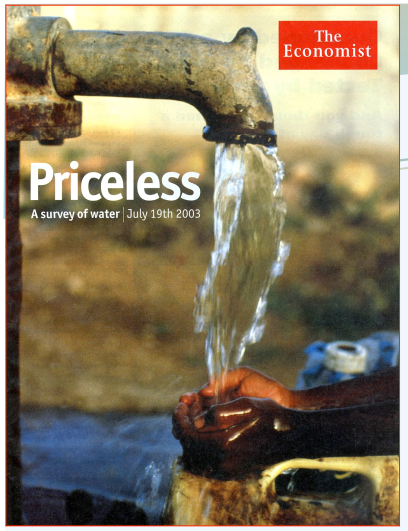
Climate, Weather and Water Services

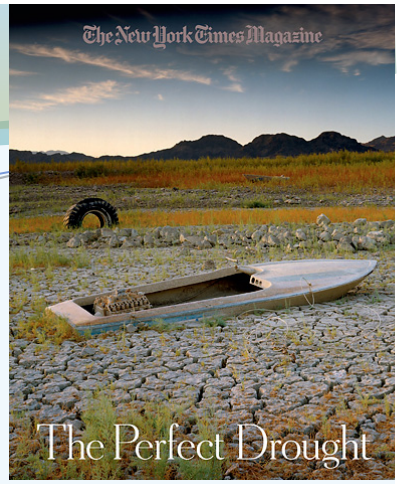
Roger S. Pulwarty

The National Integrated Drought Information System



NIDIS

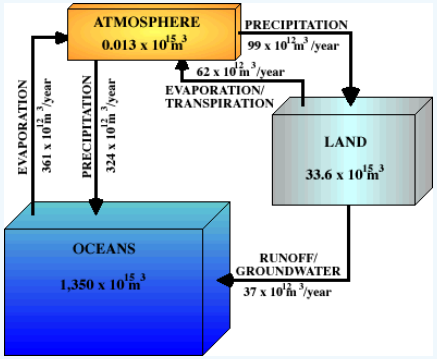
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM



The National Integrated Drought Information System

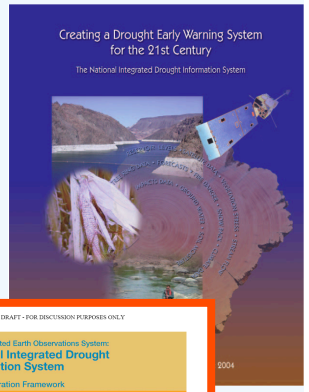
R. Pulwarty, J. Verdin, C. McNutt, L. Darby

and the NIDIS Implementation Team



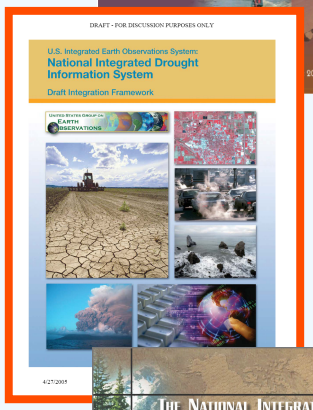
National Integrated Drought Information System

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

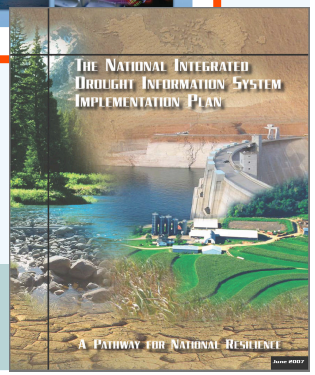


Public Law 109-430 (The NIDIS Act 2006)

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



"better informed and more timely drought-related decisions leading to reduced impacts and costs"



NIDIS
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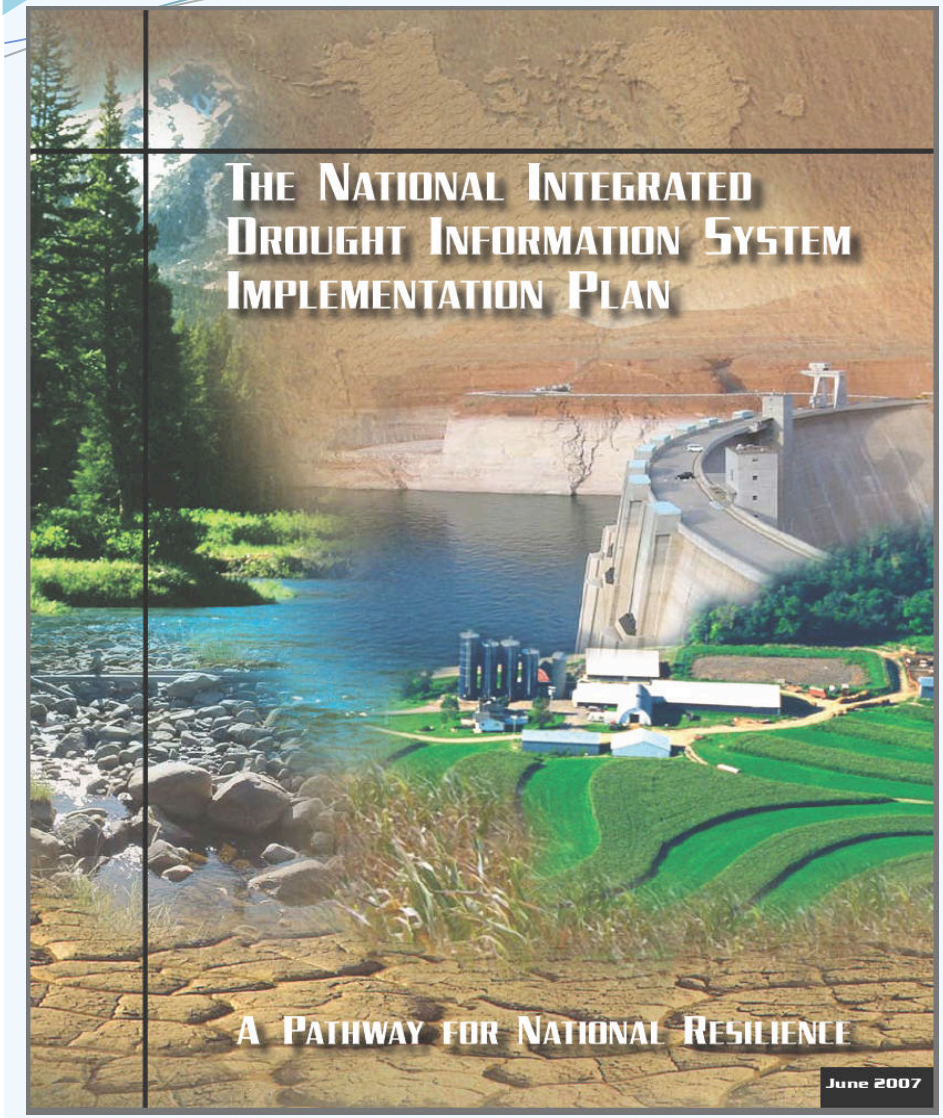
(www.drought.gov)

