



# The Continual Evolution of The United States Drought Monitor through an Innovative Approach

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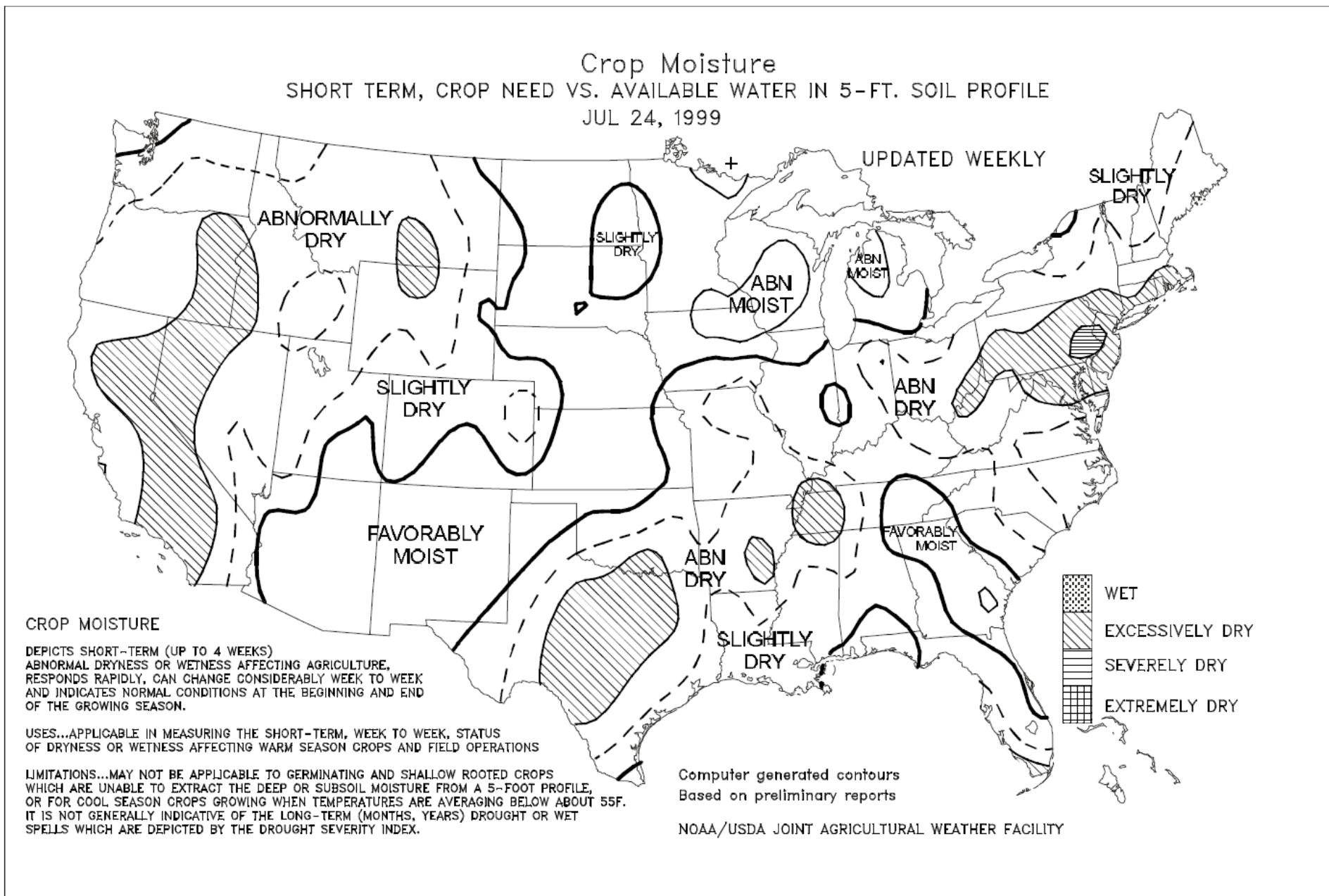
NOAA S2S Analysis, Predictions, and Services Webinar Series  
March 25, 2026



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# How was Drought being Observed Prior to the US Drought Monitor?





