

# Monitoring Drought Impacts

A photograph showing a white boat on a wooden dock in a dry, grassy area. The boat is tilted and appears to be in poor condition. In the background, there are several small structures with corrugated metal roofs, some of which are partially collapsed or damaged. The ground is rocky and sparse with vegetation, indicating a drought. The sky is overcast with grey clouds.

**Mark Svoboda, Climatologist**  
**Monitoring Program Area Leader**  
**National Drought Mitigation Center**  
**University of Nebraska-Lincoln**

2012 Caribbean Drought Training Workshop, Kingston, Jamaica, May 22-24, 2012

# Major Droughts of 2011



# Major Droughts of 2011-12: North America

## Warm weather threatens to extend U.S. drought

A New Year's Eve 'heat wave' melted away welcomed winter snow, reviving fears that harmfully warm and dry conditions will persist into 2012. **By Carey Gillam, Reuters**



## Mexico: Drought hits water supply for 2.5 million

November 25, 2011

### North American Drought Monitor

February 29, 2012

Released: March 13, 2012

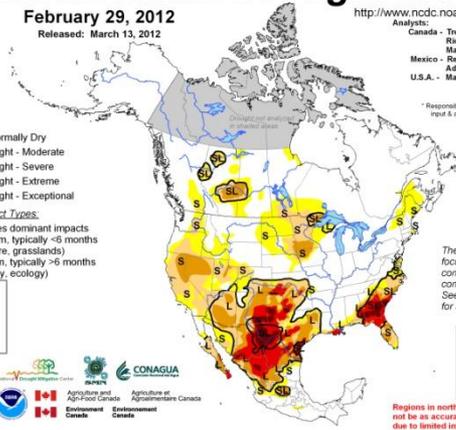
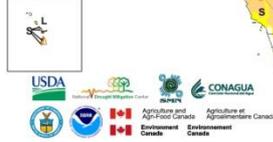
<http://www.ncdc.noaa.gov/nadm.html>

Analysts:  
 Canada - Trevor Hedwen\*  
 Richard Rieger  
 Mallory MacDonald  
 Mexico - Reynaldo Pascual  
 Adeline Albasil  
 U.S.A. - Mark Svoboda

\*Responsible for collecting analyst input & assembling the NA-DM map

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

**Drought Impact Types:**  
 ~ Delineates dominant impacts  
 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.



Cracks are seen in dry earth in San Isidro de Cienega in the state of Nuevo Leon. Mexico is being battered by its worst drought in seven decades, affecting almost 70 percent of the country and which has devastated farm life and is expected to Stringer)

## Mexico drought is worst in 70 years

Associated Press  
 Saturday, December 3, 2011



## Mexican farmers despair over record drought

December 13, 2011

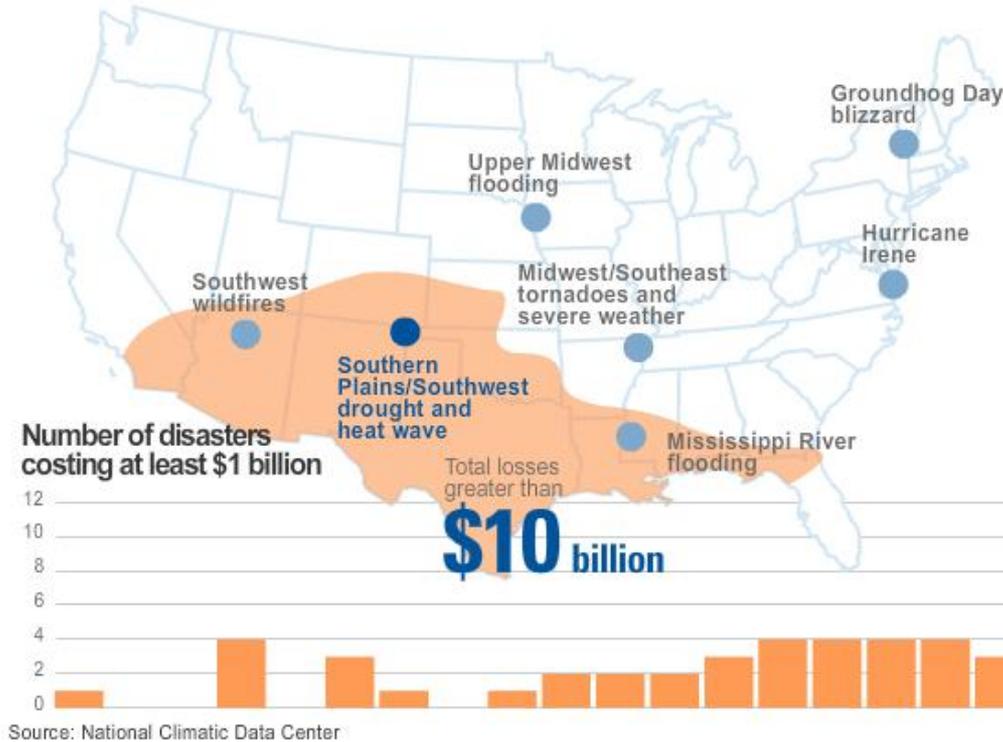
Alberto Puente / AP

ed out cactus on a field near e of Coahuila, one of the hardest hit in the country's record dry spell.



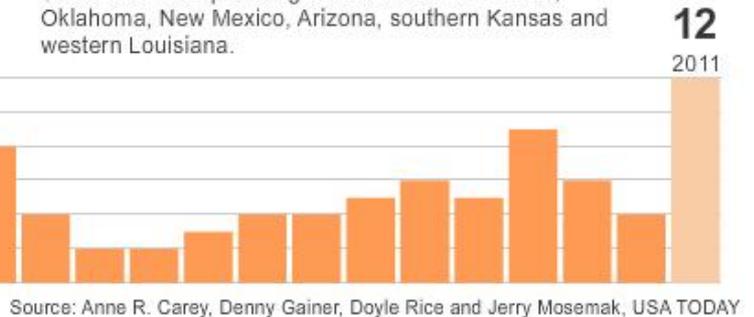
# A costly, catastrophic year

The U.S. has endured 12 separate weather and climate disasters that each caused at least \$1 billion in damage in 2011. This breaks the record of nine, set in 2008. The total damage from these 12 events is approximately \$52 billion.



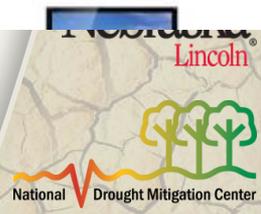
A Texas state park police officer walks across the cracked lakebed of O.C. Fisher Lake, Aug. 3, 2011, in San Angelo, Texas.  
By Tony Gutierrez, AP

**2 Southern Plains / Southwest drought and heat wave**  
Spring-Fall: Drought and extreme heat caused at least \$10 billion in crop and agricultural losses in Texas, Oklahoma, New Mexico, Arizona, southern Kansas and western Louisiana.



