

2021 Western Drought & Extreme Heat Assessment

Assessment Period: July 12-18, 2021

Publication Date: July 23, 2021

USDA NASS

Disaster Monitoring Team



Outline

- The attached slides provide an overview of the extreme heat and drought conditions in five NASS Regions: Northwest, Pacific, Mountain, Northern Plains, and Upper Midwest.
 - Slides 3-5 illustrate **temperature and precipitation anomalies** for the conterminous U.S. from July 1-22, 2021. This is based on PRISM Climate Group data and 30 years of climatological information.
 - Slides 6-11 illustrate areas impacted by **heat stress** for each region individually for Weeks 27 (July 5-11, 2021) & 28 (July 12-18, 2021) in 2021, Week 28 in 2020, and the Week 28 five-year average.
 - Slides 12-30 identify the resulting impact of the lack of precipitation and extreme heat on **cropland subsoil moisture**. Weekly average subsoil moisture, anomalies, and categorical levels for Week 28 (July 12-18, 2021) are illustrated. The information was obtained from the Crop-CASMA web application. Figures use a crop mask (gray) to block out non-cropland areas. An analysis was conducted to identify the percent of cropland at varying levels with extreme conditions highlighted.

PRISM Climate Group Data

- Offers an "early glimpse" version of precipitation and temperature data from the current month
- The datasets are modeled using climatologically-aided interpolation (CAI), which uses the long-term average pattern (i.e., the 30-year normals) as first-guess of the spatial pattern of climatic conditions for a given month or day
- Data supported by USDA RMA



Map provided by PRISM Climate Group: <https://prism.oregonstate.edu/mtd/>

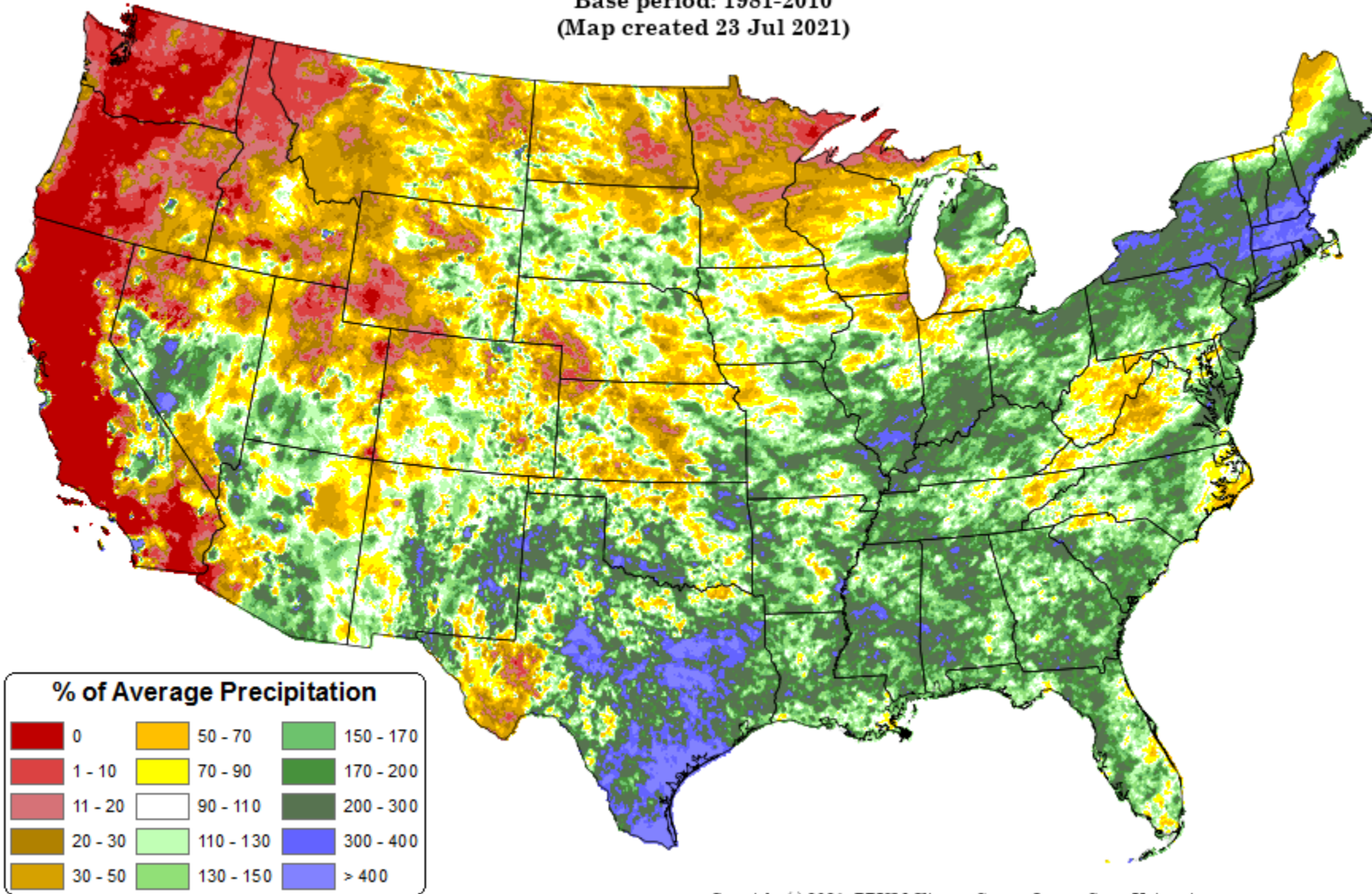


Total Precipitation Anomaly: 01 Jul 2021 - 22 Jul 2021

Period ending 7 AM EST 22 Jul 2021

Base period: 1981-2010

(Map created 23 Jul 2021)



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Map provided by PRISM Climate Group: <https://prism.oregonstate.edu/mtd/>

