U.S. Drought Monitoring Efforts

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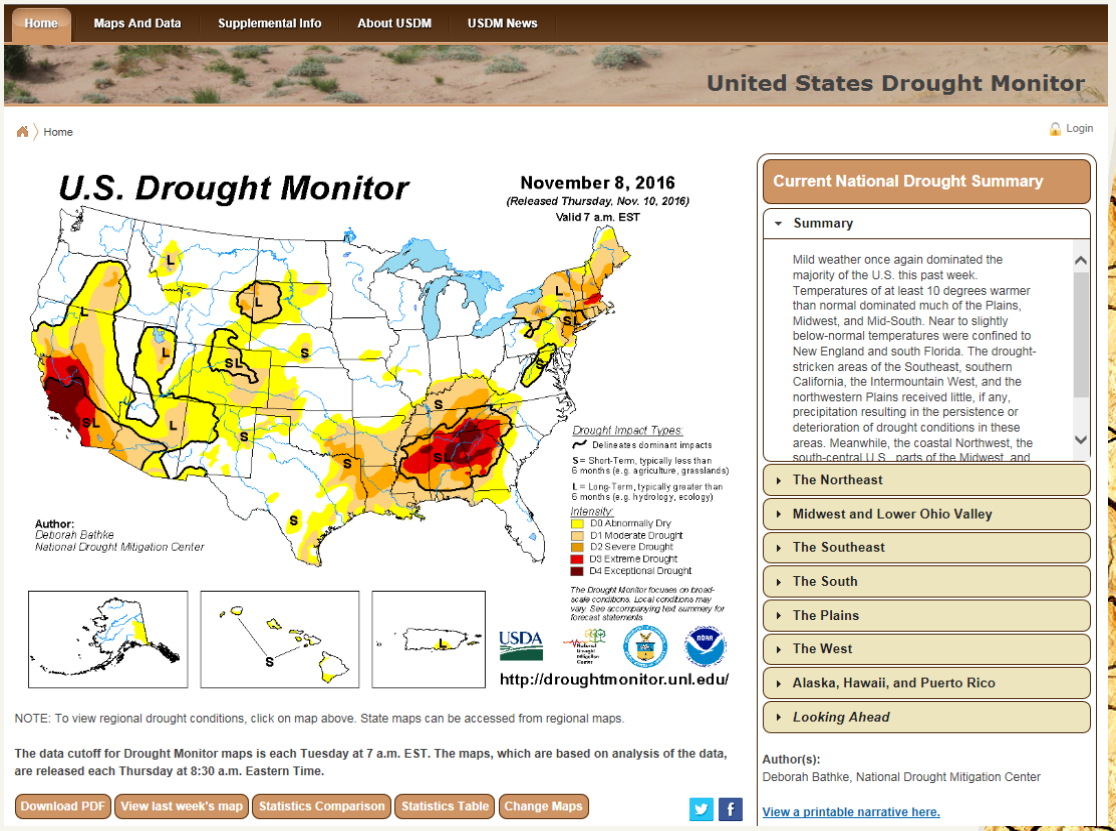
Sort-out Drought Workshop
Dresden-Pillnitz, Germany, November 16-18, 2016

U.S. Drought Monitor (USDM):

- **State-of-the-science** 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 **400+ experts!**
- **Policy implications in** Farm Bill (USDA), IRS, NOAA-NWS and several state drought plans and task forces
- **"Go to source"** for media and the public

droughtmonitor.unl.edu



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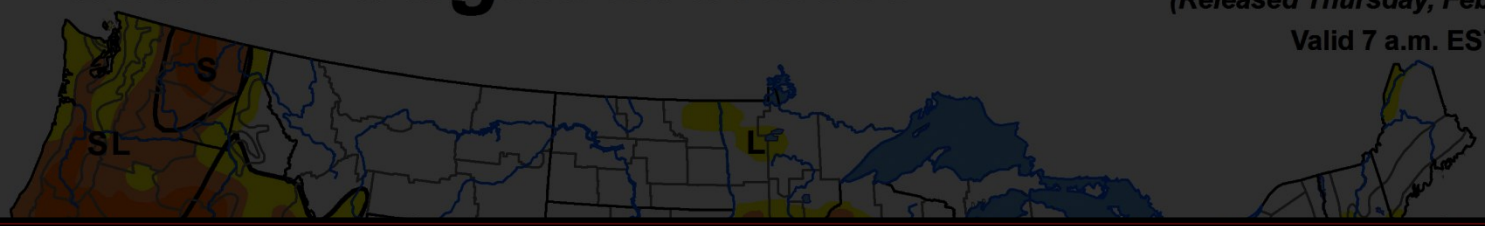
U.S. Drought Monitor

February 18, 2014
(Released Thursday, Feb. 20, 2014)
Valid 7 a.m. EST

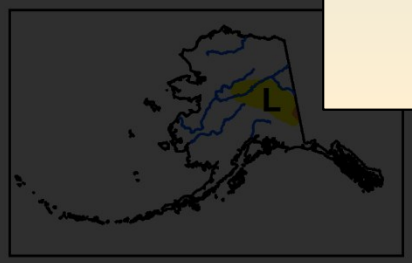


Drought Category	Color	Frequency	Pctile
• D4, Exceptional Drought:		once per 50-100 years	0-2
• D3, Extreme Drought:		once per 20-50 years	2-5
• D2, Severe Drought:		once per 10-20 years	5-10
• D1, Moderate Drought:		once per 5-10 years	10-20
• D0, Abnormally Dry:		once per 3-5 years	20-30

Author:
David Miskus
NOAA/NWS/NCEP/CPC

The drought categories are associated with historical occurrence/likelihood (percentile ranking).

