Soil Moisture Applications/Needs at the NDMC: The United States Drought Monitor Process and BEYOND

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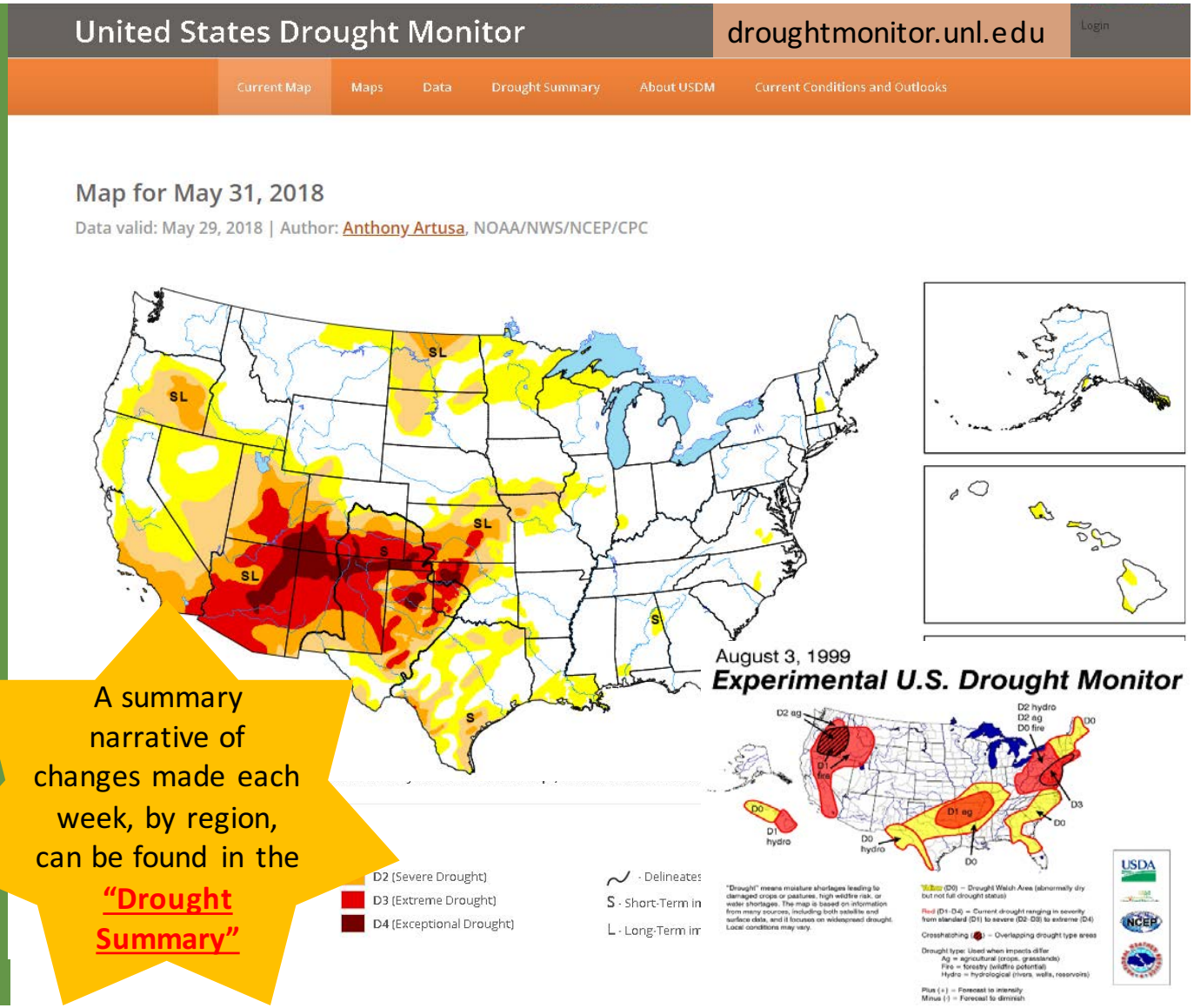
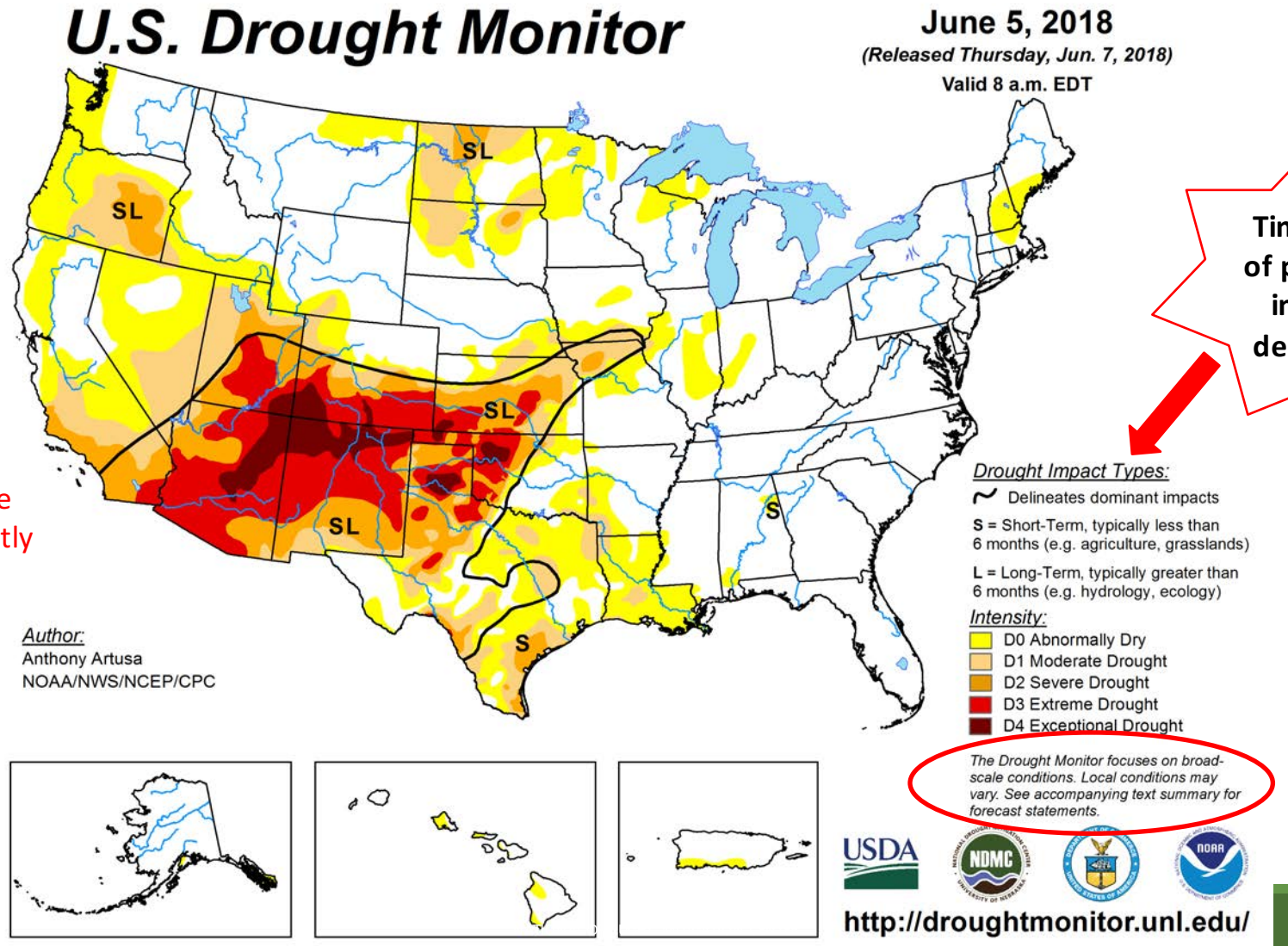
The United States Drought Monitor

