U.S. Drought Monitor:
An Author's Perspective

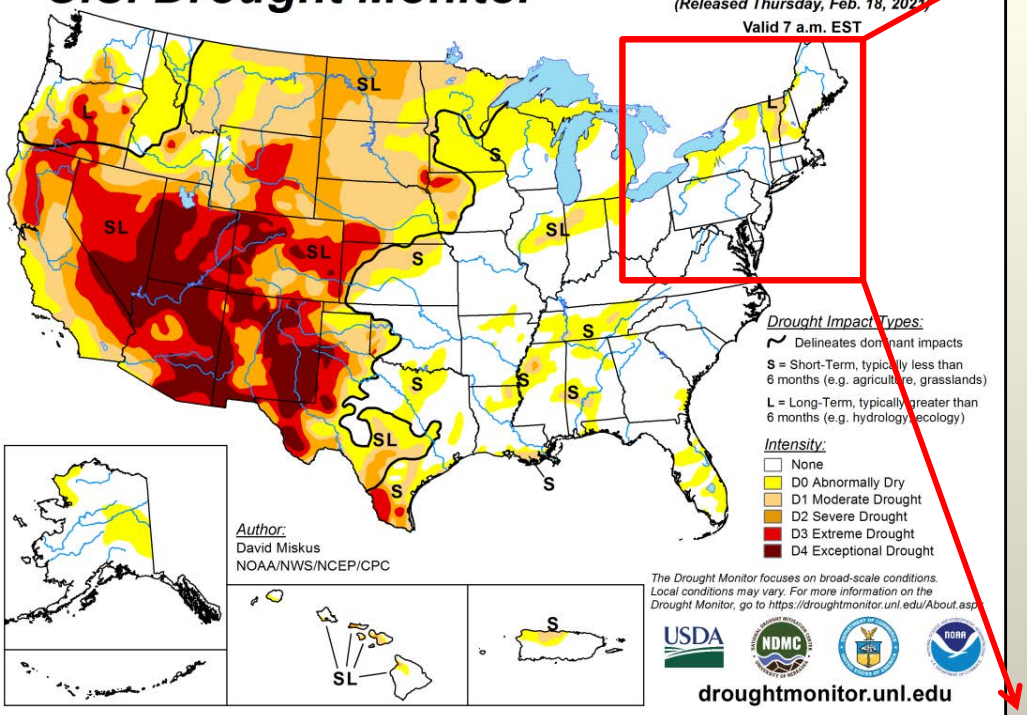
David Miskus

Climate Prediction Center/NCEP/NWS/NOAA

NOAA Eastern Region Climate Services Webinar
Thursday, February 25, 2021, 9:30-10:30 am EST

U.S. Drought Monitor

February 16, 2021
(Released Thursday, Feb. 18, 2021)
Valid 7 a.m. EST



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:
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

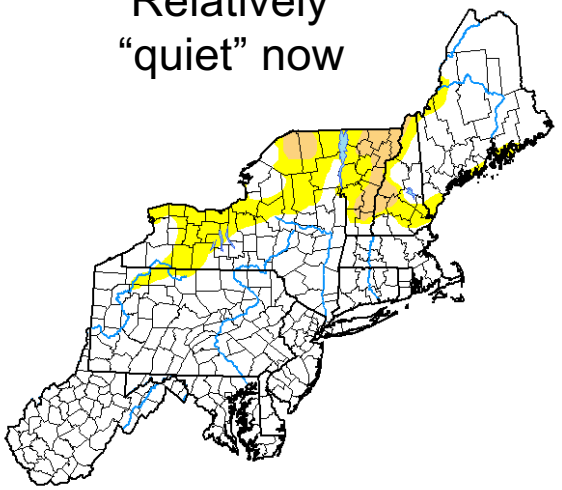
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
David Miskus
NOAA/NWS/NCEP/CPC

droughtmonitor.unl.edu

U.S. Drought Monitor
Northeast

Relatively "quiet" now



February 16, 2021
(Released Thursday, Feb. 18, 2021)
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Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	81.85	18.15	3.90	0.00	0.00	0.00
Last Week 02-09-2021	81.85	18.15	3.90	0.00	0.00	0.00
3 Months Ago 11-17-2020	40.61	59.39	34.06	4.54	0.75	0.00
Start of Calendar Year 12-29-2020	77.61	22.39	3.63	0.00	0.00	0.00
Start of Water Year 09-29-2020	29.83	70.17	45.34	26.30	3.91	0.00
One Year Ago 02-18-2020	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:
- None
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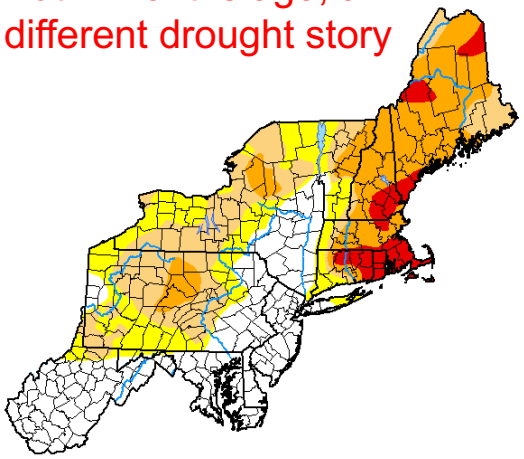
U.S. Drought Monitor
Northeast

But 4 months ago, a different drought story



Dryness + Heat

October 6, 2020
(Released Thursday, Oct. 8, 2020)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	32.76	67.24	49.35	27.27	5.85	0.00
Last Week 09-29-2020	29.83	70.17	45.34	26.30	3.91	0.00
3 Months Ago 07-07-2020	22.54	77.46	26.07	2.01	0.00	0.00
Start of Calendar Year 12-31-2019	99.61	0.39	0.00	0.00	0.00	0.00
Start of Water Year 09-29-2020	29.83	70.17	45.34	26.30	3.91	0.00
One Year Ago 10-08-2019	56.34	43.66	10.09	1.29	0.00	0.00

Intensity:
- None
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- D4 Exceptional Drought

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Author:
Brian Fuchs
National Drought Mitigation Center

droughtmonitor.unl.edu

Outline:

✓ U.S. Drought Monitoring

a) before the U.S. Drought Monitor (USDM);

b) USDM Background & Concepts;

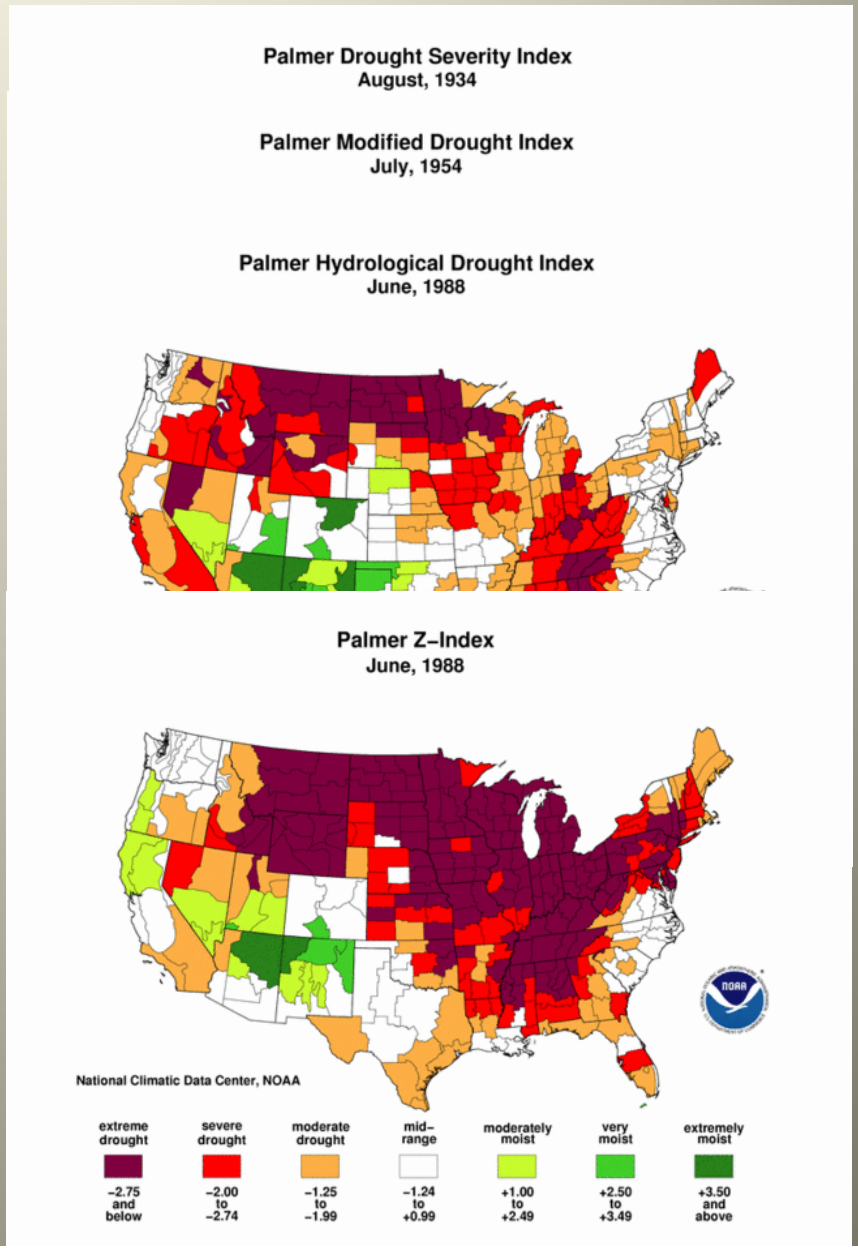
c) USDM Process (Analysis & Preparation)

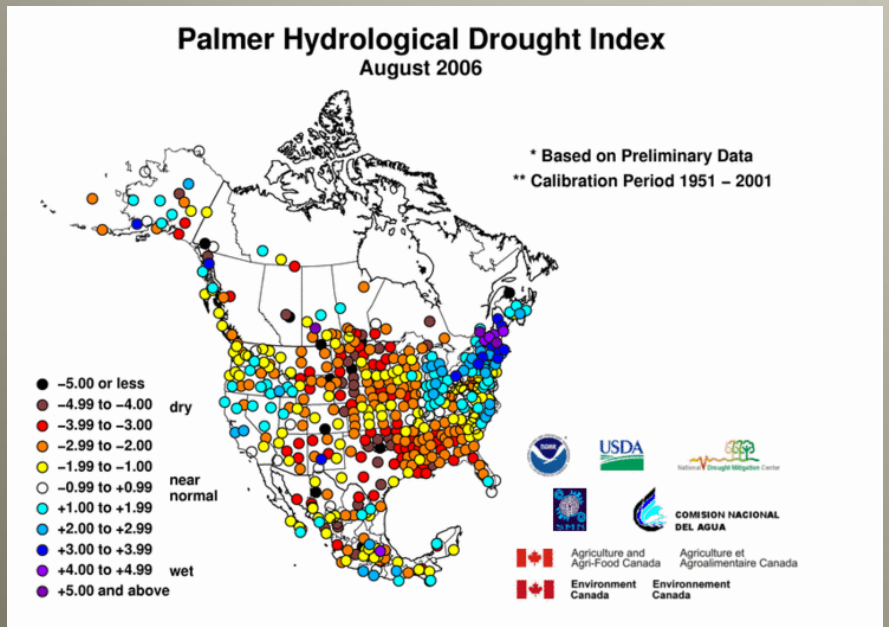
- Examination of Indicators;
- GIS ArcMap;
- Impacts & Reports from the Field;
- Conundrums of the USDM;
- Final thoughts from a newly-retired USDM author

Drought Monitoring before the USDM

✓ 1960s-1990s: Palmer Drought Index Reigned Supreme

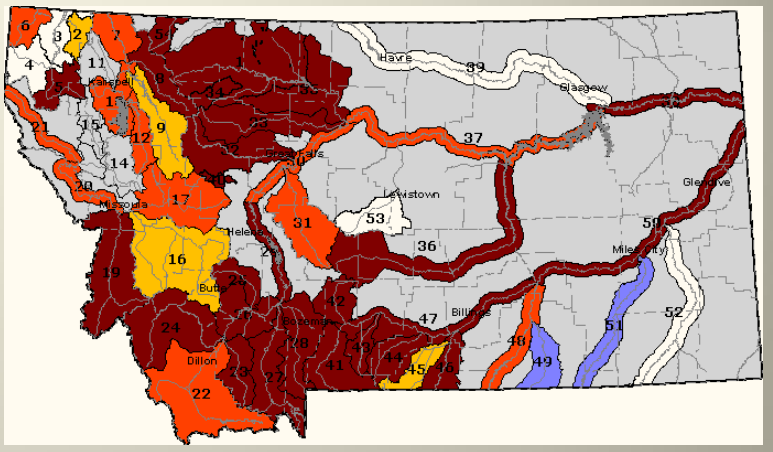
- Mostly for U.S. climate divisions on Mainland
- Water budget model with primitive soil moisture component
- Balance between water supply and water demand
- normalized index: - dry, + wet, 0 neutral



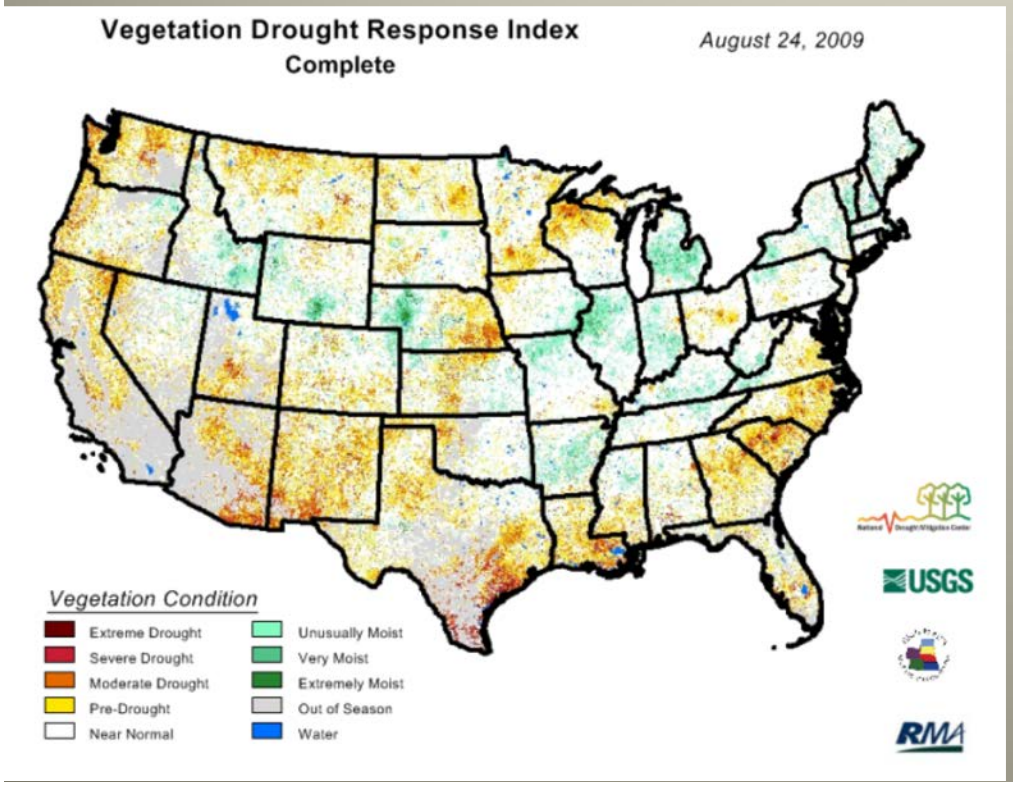


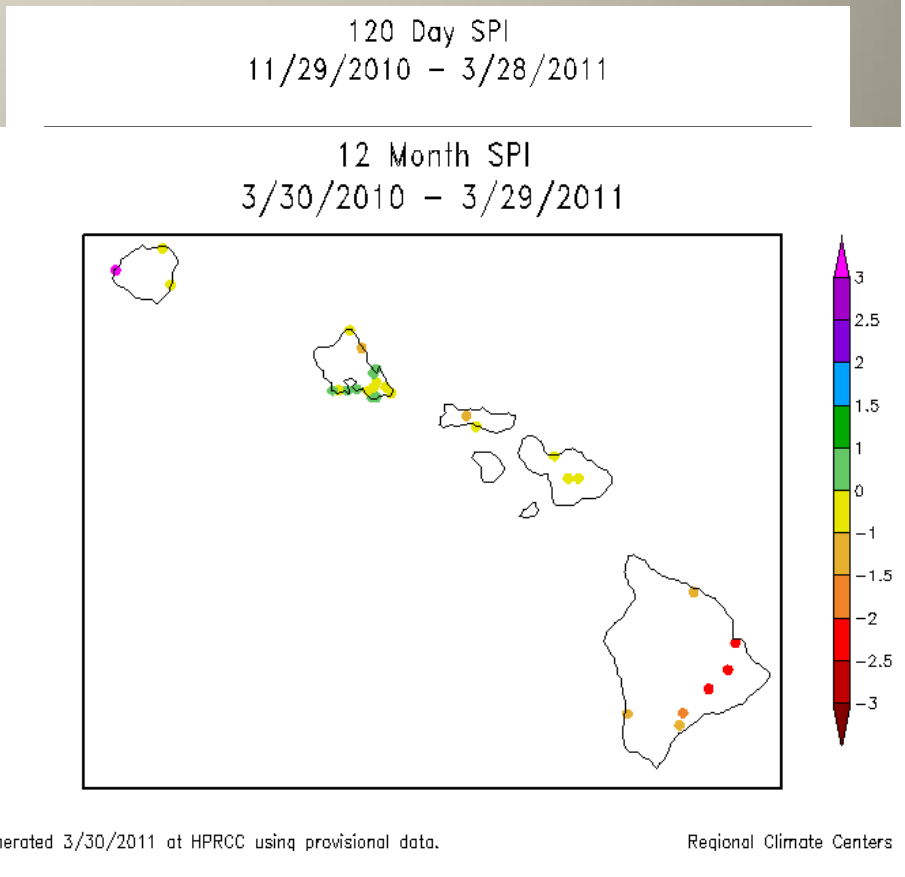
Drought Monitoring before the USDM

- ✓ **Other Drought Indices**
  - SWSI (Surface Water Supply Index)
  - SPI (Standardized Precipitation Index)
  - VegDRI
  - many others



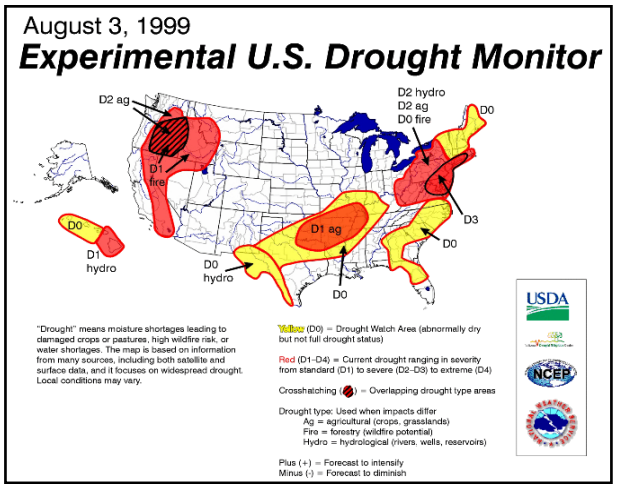
http://www.ncdc.noaa.gov/oa/climate/research/dm/weekly-dm-animations.html

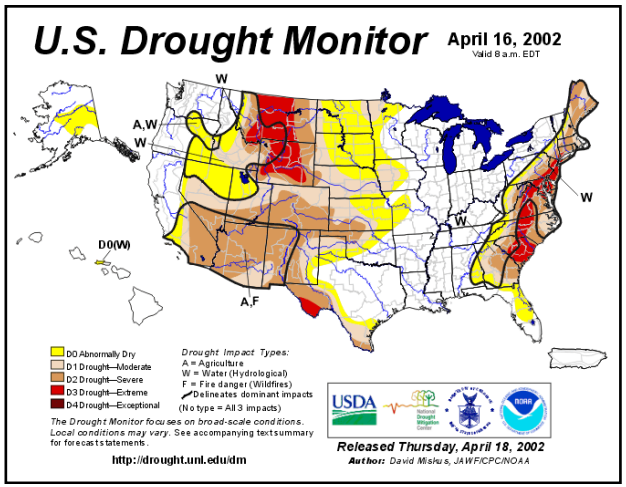


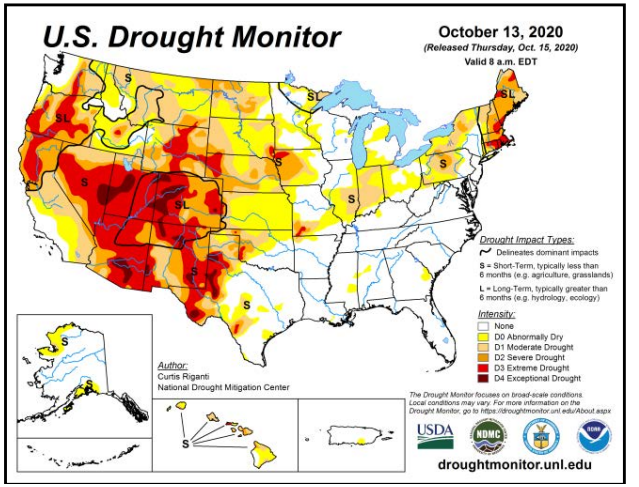


USDM Background

- Since 1999, ~11 authors between NOAA (CPC & NCEI), NDMC, USDA, & RCC's (WRCC) have produced a **weekly** composite drought map with input from numerous federal & non-federal partners (~450 experts).
  - Released Thursday 12:30 UTC for the period 12 UTC last Tuesday to 12 UTC this Tuesday;
  - Initially, both U.S. Drought Monitor & Drought Outlook (DO) combined into 1 map (drought monitoring & forecasting);
  - In 2000, split into 2 separate products, USDM & Seasonal DO;
  - In 2003, from CorelDraw to GIS (ArcMap) to create the maps (overlay inputs);
  - 5 Categories (4 Drought): (D0=Abnormal dryness; D1=Moderate; D2=Severe; D3=Extreme; D4=Exceptional);







