

The Need and Role of Drought Impact Information in the Context of Drought Risk Management

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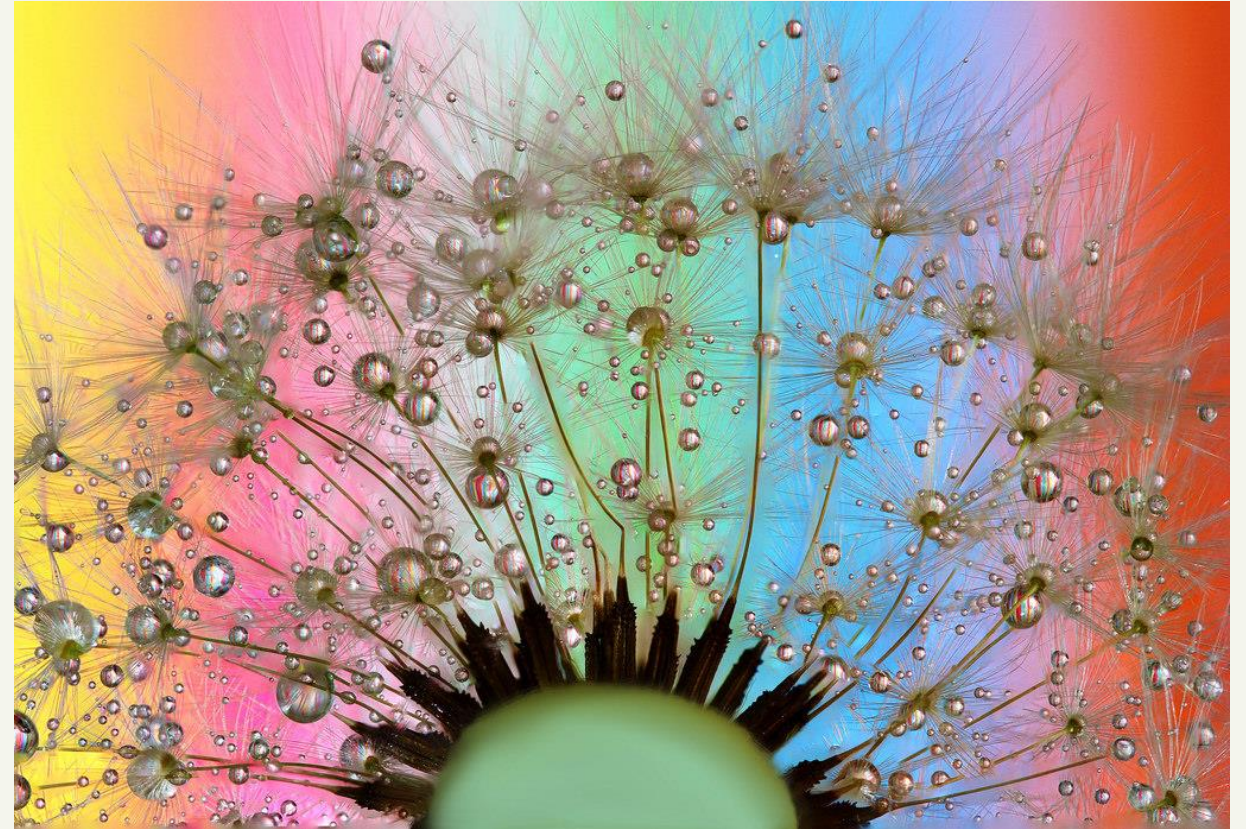
*Drought: Benefits of Action & Costs of Inaction Workshop
IDMP/World Bank, Washington, D.C., April 25, 2017*

What is Drought?



“In essence, as with rainbows, each person experiences their own drought.”

Redmond, Kelly T. “The Depiction of Drought: A Commentary.” *Bulletin of the American Meteorological Society*, August 2002, Vol. 83, Issue 8, p. 1143.



<http://121clicks.com/gallery-category/nature-subtle>

Diagnosing drought -- scales



Photo: Compiled by Chuck Nelson. "A true-color cropped image of portion of the Sacramento-San Joaquin River Delta. This image was taken from a California Department of Fish and Game website available to the public as a GIS file and is part of a U.S. Department of Agriculture National Agricultural Imagery Program flight."
<http://www.csuchico.edu/inside/2012-05-10/bigpicture-2.shtml>



From Bandera: Cowboy Capital of the World, Palo Alto College, San Antonio, Texas
<http://pacweb.alamo.edu/InteractiveHistory/projects/rhines/StudentProjects/1999/bandera/BANDERA.htm>

Context: Why Plan Ahead and Prepare for Natural Disasters?

- 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***

Context: Why Plan Ahead and Prepare for Natural Disasters?

Number

500

400

300

200

100

1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012

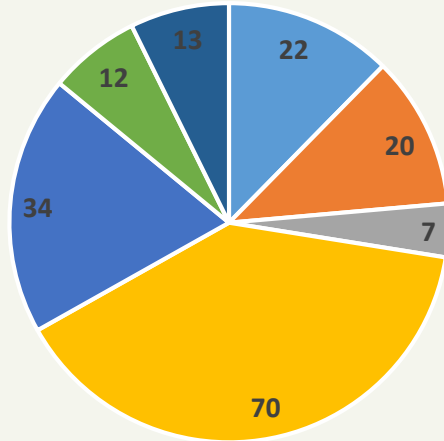
Geophysical events
(Earthquake, tsunami,
volcanic eruption)

Meteorological events
(Storms, etc.)