- Hosted by the NDMC as part of a 3-way partnership with NOAA and USDA
- Weekly maps provided since 1999
- Over 450+ "Local Experts" participating each week
- Over 12.5 million hits a year
- Used in several USDA programs
- Used by the IRS for tax deferrals
- Many others !

A summary narrative of changes made each week, by region, can be found in the **"Drought Summary"**

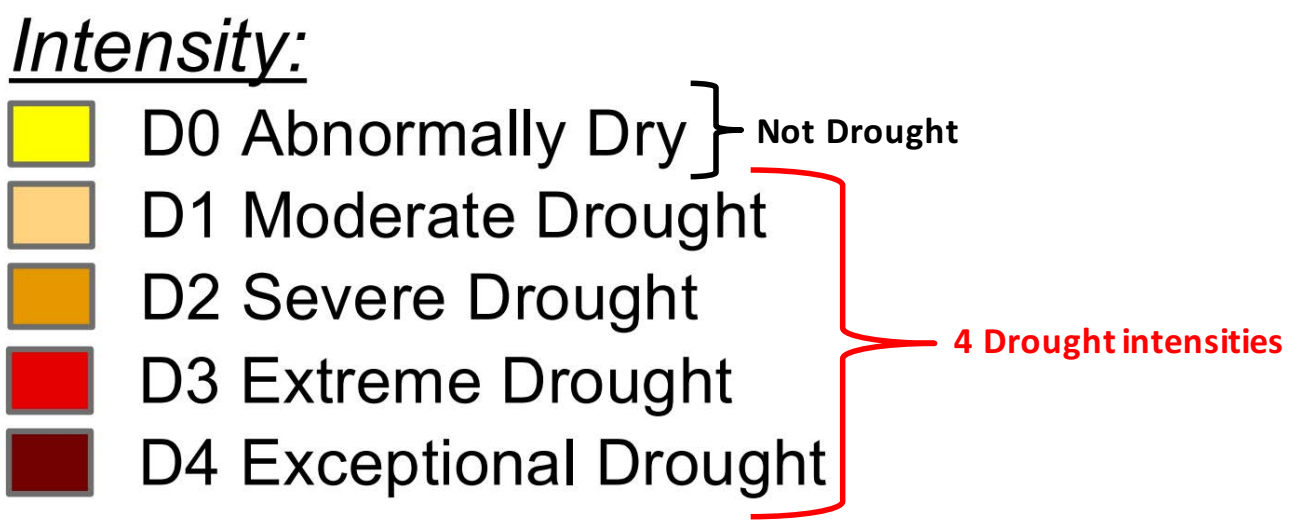




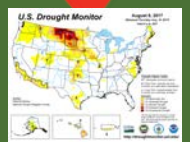
Timescales of potential impacts delineated

22.63% of the country currently in drought

5 levels of intensity on the map, 4 are considered drought, 1 is not…



U.S. Drought Monitor Objectives



- Assessment of **current** drought conditions and **current** drought impacts
- The U.S. Drought Monitor is ***NOT*** a model
  - The map is made manually each week based off the previous map
- The U.S. Drought Monitor is ***NOT*** interpreting just precipitation
- The U.S. Drought Monitor is ***NOT*** a forecast or drought declaration
  - Can be used by decision makers in this way though
- Identifying **impacts**
  - "**S**" short-term impacts, "**L**" long-term impacts or "**SL**" for a combination of both
  - "**S**"-6 month time scales or less, "**L**"-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 and indicators ***must*** support the depiction on the map
  - Impact data validates physical data

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
- Puts drought in historical perspective:

  How many occurrences in a given period of time

D4: Exceptional Drought (*1st-2nd* percentile)

