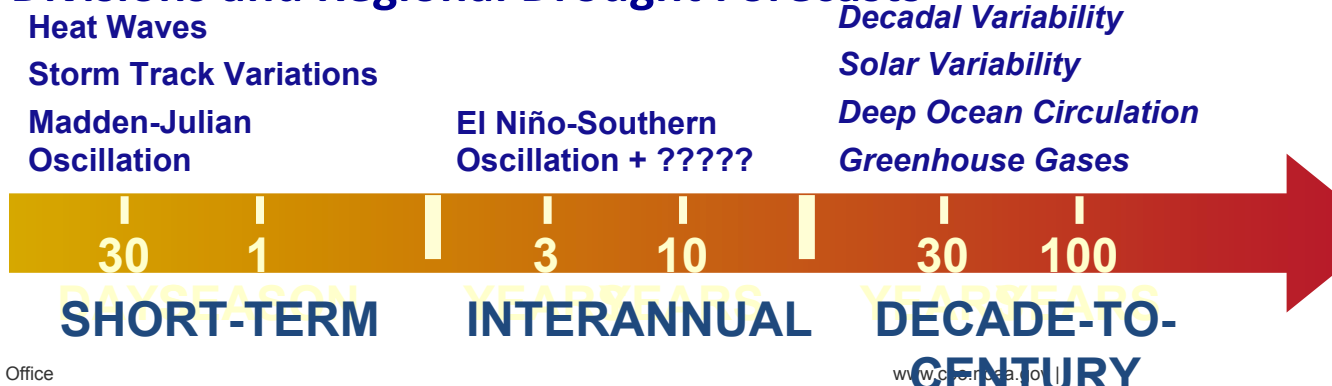
- Drought ACIS
- Map Viewer
- Time series and pie charts
- Drought Risk Atlas
- Soil moisture viewer
- Drought management database

The screenshot displays the Drought.gov website interface. At the top, the header includes the National Oceanic and Atmospheric Administration logo, the NIDIS logo, and the text 'Drought.gov U.S. Drought Portal'. Navigation links for 'Data, Maps & Tools', 'Regions', 'Research', 'Resources for ...', 'What is NIDIS?', 'Calendar', 'FAQs', and 'Contact' are visible. Below the navigation bar, the 'Data, Maps & Tools' section is highlighted, with a sub-header 'How to find your way through this section:' followed by two bullet points: 'By topic' and 'By interactivity'. A grid of nine categories is shown, each with a representative image and a placeholder text: 'DROUGHT CONDITIONS AND OUTLOOK' (cracked earth), 'SOIL MOISTURE' (tillage rows), 'VEGETATION' (green field), 'FIRE' (wildfire), 'TEMPERATURE & PRECIPITATION' (rain clouds), 'AGRICULTURE' (green crops), 'WATER' (dried lake), 'PAST DROUGHTS & CLIMATOLOGY' (drought map), and 'TOOLS' (colorful map). At the bottom, a section titled 'How is Drought Affecting your Neighborhood?' prompts users to enter their zip code. The footer contains logos for the National Drought Mitigation Center, USDA Federal Drought Assistance, and the National Drought Resilience Partnership (NDRP), along with various partner agency logos like FEMA, NOAA, and the EPA.



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





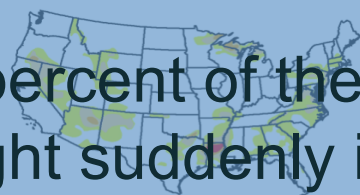
Building on the Scientific Foundation

Develop Models for Regional Science and Applications

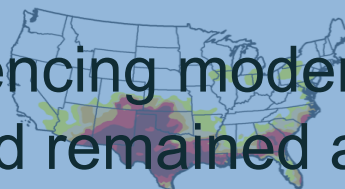
- Improvements in coupled ocean and atmosphere models to simulate regional change and variability
- Increased complexity needed to simulate climate change associated with aerosols and clouds
- Increased resolution and improved physics to simulate extreme events and regional climate
- Investments in model development and analysis (computational and human requirements)
- Modelers and observational and process scientists working more closely together; "Climate Process Teams"
- Need to facilitate access to models and provide capacity for scientists outside modeling centers to conduct experiments
- Strengthen collaborations, including with information users