# Instead of using a single drought indicator/index, a Hybrid / Combined Indicator Approach was developed: U.S. Drought Monitor

**Objective**  
Physical indicators  
& indices

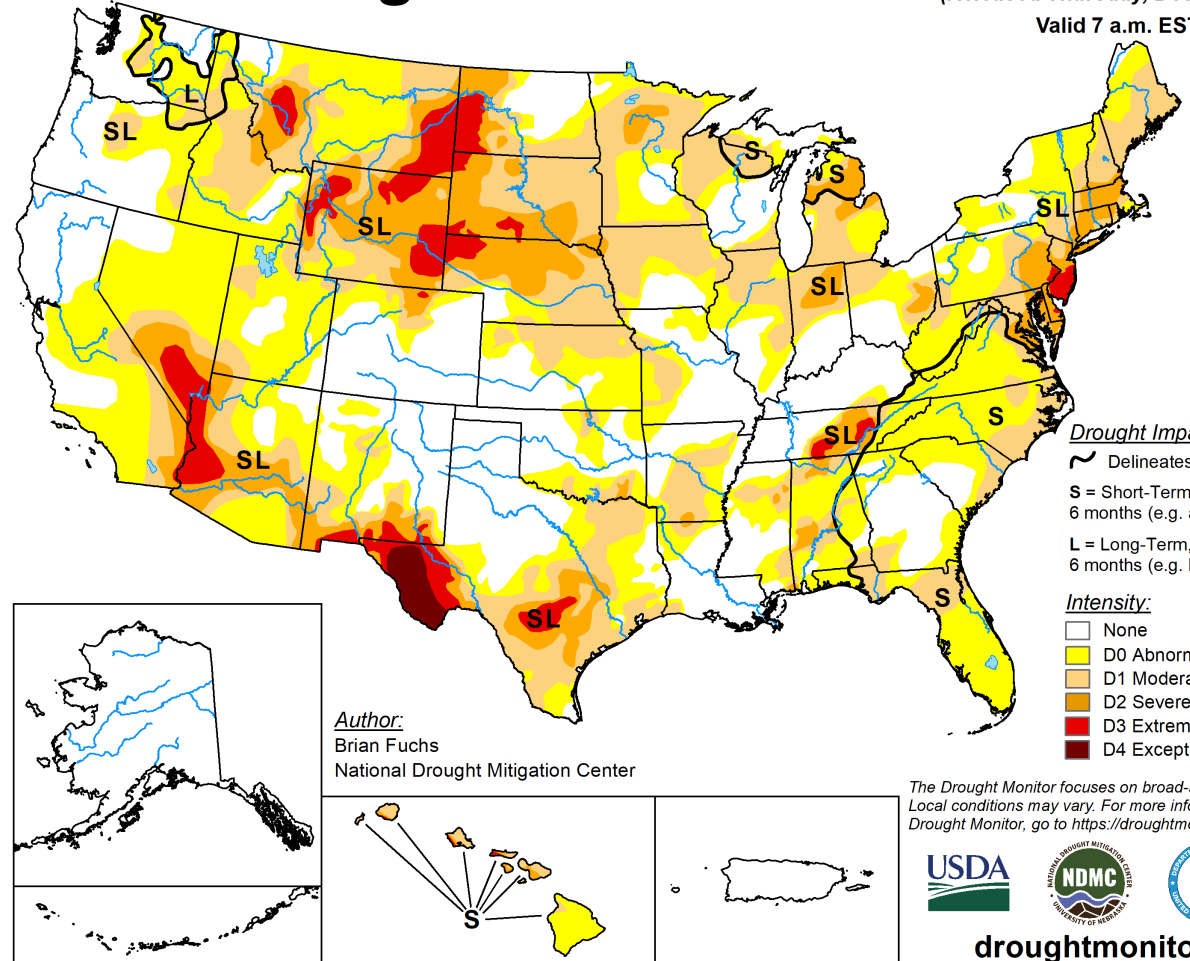


**Knowledge Based**  
local expertise  
and impacts  
incorporated



## U.S. Drought Monitor

December 17, 2024  
(Released Thursday, Dec. 19, 2024)  
Valid 7 a.m. EST

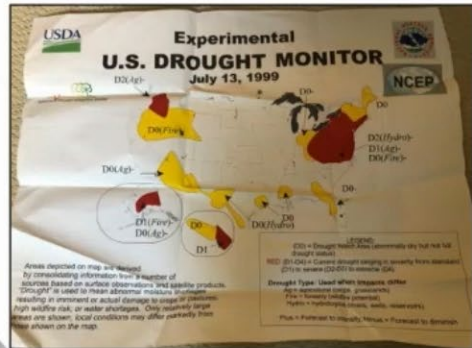


# Continuous Development Process

Development Team