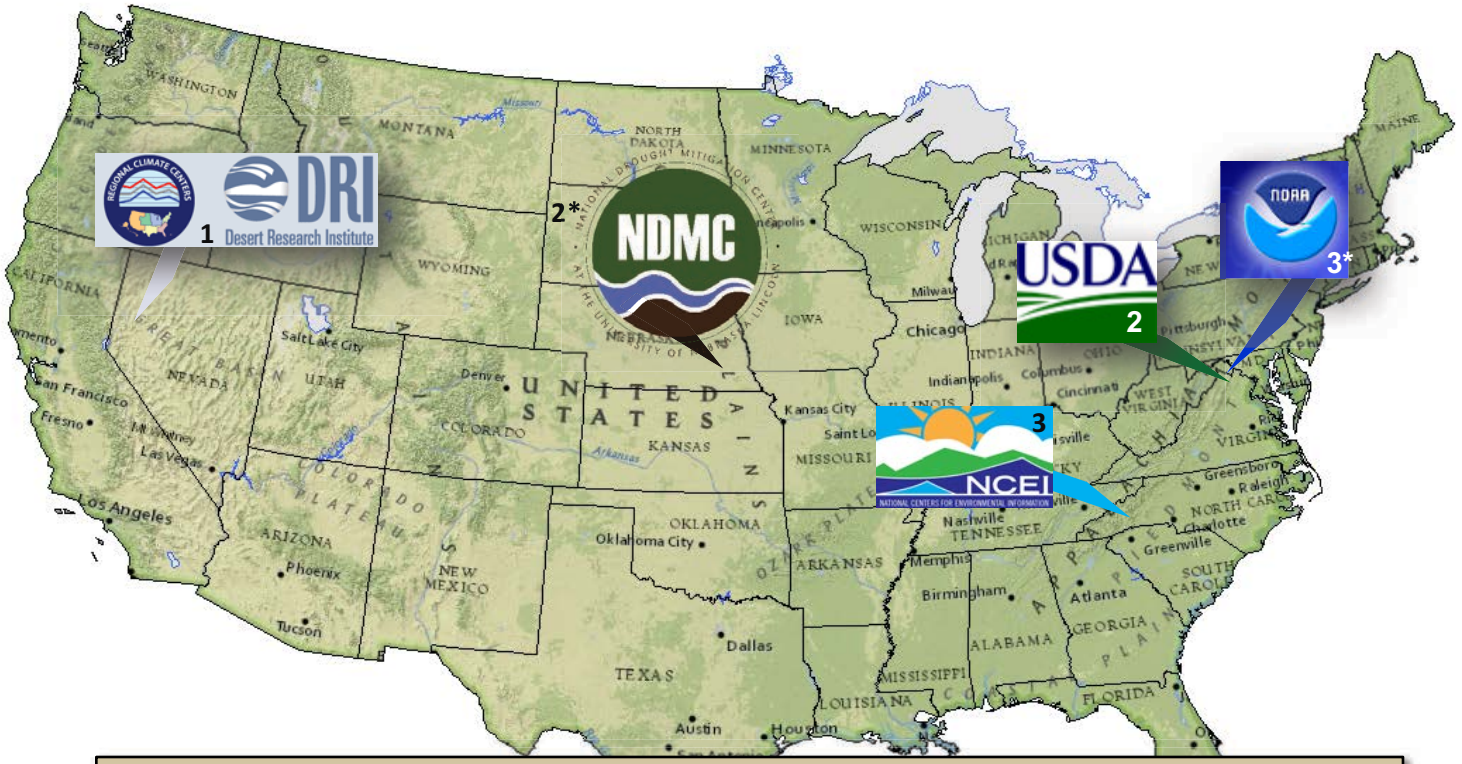
D3: Extreme Drought (*3rd-5th* percentile)

D2: Severe Drought (*6th-10th* percentile)

D1: Moderate Drought (*11th-20th* percentile)

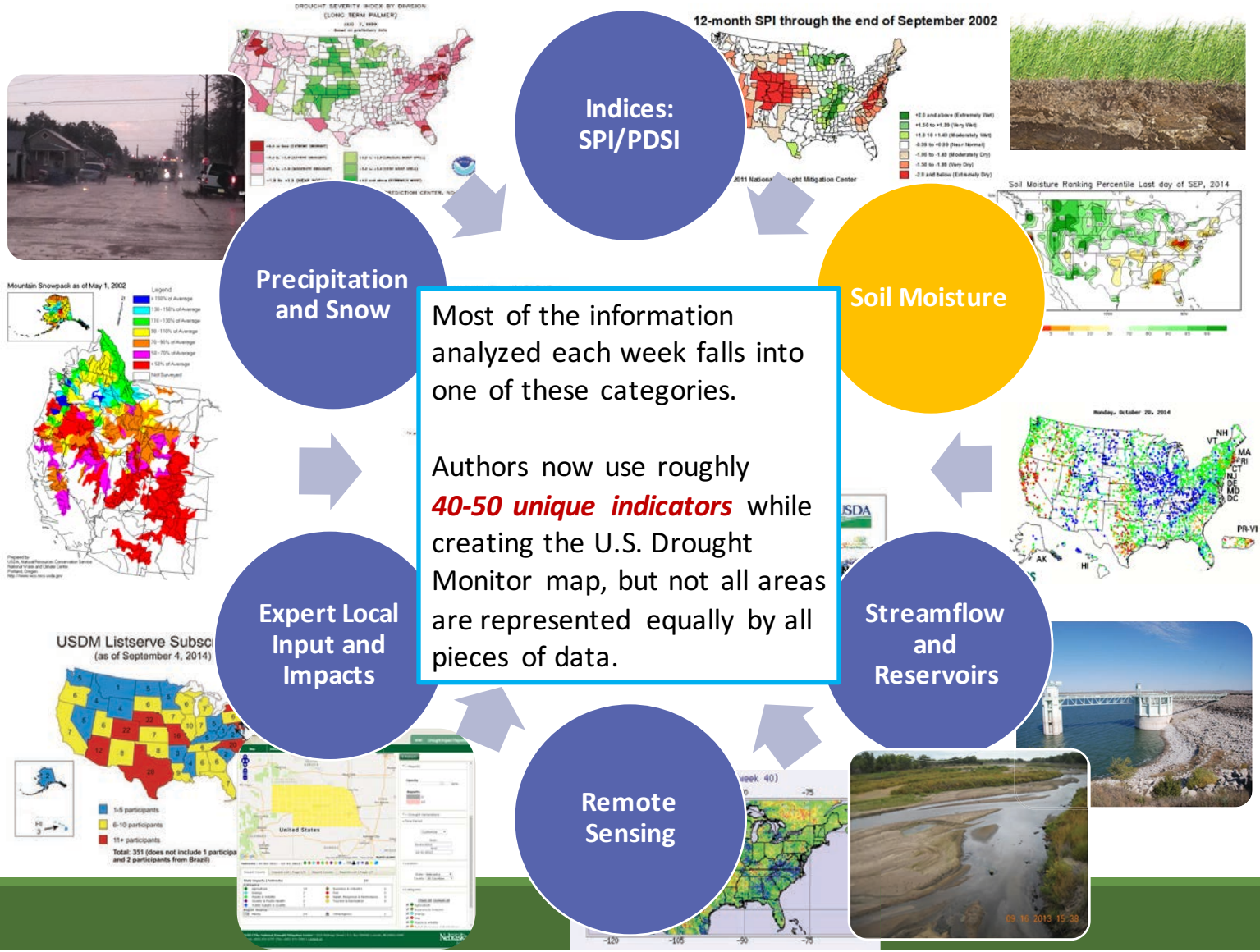
D0: Abnormally Dry (*21st-30th* percentile)

How is all of this done?