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

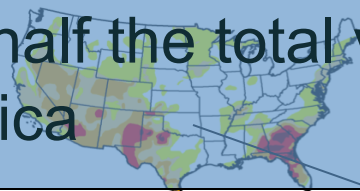


July 2010
8% moderate to exceptional

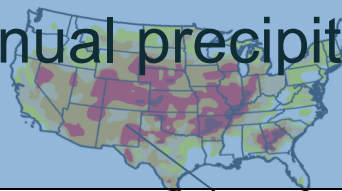


July 2011
28% moderate to exceptional

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



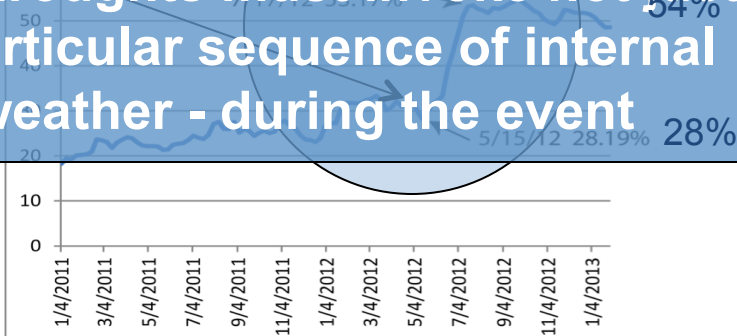
July 2012
64% moderate to exceptional

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



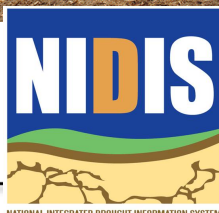
January 2013
The great drought



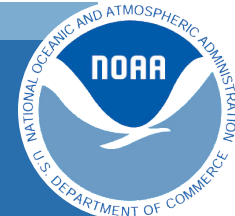
NOAA Drought Task Force
Narrative Team

Lead: M. Hoerling

Co-Leads: S. Schubert and K. Mo



NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM



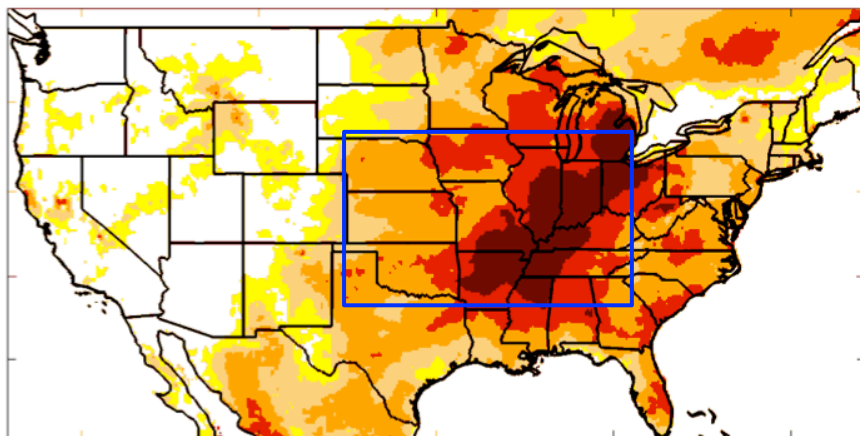
Evaporative Demand Drought Index

EDDI shows strong early warning potential

Aug 31 7

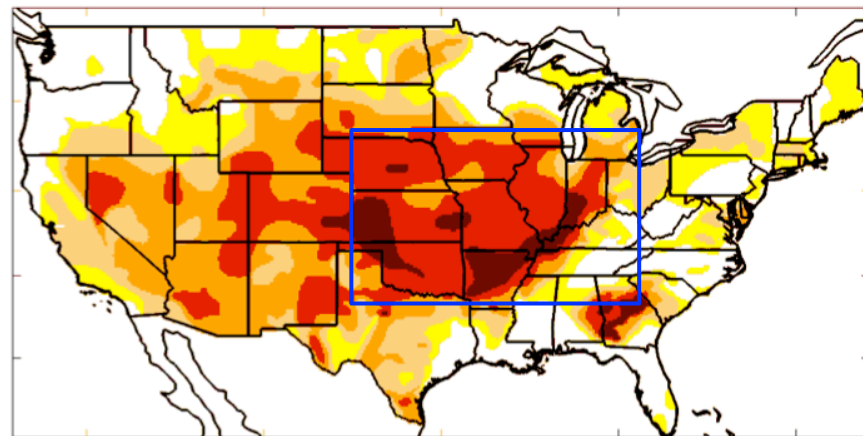
$$EDDI_j = \frac{\sum_{t=i}^j (ET_{0t} - \overline{ET_{0t}})}{\sigma_{\overline{ET_{0t}}}}$$

2-week EDDI



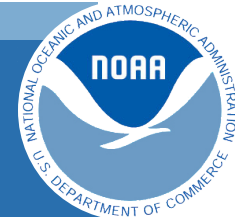
flash drought in MO, AR, KS, OK, TX region
note little drought in western US

USDM



Due to land-atmosphere feedbacks, EDDI does not deepen drought in the region as much of region;
drought in NY, PA, and VA, 2 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.



Status and Next Steps

- *EDDI* furnished weekly in 2014 experimentally to:
 - USFS Rocky Mountain Research Station,
 - improving CONUSwide wildland fire forecasts (# large fires, suppression \$).
 - Colorado State climatologist (Nolan Doesken),
 - Upper Colorado Basin Regional Drought Early Warning System (UCB-RDEWS).
- Two *EDDI*-defining papers to be submitted, March:
 - i. physical basis of *EDDI*;
 - ii. applications and assessment of *EDDI*.
- Chapman Conference on California Drought, April.
- Engagement of USDM authors, through 2015.
- Attribution of flash drought dynamics.
- Linkages with short-term and seasonal forecasting of ET_0 .

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

RICHARD SEAGER
Lamont Doherty Earth Observatory of Columbia University

MARTIN HOERLING
NOAA Earth System Research Laboratory

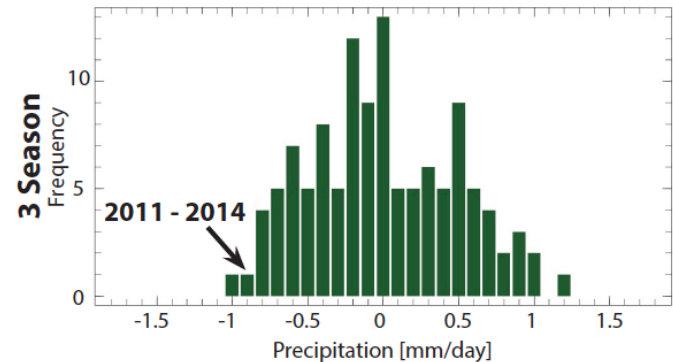
SIEGFRIED SCHUBERT
HAILAN WANG
NASA Goddard Space Flight Center

BRADFIELD LYON
International Research Institute for Climate and Society

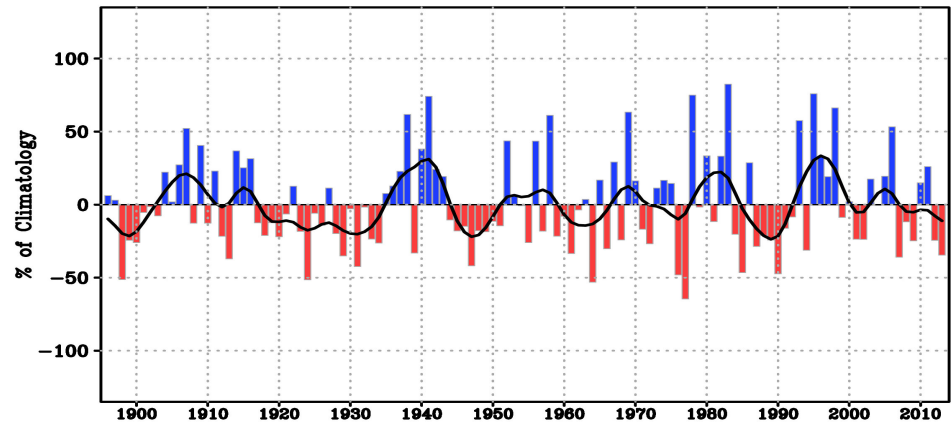
ARUN KUMAR
NOAA Climate Prediction Center