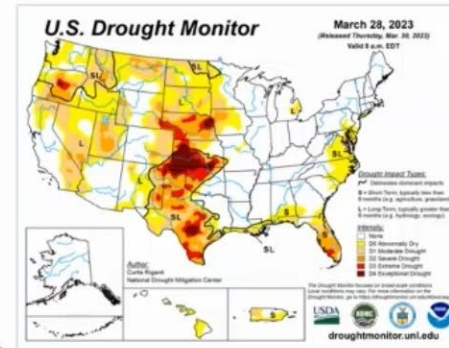


**Discovery**  
“Build the right thing.”



Continuous Feedback

**Delivery**  
“Build the thing right.”



Delivery & Deployment

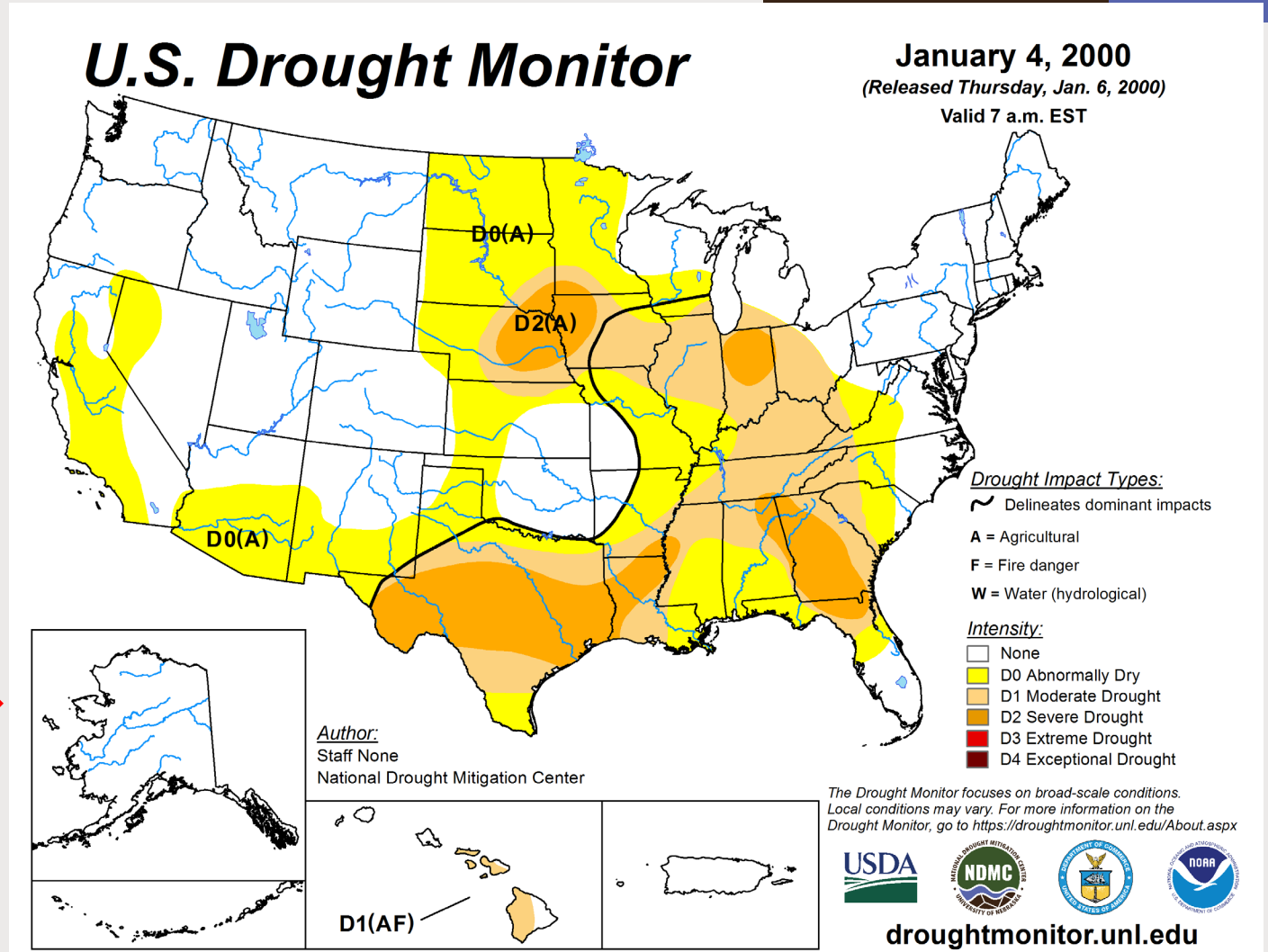
Users



# What is Continuous Development?

An ongoing, iterative effort to improve products or services through small, incremental changes focusing on efficiency, effectiveness, and adaptability rather than big, infrequent overhauls

