Integrating Drought Risk Management

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University of Nebraska-Lincoln, USA

Drought Monitoring Impacts Tour, Maricopa, Mohave and Pima Counties, Arizona March 22-24, 2011

National Drought Mitigation Center

Founded: **1995 at the University of Nebraska-Lincoln by Dr. Don Wilhite. Dr. Mike Hayes is the current Director.**

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

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NDMC Program Objectives

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

"End-to-End": Research-Applications-Operations-Outreach Continuum

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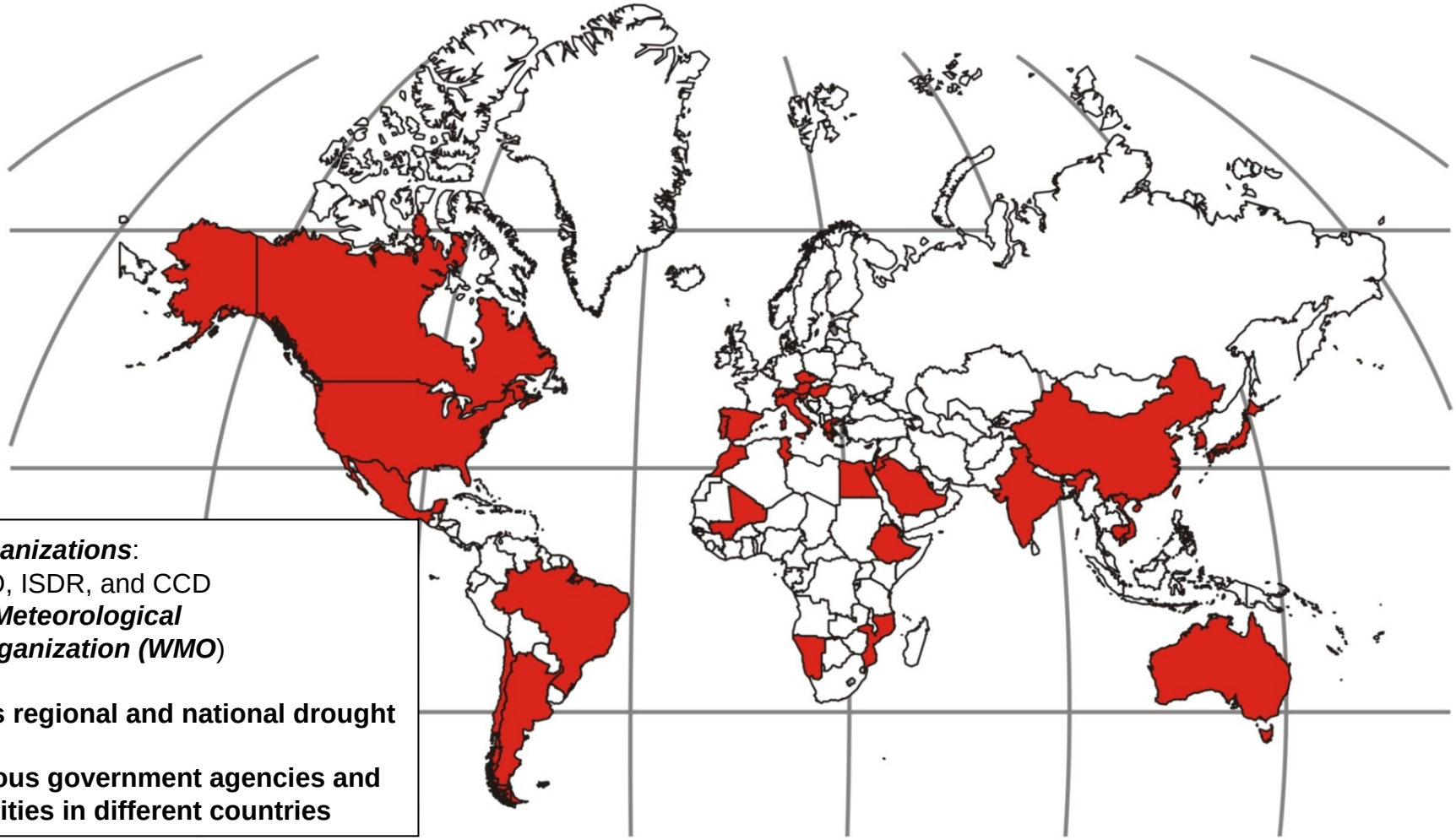
NDMC International Activities



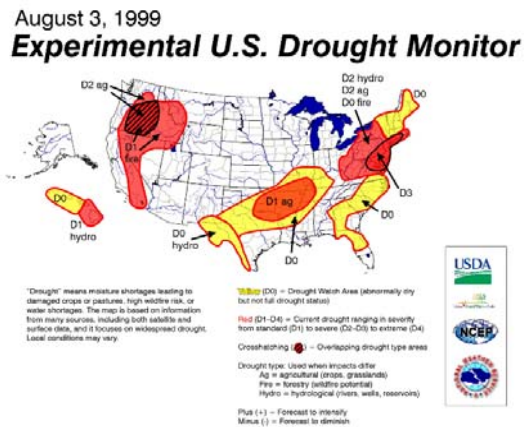
- ***UN organizations***:
  FAO, ISDR, and CCD
- ***World Meteorological Organization (WMO)***
- ***USAID***
- **Various regional and national drought centers**
- **Numerous government agencies and universities in different countries**

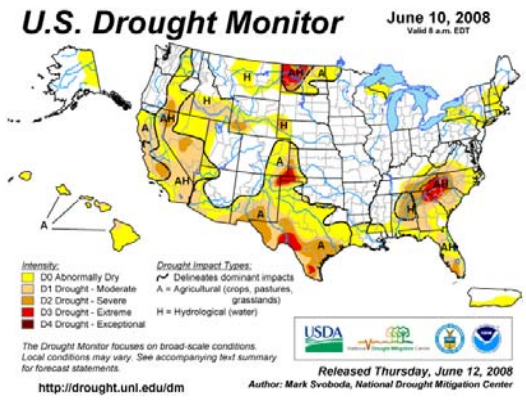
Czech Republic • Italy • Switzerland • Spain • Slovenia • European Union • Southern Europe/Northern Africa • Morocco • Tunisia • Mali • Ethiopia • Mozambique • Namibia • Egypt • Saudi Arabia • Jordan • India • Japan • China • South Korea • Vietnam and Cambodia • Australia • Brazil • Chile • Mexico • Canada • United States

The U.S. Drought Monitor

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

- **Western Region Climate Center on board 2008**
  - **CalDry listserver hosted by CA DWR**
- **10 authors in all**
- **Incorporate relevant information and products from all entities (and levels of government) dealing with drought (RCC's, SC's, federal/state agencies, etc.)** ***(~290 experts)***





