A National Integrated Drought Information System (NIDIS)

Robert S. Webb
NOAA Earth System Research Laboratory
Physical Sciences Division
Boulder, CO
Drought Spans Weather to Climate—Both a continuum and a cumulative deficit

Heat Waves
Storm Track Variations
Madden-Julian Oscillation
El Niño-Southern Oscillation + ????

Decadal Variability
Solar Variability
Deep Ocean Circulation
Greenhouse Gases

SHORT-TERM
INTERANNUAL
DECADE-TO-CENTURY

1930s 1950s
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”

(www.drought.gov)
NIDIS Objectives

NIDIS has three general tasks under its authorization:

(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 programs and partnerships.
NIDIS Components

NIDIS Program Office
U.S. Drought Portal
Climate Test Beds/Drought
Integrating data and forecasts
Coping with Drought
  Applications and Decision support
  Research (RISAs, SARP, MAPP..)
NIDIS Early Warning
Information Systems
Design, Prototyping,
Implementation(multi-agency, multi-state)
NIDIS Governance: Executive Council

NIDIS Program Office

NIDIS Implementation Team: Over 50 Federal, state, tribal and private sector representatives

NIDIS Technical Working Groups

- Public Awareness And Education
- Engaging Preparedness Communities
- Integrated Monitoring and Forecasting
- Interdisciplinary Research and Applications
- U.S. Drought Portal

Integrated Drought Information Systems
Drought Early Warning System Design-Information clearinghouse, Pilots, and Implementation
Public Awareness And Education  
Engaging Preparedness Communities 
U.S. Drought Portal  
Integrated Monitoring and Forecasting  
Interdisciplinary Needs Assess., Research, Applications 

NIDIS Implementation 
Over 50 Federal, state, tribal and private sector representatives nationally

Integrated Monitoring and Forecasting 
- NRCS, USGS River Forecast Center, BoR Climate Prediction Center USDA

Interdisciplinary Needs Assess., Research, Applications 
- Regional Integrated Sciences and Assessments 
  Regional Climate Centers NCAR

U.S. Drought Portal 
- NCDC NDMC-NOAA, USGS, USDA, USBoR

Public Awareness And Education 
- State Climatologists, NWS-CSD USDA Extension

Engaging Preparedness Communities 
- NDMC State and Tribal Offices, RISAs US BoR, USACE, Counties
In *Drought and Its Causes and Effects*, Tannehill (1947) wrote: "We have no good definition of drought. We may say truthfully that we scarcely know a drought when we see one. We welcome the first clear day after a rainy spell. Rainless days continue for a time and we are pleased to have a long spell of such fine weather. It keeps on and we are a little worried. A few days more and we are really in trouble. The first rainless day in a spell of fine weather contributes as much to the drought as the last, but no one knows how serious it will be until the last dry day is gone and the rains have come again... we are not sure about it until the crops have withered and died."
Two years ago (top left; U.S. Drought Monitor of 13 July 2010), many basins across the USA were drought free.

One year later (center left; 12 July 2011), exceptional drought was covering much of the south-central and southeastern US, while there was Missouri River flooding and near record snowpack across the western US.

Last week (bottom left): drought was covering much of the lower 48 states.

Were these conditions expected? Are they predictable? Were they prepared for?
Drought Early Warning

“A drought early warning system is designed to identify climate and water supply trends and thus to detect the emergence or probability of the occurrence and likely severity of drought. This information can reduce impacts if delivered to decision makers in a timely and appropriate format and if mitigation measures and preparedness plans are in place (WMO). With careful coordination at local, regional and national levels, stakeholders can monitor various early warning indicators and implement more efficient and effective drought-relief interventions.”

http://www.agriskmanagementforum.org/farmd/

- Monitoring
  - Hydrological and Meteorological
    - Historical Context/Climatology
    - Knowledge of teleconnections (e.g., ENSO)
  - Forecasting/Outlook
    - Onset, intensification and recovery
- Management triggers
  - Assumes a drought plan is in place
- Anticipated impacts
- Effective communication to stakeholders
Support cross-regional efforts to assess user needs, test drought-focused decision support tools

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

Evaluate and transition drought information products to operations

Regional Climate Centers
State Climatologists
MAPP Drought Task Force Research

Who/What
- A multi-agency/multi-institution group of 30-plus MAPP Investigators research involving CTB
- Research projects exploring improved methodologies for drought monitoring (e.g. remote sensing) and prediction (e.g. NMME)