USDM Background

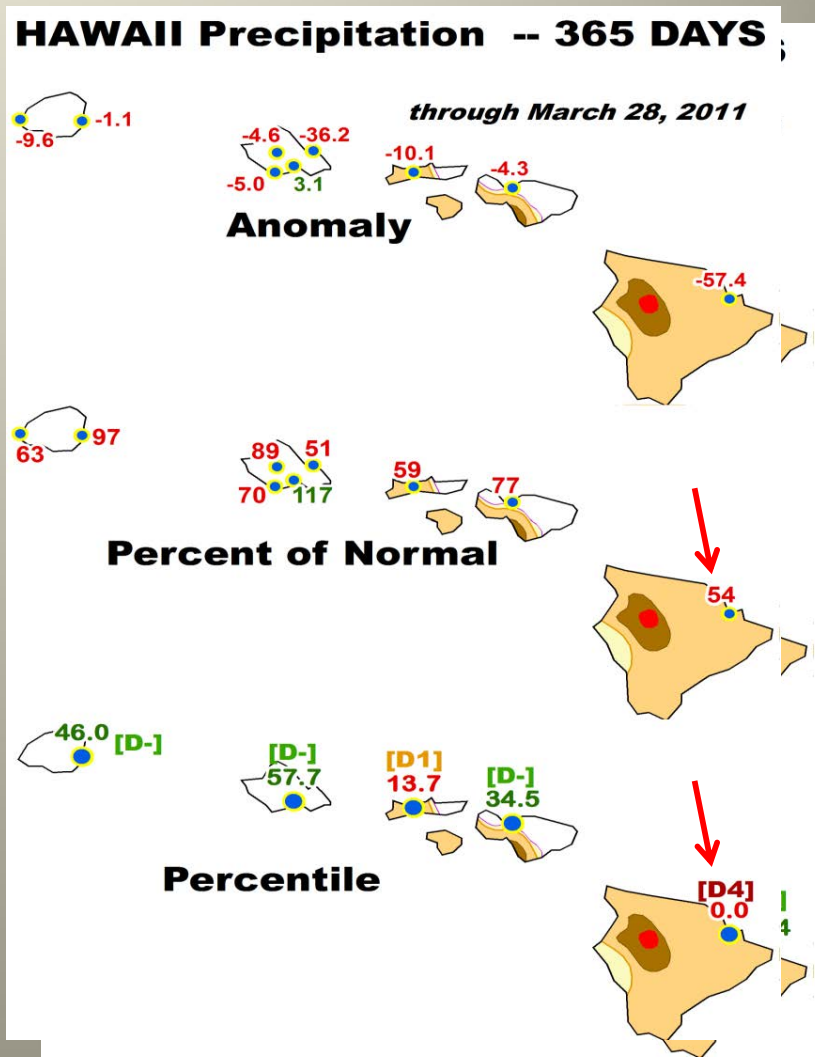
- A **consolidation** of current conditions and current impacts into one comprehensive national drought map. The DM…
  - Is NOT a model (manually made weekly based off previous map);
  - Is NOT just interpreting precipitation;
  - Is NOT a forecast (see Drought Outlook) or drought declaration;
  - Incorporate local expert input (by email, impact reports, & tweets);
  - Identifying impacts (“S” <6-months; “L” >6-months; “SL” both);
  - Be as **objective** as possible (using percentiles methodology). The physical data & indicators must support the map depiction. The impact data validates physical data.

USDM Background

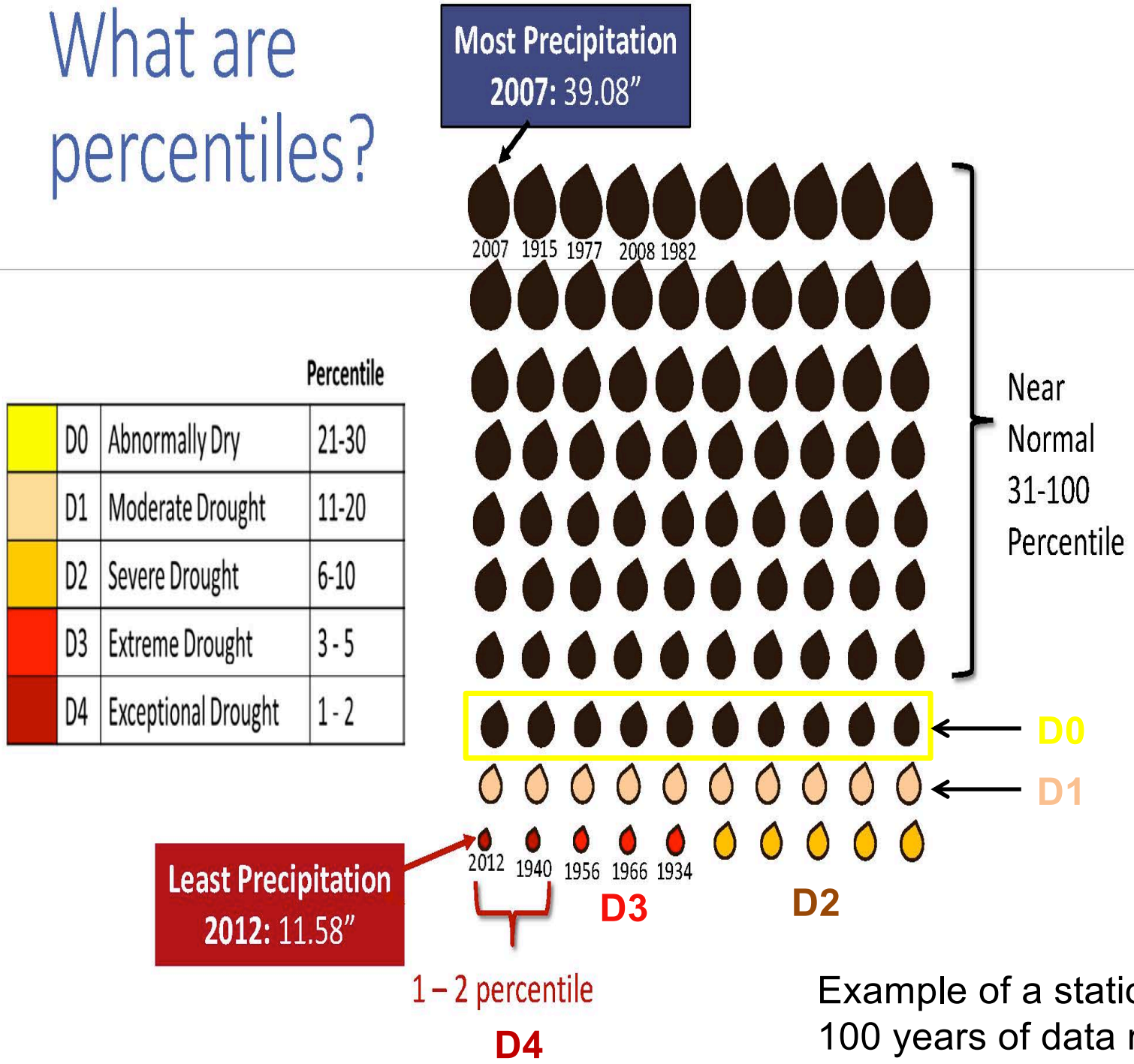
- A **"Convergence of Evidence"** approach.
  - Many types of drought "information" can be collectively analyzed
    - Determining if majority of information is "converging" (telling the same story) about the accuracy, or inaccuracy, of the drought as depicted by the DM;
  - Authors need to look at 100% of the data, but don't believe in any one piece of data input 100% in making a decision…
  - Multiple indicators & many types of info are part of the analysis;
    - These data will identify different climatic & hydrologic parameters which are needed to understand the complete picture of a drought indicator's performance and how they interact;
  - Impacts are the "ground truth", yet aren't monitored to the extent which other data are…you can't measure what you don't monitor!
- The DM rates drought intensity by **percentile ranks**:
  - Can be applied to any parameter;
  - Can be used for any length of data record;
  - Puts drought into historical perspective (how many occurrences in a give period of time)

Percentile versus Percent of Normal

- ✓ ***Percent of Normal*** **compares the value to some base period mean (*1981-2010,* a 30-year average)**
- ✓ ***Percentile*** **expresses how rare the value is compared to its historical record**
- ✓ **Examples:**
  - 30-days: 33% of normal occurs once every 5 years (20th percentile) (not a big deal)
  - 365-days: 54% of normal occurs rarely (once every 100 years or less often) (0th percentile) (rare, record dry?) *(click for map)*



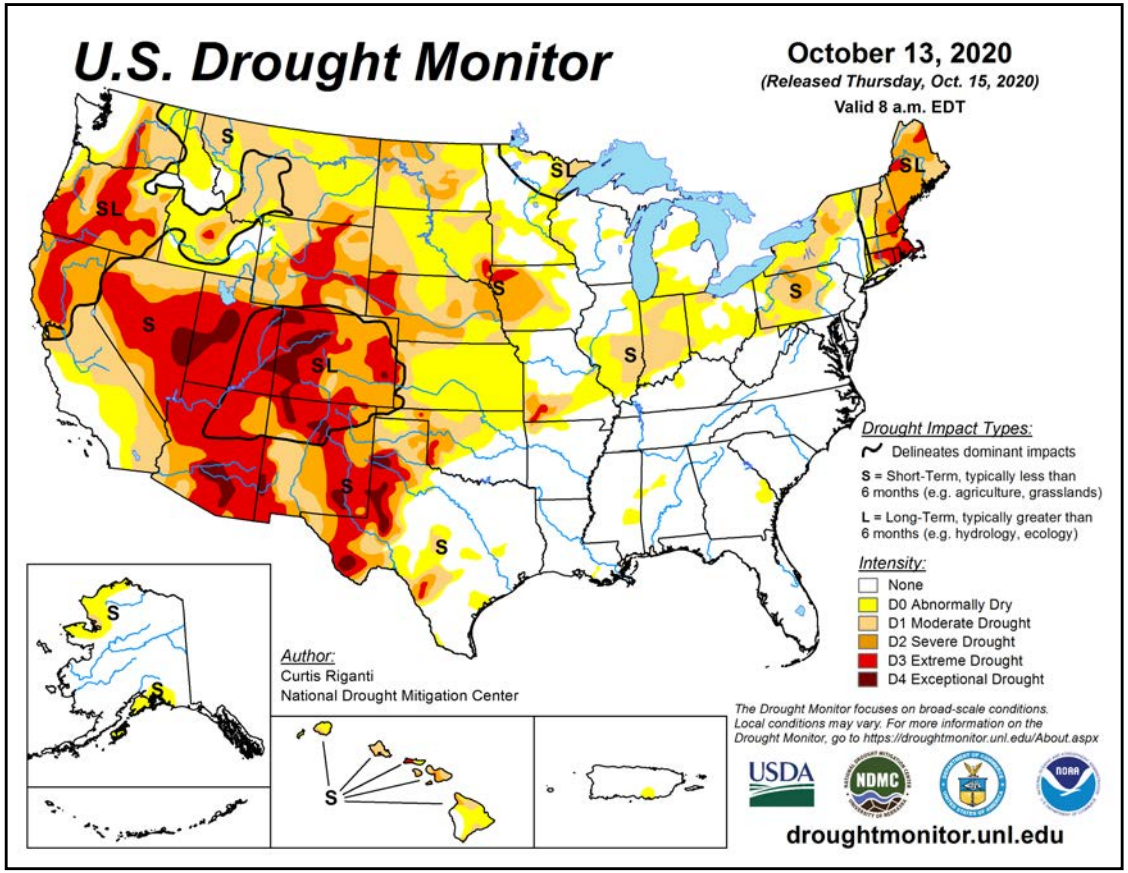
What are percentiles?



		Percentile
D0	Abnormally Dry	21-30
D1	Moderate Drought	11-20
D2	Severe Drought	6-10
D3	Extreme Drought	3 - 5
D4	Exceptional Drought	1 - 2

Example of a station with 100 years of data records.

USDM Interpretation



Drought Intensity Categories – by Percentiles

D0 **Abnormally Dry (30%tile)**
(once every 3-5 years)

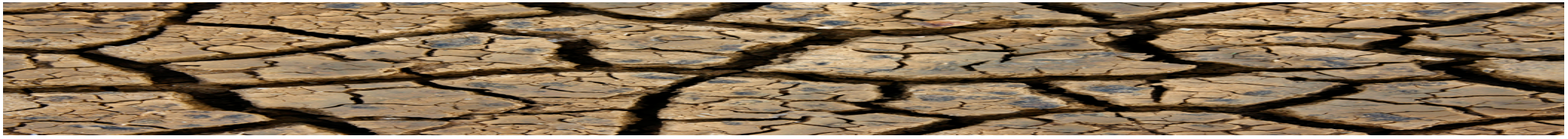
D1 Drought – **Moderate (20%tile)**
(once every 5-10 years)

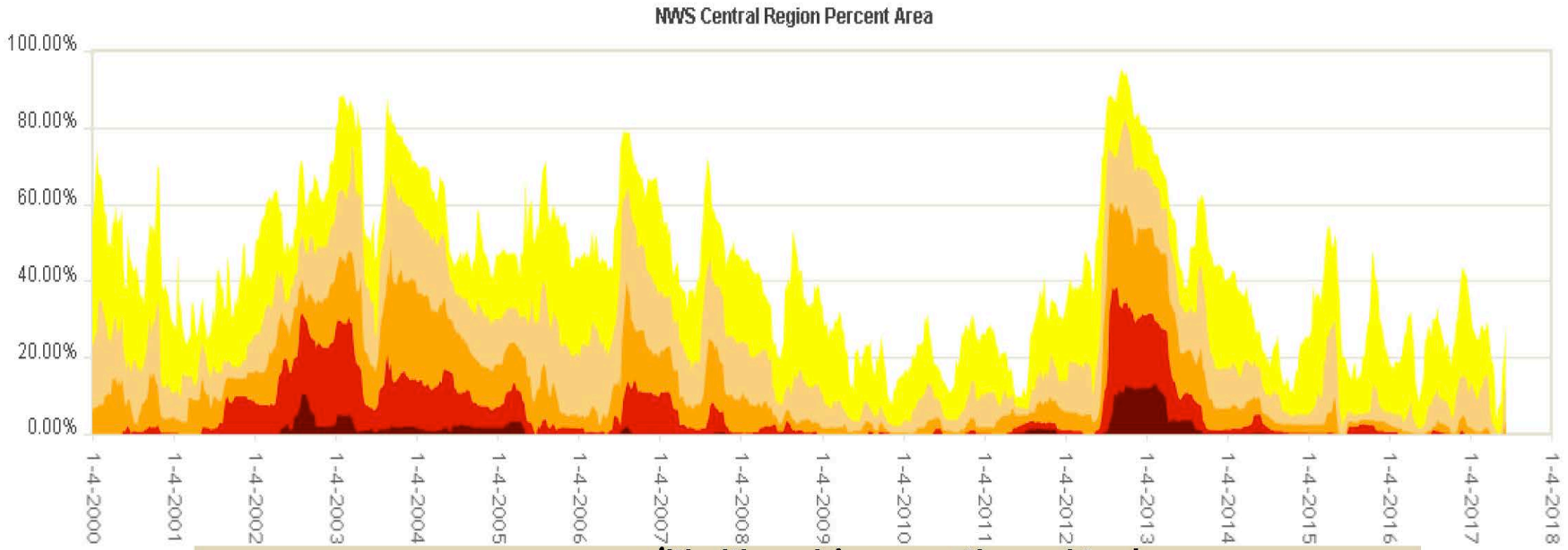
D2 Drought – **Severe (10%tile)**
(once every 10-20 years)

D3 Drought – **Extreme (5%tile)**
(once every 20-50 years)

D4 Drought – **Exceptional (2%tile)**
(once every 50+ years)

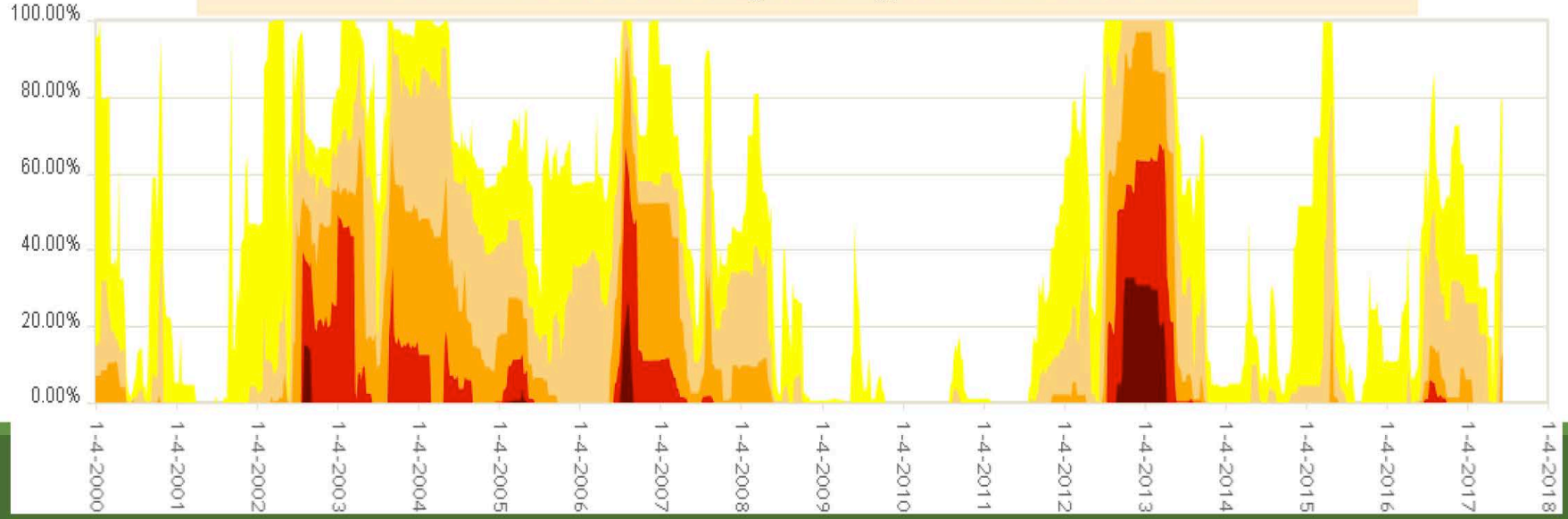
Impacts (“S” <6-months; “L” >6-months; “SL” both);

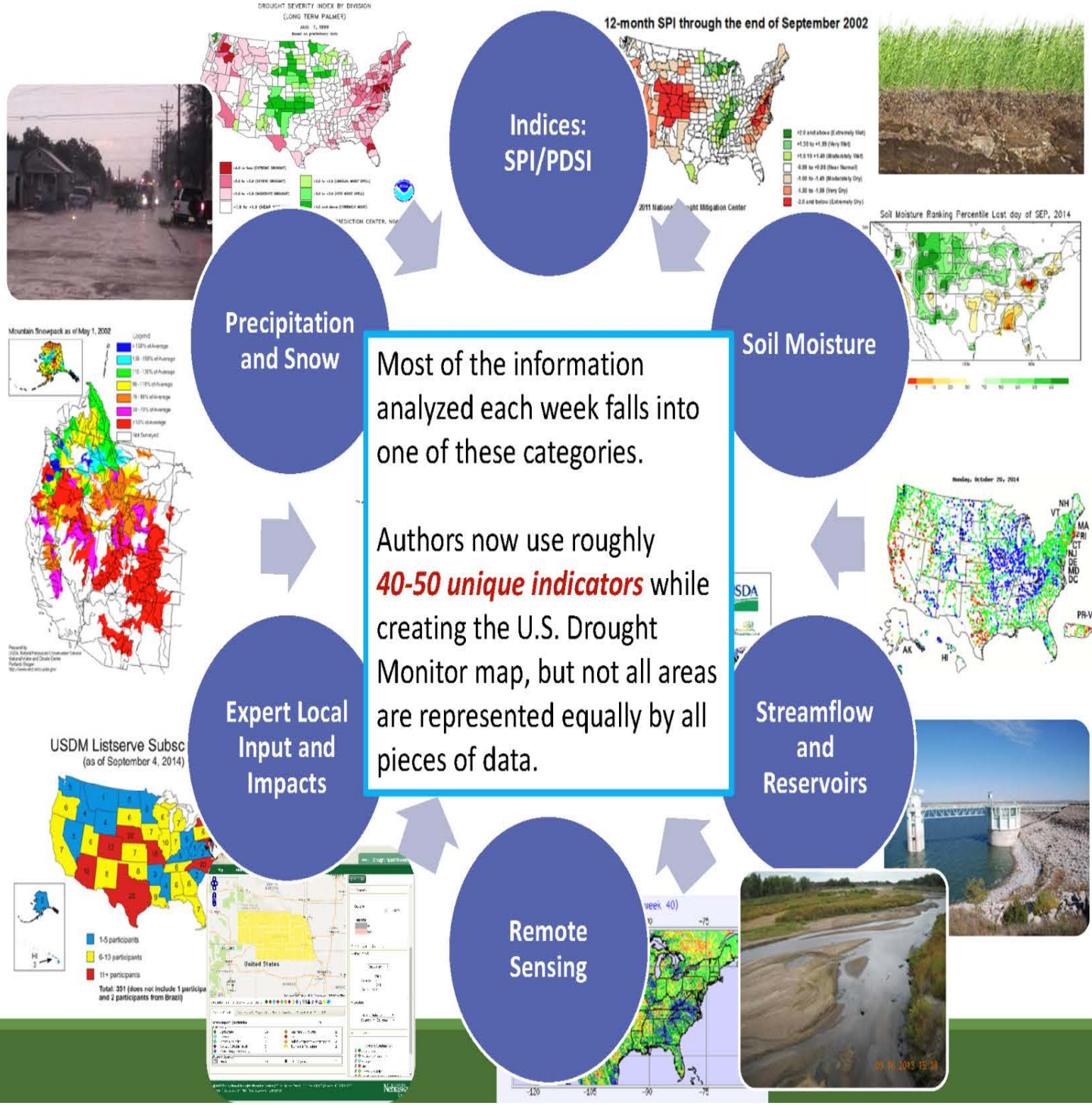




occurrence/likelihood (percentile ranking)

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!!"