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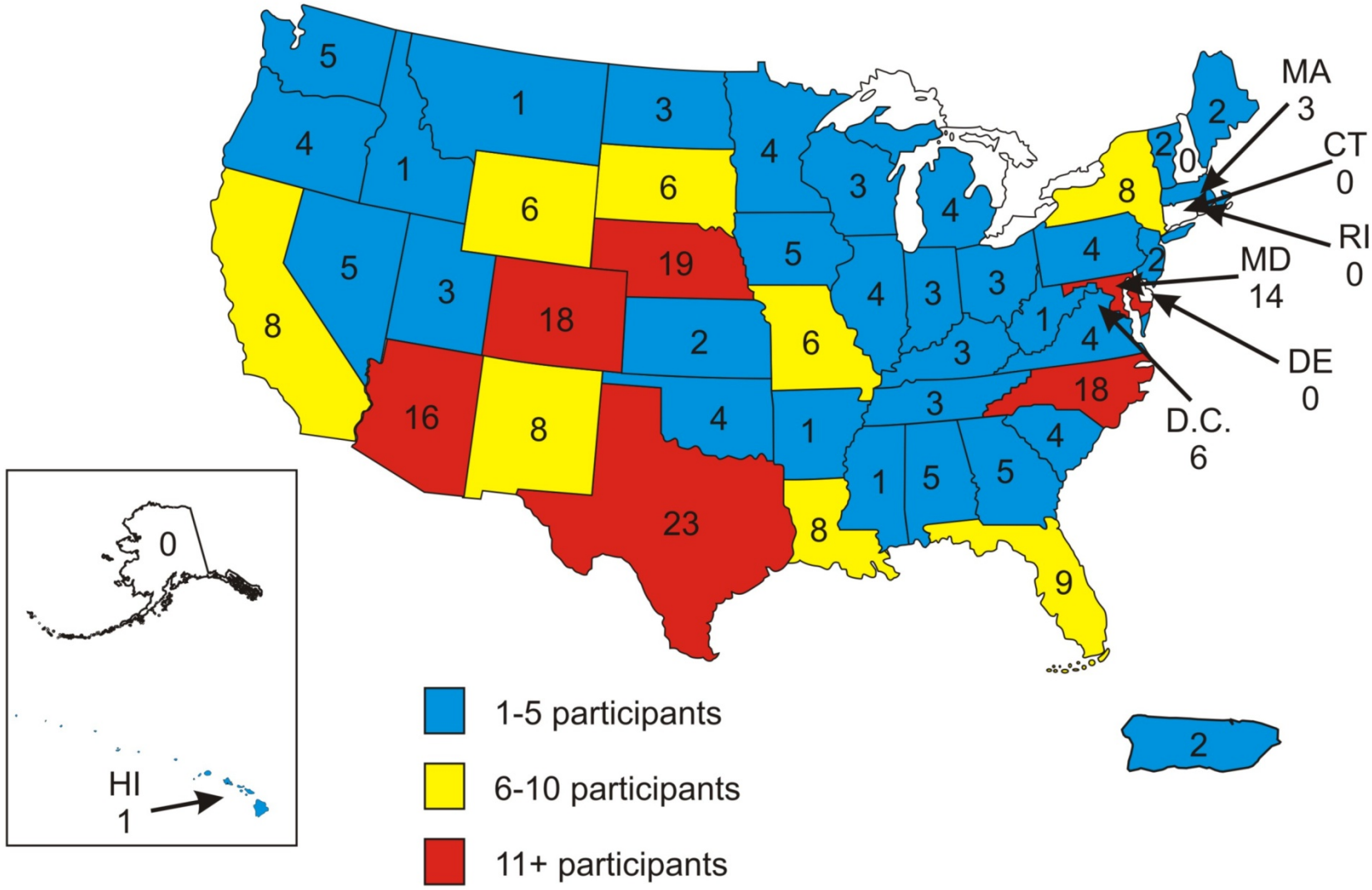
USDM Listserve Subscribers

(as of July 6, 2010)



Total: 269 (does not include 1 participant from Canada, 2 participants from Mexico, and 1 participant from the Netherlands)

U.S. Drought Monitor Map

Drought Intensity Categories

D0 **Abnormally Dry (30%tile)**

D1 Drought – **Moderate (20%tile)**

D2 Drought – **Severe (10%tile)**

D3 Drought – **Extreme (5%tile)**

D4 Drought – **Exceptional (2%tile)**

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U.S. Drought Monitor

Integrates Key Drought Indicators:

- ***Palmer Drought Index***
- ***SPI***
- **KBDI**
- ***Modeled Soil Moisture***
- **7-Day Avg. Streamflow**
- **Precipitation Anomalies**

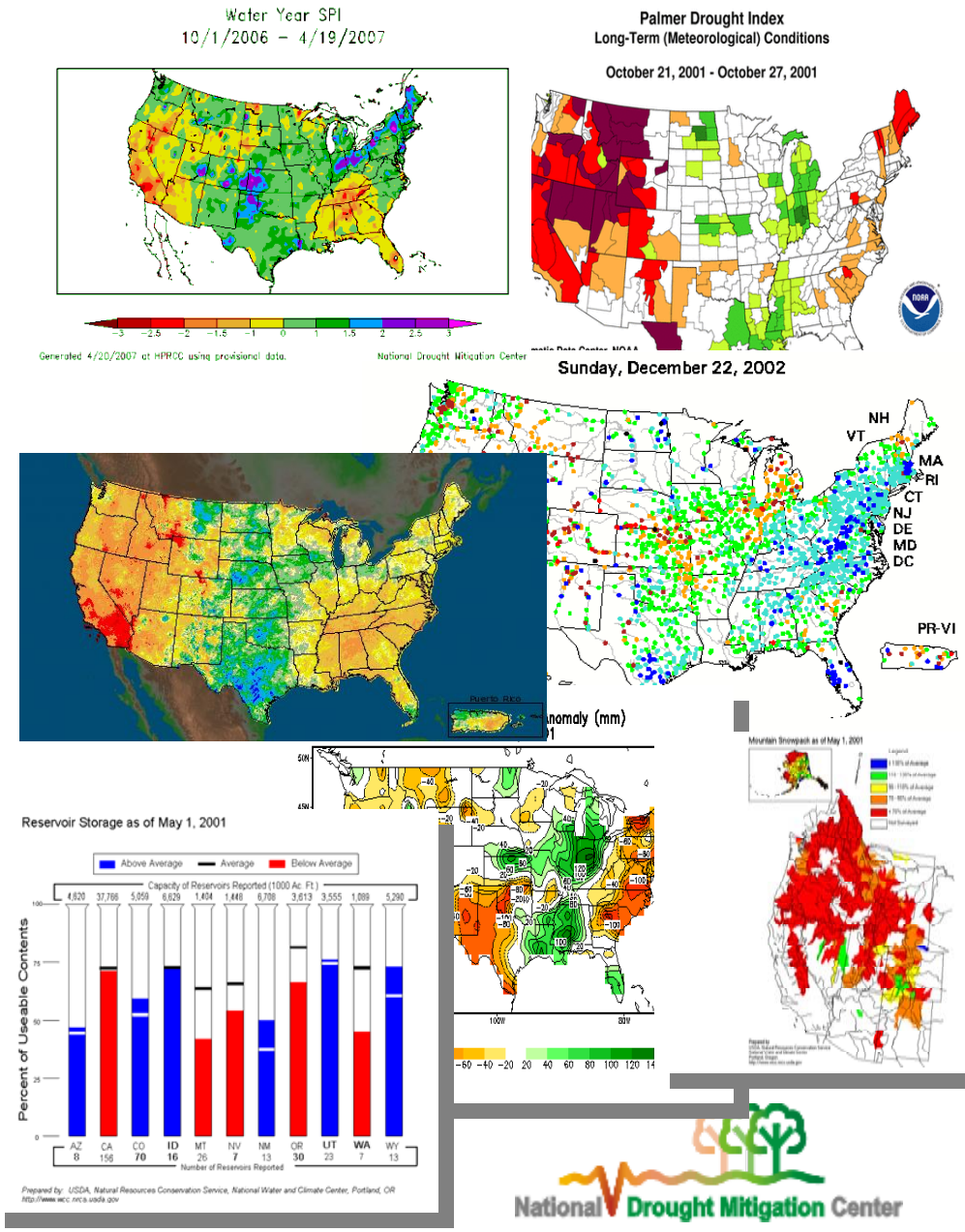
Growing Season:

- ***Crop Moisture Index***
- ***Sat. Veg. Health Index***
- ***Soil Moisture***
- ***Mesonet data***

In The West:

- **SWSI**
- **Reservoir levels**
- **Snowpack (SNOTEL)**
- **SWE**
- **Streamflow**

Created in ArcGIS



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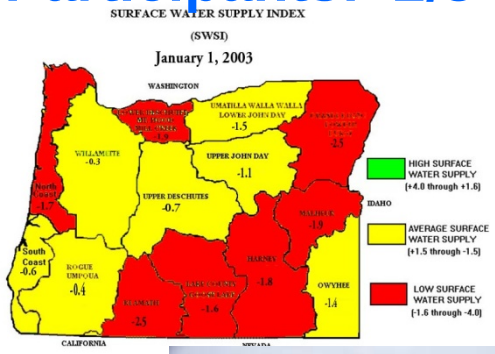
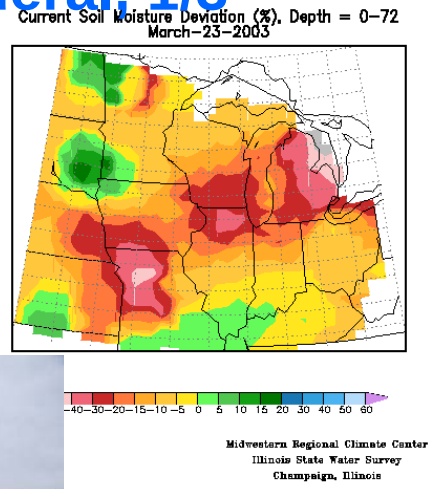
The Importance of Local Expert Input

- **The U.S. Drought Monitor Team Relies on Field Observation Feedback from the Local Experts for Impacts Information & "Ground Truth"**
  - **Listserver (295 Participants: 2/3 Federal, 1/3 State/Univ.)**

