

Impacts: The Face of Drought



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National Drought Mitigation Center
University of Nebraska-Lincoln**

*Improving Drought Prediction at Seasonal to Inter-Annual Timescales, WSWC-CADWR,
San Diego, CA, April 29 – May 1, 2013*

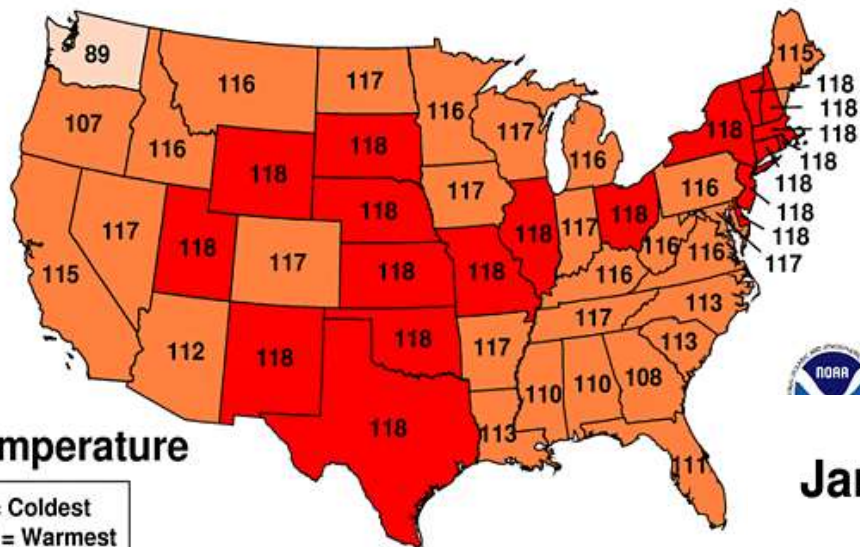
2012 Drought Recap

- ▶ **Warmest** year on record for the Lower 48 states, beating 1998 by 1°F
 - Every state in the contiguous U.S. had **above-average** annual temperature
 - 19 states had a record **warm** year
 - 26 states Top 10 **warmest**
 - **Warmest** March and July on record for the U.S.
- ▶ 15th driest year on record for the U.S.
 - **Driest** since 1988
 - NE and WY **driest** years on record
 - USDM **peak of 65%** U.S. in drought during September
- ▶ 2012 was the 2nd most extreme year on record with **11 disasters costing \$1B** or more, second only to 1998



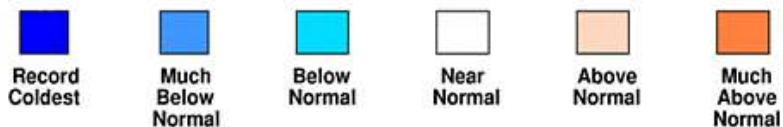
January-December 2012 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA



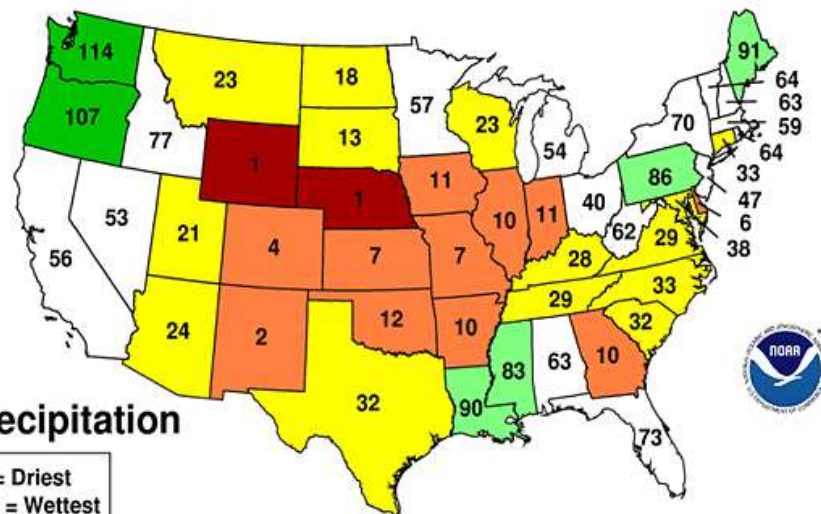
Temperature

1 = Coldest
118 = Warmest



January-December 2012 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA



Precipitation

1 = Driest
118 = Wettest



Standard Rainuage

-New Nebraska Rainuage



Thoughts on Drought Impacts



- ▶ All droughts/impacts are **LOCAL**
 - Monitoring local/regional/national/global (bottom-up or top-down or a combination of both)
 - Planning local/regional/national (**Vulnerability assessment critical**)
- ▶ Droughts are one of the globe's **leading causes of economic loss!**
 - Large spatial footprint, long duration, many affected
 - Indirect impact: loss of life via famine
- ▶ **Impact collection/monitoring must be an integral part** of any drought early warning information system....so why isn't it?
- ▶ Enter/record your drought impacts into the **Drought Impact Reporter**: (<http://droughtreporter.unl.edu>)