Indices: SPI/PDSI
Precipitation and Snow
Soil Moisture
Expert Local Input and Impacts
Streamflow and Reservoirs
Remote Sensing
Most of the information analyzed each week falls into one of these categories.
Authors now use roughly 40-50 unique indicators while creating the U.S. Drought Monitor map, but not all areas are represented equally by all pieces of data.
12-month SPI through the end of September 2002
Soil Moisture Ranking Percentile Last day of SEP, 2014
Mountain Snowpack as of May 1, 2002
USDM Listserve Subsc
(as of September 4, 2014)
1-5 participants
6-10 participants
11+ participants

U.S. Drought Monitor

Integrates Key Drought Indicators:

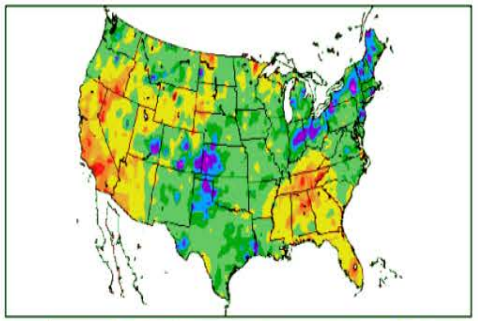
- Palmer Drought Index
- SPI
- SPEI
- KBDI
- Modeled Soil Moisture
  - NLDAS
- 7-14 Day Avg. Streamflow
- Precipitation Anomalies
- AHPS Precipitation
- Other data which are available

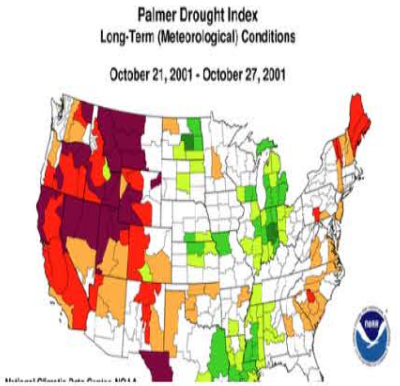
Growing Season:

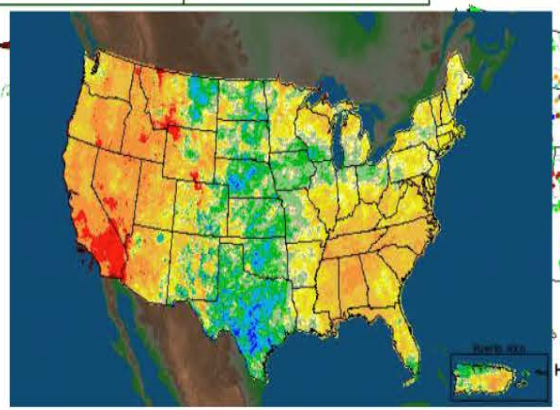
- Crop Moisture Index
- Sat. Veg. Health Index
- VegDRI/ESI/etc.
- Soil Moisture
- Mesonets
- State/Regional data

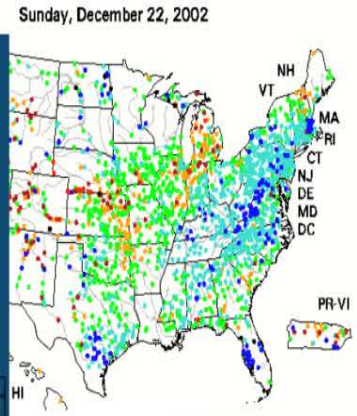
In The West:

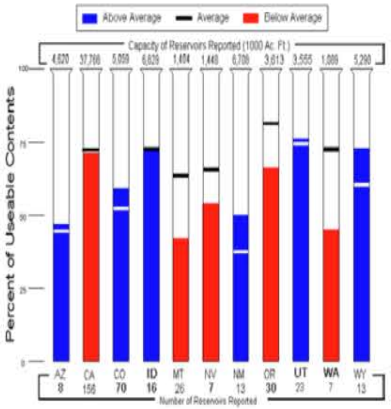
- SWSI
- Reservoir levels
- Snowpack (SNOTEL)
- SWE
- Streamflow

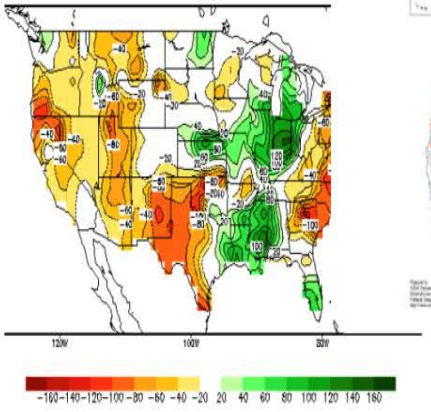


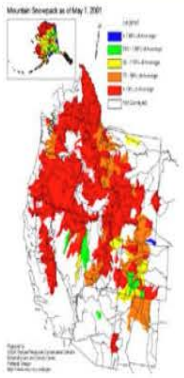










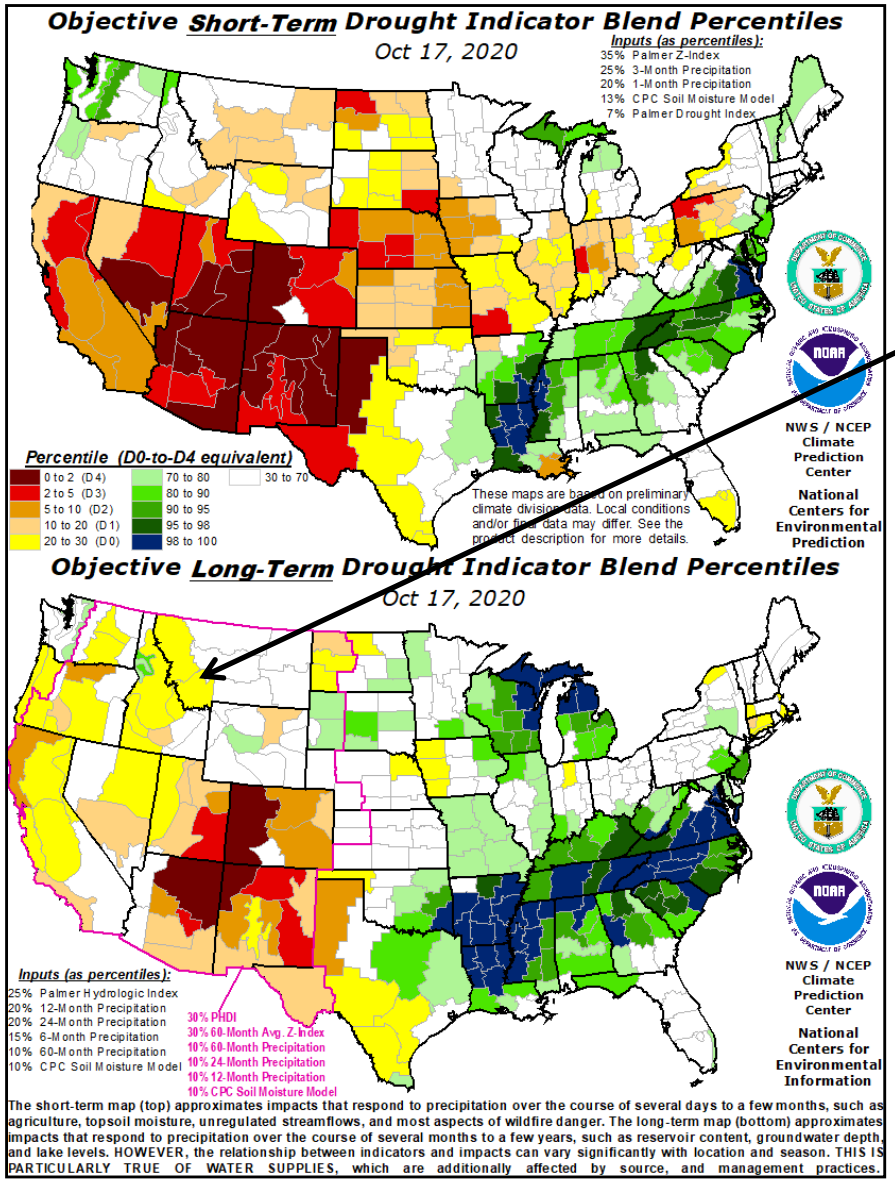


Created in ArcGIS

USDM – Examination of Indicators

http://www.drought.gov

USDM Monitoring Tools



- Want to make USDM as objective as possible;
- Several drought indices converted to percentiles, weighted, then combined to calculate Short-Term and Long-Term Objective blends. West is weighted differently in Long-Term blend;

Latest USDM Drought Classification Table with Impacts & 5 Parameters

Drought Severity Classification

Category	Description	Possible Impacts	Ranges: Palmer Drought Severity Index (PDSI)	Ranges: CPC Soil Moisture Model (Percentiles)	Ranges: USGS Weekly Streamflow (Percentiles)	Ranges: Standardized Precipitation Index (SPI)	Ranges: Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: • short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • some lingering water deficits • pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Short-term drought indicator blends focus on 1-3 month precipitation. Long-term blends focus on 6-60 months. Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Keetch-Byram Drought Index (KBDI), and NOAA/NESDIS satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West include snow water content, river basin precipitation, and the Surface Water Supply Index (SWSI). Other indicators include groundwater levels, reservoir storage, and pasture/range conditions.

Latest USDM Drought Classification Table with Impacts & 5 Parameters

Drought Severity Classification

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
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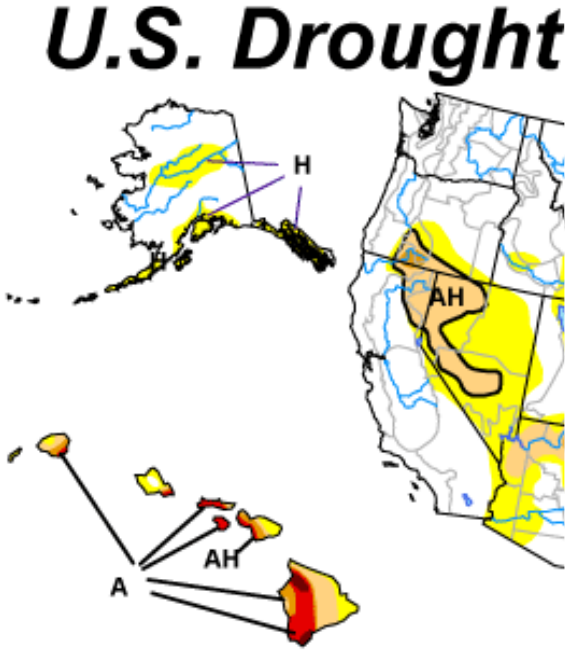
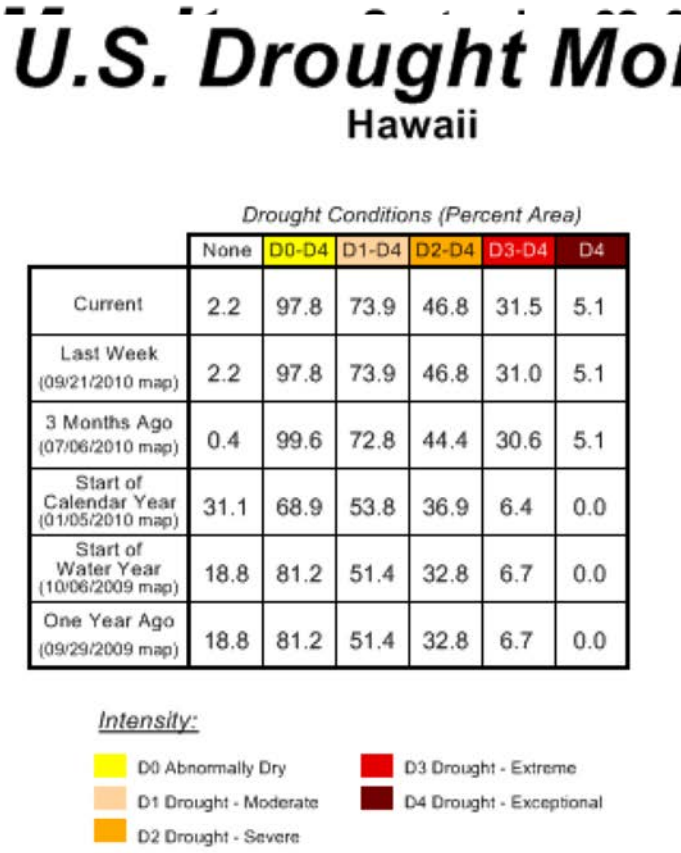
http://droughtmonitor.unl.edu/AboutUSDM/DroughtClassification.aspx

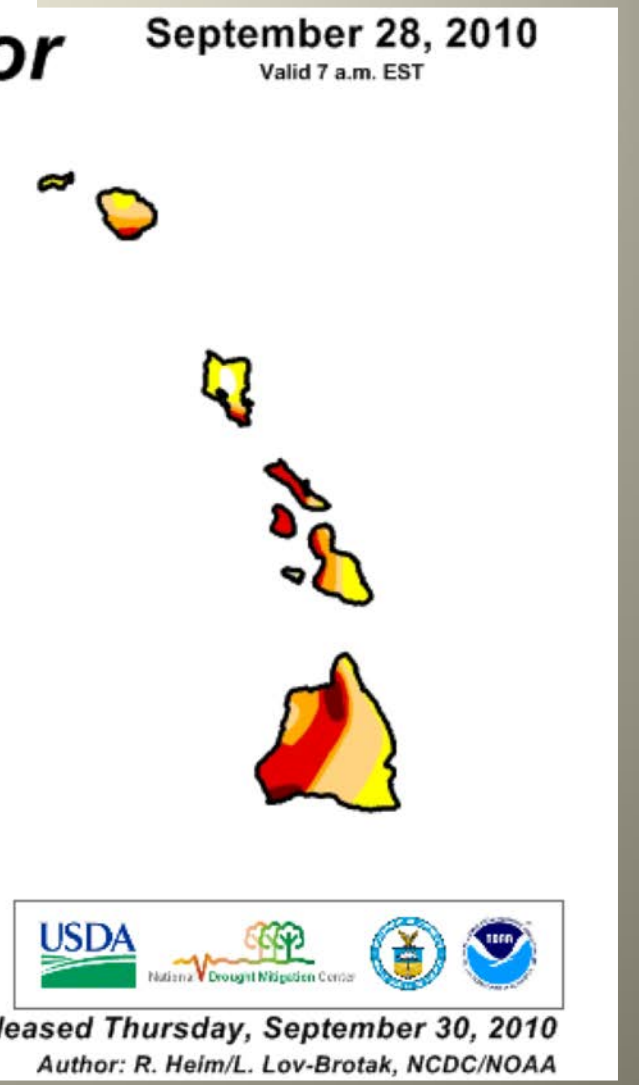
USDM – Drill Down Capability

Click on Hawaii

http://drought.unl.edu/dm/monitor.html







USDM Process *(Period starts 12Z last Tuesday)*

Monday (5-6 Days of data available)

- ✓Draft map sent to local experts

Tuesday (6-7 Days of data available)

- ✓Local expert feedback
- ✓Draft map sent to local experts
- ✓Draft text sent to local experts

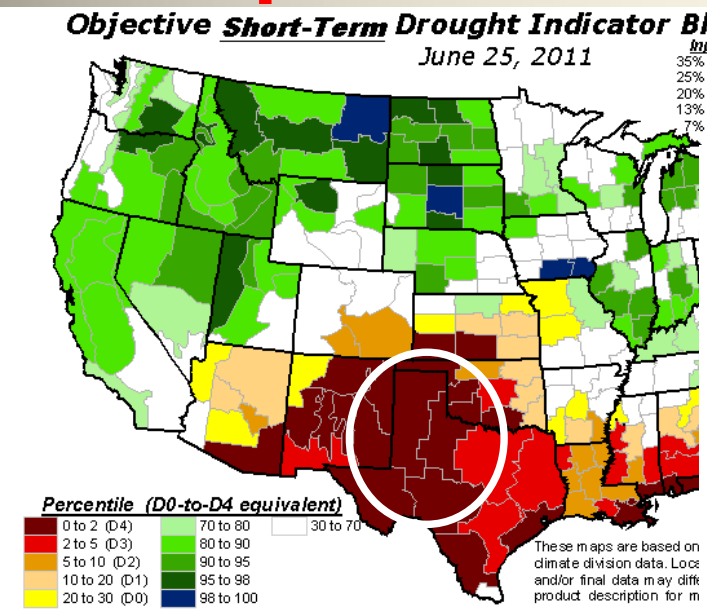
Wednesday (7 Days available; ending 12Z yesterday)

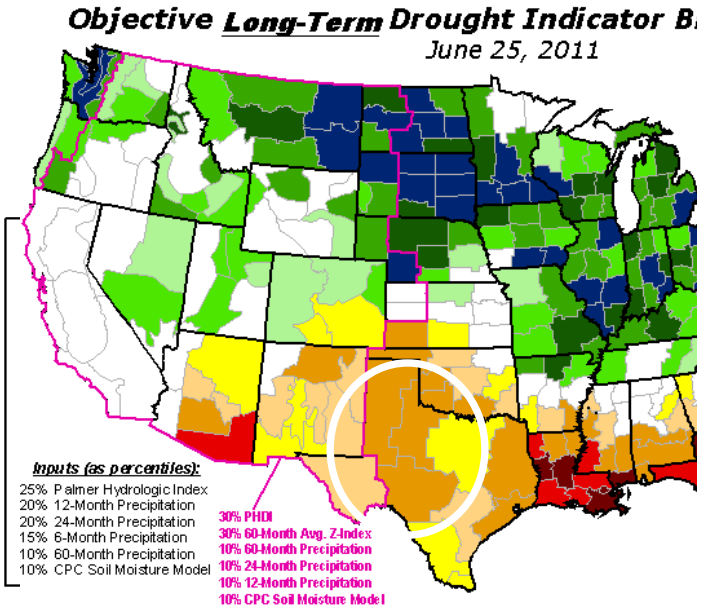
- ✓ Local expert feedback
- ✓ Draft map(s) sent to local experts
- ✓ Draft text(s) sent to local experts (Outlook)
- ✓ Final map and text sent to secured ftp server

Thursday

- ✓Final map & text released on NDMC Website

Sample Run-Through of Drought Indicators

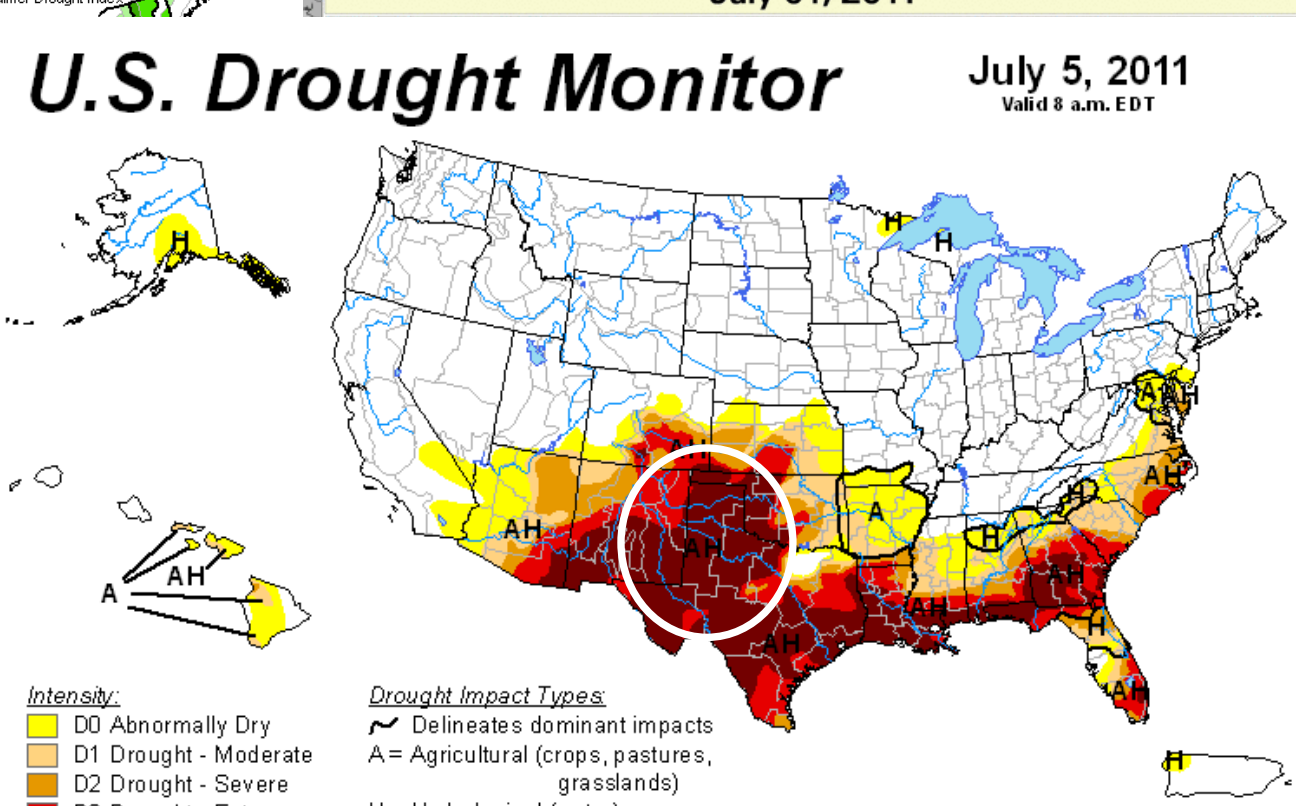




The short-term map (top) approximates impacts that respond to precipitation over the course of several days to a few months, such as agriculture, topsoil moisture, unregulated streamflows, and most aspects of wildfire danger. The long-term map (bottom) approximates impacts that respond to precipitation over the course of several months to a few years, such as reservoir content, groundwater depth, and lake levels. HOWEVER, the relationship between indicators and impacts can vary significantly with location and season. THIS IS PARTICULARLY TRUE OF WATER SUPPLIES, which are additionally affected by source and management practices.

