The Role of Drought Information Systems and Risk Management in Preparing for Future Droughts

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Photo: Nicole Wall, NDMC, Platte River, August 2012
Economic losses from disasters worldwide since 2000 are in the range of $2.5 trillion (UN, 2013)

- Considerably higher than previous estimates
- “Economic losses from disasters are out of control”

“Losses from floods, earthquakes and drought will continue to escalate” unless action is taken to reduce disaster risks
The Cycle of Disaster Management

risk management

Planning
Monitoring and Early Warning
Mitigation
Disaster

Protection
Recovery

Reconstruction
Impact Assessment

Response

crisis management
“Governments should prepare for droughts by developing and implementing strategies and plans that reduce associated impacts.”
-Wilhite and Glantz, 1985
National Drought Mitigation Center

Founded: 1995 at the University of Nebraska-Lincoln by Dr. Don Wilhite.

Mission: To lessen societal vulnerability to drought by promoting planning and the adoption of appropriate risk management techniques.
Nov 15, 2013 - As part of the President’s Climate Action Plan, the Administration is launching the NEW Drought Resilience Partnership (the Partnership). The Partnership will make it easier for communities to access the assistance they need by promoting strong partnerships and information sharing at all levels of government. It builds on existing efforts to provide States, Tribes and local communities risk-informed guidance for drought preparedness planning. The Partnership aims to align Federal drought policies and programs to help communities manage the impact of drought by linking information (monitoring, forecasts, and warnings) with drought preparedness and long-term resilience strategies in critical sectors such as municipal water systems, energy, recreation, tourism and transportation.

PRESS RELEASE  MORE INFO

CONTACT:  Email Us  202-564-8086

THE PRESIDENT’S CLIMATE ACTION PLAN

Executive Office of the President

June 2013
The Cycle of Disaster Management

risk management

Planning

Monitoring and Early Warning

Mitigation

Disaster

Protection

Recovery

Impact Assessment

Reconstruction

Response

Recovery

crisis management
Lessons

» Monitoring and Early Warning Information: can often be a starting point for the engagement of stakeholders for drought planning and risk management.

- It is often what the stakeholders know and can relate to
- Allows trust to develop (between different stakeholders, with the data, making decisions, etc…)
- Droughts provide “windows of opportunity” for engagement with stakeholders
- “Cannot manage what is not monitored”
Monitor de Secas do NE Prototipo

Tipos Seca Impacto:
- ~ Delineia impactos dominantes
- C = Curto prazo, geralmente <4 meses (por exemplo, a agricultura, pastagens)
- L = De Longo prazo, normalmente > 4 meses (por exemplo, hidrologia, ecologia)

Intensidade:
- S0 Anormalmente Seco
- S1 Seca - Moderado
- S2 Seca - Grave
- S3 Seca - Extremo
- S4 Seca - Excepcional

Maio/2012
(Disponibilizado Março/2014)
The Cycle of Disaster Management

1. Risk Management
   - Planning
   - Monitoring and Early Warning

2. Mitigation
   - Disaster

3. Protection
   - Impact Assessment

4. Recovery
   - Response
   - Recovery
   - Reconstruction
Components of Successful Drought Mitigation Planning

- Monitoring, early warning, and prediction
  - Foundation of a drought mitigation plan
  - Indices/indicators linked to impacts and triggers

- Risk and impact assessment
  - Who and what is at risk and why?

- Mitigation and response
  - Pro-active programs and actions to reduce risks
  - Safety net/programs
Planning Tools

- Planning at **all scales**
- Planning should start local and involve the “locals”
- Planning is a “living” process
Lessons

- **Partnerships and networks are fundamental:** necessary because of the complexity of drought and for reaching the stakeholders
  - National Integrated Drought Information System (NIDIS)
  - Regional Climate Centers, RISAs, Climate Science Centers, USDA Climate Change Hubs
  - State, local, NGO resources
  - Universities are critical for building the capacity related to research and outreach
    - Extension (Climate Extension Specialists)
Lubbock, TX
“Every few days I get a chance to visit Colorado. Or rather I should say, Colorado visits me. As I watched another dust storm roll in yesterday afternoon, I couldn’t help but think that this must have been what it was like to live in central Oklahoma during the dust bowl.”

March 28, 2014

Photo: Iris Imler, Cimarron County Conservation District
Near Boise City, OK, January 12, 2014
“What I find interesting is that history is repeating itself...I also saw an old blow the day before that could date back to the 30’s or 50’s.”
March 29, 2014
“The ongoing drought conditions combined with the high winds just continue to hammer away at the fields.”