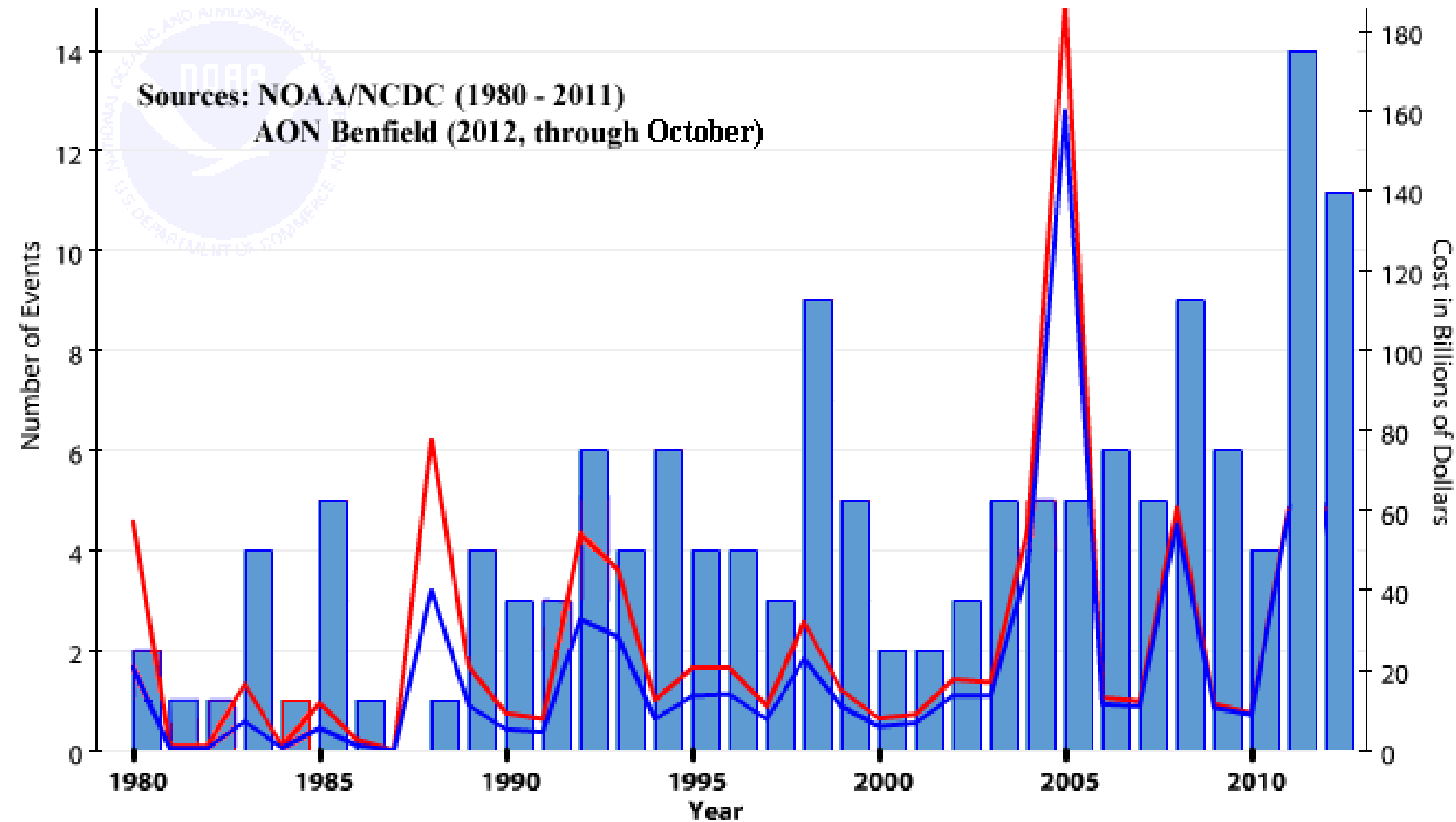


Billion-Dollar U.S. Weather Disasters, 1980 - 2012

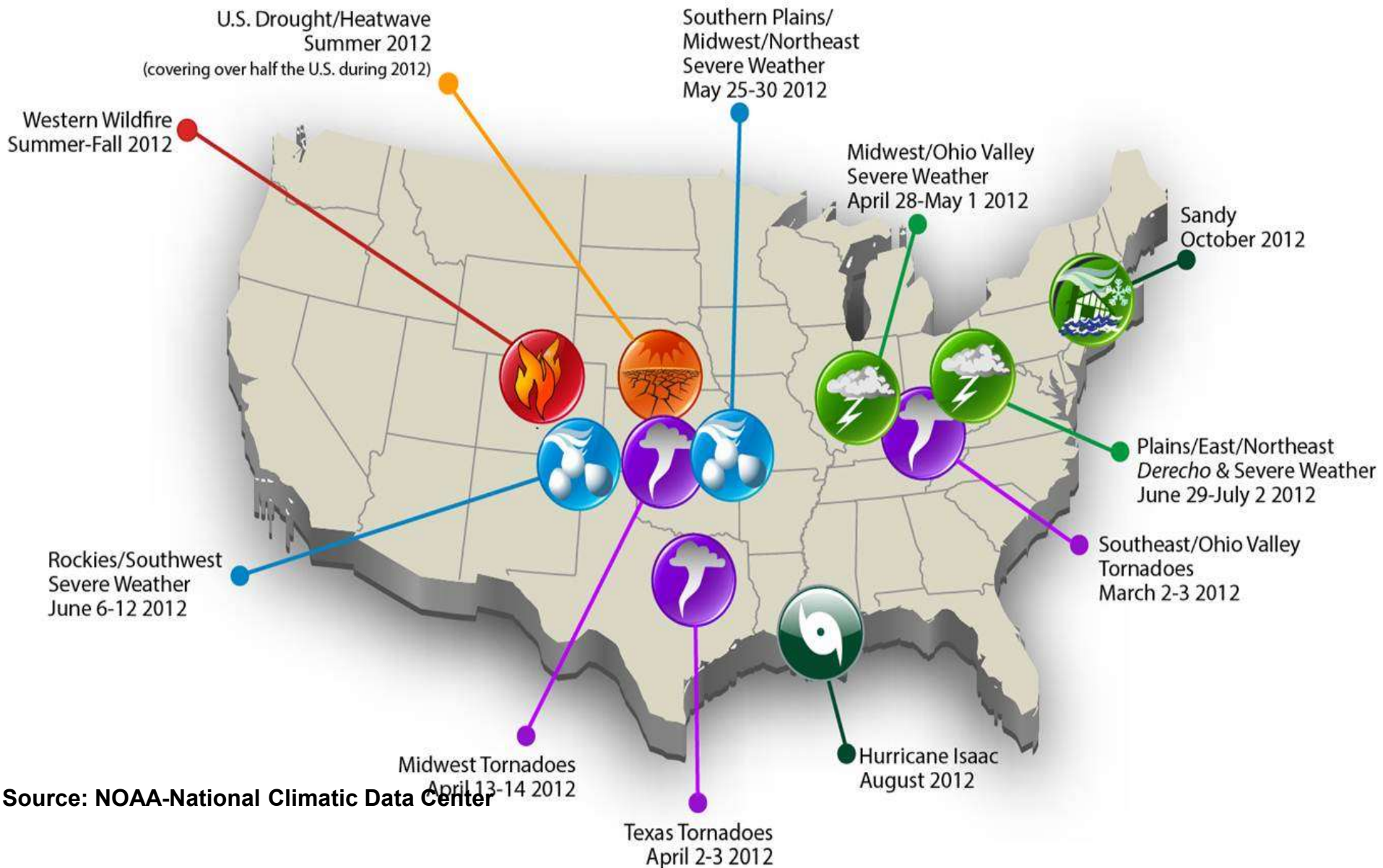
— Cost — CPI-Adjusted Cost ■ # Events (CPI-Adjusted)

Sources: NOAA/NCDC (1980 - 2011)

AON Benfield (2012, through October)



U.S. 2012 Billion-dollar Weather and Climate Disasters



Billion Dollar Disasters

(Source: NCDC, 1980-2011)

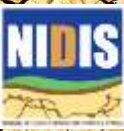
<u>Disaster</u>	<u>Events</u>	<u>Damage\$ \$/Event</u>	
<i>Hurricanes</i>	29	375	12.9
Tornadoes	30	79	2.6
<i>Droughts</i>	16	195	12.2
Floods	14	74	5.3
Fires	11	20	1.8
Winter-related	13	43	3.3
Total	113	786	7.0