Hydrological events
(Flood, mass movement)

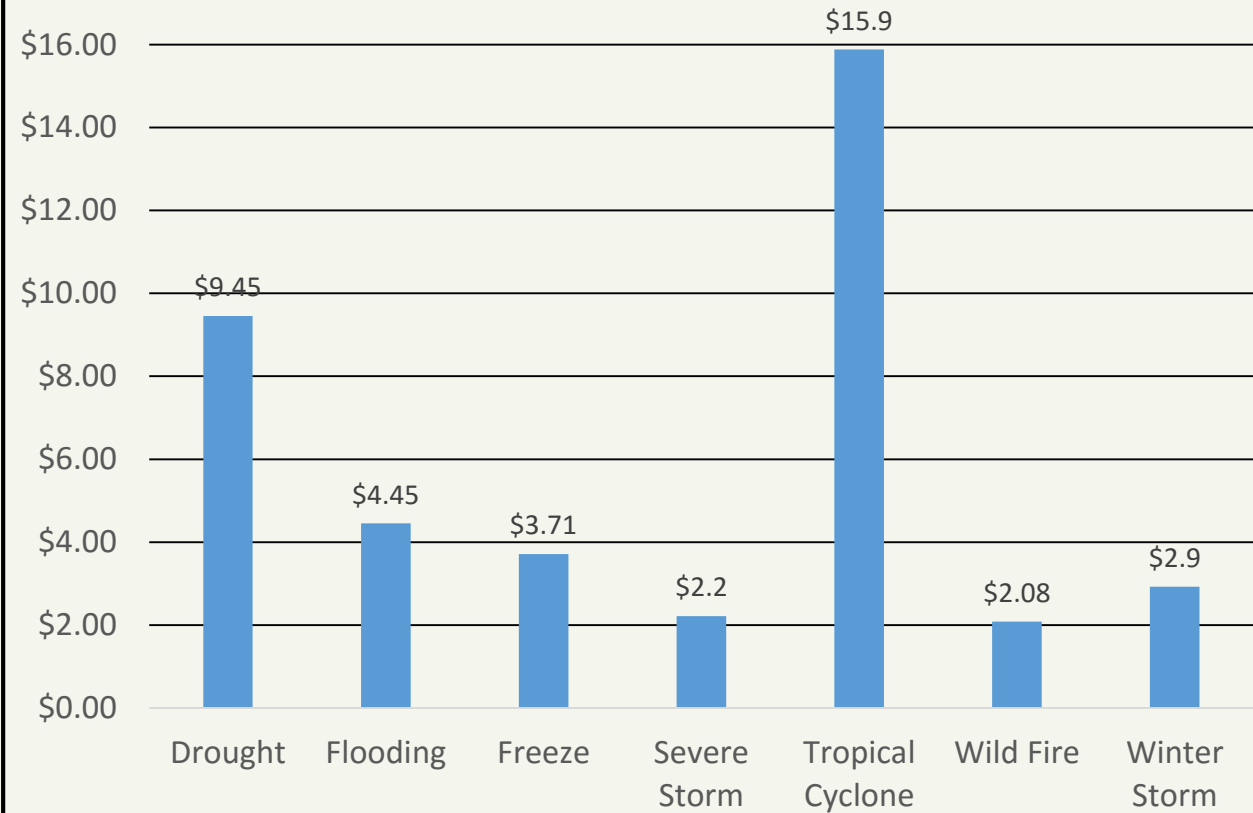
Source: Munich Re

Number of Billion Dollar Events from 1980-2014 by Hazard



■ Drought ■ Flooding ■ Freeze ■ Severe Storm
■ Tropical Cyclone ■ Wild Fire ■ Winter Storm

Average Cost per Event by Hazard



*Data are from NOAA's National Centers for Environmental Information

<http://www.ncdc.noaa.gov/billions/events>

**Cost is in billions of dollars and is CPI-Adjusted

Impacts: Unpacking the definition

“An observable loss or change that occurred at a specific place and time due to drought.”

- “Loss or change” – implies an expectation of what should happen, based on past experience
- “Due to drought” – the attribution question – how do we know drought caused it?

Why Track Drought Impacts?

- Establish an impacts **“baseline”** for **monitoring**
 - **Face of drought** (identify vulnerabilities)
 - Climate change analogy
- To know where to direct **relief**
- To reduce **risk** in advance of the next drought
- **“Ground truth”** indicators/indices, models and satellite observations
- No single, standardized methodology exists for collecting and/or **quantifying** drought losses
- Very little in the way of **environmental** or **qualitative** collection



Data



Wisdom (Policy)