March 20, 2014
“Each front that passes kicks up even more dust. It’s not just a field here and there that is blowing; the whole Earth is moving… and you can taste it in the air. When I look westward on days like yesterday, I am filled with sadness, as I know that those are people’s hopes and dreams that are blowing away. Something just doesn’t match up. What is happening is real, and is very much reminiscent of the dust bowl.”

March 28, 2014

Photo: Iris Imler, Cimarron County Conservation District
Near Boise City, OK, January 12, 2014
Linkages: Drought and Climate

“Societies will manage climate variability and potential changes in the same way that they manage droughts (for better or worse).”

- Daniel Connell, Australian National University, 2010

If we can better prepare for drought, we can better prepare to face many of the potential challenges facing the Great Plains in the future

- Dedicated efforts of Don Wilhite, NIDIS, NDMC and so many others
- ... Mark Svoboda
Standard Rain Gauge

New Nebraska Rain Gauge
Providing Useful Services and Products: Information Delivery

“To increase the impact of scientific information, there should be a focus on **usability**, not just **availability** of information. This means moving to “**value added**” products, where findings are provided in a format that allows for policy applications”

Taken from: (Jacobs/NOAA OGP) Connecting Science, Policy and Decision Making: A Handbook for Researchers and Science Agencies
Components of a Drought Early Warning and Information System

- Monitoring **AND** Forecasting
- Access to **timely** data (including **impacts**) and “value added” **information**
- **Synthesis/analysis** of data used to “trigger” set actions within a drought plan
- **Tools** for decision makers
- Efficient **dissemination/communication** (WWW, media, extension, etc.)
- Drought risk assessment and **planning**
- Education and Awareness
U.S. Drought Monitor (USDM): ✶ droughtmonitor.unl.edu

- **State-of-the-art drought assessment in the U.S. since 1999**
  - Collaborative effort between NOAA, USDA and NDMC

- **Composite indicator** blends objective indicators and indices with field input from over 350 experts

- **Policy implications** in Farm Bill/USDA, IRS, NOAA-NWS and several state drought task forces

- "Go to source" for media and the public
USDM Listserv Subscribers
(as of November 1, 2013)

Total: 345 (does not include 1 participant from Canada)
North American Drought Monitor

February 28, 2014

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

Drought Impact Types:
- S = Short-Term, typically <6 months (e.g., agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g., hydrology, ecology)

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

Regions in northern Canada may not be as accurate as other regions due to limited information.
Drought Impact Reporter (DIR):

- On-line since 2005
- 28,000+ media reports and 18,000+ impacts in our database to date and growing
- Establishing a “baseline” of impacts due to droughts over time
  - “Face of drought”
  - Risk/vulnerability
  - Climate change
- Ground truth indices/RS
- Quantitative AND qualitative
- Direct AND Indirect

droughtreporter.unl.edu
Unusual late fall fire still burning in Big Sur - NewsOK.com (OK)
Publication Date: 12-17-2013

In 2013, Oklahoma weather included a mix of significant drought, violent tornadoes, bitter cold, unbearable heat and more. - NewsOK.com (OK)
Publication Date: 01-05-2014

Texas ranchers hit hard by drought eye rebuilding - NewsOK.com (OK)
Publication Date: 01-04-2014

Water-Saving Tips for Drought Times - NewsOK.com (OK)
Publication Date: 01-08-2014
Promoting the “drought impact reporting” idea to volunteers...

* 18,000+ volunteers covering all 50 states and now into Canada!!

* CoCoRaHS “Message of the Day”

* Monthly e-mail reminders

* Guide to reporting drought impacts

* Banners on the Web

Courtesy: Henry Reges, Colorado State University
Drought Risk Atlas (DRA):

- Launched in March 2014
- ~3000 stations archived
  - 139 clusters/regions developed and analyzed
  - SPI, SPEI, PDSI, scPDSI and Deciles through 2012
  - Weekly gridded maps for all parameters back to early 1900s
- Created to answer questions about the characteristics of drought:
  - Frequency/return periods
  - Duration
  - Trends
  - Intensity
  - Spatial extent
The Drought Risk Atlas will help answer:

- How does the drought compare to other droughts historically?
- When was the last time a drought like this happened?
- How often (frequency) does a drought of this magnitude happen?
- Are we seeing any trends in drought frequency, duration, severity?
- What did the spatial footprint of the last drought look like?
Let’s use the Drought Risk Atlas to help us answer this question:

How does the drought of 2012 in central Nebraska, specifically Holdrege, compare to the Dust Bowl years?
Options Available for Station Chosen

Selected Atlas Station: 253910 (HOLDREGE)

253910: HOLDREGE
Latitude
40.452
Longitude
-99.38
Elevation (ft)
2320
State
Nebraska
County
Phelps
Climate Division
8
Time Period
1/1/1908 - 12/31/2012
Years on Record
104
Precipitation Only
No

Download Metadata

The Atlas period of record can and will vary from the ACIS period of record. Stations may have had data periods that did not meet the criteria used in the Atlas. Those data periods

Related Stations:
(Click to select)

050834: BONNY DAM 2NE
051121: BURLINGTON
141699: COLBY 1SW
Results for **HOLDREGE (253910)** between 1/1/1908 and 12/31/2012, aggregated by year.

Note: these precipitation totals may include days with no data values and these temperature averages may include days with no data values. Please see the tabular datasets for more information.
### Climate Data

**Selected Atlas Station:** 253910 (HOLDREGE)

Results for HOLDREGE (253910) between 1/1/1908 and 12/31/2012, aggregated by year.

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<th>Contains NoData</th>
<th>Tmin (°F)</th>
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</table>
Drought Time Series

Climate Data

Selected Atlas Station: 253910 (HOLDREGE)

Results for HOLDREGE (253910) for the 12 Month timestep(s) between 1/1/1908 and 12/31/2012 and aggregated by month.

Date
1/1/1908 to 12/31/2012
Period of Record: 1908
Station start date: 1/1/1908

Aggregate
Month

Timestep
Select one or more timesteps to compare.
1 month
2 month
3 month
4 month
5 month
6 month
7 month
8 month
9 month
10 month
11 month
12 month
18 month
24 month
60 month
72 month
84 month
96 month

To zoom in on the chart, click and drag across the chart area. To return to the complete chart, double-click in the chart area.
Drought Time Series

Climate Data

Selected Atlas Station: **253910 (HOLDREGE)**

**Date**

1/1/1908 to 12/31/2012

Period of Record

Station start date: 1/1/1908

**Aggregate**

Month

**Timestep**

Select one or more timesteps to compare.

1 month
2 month
3 month
4 month
5 month
6 month
7 month
8 month
9 month
10 month
11 month
12 month
18 month
24 month
36 month
48 month
72 month
84 month
96 month

Results for **HOLDREGE (253910)** for the 12 Month timestep(s) between 1/1/1908 and 12/31/2012 and aggregated by month.

SPEI

To zoom in on the chart, click and drag across the chart area. To return to the complete chart, double-click in the chart area.
Results for HOLDREGE (253910) for the 12 Month timestep(s) between 1/1/1908 and 12/31/2012 and aggregated by month.
Heat Map Visualization

Select one or more timesteps to compare:

1 month
2 month
3 month
4 month
5 month
6 month
7 month
8 month
9 month
10 month
11 month
12 month
18 month
24 month
36 month
48 month

Legend:
- < -3
- -2.5 to -2
- -2 to -1.5
- -1.5 to -1
- 1 to 1.5
- 1.5 to 2
- 2 to 2.5
- > 3
- No Data
Drought Periods

Climate Data

Selected Atlas Station: 253910 (HOLDREGE)

Results for HOLDREGE (253910) at the 12 Month timestep with a minimum drought class of -2 between 1/1/1908 and 12/31/2012.

Number of Droughts: 3

Longest Drought: 358 weeks

Average Duration: 139 weeks

Time in Drought: 7.67%

<table>
<thead>
<tr>
<th></th>
<th>Drought Start</th>
<th>Drought End</th>
<th>Duration (weeks)</th>
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<td>6/25/1957</td>
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<tr>
<td>3</td>
<td>7/30/1934</td>
<td>6/18/1941</td>
<td>358</td>
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# Climate Data

Selected Atlas Station: **253910 (HOLDREGE)**

Results for **HOLDREGE (253910)** for the 12 Month timestep and aggregated by month.

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Frequency</th>
<th>Return Period (Years)</th>
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<td>-2.6</td>
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</table>
Final Thoughts

- Developing **usable** information and services is critical (trust factor too)

- **Tools help bridge** the gap between monitoring/early warning, prediction and preparedness (**information and triggers** for decision support)

- Goal is to **link scientific knowledge w/ the actions** needed to reduce impacts and future risk via planning