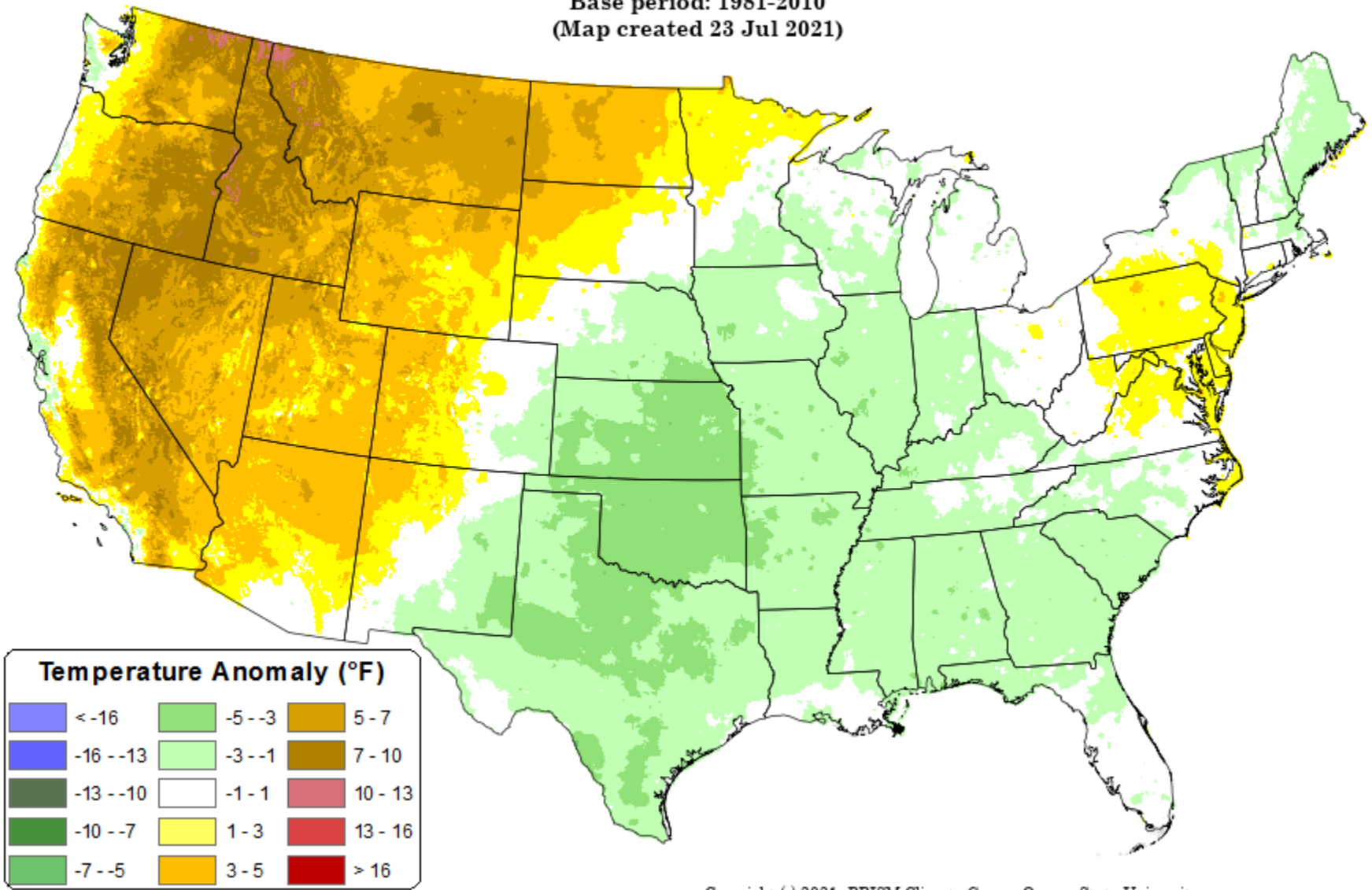


Daily Mean Temperature Anomaly: 01 Jul 2021 - 22 Jul 2021

Period ending 7 AM EST 22 Jul 2021

Base period: 1981-2010

(Map created 23 Jul 2021)



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Map provided by PRISM Climate Group: <https://prism.oregonstate.edu/mtd/>



Heat Stress Data

- Data calculated using data from two main sources of gridded products, PRISM, and RTMA.
- Heat stress is calculated as the difference between the maximum observed temperature during the day and the selected threshold (T_{dth}). If the maximum temperature is lower than T_{dth} , HSDD is equal to zero.

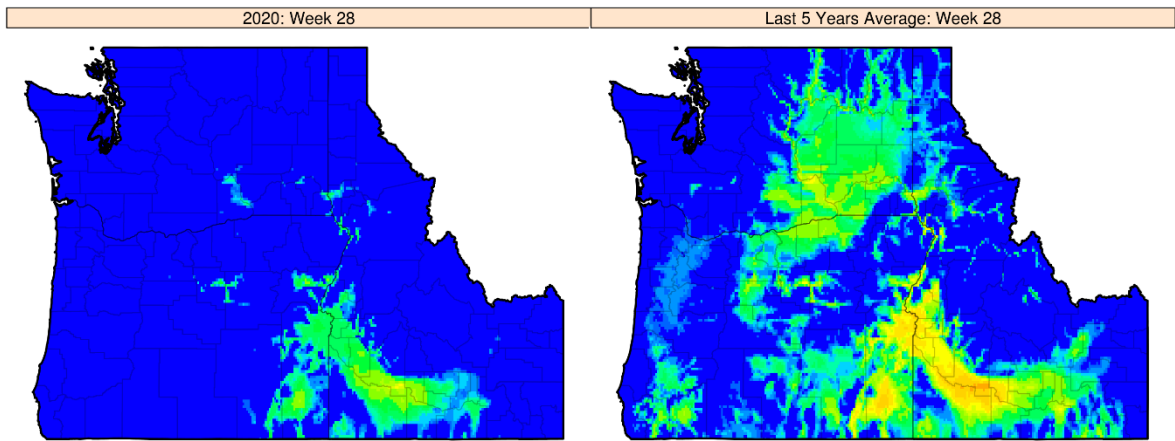
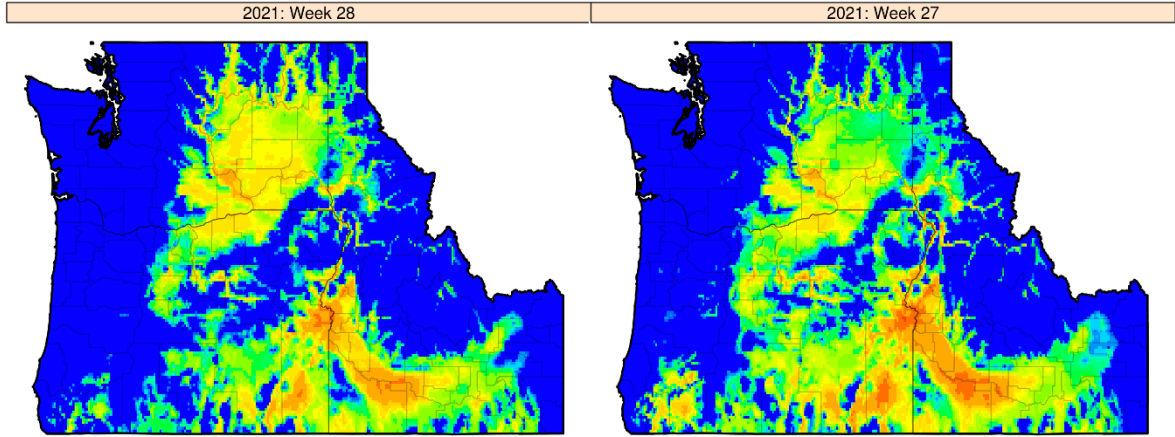
$$HSDD = (T_{max} - T_{dth})$$