A handful of in situ data aggregated at climate division scales along with a handful of “local experts” providing feedback was a significant improvement and a top-of-the-line approach to Drought Monitoring in 1999



# Technology and Data Driving Changes to the USDM Process



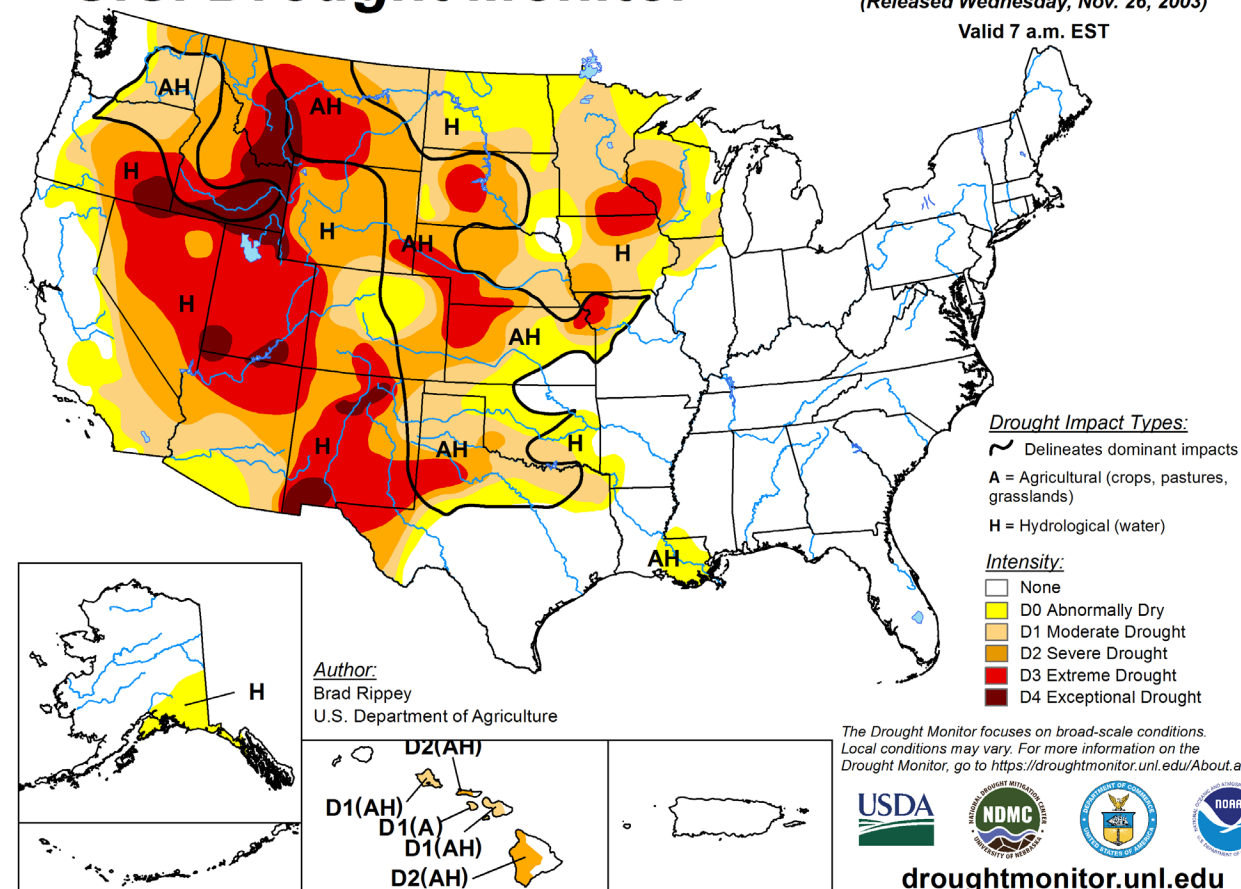
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## 2003 brought the change over to ArcGIS for the USDM Map Production