JENNIFER NAKAMURA
NAOMI HENDERSON
Lamont Doherty Earth Observatory of Columbia University

Released December 8, 2014



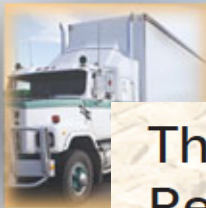
California (PRISM)
Dec-Apr Precipitation Departures: 1896-2013



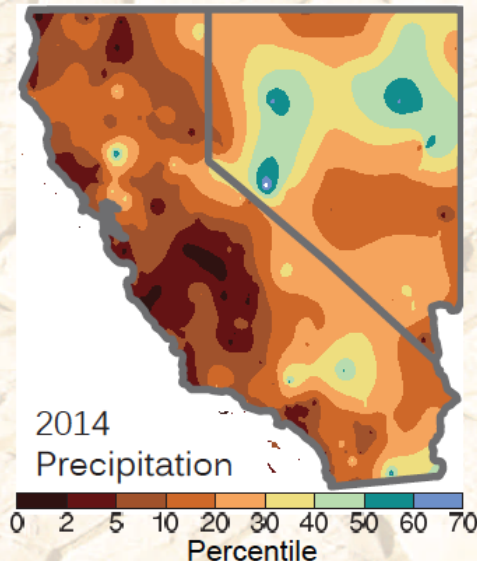
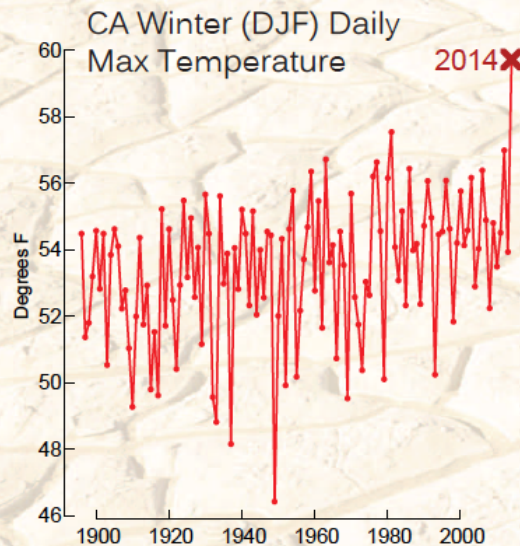
- Could “the” drought have been anticipated?
- Is the California drought a symptom of long-term climate change?

Drought Task Force

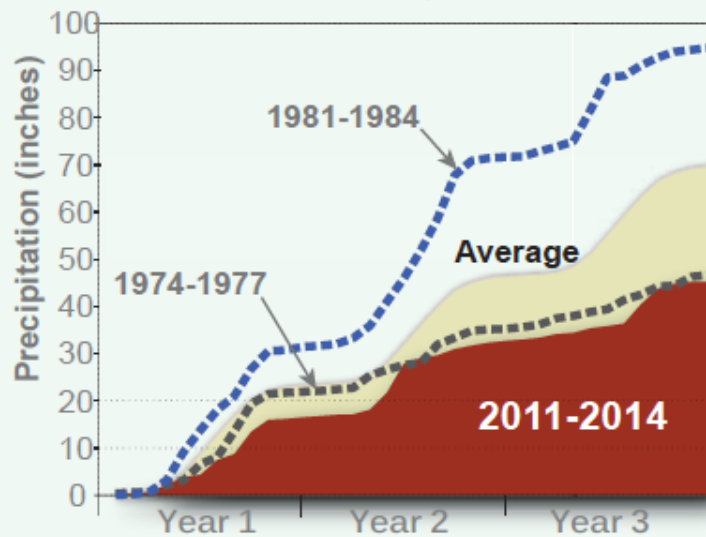




The California Drought of 2014: Record Hot, Record Dry



Statewide 3-yr Precip Accumulation

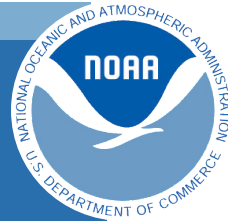


RISA/CNAP NIDIS

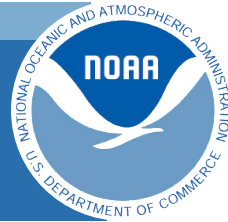


California Water Action Plan

FRATION

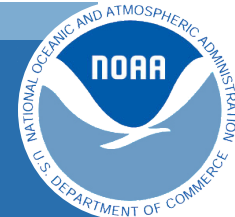


Manage and prepare for dry periods-
Streamline water transfers
Expand storage



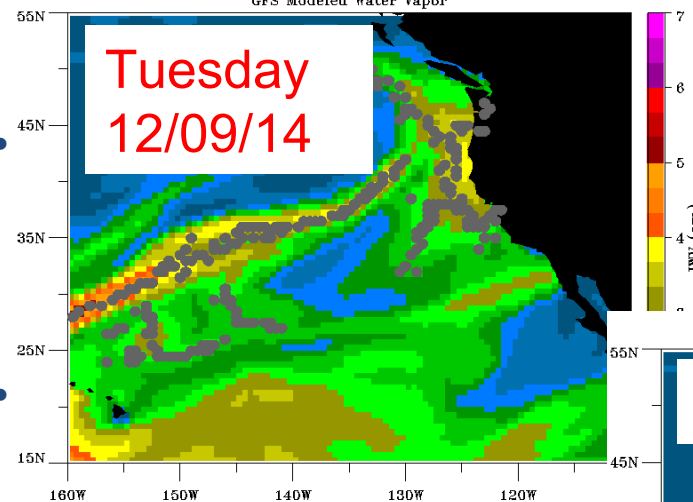
NIDIS Drought-related Activities in California: A Few Examples