It is not anecdotal or subjective, like "*It's really, really dry!!*"
or "*I don't remember it ever being this dry… we have to be D4!!!*"



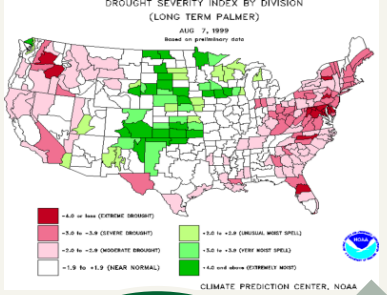
…nitor focuses on broad-… Local conditions may …panying text summary for …nts.

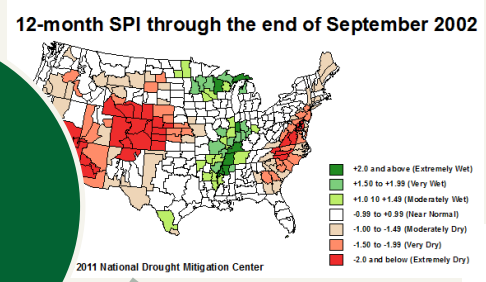
USDA National Drought Mitigation Center

http://droughtmonitor.unl.edu/

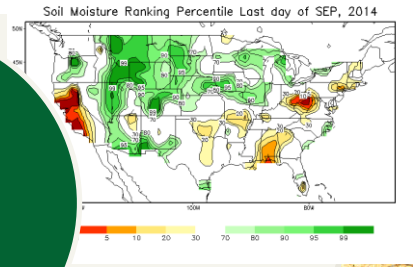
USDM Approach

- **"Convergence of Evidence"**
  - Many types of drought "information" can be collectively analyzed to ***determine if the majority of information is 'converging' (telling the same story)*** about the accuracy, or inaccuracy, of the drought as depicted by the USDM
  - Need to ***look at 100% of the data, BUT don't believe in any one piece of data input 100%*** in making a decision…
  - ***Multiple indicators and types of information*** that describe different hydroclimatic parameters are needed to get a complete picture of a drought indicator's performance
  - ***Impacts are the "ground truth"***, yet aren't monitored nearly well enough….**you can't measure what you don't monitor!**