- ✓ Improved drawing ability to assess Dx level better using GIS
- ✓ Precision of changes being made followed the data, improving accuracy. No more “eyeballing” data
- ✓ Digitized data becoming available to bring directly into GIS
- ✓ GIS allowed for more products and maps for end users
- ✓ Approximately 225 “Local Experts” now participating each week providing real-time peer reviews

## U.S. Drought Monitor

November 25, 2003  
(Released Wednesday, Nov. 26, 2003)  
Valid 7 a.m. EST



# Technology and Data Driving Changes to the USDM Process



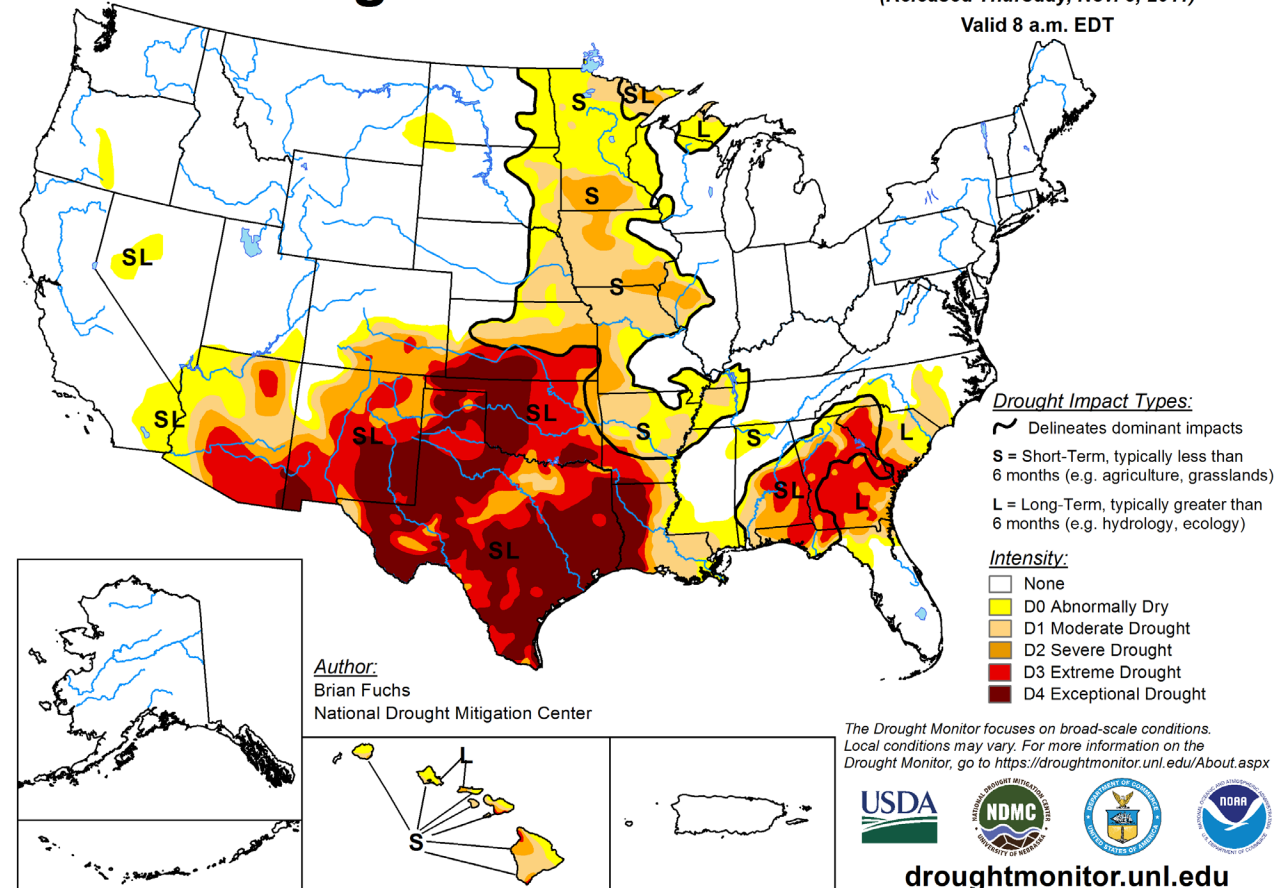
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2008 began a big improvement in data availability for the analysis process