Knowledge

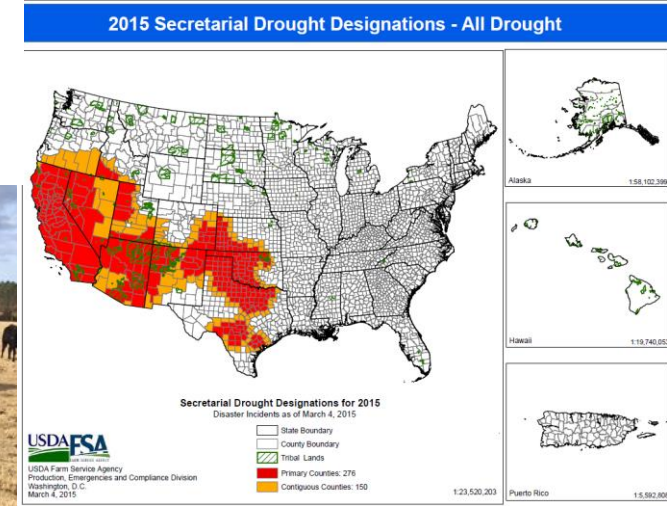
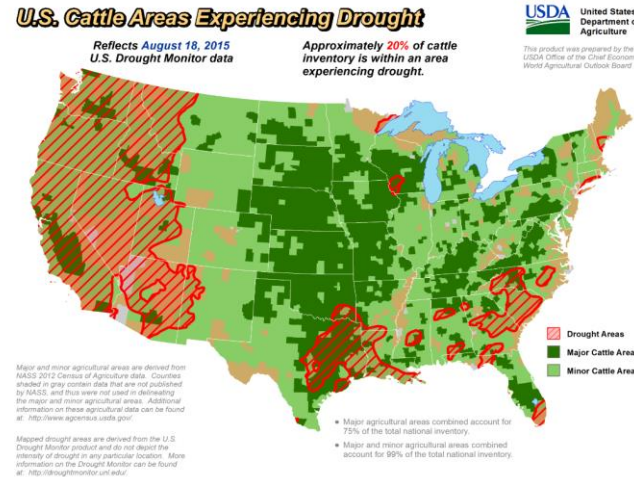
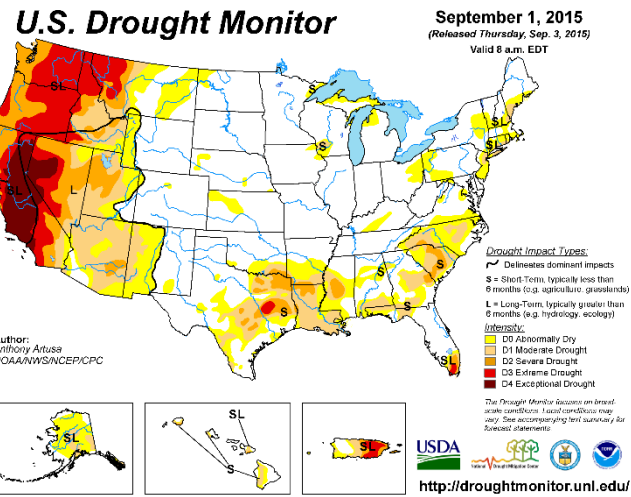
Information