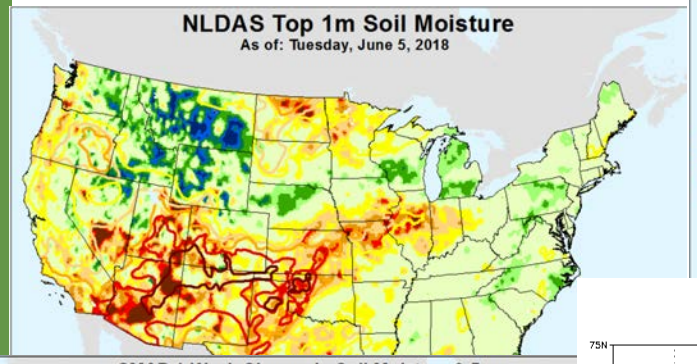
Requirement: Authors must work at a regional or national "center", government or academia/research

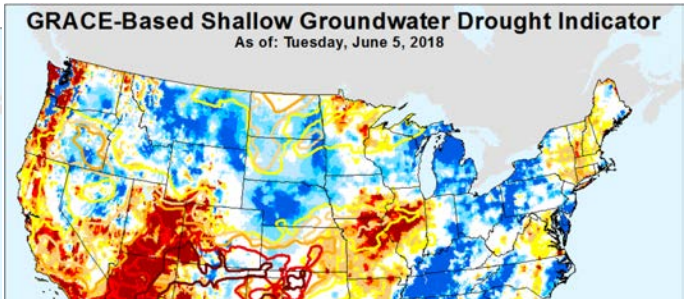
There are currently 11* authors, and all are volunteers

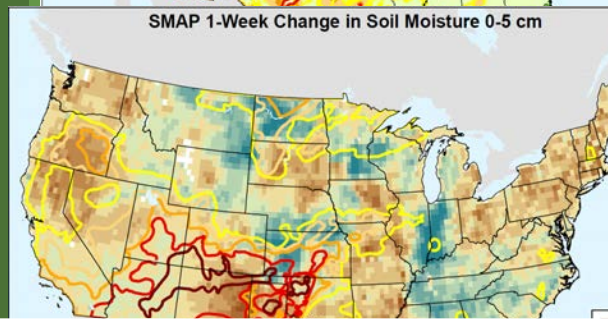

Indices: SPI/PDSI
Precipitation and Snow
Soil Moisture
Expert Local Input and Impacts
Streamflow and Reservoirs
Remote Sensing
Most of the information analyzed each week falls into one of these categories.
Authors now use roughly 40-50 unique indicators while creating the U.S. Drought Monitor map, but 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)

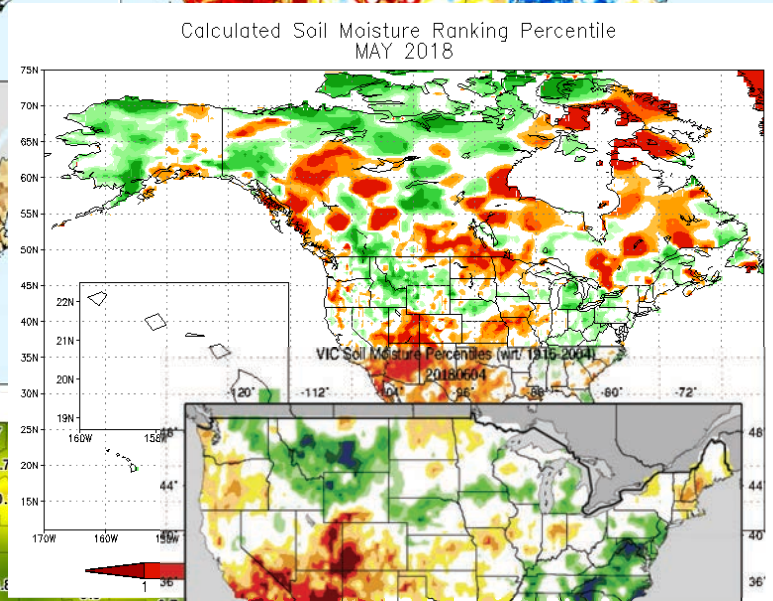
Soil Moisture Data used in the USDM production

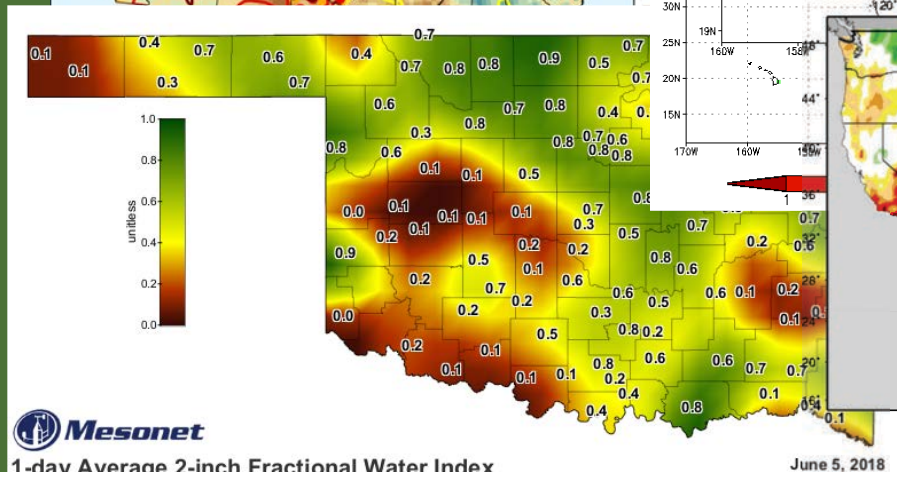
- NLDAS
- SMAP
- SCAN
- GRACE
- Mesonets
- VIC
- Sacrameto
- CPC
- And others…….