VIC Total Moisture Storage Percentiles (wrt/ 1916-2004)

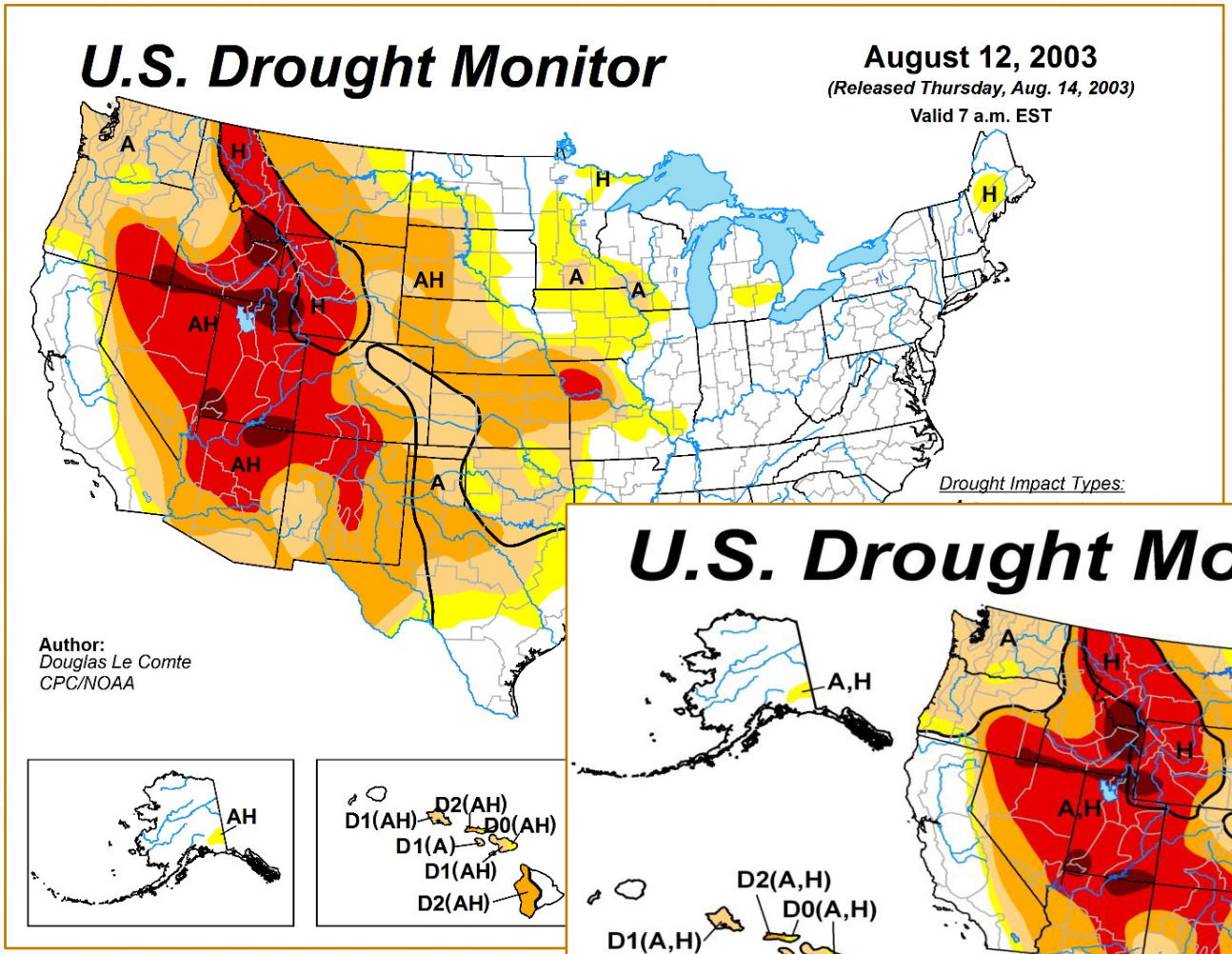
Current Large Incidents
July 01, 2011



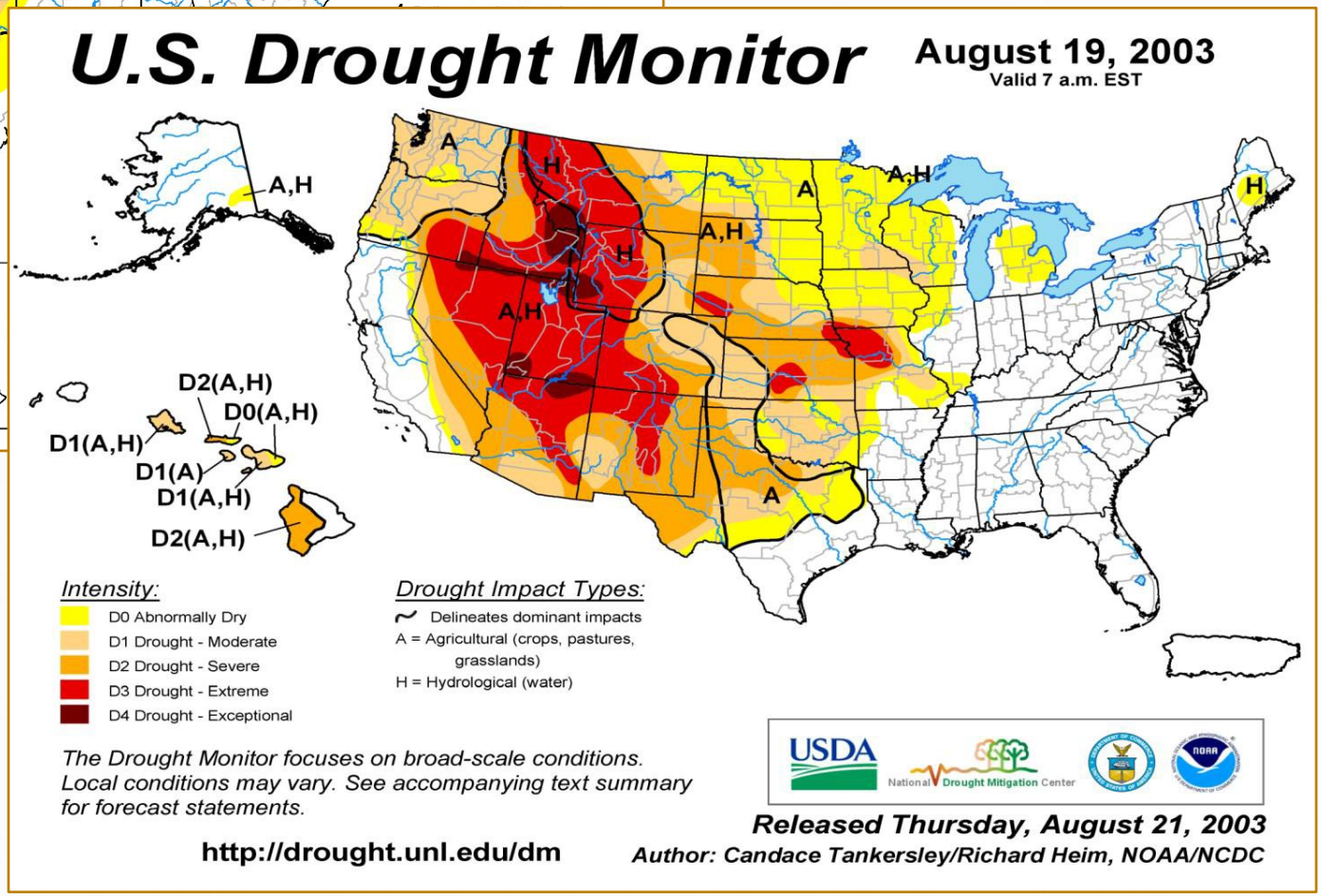
Data Center

15 - 25
10 - 15
5 - 10
0 - 5

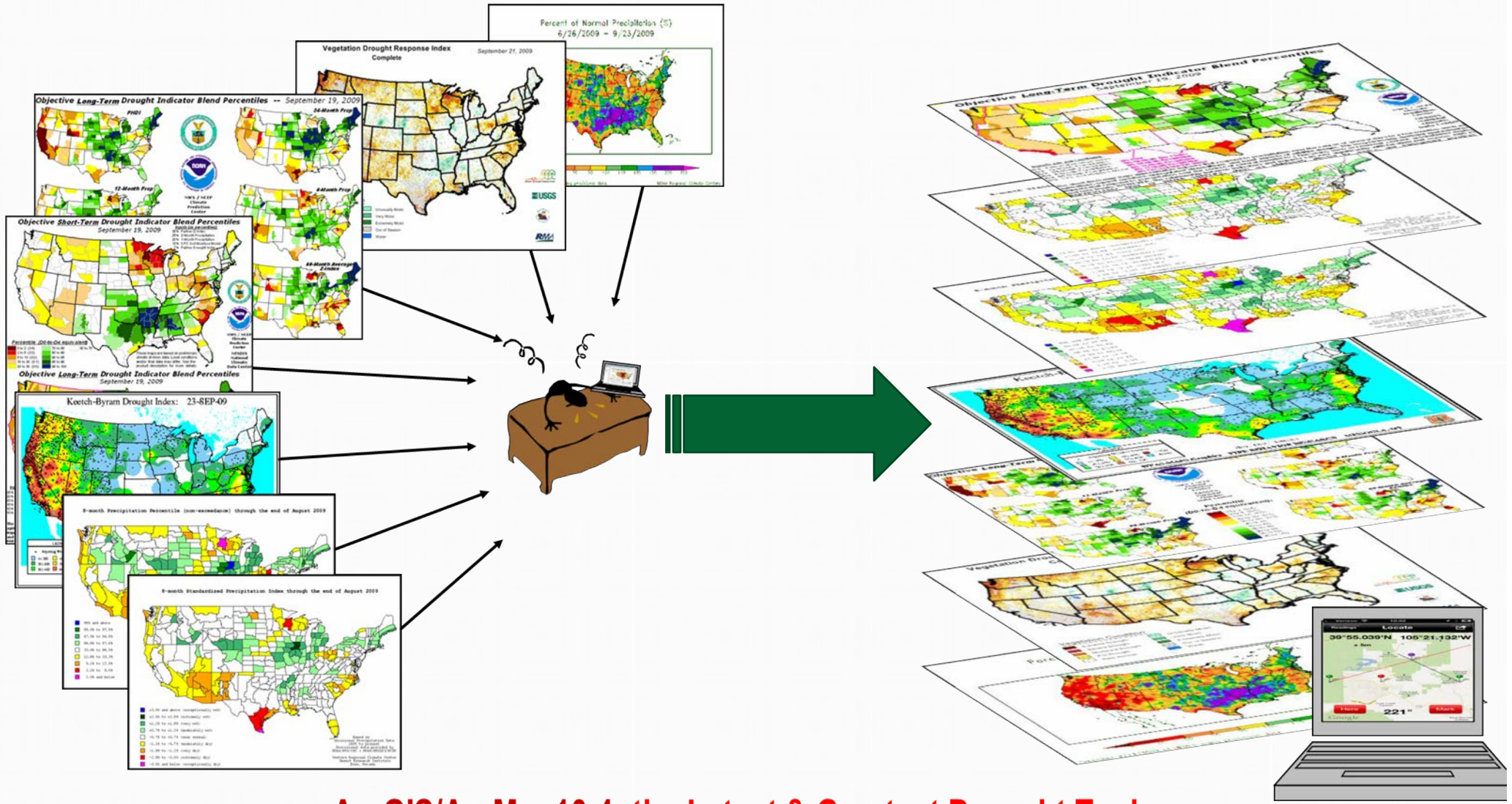
Entire USA: 26



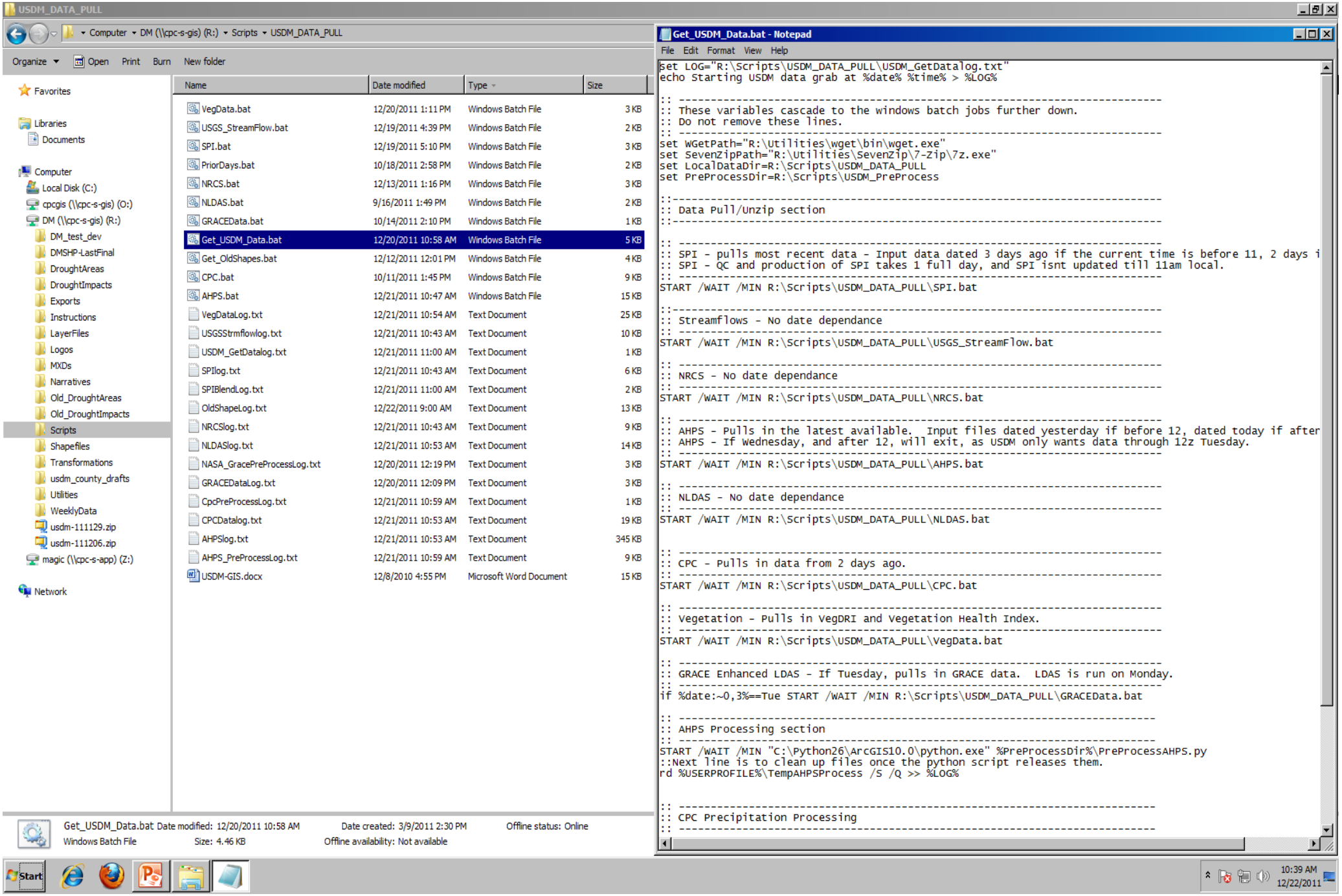
Transitioned from Corel Draw to ArcMAP (GIS) in August, 2003.