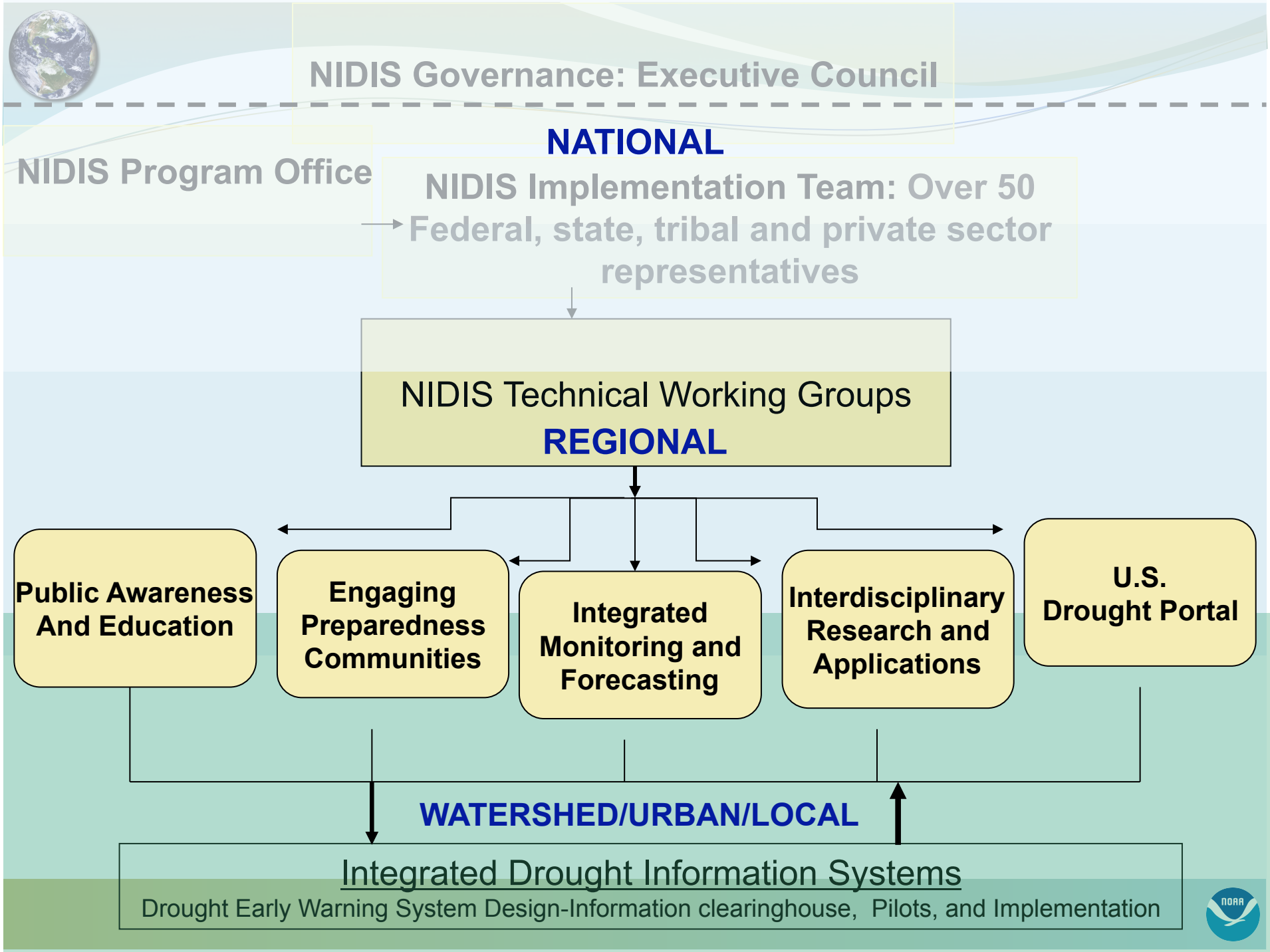
NIDIS Components



1. NIDIS Office (PSD/CPO..)

2. U.S. Drought Portal
   (NCDC, NDMC..)
3. Climate Test Beds/Drought
   - Integrating data and forecasts (CPC, RFCs..)
4. Coping with Drought
   - Applications and Decision support Research (RISAs, SARP, TRACS..)