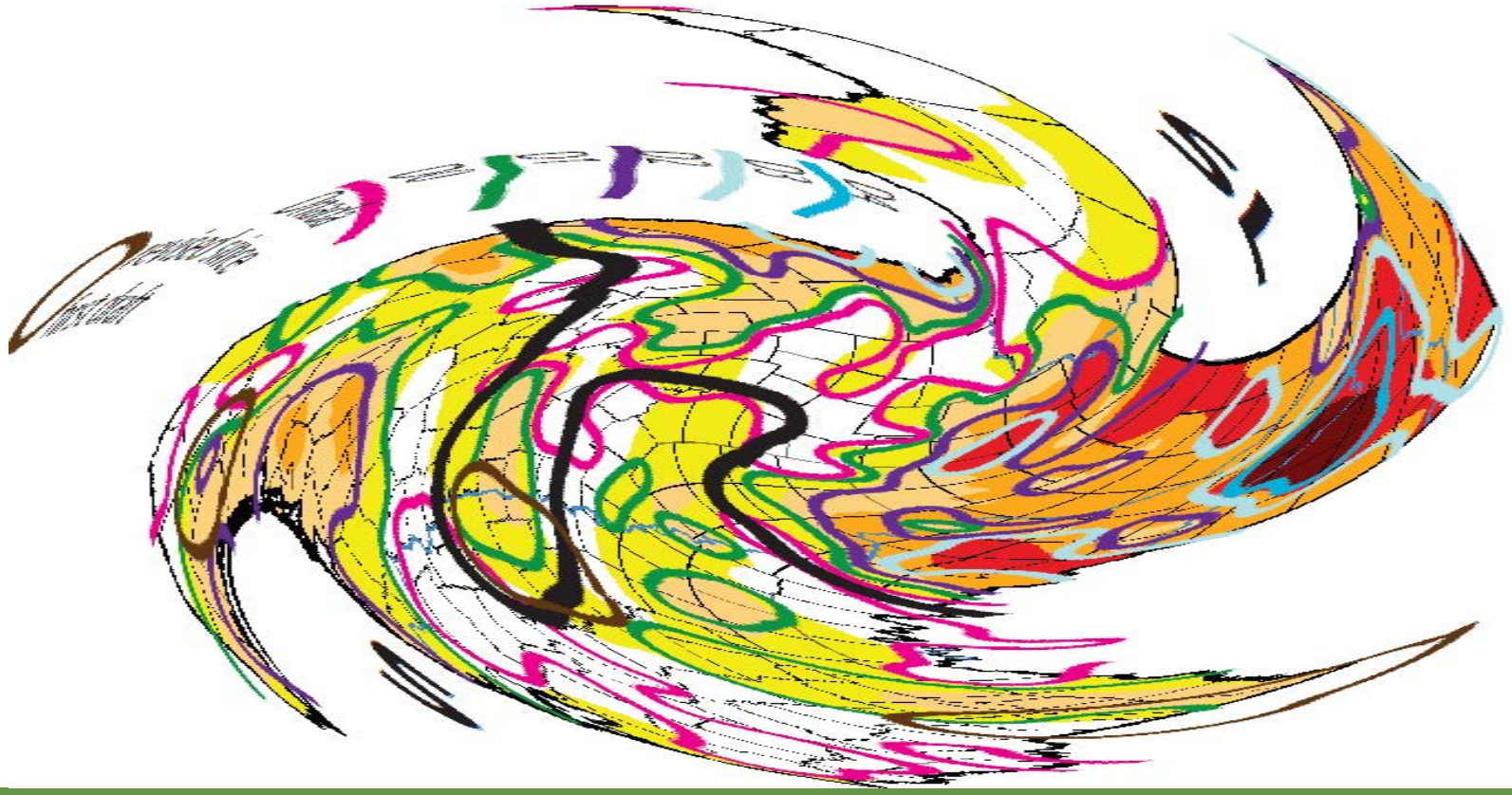




USDM Soil Moisture

"Wish List"

- Keep working towards a coordinated soil moisture product for the CONUS based upon in situ data
- Provide data in percentiles and in a GIS compatible format so the USDM Authors can ingest the data each week into their analysis
- Develop a soil moisture climatology going as far back as possible
- Provide guidance on the limitations of any aggregated products
- Weekly updates of these soil moisture products if not near-real time
- Develop hybrid products along with the remote sensing community using both in situ and satellite data for the CONUS
- Utilize existing federal platforms (SCAN, CRN, etc) and state/regional networks to expand our soil moisture monitoring efforts