## USA slammed by 12 disasters that each cost at least \$1B

Videos you may be interested in



# 2011 Drought Impacts: North America

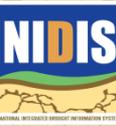


## Mexico:

- ▶ **Worst drought** in country's 70 years of record keeping
- ▶ **2.2 million** acres of crops withering in fields
- ▶ **1.7 million** cattle died
- ▶ **2.6 million** people in northern Mexico without water
  - Water being hauled in to 1,650 villages in northern Mexico

## United States:

- ▶ 2011 "Drought in the South" likely to **exceed \$10B**
  - **Exacerbated by late summer heat wave**
- ▶ Texas: **4 million acres burned** (record)
  - **4,000 homes** burned w/ 10 fatalities
  - **Hawaii** had significant drought issues as well



# Billion Dollar Disasters in the U.S. (NCDC: 1980-2011)

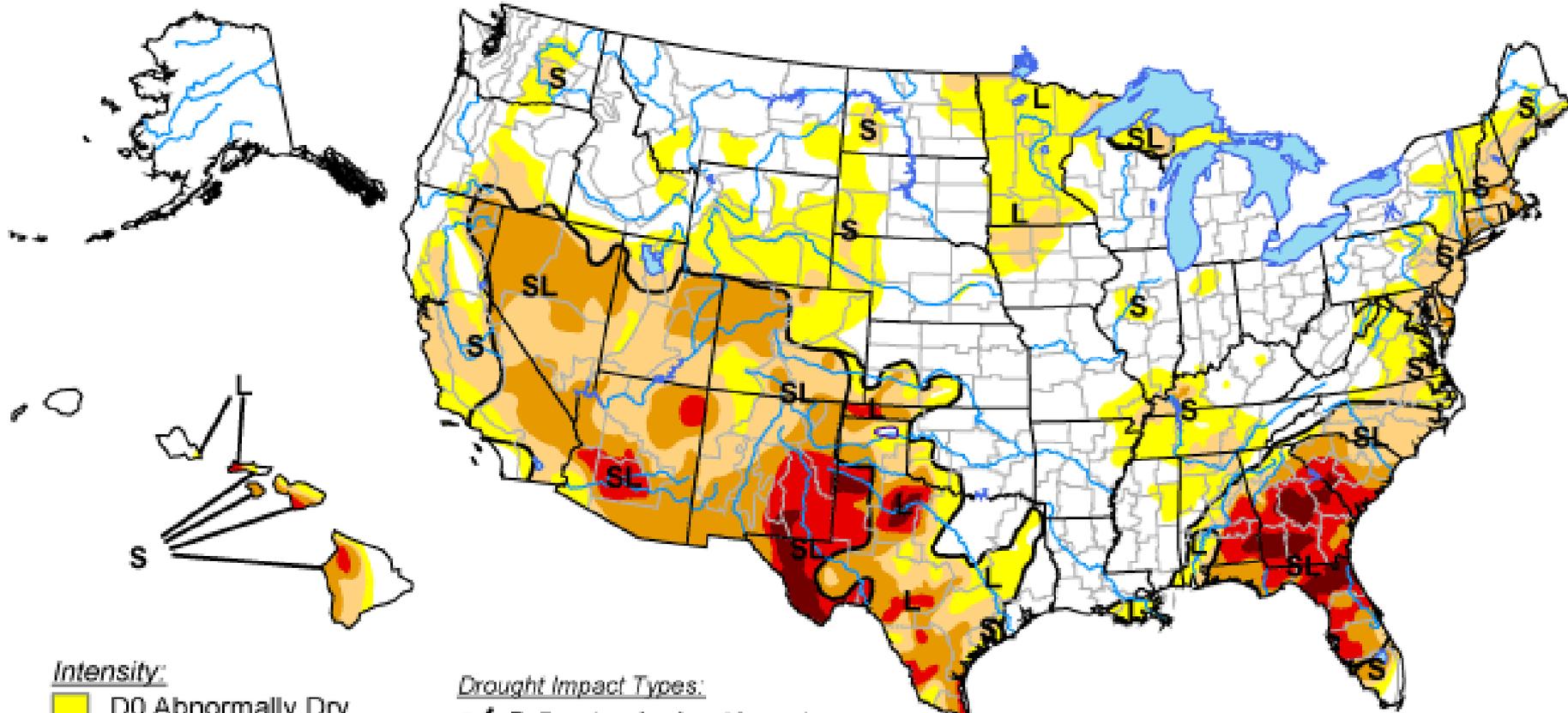
| <u>Disaster</u>        | <u>Events</u>    | <u>Damage\$</u>   | <u>\$/Event</u>    |
|------------------------|------------------|-------------------|--------------------|
| Hurricanes             | 29               | 375               | 12.9               |
| Tornadoes              | 30          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



# U.S. Drought Monitor

May 8, 2012

Valid 7 a.m. EDT



## Intensity:

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Local conditions may vary. See accompanying text summary  
for forecast statements.



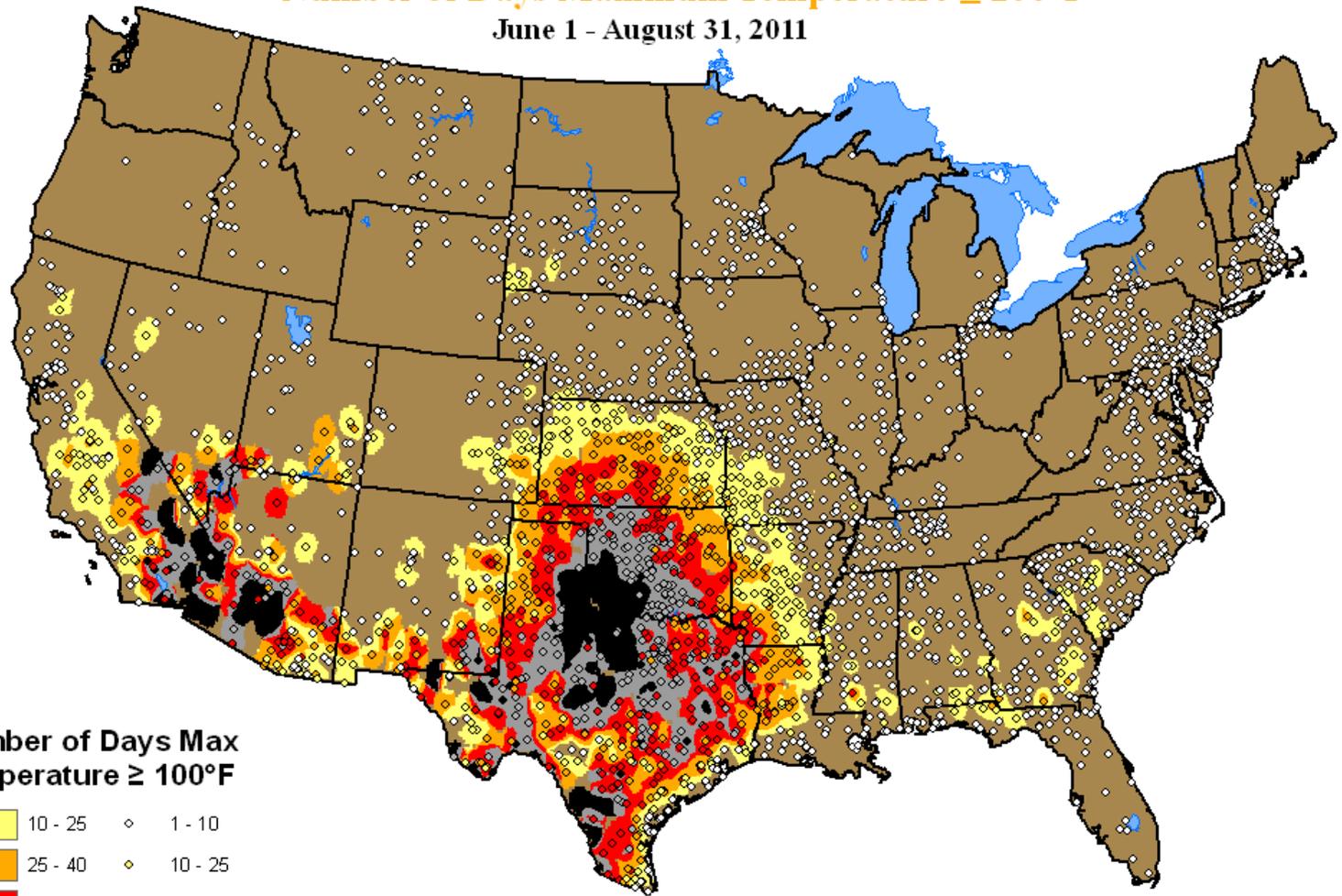
**Released Thursday, May 10, 2012**  
Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC

<http://droughtmonitor.unl.edu/>

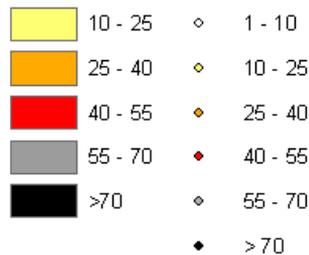
# Persistent Heat Engulfs Nation - Summer 2011

## Number of Days Maximum Temperature $\geq 100^{\circ}\text{F}$

June 1 - August 31, 2011



Number of Days Max  
Temperature  $\geq 100^{\circ}\text{F}$



Total number of stations: 2731 (only includes 60 or more non-missing days).  
Leader: Laredo AP TX 90 out of 92 possible days.  
Preliminary data: full quality assurance not yet applied.  
Updated: September 27, 2011



NOAA's  
National Climatic Data Center

# North American Drought Monitor

April 30, 2012

Released: Thursday, May 10, 2012

<http://www.ncdc.noaa.gov/nadm.html>

Analysts:

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Mallory MacDonald

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Minerva López\*

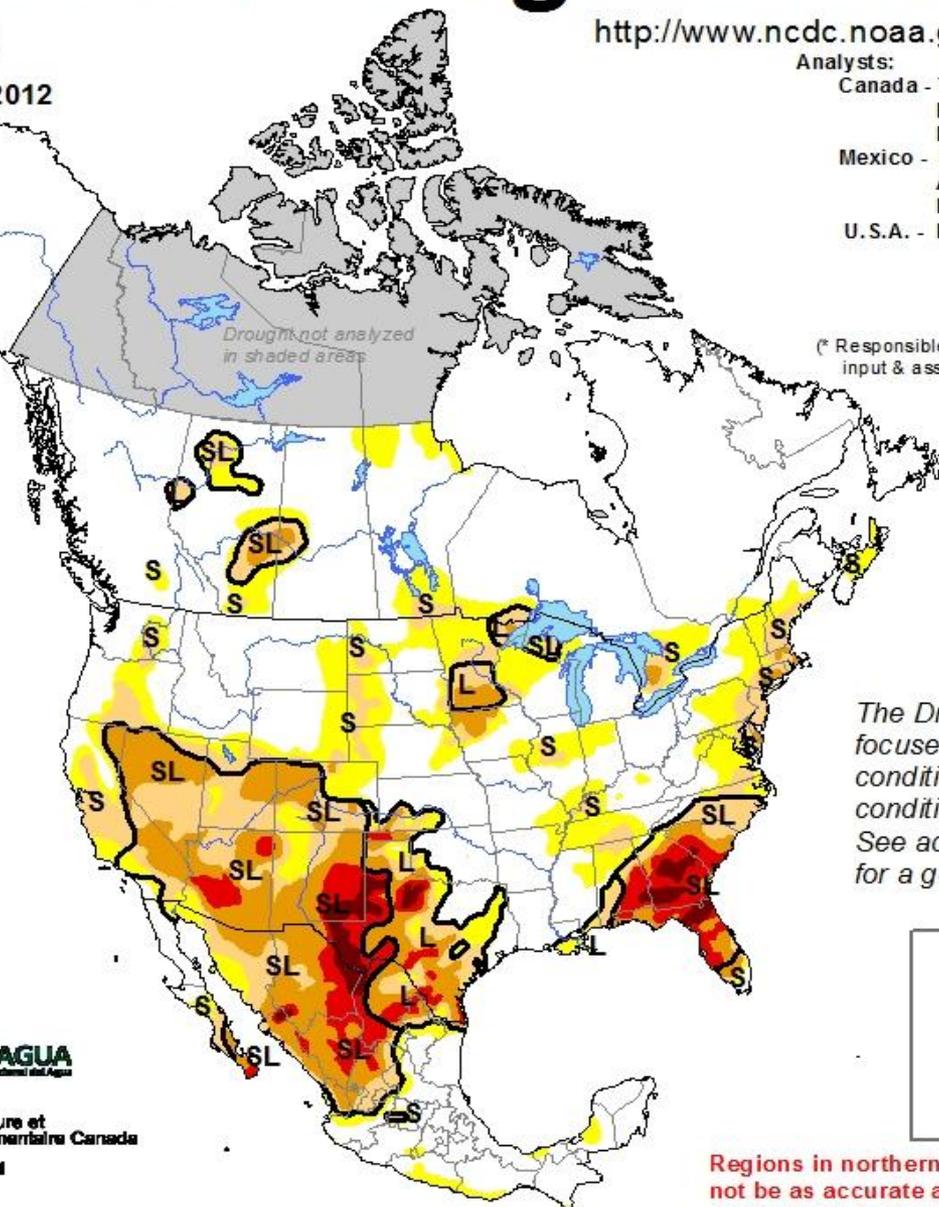
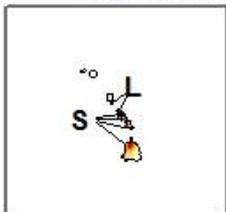
U.S.A. - Matthew Rosencrans

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Agriculture and Agri-Food Canada