GIS allowed for a new (& better!?) way of assessing drought information…

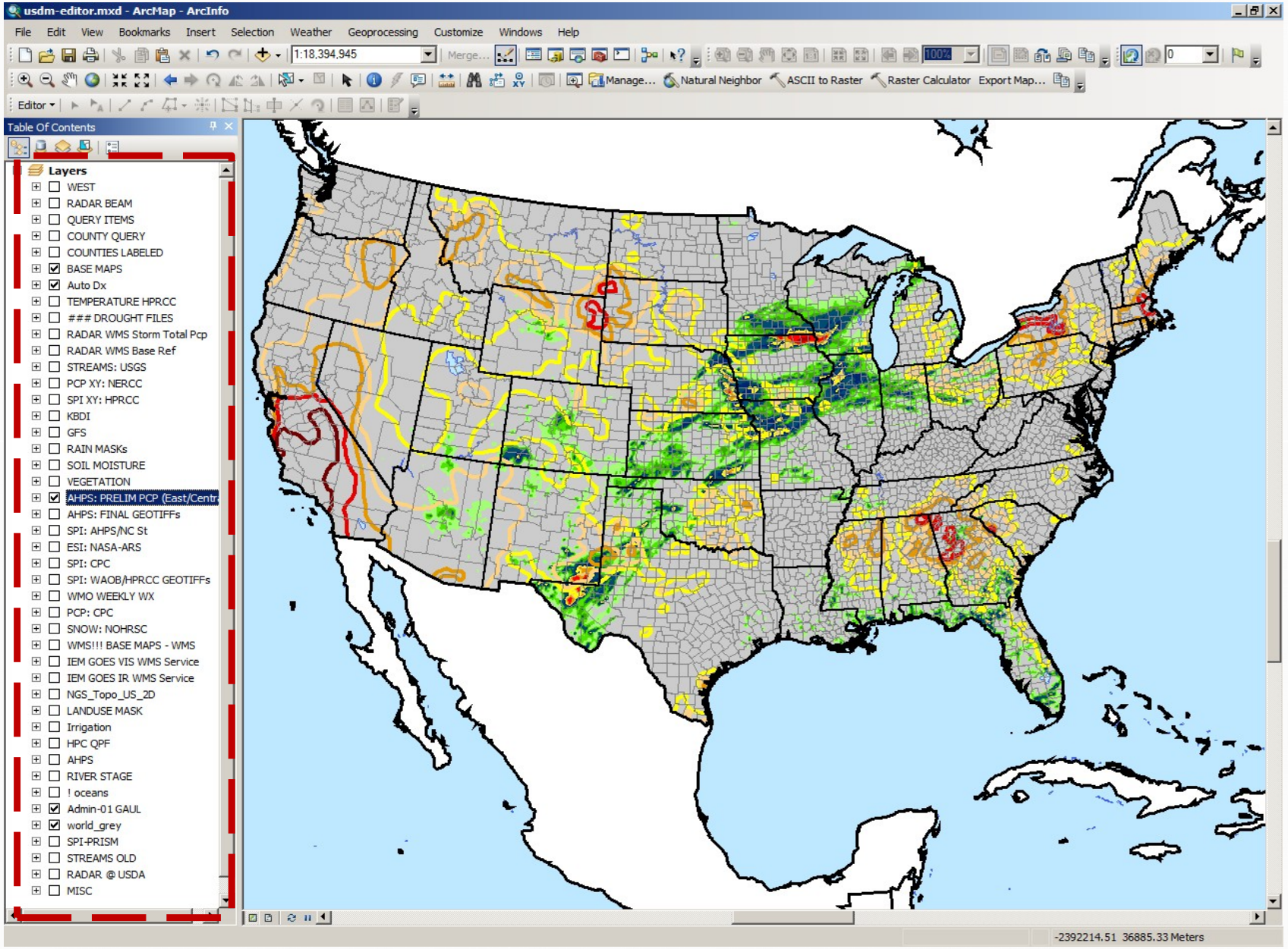


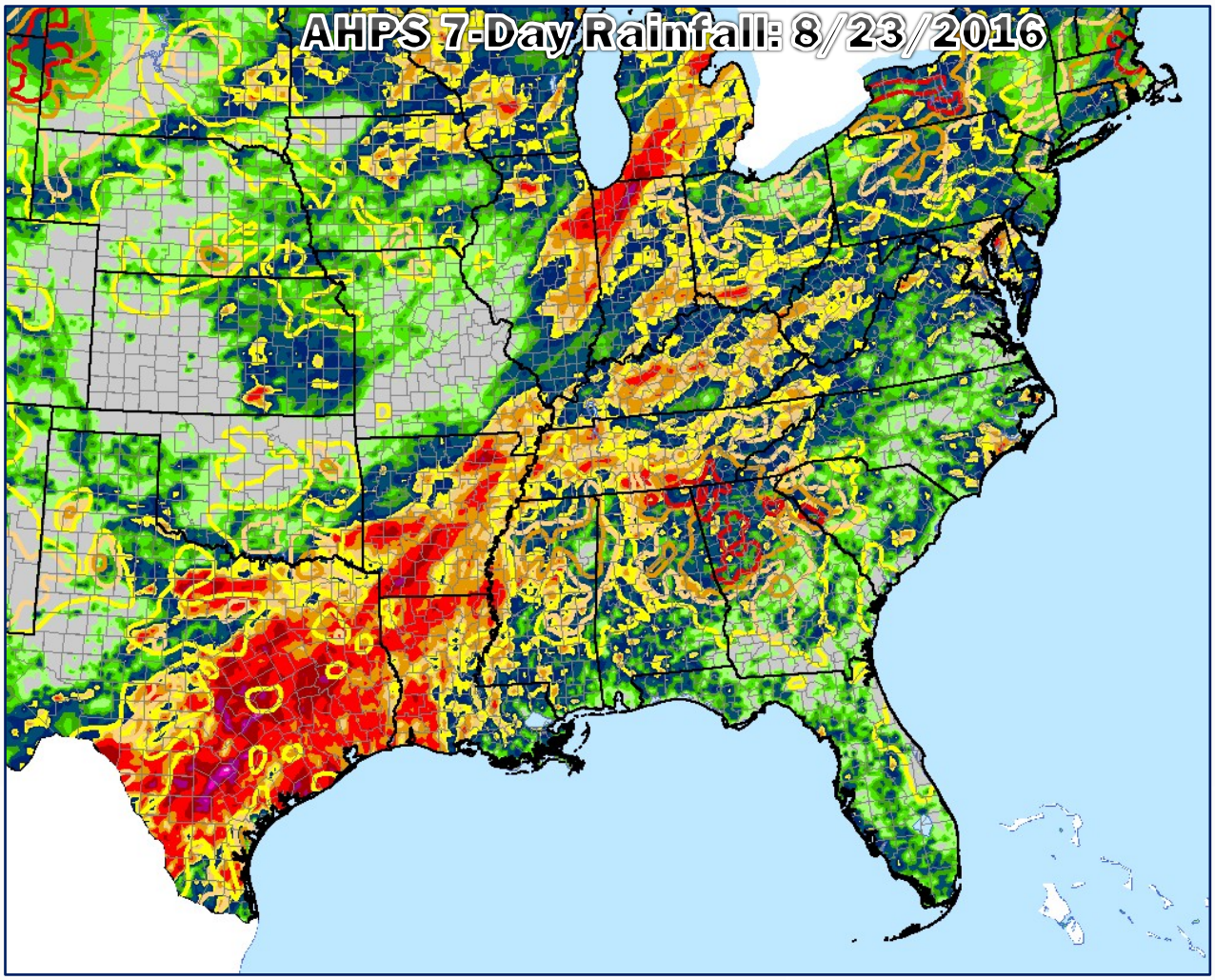
ArcGIS/ArcMap10.4, the Latest & Greatest Drought Tool



Scripts for Getting, Saving, Processing, & Displaying data and products

Wealth of GIS data that allows authors to depict different types of drought on one map

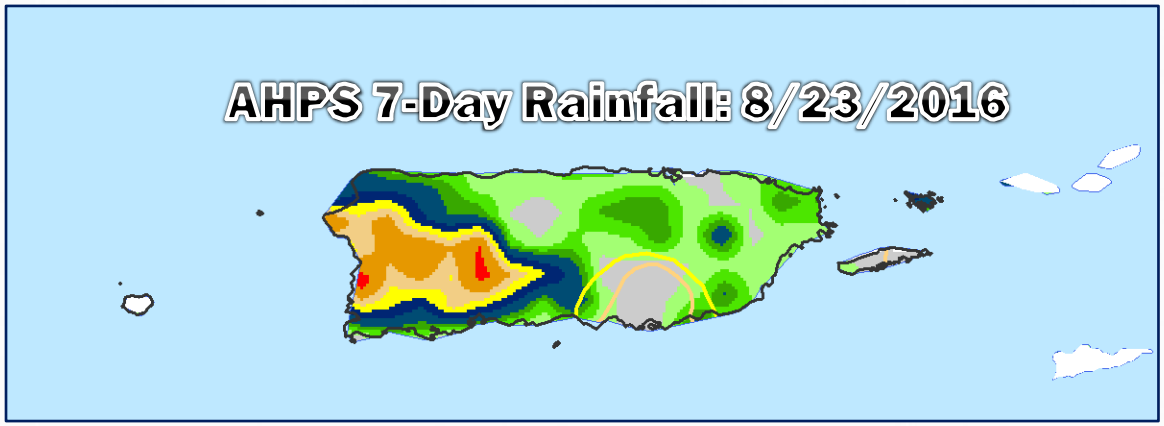




AHPS Gridded Precipitation

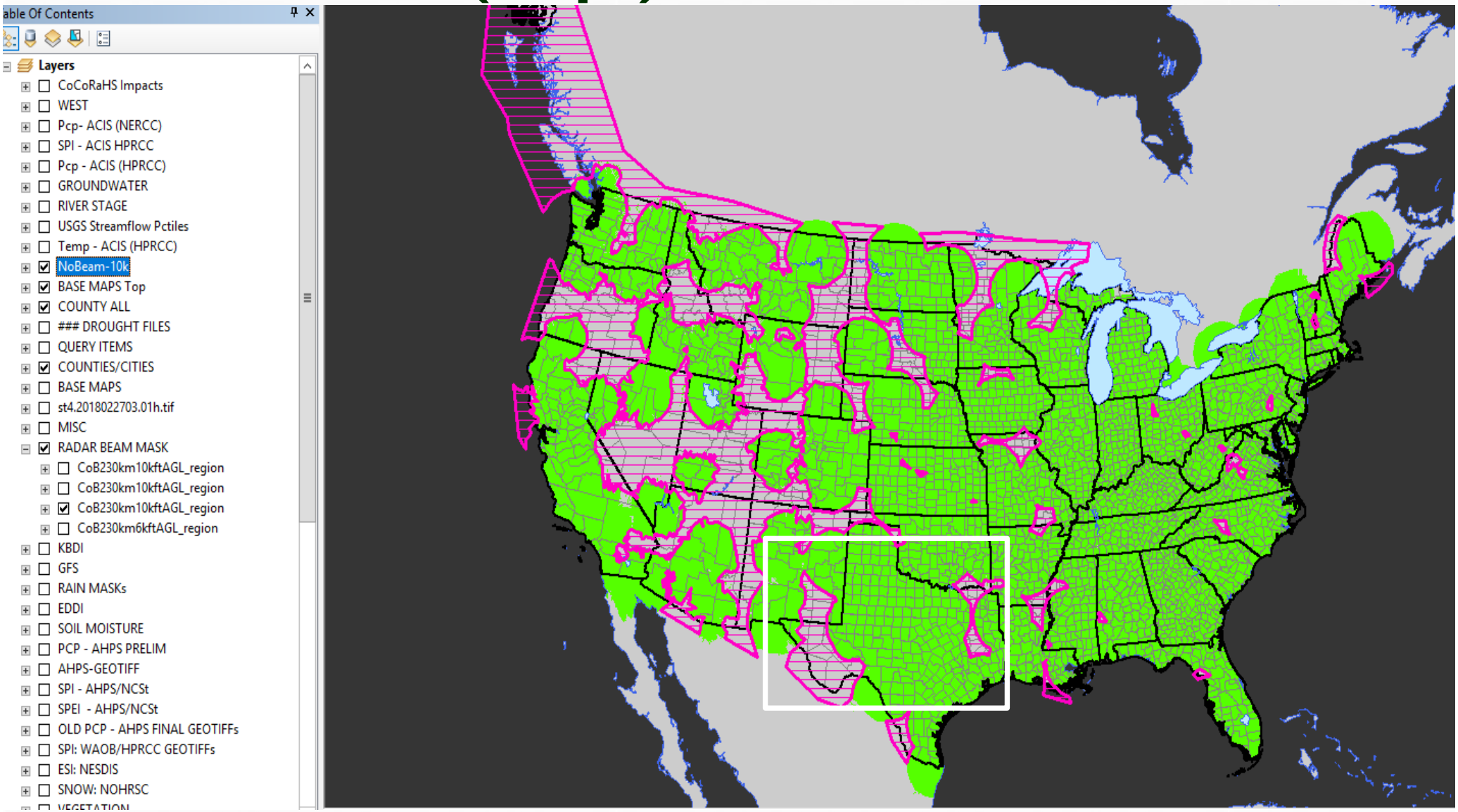
Using PRISM Data

- Departure from Normal
- Percent of Normal

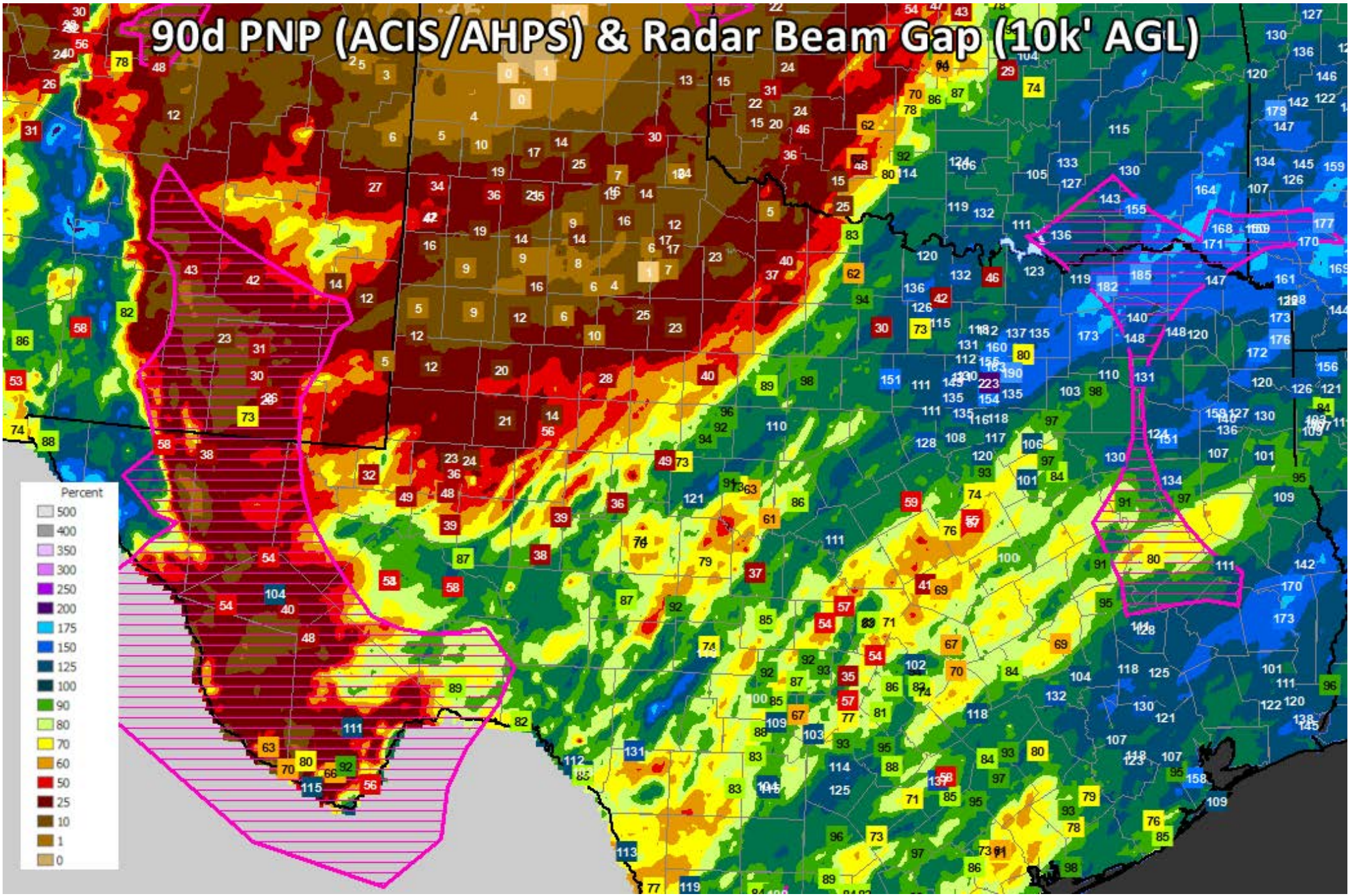


And if we didn't have enough DM issues to worry about…..

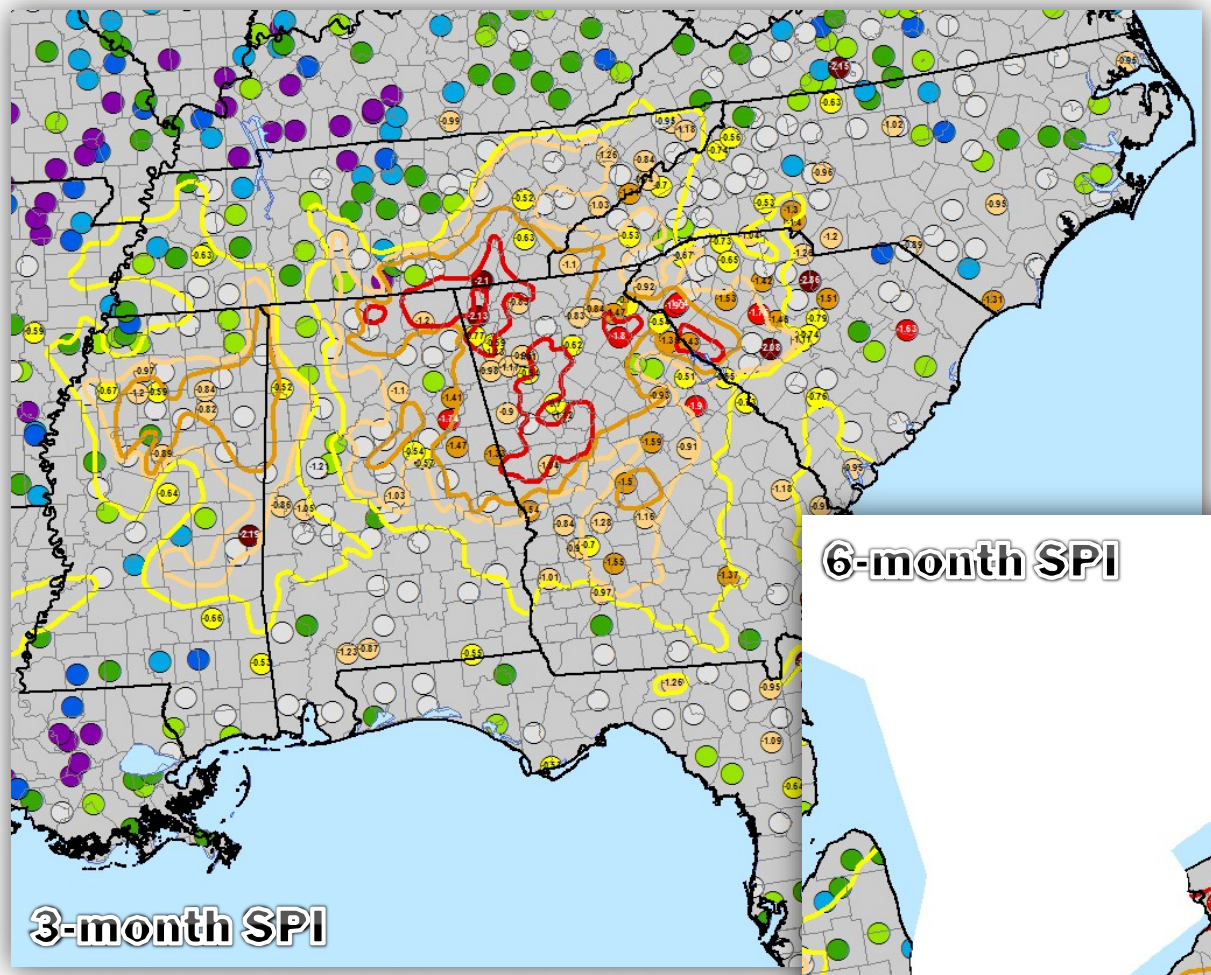
AHPS Radar Beam N/A (Gaps) below 10,000 feet