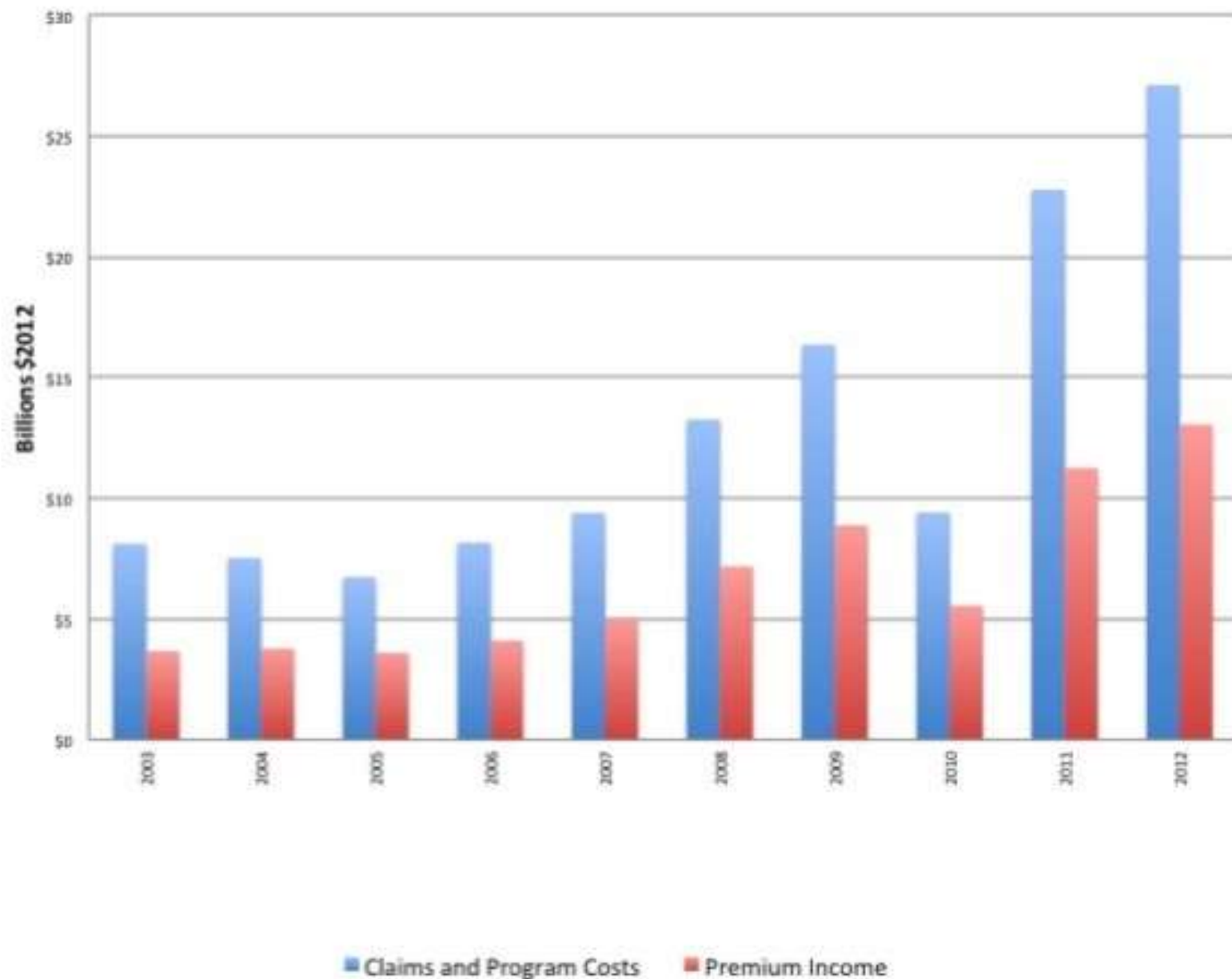
2012 Drought Impacts



- ▣ Economic loss estimates
 - **\$20 billion**, Munich Re
 - **\$35 billion**, Aon Benfield
 - **\$50 billion**, Morgan Stanley
 - **\$77 billion**, Purdue University economist
- ▣ Crop indemnities: **\$12.4 billion** as of January 25th
 - Estimated to increase to \$20 billion
 - 2011 holds the previous record with \$10.8 billion
- ▣ State indemnities (\$ billion): Illinois (1.8), Iowa (1.4), Kansas (1.2), Nebraska (1.2), Texas (1.2)
- ▣ Crop indemnities (\$ billion): corn (7.8), soybeans (1.6)

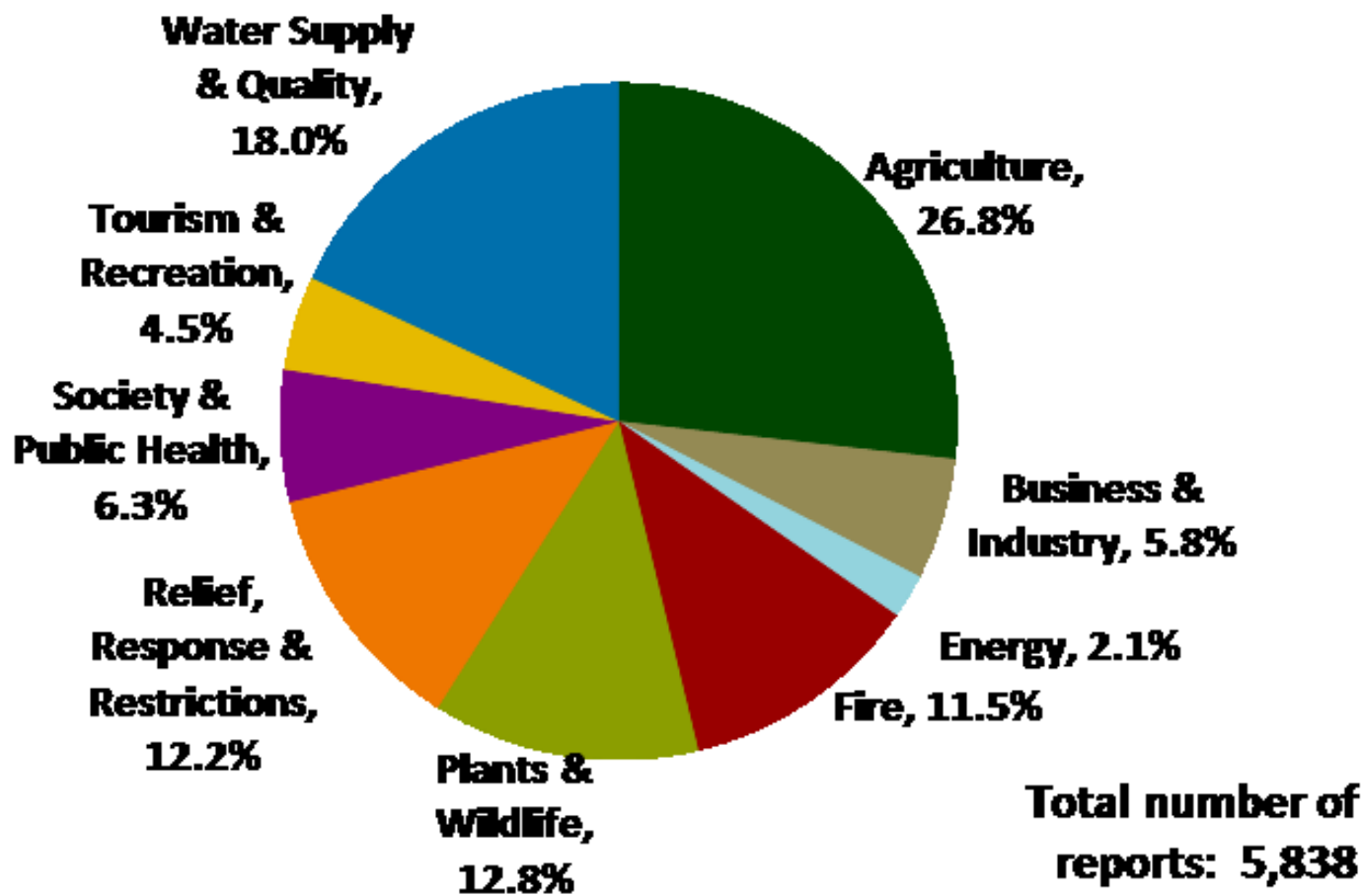


Federal Crop Insurance Financial Statement of Costs and Revenue (source USDA Risk Management Agency)