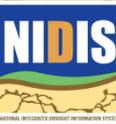
Agriculture et Agroalimentaire Canada

Environment Canada

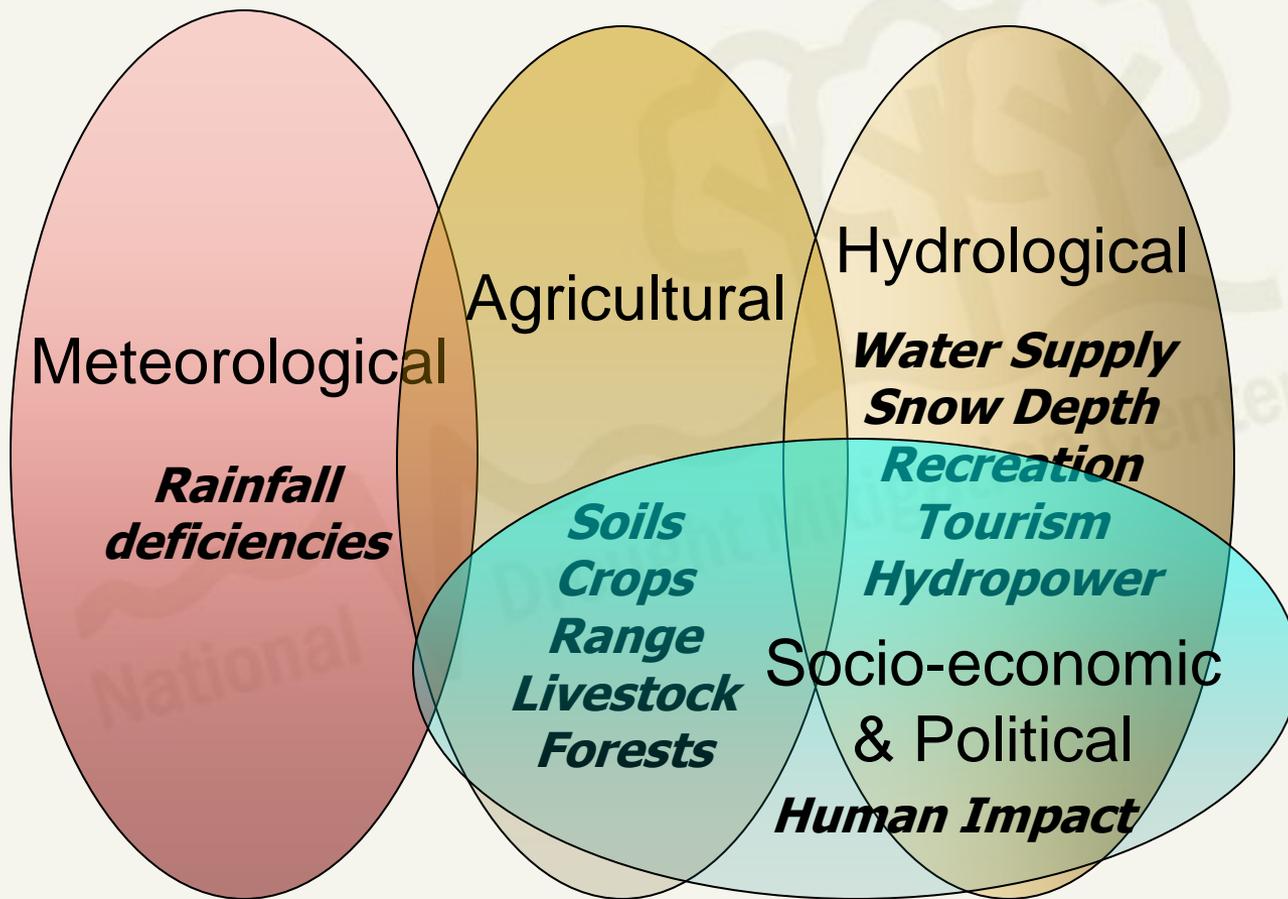
Environnement Canada

# Why Track Drought Impacts?

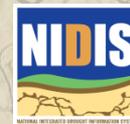
- ▶ Establish an impacts **baseline** for monitoring now and in the future
  - The “face” of drought (vulnerability)
  - Climate change
- ▶ To know where to direct **relief**
- ▶ To reduce **vulnerability** in advance of the next drought
- ▶ **“Ground truth”** indices and models
- ▶ No single method exists for collecting and/or **quantifying** drought losses
- ▶ Very little in the way of **environmental** or **qualitative** collection



# What we've learned: Defining Impacts



Time/Duration of the event



# -Must understand drought impacts

## - - symptoms of underlying

### Economic Category

- Agricultural
- Industry
- Tourism and Recreation
- Energy
- Financial
- Transportation

### Social Category

- Stress and Health
- Nutrition
- Recreation
- Public Safety
- Cultural Values
- Aesthetic Values

### Environmental Category

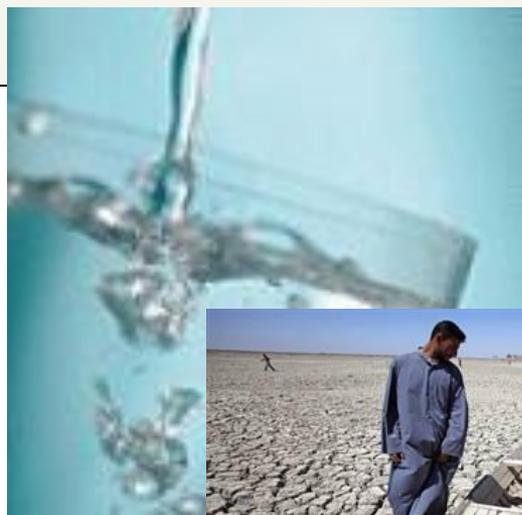
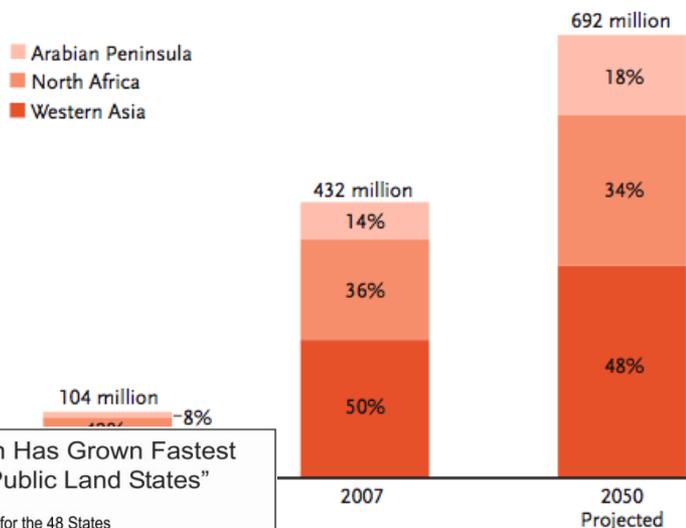
- Animal/Plant
- Wetland
- Water Quality



# Why are Drought Impacts Occurring?

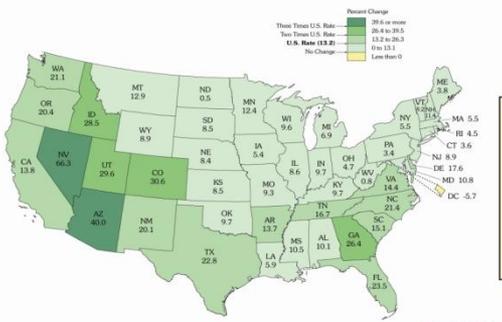
–what are the underlying vulnerabilities for a particular place?

Population Growth in the MENA Regions: 1950, 2007, and 2050

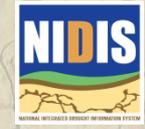
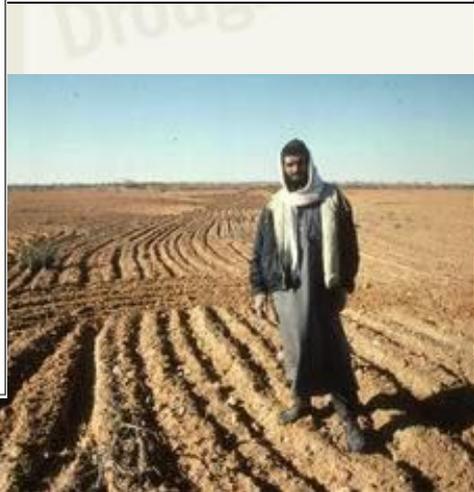


Demographic Changes: Population Has Grown Fastest in the West, Particularly in the “Public Land States”

Percent Change in Resident Population for the 48 States and the District of Columbia: 1990 to 2000



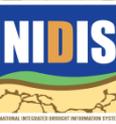
- Darker areas denote faster growth rates.
- Nevada (66%) and Arizona (40%) lead the nation.
- Intermountain states average about 30%.



# Drought Plan Components

- ▶ **Monitoring and early warning**
  - assess, communicate, and **trigger** action
  - **Foundation** of a drought mitigation plan
- ▶ **Vulnerability assessment**
  - Who and what is at **risk** and why?
- ▶ **Mitigation and response actions**
  - Actions/programs that **reduce risk and impacts** and enhance recovery

