

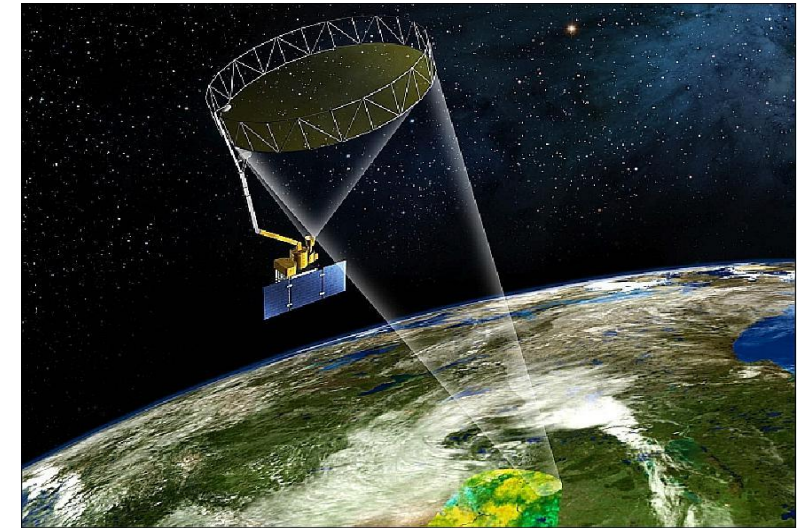
Operational Soil Moisture Monitoring for Crop Progress Reporting via CropCASMA SMAP

Zhengwei Yang, Ph.D.