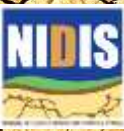
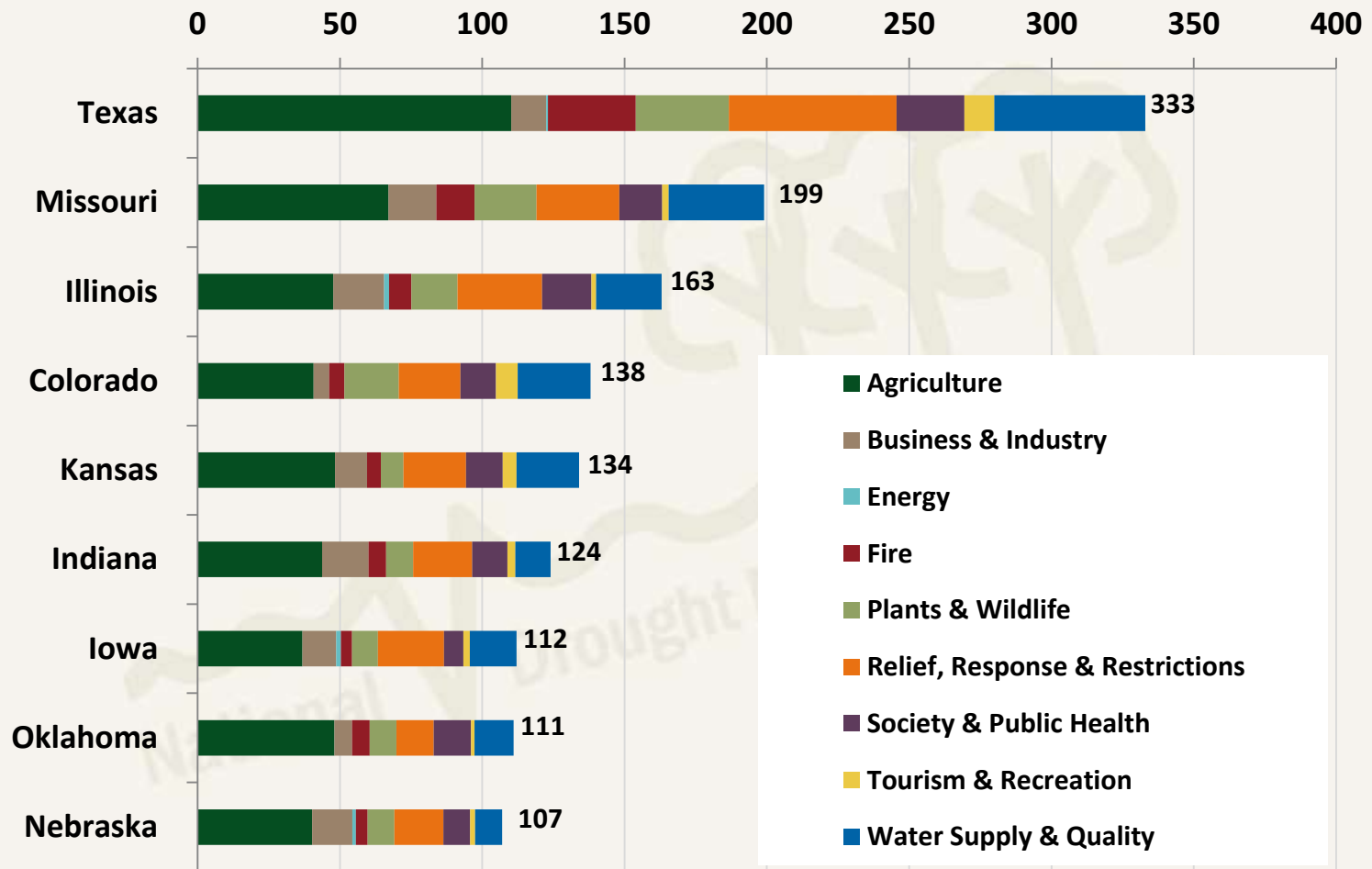