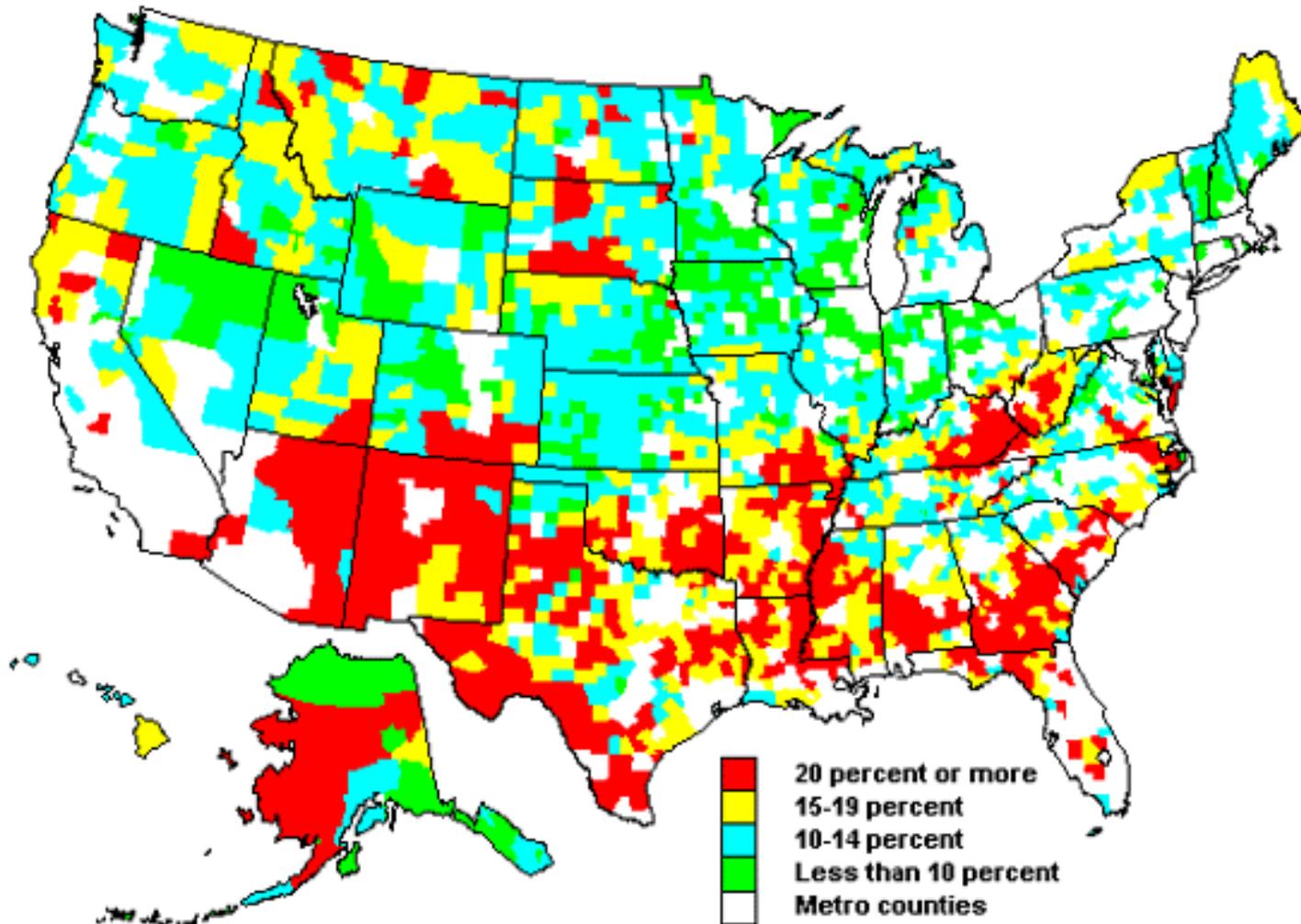
***Most processes and plans in the past have primarily focused on monitoring and response...***



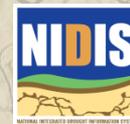
# Vulnerability: Not all impacts are created equal

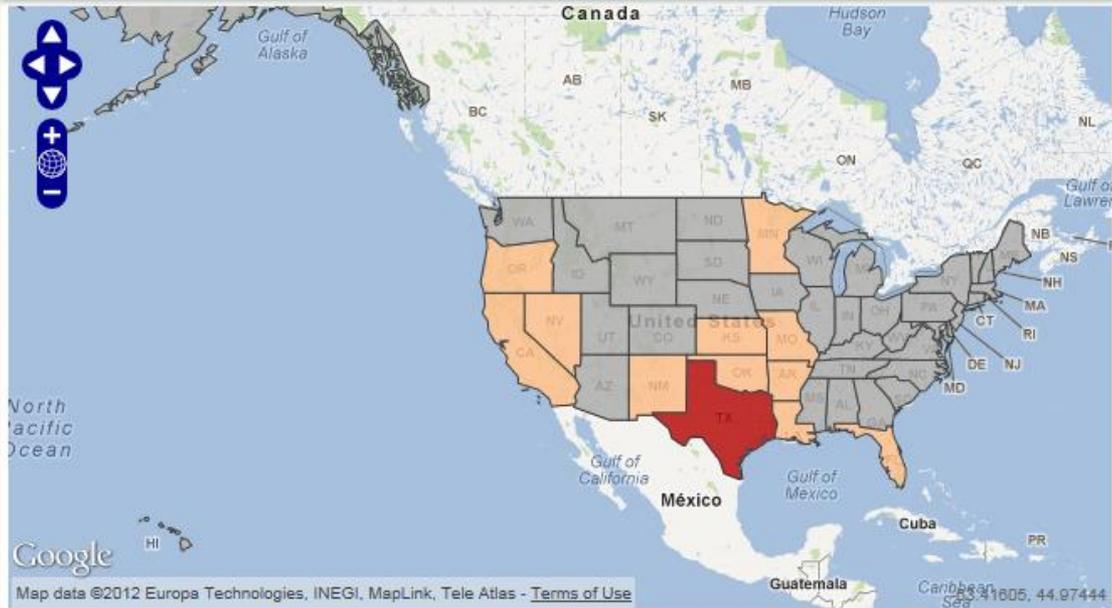
## Rural Poverty Rates, 1997

Nonmetro counties with high shares of poor residents are concentrated in the South and Southwest



Source: U.S. Census Bureau, Small Area Income and Poverty Estimates, 1997.





Refresh

Categories

Check All    Uncheck All

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

All States | 12-20-2011 - 01-20-2012 | [Color Legend]

Impact Counts    Impacts List | Page 1/4    Report Counts    Reports List | Page 1/22

**Total Impacts | All States** **40**

| Category                        |    |
|---------------------------------|----|
| Agriculture                     | 22 |
| Energy                          | 1  |
| Plants & Wildlife               | 4  |
| Society & Public Health         | 5  |
| Water Supply & Quality          | 10 |
| Business & Industry             | 2  |
| Fire                            | 9  |
| Relief, Response & Restrictions | 9  |
| Tourism & Recreation            | 6  |

Report Source

Report Types

Check All    Uncheck All

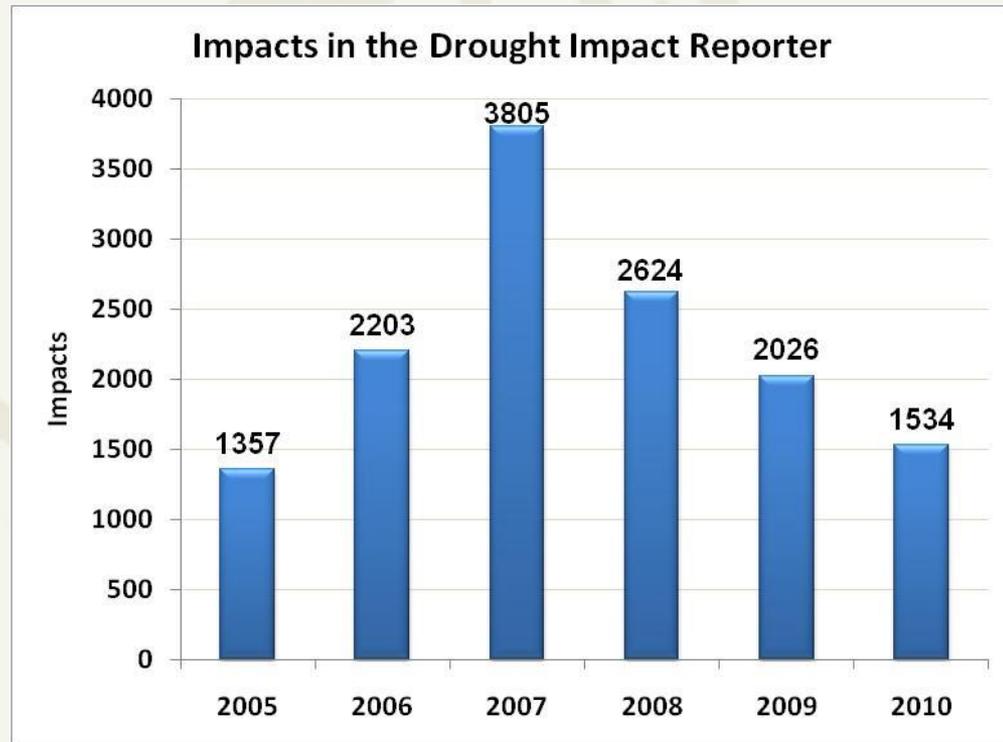
- Media
- User
- CoCoRaHS
- National Weather Service
- Burn Ban
- Water Restriction
- Other Agency
- Hawaii