- ✓ More digitized data becoming available to bring directly into GIS
- ✓ Accuracy continues to improve with sub-county ability to determine Dx levels
- ✓ GIS allowed for more products and maps for end users: Regional, State, County level products
- ✓ Approximately 300 “Local Experts” now participating each week providing real-time peer reviews

## U.S. Drought Monitor

November 1, 2011  
(Released Thursday, Nov. 3, 2011)  
Valid 8 a.m. EDT





# Science and Technology Drives the United States Drought Monitor Process

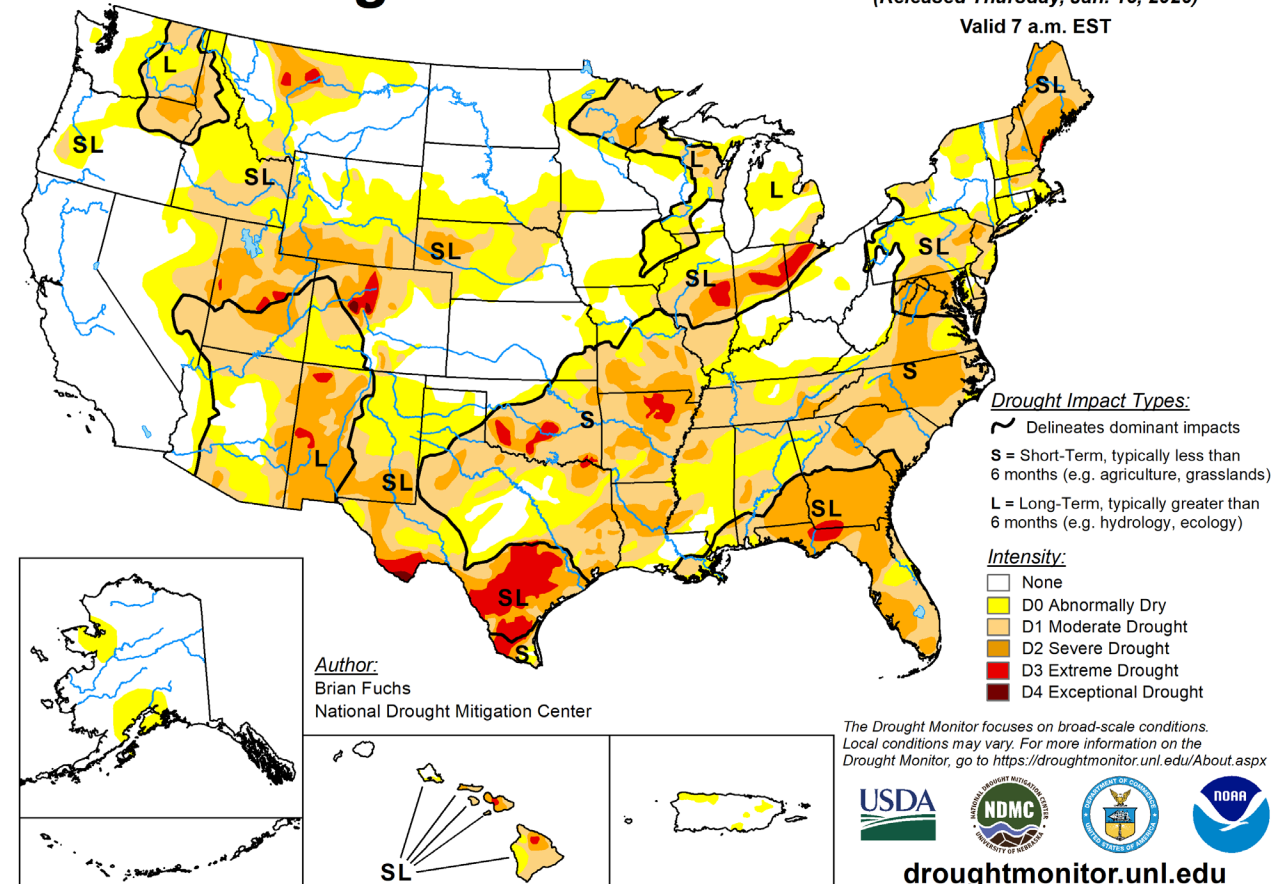


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- ✓ **Climate Non-Stationarity** is built into many of the newer data being incorporated into the USDM process. Consensus guidance is still needed from the climate community
- ✓ **Processing power** is allowing for more complex development of CDI's that include regional and seasonal components improving accuracy of the USDM
- ✓ **Data+People** continues to be the strength of the USDM process
- ✓ **Process Replication?** The USDM is no different from a forecasters making decisions using an ensemble model approach where a final outlook is made based on expertise and team guidance