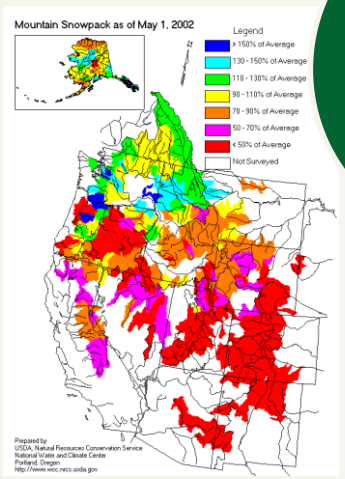




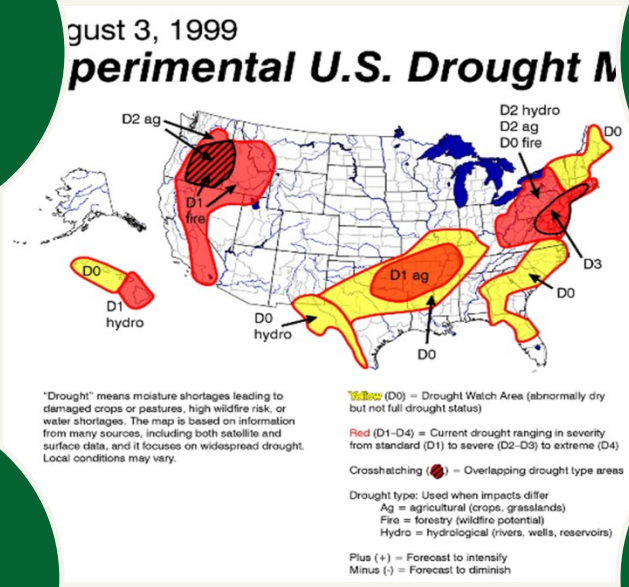
Indices: SPI/PDSI

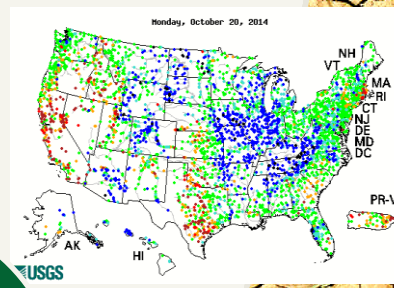


Soil Moisture



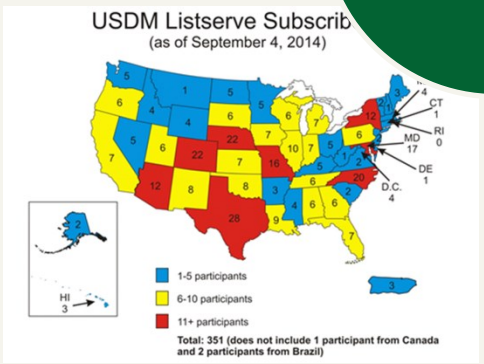
Snow



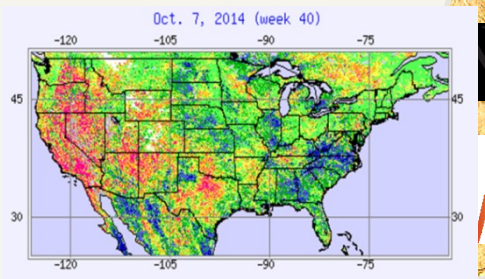


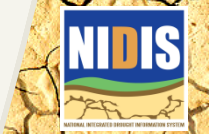
Expert Local Input

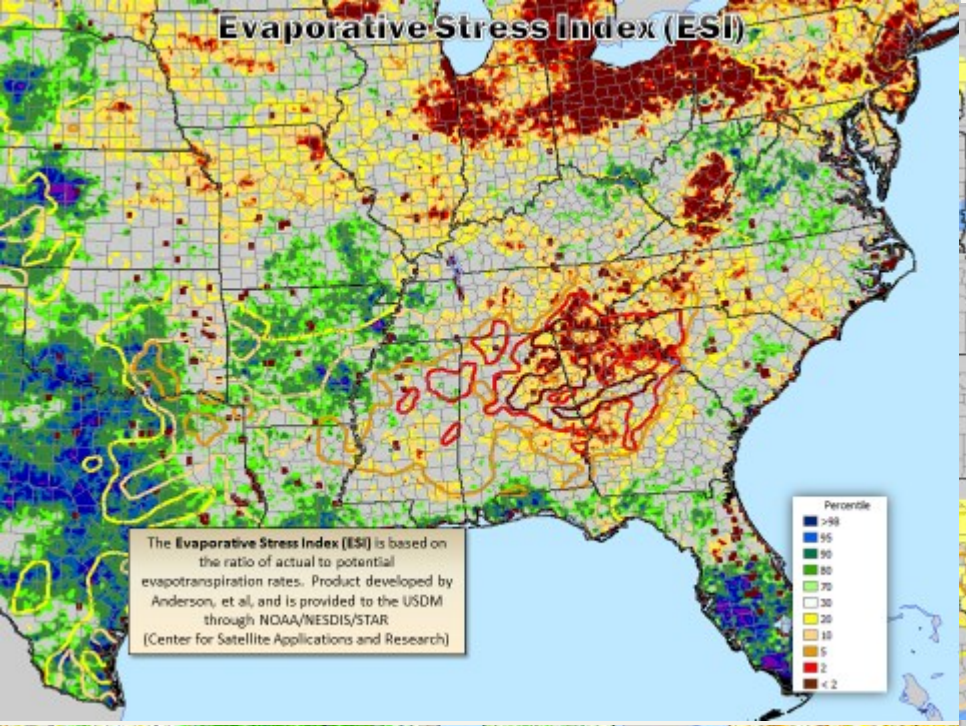
Streamflow

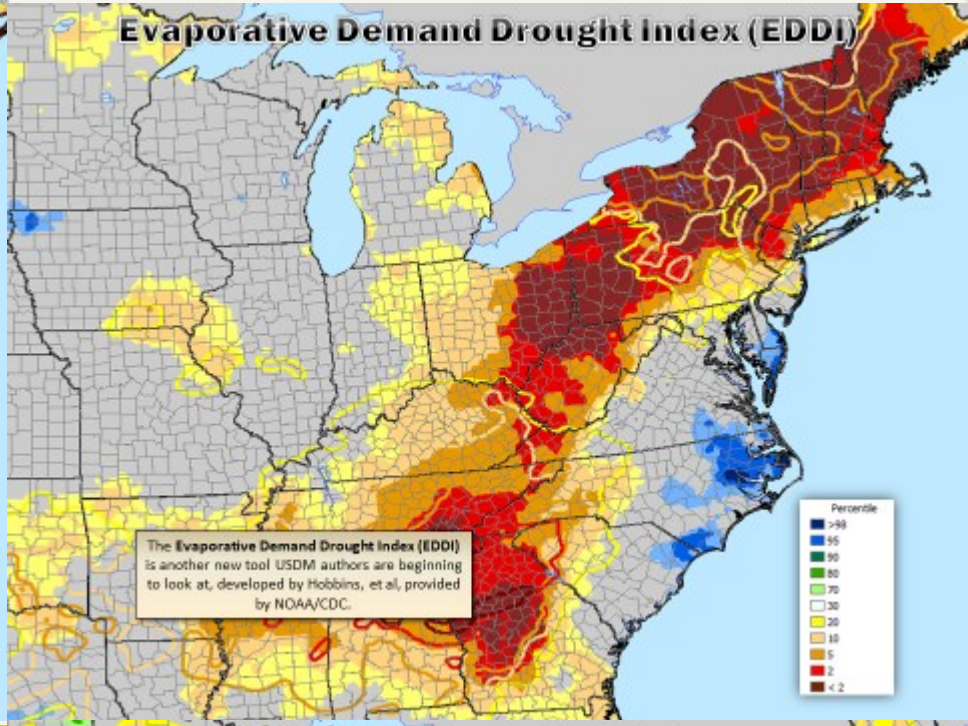