- **Predicting Drought Amelioration: How Much Precipitation is Needed to End a Drought** (NCDC/CPC/IRI/NIDIS)
- **Causes and Predictability of the 2011-14 California Drought:** Modeling Analysis Prediction and Projection (MAPP) Drought Task Force Report on drivers of the present and past drought conditions (in collaboration with NIDIS)
- **Partnerships and research relevant to the California State Water Action Plan** (RISA/California Nevada Applications Project/NIDIS/NWS)
- **Within-season monitoring of Fallow Lands** (NIDIS/NASA, California DWR, others): Timely knowledge of the amount and spatial distribution of fallowing and irrigation
- **California Services Assessment** – across NOAA lines, assessing NOAA's response and drought service capabilities in California to inform future actions (NCDC lead, NIDIS supported)

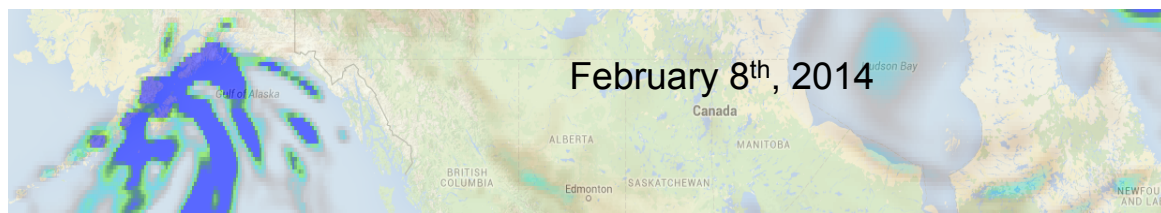


Atmospheric Rivers (ARs)

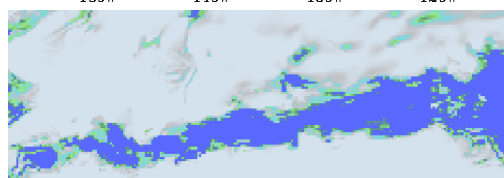
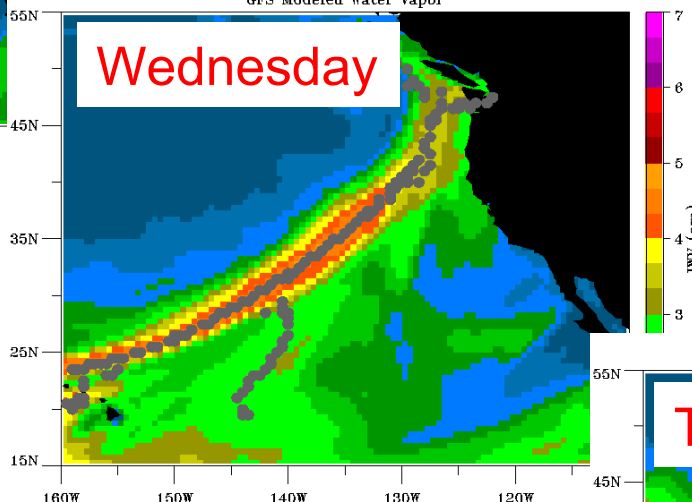
20141204 120 Hour Forecast
GFS Modeled Water Vapor