2012 U.S. Drought Reports by Sector

Category analysis for 2012 reports



Impacts in 2012



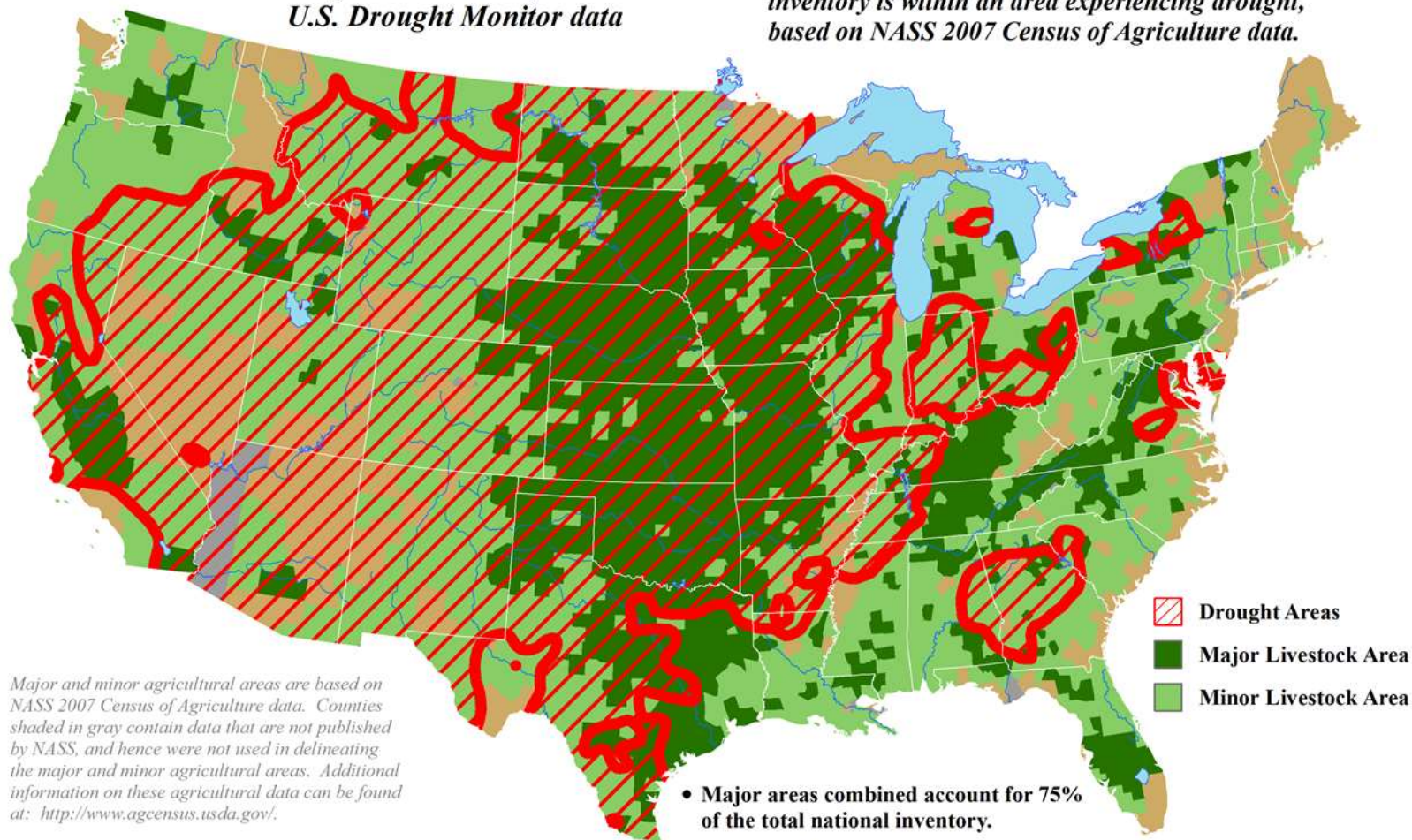
U.S. Corn Areas Experiencing Drought

U.S. Soybean Areas Experiencing Drought

U.S. Cattle Areas Experiencing Drought

Reflects October 2, 2012
U.S. Drought Monitor data

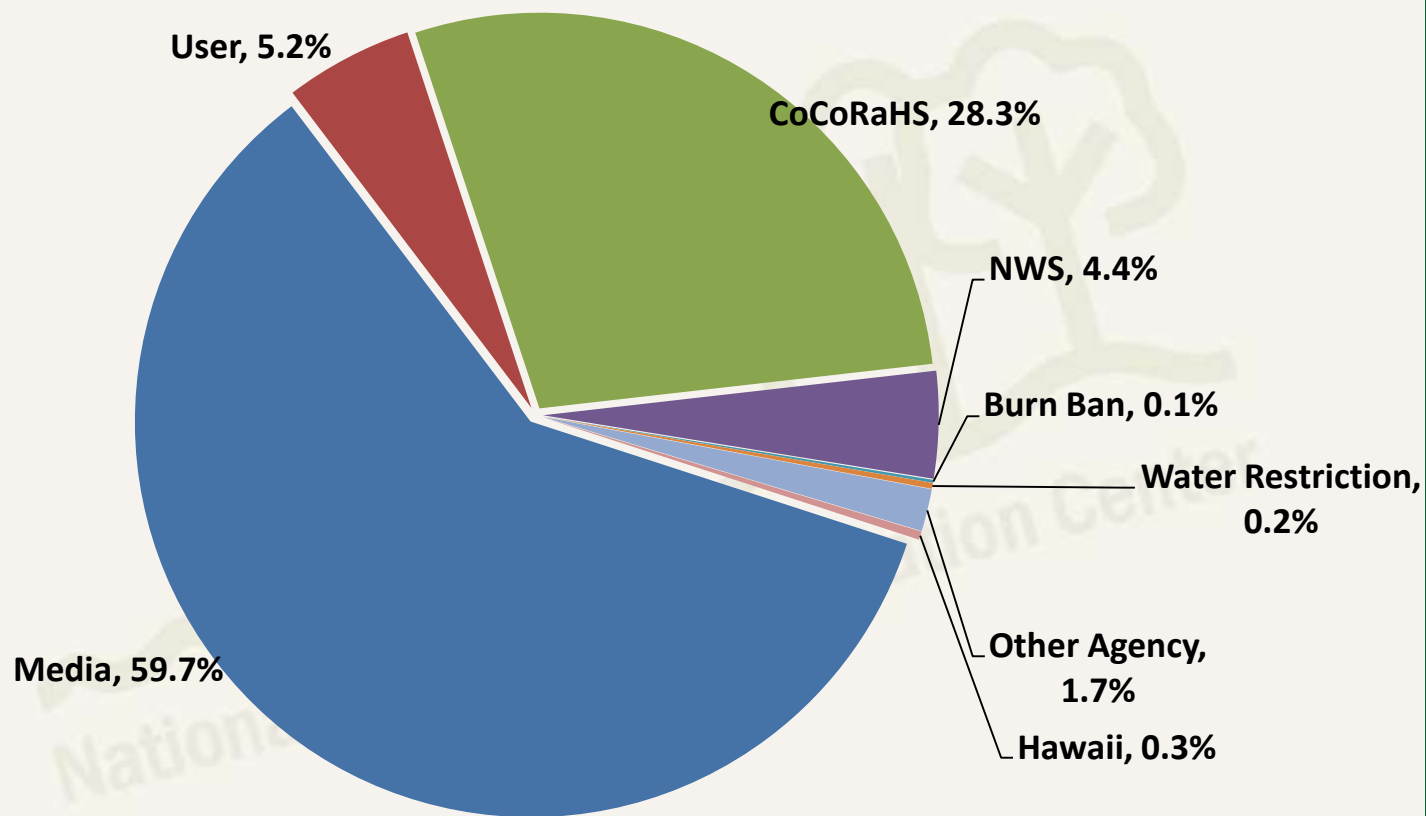
Approximately 73% of the domestic cattle inventory is within an area experiencing drought, based on NASS 2007 Census of Agriculture data.



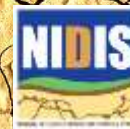
Major and minor agricultural areas are based on NASS 2007 Census of Agriculture data. Counties shaded in gray contain data that are not published by NASS, and hence were not used in delineating the major and minor agricultural areas. Additional information on these agricultural data can be found at: <http://www.agcensus.usda.gov/>.

- Major areas combined account for 75% of the total national inventory.
- Major and minor areas combined account for 99% of the total national inventory.

Report sources in 2012



Total number of
reports: 5,838



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



Assessment Report

NOAA Drought Task Force
Narrative Team

Lead: Martin Hoerling

Co-Leads: Siegfried Schubert & Kingtse Mo

20 March 2013





The 2012 crop yield deficit and the implied climatic impact was a historic event. In terms of absolute loss in bushels of corn production, no single year since 1866 experienced so large a curtailment as occurred during 2012.