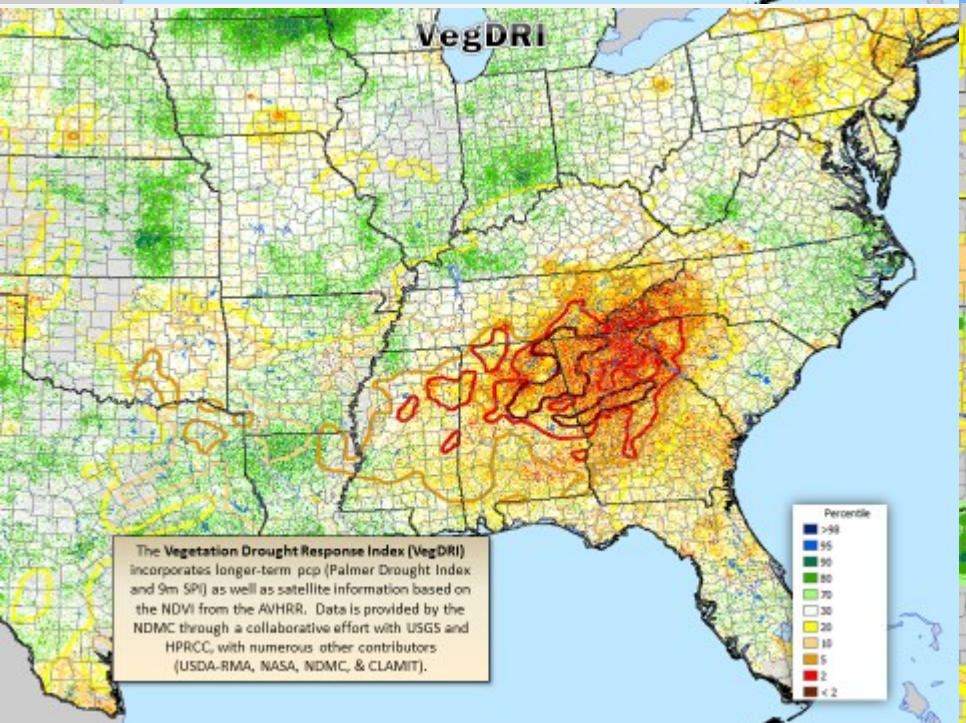
Remote Sensing

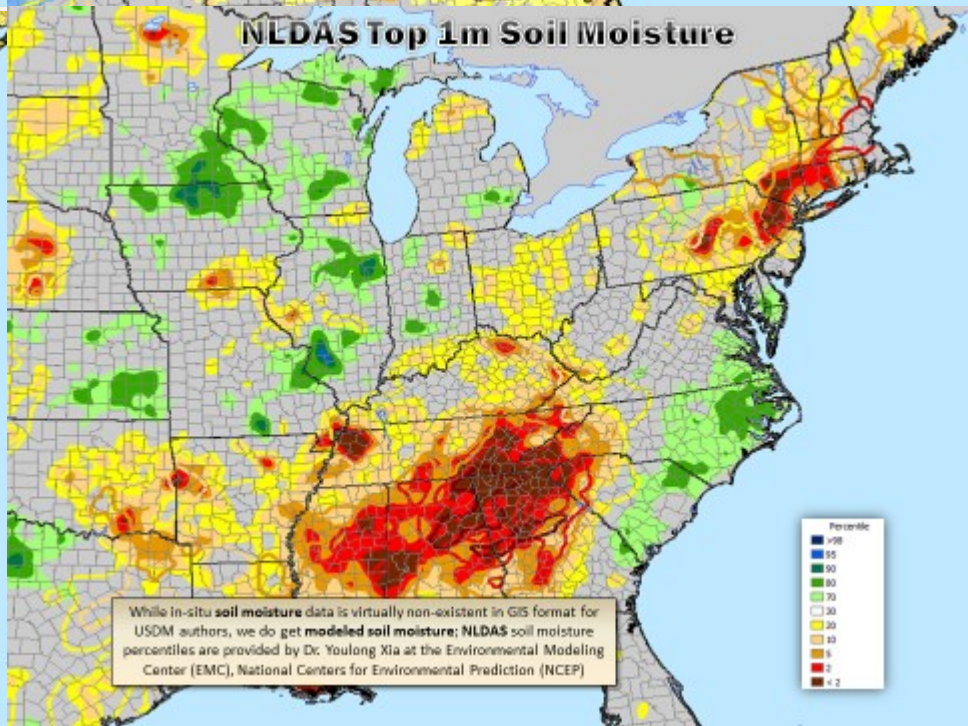





Evaporative Stress Index (ESI)
The Evaporative Stress Index (ESI) is based on the ratio of actual to potential evapotranspiration rates. Product developed by Anderson, et al, and is provided to the USDM through NOAA/NESDIS/STAR (Center for Satellite Applications and Research)
Percentile
>98
95
90
80
70
30
20
10
5
2
< 2