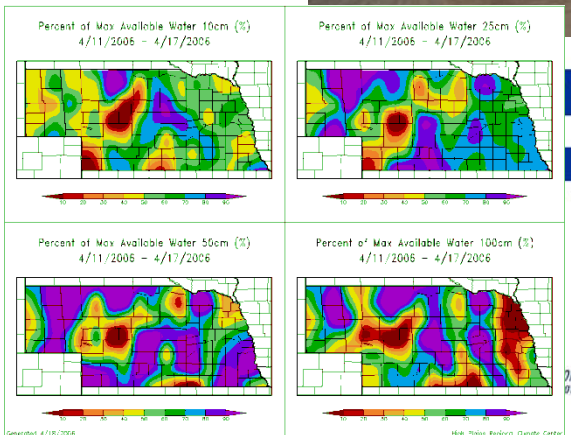
Local NWS & USDA/NRCS Offices



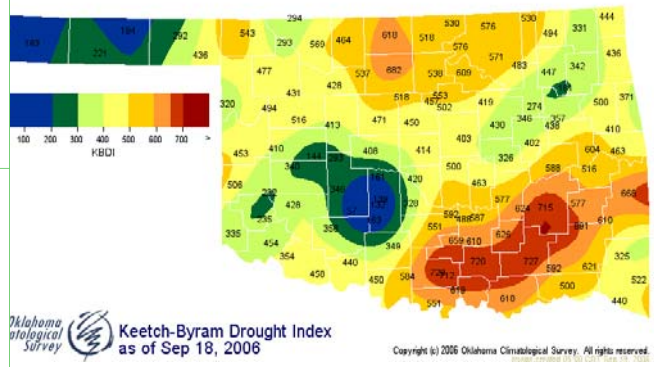


State Climate Offices

State Drought Task Forces



Regional Climate Centers



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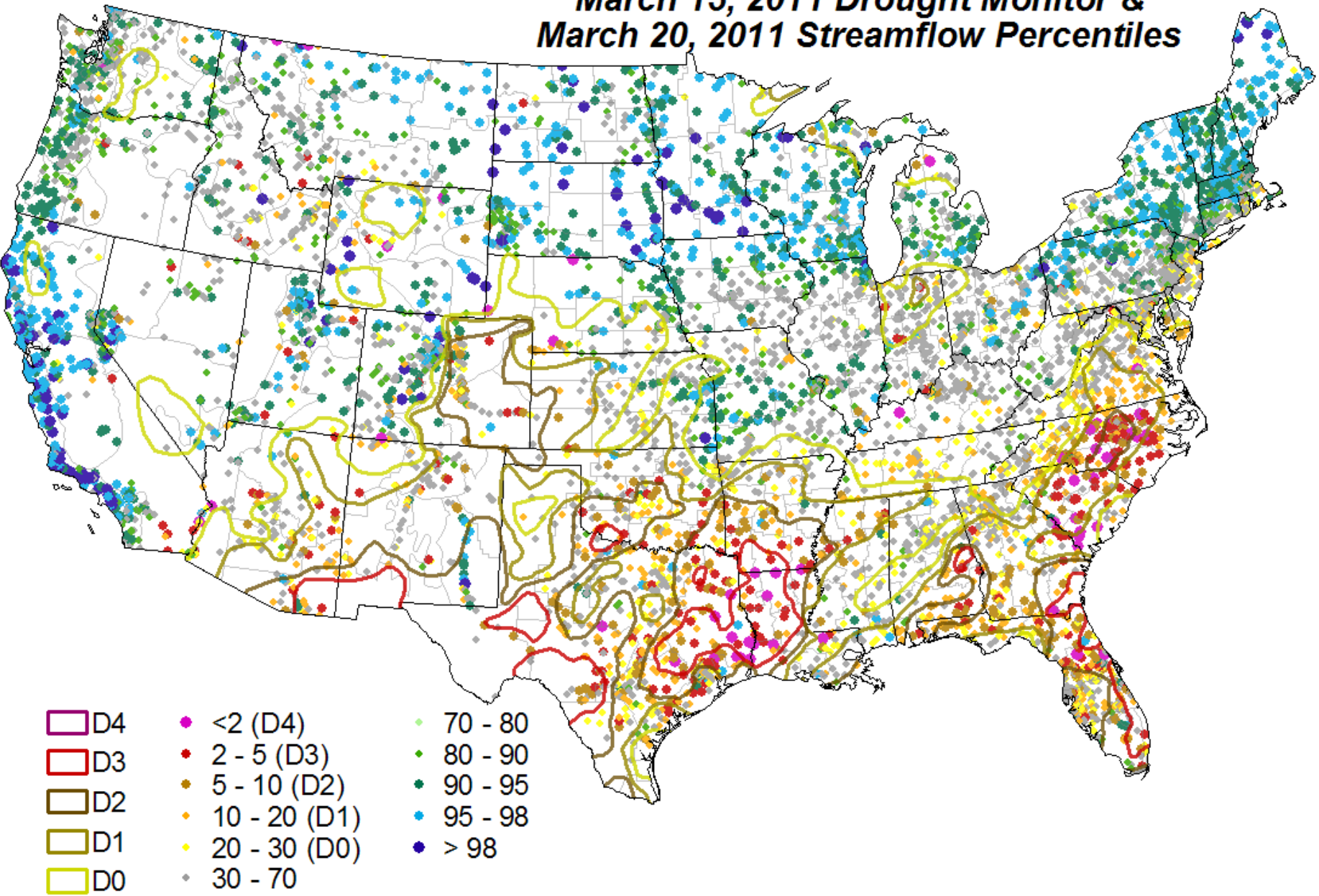
March 15, 2011 Drought Monitor & March 20, 2011 Streamflow Percentiles