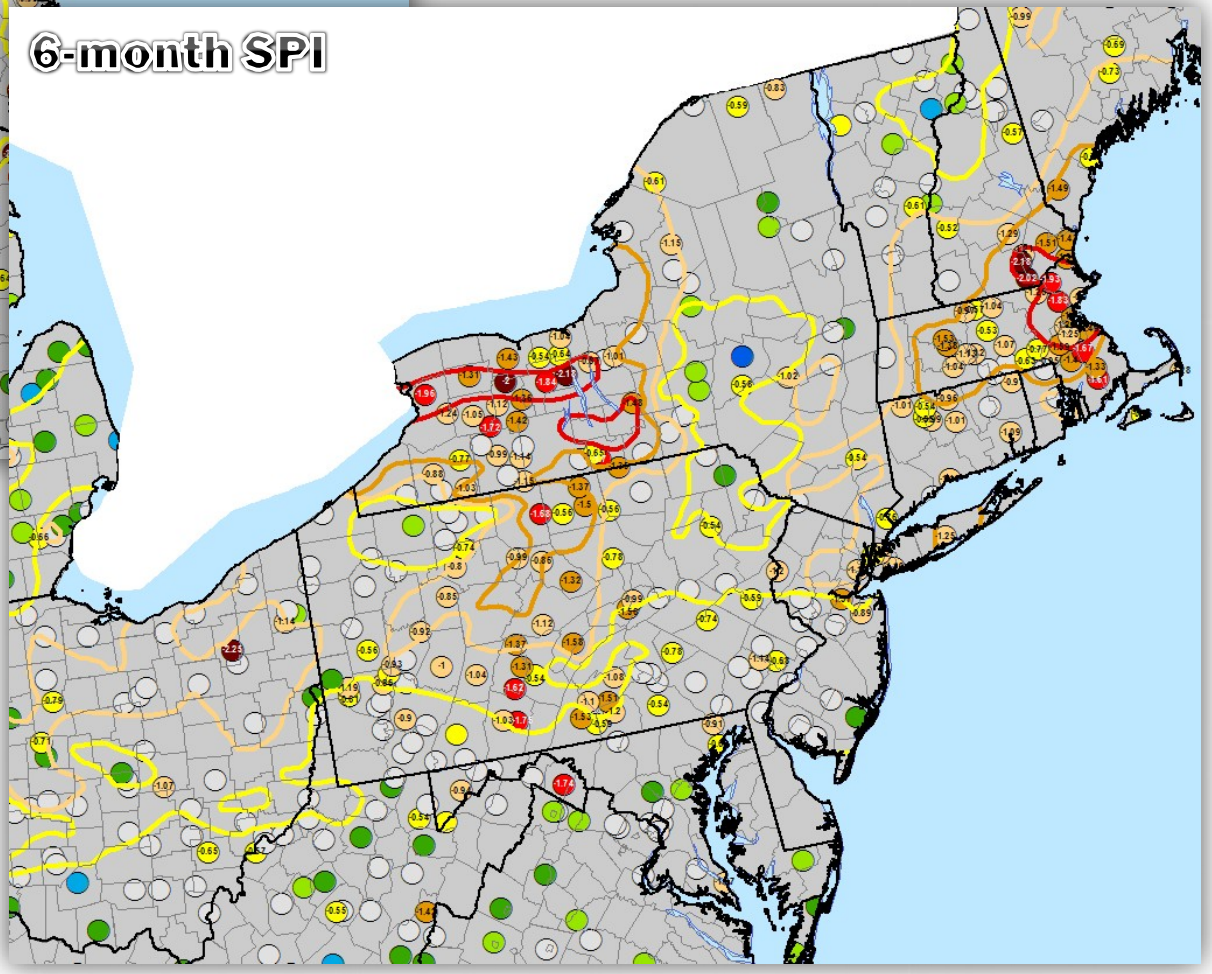


So that's why we look at several sources of DM information



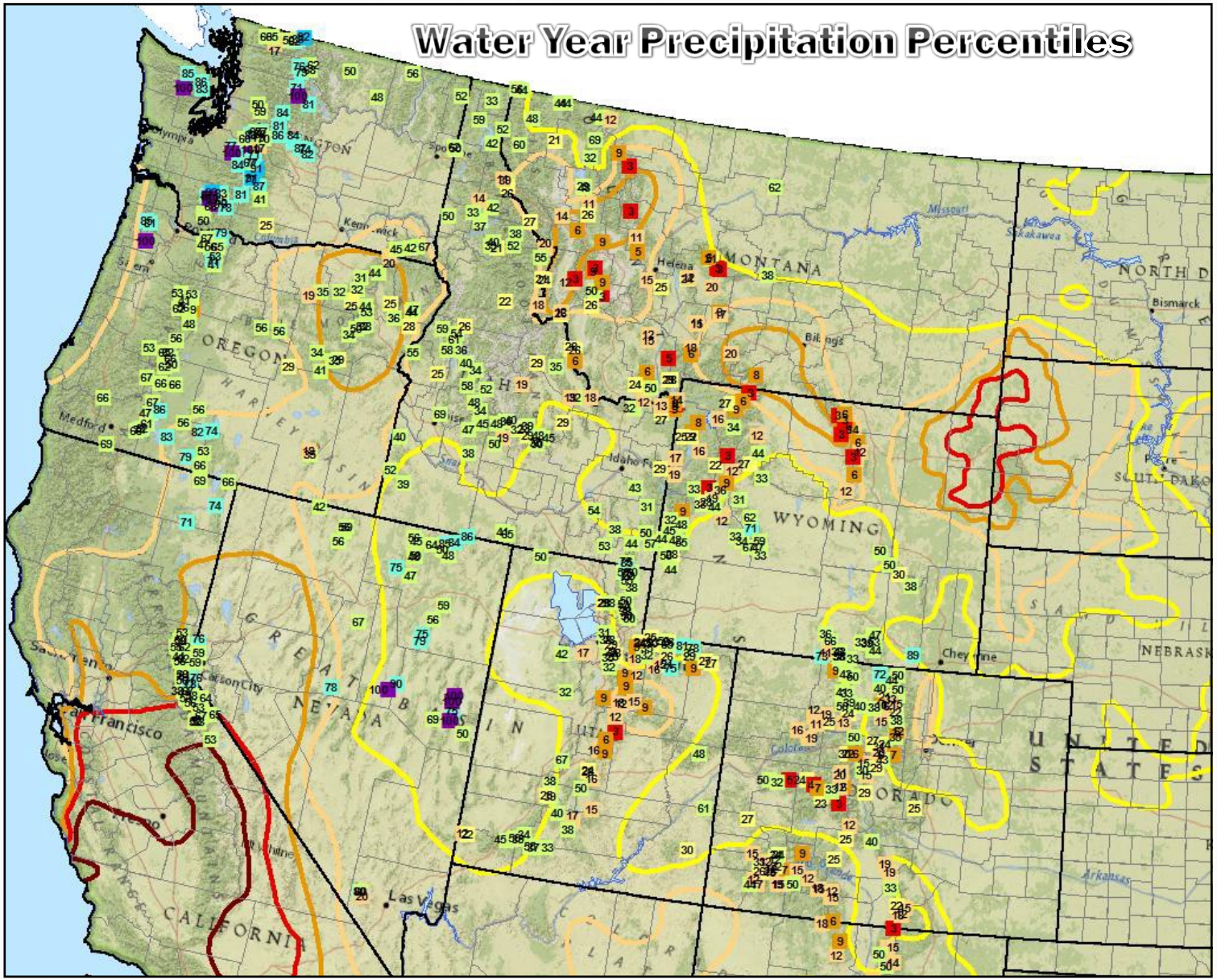
Station-based Standardized Precipitation Index (SPI)



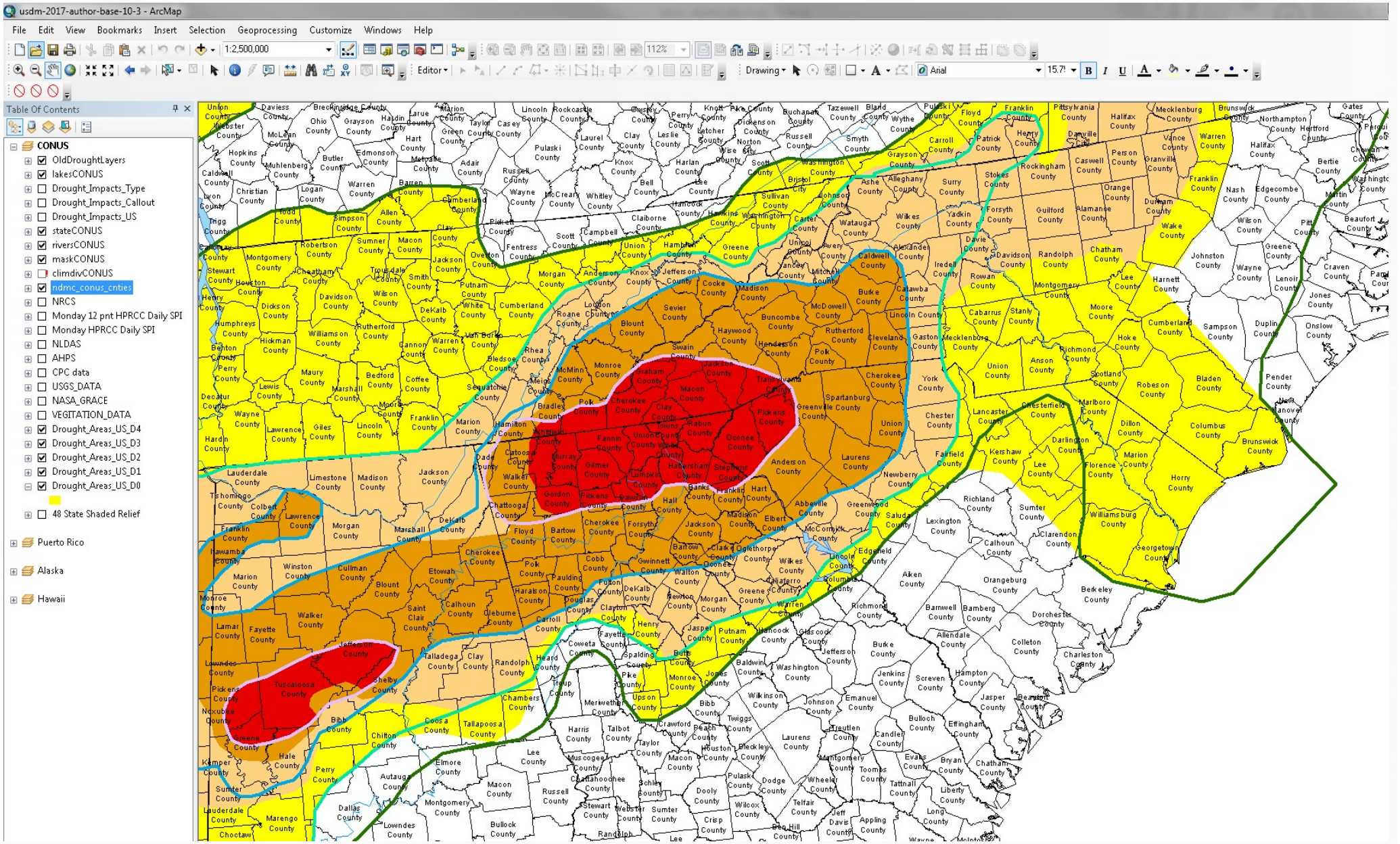


HPRCC

USDA/NRCS SNOTEL

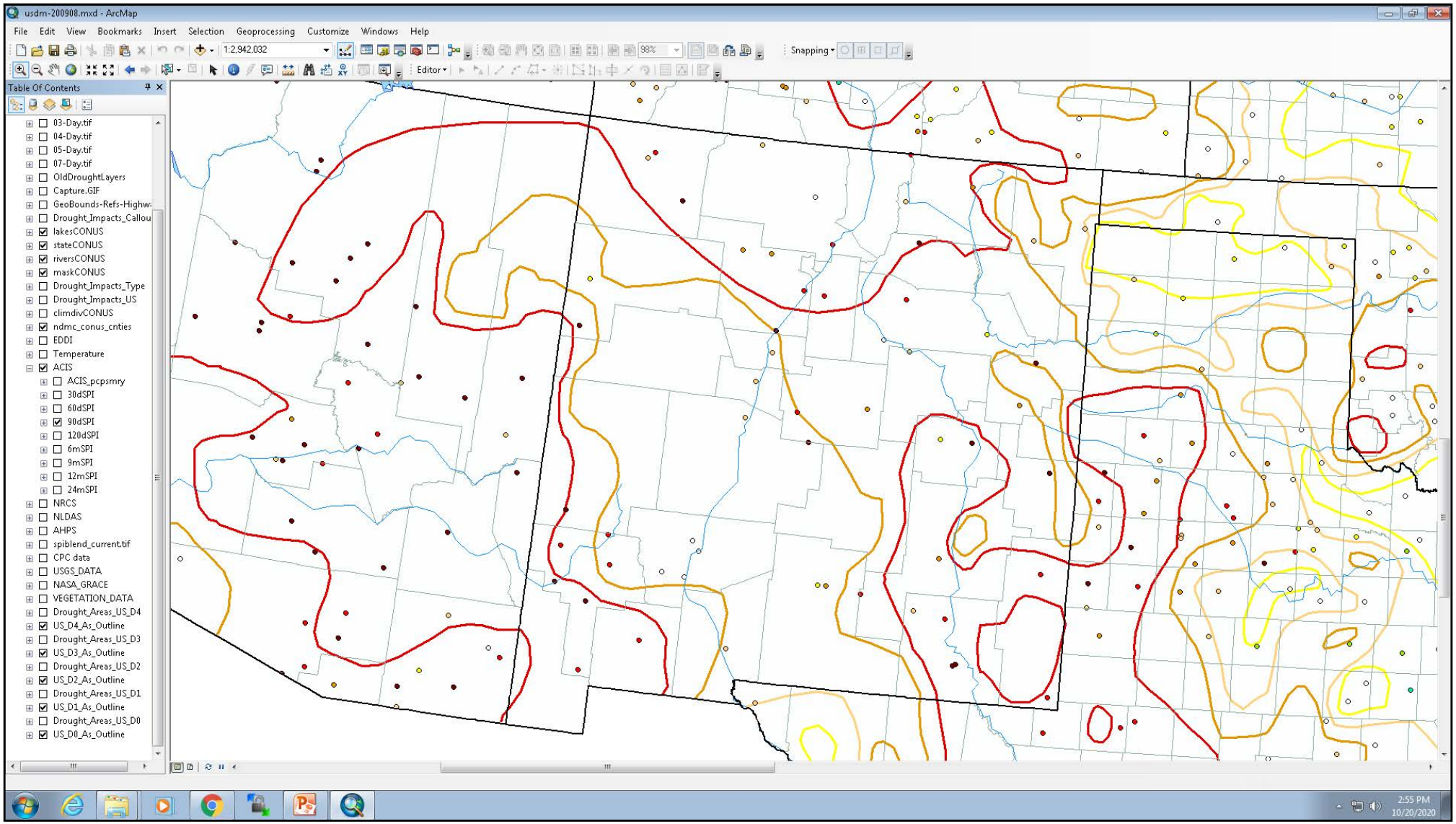


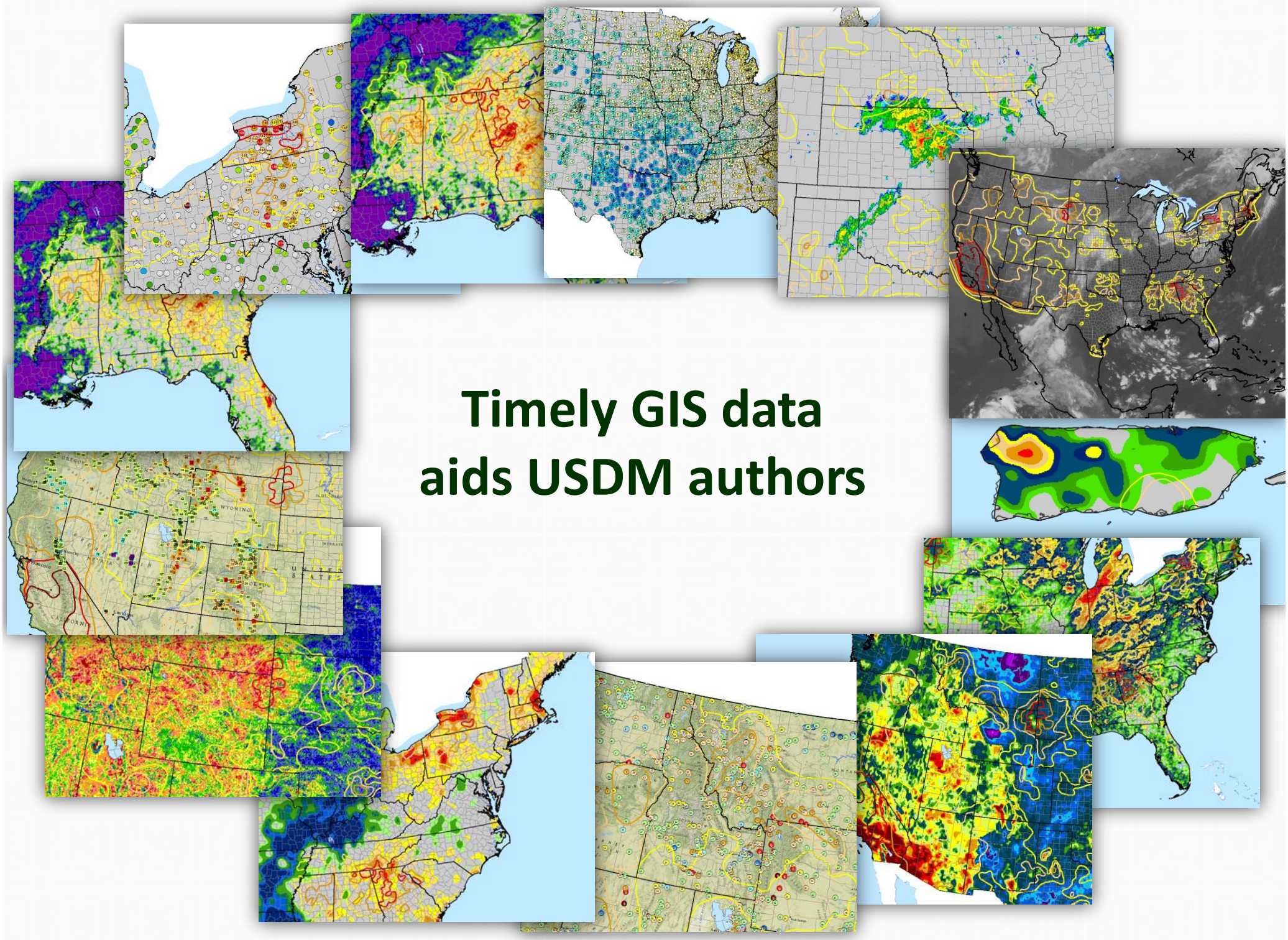
Previous week's drought layers



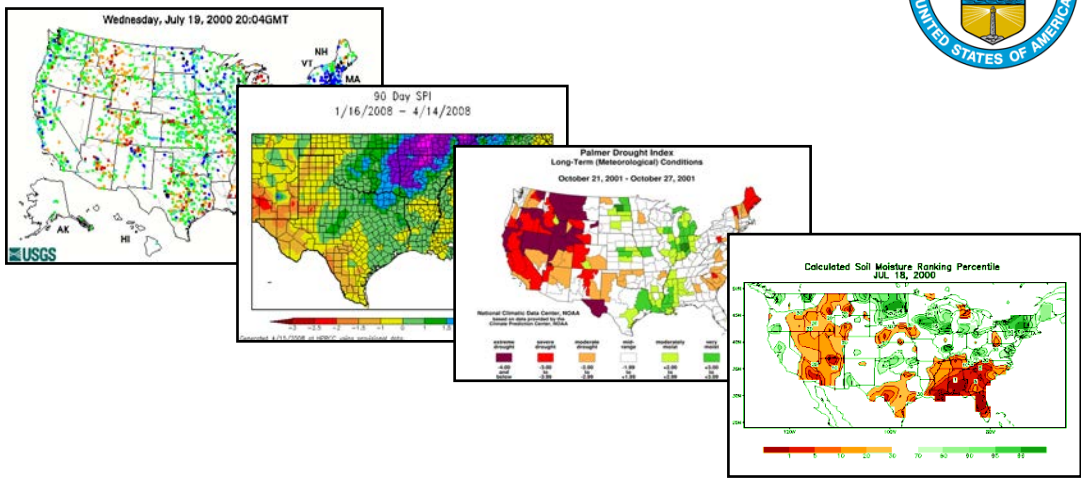
USDM GIS (ArcMap) Input Overlays

40-50 different inputs, but in-situ station data with long and complete history is best for producing percentiles. This example is current 90-day SPI plotted in the drought category colors