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



20141204 144 Hour Forecast
GFS Modeled Water Vapor

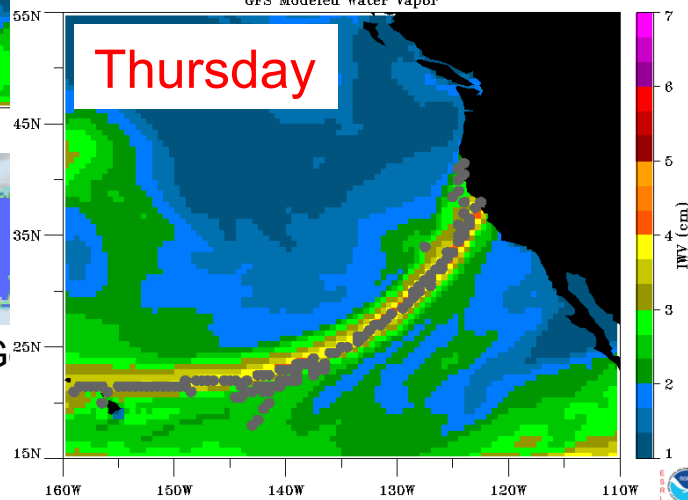


CFSR - G

Huntington 2014

February 8th, 2014

20141204 168 Hour Forecast
GFS Modeled Water Vapor



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



Landsat and Drought Monitoring with Google



Huntington 2014

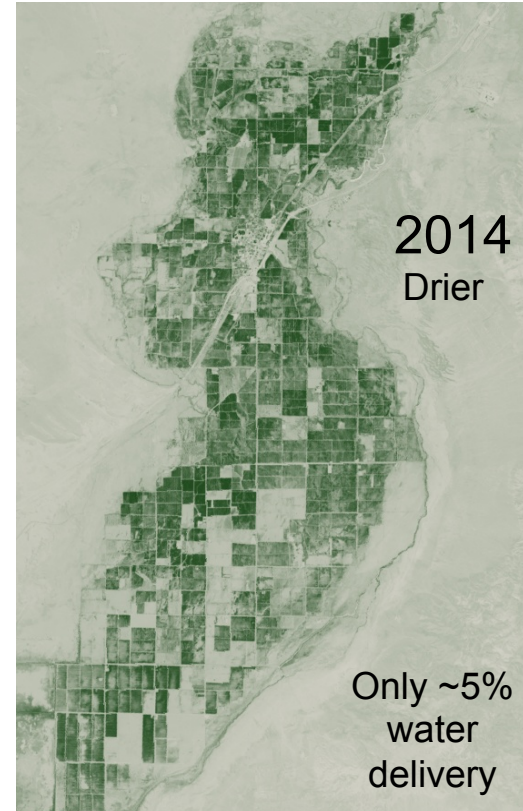
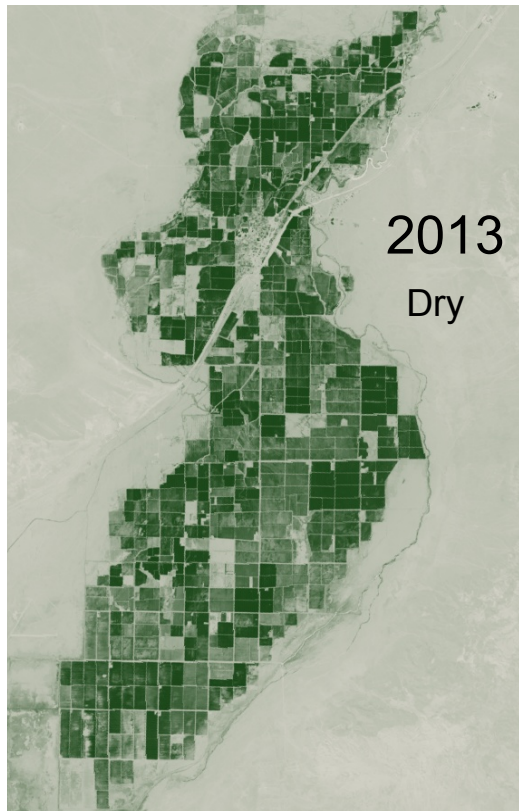
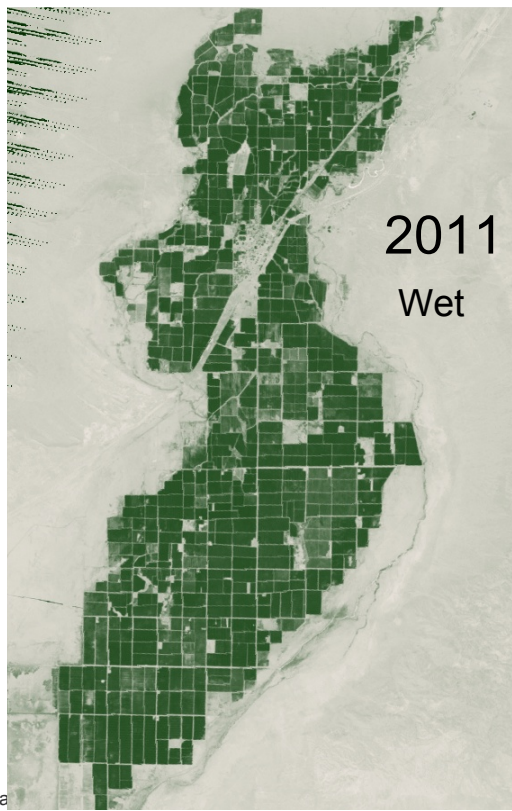


Lovelock, Nevada – Humboldt River Basin

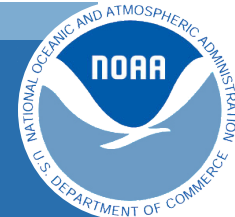
- No groundwater pumping for irrigation (too salty)
- Very little storage upstream
- Extremely sensitive to persistent hydrologic drought



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



Only ~5%
water
delivery

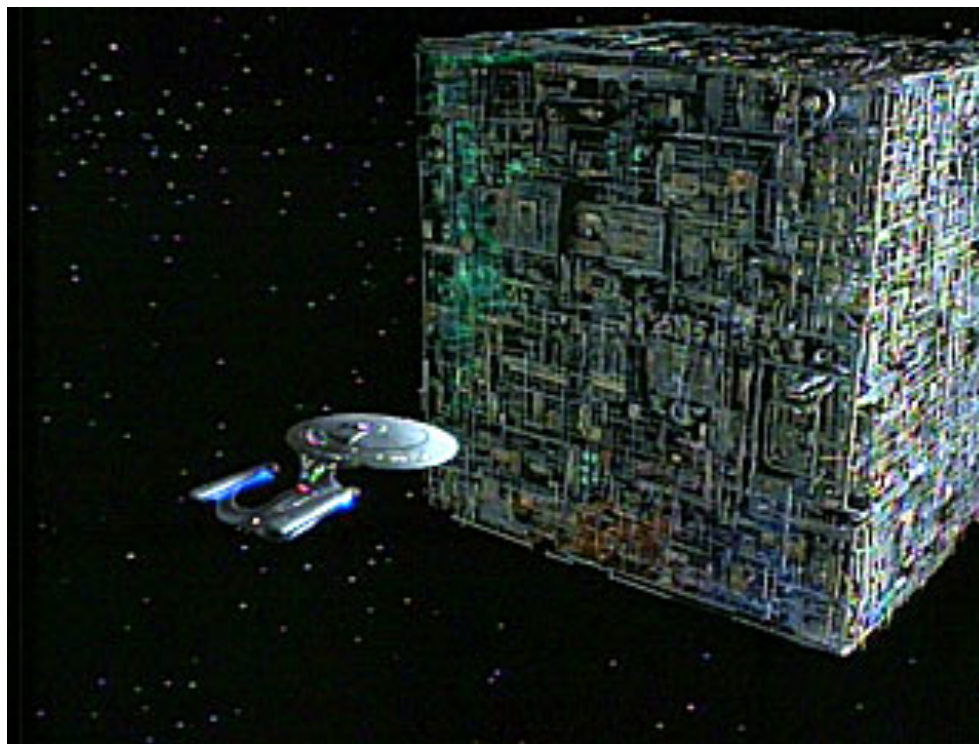


If it's so easy why is it so hard?