<http://fractalfoundation.org/resources/fractivities/sierpinski-triangle/>

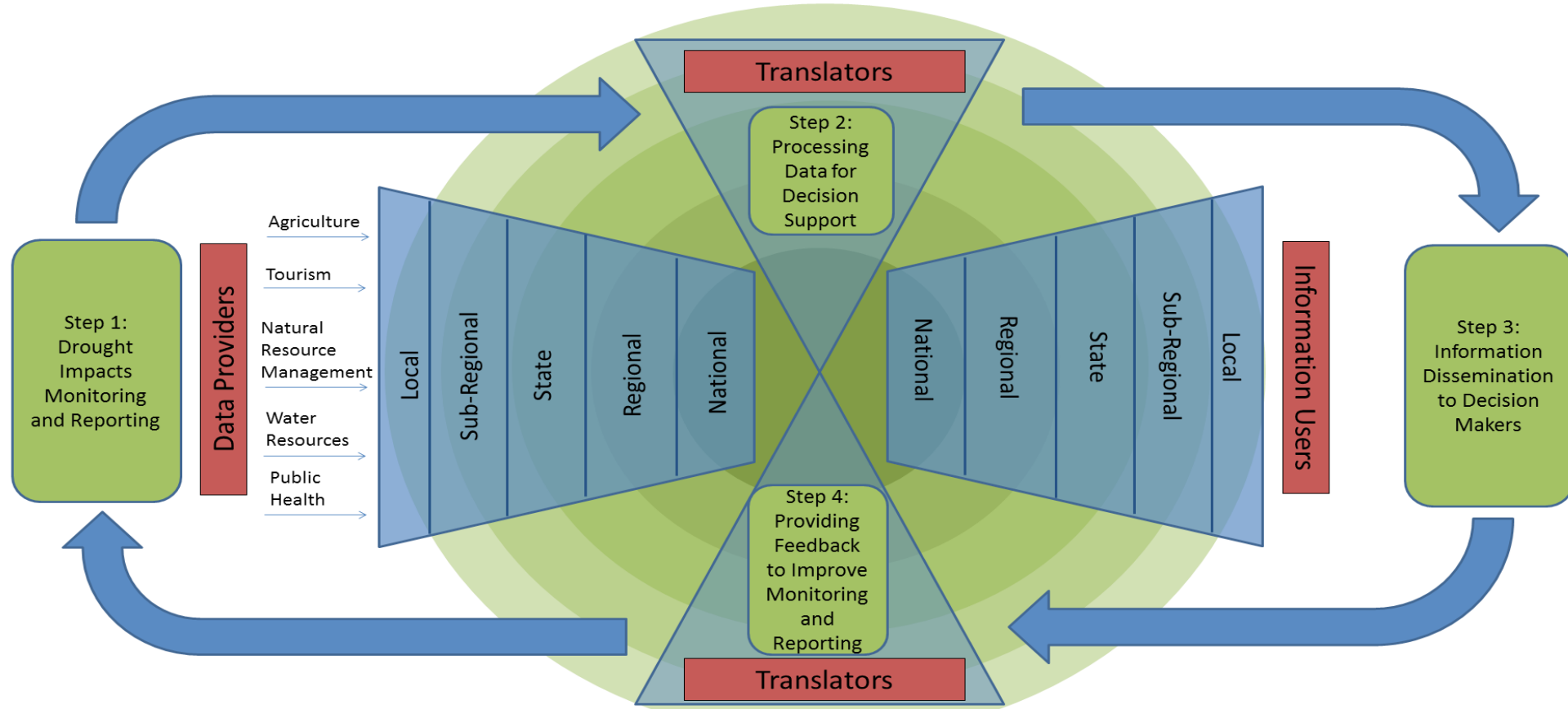
Agricultural drought impacts

Data → Information → Knowledge → Policy

STATIONS	CALIFORNIA CROP WEATHER - WEEK ENDING 8/16/2015											
	TEMPERATURE				GROWING DEGREE DAYS AT 50°F BASE			PRECIPITATION 1/				
	Average Week Ending 8/16/2015	Departure from Normal 2/	High	Low	This Year 8/16/2015	Normal Year 8/16/2015	This Season 8/16/2015	This Week 8/16/2015	This Season 8/16/2015	Normal Season 2/ 8/16/2015	Normal Year 2/ 8/16/2015	
North Coast	62	4	72	53	95	39	5	0	0.16	0.32	38.10	
Eureka WFO	73	-1	105	49	1,346	948	2	0	0.13	0.05	38.90	
Santa Rosa AP	72	5	104	51	766	690	2	0	0.05	0.06	31.01	
Napa State Hosp	73	5	104	52	979	756	1	0	0.01	0.05	26.46	
Central Coast	70	7	92	58	548	294	0	0	0	0.03	20.11	
San Jose AP	73	3	97	57	929	1,015	1	0	0.02	0.06	15.06	
Salinas AP	70	6	83	54	627	325	2	0	0.07	0.04	12.91	
Monterey AP	67	7	81	55	429	125	4	0	0.12	0.09	20.54	
King City Ag	74	5	104	52	999	806	2	0	0.03	0.01	12	
Paso Robles AP	76	3	107	52	1,327	1,063	2	0	2.09	0.01	13	
Sacramento Valley	81	2	107	60	2,496	1,708	1	0	0.04	0.12	33	
Red Bluff	79	-2	105	60	2,256	1,833	1	0	0.03	0.10	24	
Willows SW	76	1	102	53	1,857	1,407	1	0	0.05	0.06	19	
Orland AP	78	2	101	58	2,025	1,530	1	0	0.01	0.08	26	
Marysville	77	-1	102	56	1,812	1,740	0	0	0	0.07	22	
Sacramento AP	78	3	105	58	1,658	1,345	0	0	0	0.05	17	
Ran Joaquin Valley	78	2	104	58	1,705	1,543	2	0	0.02	0.05	13	
Stockton	79	3	104	63	2,026	1,651	0	0	0	0.05	13	
Mokelum AP	78	0	104	57	1,780	1,630	0	0	0	0.03	12	
Merced Macrady	79	1	105	59	1,989	1,740	2	0	0.12	0.01	11	
Madera AP	82	3	105	64	2,339	1,895	2	0	0.43	0.01	11	
Fresno AP	80	3	105	60	2,102	1,697	2	0	0.12	0	7	
Lemoore H&S	79	2	102	61	2,107	1,730	3	0	0.20	0.01	11	
Visalia AP	83	1	105	67	2,561	2,122	1	0	0.04	0	6	
Bakersfield AP	86	0	93	37	628	349	12	0	1.44	0.46	12	
Cascade Sierra	88	3	91	46	811	373	6	0	1.50	0.55	39	

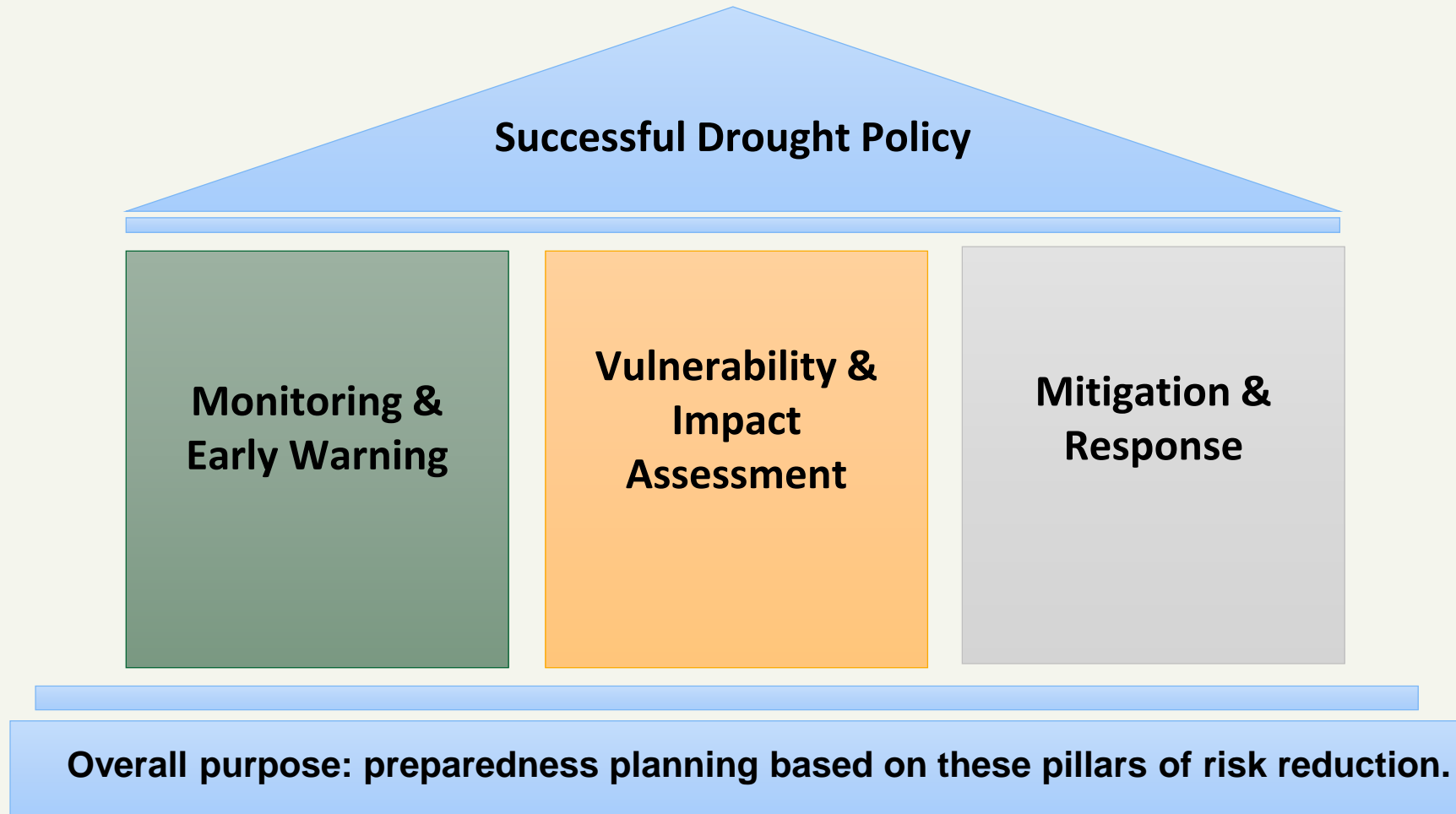


Impacts Reporting, full circle...it's complicated!