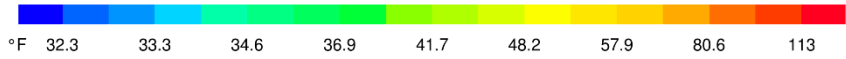
Source: NASS Climate-based Information System



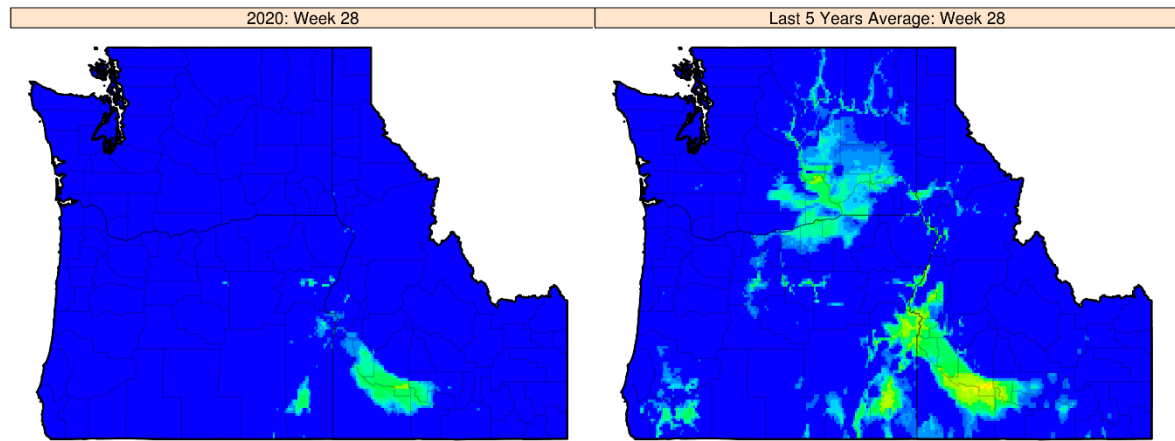
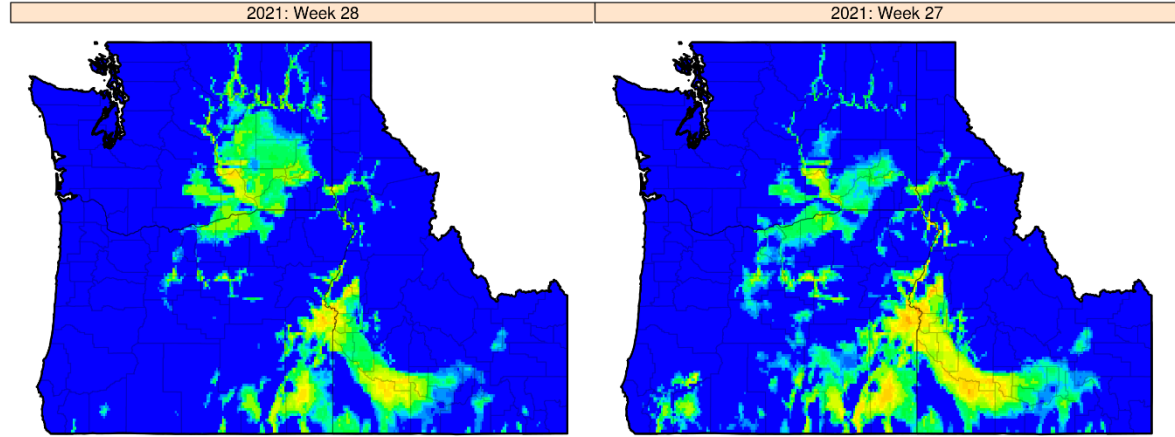
Northwest Region - Heat Index (93°F) - 2021: Week 28
Accumulated Degrees above 93 Degrees



*Does not include Alaska



Northwest Region - Heat Index (97°F) - 2021: Week 28
Accumulated Degrees above 97 Degrees