Roles
- Providing focus, coordination and leadership to drought research in support of NIDIS
- Extending NOAA’s research capability via external collaborations
- Improving NOAA operations via CTB
- Contributing/leveraging International efforts (GDIS)

Broad Priorities
- To define and apply metrics to evaluate advances
- A case study approach to assess current monitoring and prediction capability
- To incorporate research advances in an experimental drought system

Drought Task Force Advancing U.S. drought monitoring and prediction
Climate Outlooks

Precipitation anomalies start and end drought

Temperature anomalies amplify and prolong drought

http://www.cpc.ncep.noaa.gov/
Inputs include: the one month and seasonal temperature and precipitation outlooks, various medium- and short-range forecasts and models, the 384-hour Global Forecast System total precipitation amounts, soil moisture forecasts, Climate Forecast System output, Palmer drought termination and amelioration probabilities, seasonal cycle and climatology, and antecedent conditions.
Plenty of tools to assess current conditions and to provide short-term and seasonal forecasts…but how to communicate effectively the potential problems associated with drought? How do agencies and citizens work together to mitigate the negative impacts of drought?
U.S. Drought Monitor

September 18, 2012

Where are Drought Conditions Now?
How is the Drought Affecting Me?
Will the Drought Continue?

http://droughtmonitor.unl.edu/

Author: David Simmer, Western Regional Climate Center

Released Thursday, September 20, 2012

The 2012 Drought in Colorado, Utah and Wyoming
More Information from Western Water Assessment

Drought Information Statements

Maps & Tools
- Map & Data Viewer - new!
- Geodata Portal
- Drought Monitor Graphics
- CBN Soil Data

Events & Announcements
- Carolinas DEWS Scoping Workshop July 2012
- April 2012 Southern Plains Drought Assessment & Outlook Forum
- Risk Management Meeting 11/2011
- ACF Climate Outlook Forum and Plot Review Meeting 2011
- Engaging Preparedness Communities Webinar: Dec. 11th 1-3 PM PDT

Regional Drought Webinars
- ACFRS Drought Assessment Webinar - July 5th, 2012
- ACFRS Drought Assessment Webinar - Nov 15th, 2012
- ACFRS Drought Assessment Webinar - May 22nd, 2012
- ACFRS Drought Assessment Webinar - February 20th, 2012
- ACFRS Briefing Presentation - January 17th, 2012
- Managing Drought in the Southern Plains
- ACF Briefing Presentation - November 15th, 2011
- Colorado - weekly, 12PM EDT
Forecasting is a developing component of the drought management issue. New products will be added to this web site as they become operational.

**U.S. Seasonal Drought Outlook**

*Drought Trendy during the Valid Period*

*Valid for September 20 - December 31, 2012*

*Released September 20, 2012*

**KEY:**
- **Drought to persist or intensify**
- **Drought ongoing, some improvement**
- **Drought likely to improve, impacts ease**
- **Drought development likely**

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events – such as individual storms – cannot be accurately forecast more than a few days in advance. Use caution for applications — such as crops — that can be affected by such events.

*Ongoing* drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.
Mapping and Data
Southern Climate Impacts Planning Program (SCIPP)
A NIDIS RISA Focused on Drought

Response to emerging drought conditions:
- Climate Outlook Forums
- Webinars on various drought topics
  - La Niña
  - Flash Drought
  - Water Resources
  - Cattle Industry
  - Seasonal Forecasts
  - Wildfire
  - U.S. Drought Monitor
  - Wildlife

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: https://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 https://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.
Welcome to the National Drought Mitigation Center

Quick Links

U.S. Department of Agriculture Disaster and Drought Assistance page

NDMC News

Drought Briefings, July 19, 2012

Jul 20, 2012
July 19 presentations by NDMC staff on drought conditions and impacts are online.
Read more »

July 17 U.S. Drought Monitor map shows drought spreading and intensifying

Jul 19, 2012
The July 17, 2012, U.S. Drought Monitor map showed increases in the area of the United States in all categories of drought, setting a record for the third consecutive week for the total area of the country in drought during the 12-year history of the map. As of July 17, 53.17 percent of the country was in moderate drought or worse, up from 50.92 percent a week earlier.
Read more »

Read the Summer 2012 edition of DroughtScape

Jul 13, 2012
The Summer 2012 edition of DroughtScape is online.