Spatial Analysis Research Section

USDA-NASS, Research and Development Division

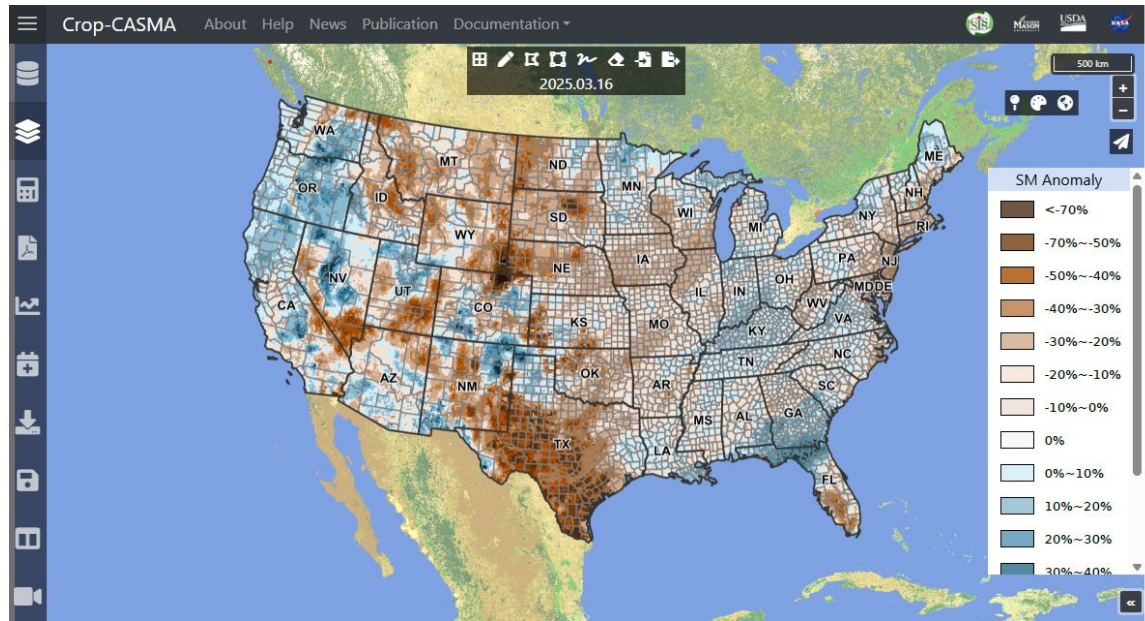
May 20, 2025



United States Department of Agriculture
National Agricultural Statistics Service



CropCASMA – A Crop Condition and Soil Moisture Analytics Tool

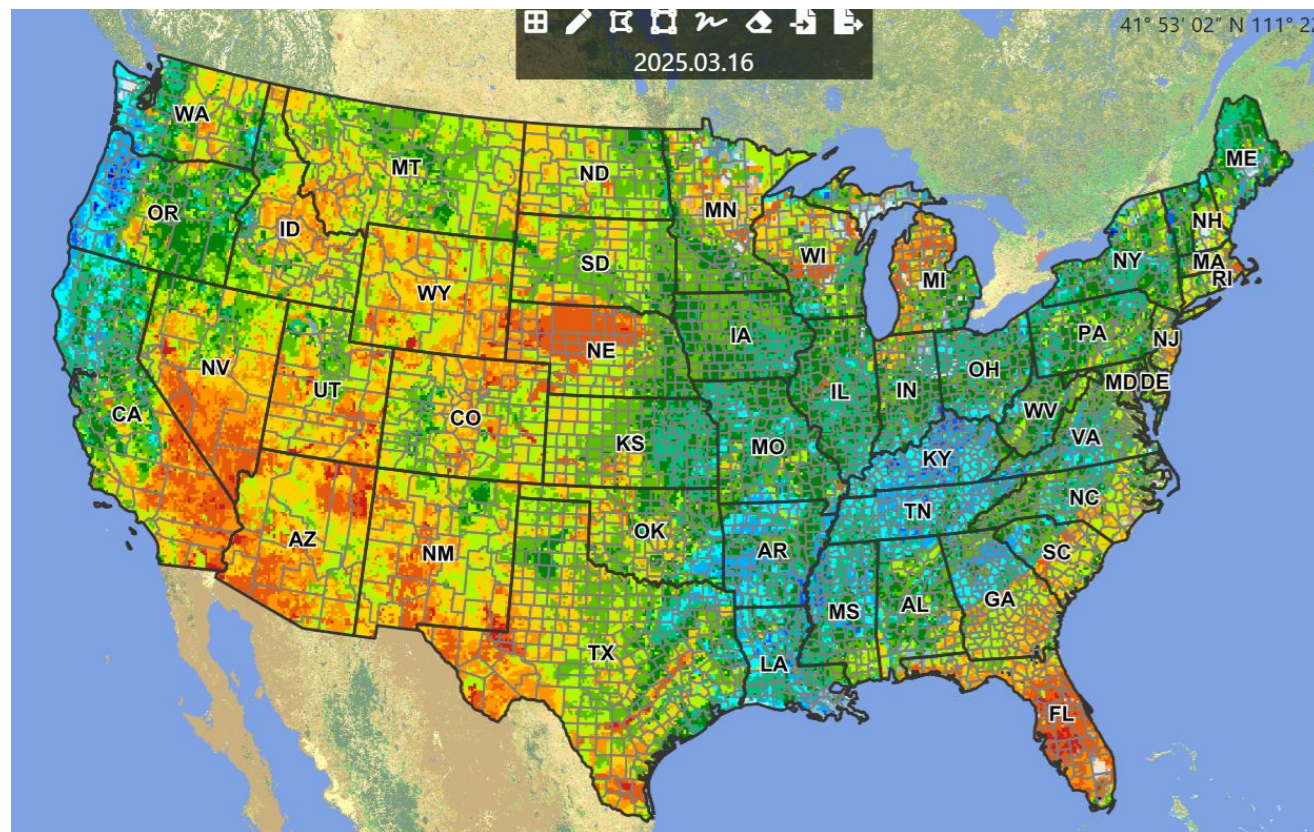


- **Crop-CASMA (Crop Condition and Soil Moisture Analytics)**
 - web-based geospatial application developed by the USDA's NASS, in collaboration with George Mason University and NASA.
- **Crop-CASMA provides access to SMAP soil moisture and crop vegetation condition maps and data**
 - derived from NASA SMAP (Soil Moisture Active Passive) and MODIS (Moderate Resolution Imaging Spectroradiometer) data
- **Tools are designed to help**
 - NASS crop weather operation and disaster monitoring and assessment
 - General public such as farmers, researchers, statisticians, and students with spring planting, tracking natural disasters damage, and crop health monitoring and assessment.
- **Users can select an area of interest, analyze data, create a PDF map, and download data to input into their own models.**

CropCASMA Soil Moisture Data

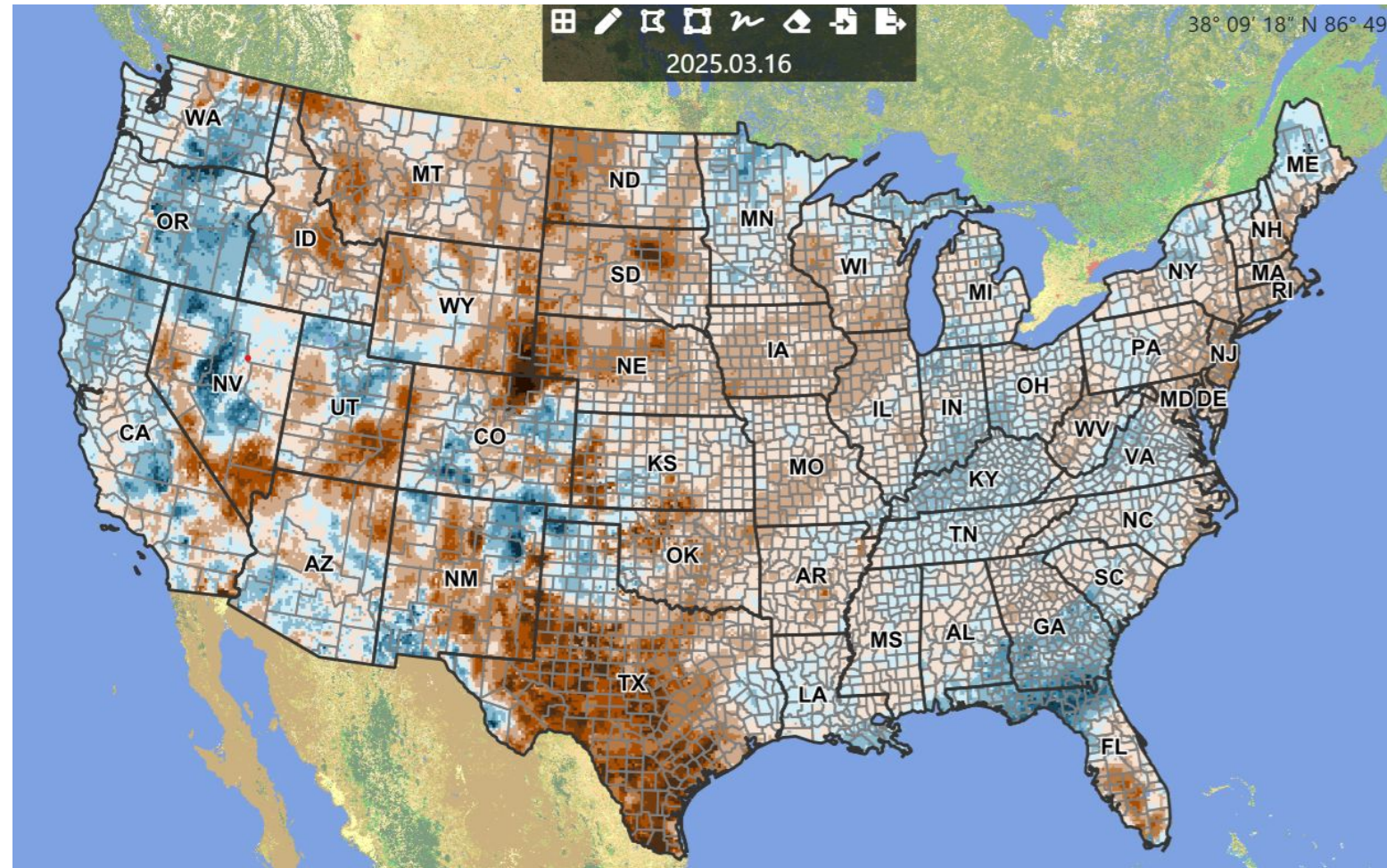
- SMAP Level 4 Data Product

- SMAP soil moisture data are volumetrically measured in (cm^3 water/ cm^3 soil)
- SMAP level-4 product is produced by assimilating SMAP observations with physically-based models that incorporate ground station data
- Level 4 data product spec:
 - 9km spatial resolution (~20,000 Acres)
 - Topsoil moisture (top 5cm)
 - Subsoil moisture (top 1m of the soil column)
 - Eight outputs/day (every 3 hours)
 - Aggregated daily and weekly average data