# Some DIR Factoids



➤ **Established  
in 2005**

➤ **DIR DB now  
contains  
>14,000  
impacts**



# What We've Learned: Refine Categories

## Original

**Map Options**

**Impact Categories:**

|  |  |
|--|--|
| <input checked="" type="checkbox"/>  Agriculture  | <input checked="" type="checkbox"/>  Fire   |
| <input checked="" type="checkbox"/>  Water/Energy | <input checked="" type="checkbox"/>  Social |
| <input checked="" type="checkbox"/>  Environment  | <input checked="" type="checkbox"/>  Other  |

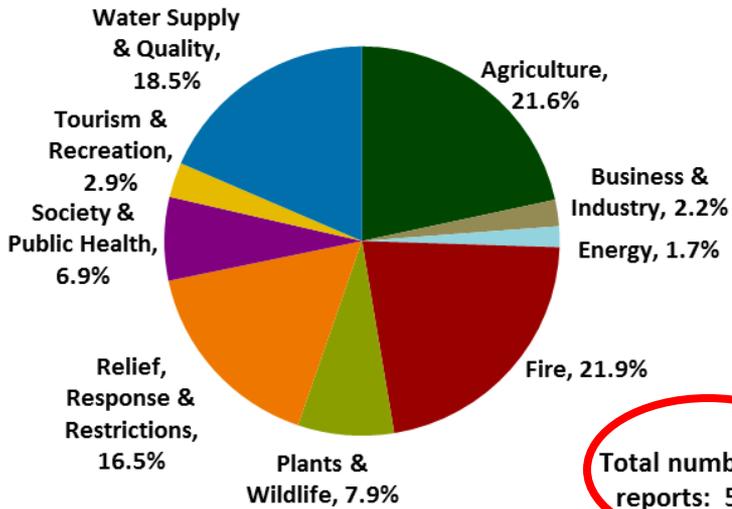
Source:

Time Period:

## New DIRv2

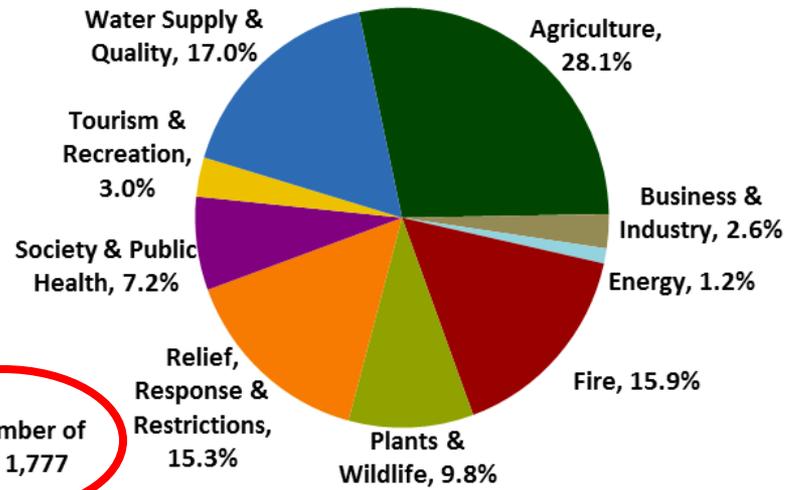
- [+]  Media Reports
-  Society & Public Health
-  Agriculture
-  Disaster Declarations & Aid
-  Energy
-  Water Supply & Quality
-  Wildfire
-  Plants & Wildlife
-  Other Business & Industry
-  Tourism & Recreation
-  General Awareness

### Category analysis for 2011 reports



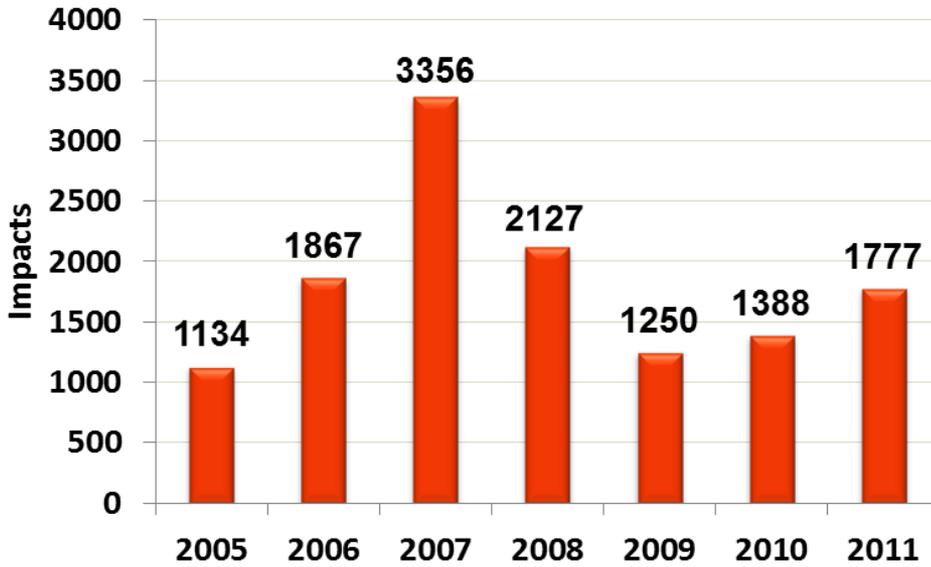
Total number of reports: 5,359

### Category analysis for 2011 impacts



Total number of impacts: 1,777

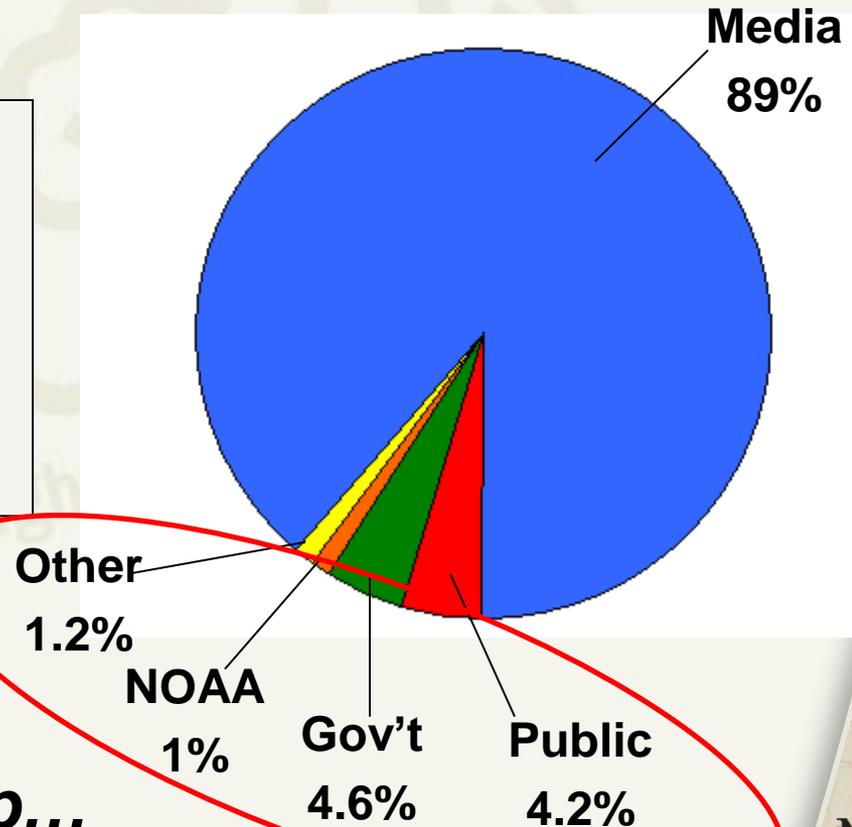
### Impacts in the Drought Impact Reporter