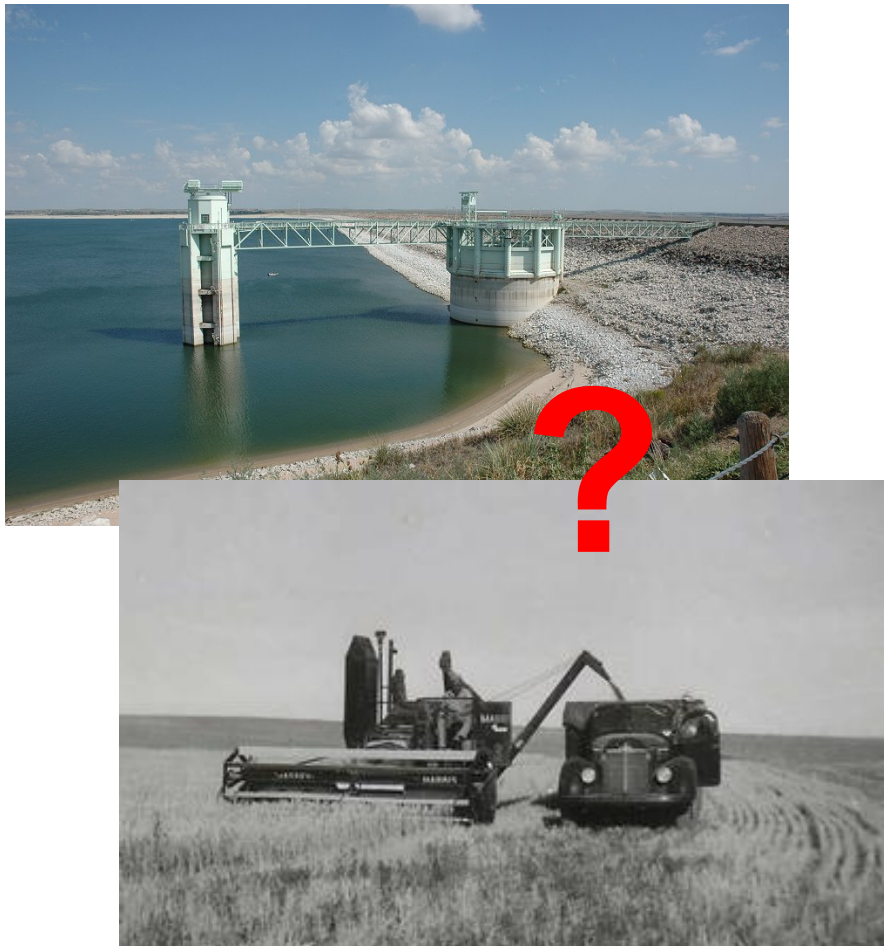

Timely GIS data
aids USDM authors

Local Experts Feedback – Reports From the Field

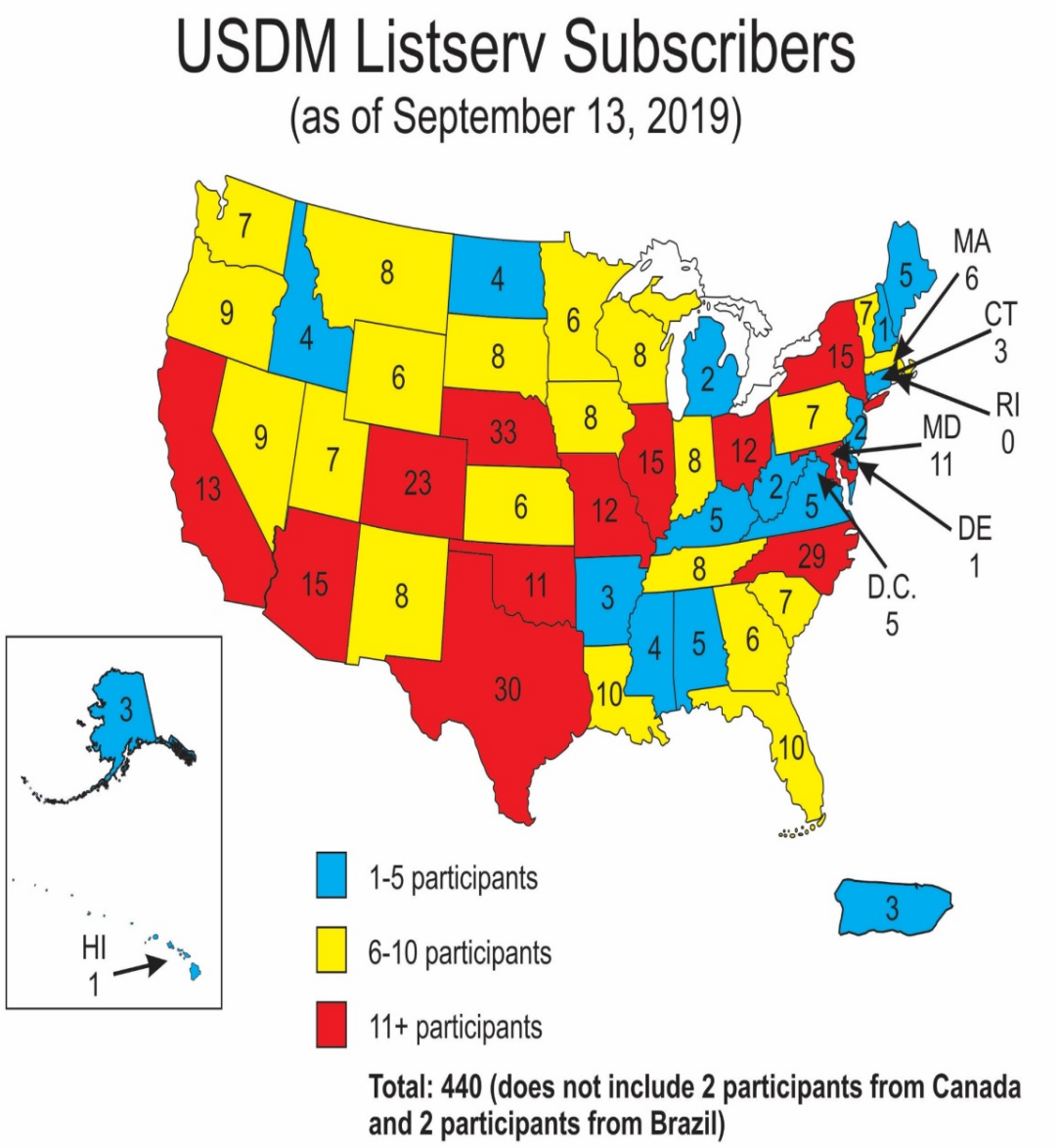


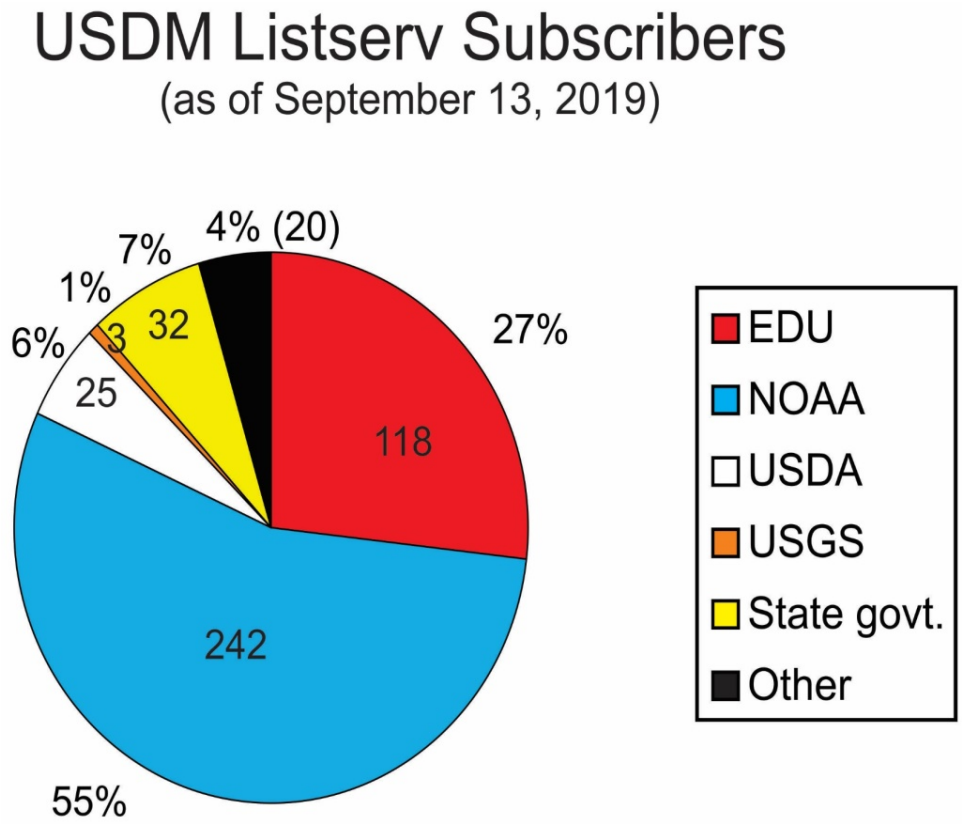
- ✓ We have dozens of maps showing dozens of drought indicators.
- ✓ But they don't show us the whole picture. What about impacts? The rainfall may be very low, but is it *affecting* anybody?
- ✓ Local feedback from experts in the field provides the answer.

- Annual User Feedback Forums (USDM/NADM) since 2000;
- Various webinars/telecoms/reports/data/products;
- Regional Climate Centers & NOAA Regional Climate Service Directors & Coordinators along with Weather Forecast Offices (WFOs);
- State Climatologists;
- USDA FSA/NRCS;
- Native American Tribal input;
- CoCoRaHS (impacts);
- NIDIS DEWS basin webinars (UCRB, ACF-RB, S Plains, MORB, CA/NV, PNW, Midwest);
- Drought Task Forces (NC, HI, OK, TX, NM, AL, FL, SD, KY, AZ, MT, CA);
- And MANY Others.



USDM ListServe Subscribers





Local Feedback – Reports From the Field

Shackelford / Throckmorton Counties:

When our county emergency boards met on January 13th & 14th, here is what they stated for both Counties:

The CEB met to discuss the crop conditions as result of the dry weather. The CEBs reviewed weather and crop data and estimates the following losses that occurred due to the adverse weather conditions:

Crop(s)	% of Loss
Wheat for grazing (Shackelford Co)	70%
Wheat for grazing (Throckmorton Co)	50%

These losses are due to the drought conditions that began October 15, 2010 and still continuing. The CEB noted that Shackelford County normally receives 7.00" of rainfall during October through January. During the past 113 days, Shackelford County has only received 3.06" (44% of normal) during these months. The CEB noted that Throckmorton County normally receives 6.30" of rainfall during October through January. During the past 111 days, Throckmorton County has only received 2.48" (39% of normal) during these months. As result of these drought conditions, the wheat for grazing crop has suffered. The CEB noted the wheat for grazing would normally be 6-8" high compared to the ground level height we are experiencing throughout the county. In addition, wheat producer are only able to run one third of their normal livestock due to the dry conditions. Most producers have to feed supplemental feed along with the wheat grazing to maintain weight gains on cattle. Livestock watering tanks are 50% full.

The CEB took in consideration the amount of rainfall received, the overall climate conditions, personal knowledge, and producer information. Also, the CEB reviewed the COC monthly assessments of losses

Jacob Chapman, CED
Farm Service Agency
Shackelford and Throckmorton FSA Offices
Shackelford Phone: (325) 762-2277
Throckmorton Phone: (940) 849-5331

Local Feedback – Reports From the Field

State Summaries – Hawaii:

Some drought impacts in Hawaii include the following:

- There were no drought impacts to report on Oahu. Water levels in the Waimanalo reservoir continued to increase over the past month. The State of Hawaii Department of Agriculture once again eased water use restrictions for farmers on the Waimanalo system, going from a mandatory 20 percent cutback to a 10 percent cutback on January 20th.
- On Molokai, no significant changes since January 6th. Water levels in the Kualapuu reservoir continued to increase slowly but it was not enough to warrant any easing of the 30 percent cutback in irrigation water consumption.
- No significant changes on Lanai since January 6th. In 2010, drought conditions forced cattle ranchers to ship feed from off-island which resulted in financial impacts.
- No significant changes since January 6th on Maui. Despite mid-January heavy rainfall, pastures in leeward Maui have not recovered enough to fully support cattle ranching operations. Water supply levels remained sufficient for upcountry Maui. However, as a precaution, the Maui County department of water supply continued to request a 5 percent reduction in water use by upcountry residents. A 10 percent reduction in water use by central and south Maui residents also remained in effect.
- On the Big Island, pastures in the lower slopes of the south Kohala district and the southern portion of the Kau district improved during December but have not yet fully recovered. One rancher in south Kohala reported only 40 percent of his pastures available for grazing. Some ranchers were still hauling water to support livestock. Ranchers have cited a need for additional rainfall in the coming months to produce a full drought recovery.

NDMC's Drought Impact Reporter

Also getting "Drought Tweets"

NDMC Drought Impact Reporter

Map | Advanced Search | Submit a Report | About the DIR | Help

Refresh

Impacts & Reports | Overlays

Scales
- National
- Multistate
- State
- County
- City

Impacts

Opacity 80%

Impacts
- 0
- 1 - 7
- 8 - 14
- 15 - 21
- 22 - 28
- 29 - 35

Reports

Drought Declarations

Time Period

Location

Categories

Report Types

México

Data CC-By-SA by OpenStreetMap

Venezuela

-75.12748, 9.72249

All States | 01-28-2018 - 02-28-2018

Impact Counts | Impacts List | Page 1/17 | Report Counts | Reports List | Page 1/97

County Impacts | All States 162

Category

Agriculture	51	Business & Industry	11
Energy	1	Fire	37
Plants & Wildlife	65	Relief, Response & Restrictions	27
Society & Public Health	12	Tourism & Recreation	24
Water Supply & Quality	53		

Report Source

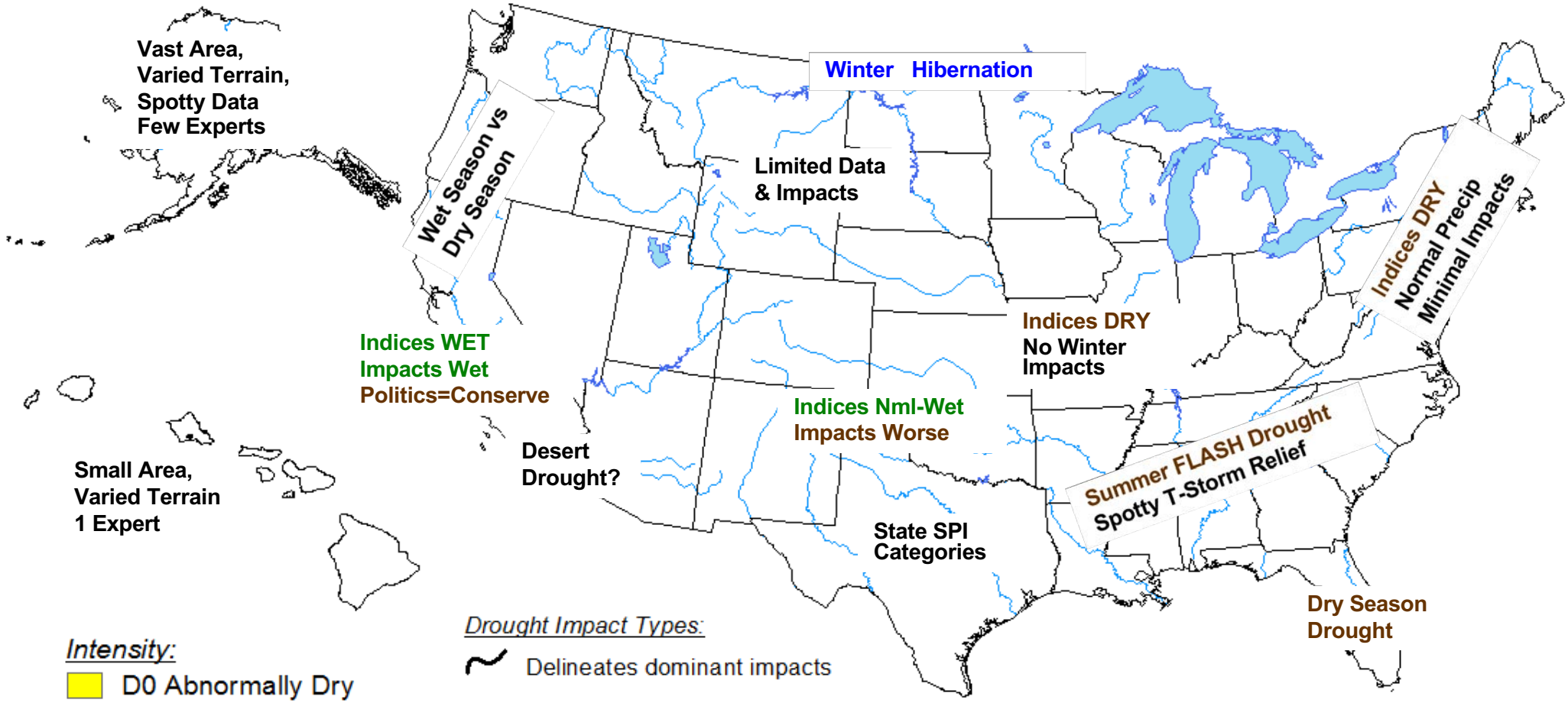
Media	50	User	11
CoCoRaHS	103		

USDM Decision Process & Conundrums

11 different authors, 11 (12 soon) different "personalities" of analyzing the DM;

- **2-week shifts: 1st week generally more difficult (acclimation & spin-up) than 2nd week;**
- **Some authors get early jump on DM (Fri-Sun), others wait until Monday;**
- **Monday afternoon: Objective blends (Short, Long, Unified, Worst) provide a good general overview of the week's moisture conditions (by climate divisions). Worst blend provides general outline for Impact types. Unfortunately, weekly blends are not always produced on-time or routinely.**
- **Applicable data/products are color-coded to the appropriate D0-D4 level on the ArcMap. This makes it easier to see where improvement (wetter) or deterioration (drier) occurred that week;**
- **The DM data/product input and GIS map overlay display slightly differs between organizations. So NDMC is planning for DM author consistency by hosting a "one stop DM production shop" with secure 24/7 VPN Remote Access to updated data/products and GIS map overlay display [but will take ~1 year];**
- **Various weekly telecons/webinars (TX, NC, CA/NV, NM), state/regional NIDIS summaries (CO River Basin, ACF River Basins), and dozens of state climatologists with local impacts (some with specific Dx recommendations). Some authors take the recommendations as is, others make DM changes first, then look at recommendations and verify with modifications. This sometimes depends on the amount of time to work on the DM as many authors have other tasks to do Mon-Wed;**
- **DM analysis tries to take into account the seasonality (winter vs summer); regional climatology (West vs East); elevations; vegetation , soil, temperatures, wind differences (e.g. flash droughts in ag areas during growing season); and past moisture conditions (e.g. CA & S Plains long-term droughts with lingering hydro concerns). *Users have to remember the DM focuses on broad-scale conditions, and local conditions may vary*;**
- **With all of the various types of input to summarize, the DM is produced both objectively & subjectively since the indices sometimes do not match the field impacts (e.g. OK [indices wet, but reported ground impacts much drier] vs IL [indices dry, but no obvious dry impacts]);**
- **Unfortunately, some "users" have recently discovered the DM trigger for USDA $ drought relief and may be exaggerating their condition*. DM authors & local experts are unbiased w/r to the Dx levels and want proof of the impacts – hence the following CONUNDRUM slides*;**

U.S. Drought Monitor



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)

Small Area,
Varied Terrain
Few Experts

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

http://droughtmonitor.unl.edu/

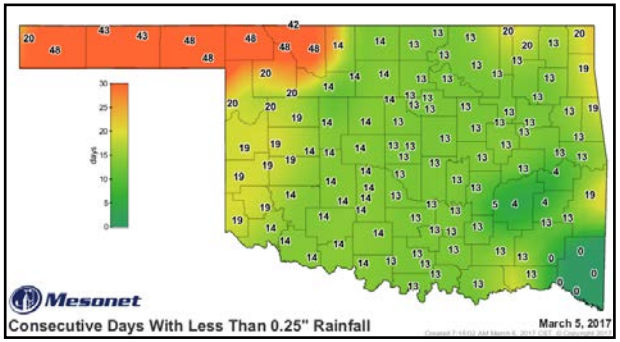
USDA National Drought Mitigation Center

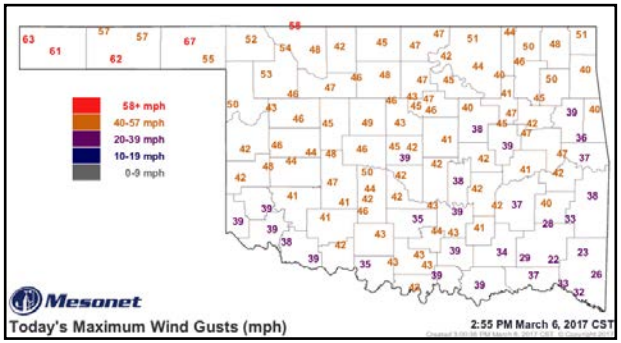
Conundrums

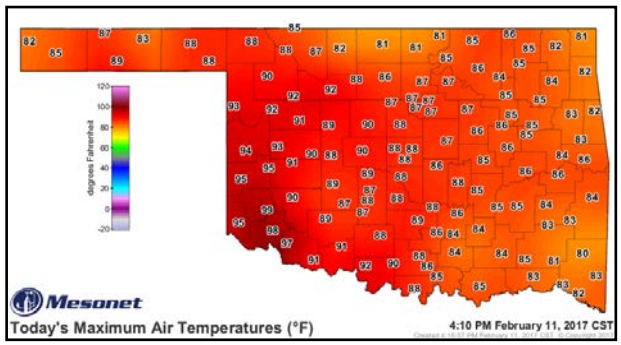
A Sampling of Conundrums

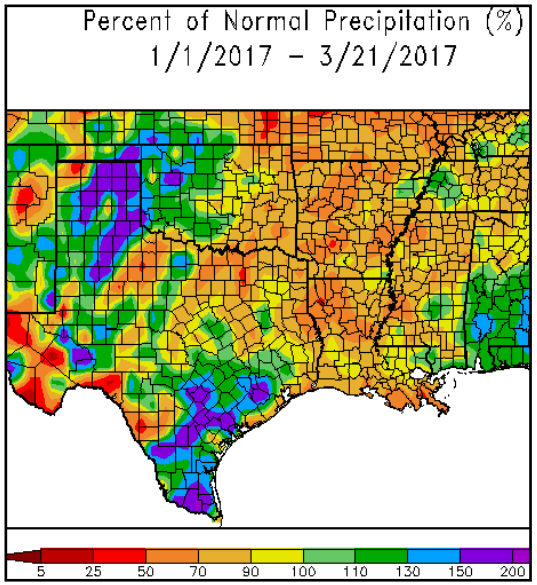
1) South-Central Plains (OK):

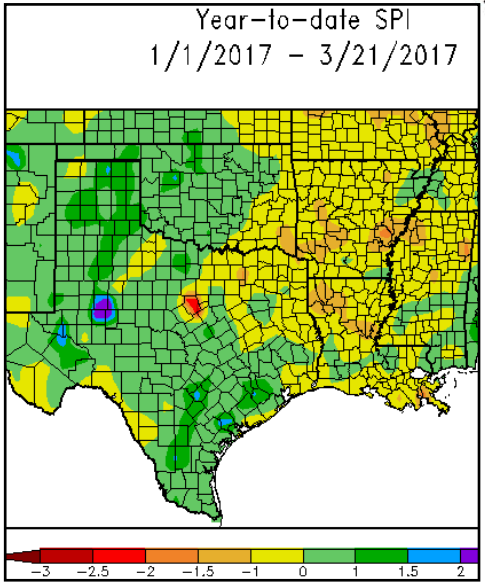
Short-Term Indices Normal-Wet,
but Impacts Severely Dry;
(Winter Warmth, Wind, low RH)