Lackstrom, K., et al. (2013). The Missing Piece: Drought Impacts Monitoring. Report from a drought impacts community of practice workshop in Tucson, AZ, March 2013.

Drought Risk Management: The Three Pillars

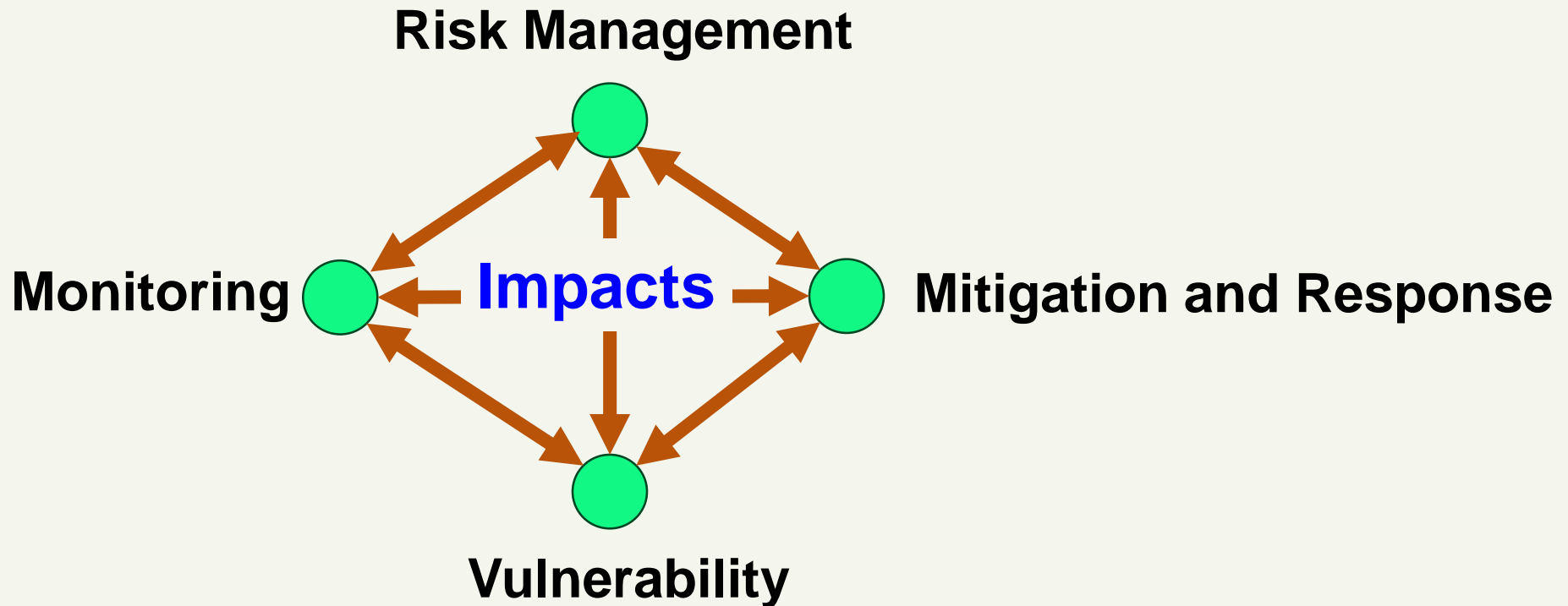


Why is a Vulnerability Assessment Needed?

- Assuming that a drought occurs, ***vulnerability is the key determinant of drought risk and the main driver of drought impacts and economic losses.***
- An outstanding **knowledge of drought monitoring and vulnerability itself does little to reduce drought impacts and economic losses *unless the knowledge is implemented into practice*** (Ismail-Zadeh et al. 2017).