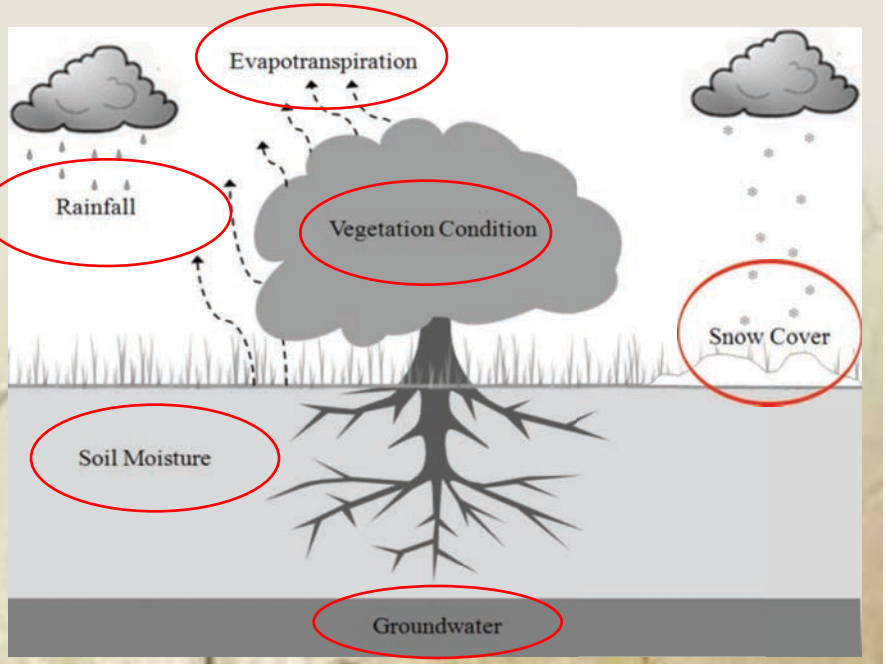
And now….BEYOND the USDM

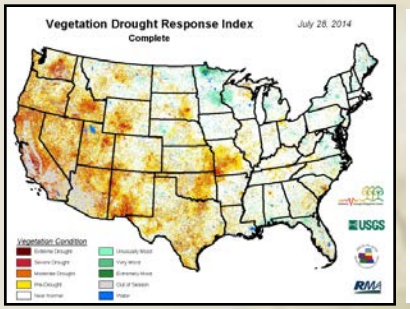
Emerging Satellite-based Observations and Products

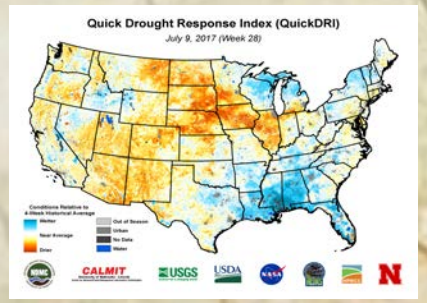
Over the past 10+ years, a number of satellite remote sensing-based tools and ***products characterizing different parts of the hydrologic cycle that influence drought conditions*** allowing new composite drought indicators to be developed.

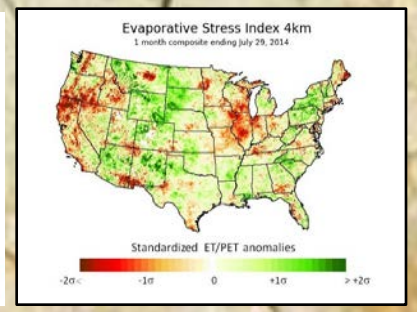
Examples

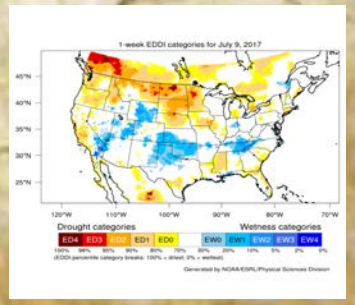
- Evaporative Stress Index (ESI)
- Quick Drought Response Index (QuickDRI)
- Evaporative Demand Drought Index (EDDI)
- GRACE soil moisture and groundwater anomalies
- Vegetation Drought Response Index (VegDRI)