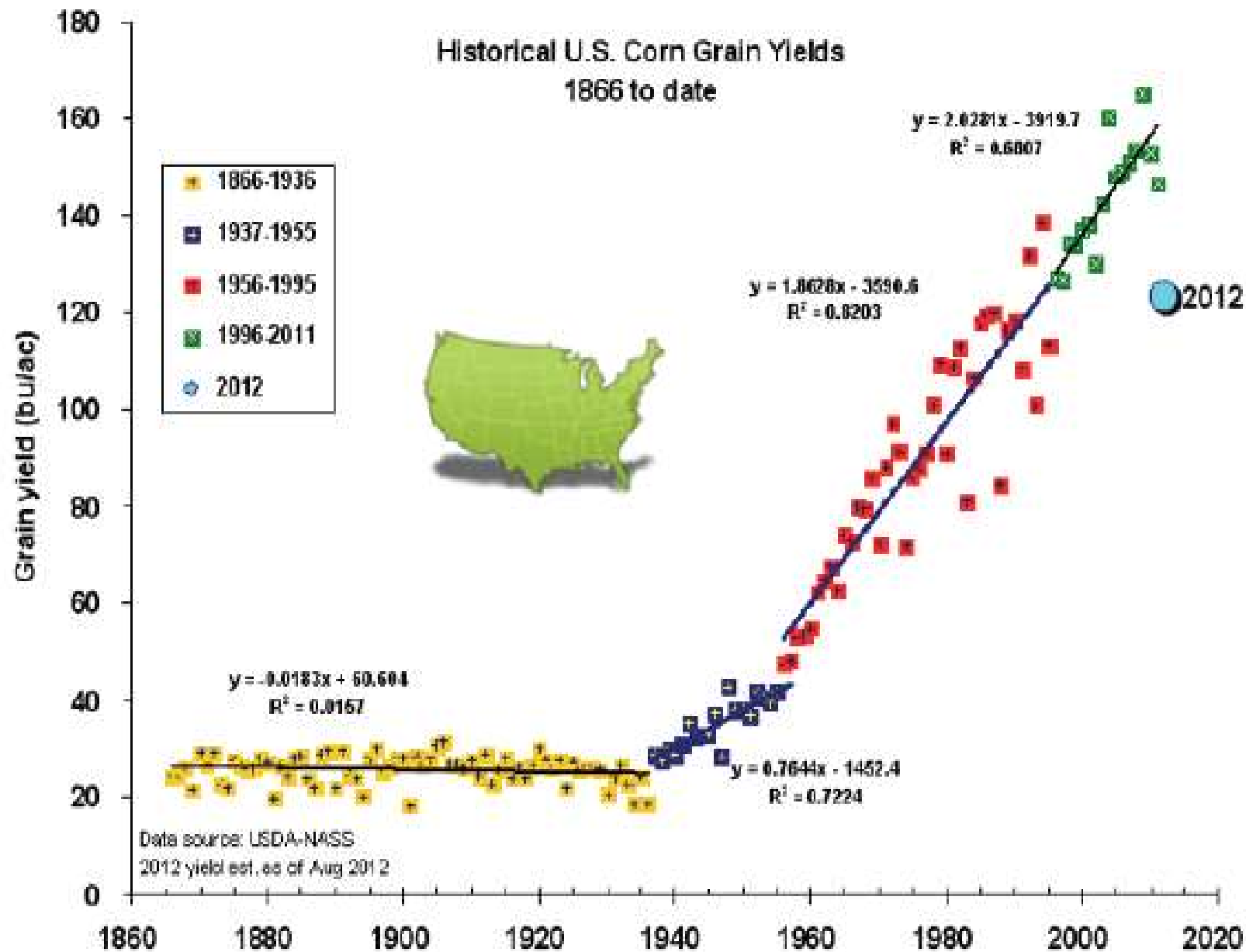
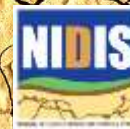


Figure 5. Historical U.S. corn yields from 1866 to 2012 (bushels/acre). Linear fit to different segments of the time series shown in solid lines, including regression formula. The 2012 yield is plotted in the blue circle, based on August estimates. Subsequent data revised the 2012 yield downward to about 123 bushels. Data source is USDA.

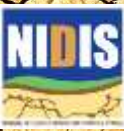


It is expected that water supply reductions in the semi-arid western portions of the drought where reservoir storage was depleted by lack of rains will also have long-term impacts, as will livestock health and its long term effect on herd stocks.



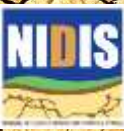
Why Track Drought Impacts?

- ▶ Establish an impacts **baseline** for monitoring
 - "Face of drought"
 - Climate change
- ▶ To know where to direct **relief**
- ▶ To help identify and reduce **vulnerability** in advance of the next drought
- ▶ **"Ground truth"** indicators and models
- ▶ No single method exists for collecting and/or **quantifying** drought losses
- ▶ Very little in the way of **environmental** or **qualitative** collection



Drought Impact:

- ▣ An observable loss or change that occurred at a specific place and time (or range of time) due to drought
- ▣ Can be "***qualitative***" or "***quantitative***"....and there is value in having both
- ▣ ***Not all impacts are negative!***
 - ▣ Viticulture
 - ▣ Transportation (OTR)
 - ▣ Construction and other outdoor vocations



Impacts

- ▣ What are the indicators (precursors)
- ▣ Who observes (records) indicators?
- ▣ Who/where is affected?
- ▣ Who aggregates?
- ▣ Who decides?

National Drought Mitigation Center



Examples of Impacts

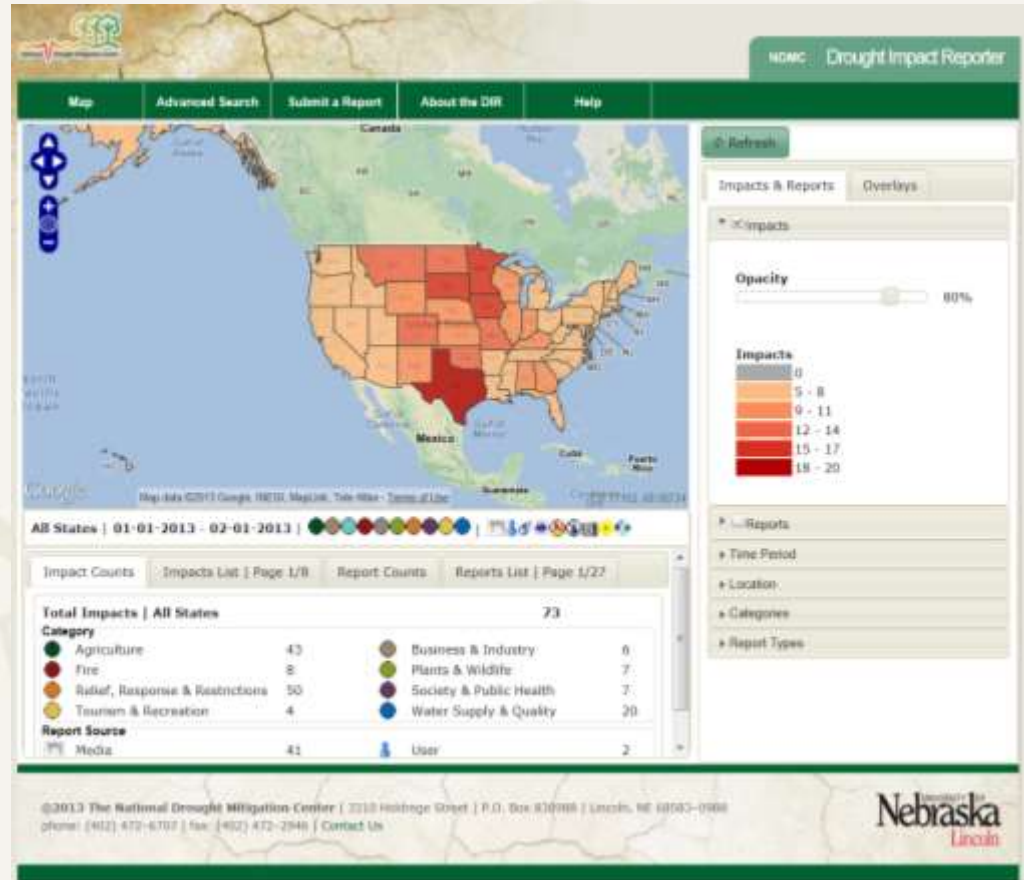
- ▶ Loss of agricultural production
- ▶ Layoffs, i.e., packing plant closures in the Midwest 2012-13
- ▶ More “structural” than you think!
 - Foundations
 - Water mains and other utilities
 - Roads and other infrastructure
- ▶ Loss to landscaping businesses & carwashes
- ▶ Water restrictions
- ▶ Losses due to wildfire
- ▶ Losses to seafood and fisheries affected by salinity
- ▶ Loss of wildlife habitat
- ▶ Loss of ecosystem services



Drought Impact Reporter (DIR):

 droughtreporter.unl.edu

- On-line since **2005**
- **23,000+** media reports and **16,000+** impacts in our database to date
- Establishing a **"baseline"** of impacts due to droughts over time
 - "Face of drought"
 - Risk/vulnerability
 - Climate change
- **Ground truth** indices/RS
- Quantitative **AND** qualitative
- **Open to the public!**