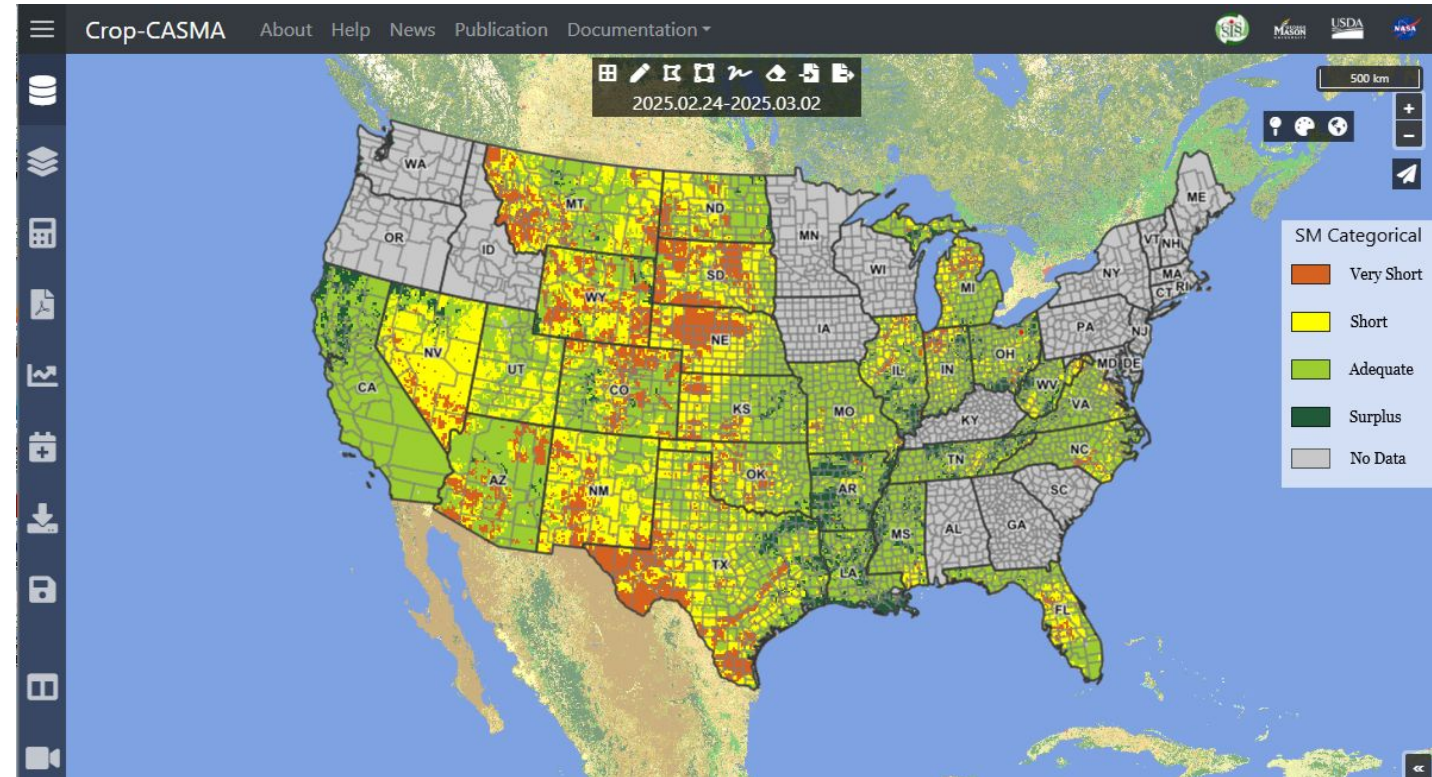
Derivative Products: Soil Moisture Anomaly

- Anomaly data product (9km) (daily & weekly)
 - Topsoil moisture (top 5cm)
 - Sub (Root zone) soil moisture (top)
- Anomaly data show the deviation of the current data from the historical average soil moisture level
- Good for drought or extreme moisture monitoring