## U.S. Drought Monitor

January 13, 2026  
(Released Thursday, Jan. 15, 2026)  
Valid 7 a.m. EST



# New Partnerships for the United States Drought Monitor Core Team in 2026

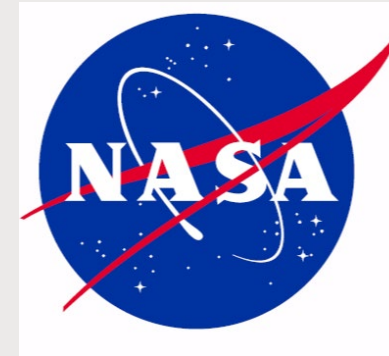


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The Development of the USDM and oversight was always a 3 Way Partnership since the beginning in 1999 including:

- ❑ The National Drought Mitigation Center
- ❑ United States Department of Agriculture
- ❑ The National Oceanic and Atmospheric Administration (CPC, NCEI, RCC)

2026 will bring the addition of the National Aeronautics and Space Administration (NASA) as an additional partner



# Where are We Going Next with the Continuous Development Process ?



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# Weekly Composite Drought Indicators (CDI's)



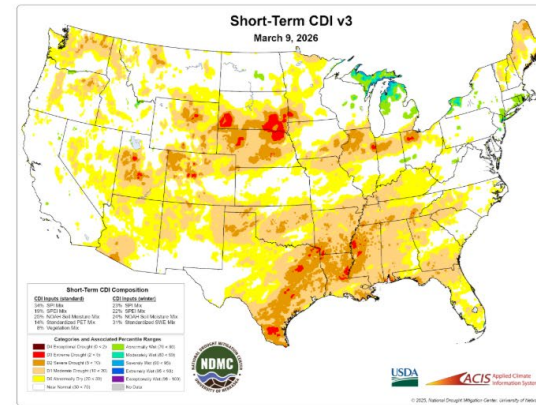
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<https://ndmcblends.unl.edu/>

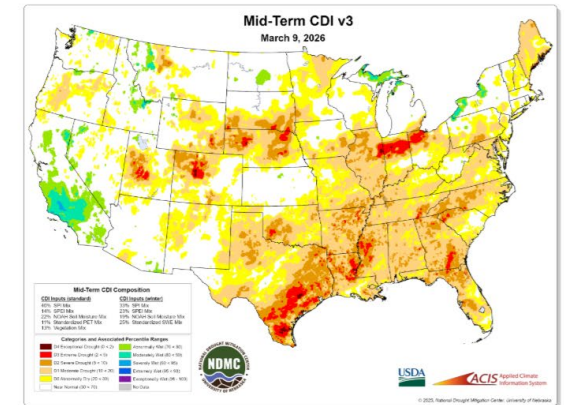
- ✓ Developed using ML/AI techniques
- ✓ Week to week continuity with consistent inputs and weights
- ✓ Incorporates climate non-stationarity into the products
- ✓ Captures 4 specific timescales of drought (short/mid/long/flash) that feeds into the weekly USDM production
- ✓ Individual maps and inputs available each week
- ✓ Full archive of weekly CDI's to 1980
- ✓ Research continuing with Version 4 being released later in 2026
- ✓ Potential to have a “composite of composites” providing a “First Look” USDM product

NDMC Composite Drought Indicators

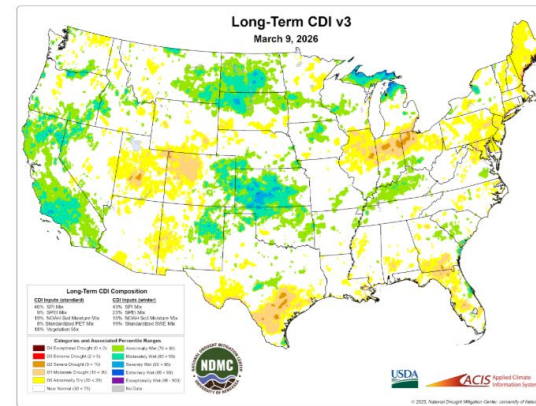
[Home](#) [Change](#) [Archive](#) [Data](#) [Inputs](#) [Metadata](#) [Contact](#)