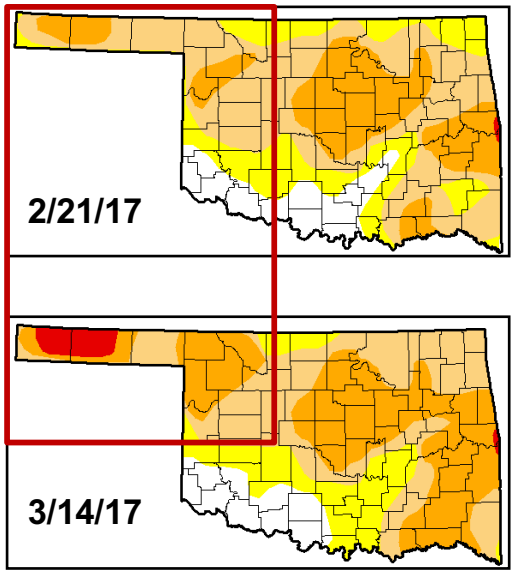








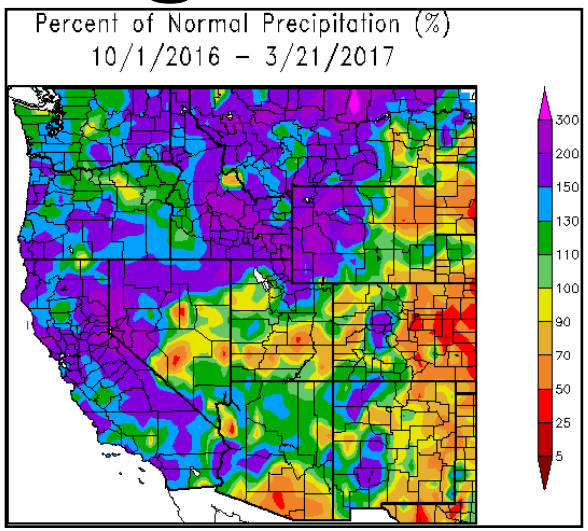


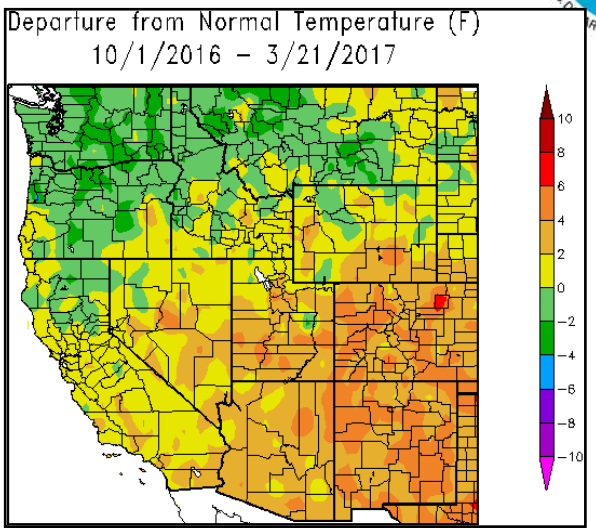


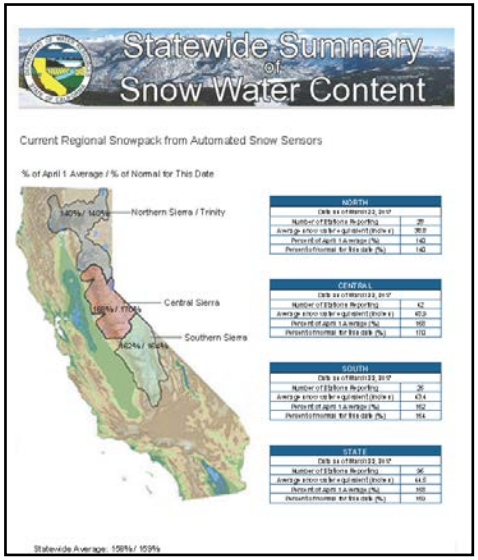
A Sampling of Conundrums

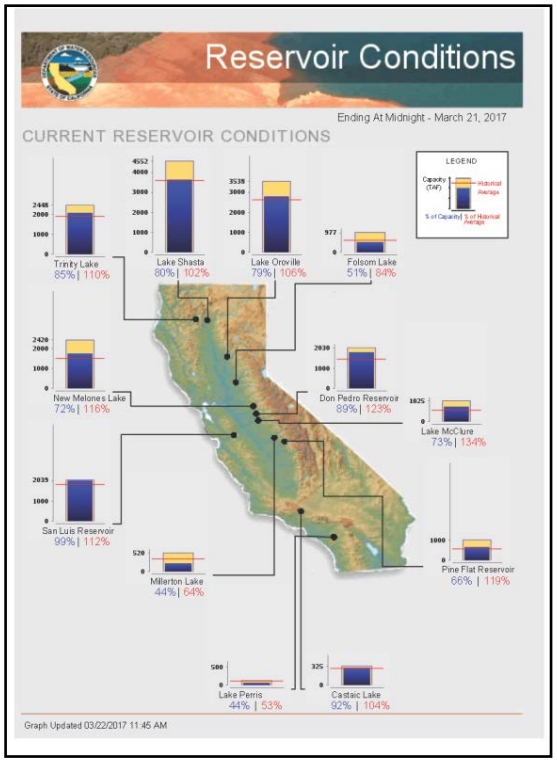
2) Far West (CA):

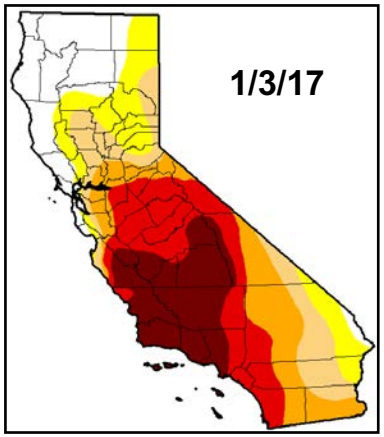
Short-Term Indices Very Wet,
Most Impacts Very Wet;
(Water Conservation - Drought)
"*Wait until April 1 for changes*"

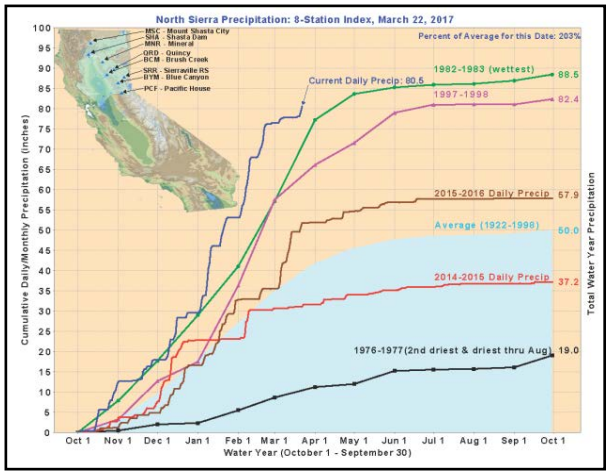










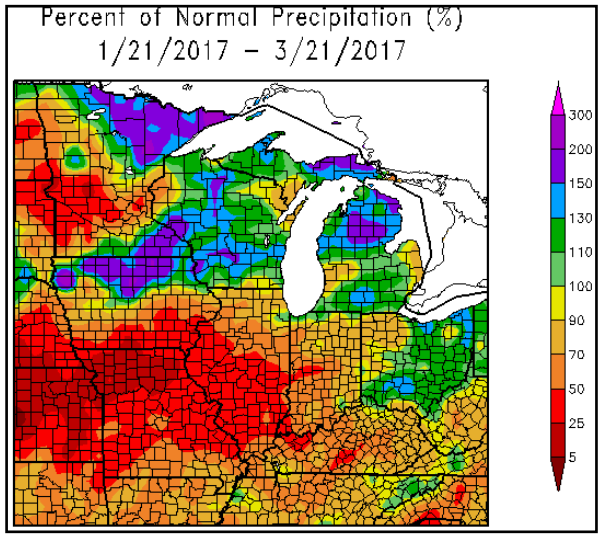


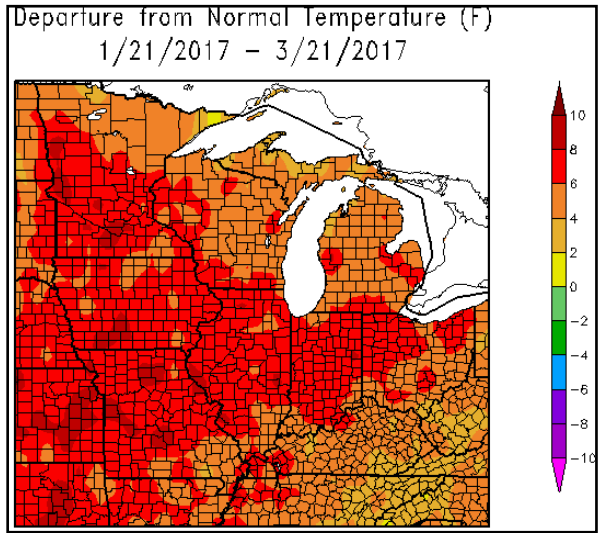
D1: Less precipitation & runoff led to lower reservoir levels, plus low ground water supplies

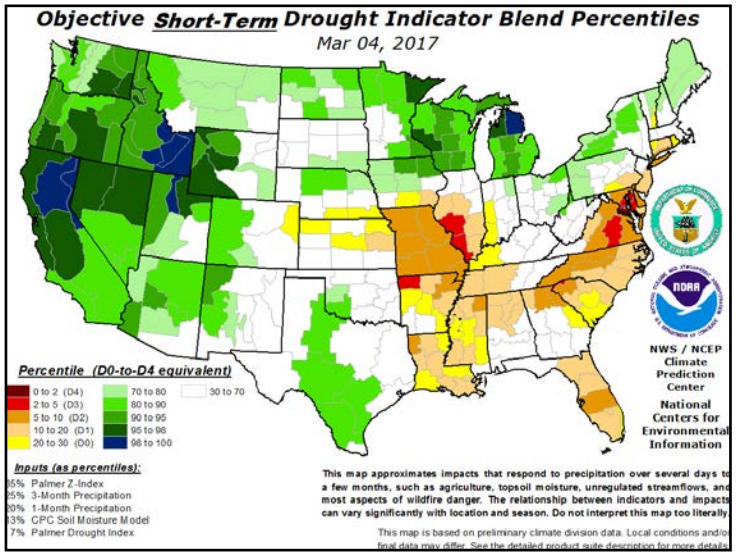
A Sampling of Conundrums

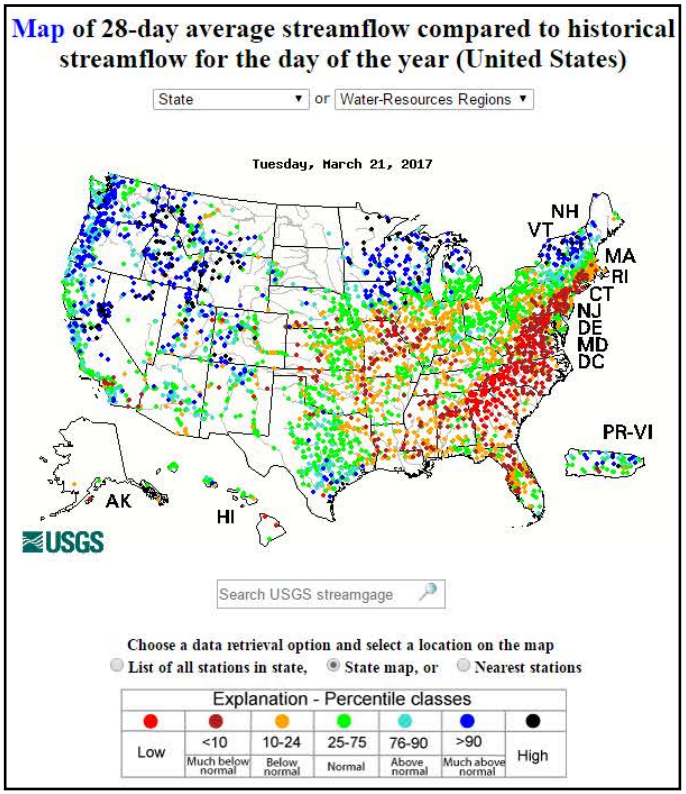
3) Middle MS Valley (MO, IL):

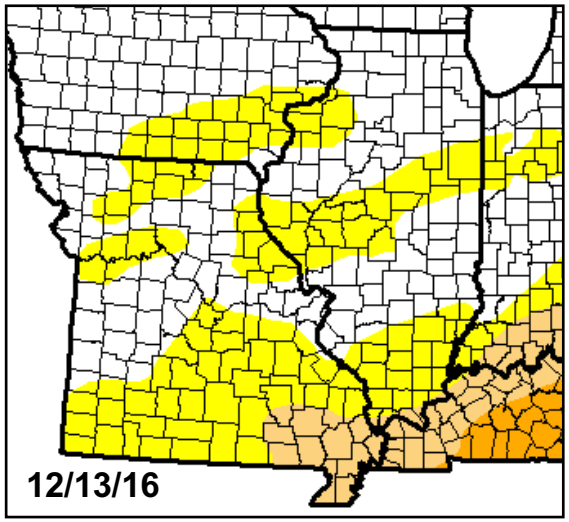
Short-Term Indices Dry & Warm
but No Real Impacts;
"*Drought without Impacts?*"

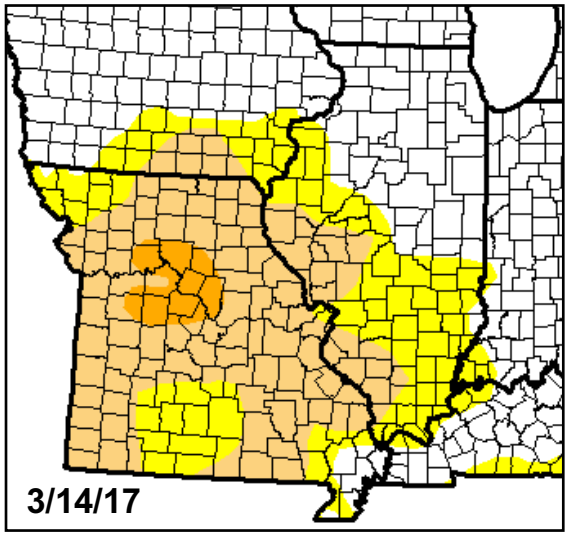












Farmers prefer drier spring fields for plowing & seeding, but if not depicted earlier, drought would quickly appear during growing season.

USDM Conundrum Conclusions

- ***Can Drought Develop during Winter in northern (cold) States?***

  Yes, especially when extended subnormal precipitation is combined with abnormal mildness and lack of snow & frozen ground, even if there are no obvious impacts. If not designated during the winter, drought could quickly ramp up ("pseudo flash drought") in the Spring once temperatures and evapotranspiration increases. Similarly, drought can develop in southern (mild) States with a dry Winter season [e.g. Florida], although it may take a while. In contrast, areas in winter hibernation [e.g. completely frozen ground with snow cover; interior Alaska] generally do not, but may have "snow drought" designated as D0 (keep an eye on).

- ***When most indices/data = normal/wet but Impacts = dry, it is drought?***

  Yes, as the indices may not catch all of the subtle signs from unusual parameters [e.g. abnormal warmth, high winds, low humidity] or from past long-term drought [e.g. 2011 SC Plains] that probably did not get completely alleviated. This is why ground-based reported impacts are critical to the DM.

- ***When indices/data AND Impacts = less drought & local experts say no change?***

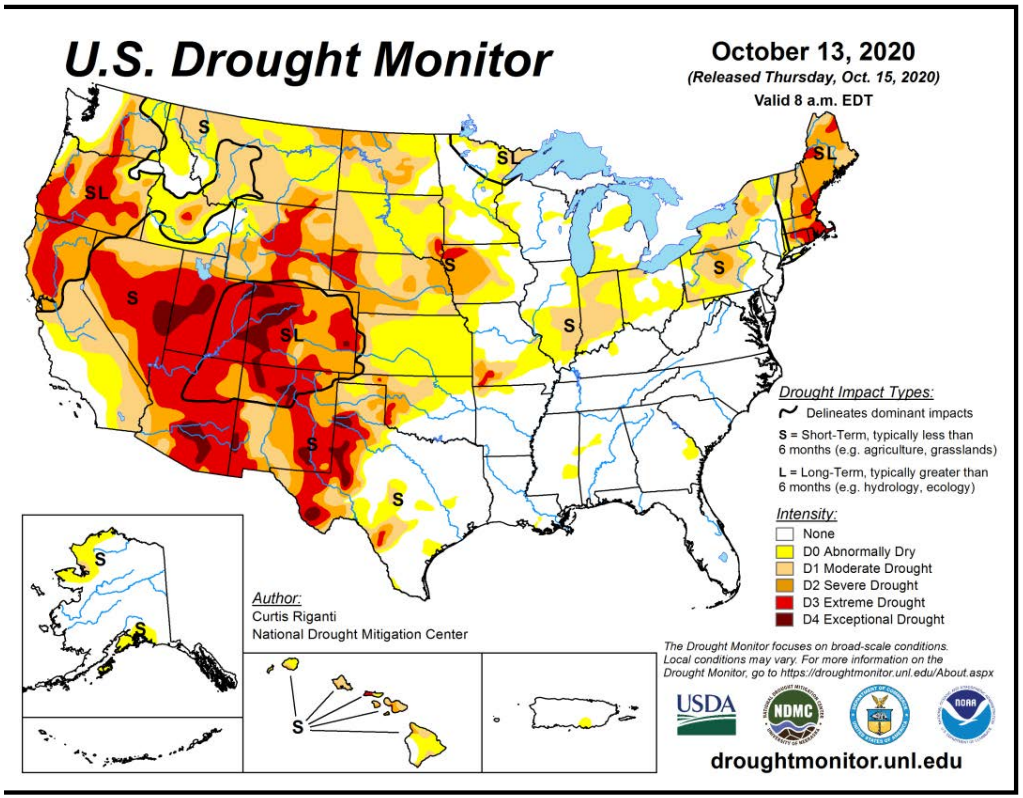
  A tough one as sometimes the local experts are basing their recommendations on government/political concerns [e.g. CA - keeping mandatory water restrictions after heavy precipitation events], or, unfortunately, wanting to maintain or get USDA drought aid based on >D2 ratings. However, we must produce an unbiased DM analysis based upon "*convergence of evidence*".

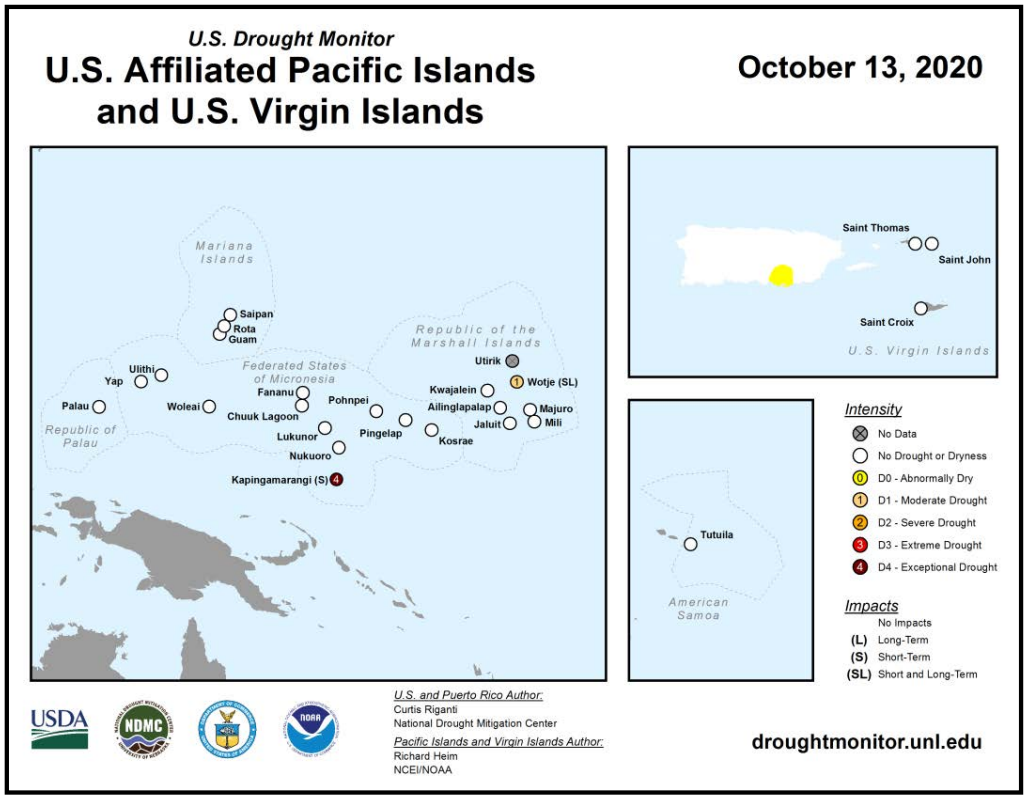
Considering the demands placed upon each author and all of the evidence [indices, impacts, emails, etc.] to sift through, I believe we have & are doing a very good job. Can we do better? Sure, but that's a discussion for another presentation. And we definitely need some NEW authors!

USDM "Verification"

Over time, the USDM has become THE verification of current drought conditions! USDA payments to farmers/ranchers affected by drought is based upon the USDM – which started in 2003 with dried milk supplements for livestock feed, then through Livestock Forage Program (LFP) payouts since 2008. Grand total in LFP payouts through 8/29/18 has topped $7.3 billion.

New "OCONUS" USAPI & USVI started in 2019





THANK YOU!

Any Questions, contact:

David.Miskus@noaa.gov

(301) 683-3453 (but not while COVID teleworking)