Dreadnaught-class Starship

Meet "The Borg"

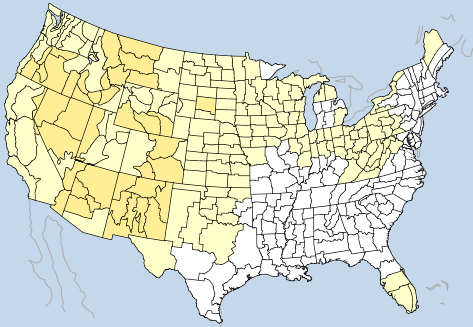


Are Transitions to Semi-Permanent Drought Imminent?

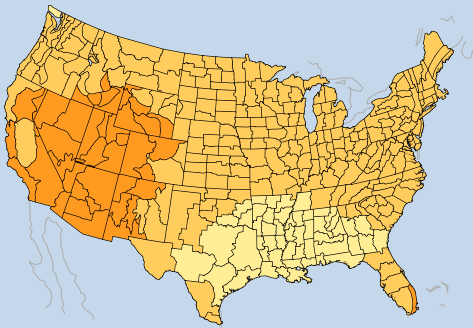
Precipitation



Soil Moisture

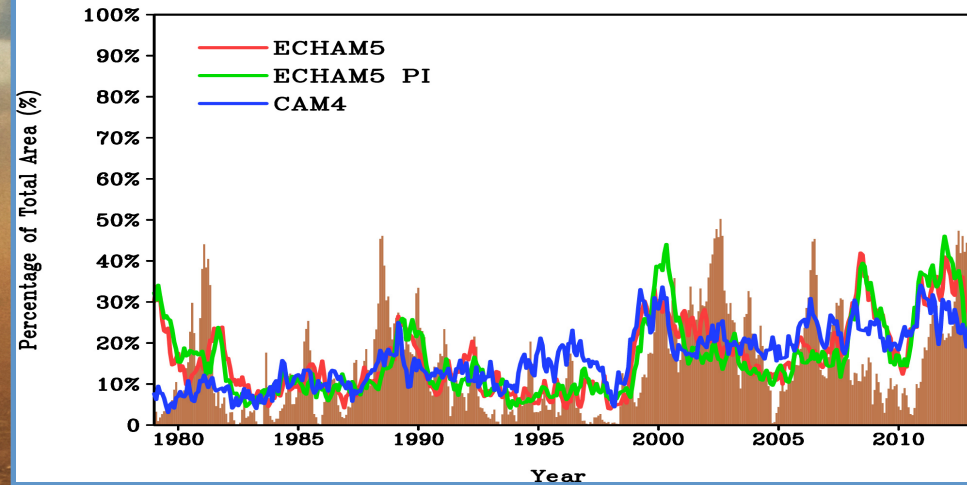


Temperature

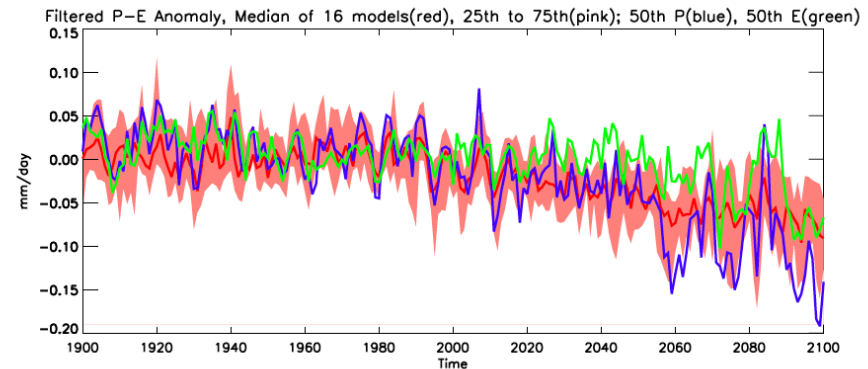


Effect of Long Term Global Ocean Warming and
Radiative Forcing since 1880
ECHAM5 Historical Simulations

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

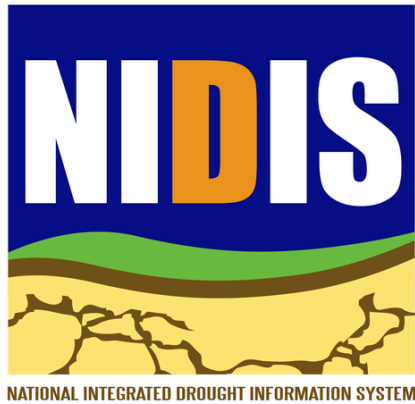


P , E and $P-E$ averaged across all of SW North America in
the IPCC AR5 global climate model simulations and
projections for 1900 to 2100



Ongoing transition to a drier climate driven by decreasing precipitation

NIDIS complements the National Drought Resilience Partnership goals



National Integrated Drought Information System: Public Law 113-86; reauthorized in 2014