See articles on:

- The record-breaking expanse of drought shown on the U.S. Drought Monitor and the U.S.

Pause Slideshow

Map
Submit a Report
About the DIR
Help

Drought Impact Reporter

The Drought Impact Reporter compiles drought impacts from a variety of sources, including news media, government agencies, and individual observers.

Contact Information

National Drought Mitigation Center
University of Nebraska-Lincoln

The NDMC partners with the National Integrated Drought Information System (NIDIS) to help the U.S. be better prepared for drought.
Effective Communication

*It is imperative to include local knowledge in a drought early warning system and to build partnerships among stakeholders*

State climatologists  Local government
Local water suppliers  Local monitoring experts
Local forecasters  Researchers with local expertise

Communication tools include…
Webinars
Newsletters
“2-page” assessments
Web postings
Press briefings

Include…
Current and anticipated conditions and impacts
Forecast and Outlook caveats
NIDIS Drought Early Warning Pilots

New Pilots

Carolinas          Chesapeake Bay
Missouri Basin     Rio Grande/Rio Bravo
NIDIS Regional Pilots as Prototypes: guidance for implementing regional information systems

• Developing an **Information Pedigree** - Relevant, authoritative, accessible, compatible, usable

• Downscaling is valuable but not a substitute for monitoring and understanding local climates

• **Overcoming impediments to information flow and to the nodes working as a system**
  - Existing barriers to cross-agency collaboration to be addressed or least be made explicit
  - Innovations and new information to be introduced and tested as baselines change, and
  - The benefits of participation in design, implementation and maintenance to be clarified

Mature prototypes become the regional system and are more likely to be viewed as transferable
Monitoring and forecast products

Experimental PSD Precipitation Forecast Guidance
OCT – DEC 2012 (Issued September 18, 2012)
ACF River Basin Pilot

- 5 Corps-operated dams
- 11 Dams owned and operated by power companies
- Buford Dam constructed for flood control, hydropower, navigation
- At least 20 years of litigation regarding allocation of water in the basin and the three sub-basins
Commonalities among the three sub-basins

1) Education and Communication
2) Forecasting improvements
3) Improved interactions with the Corps
4) Data
5) Consistency in drought planning among the three states
6) ACF Basin webinars and Climate Outlooks
7) Drought Index
8) Resolve discrepancies in our understanding of groundwater
9) Presentation of Information
California Activities

Klamath River Basin-wide Hydroclimate Information System: Regional Climate Center integrated information system to provide access to River Forecast Center hydroclimate data.

North Bay Counties and Russian River Valley: Focus on hydrologic extremes with droughts draining reservoirs and extreme precipitation events filling reservoirs.

Central Valley Fallowed Land Monitoring Service: Objective method to remotely sense changes in fallowed acreage due to water shortage.

Southern California – Urban: Challenges of providing drought information in a well-plumbed system.
The NIDIS Way

- Identify appropriate partners and representatives
- Set goals and priorities—problem definition
- Use professionals from relevant agencies/communities etc. to build common ground
- Produce collectively authored gaps assessments and agreement on the way forward
- Build longer term collaborative partnerships that allows for query of provided information
- Determine tradeoffs and characterization: Decision quality vs decision acceptability
NIDIS and Groundwater

- Groundwater is used at times as an input into the Drought Monitor.
- Changes in shallow groundwater are simulated in the experimental North American Land Data Assimilation System (NLDAS).
- Many cities, water districts, tribal nations, and agriculture producers are partially, and in some cases fully, dependent on groundwater for supply, reducing short-term vulnerabilities to drought.
- Brackish groundwater-desalting facilities are seen as an alternative water supply that can also be used to mitigate vulnerabilities to drought.
- Collector wells adjacent to rivers extract groundwater from alluvial aquifers for water supply and to mitigate drought impacts. There is some disagreement on how these wells impact instream flows.
- Some cities, water districts, and tribal nations have developed supplemental groundwater as a supply to manage drought impacts.
- Groundwater banking is employed by states and local communities to store excess water supply for later use under drought conditions.
- The timescales of aquifer recharge are often poorly understood even when groundwater is identified as a reliable source to manage drought.