5. NIDIS Early Warning
   Information Systems
   - Design, Prototyping, Implementation
     (multi-agency, multi-state
     RCCs, State Climatologists)


NIDIS Governance: Executive Council
NATIONAL
NIDIS Program Office
NIDIS Implementation Team: Over 50 Federal, state, tribal and private sector representatives
NIDIS Technical Working Groups
REGIONAL
Public Awareness And Education
Engaging Preparedness Communities
Integrated Monitoring and Forecasting
Interdisciplinary Research and Applications
U.S. Drought Portal
WATERSHED/URBAN/LOCAL
Integrated Drought Information Systems
Drought Early Warning System Design-Information clearinghouse, Pilots, and Implementation

National Level

NIDIS Knowledge Assessment Workshops (selected)

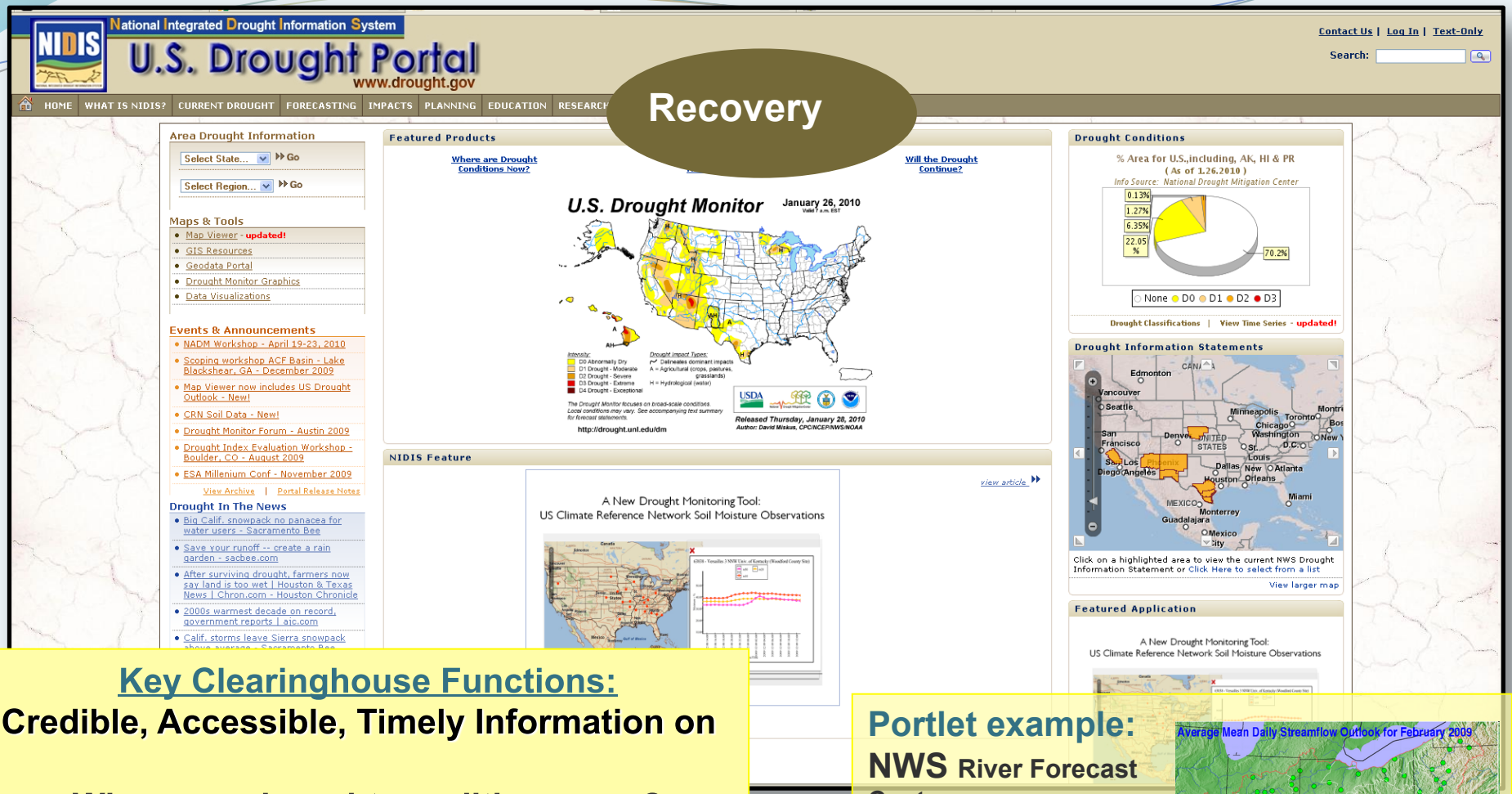
- **Remote Sensing Contributions to Drought Monitoring, February, 2008, Boulder-** NOAA, USGS, NASA, USDA, universities, state climatologists, state-local drought officials

- **National Status of Drought Early Warning Systems, June 2008, Kansas** City-NOAA, USGS, USAID, USDA, USACE, NASA, tribes, universities, state government, water managers

- **Drought, Climate change and Early Warning on Western Tribal Lands June 09-** Columbia, Colorado, Rio Grande, Missouri Basin tribes

The NIDIS U.S. Drought Portal

(www.drought.gov)



Key Clearinghouse Functions:

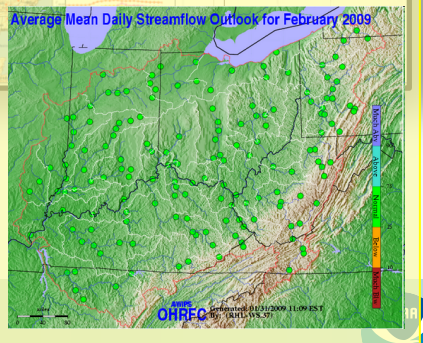
Credible, Accessible, Timely Information on

Where are drought conditions now?
Does this event look like other events?
How is the drought affecting me?
Will the drought continue?
Where can I go for help?

Portlet example:

NWS River Forecast Center

Ohio River Water Resources Outlook- Ecosystem recovery

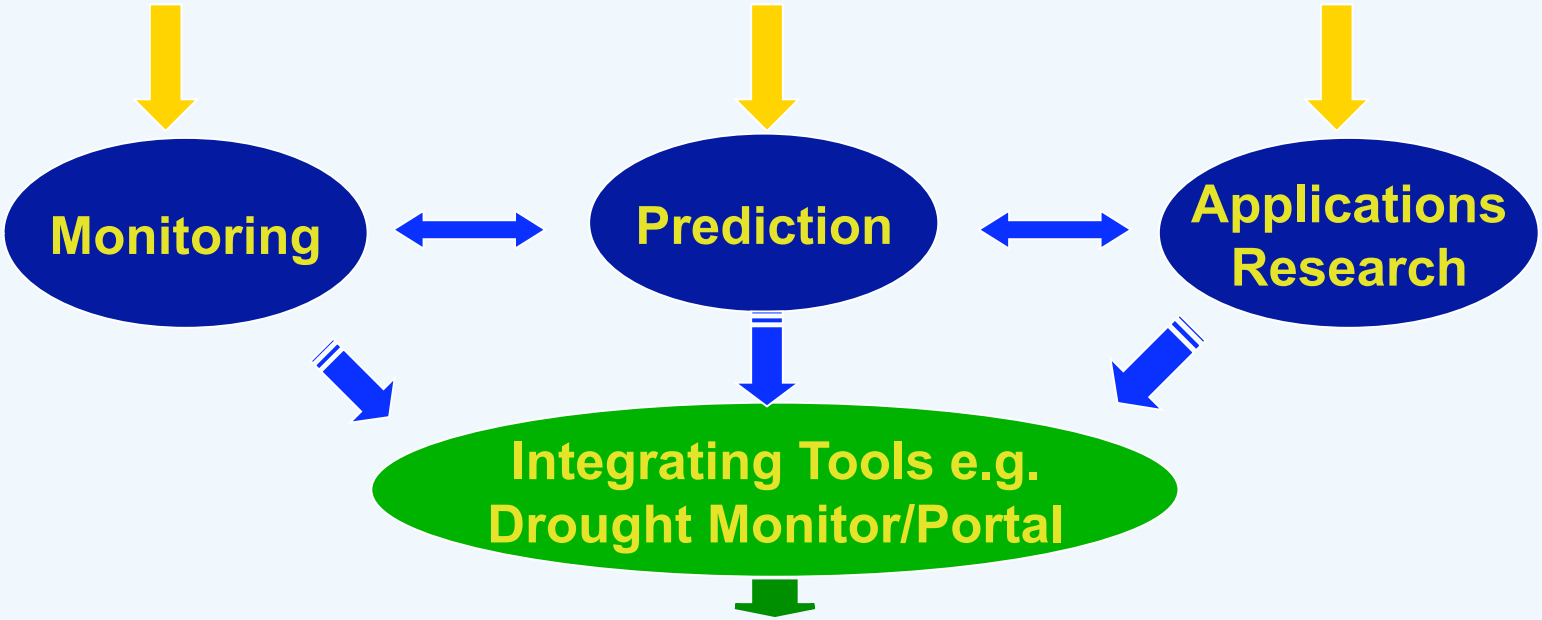


NIDIS Regional Early Warning Systems Pilots

Blue-first round prototypes; **Yellow**-second round-transferability

NIDIS Information Management Model

Coordinating federal, state, and local drought-related activities (e.g., within watersheds and states)



Identifying and transferring innovative strategies for drought risk assessment, communication and preparedness-usability experiments

Drought and Water Resources: Federal Partnerships

Monitoring & Forecasting

Drought and Flood Impacts Assessments and Scenarios

NIDIS-Information Services in support of Adaptation

Communication and Outreach

Engaging Preparedness & Adaptation

Pilot EWS Implementation: Upper Colorado River Basin

Categories of drought information users & scales of analysis

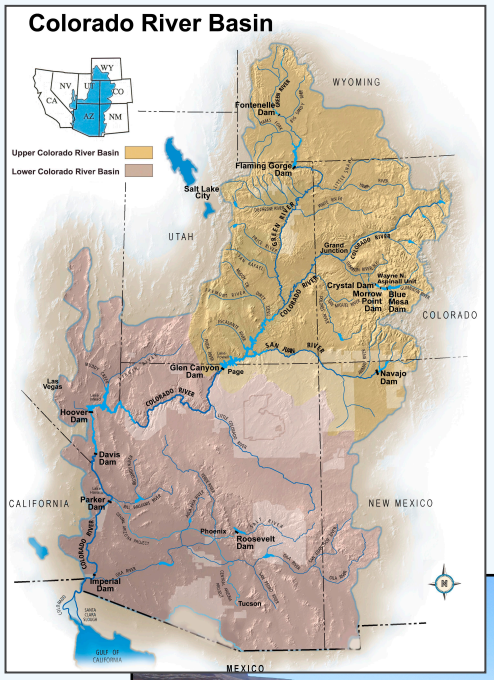
Upper Basin down to Lake Mead

•Coordinated reservoir operations: Low flow shortage triggering criteria (Powell/Mead)

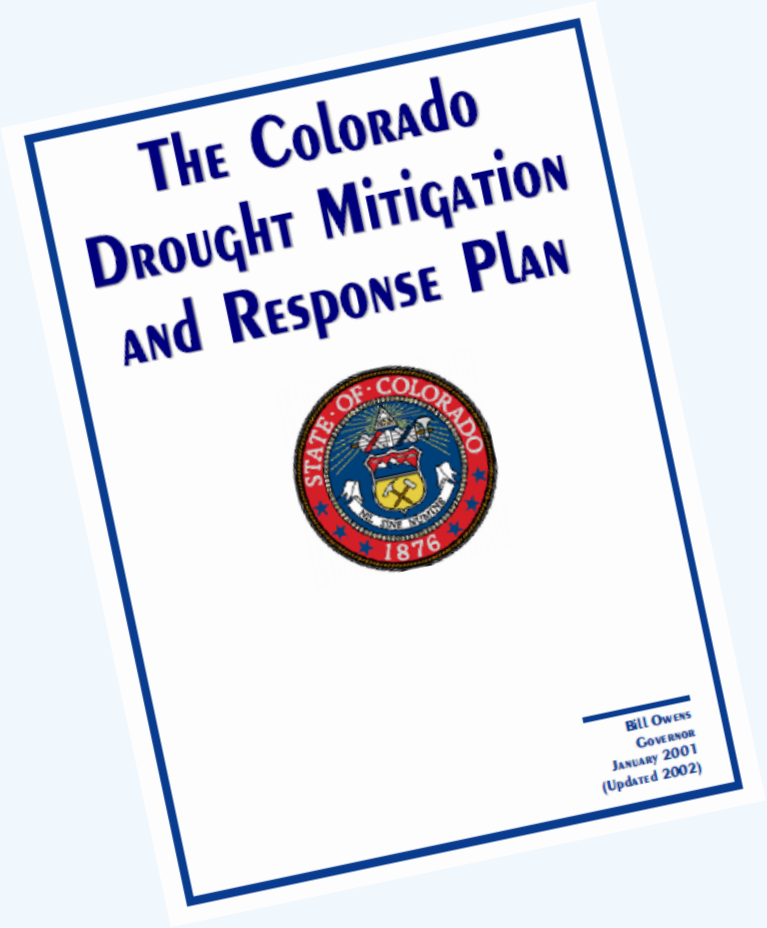
Sub-basin

•Inter- and Intra-basin transfers; Front range urban-agriculture-Changing water demand during drought