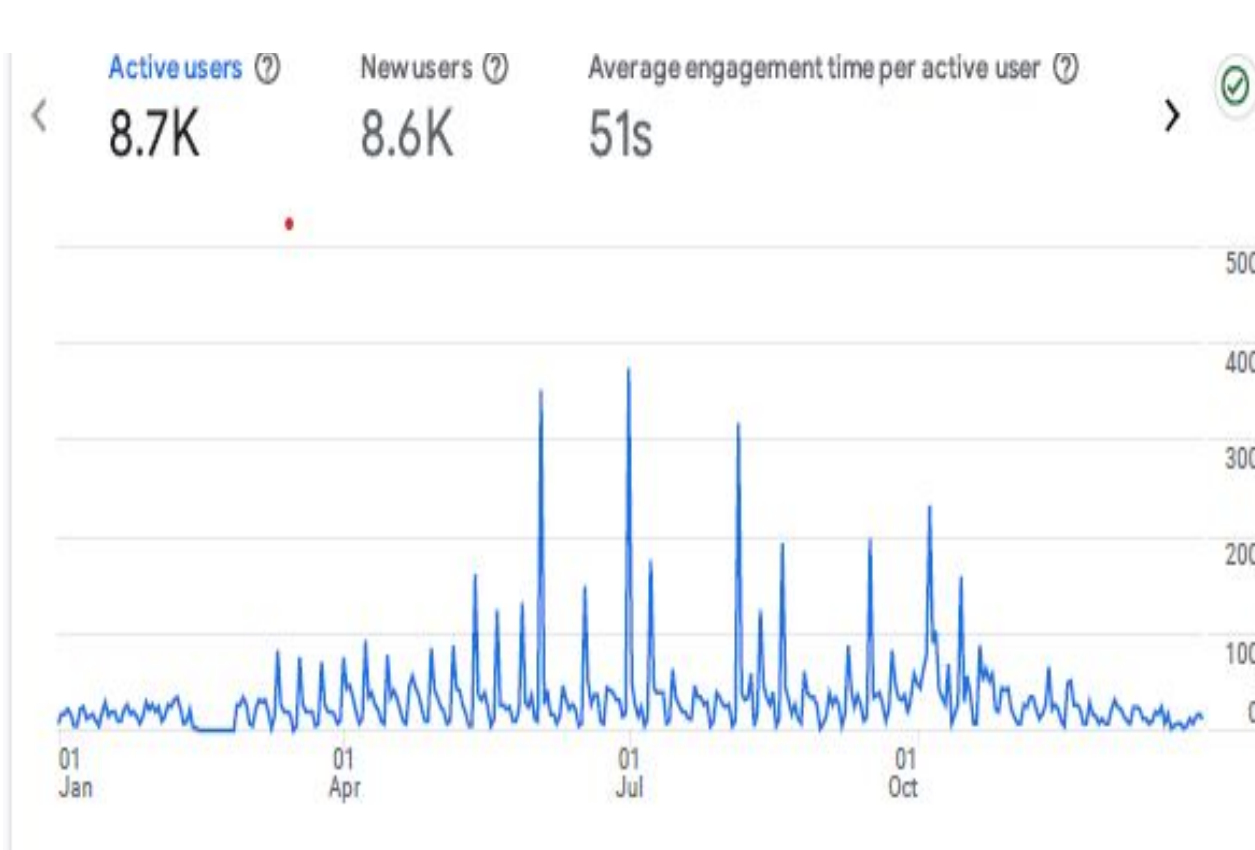


Categorical Crop Soil Moisture Condition Map

- SMAP soil moisture data matches NASS soil moisture condition categories from the weekly report
- Useful for assisting crop soil moisture condition analysis



Crop-CASMA 2024 Annual Usage Statistics



Overall number of global users: **8,700**

Region	Active users	New users	Engaged sessions	Engagement rate
Total	6,262 100% of total	6,192 100% of total	4,516 100% of total	39.14% Avg 0%
1 Washington	755	733	269	32.76%
2 Virginia	725	677	497	50.66%
3 Texas	630	600	334	30.95%
4 Wyoming	618	613	97	15.5%
5 Iowa	488	472	258	40.12%
6 California	462	439	351	41.05%
7 Illinois	379	352	328	36.65%
8 Indiana	187	174	169	58.08%
9 Colorado	161	147	145	49.15%
10 Maryland	152	118	109	34.82%

Top 10 US States



United States Department of Agriculture
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Crop-CASMA 2024 Annual Usage Statistics

Active users▼ by Country



COUNTRY	ACTIVE USERS
United States	6.3K
China	386
Brazil	214
Canada	170
India	158
Netherlands	157
Finland	108

International Users: 2,400



Crop-CASMA Adoption Status in NASS Operation

Three NASS Regional Field Offices have adopted soil moisture maps for crop weather reporting operations since 2022

- Pacific RFO (CA, Nevada)
- Delta RFO (Arkansas, Mississippi, Louisiana)
- Heartland RFO (Missouri, Illinois)

Four more Regional Field Offices adopted the soil moisture maps for crop weather reporting operations this growing season

- Northwest RFO (Washington, Oregon, Idaho)
- Southern Plain RFO (Oklahoma, Texas)
- Southern RFO (South Carolina, Georgia, Alabama, Florida)
- Mountain RFO (Colorado, Arizona, Montana, New Mexico, Utah, and Wyoming)

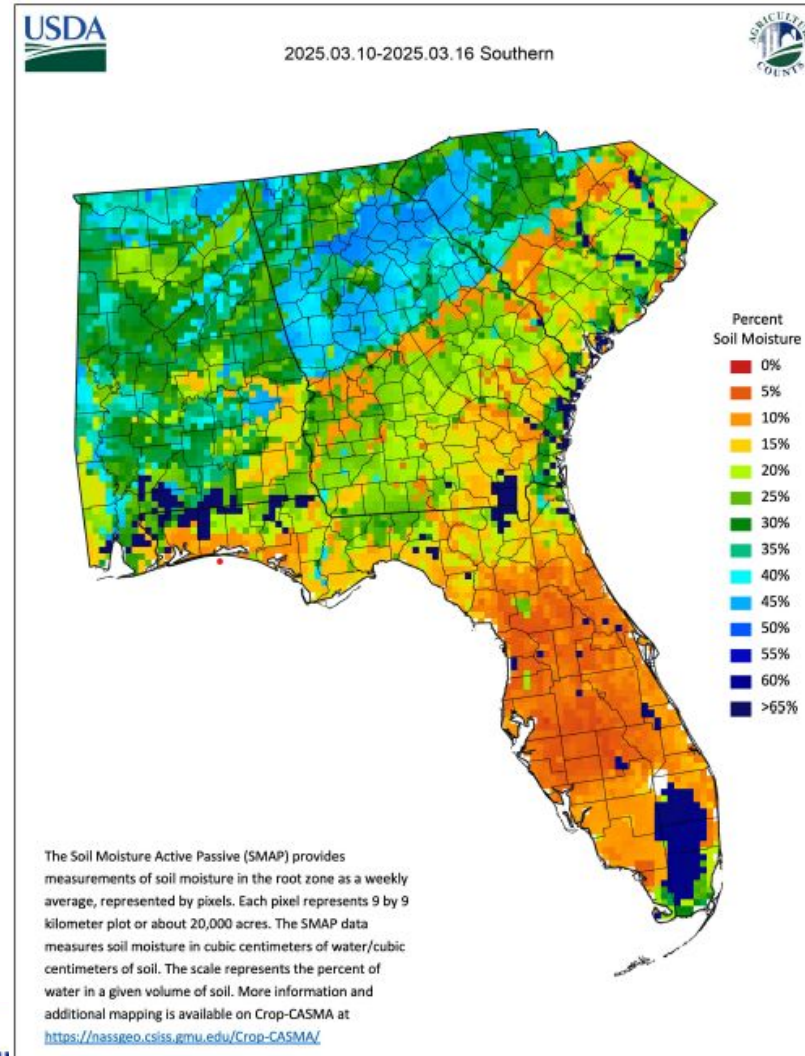
Ad Hoc operational uses:

- RDD disaster analysis operation
- RDD county crop yield prediction modeling
- Some states use for ad hoc needs.



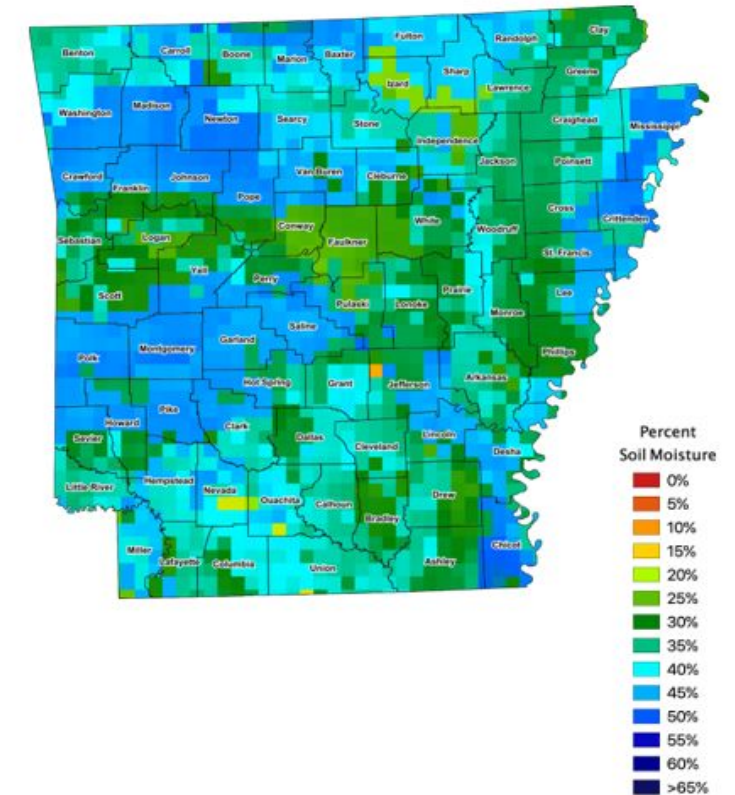
Customized Soil Moisture Maps for Crop Weather Report

- Regional and State map templates developed
- Template includes
 - map
 - map data description statement,
 - legend that describes table of colors that helps users understand and interpret the map
- Customizable map with the option for showing or not showing state and county boundaries as well as county labels



Arkansas Subsoil Moisture Map for the week of April 28 – May 4, 2025

The Soil Moisture Active Passive (SMAP) provides measurements of soil moisture in the root zone as a weekly average, represented by pixels. Each pixel represents 9 by 9 kilometer plot or about 20,000 acres. The SMAP data measures soil moisture in cubic centimeters of water/cubic centimeters of soil. The scale represents the percent of water in a given volume of soil. More information and additional mapping is available at <https://nassgeo.csiss.gmu.edu/CropCASMA/>.



Crop Weather Report – Using Soil Moisture Map



United States Department of Agriculture
National Agricultural Statistics Service
California Crop Progress & Condition



Cooperating with the California Department of Food and Agriculture
Pacific Region • 650 Capitol Mall, Suite 6-100 • Sacramento, CA 95814 • (916) 738-6600 • (855) 270-2722 FAX
www.nass.usda.gov/ca

Week Ending May 4, 2025

Released May 5, 2025

DAYS SUITABLE FOR FIELDWORK

	This Week	Last Week	Last Year	5-Yr Avg
Days	6.9	7.0	7.0	6.9

SOIL MOISTURE (percent)

	Very Short	Short	Adequate	Surplus
Topsoil	0	5	85	10
Subsoil	0	0	90	10

CROP PROGRESS (percent)

	This Week	Last Week	Last Year	5-Yr Avg
Cotton Planted	65	50	61	74
Rice Planted	35	20	19	27
Winter Wheat Headed	85	80	79	79

CROP CONDITIONS (percent)