Evaporative Demand Drought Index (EDDI)
The Evaporative Demand Drought Index (EDDI) is another new tool USDM authors are beginning to look at, developed by Hobbins, et al, provided by NOAA/CDC.
Percentile
>98
95
90
80
70
30
20
10
5
2
< 2


VegDRI
The Vegetation Drought Response Index (VegDRI) incorporates longer-term pcp (Palmer Drought Index and 9m SPI) as well as satellite information based on the NDVI from the AVHRR. Data is provided by the NDMC through a collaborative effort with USGS and HPRCC, with numerous other contributors (USDA-RMA, NASA, NDMC, & CLAMIT).
Percentile
>98
95
90
80
70
30
20
10
5
2
< 2

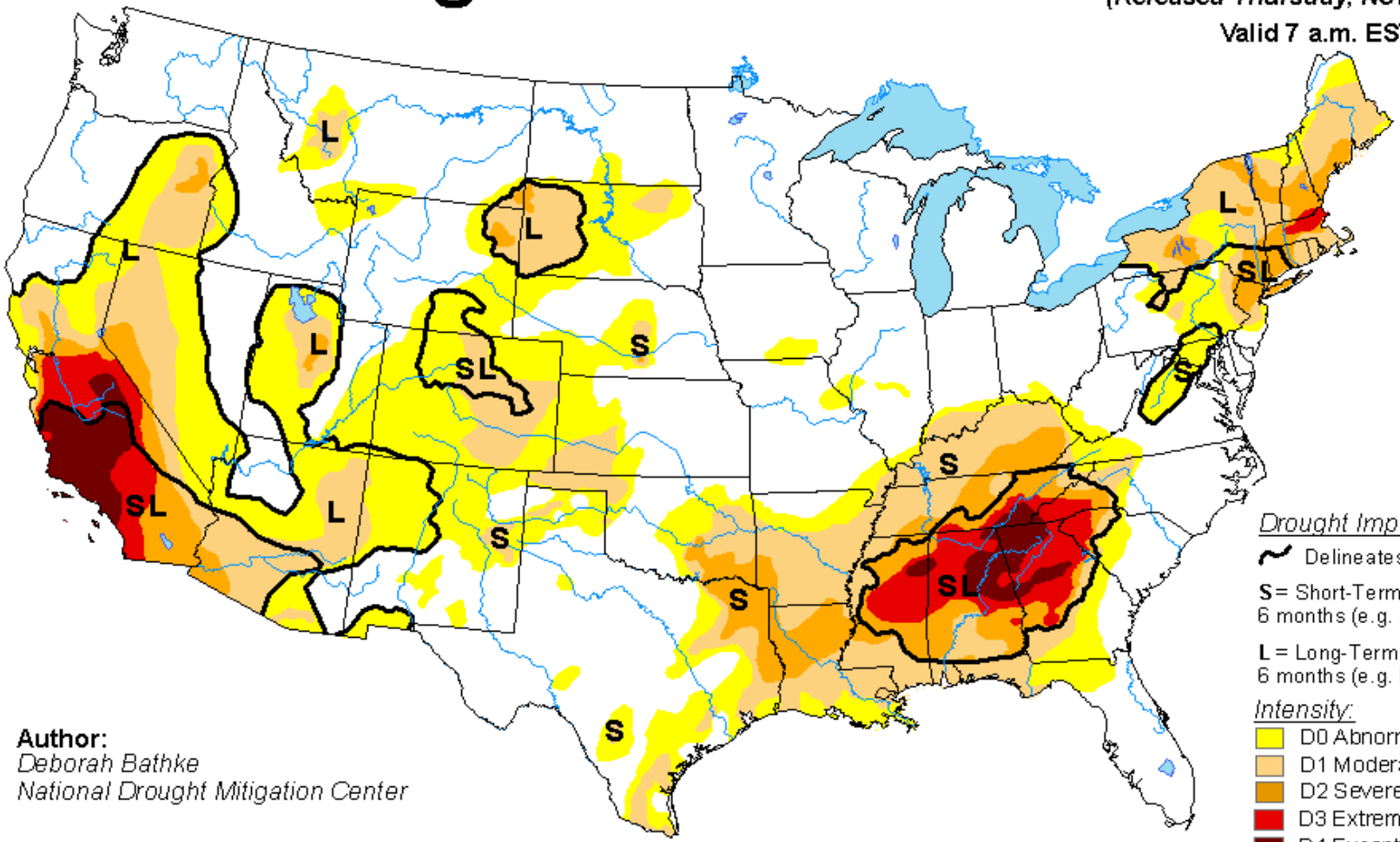

NLDAS Top 1m Soil Moisture
While in-situ soil moisture data is virtually non-existent in GIS format for USDM authors, we do get modeled soil moisture; NLDAS soil moisture percentiles are provided by Dr. Youlong Xia at the Environmental Modeling Center (EMC), National Centers for Environmental Prediction (NCEP)
Percentile
>98
95
90
80
70
30
20
10
5
2
< 2

U.S. Drought Monitor

November 8, 2016

(Released Thursday, Nov. 10, 2016)