•Ecosystem health/services including recreation and tourism impacts



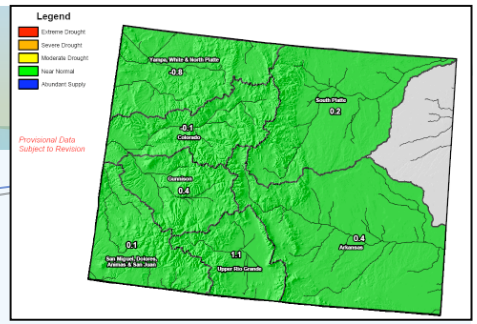
Coordination with Colorado Water Conservation Board



- Revision of the Plan to meet drought requirements of the State Natural Hazard Mitigation Plan, <u>as well as FEMA and EMAP</u>

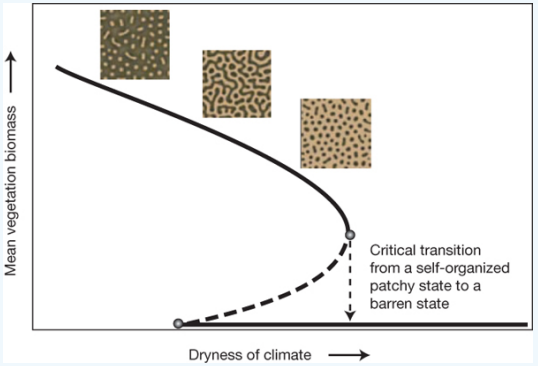
- <u>Development of indices</u> that incorporate current surface water conditions and a forecast component

- Evaluate <u>trigger points and the responses</u> that they activate



NRCS Revised Surface Water Supply Index (SWSI) for Colorado

Impacts on Native American Lands in the Four-Corners Region



(Nature, 2009)

Drought and Water Resources:

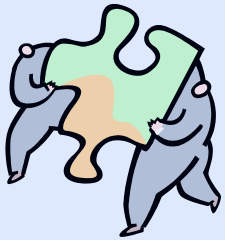
Engaging communities, resources managers as climate varies and changes

(RISAs, Climate and Hydromet Test-Beds, RCCs…….

→ **Regional Teams, NWS Field Offices, Coastal Services Center,…)**

Integrated Climate, Ecosystems, Hydrology:Technical Info & Data

+



Watershed, state, tribal, local: Experience & Knowledge

=

Decision Support

Climate information needs and usability:
Entry points for proactive Planning-triggers and indicators

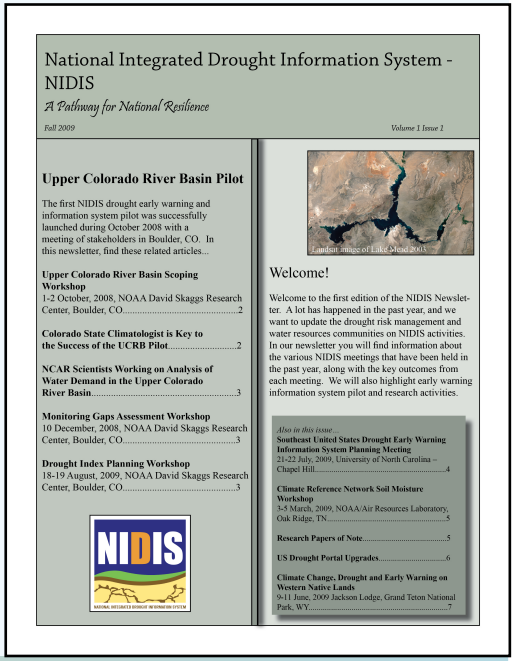
Enabling resilience:
Best available drought risk & water supply information to inform infrastructure development and ongoing adaptation

NIDIS Relies on ESRL/PSD

(integrated research, development of service prototypes)

- Reconciling CO Basin flow projections
- Attribution: Drought severity
- Low flow impacts on protected species

- Analyses of emerging events
- Drought demise-two week forecasts, Hydromet Test-bed
- Partnerships with WWA



National Integrated Drought Information System - NIDIS

A Pathway for National Resilience

Fall 2009 *Volume 1 Issue 1*

Upper Colorado River Basin Pilot

The first NIDIS drought early warning and information system pilot was successfully launched during October 2008 with a meeting of stakeholders in Boulder, CO. In this newsletter, find these related articles...

Landsat image of Lake Mead 2003

Welcome!

Welcome to the first edition of the NIDIS Newsletter. A lot has happened in the past year, and we want to update the drought risk management and water resources communities on NIDIS activities. In our newsletter you will find information about the various NIDIS meetings that have been held in the past year, along with the key outcomes from each meeting. We will also highlight early warning information system pilot and research activities.

Also in this issue...