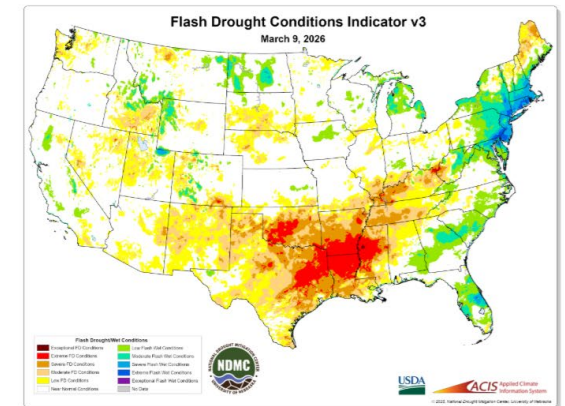
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# Continued Collaboration with Partners and Data Providers to Implement New Data Products



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- ✓ The NDMC is an early adopter of the NLDAS-3 data and products and has worked extensively with the NASA team during the development of these data
- ✓ Working directly with the PRISM group at Oregon State to implement new PRIMS based SPI and SPEI data as well as other products directly into the USDM process
- ✓ Working with NASA/JPL to continue updating the AIRS suite of products created for the USDM
- ✓ Updating the models used to create VegDRI and QuickDRI with the USGS EROS Data Center
- ✓ Continued work with the CoCoRaHS team to implement more data and condition monitoring reports directly from their systems into the USDM authoring interface

## NLDAS-3 will provide consistent and near real-time data for water resource monitoring

Table 2: List of expected Noah-MP LSM output variables from HydroGlobe.

Variable	Short Name	Units
Surface net downward shortwave flux	SWnet_tavg	W m <sup>2</sup>
Surface net downward longwave flux	LWnet_tavg	W m <sup>2</sup>
Surface upward latent heat flux	Qle_tavg	W m <sup>2</sup>
Surface upward sensible heat flux	Qh_tavg	W m <sup>2</sup>
Downward heat flux in soil	Qg_tavg	W m <sup>2</sup>
Snowfall rate (frozen)	Snowf_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Rainfall rate (liquid)	Rainf_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Total evapotranspiration	Evap_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Surface runoff amount	Qs_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Subsurface runoff amount	Qsb_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Surface temperature	AvgSurfT_tavg	K
Daily minimum surface temperature	AvgSurfT_tavg_min	K
Daily maximum surface temperature	AvgSurfT_tavg_max	K
Liquid water content of surface snow	SWE_tavg	kg m <sup>-2</sup>
Snow depth	SnowDepth_tavg	m
Soil moisture - 4 layers [0-10cm; 10-40cm; 40-100cm; 100-200cm]	SoilMoist_tavg	m <sup>3</sup> m <sup>-3</sup>
Soil temperature - 4 layers [0-10cm; 10-40cm; 40-100cm; 100-200cm]	SoilTemp_tavg	K

Potential evapotranspiration	PotEvap_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Vapor pressure deficit	VPD_tavg	Pa
Vegetation transpiration	TVeg_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Bare soil evaporation	ESoil_tavg	kg m <sup>-2</sup> s <sup>-1</sup>
Total canopy water storage	CanopInt_tavg	kg m <sup>-2</sup>
Water table depth	WaterTableD_tavg	m
Terrestrial water storage	TWS_tavg	mm
Groundwater storage	GWS_tavg	mm
Surface snow area fraction	Snowcover_tavg	[-]
Gross primary production	GPP_tavg	g m <sup>-2</sup> s <sup>-1</sup>
Net primary productivity	NPP_tavg	g m <sup>-2</sup> s <sup>-1</sup>
Net ecosystem exchange	NEE_tavg	g m <sup>-2</sup> s <sup>-1</sup>
Leaf area index	LAI_tavg	[-]

Variable	Short Name	Units
Streamflow	Streamflow_tavg	m <sup>3</sup> s <sup>-1</sup>
River depth	RiverDepth_tavg	m
Flooded fraction	FloodedFrac_tavg	[-]
Surface water elevation	SurfElev_tavg	m
Surface water storage	SWS_tavg	mm

# *Any Questions?*



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**Thank You !**