Valid 7 a.m. EST



Author:
Deborah Bathke
National Drought Mitigation Center

Drought Impact Types:

~ Delineates dominant impacts

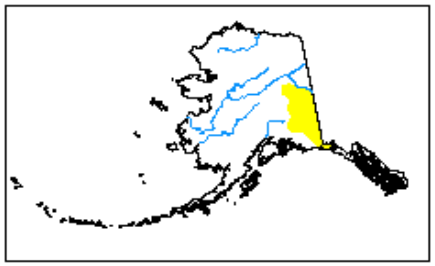
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

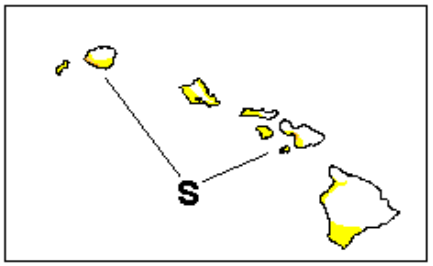
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

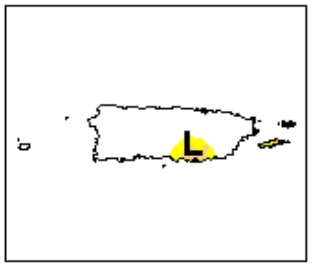
Intensity:

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

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







USDA

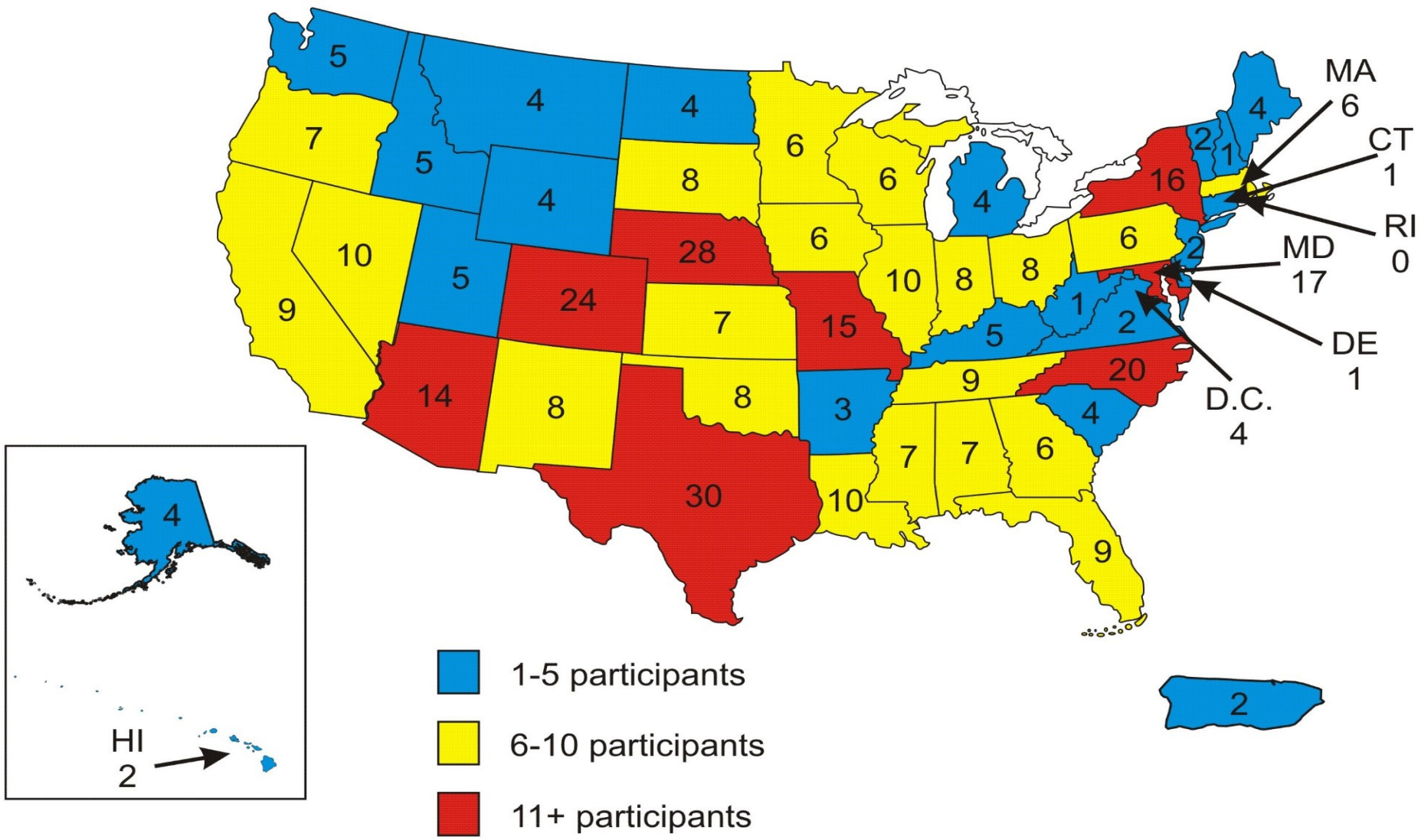
National Drought Mitigation Center

NOAA

http://droughtmonitor.unl.edu/

USDM Listserve Subscribers

(as of August 24, 2016)