NIDIS

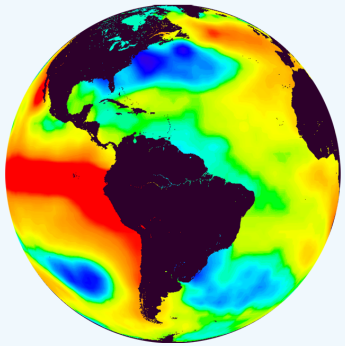
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

www.drought.gov
NIDIS Newsletter

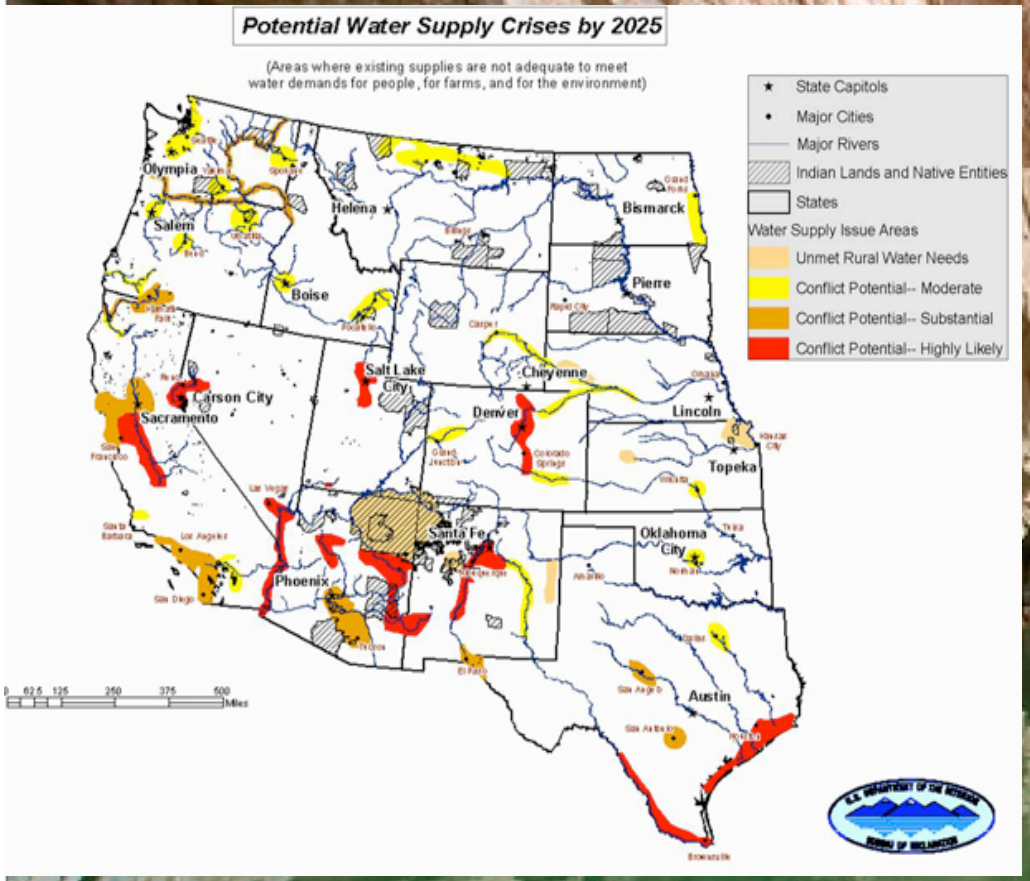
A NIDIS Goal: Informing Climate Services Development

"If we don't get NIDIS right, we can't get a national climate service right"

Kelly Redmond, Western Regional Climate Center



6th Drought Monitor Forum
Austin, Tx Oct. 7-8, 2009



NIDIS

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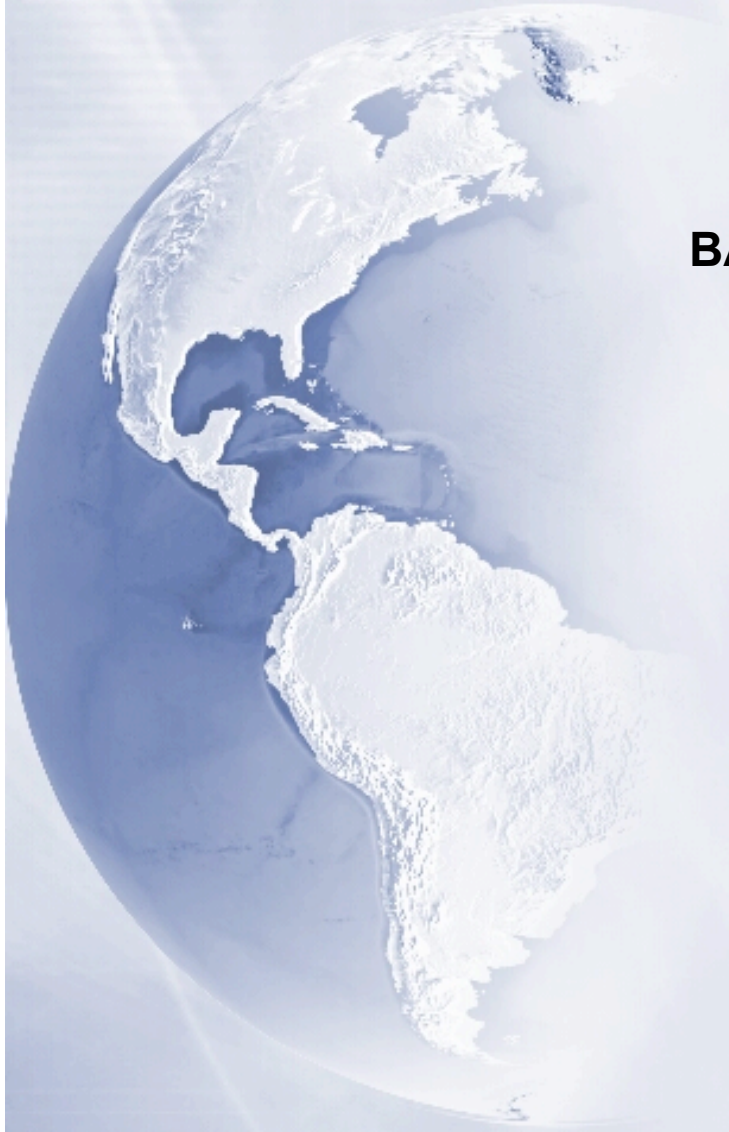
THANK YOU



BACKUP SLIDES

Regional and Watershed Level

Applications and Decision Support Research in support of NIDIS (RISA, SARP,TRACS)

- Evaluating Adaptation Policies For Urban Water Resource Management-Short-Term Drought Responses And Long-Term Planning
- Socioeconomic Assessments to Build Community Resilience in Mitigating Drought
- Climate Information System to Enhance Drought Preparedness by Underserved Farmers in the SE U.S.