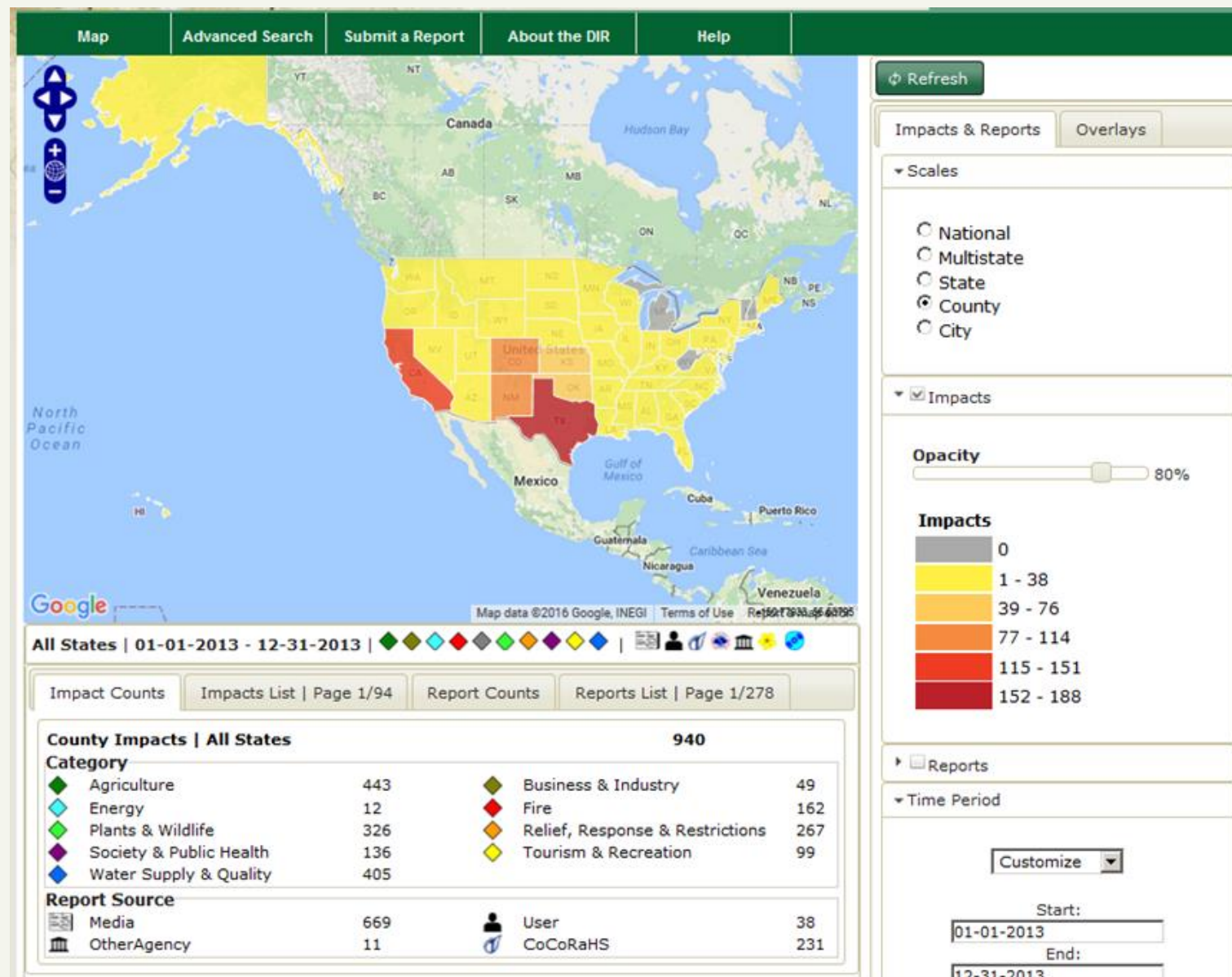
Vulnerability: Where to Begin?

- **Impacts are a great starting point...**
 - *Who and what is at risk and why?*
 - *Informs what should be monitored and managed*



Droughtreporter.unl.edu

- Launched in 2005 as nation's on-line archive of drought impacts
- **45,000+** media reports and **22,000+** impacts in our database to date and growing
- Reports from media, individual observers ("Users," CoCoRaHS), agencies
- **Searchable by time, place, scale, category, term**
- Moderated @ NDMC
- Quantitative AND Qualitative
- Direct AND Indirect

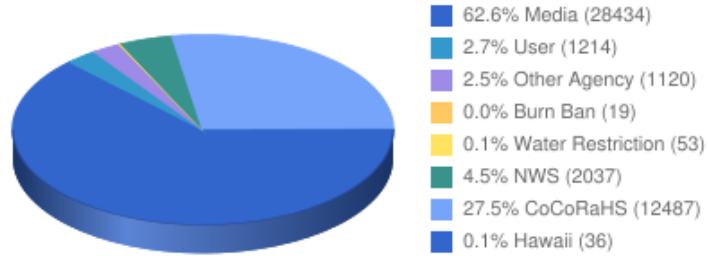


Wilhite, Donald A., Mark D. Svoboda, and Michael J. Hayes. "Understanding the complex impacts of drought: a key to enhancing drought mitigation and preparedness." *Water resources management* 21.5 (2007): 763-774.
<http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1042&context=droughtfacpub>

Welcome to the Drought Impact Reporter!