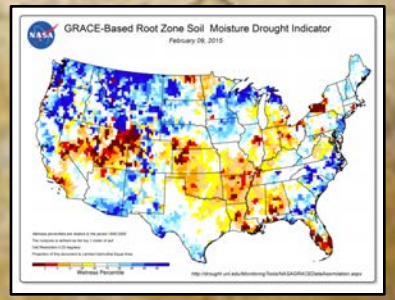




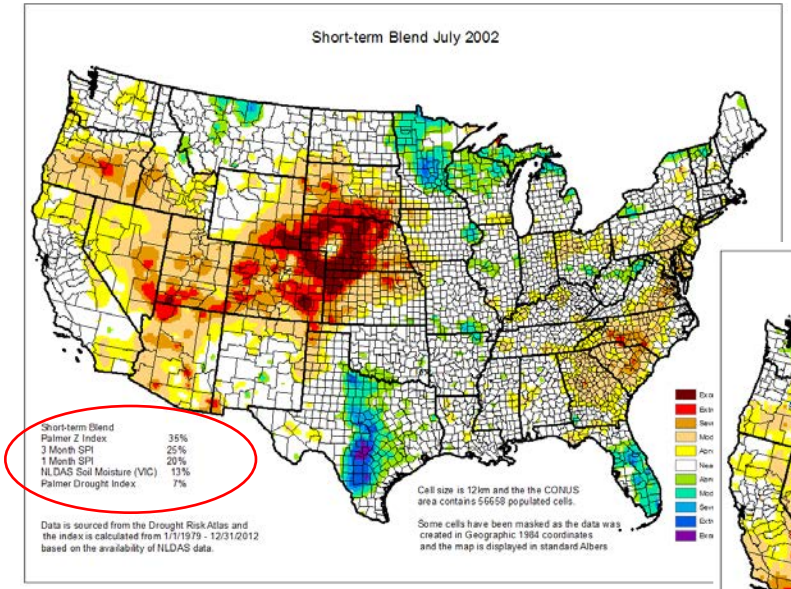


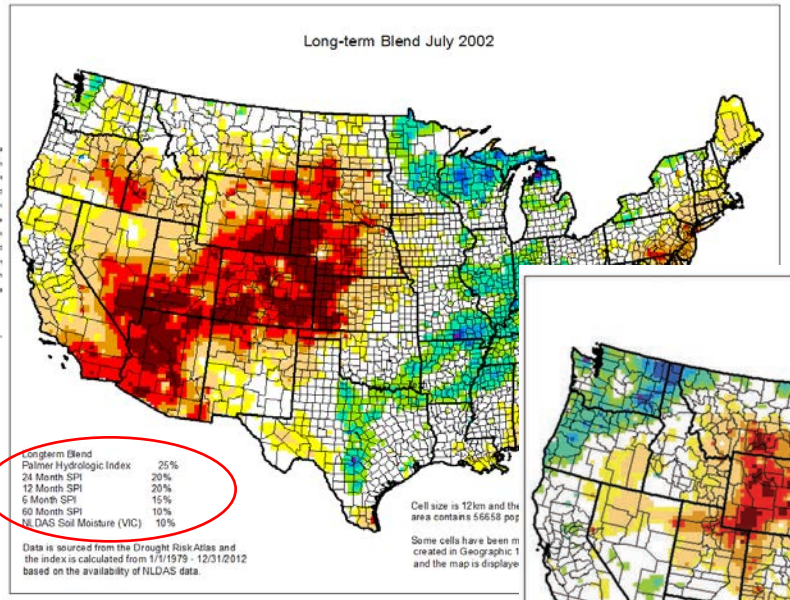


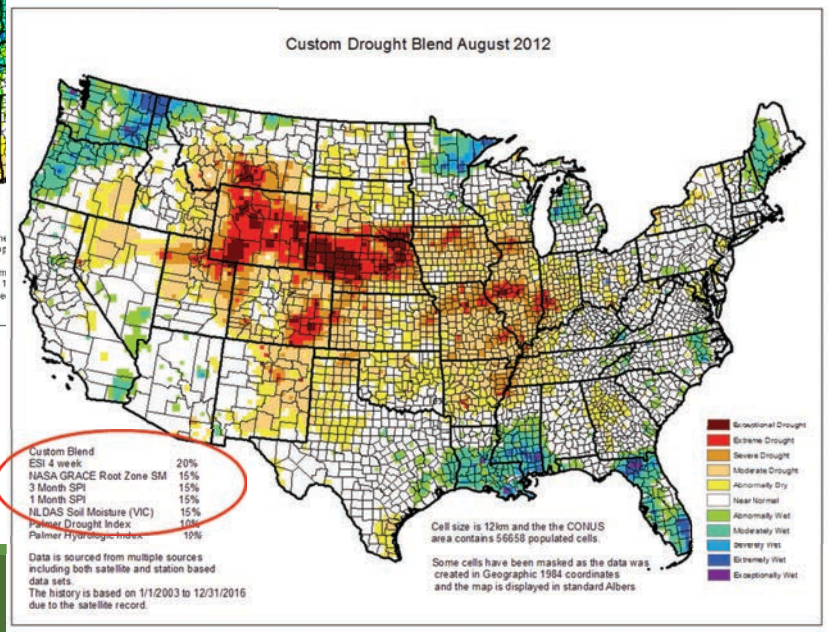




Blending it all together…..



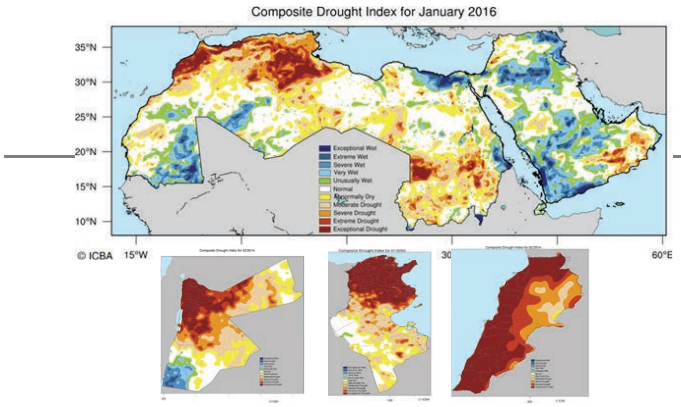


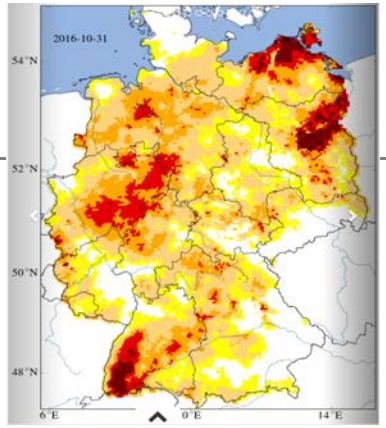


- Flash drought
- Snow drought
- Hydro drought
- Eco drought
- Ag drought
- Capture regional/seasonal differences in drought
  - Characteristics and climatologies…
- Take advantage of machine learning/geospatial techniques