- Ensemble Hydrologic Forecasts
- Drought Index Evaluation and Implementation in a Geospatial Framework Linked to Hydrologic Data Web Services

Year 2 Actions

Prototyping/gaming: 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(seasons, decadal, change)
3. Develop EWS Fora
4. Feedback on priorities (e.g. data gaps) to Executive Council

Mission: Implement a dynamic, accessible, authoritative drought information system

NOAA Produces:	With Our Partners:	Used By:
Monitoring and Forecasting		
U.S. Drought Monitor	USDA, National Drought Mitigation Center	USDA, state and local governments
U.S. Soil Moisture Monitoring	DOE, USDA (NRCS)	USDA, agricultural producers
Normalized Difference Vegetation Index	USGS, NASA	USAID (FEWS NET)
Crop Moisture Index	USDA	USDA, agricultural producers
Ensemble Water Supply Forecasts	USDA	USBR, USACE, state water management agencies, local district water managers
Soil Moisture Anomaly Forecast	USDA (NRCS)	USDA, agricultural producers

NOAA Produces	With Our Partners:	Used By:
Products Informing Risk Assessment and Management		
Reconciling projections of future Colorado River stream flow in a changing climate	USBR, USGS, University of Washington, University of Colorado, University of Arizona, University of California-San Diego	USBR, state and local water providers, reservoir managers, Water Conservancy Districts
USGS Circular 1331: Climate Change and Water Resources Management: A Federal Perspective	USGS, USBR, USACE	USBR, USACE, Water Utilities
Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation	Colorado Water Conservation Board, University of Colorado, Western Water Assessment RISA	Colorado water planners, State Climatologists
Managing Threatened and Endangered Salmon in Low Water Conditions	USBR, CA Department of Fish and Game, CA Department of Water Resources, University of California Davis, Humboldt State University	NMFS, CA Department of Fish and Game, CA Department of Water Resources, Pacific Fisheries Management Council
Assessing Drought Indicators and Triggers	USGS, USDA (NRCS), Colorado Water Conservation Board, Colorado State University, Utah State University, University of Wyoming	USGS, USDA, USBR, water planners/providers, reservoir managers, State Climatologists

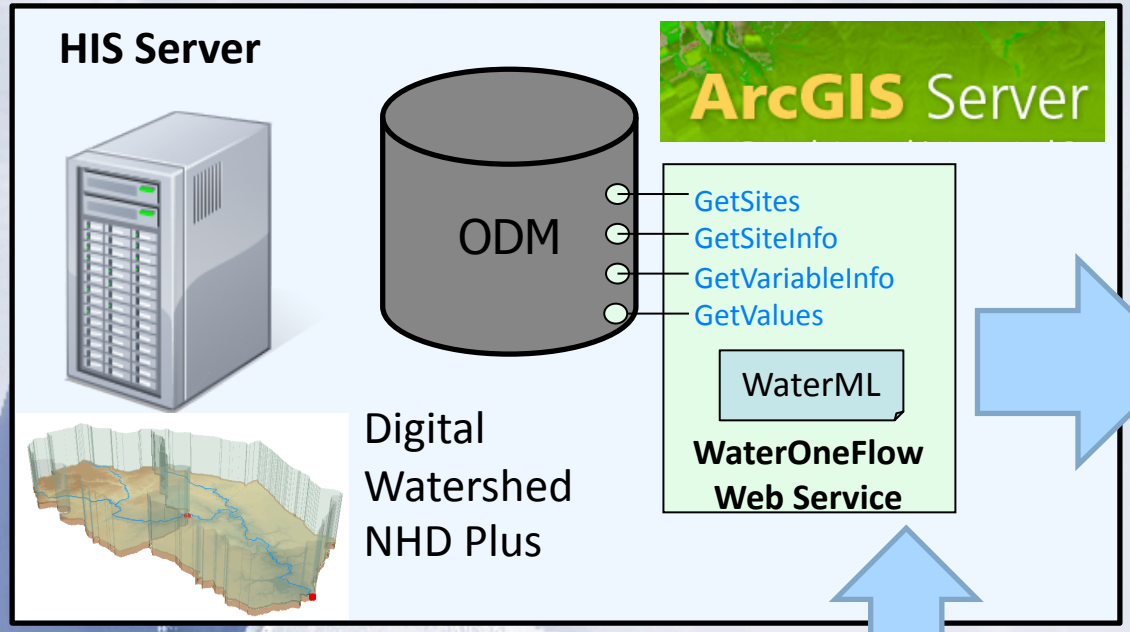
Pilot Implementation
Upper Colorado River Basin:

Existing mandates, decision cycles, and organizational capacities to guide implementation of the pilot

- Colorado Division of Water Resources (CDWR)
- Colorado State Climatologist
- Colorado River Water Conservation District (CRWCD)
- Colorado Water Conservation Board (CWCB)
- CU – Western Water Assessment, CIRES, and CADSWES
- Denver Water Board
- Northern Colorado Water Conservancy District (NCWCD)
- Wyoming State Engineer
- Wyoming State Climatologist
- Utah State Climatologist
- Desert Research Institute/WRCC