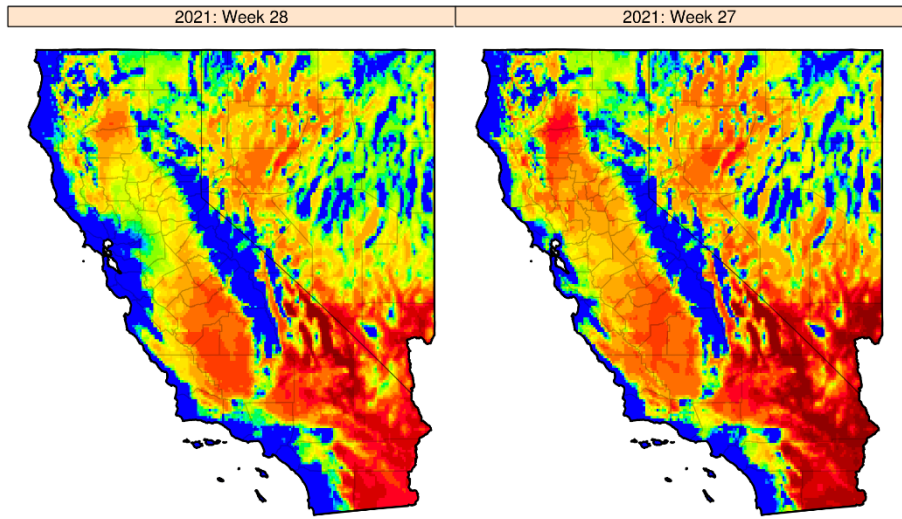
*Does not include Alaska



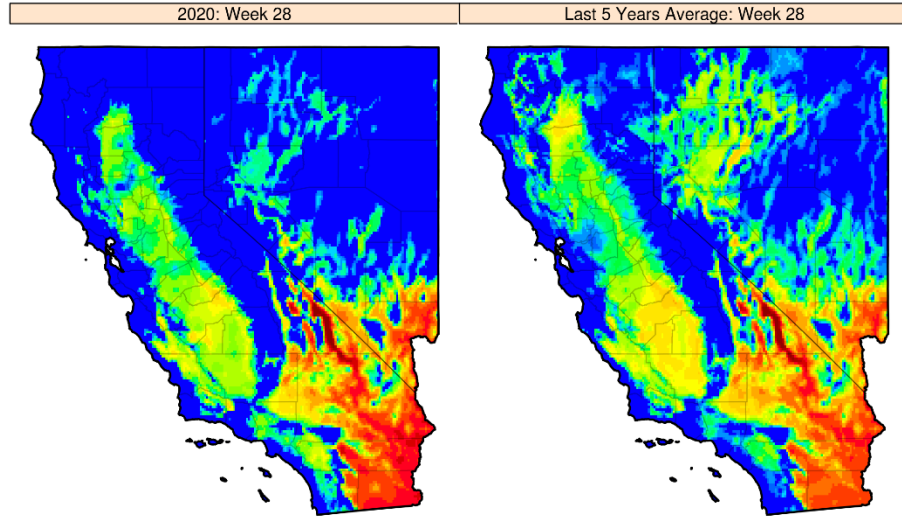
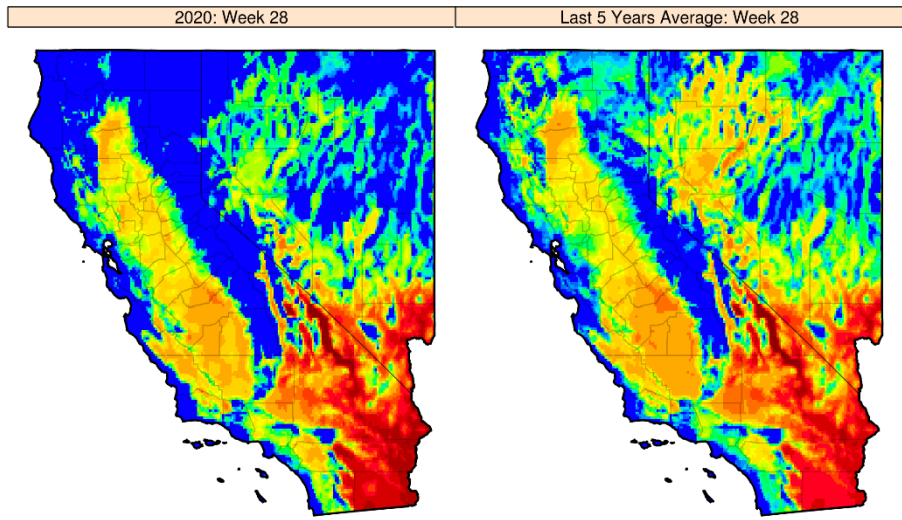
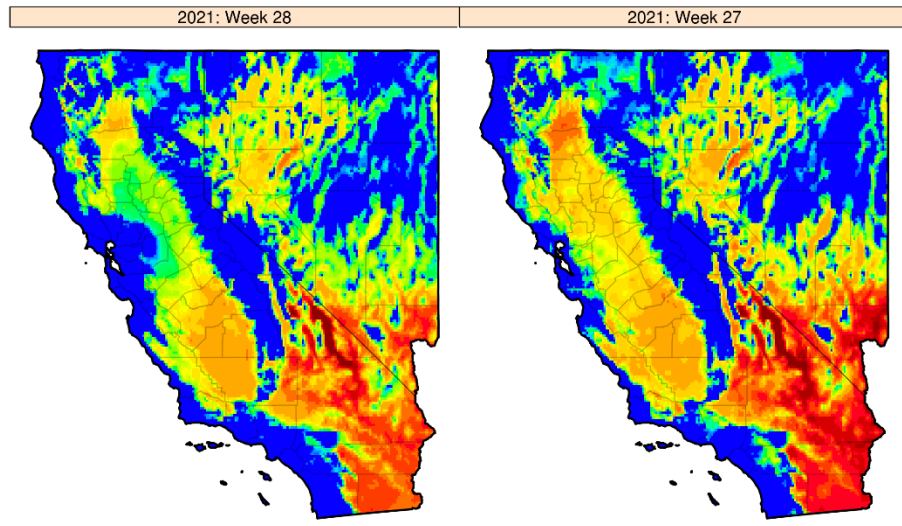
Source: NASS Climate-based Information System



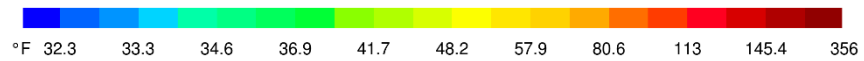
Pacific Region - Heat Index (93°F) - 2021: Week 28
Accumulated Degrees above 93 Degrees



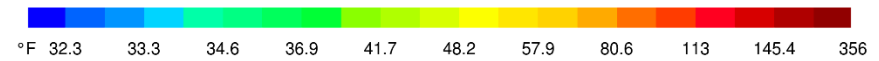
Pacific Region - Heat Index (97°F) - 2021: Week 28
Accumulated Degrees above 97 Degrees