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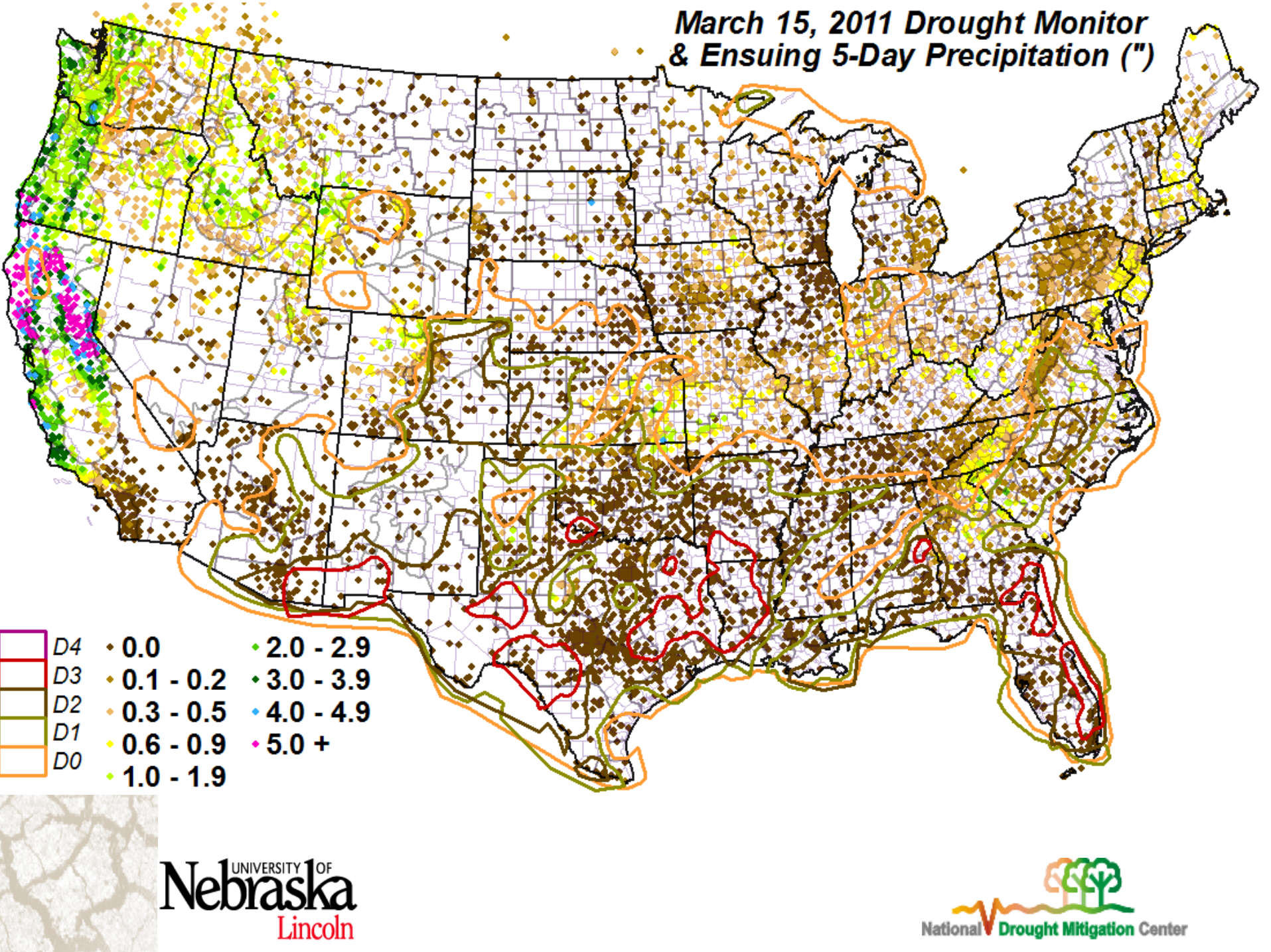
March 15, 2011 Drought Monitor
& Ensuing 5-Day Precipitation (")
D4
D3
D2
D1
D0
0.0
0.1 - 0.2
0.3 - 0.5
0.6 - 0.9
1.0 - 1.9
2.0 - 2.9
3.0 - 3.9
4.0 - 4.9
5.0 +
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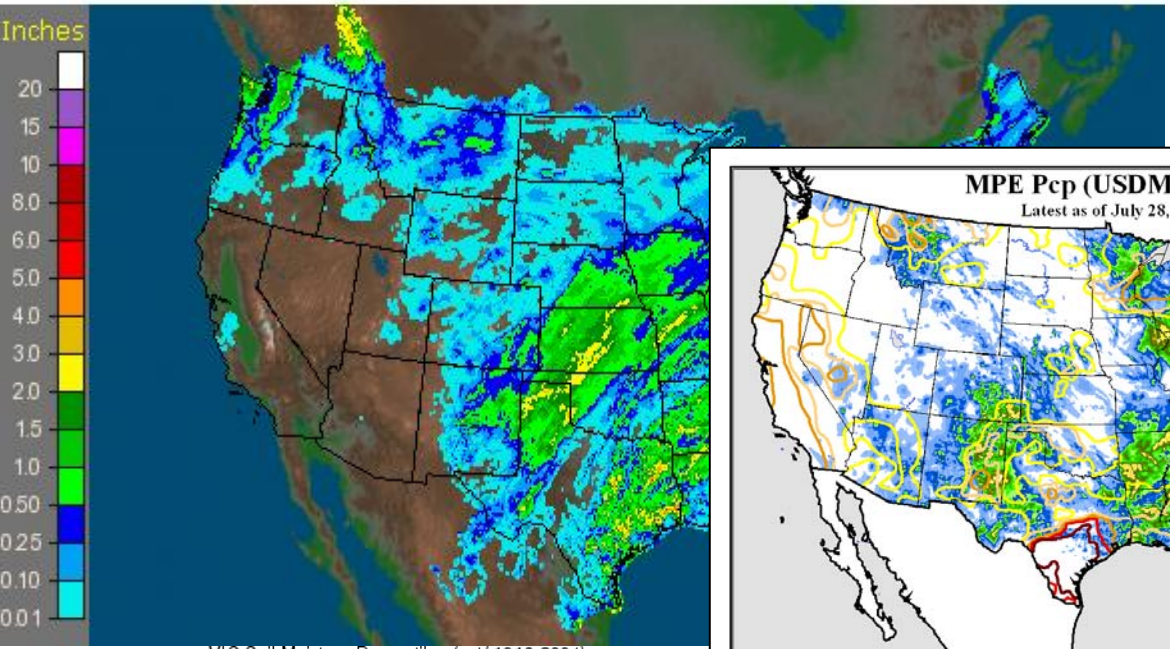
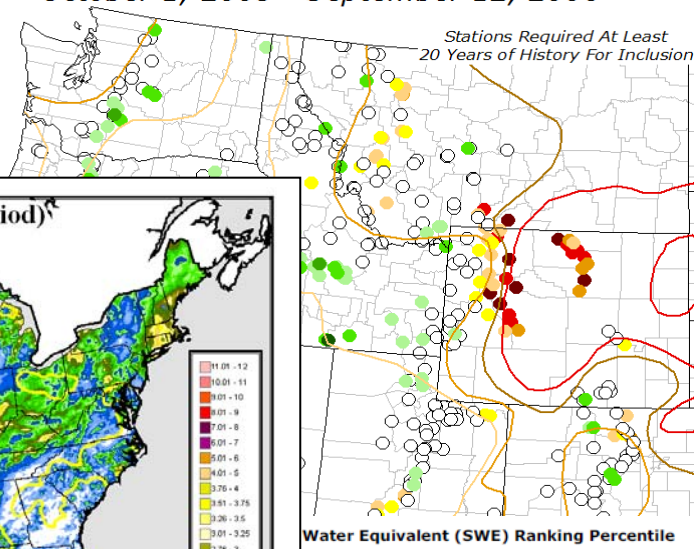
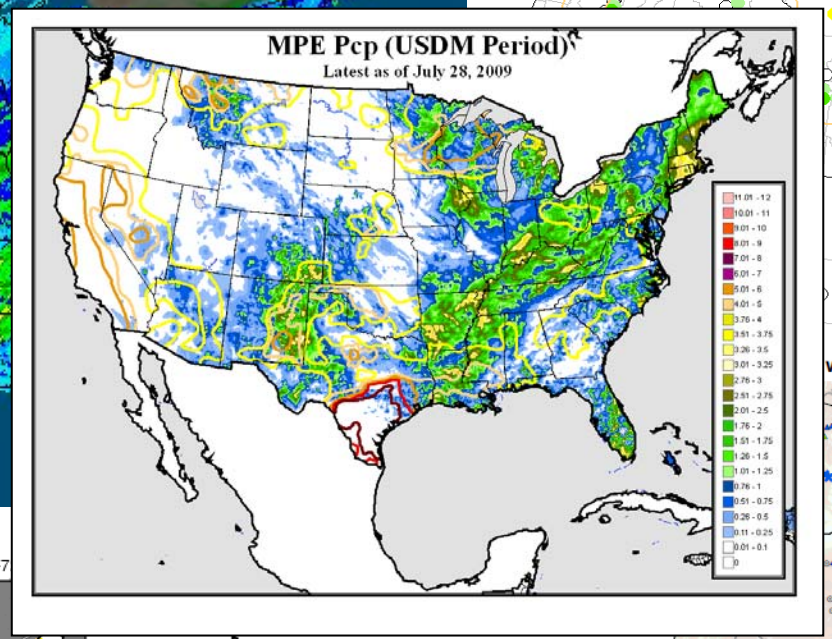
CONUS + Puerto Rico: Current 7-Day Observed Precipitation
Valid at 10/21/2008 1200 UTC- Created 10/21/08 22:38 UTC



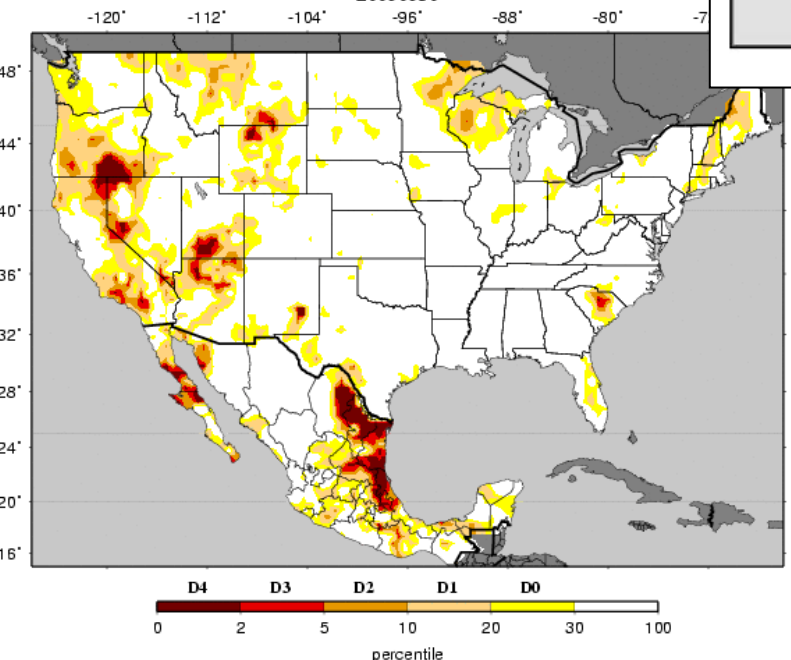
SNOTEL Water Year Precipitation Percentiles