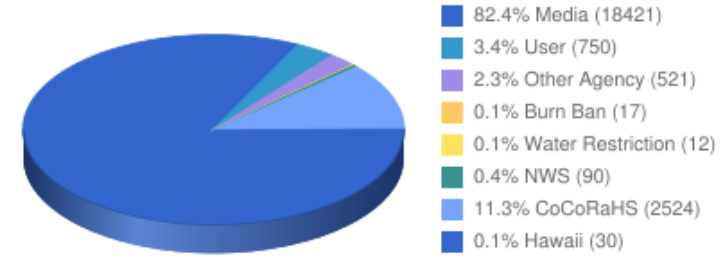
Report Composition

45,400 reports

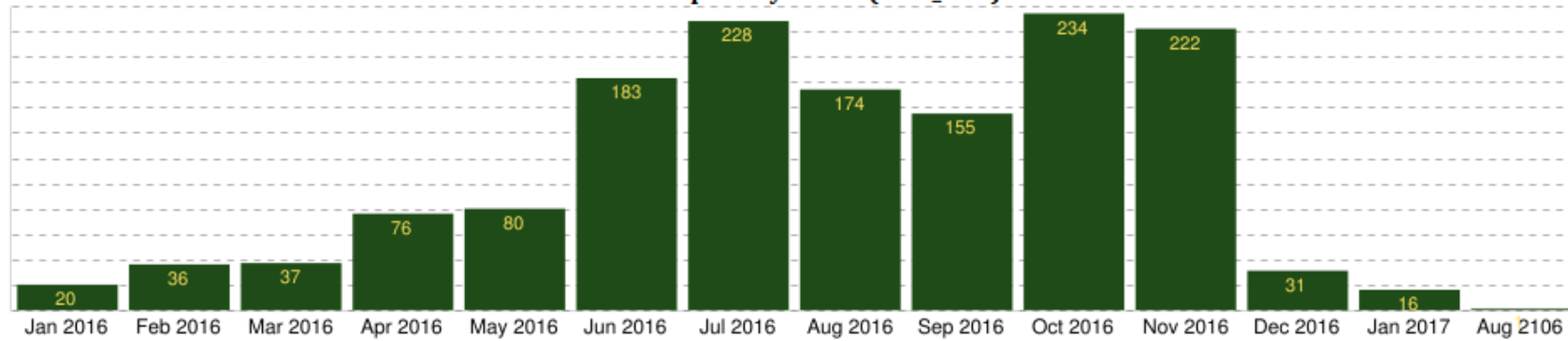


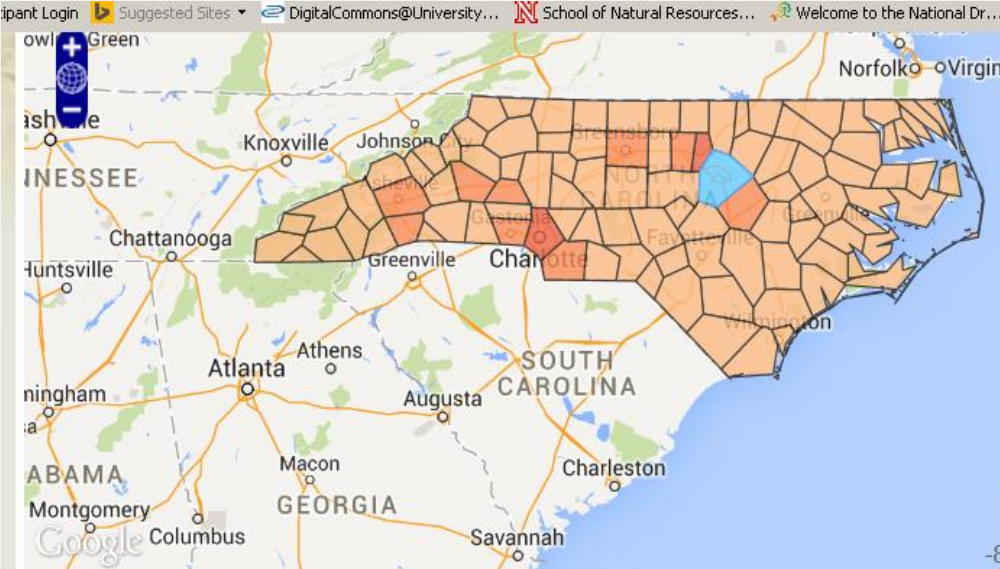
Impact Composition

21,973 impacts



Impacts by month (start_date):





North Carolina | 01-01-2004 - 12-01-2014 | [Legend]

Impact Counts | Impacts List | Page 1/106 | Report Counts | Reports List | Page 1/106

Total Impacts North Carolina		1059
Statewide Impacts		214
Category		
Agriculture	204	Business & Industry
Energy	1	Fire
Plants & Wildlife	73	Relief, Response & Restriction
Society & Public Health	184	Tourism & Recreation
Water Supply & Quality	457	

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 phone: (402) 472-6707 | fax: (402) 472-2946 | Contact Us

Impacts | Wake County, NC
01-01-2004 - 12-01-2014

Total Impacts	358
Statewide Impacts	214
Category	
Agriculture	84
Business & Industry	13
Fire	33
Plants & Wildlife	11

Impacts | Wake County, NC
01-01-2004 - 12-01-2014
Page 3 of 36

The number of cattle on feed fell to 10.144 million, the lowest October count since 1998

STATE |
Duration: 10-01-2013 - unknown

Rebate program in Raleigh, North Carolina connected with replacement of more than 12,000 toilets

Duration: 12-31-2009 - 01-01-2014

Raleigh, North Carolina residents reduced their daily water use to an average of just 98 gallons during the height of the 2007-08 drought

Duration: 12-01-2007 - 11-12-2013

Announcement of National Drought Resilience Partnership

STATE |
Duration: 11-14-2013 - unknown

OK

Via CoCoRaHS: Promoting drought impact reporting to volunteers...



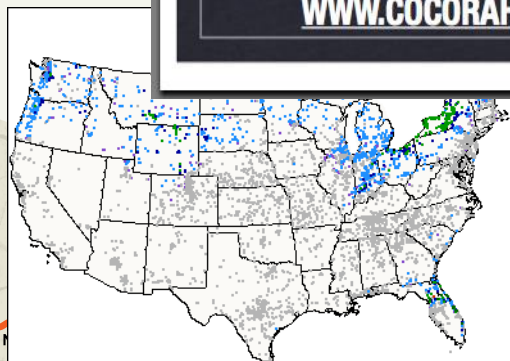
* **20,000+ volunteers covering all 50 states!!**