*Does not include Hawaii



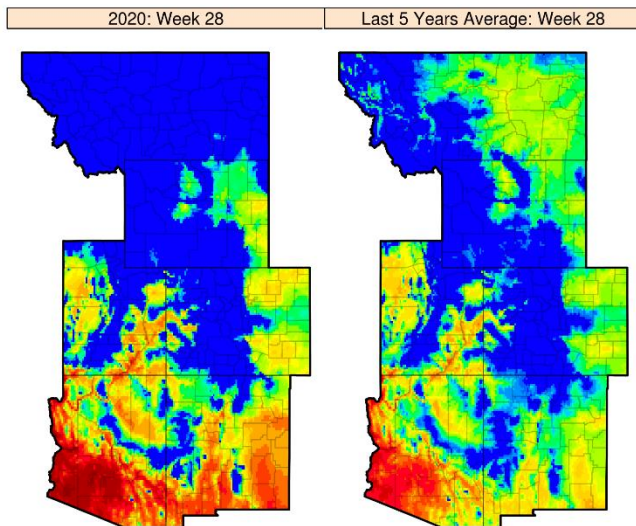
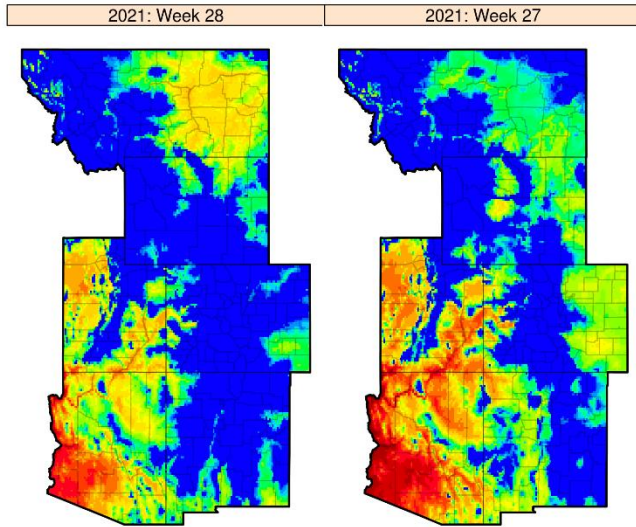
*Does not include Hawaii



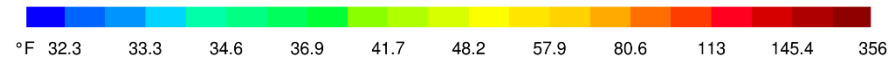
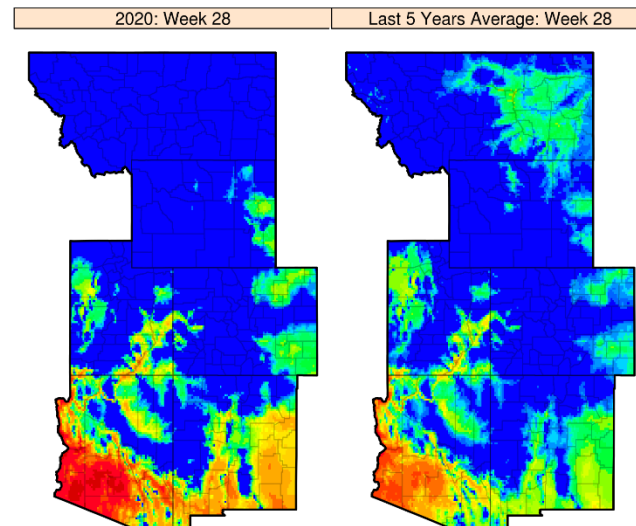
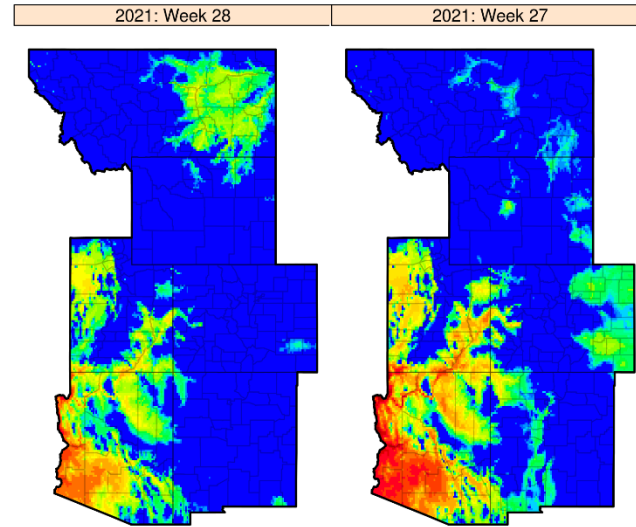
Source: NASS Climate-based Information System



Mountain Region - Heat Index (93°F) - 2021: Week 28 Accumulated Degrees above 93 Degrees



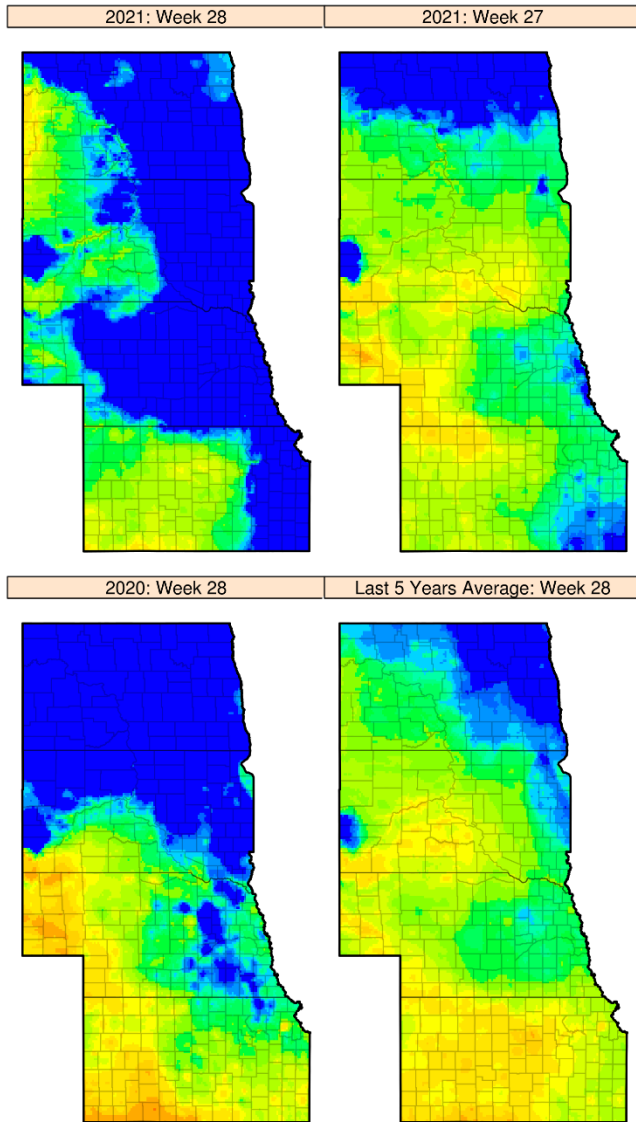
Mountain Region - Heat Index (97°F) - 2021: Week 28 Accumulated Degrees above 97 Degrees