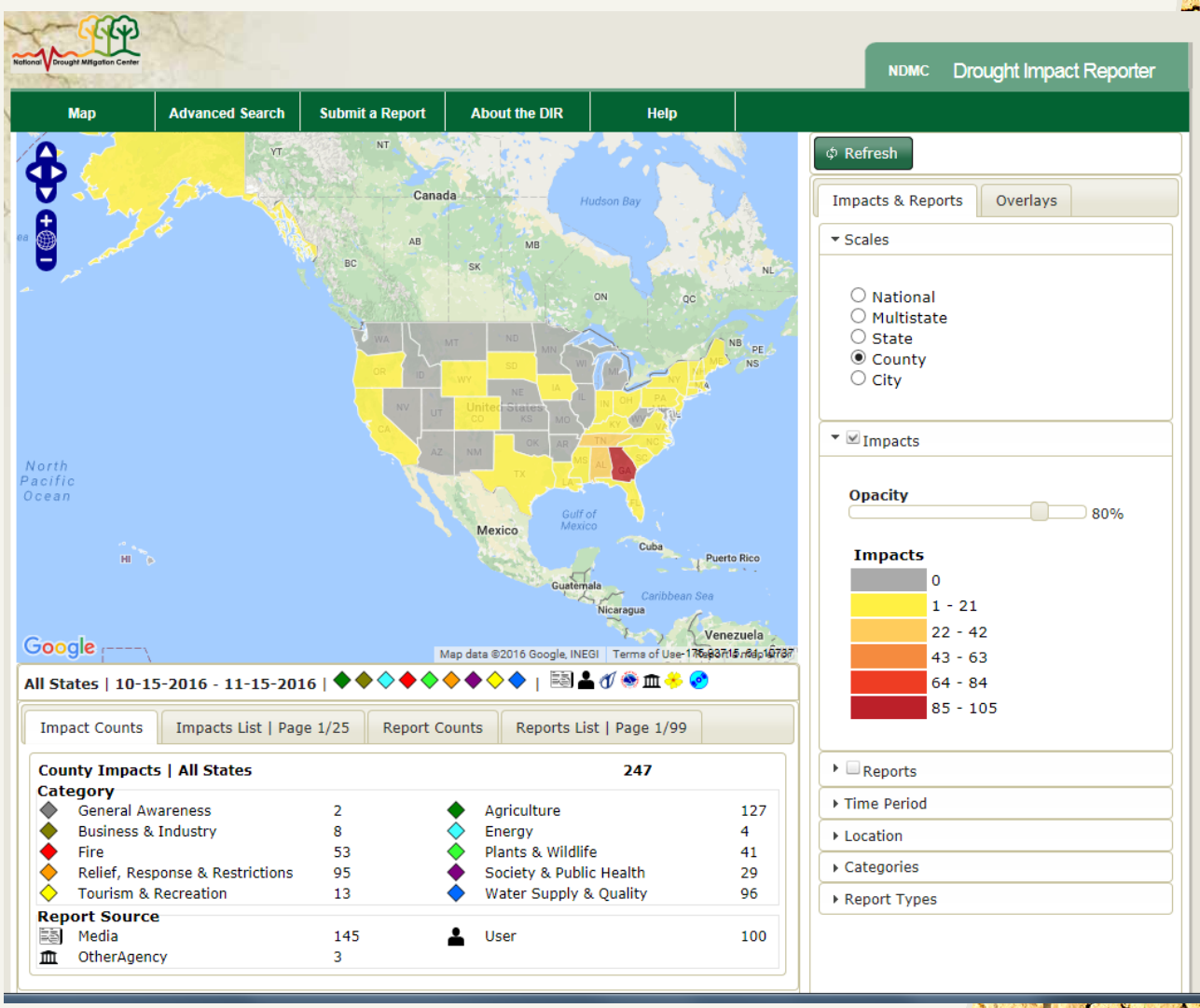


Total: *400+* **does not include 2 participants from Canada and 2 participants from Brazil)**