Drought Impact Reporter Categories

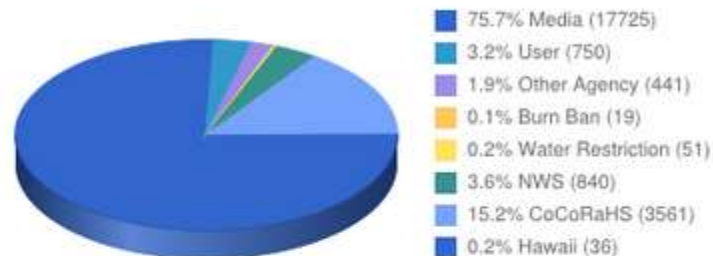
- [+] ☐ Media Reports
- ☐  Society & Public Health
- ☐  Agriculture
- ☐  Disaster Declarations & Aid
- ☐  Energy
- ☐  Water Supply & Quality
- ☐  Wildfire
- ☐  Plants & Wildlife
- ☐  Other Business & Industry
- ☐  Tourism & Recreation
- ☐  General Awareness



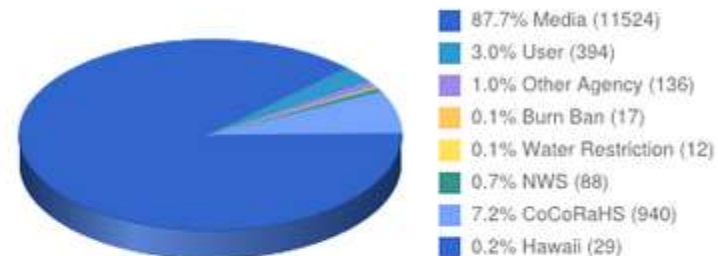
What's in the DIR

Welcome to the Drought Impact Reporter!

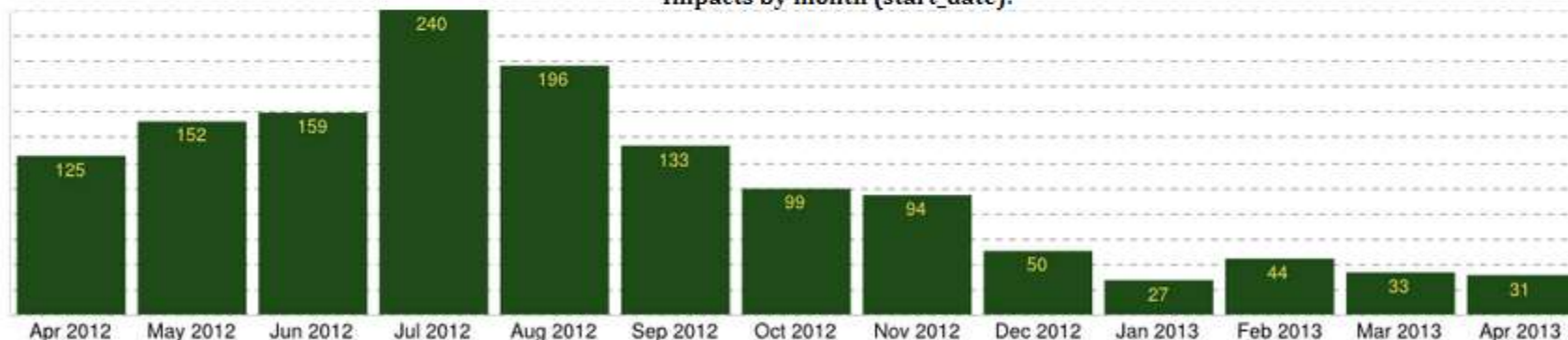
Report Composition
23,423 reports



Impact Composition
16,206 impacts



Impacts by month (start_date):

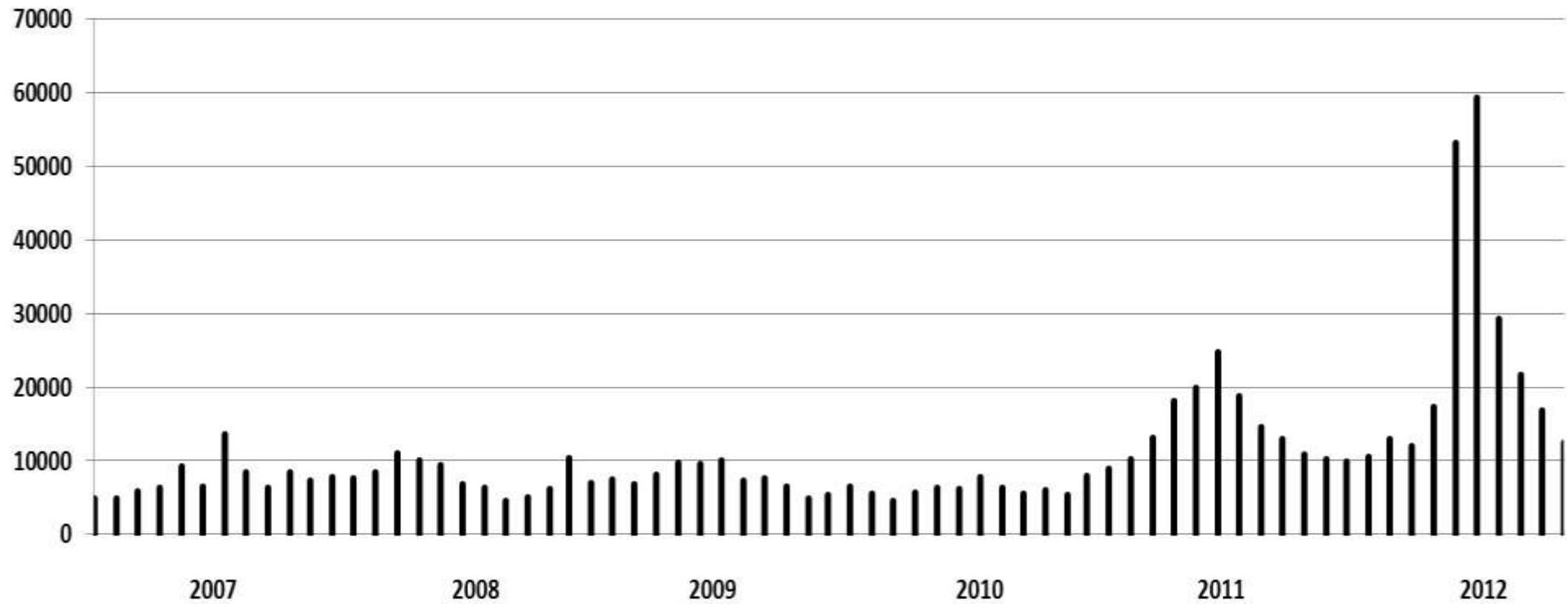


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UNIVERSITY OF
Nebraska
Lincoln