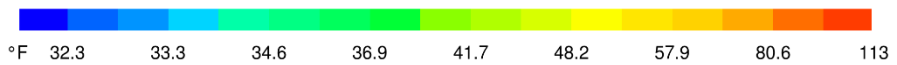
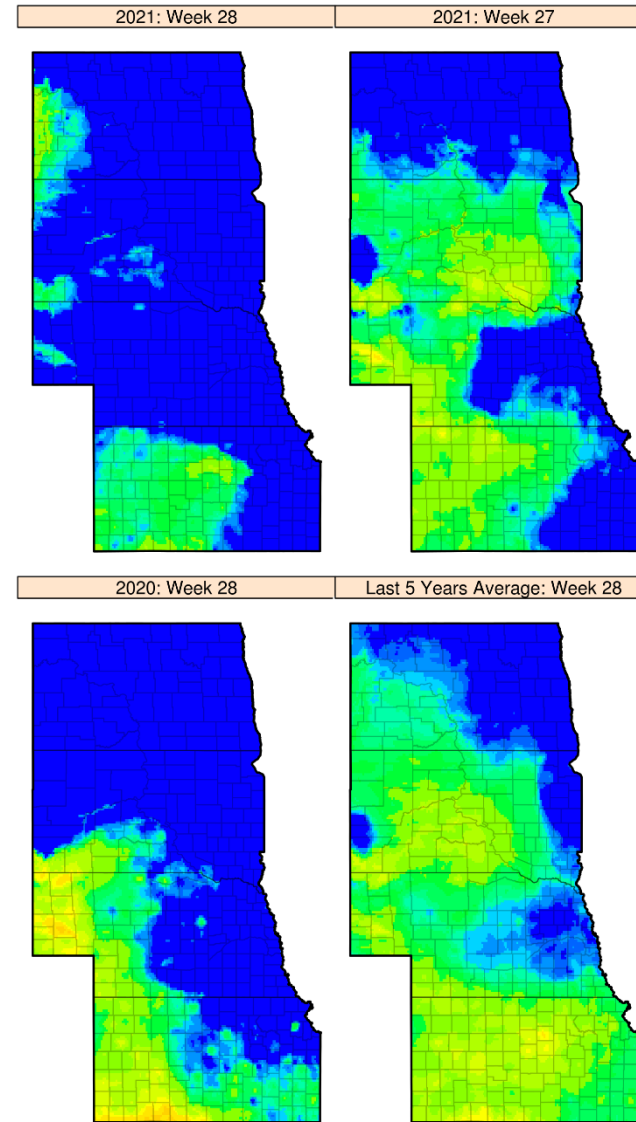
Source: NASS Climate-based Information System



Northern Plains Region - Heat Index (90°F) - 2021: Week 28 Accumulated Degrees above 90 Degrees



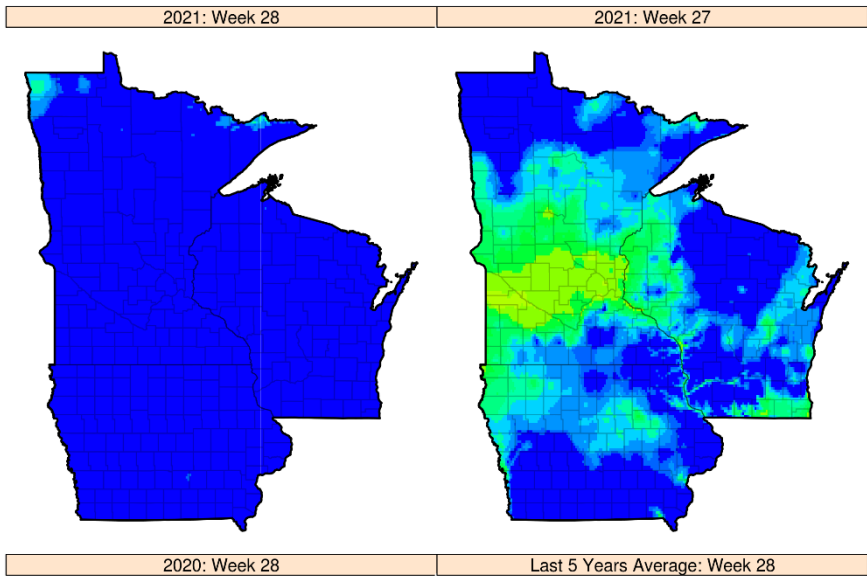
Northern Plains Region - Heat Index (93°F) - 2021: Week 28 Accumulated Degrees above 93 Degrees



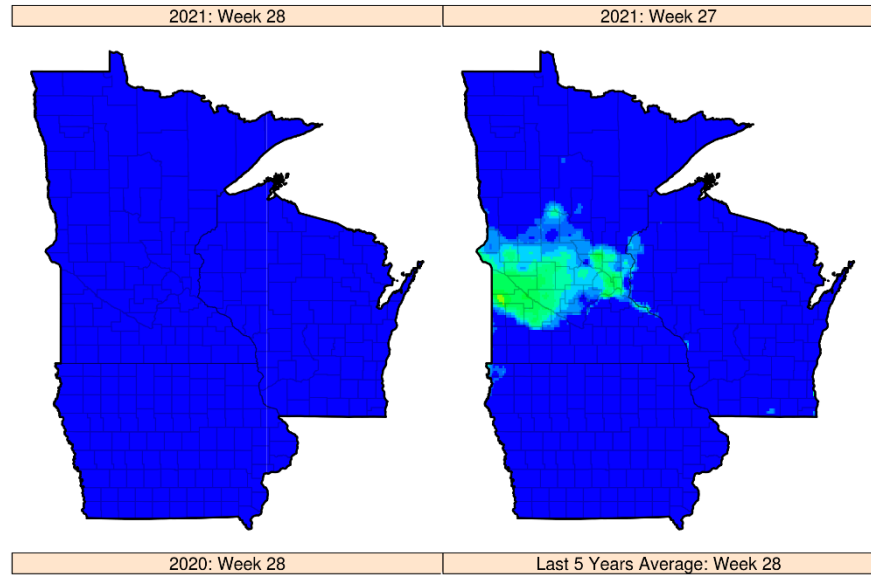
Source: NASS Climate-based Information System



Upper Midwest Region - Heat Index (90°F) - 2021: Week 28 Accumulated Degrees above 90 Degrees



Upper Midwest Region - Heat Index (93°F) - 2021: Week 28 Accumulated Degrees above 93 Degrees



Source: NASS Climate-based Information System



Soil Moisture Data

- Hosted by Crop-CASMA (Crop Condition and Soil Moisture Analytics) <https://nassgeo.csiss.gmu.edu/CropCASMA/>
- Data Used
 - Sub Soil Moisture, 9km, Weekly, Year 2021, Week 28, July 12-18, 2021
 - Sub Soil Moisture Anomaly, 9km, Weekly, Year 2021, Week 28, July 12-18, 2021
 - Sub Soil Moisture Categorical, 9km, Weekly, Year 2021, Week 28, July 12-18, 2021
- Total Cropland derived by 2020 Cultivated Layer hosted on Crop-CASMA.