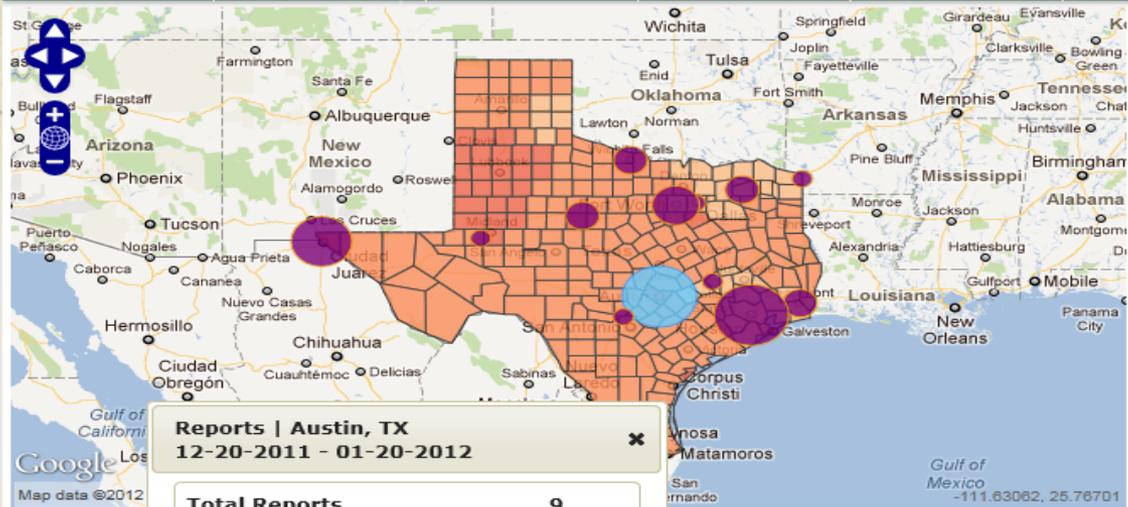
# What's in the Current DIR?

## Impact Categories:

- |  |  |
|--|--|
| <input checked="" type="checkbox"/>  Agriculture  | <input checked="" type="checkbox"/>  Fire   |
| <input checked="" type="checkbox"/>  Water/Energy | <input checked="" type="checkbox"/>  Social |
| <input checked="" type="checkbox"/>  Environment  | <input checked="" type="checkbox"/>  Other  |



*utilizing CustomScoop...*



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

Total Reports: **9**

| Category                        | Count |
|---------------------------------|-------|
| General Awareness               | 3     |
| Agriculture                     | 2     |
| Business & Industry             | 1     |
| Energy                          | 1     |
| Fire                            | 2     |
| Plants & Wildlife               | 3     |
| Relief, Response & Restrictions | 2     |
| Society & Public Health         | 1     |

Report Source

|       |   |
|-------|---|
| Media | 9 |
|-------|---|

**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

## 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)

|    |                      |
|----|----------------------|
| \$ | <input type="text"/> |

### 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

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

\* **14,000+ volunteers covering all 50 states!!**

\* **CoCoRaHS “Message of the Day”**

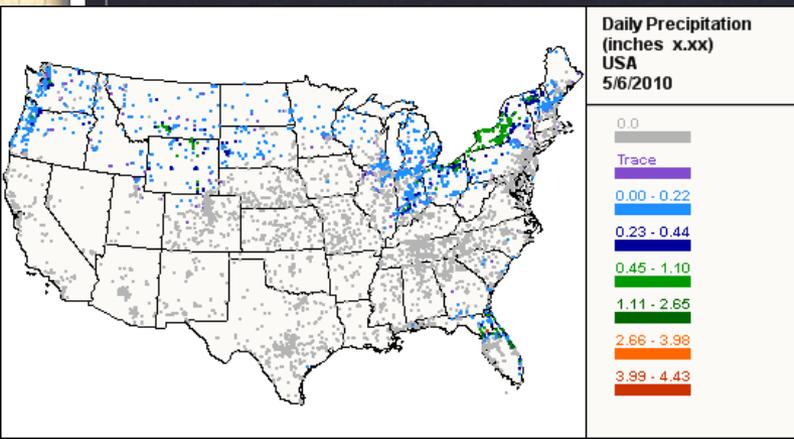
\* **Monthly e-mail reminders**

\* **Guide to reporting drought impacts**

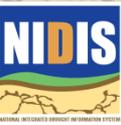
\* **Banners on the Web**

**COCORAHHS & DROUGHT**  
HOW HAS THE LACK OF RAIN IMPACTED YOU? LET US KNOW

WRITE FISHING HOLE GONE?  
COMMENTS ARE VERY IMPORTANT!



*Courtesy: Henry Reges, Colorado State University*



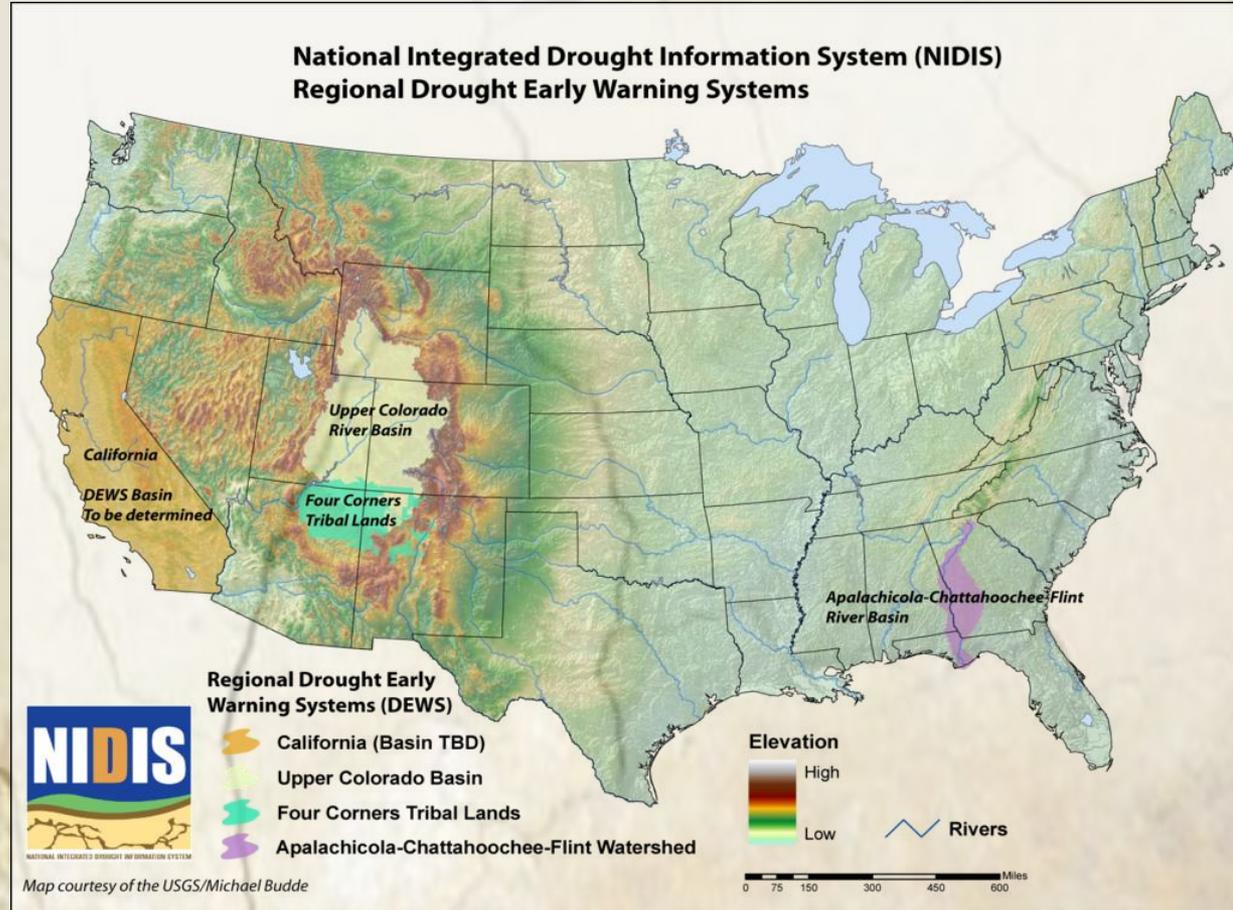
# National Integrated Drought Information System (NIDIS)