droughtreporter.unl.edu

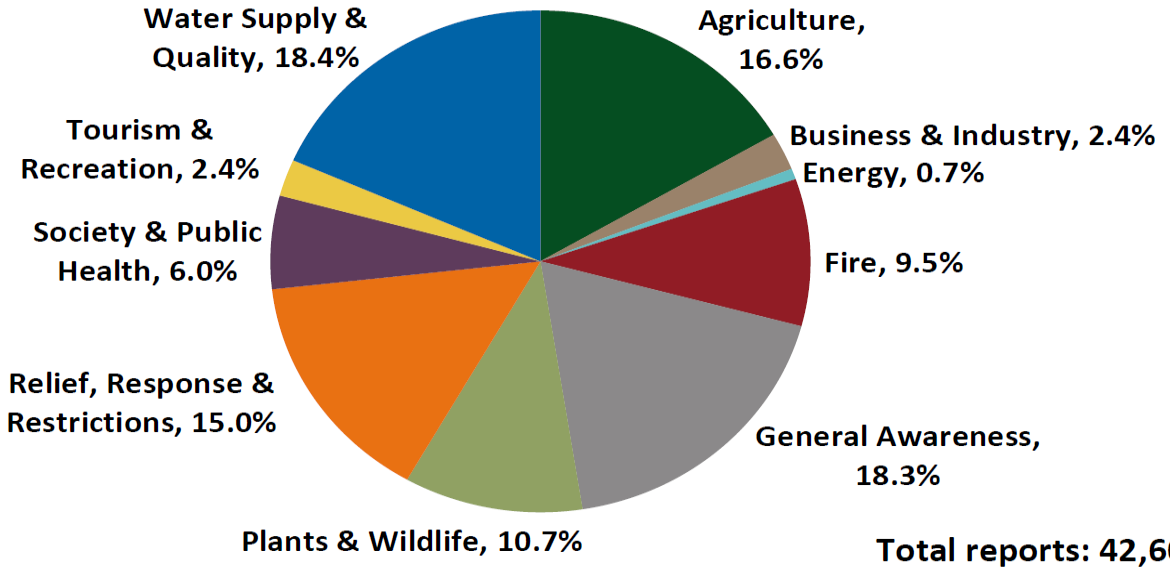
Drought Impact Reporter (DIR):

- On-line since 2005
- 42,000+ media reports and 21,000+ 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



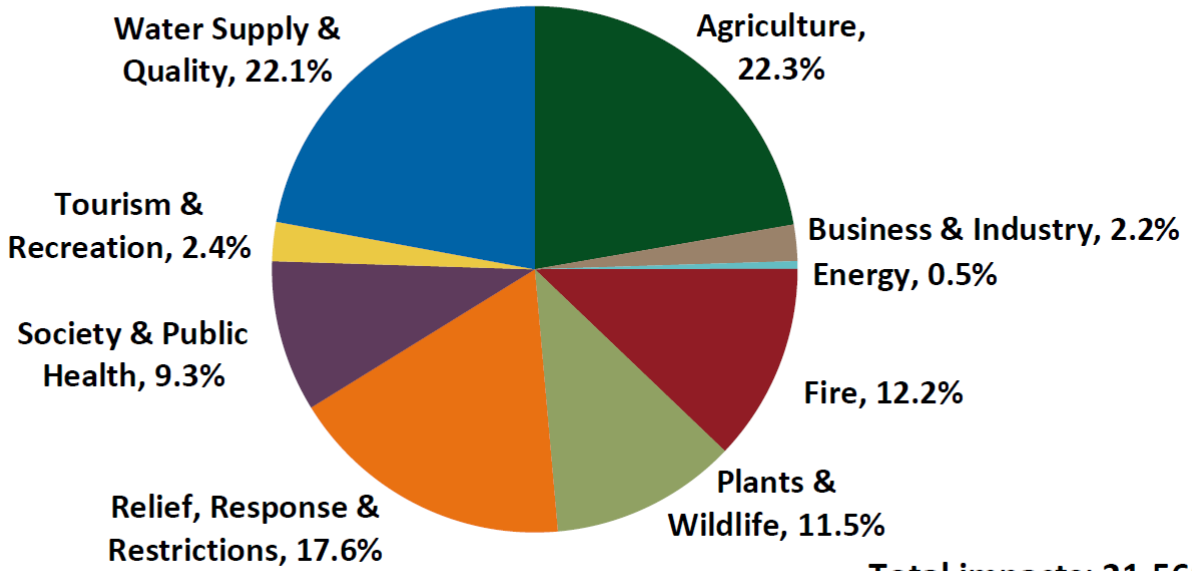
National Drought Mitigation Center

All reports in the Drought Impact Reporter



Total reports: 42,607

All impacts in the Drought Impact Reporter



Total impacts: 21,569

Next Steps

- **Continue *interactions* with local drought task forces, State Climate Offices, USDA-Service Centers, NOAA-WFOs/RFCs, Regional Climate Centers and RISAs**
  - **Foster new basin/state interactions *(USDA Climate Hubs)***
  - **NIDIS RDEWS basin briefings…more coming**
    - **S.Plains/California-Nevada/Missouri-Midwest Basins/Carolinas/Pacific NW-Columbia/others??**
    - **Potential transferability**
  - **USDM 101 (User's Guide)**
- **Continue to encourage and incorporate *new/enhanced/innovative products via GIS*:**
  - **ACIS gridded SPI-SPEI/sc-PDSI**
  - **Gridded Objective Indice Blends *(coming in 2017)***
  - **AHPS Precipitation (+ SPEI) from National Weather Service**
  - **Augment *in situ* with remote sensing products (ESI, ET, EDDI, RH, VPD, VIs)**
  - **NLDAS, Composite Drought Indices, Soil Moisture (SMAP)**

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Final Thoughts

- Drought Early Warning System (DEWS) = Monitoring ***AND*** Forecasting
- ***Due Diligence*** needed ("even if we had a perfect forecast"….)
  - Onset, intensity, magnitude, recovery
  - Drought should never sneak up on anybody
- Monitoring is the ***foundation*** of risk management planning
  - ***Trigger for who does what and when!***
  - ***One can not manage what is not monitored….and you can't monitor what you don't measure!***

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