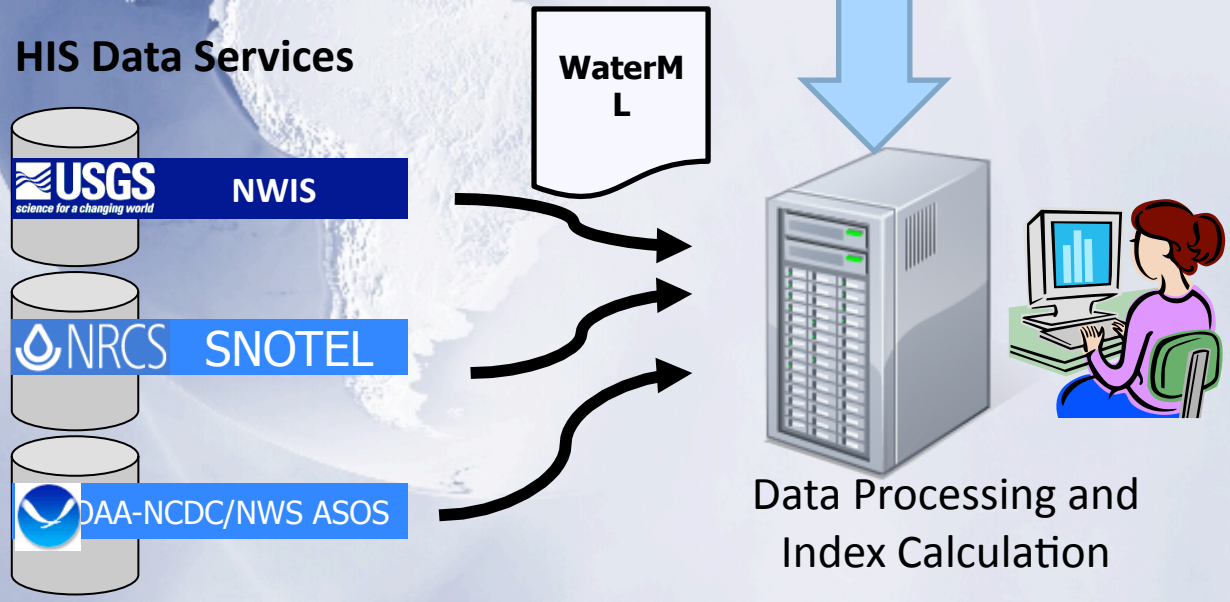
- National Center for Atmospheric Research (NCAR)
- National Drought Mitigation Center (NDMC)
- USDA: Natural Resources Conservation Service
- USFS: Region 2
- USBR: Eastern Colorado Area Office, Great Plains Region, Office of Policy and Programs, Research and Development
- USGS: Colorado Water Science Center, Central Region, Grand Canyon Monitoring and Research Center
- NOAA: Earth System Research Laboratory, National Centers for Environmental Prediction, National Climatic Data Center, National Weather Service

Drought Index System Architecture



Data Products and Services

- Web Map Based Display of Index
- WaterOneFlow Web Service(s) for inputs and outputs
- GIS Data Services
  - WMS, WFS, WCS
  - Digital Watershed
  - Drought Index Results



CUAHSI

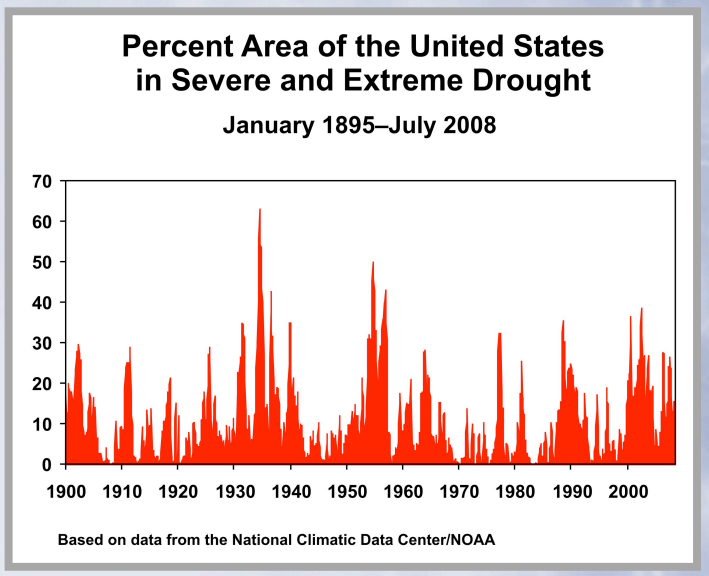
D. Tarboton

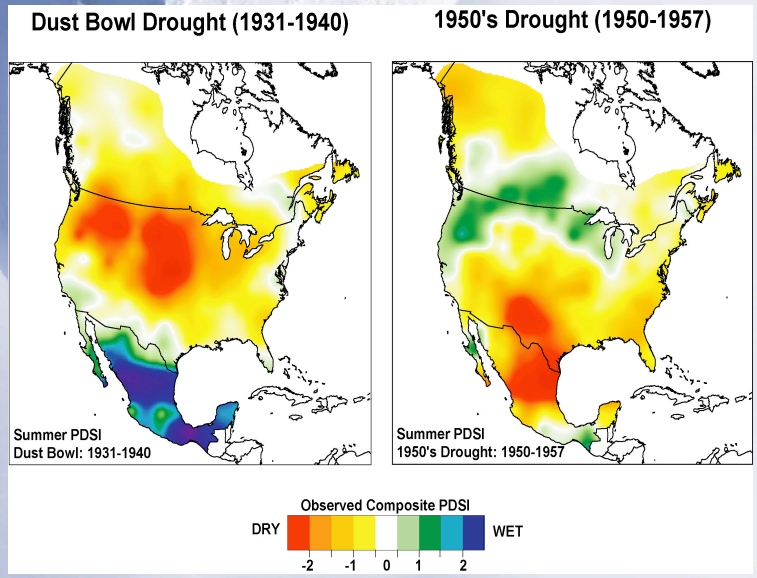
J. Horsburgh

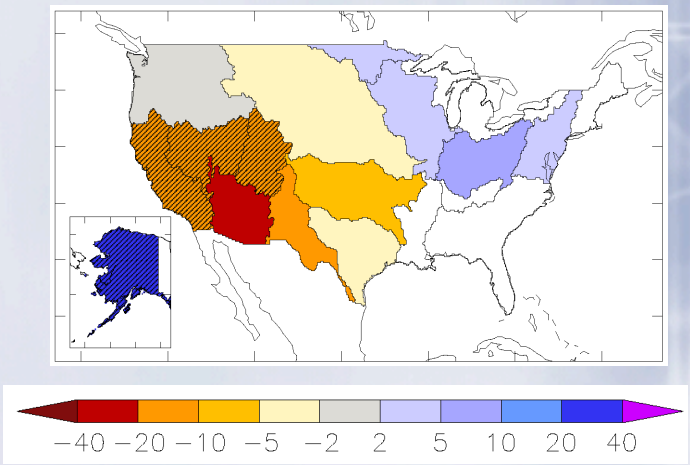
Utah State University

Climate, Water and Drought:

A continuum that crosses many time and space scales







The future (2041-2060): where do the models agree?