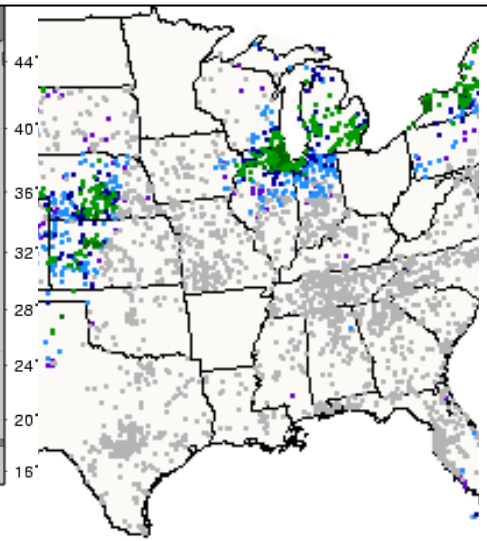
October 1, 2005 - September 12, 2006

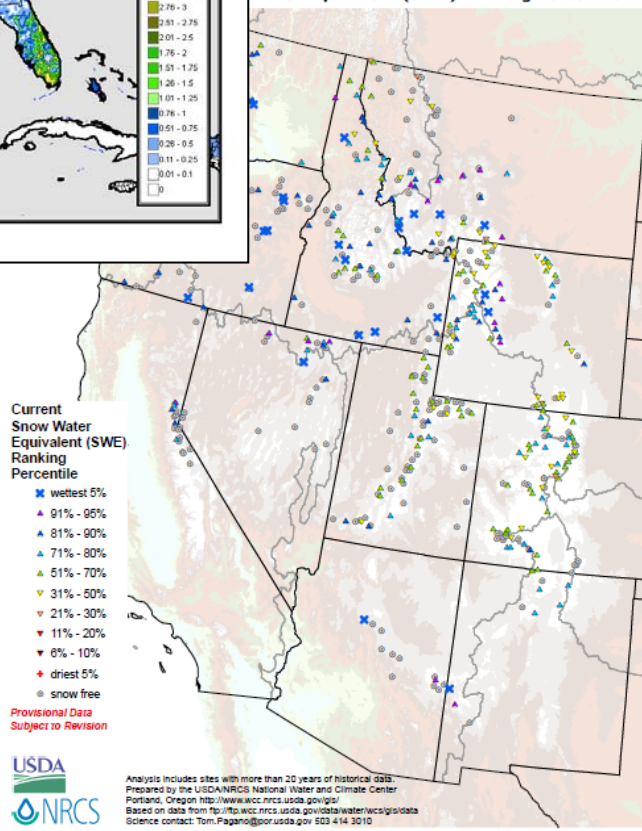




VIC Soil Moisture Percentiles (wrt/ 1916-2004)
20090930

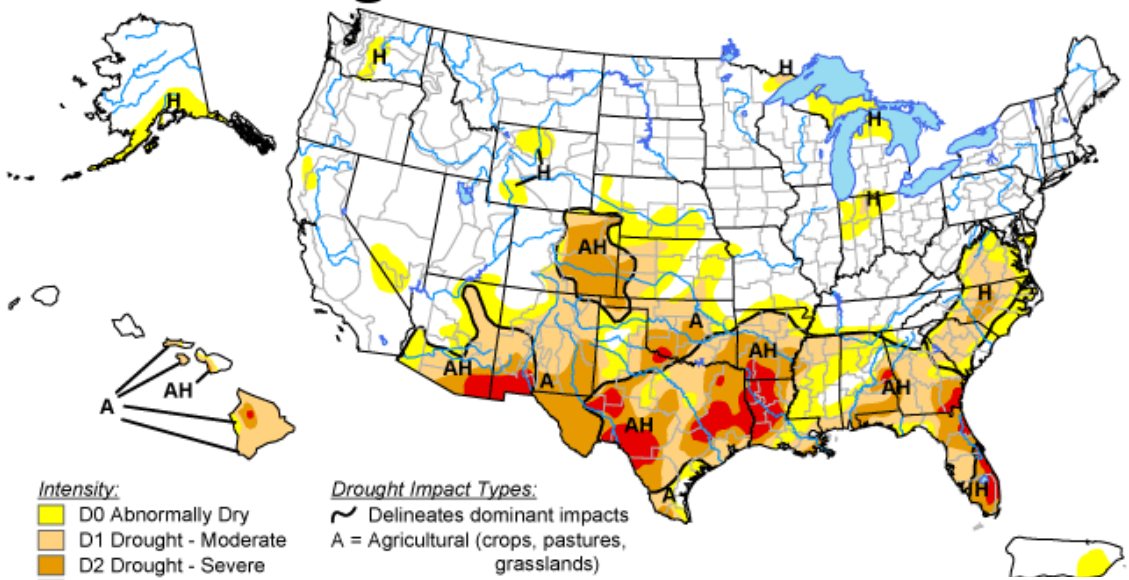






U.S. Drought Monitor

March 15, 2011
Valid 8 a.m. EDT



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

Drought Impact Types:
- Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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

http://drought.unl.edu/dm

USDA National Drought Mitigation Center

Released Thursda
Author: Laura Edwards, Western Re

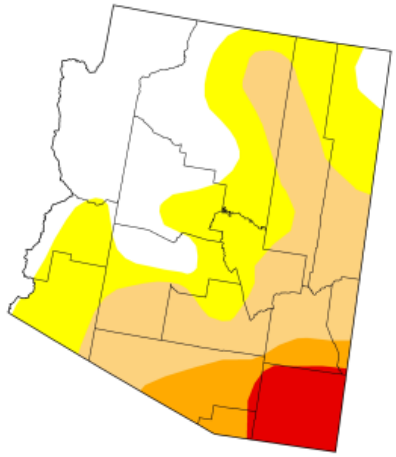
U.S. Drought Monitor

March 15, 2011
Valid 7 a.m. EST

Arizona

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	28.64	71.36	40.88	12.59	5.96	0.00
Last Week (03/08/2011 map)	29.07	70.93	40.88	12.59	5.60	0.00
3 Months Ago (12/14/2010 map)	5.65	94.35	26.15	0.00	0.00	0.00
Start of Calendar Year (12/28/2010 map)	31.40	68.60	32.45	0.00	0.00	0.00
Start of Water Year (09/28/2010 map)	40.00	60.00	18.58	3.23	0.00	0.00
One Year Ago (03/09/2010 map)	23.75	76.25	30.29	9.17	0.00	0.00