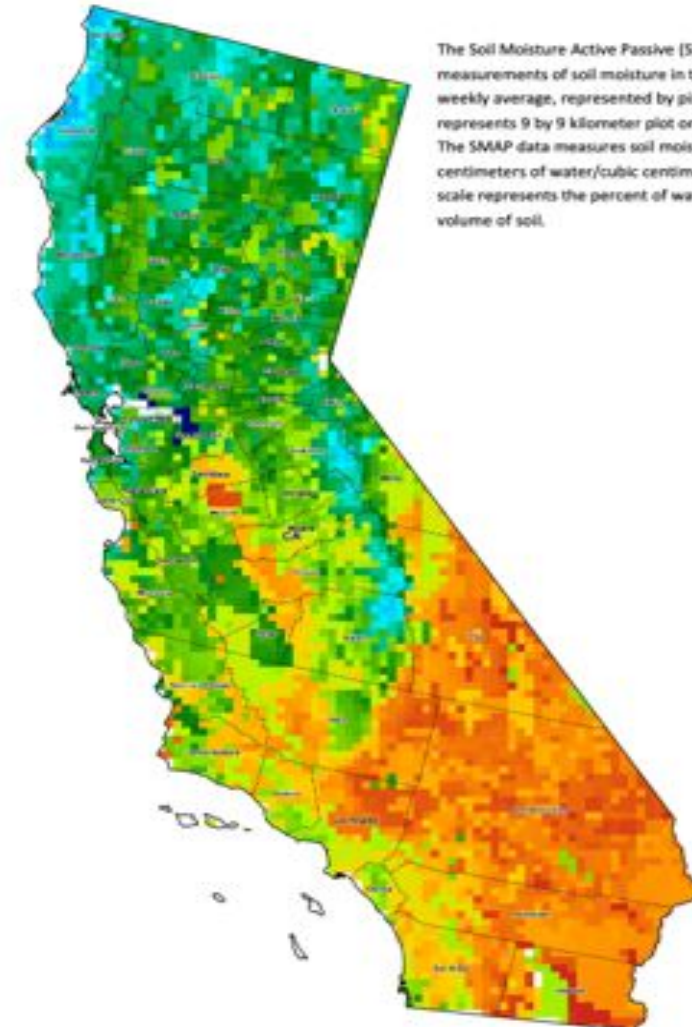
	Very Poor	Poor	Fair	Good	Excellent
Pasture	0	0	5	35	60
Winter Wheat	0	0	5	25	70



California Soil Moisture Map for the Week of April 21 - 27, 2025



The Soil Moisture Active Passive (SMAP) provides measurements of soil moisture in the root zone as a weekly average, represented by pixels. Each pixel represents 9 by 9 kilometer plot or about 20,000 acres. The SMAP data measures soil moisture in cubic centimeters of water/cubic centimeters of soil. The scale represents the percent of water in a given volume of soil.



Crop Weather Report – Using Soil Moisture Anomaly Map



Illinois Crop Progress and Condition

Released May 12, 2025

There were 4.8 days suitable for fieldwork in the week ending May 11, 2025. Topsoil moisture supply was rated 3 percent very short, 16 percent short, 54 percent adequate, and 27 percent surplus. Subsoil moisture supply was rated 4 percent very short, 18 percent short, 55 percent adequate, and 23 percent surplus. Corn planted reached 54 percent, compared to the 5-year average of 60 percent. Corn emerged reached 25 percent, compared to the 5-year average of 26 percent. Soybeans planted reached 51 percent, compared to the 5-year average of 48 percent. Soybeans emerged reached 22 percent, compared to the 5-year average of 18 percent. Winter wheat headed reached 46 percent, compared to the 5-year average of 57 percent. Winter wheat condition was rated 1 percent very poor, 5 percent poor, 34 percent fair, 49 percent good, and 11 percent excellent.

Days Suitable for Fieldwork and Soil Moisture Supply: Week Ending May 11, 2025

State	Days Suitable for Fieldwork	Topsoil Moisture Supply				Subsoil Moisture Supply			
		Very Short	Short	Adequate	Surplus	Very Short	Short	Adequate	Surplus
		(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)
Illinois	4.8	3	16	54	27	4	18	55	23

Crop Progress – Illinois

Item	Week ending			2020-2024 Average
	May 11, 2025	May 4, 2025	May 11, 2024	
	(percent)	(percent)	(percent)	(percent)
Corn planted	54	32	41	60
Corn emerged	25	8	23	26
Soybeans planted	51	33	38	48
Soybeans emerged	22	10	19	18
Winter wheat headed	46	23	80	57
Alfalfa hay 1st cutting	5	+	6	3
Other hay cut	3	+	2	3

+ Represents zero.