- 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

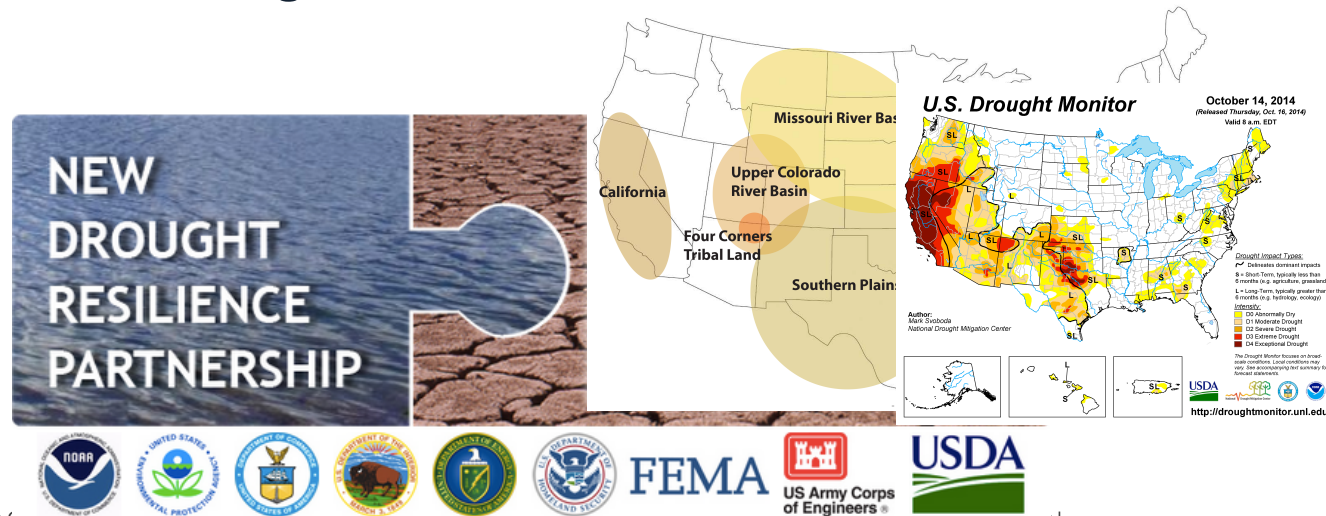
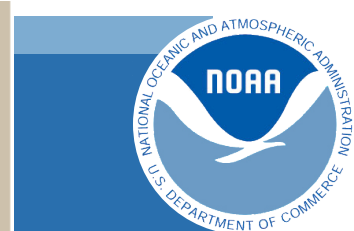
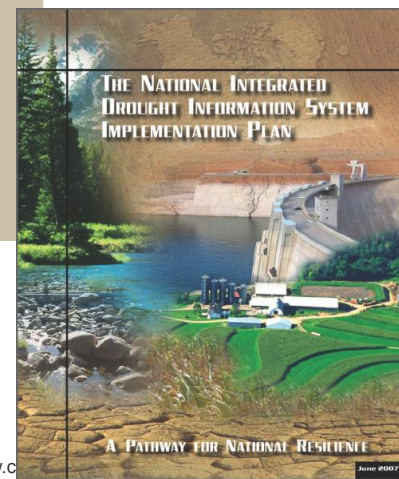


Table 1. Short-, medium-, and long-term NIDIS Pilot activities contributing to national drought preparedness and early warning

Short – Term 1-3yrs	Medium – Term 3-5 yrs	Long – Term >5 yrs
Establish a limited number of NIDIS Pilot projects to explore and demonstrate drought risk reduction strategies using drought monitoring and prediction information in partnership with users and federal, state, regional, and local agencies.	Evaluate effectiveness of Early Warning System Pilot projects; and initiate second series of regional NIDIS Pilot projects using lessons and technologies from the first series of Pilots in conjunction with already existing activities.	Transferability: Complete staging and diffusion of regional Pilot projects to achieve national coverage.
Initiate NIDIS Pilot identified activities needed to improve regional to local capabilities to educate and communicate drought information and awareness.	Develop an understanding of factors contributing to droughts for improving the usefulness of prediction products and for improving drought preparedness.	Use integrated interagency drought information network for education and delivery of products and services at regional to local level.
Initiate NIDIS Pilot defined activities to develop drought impacts assessment methodology and reporting requirements.	Begin process for transferring NIDIS Pilot lessons to non-Pilot projects at state and county levels to assess regional and local drought impacts.	Continued drought information system refinements such as inputs into watershed, state, and local drought plans and operations.



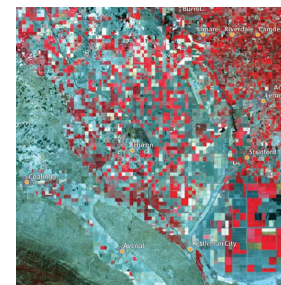
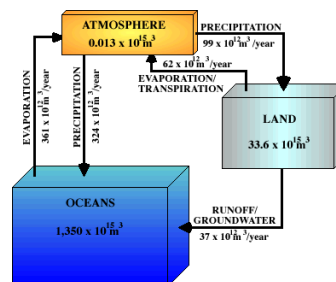
(NIDIS, 2007)



1. Integrated Monitoring and Forecasting

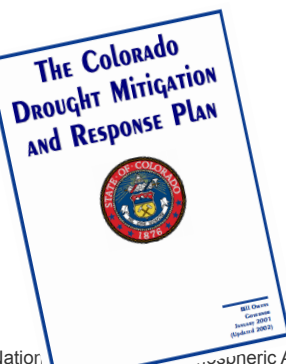
Drought Research Task Force- predictions and links between climate forecasts and stream flow projections for particular basins-drivers of drought frequency, onset, duration, and intensity.
National Drought Monitor and Outlooks

NIDIS Working Groups



2. Interdisciplinary Needs Assess., Research, Applications

“Coping with Drought” Research: assess impacts of drought, assess previous coping strategies and practices, develop decision support tools for regional, state, and local use.
Consistent framework for developing triggers for actions



3. National & Regional Drought Portals

Drought Portal: (e.g. www.drought.gov) Drought-related information-credible and accessible-where to go for help

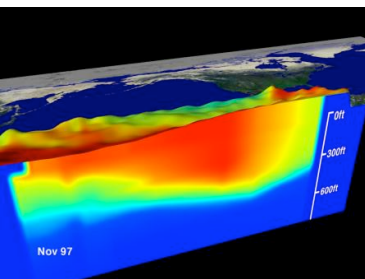
NIDIS Working Groups

4. Public Awareness and Education

Assessment and scientifically-based outlooks of existing and potential drought conditions and impacts-
Developed with partners: webinars and one on one, direct workshops

5. Engaging Preparedness Communities

User guidance, cross-agency coordination and decision support tools to support drought planning and risk reduction-Conducted in partnership-test triggering criteria



- Reconstitute the NIDIS Working Groups and Program Implementation Team
- Continue advances in prediction esp. on drought persistence and amelioration (role of ARs etc)
- Establish a new cooperative institute focused on impacts assessment and drought planning under NIDIS
- Complete RDEWS and expand/transfer lessons/methods to new areas
- Strengthen cross-agency (Fed-state-tribal) monitoring capabilities incl sfc-groundwater demand and input to drought.gov
- National and international partnerships

Memorandum of Understanding

Western Governors' Association (WGA) and National Oceanic and Atmospheric Administration (NOAA)

JUNE 2014



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

June 9, 2014
Colorado Springs, Colorado



The 2015 Chairman's Initiative of Gov. Brian Sandoval of Nevada is designed to foster a regional dialogue in which states and industry can share case studies and best practices on drought policy, preparedness and management. In addition to meetings that will focus on specific sectors, the Western Governors' Drought Forum will create an online resource library that will feature a growing collection of drought resources.