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

http://drought.unl.edu/dm

USDA National Drought Mitigation Center

Released Thursday, March 17, 2011
Laura Edwards, Western Regional Climate Center

UNIVERSITY OF Nebraska Lincoln

The Drought Monitor is Widely Used

- ***Policy:*** Farm Bill/IRS/USDA/NWS DGT-DIS/State drought plan triggers
- ***~3.5M+*** page views and ***~2M+*** visitors/year
- ***Media:*** The Weather Channel/USA Today and all major newspapers/Internet /radio/ Nightly Network News/CNN/NPR/etc.
- Presidential/Congressional/Governor ***briefings***
- ***NIDIS*** portal/portlet
- A ***model*** of interagency collaboration

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National Integrated Drought Information System (NIDIS)

A NOAA-led Federal, State, Tribal and Local Partnership

(Public Law 109-430, 2006)

Goal of NIDIS: Improve the nation's capacity to 'proactively' manage drought-related risks by **providing decision makers with the best available information and tools** to assess the impact of drought and to better prepare for and mitigate the effects of drought.

NIDIS

NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

www.drought.gov

National Integrated Drought Information System (NIDIS)

A NOAA-led Federal, State, Tribal and Local Partnership

(Public Law 109-430, 2006)

NIDIS has three general tasks:

(I) Provide an effective *drought early warning system* that:

(a) *collects and integrates* information on the key indicators of drought and drought severity; and

(b) *provides timely information* that reflect state and regional differences in drought conditions

(II) *Coordinate* Federal research in support of a drought early warning system; and

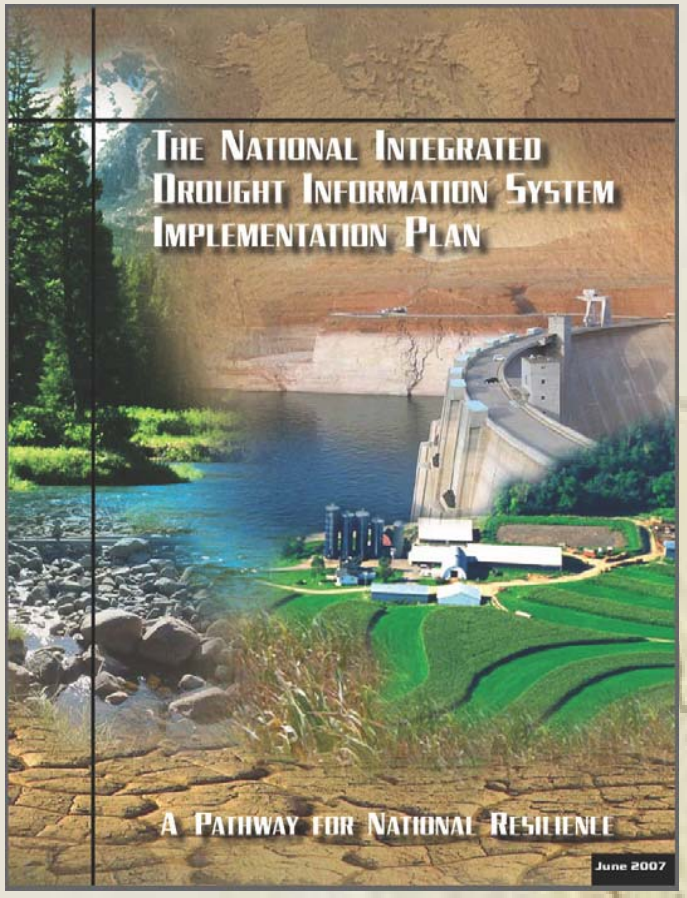
(III) *Build upon* existing forecasting and assessment.

NIDIS

NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

www.drought.gov

NIDIS Implementation Team Partners (to date):



www.drought.gov

Other Partners:

Western Governors Association (WGA)

National Drought Mitigation Center (NDMC)

Regional Climate Centers

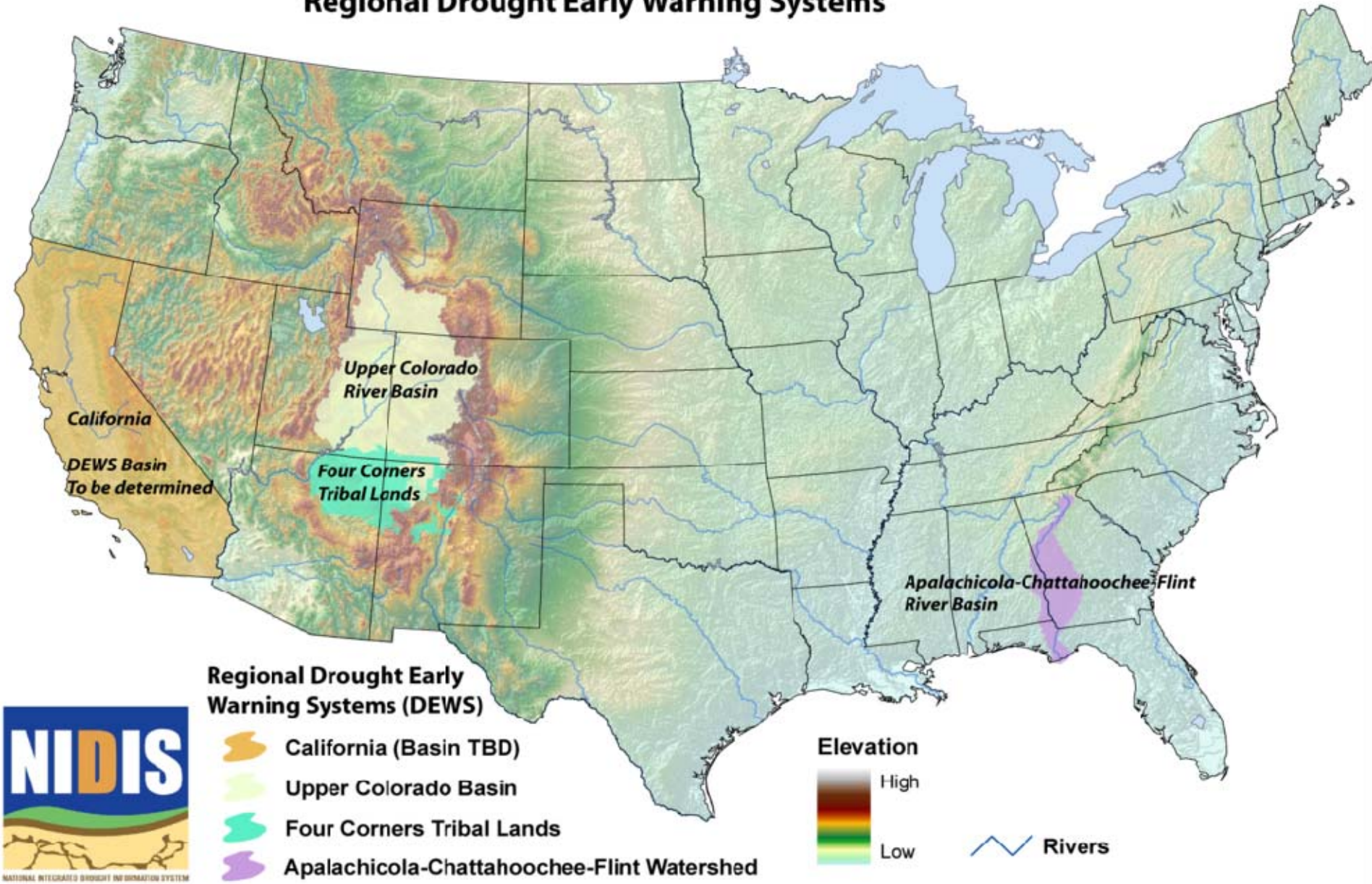
American Association of State Climatologists