## NIDIS:

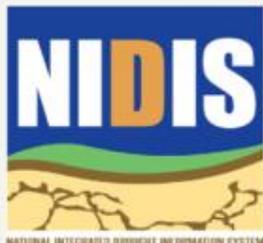
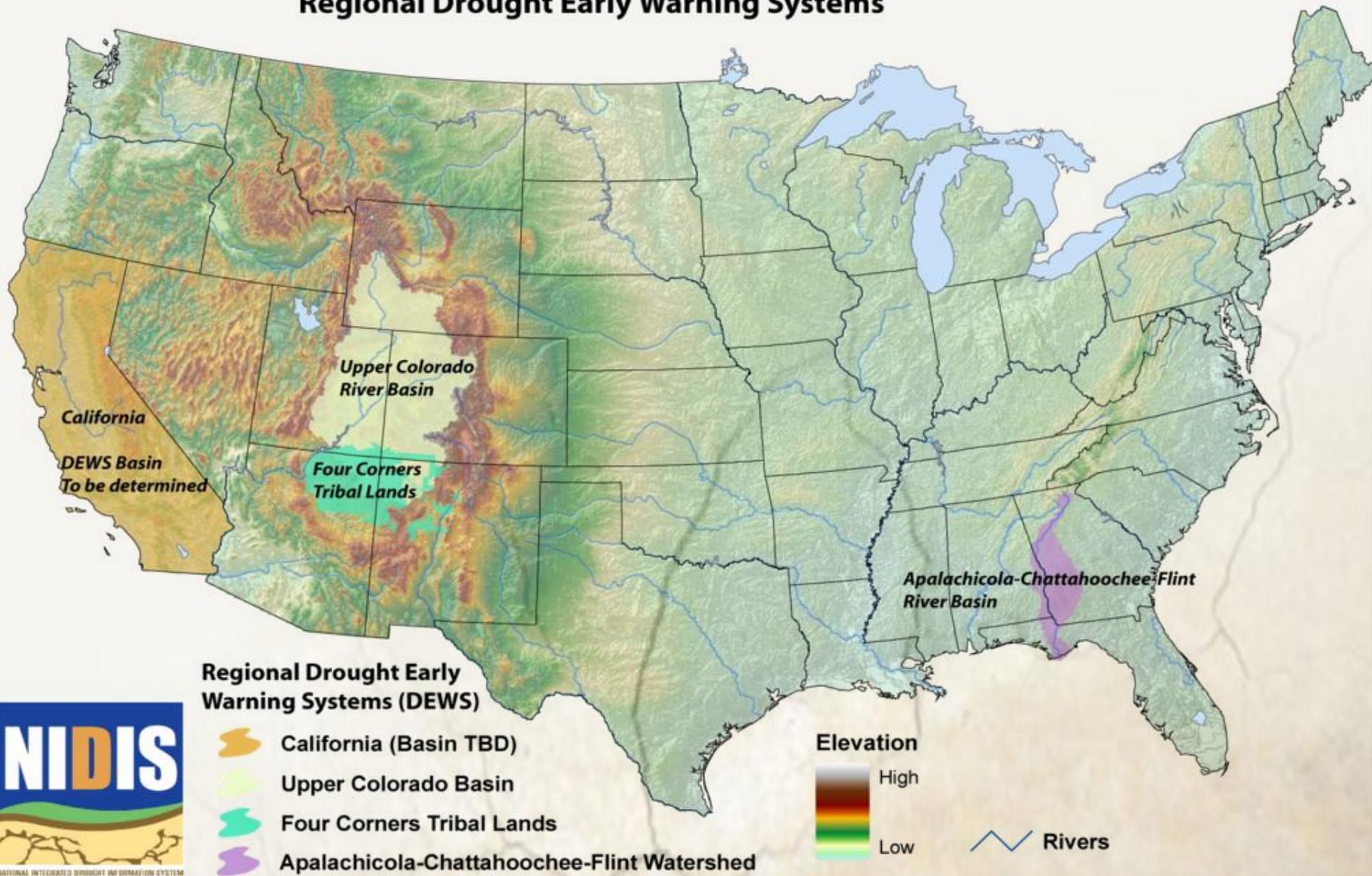
(TASK 1): Provide an effective *drought early warning system* that:

(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

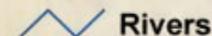


# National Integrated Drought Information System (NIDIS) Regional Drought Early Warning Systems



## Regional Drought Early Warning Systems (DEWS)

- California (Basin TBD)
- Upper Colorado Basin
- Four Corners Tribal Lands
- Apalachicola-Chattahoochee-Flint Watershed

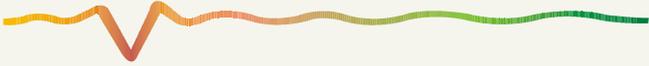


# Other Impacts Research and Efforts:

- ▶ **CoCoRaHS**
- ▶ **States:** AZ, HI, CA, TX, reporting impacts
  - how **connected to policy** process is it?
  - how **connected to drought indices/indicators**?
- ▶ **Case studies:** North Carolina landscapers
- ▶ **Transferability** to North America? What about the Caribbean?
- ▶ **GEO/GEOSS** system of systems/tying together virtual networks of global drought impact reporting...



# Challenges



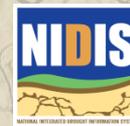
- ▶ **Systematic** impact assessments are needed
- ▶ Convince **decision-makers** that their mitigation/adaptation actions will reduce future drought impacts
  - **Quantify impacts** and benefits
  - Incorporate into **drought planning**/mitigation
    - ▶ Proactive vs. Reactive
  - Continual **education**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



# Thoughts on Drought Impacts



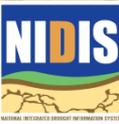
- ▶ All droughts are **LOCAL**
  - Monitoring local/basin/regional/tribal/national/global (bottom-up or top-down or a combination of both)
  - Planning local/regional/national (**Vulnerability assessment critical**)
- ▶ Droughts are one of the globe's **leading causes of economic loss!**
  - Large spatial 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
- ▶ **The Drought Impact Reporter:**  
(<http://droughtreporter.unl.edu>)



# Summary



- ▶ Drought is **NOT** just a physical event
- ▶ Like drought, impacts recognize **no borders!**
- ▶ **Vulnerability** matters
- ▶ Impacts (establish a **baseline**)
- ▶ Much more work needed to **tie impacts** to **drought indicators/indices**
- ▶ Promote and Encourage **Citizen Science**
  - **Capitalize on social media and cellular technology/culture**



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

**Thanks!**

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