* **CoCoRaHS “Message of the Day”**

* **Monthly e-mail reminders**

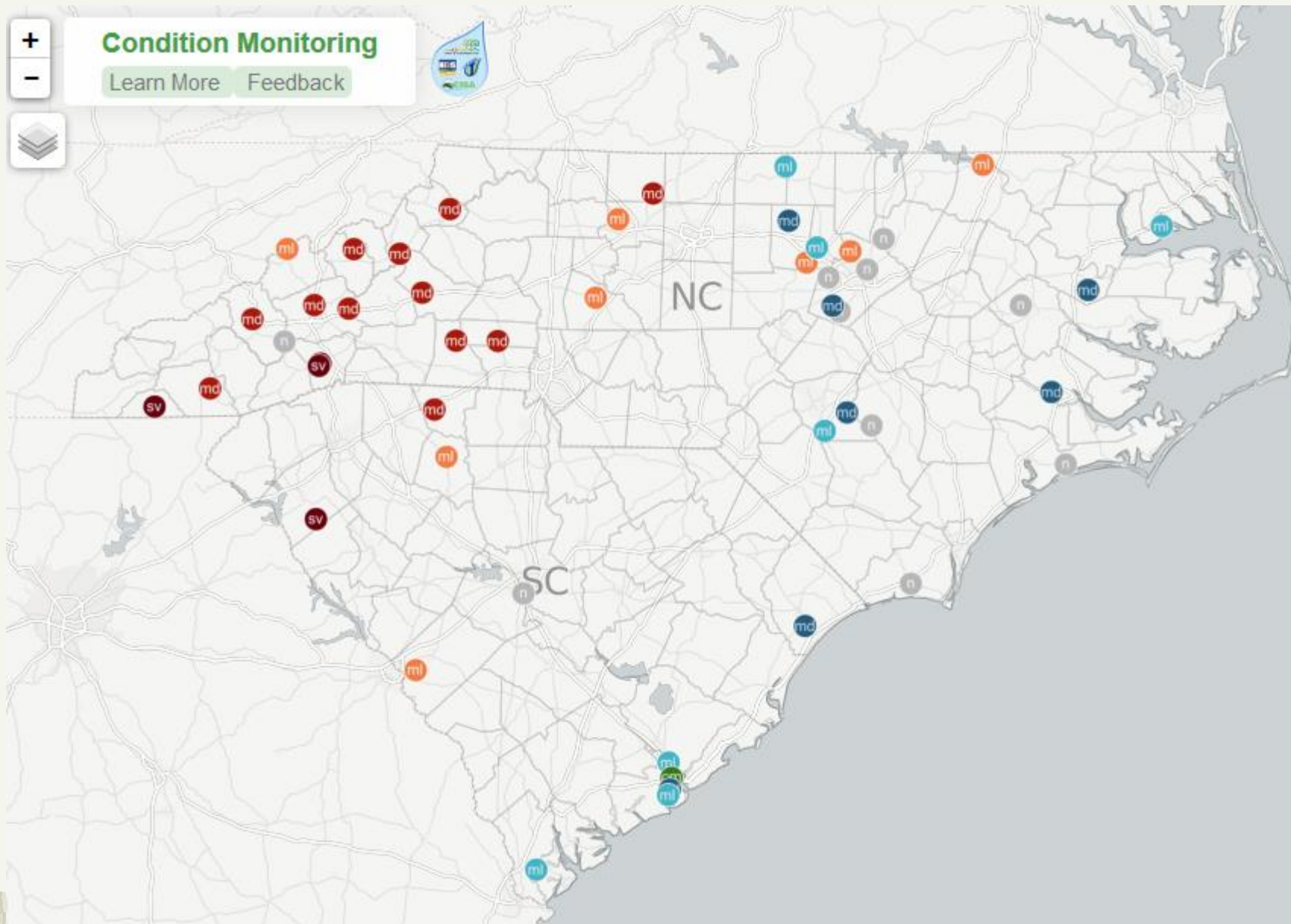
* **Guide to reporting drought impacts**

* **Banners on the Web**



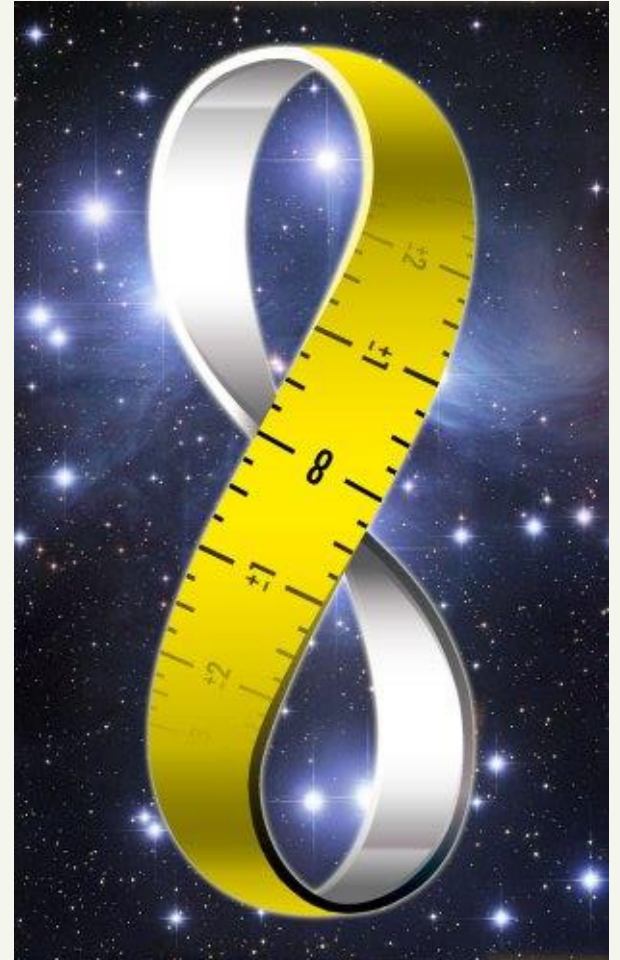
Courtesy: Henry Reges,
Colorado State University





Questions & Challenges

- No **systematic/standardized methodology** for valuing or quantifying drought impacts
 - Even in agriculture
- **No common unit**
- Easier to list than to summarize impacts
- “Angst index”/biases?
- **Disincentives** to sharing some info
 - Proprietary
 - Competitive
 - \$\$



Final Thoughts

- **If** drought monitoring and early warning is the **foundation** of risk management planning
 - Trigger to who does what and when!*
 - One can not manage what is not monitored (e.g., **IMPACTS**)!*
- **Then, impact collection must be an integral part** of any drought early warning information system
- Goal is to **link scientific knowledge w/ the science and actions** needed to inform policy while also reducing impacts and future risk

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<http://drought.unl.edu>