Indigenous Waters Network

Weather Channel

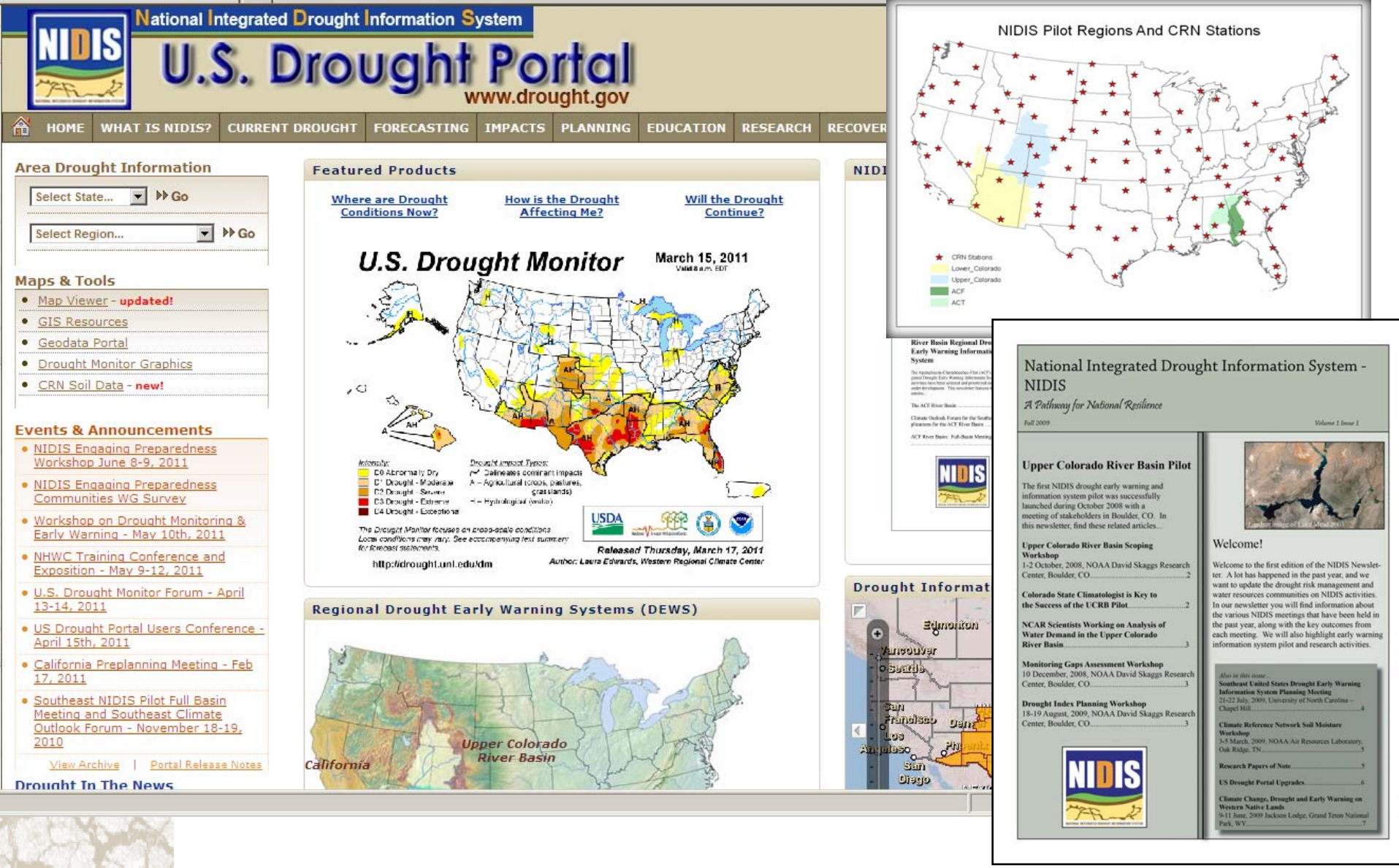
Numerous Universities including:
University of Oklahoma, University of South Carolina, University of Washington, South Dakota State University, and Cornell University.

National Integrated Drought Information System (NIDIS)
Regional Drought Early Warning Systems



Map courtesy of the USGS/Michael Budde

Year 1: Scoping	Year 2+. Implementation of the Drought Early Warning System
Develop sub-teams to assess: **(1) Monitoring and forecasting; (2) Impact indicators and triggers (3) Preparedness and education**: *Assemble drought-sensitive planning indicators and management triggers database; Assess present drought information coordination partnerships and processes* Identify Federal and state-level partnerships, decision support tools and actions needed (to improve information development, coordination and flow for preparedness and risk reduction) Develop an operational plan for designing and implementing an EWS process	***Initiate development region or basin specific Drought Information Monitor*** and Portal (as a subset of the U.S. Drought Portal)-develop and communicate regional drought outlooks Develop decision support tools for demand projections and revise triggering criteria *Prototyping: Given better data and information coordination would responses have been improved for past events? Assess (1) value of improved information using past conditions, (2) responses for projections/ scenarios (decadal, climate change), (3) feedback on priorities (e.g. data gaps) to Executive Council.* **Feedback into regional Drought Monitor and Portal. Early Warning System maintenance (Fed-state-tribal) and transfer to other sub-basins**



Courtesy of NIDIS at: drought.gov

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Final Thoughts

- All droughts are ***LOCAL***
  - Monitoring local/regional/national/global
  - Planning local/regional/national
- Collaboration
  - Leverage resources
  - Leverage skills/products
  - Data sharing (derivative and/or joint products)
- Ownership
- Attribution
- Communication

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Please visit the NDMC website for more information: http://drought.unl.edu

Thanks!

Contact me at:
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msvoboda2@unl.edu

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