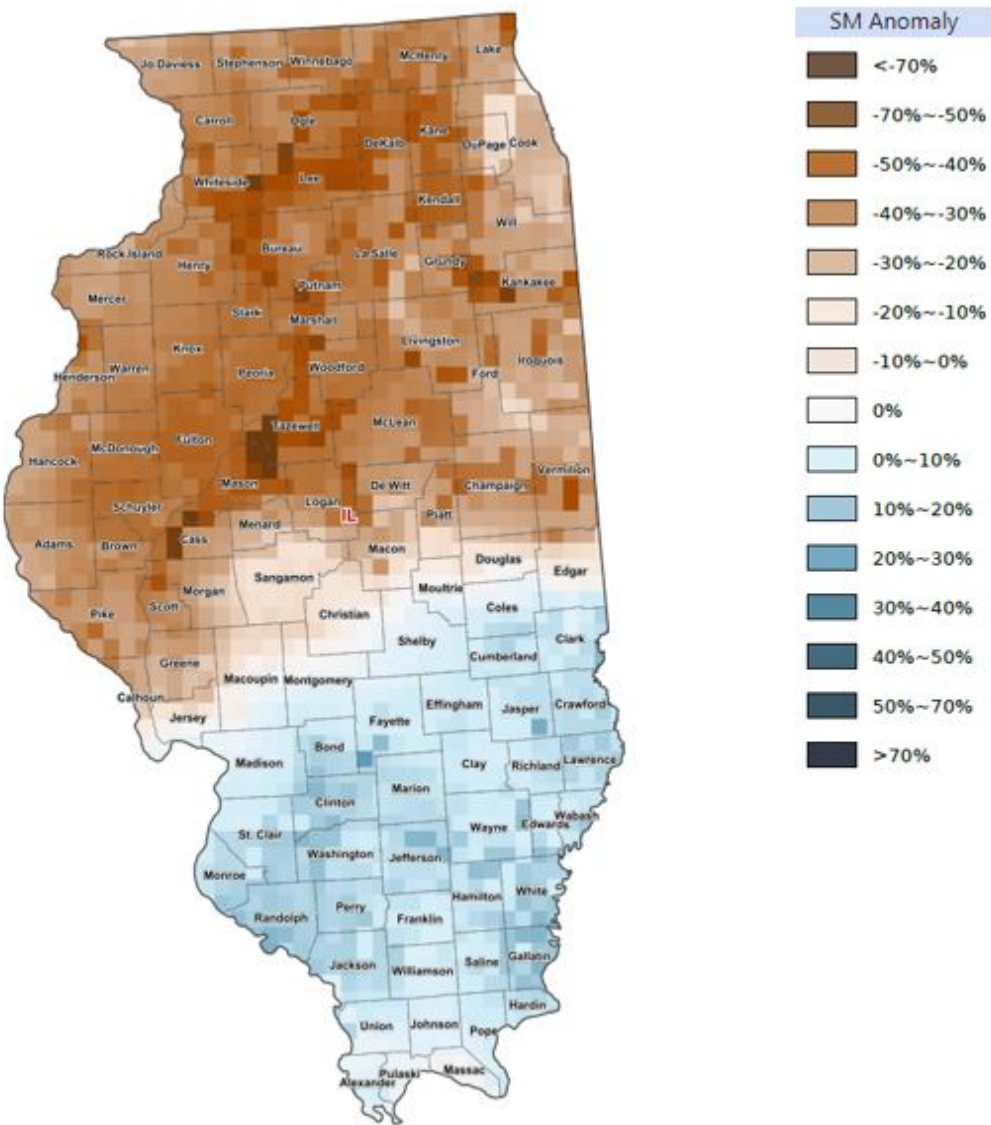
Winter Wheat Condition – Illinois

Date	Very Poor	Poor	Fair	Good	Excellent
	(percent)	(percent)	(percent)	(percent)	(percent)
May 11, 2025	1	5	34	49	11
May 4, 2025	1	4	34	50	11
May 11, 2024	2	4	17	56	21

Pasture Condition – Illinois

Date	Very Poor	Poor	Fair	Good	Excellent
	(percent)	(percent)	(percent)	(percent)	(percent)
May 11, 2025	1	4	24	47	24
May 4, 2025	2	5	27	45	21
May 11, 2024	1	2	18	48	31

Soil Moisture Deviation from Historical Average – May 9, 2025

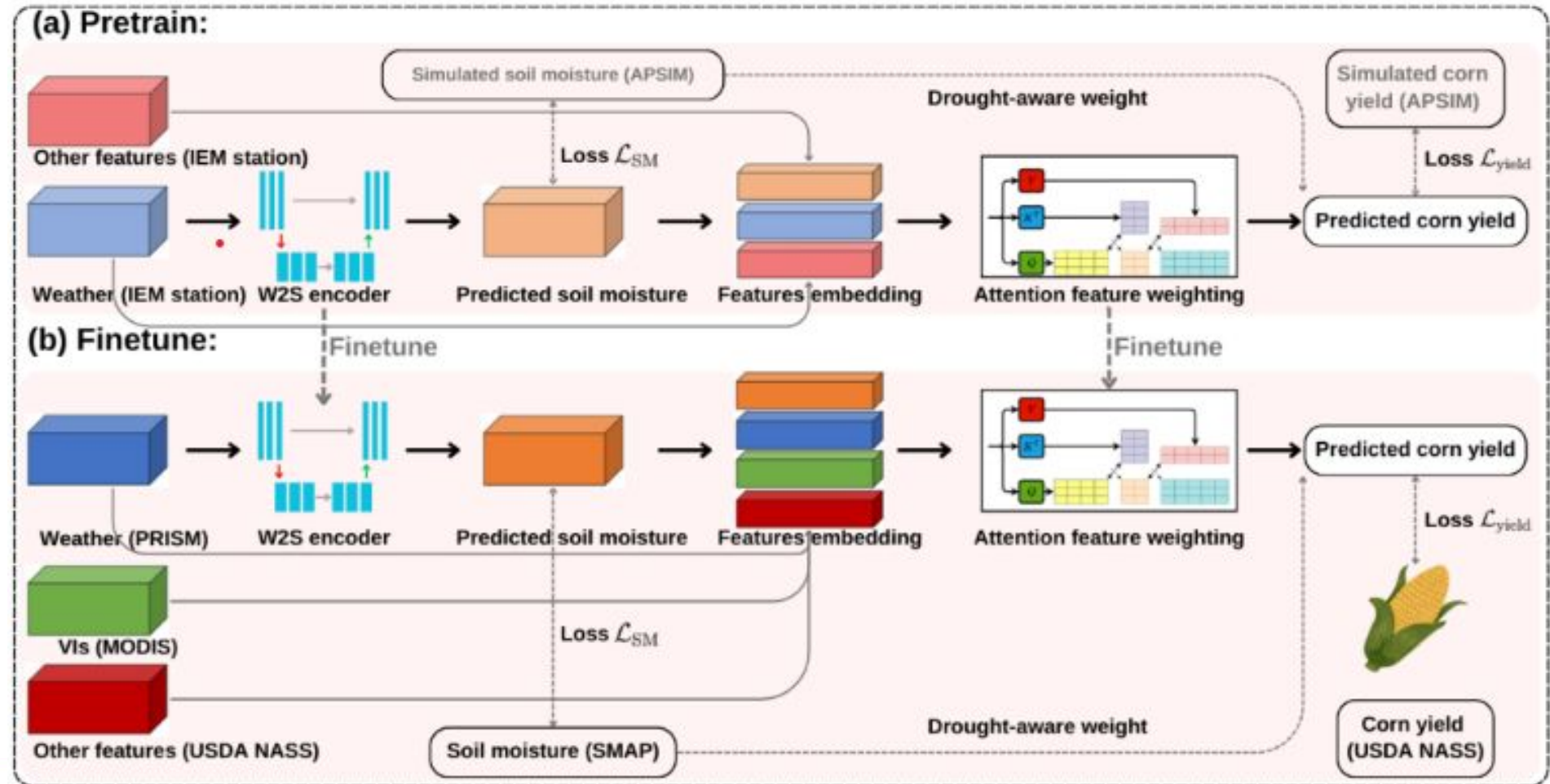


<https://cloud.csiss.gmu.edu/Crop-CA SMA/>
(historical average includes 2015 to current)