Sub Soil Moisture

- NASA Remotely Sensed Rootzone Soil (sub soil) is defined as the top 3.2 feet (approximately 1 meter).
- The NASA SMAP (Soil Moisture Active Passive) 9km soil moisture measurements are volumetric soil moisture (i.e. volumetric water content in the soil). It is simply the ratio of water volume to soil volume.
- Sub soil moisture measuring at $0.1 \text{ cm}^3/\text{cm}^3$ and below (10% water content) could be considered very dry.



Sub Soil Moisture Anomaly

- The soil moisture anomaly (SMA) in CropCASMA is a measure of deviation of the current soil moisture value from the "normal" soil moisture level, which is represented by a historical average soil moisture value (from 2015 to current).
- The SMA of a given location is defined by the following formula:

$$SMA = \frac{SM - SM_m}{SM_m} \times 100\%$$

where SM and SM_m denote current soil moisture value and the historical average soil moisture value of a given location.

- Soil moisture anomaly below -40% could be considered very abnormal, which means there is 40% less soil moisture than normal conditions.



Sub Soil Moisture Categorical

- SMAP values are categorized into NASS categories which include:
 - Very Short - Soil moisture supplies are significantly less than what is required for normal plant development. Growth has been stopped or nearly so and plants are showing visible signs of moisture stress. Under these conditions, plants will quickly suffer irreparable damage.
 - Short - Soil dry. Seed germination and/or normal crop growth and development would be curtailed.
 - Adequate - Soil moist. Seed germination and/or crop growth and development would be normal or unhindered.
 - Surplus - Soil wet. Fields may be muddy and will generally be unable to absorb additional moisture. Young developing crops may be yellowing from excess moisture.

