The United States Drought Monitor Process: History, What it is, and How is the map made?

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Outline

* Overview of the United States Drought Monitor Process (PPT)
* Tour of the United States Drought Monitor website (live)
* Tour of the NDMC’s Drought Risk Atlas took (live)
* Q and A
Scientists have been trying to monitor and map drought conditions for quite some time.
The USDM has continuously evolved from past efforts to monitor drought to early efforts of the USDM.
1999

The **very first** U.S. Drought Monitor!!

**Collaborative effort** between the NDMC, NOAA and USDA

It was **experimental**, and became operational, partially in response to intensifying dryness in the eastern U.S. and across portions of the West. **The map was created in CorelDRAW!** 😊
August 11, 1999

The revised map was presented to senior-level government officials at a Secretarial White House Briefing.

They liked it so much…
August 18, 1999

…the following week, it went operational, making this the first “official” U.S. Drought Monitor!

This might have been the fastest Experimental to Operational product in government history!

~24 experts make up the DROUGHT listserver
Summer/Fall 2002

First federal use (USDA) of USDM as a trigger for drought response/relief (Dried Milk) for livestock.
2003

The Fire ("F") Impact type was dropped in early 2003 b/c there is always a fire season and it is hard to weigh the impact of drought on fire.

DROUGHT List Server grows to 150...
August 2003

USDM Authors make a transparent **switch from CorelDRAW to GIS** (Geographic Information System) to create the map. There was a steep learning curve, but it made the USDM a leader on the GIS front and would pay big dividends down the road in regards to timeliness and accuracy.
Are we making a difference?

No weeks missed in over 20 years!

Wordle of “the most valuable aspects of the USDM process or product”

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Timescales of potential impacts delineated
The map is...

An attempt to represent all the different types of drought on one map

Each one of us has a different perspective of what drought is as drought means different things to different people

Types of Drought

- Meteorological
- Agricultural
- Hydrological
- Socio-economic
- Ecological
The United States Drought Monitor

- Hosted by the NDMC as part of a 3-way partnership with NOAA and USDA
- Over 12.5 million hits a year (more during significant drought events)
- Used in several USDA programs
- Used by the IRS for tax deferrals
- Many others!
Requirement: Authors must work at a regional or national “center”, government or academia/research
There are currently 9* authors, and all are volunteers
US Drought Monitor Approach

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

- **Not Drought**

- 4 Drought intensities

**Assessment of** current conditions and current impacts for all types of drought

**Identifying impacts** using “S” for short-term impacts and “L” long-term impacts or “SL” for a combination of both

- “S”-generally 6 month time scales or less
- “L”-generally greater than 6 month time scales

**Incorporate local expert input**

- Accomplished via email and impact reports
- Validation of Objective Indicators

**Authors try to be as objective as possible (using the percentiles methodology) and the “Convergence of evidence” approach**

- The physical data, drought indices/ indicators must support the depiction on the map
- Impact data validates physical data
- The U.S. Drought Monitor has the final call on all decisions
Many types of drought “information” can be collectively analyzed for all types of drought, depicted on a single map.

- Determining if the majority of information is ‘converging’ (telling the same story) about the accuracy, or inaccuracy, of the drought as depicted by the U.S. Drought Monitor.
- Several dozen inputs are considered (equally) in any given week.

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.

- No single input carries more weight than another, authors do not “cherry pick” the best or worst indicators to show the depiction.

Multiple indicators and many types of information are part of the analysis.

- These data will identify different climatic and hydrologic parameters which are needed to understand the complete picture of a drought indicator’s performance and how they interact in each part of the country.

Impacts are the “ground truth”, yet are not monitored to the same extent in which other data are….you can’t measure what you don’t monitor!
The USDM is a computer model analyzing only precipitation when the map is being created.
USD Data: All the pieces of the drought puzzle
Percentiles and the U.S. Drought Monitor

Advantages of percentiles:
- Can be applied to any parameter used in the drought analysis
- Can be used for indicators of any length of data record
- Indicators of various periods of record can be analyzed side by side
- Puts drought in historical perspective:
  - How many occurrences in a given period of time

Every input can be put into percentiles to compare current data to historical records

D4: Exceptional Drought (1st-2nd percentile)
D3: Extreme Drought (3rd-5th percentile)
D2: Severe Drought (6th-10th percentile)
D1: Moderate Drought (11th-20th percentile)
D0: Abnormally Dry (21st-30th percentile)
Data values ranked from highest to lowest

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Intensity is based on historical likelihood

- **Normal**
- **Unusually Dry**
- **Moderate Drought**
- **Severe Drought**
- **Extreme Drought**
- **Exceptional Drought**

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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 D3!!”
How is all of this done?
The map is a participatory process
A hybrid approach of combining the attributes of dozens of inputs to tell the “story” about drought in a region
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.
Data drives the editing
Emerging Satellite-based Observations and Products

Over the past 10+ years, a number of satellite remote sensing-based tools and products characterizing different parts of the hydrologic cycle that influence drought conditions allowing new composite drought indicators to be developed.

Examples

- Evaporative Stress Index (ESI)
- Quick Drought Response Index (QuickDRI)
- Evaporative Demand Drought Index (EDDI)
- GRACE soil moisture and groundwater anomalies
- Vegetation Drought Response Index (VegDRI)
Objective data: Ending at 8am Central each week

USDM
Convergence of Evidence

Author’s rotate every 2 weeks

Impact reports

Multiple DRAFT MAPS

Local experts

FINAL MAP RELEASED THURSDAY
Once the map is completed and published for the week, the map is final and **no changes will be made retroactively!**
We want YOU!
Some Examples of Decision Making and Policy Using the USDM

(**Science before Policy**)
The map is **NOT** created for any one policy or use.

**SCIENCE**  
Research based  
Established methods  
Peer-review

**Policy**  
Drought declarations  
Aid & relief payments

**Service**  
Decision support  
Product development

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What is next......

- We will continue to listen to users/partners!
- Continue to work with partners on data sets/availability of data in GIS
- USDM change maps services will be available
- Transition to operational “Objective Blends” based on gridded data similar to what CPC is currently doing with climate division data
- Transition to an on-line ESRI based portal for the development of the weekly map
  - First for the Authors
  - Next for the USDM community
- New “potential impacts” tables being developed for each state based upon data collected in the Drought Impact Reporter (DIR)
- DONE!
- Continue to develop tools, maps, etc. based upon stakeholder feedback as funding allows
- Allow the USDM to change as data and technology allows
Any Questions?

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