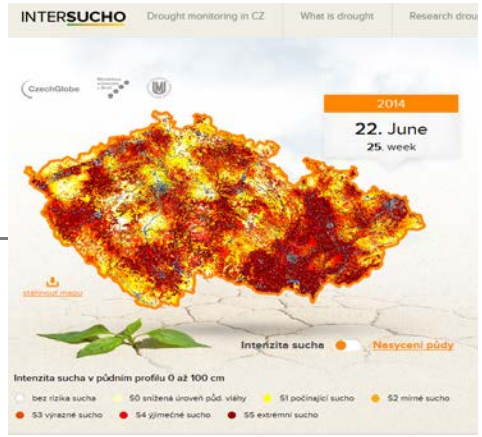
International CDI Activities

MENA

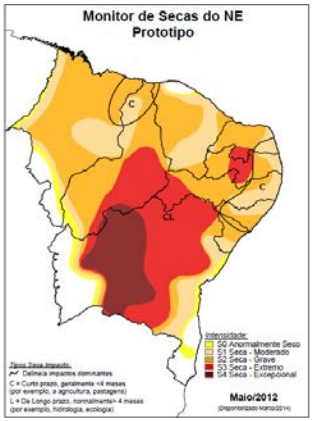




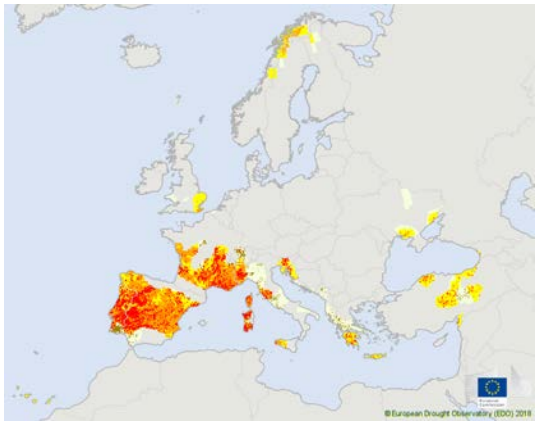
Germany



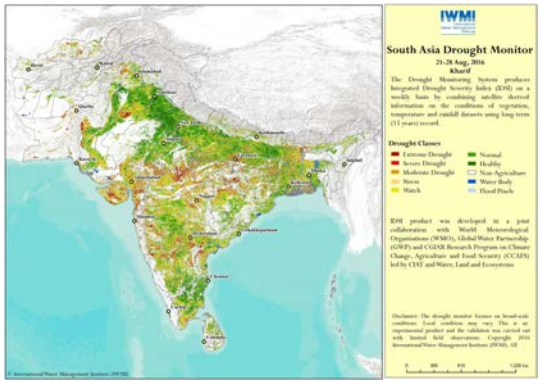
Czech Republic



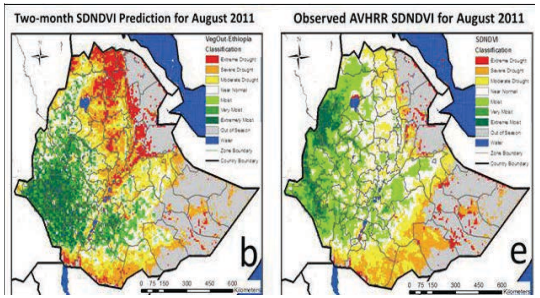
Brazil



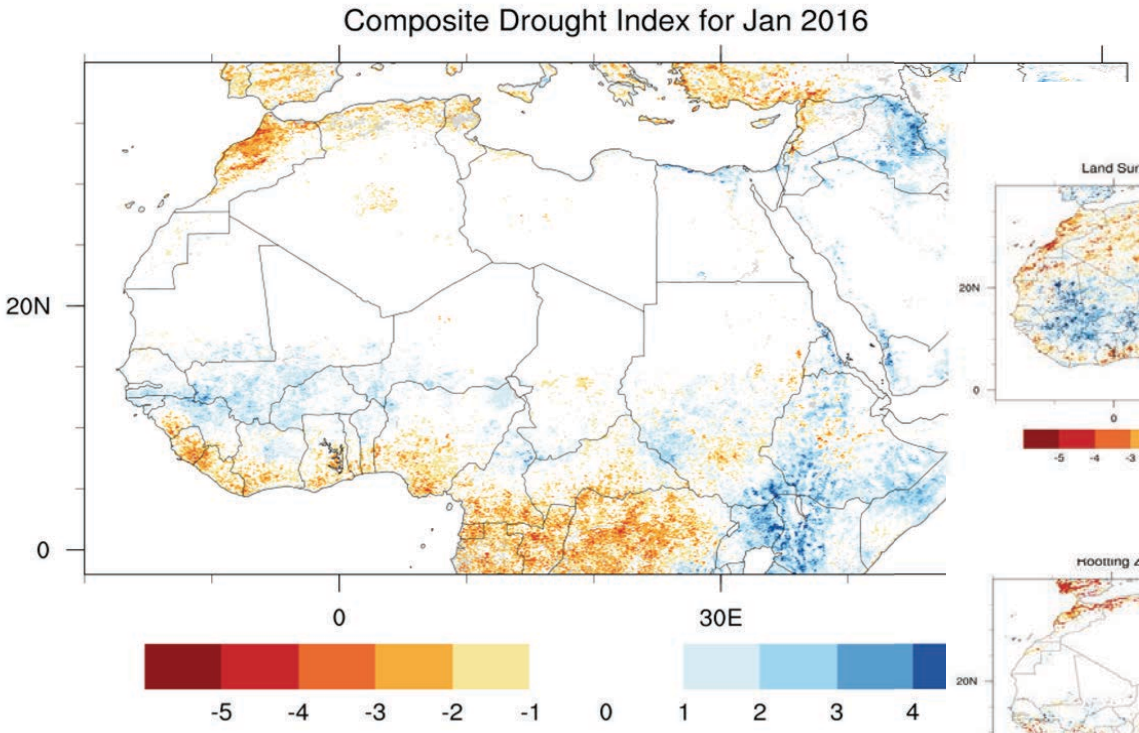
JRC-EDO

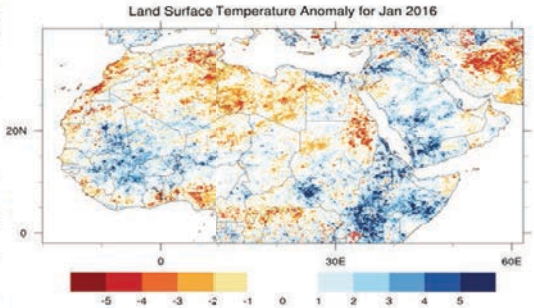


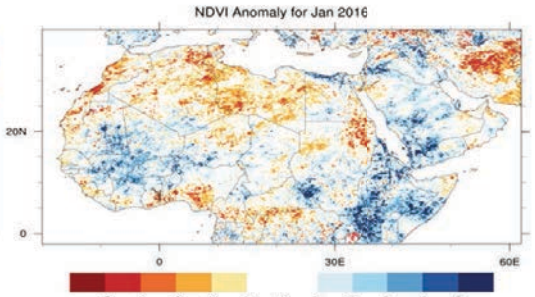
IWMI-South Asia

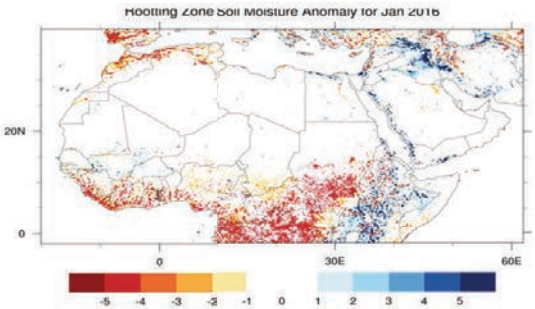


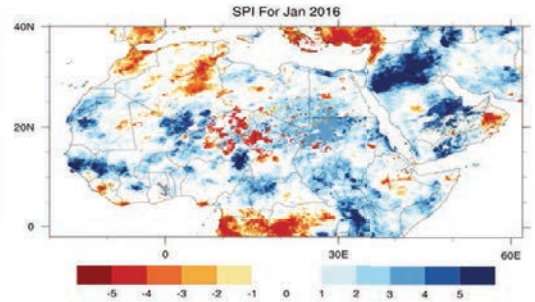
Greater Horn of Africa











USAID FROM THE AMERICAN PEOPLE

ICBA AGRICULTURE FOR TOMORROW

NDMC

Water for Food DAUGHERTY GLOBAL INSTITUTE at the University of Nebraska

OUR PARTNERS

Any Questions ?

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