Total Media Reports Found

Articles per month 2007 - 2012



Nebraska
Lincoln



Reports

Media

User

CoCoRaHS

Agency

NWS DIS

Burn bans

Water restrictions

Hawaii

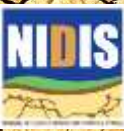
Impacts

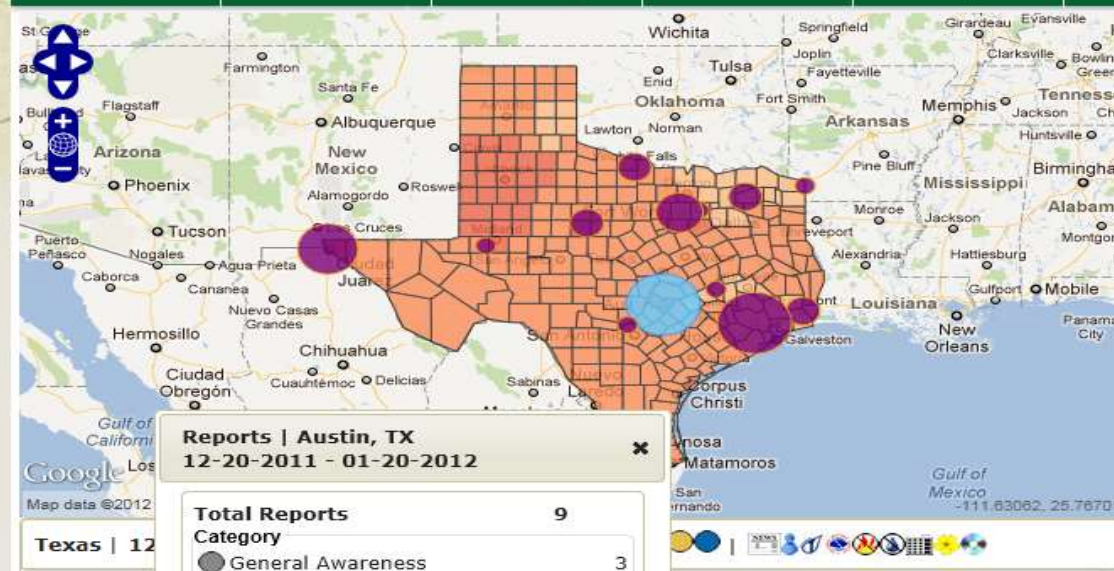
- Map w/ stats
- Advanced search w/ stats
- CSV export

Input

Aggregation

Output





Refresh

Impacts & Reports Overlays

Impacts Reports

Query Reports By

Source Location Affected Area

Opacity 80%

Legend

- 1 - 2
- 3 - 4
- 5 - 6

Reports | Austin, TX
12-20-2011 - 01-20-2012
Page 1 of 1

Billion-dollar weather disasters smash U.S. record - Austin American-Statesman (TX)

Publication Date: 12-07-2011

Texas drought takes cow numbers down by 600K - Austin American-Statesman (TX)

Publication Date: 12-16-2011

Texas may have lost 10% of its trees - Austin American-Statesman (TX)

Publication Date: 12-19-2011

Drought may have claimed 500 million Texas trees - Austin American-Statesman (TX)

Publication Date: 12-19-2011

OK

[Map](#)
[Advanced Search](#)
[Submit a Report](#)
[About the DIR](#)
[Help](#)

Submit a Report

[Learn how your report becomes an impact.](#)

* indicates required field

Description

Please provide a **Description** of how drought is affecting you, your livelihood, your activities, etc.

If there is a report online that helps illustrate your observation, please use the **Related Link** box to provide the link.

A **Baseline Report** allows a regular observer to describe normal conditions that are likely to change during drought, to create a basis for comparison. Please check Baseline Report if that's what you are submitting. If you aren't sure, please leave it unchecked.

Impact Description*

Related Link

☐ Baseline report

Categories

To help get a handle on drought's complex impacts, we divide them into **Categories**. Not all impacts fit neatly within a category, but many do.

Please click on the checkbox or category name to select it.

When you select a category, you have the option to enter a **Value** in dollars for losses or gains. Any information about dollar losses or gains will appear along with the other information you submit in your report.

Categories

- ☐ Agriculture
- ☐ Business & Industry
- ☐ Energy
- ☐ Fire
- ☐ Plants & Wildlife
- ☐ Relief, Response & Restrictions
- ☐ Society & Public Health
- ☐ Tourism & Recreation
- ☐ Water Supply & Quality

Value (not required)

\$	
\$	
\$	
\$	
\$	
\$	
\$	
\$	
\$	

Duration

The **Start Date** and **End Date** can be approximate. A **Start Date** is required. It is OK to leave the **End Date** blank if the impact is ongoing or if you don't know when it ended.

Click on the calendar icon and then on a specific date to select a **Start Date** or **End Date**, or manually enter a date using MM/DD/YYYY format.

* Start Date

End Date

Challenges



- ▶ **Systematic** impact assessments are needed
- ▶ Convince **decision-makers** that their mitigation/adaptation actions will reduce future drought impacts
 - **Quantify impacts** and benefits
 - Incorporate into **drought planning**/mitigation
 - ▶ Proactive vs. Reactive
 - Continual **education** and awareness
 - It is also hard for mitigation measures to **compete for funding** with the many urgent and immediate emergency funding needs facing governments



Other Impacts Research and Efforts:

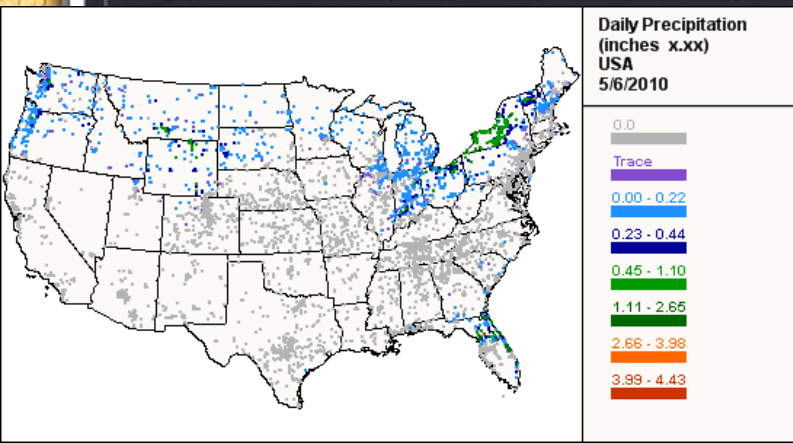
- ▶ **CoCoRaHS**
- ▶ **States:** AZ, HI, OK, reporting impacts formally or informally to some degree
 - How connected to the policy process is it?
 - How connected to indicators/indices?
- ▶ **Case studies:** North Carolina landscapers, Tribal, etc.
- ▶ **Transferability** to North America? Others?
- ▶ **GIDIS/GEO/GEOSS** system of systems/tying together virtual networks of global drought impact reporting...



Promoting the “drought impact reporting” idea to their volunteers...



- * **14,000+ volunteers covering all 50 states!!**
- * **CoCoRaHS “Message of the Day”**
- * **Monthly e-mail reminders**
- * **Guide to reporting drought impacts**
- * **Banners on the Web**



Courtesy: Henry Reges, Colorado State



Summary



- ▶ Drought is **NOT** just a physical event
 - Droughts defined by their impacts
- ▶ Like drought, impacts recognize **no geopolitical borders**
- ▶ **Vulnerability** matters! Risk is ever changing
- ▶ Impacts (**baseline establishment** critical, but lacking)
- ▶ Much more work need to **tie impacts to drought indicators/indices**
- ▶ Can we engage and help address via **Citizen Science and social media**?





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National Drought Mitigation Center

<http://drought.unl.edu>

Photo: Cimarron County, Oklahoma

Gary McManus, Oklahoma Climatological Survey, late June, 2008