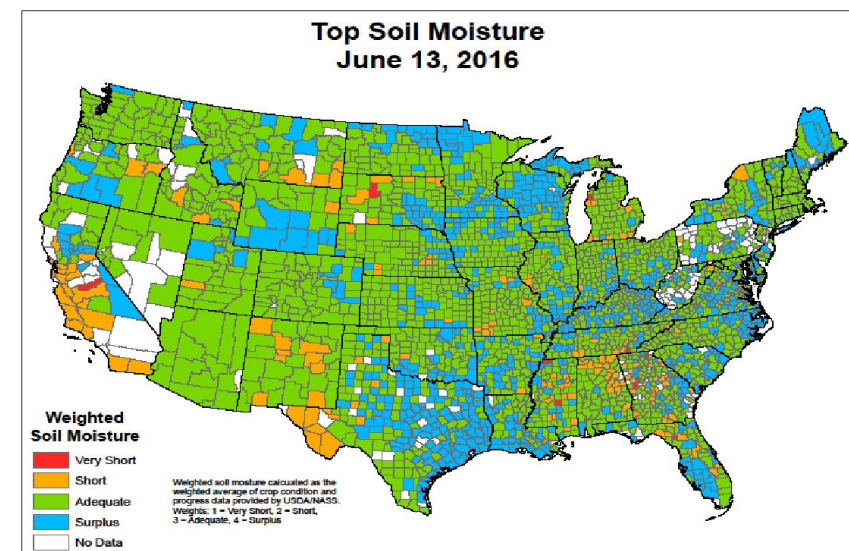
Soil Moisture Data as Crop Yield Prediction Model Input

- Improved crop yield prediction accuracy



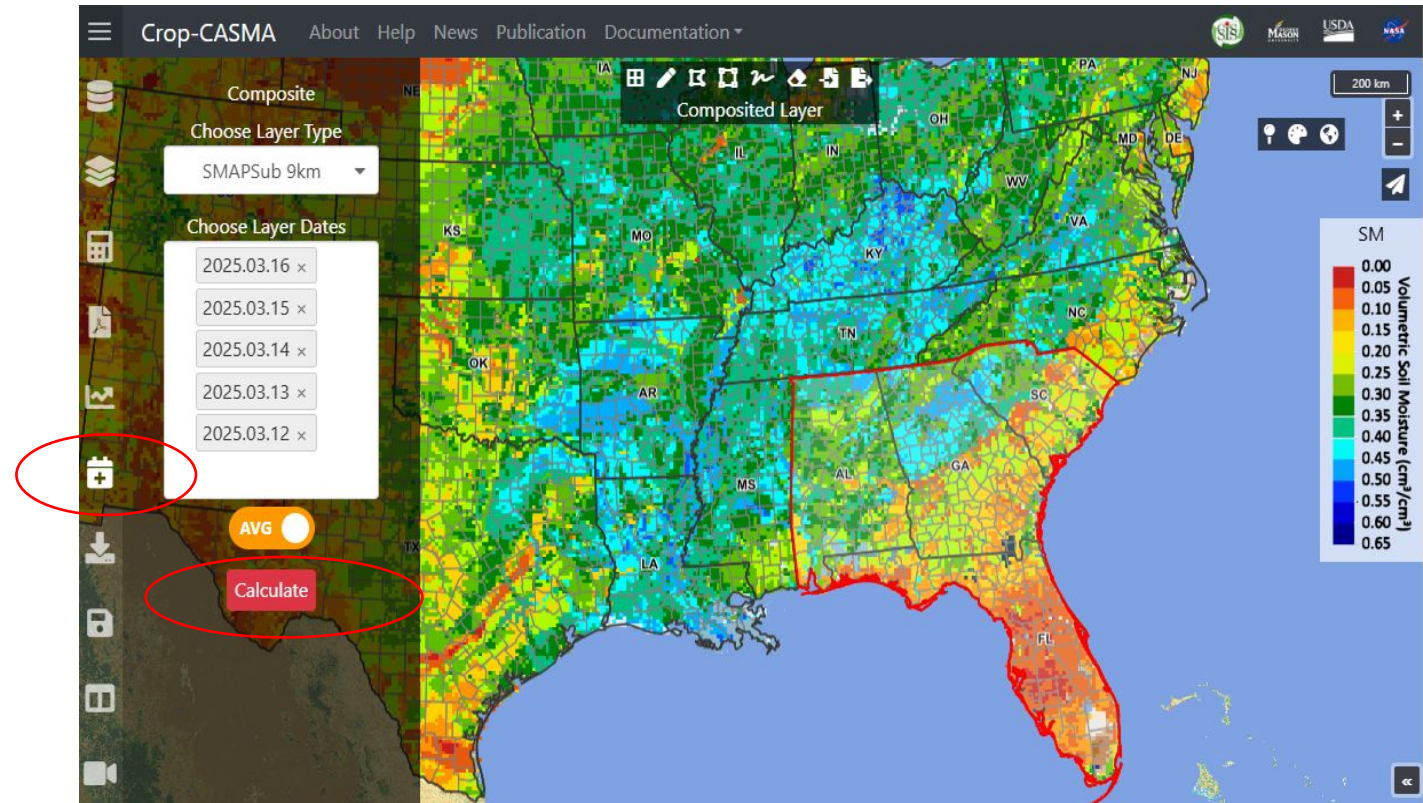
Other NASS Operational Enhancements with SMAP Soil Moisture

- Track soil moisture changes with time series
- Independent data source for cross reference
- Imputation data source for non-response
- Response burden reduction



Caveats and Alternatives for Timely Reporting

- 3-4 days data latency
 - weekly soil moisture of the immediate past week is not available
- Alternatives:
 - prior week
 - the latest available daily data
 - customized composite of the most recent daily data (Ad hoc composite function readily available)



Composite Most Recent Multiday Average Soil Moisture Data Layer

Questions?

Contact: zhengwei.yang@usda.gov



United States Department of Agriculture
National Agricultural Statistics Service