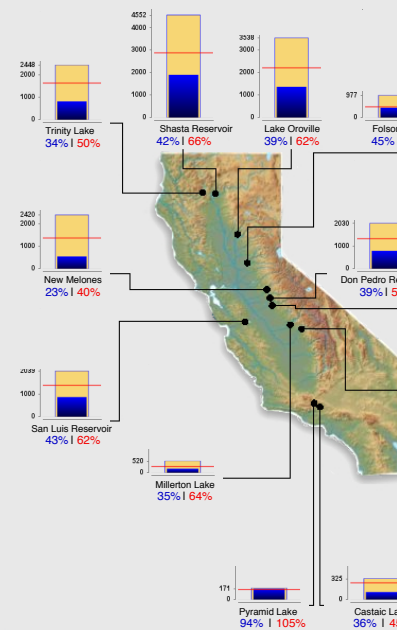
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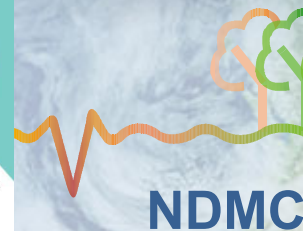
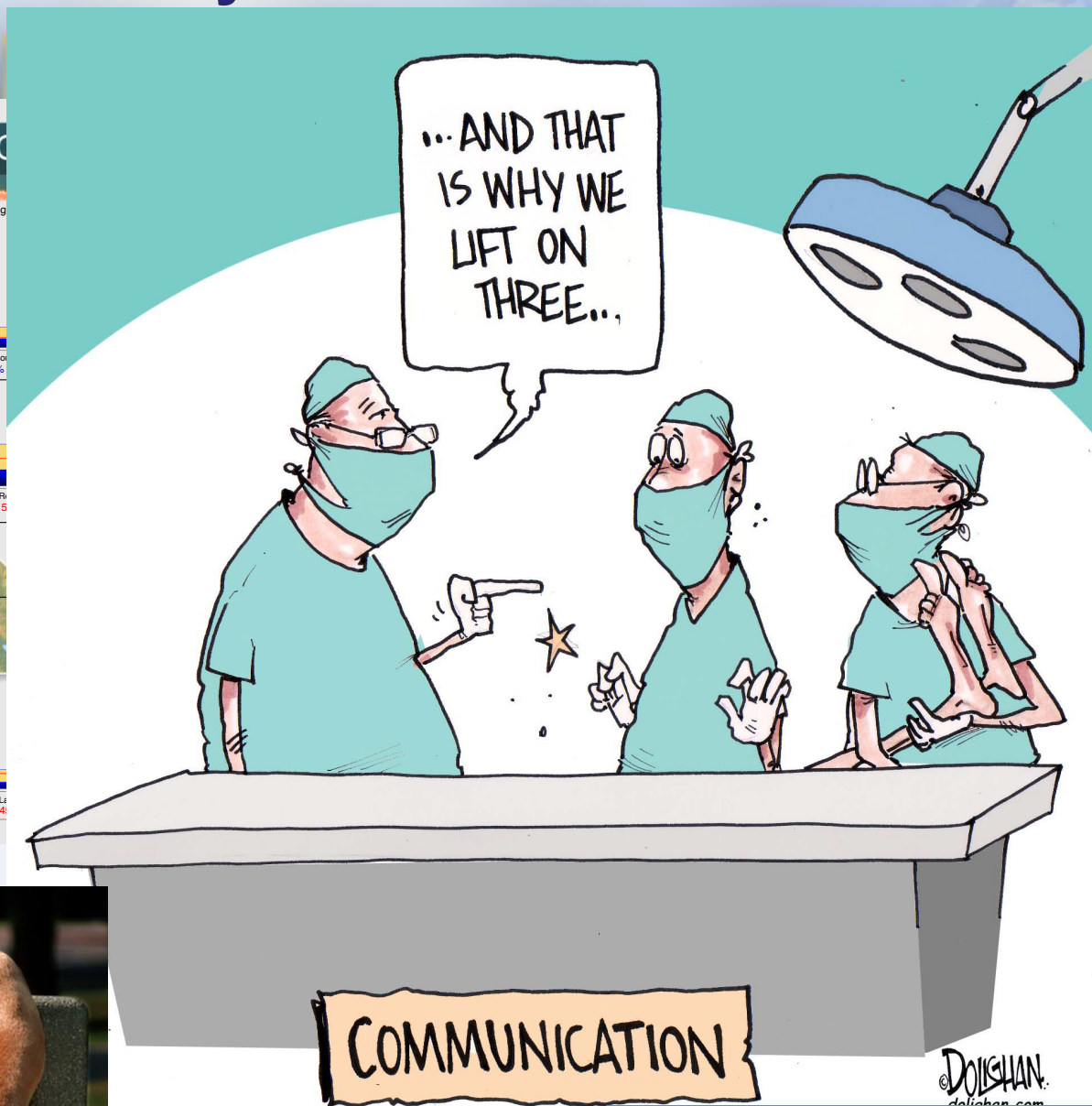
Thank you!

Reservoir C

CURRENT RESERVOIR CONDITIONS

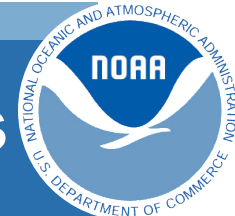


Graph Updated 01/06/2015 04:45 PM



Coordination





NOAA Climate Goal Societal Challenges



Weather-climate continuum and adaptation deficits