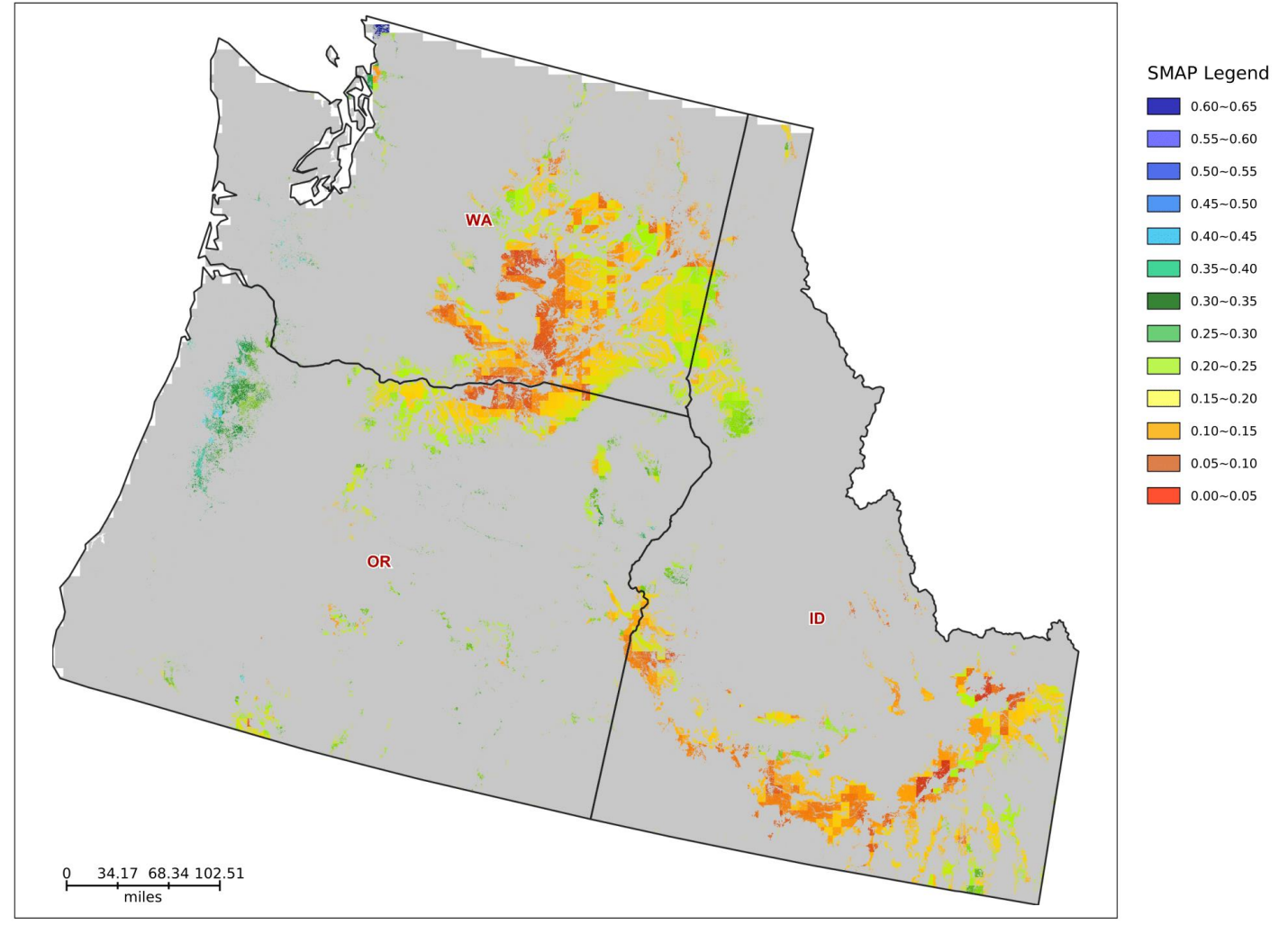


Northwest Region
 Sub Soil Moisture 9km
 July 12-18, 2021

Sub Soil Moisture (9km, July 12-18, 2021)				
Volumetric Soil Moisture (cm ³ /cm ³)	Northwest Region	Idaho	Oregon	Washington
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
0.0-0.05	5.35%	5.29%	5.21%	5.55%
0.05-0.1	17.54%	18.97%	6.85%	21.36%
0.1-0.15	27.96%	36.02%	17.49%	26.41%
0.15-0.2	33.00%	26.34%	37.44%	36.41%
0.2-0.25	11.98%	12.45%	17.06%	8.86%
0.25-0.3	1.99%	0.93%	7.06%	0.51%
0.3-0.35	1.64%	0.00%	7.25%	0.39%
0.35-0.4	0.30%	0.00%	1.22%	0.11%
0.4-0.45	0.09%	0.00%	0.42%	0.00%
0.45-0.5	0.00%	0.00%	0.00%	0.00%
0.5-0.55	0.00%	0.00%	0.00%	0.00%
0.55-0.6	0.00%	0.00%	0.00%	0.00%
0.6-0.65	0.00%	0.00%	0.00%	0.00%
> 0.65	0.16%	0.00%	0.00%	0.37%
Total	100.00%	100.00%	100.00%	100.00%



NW Sub SM 9km Jul 12-18, 2021



Produced by VegScape - <http://nassgeodata.gmu.edu/VegScape>

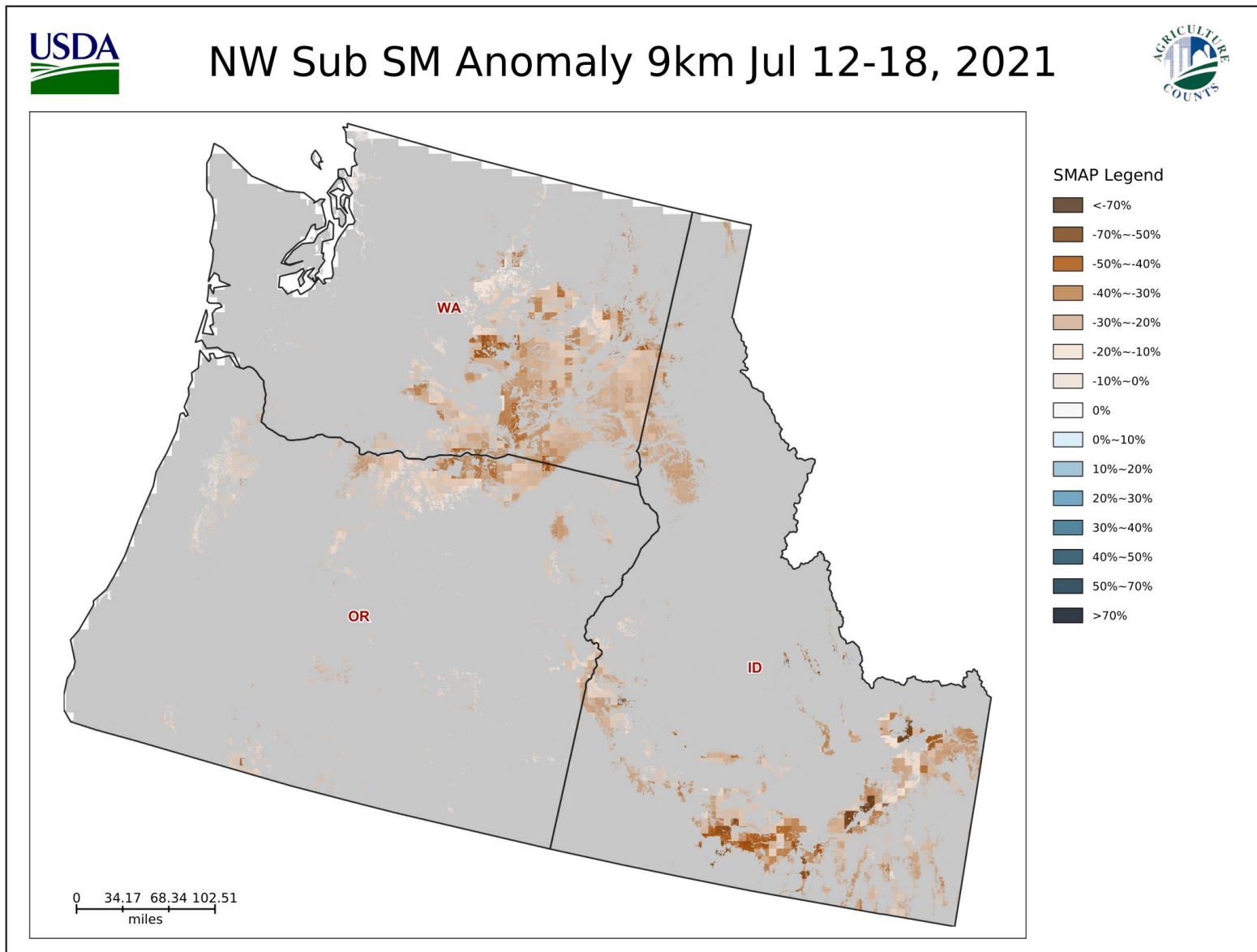


Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



Northwest Region
 Sub Soil Moisture Anomaly 9km
 July 12-18, 2021

Sub Soil Moisture Anomaly (9km, July 12-18, 2021)				
Soil Moisture Anomaly	Northwest Region	Idaho	Oregon	Washington
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
<-70%	0.00%	0.00%	0.00%	0.00%
-70%~-50%	0.98%	2.73%	0.00%	0.00%
-50%~-40%	2.57%	4.92%	0.67%	1.56%
-40%~-30%	6.04%	7.78%	3.96%	5.61%
-30%~-20%	31.36%	43.48%	16.79%	28.01%
-20%~-10%	54.17%	39.78%	70.89%	58.19%
-10%~0%	4.88%	1.31%	7.69%	6.63%
0%~-10%	0.00%	0.00%	0.00%	0.00%
10%~20%	0.00%	0.00%	0.00%	0.00%
20%~30%	0.00%	0.00%	0.00%	0.00%
30%~40%	0.00%	0.00%	0.00%	0.00%
40%~50%	0.00%	0.00%	0.00%	0.00%
50%~70%	0.00%	0.00%	0.00%	0.00%
>70%	0.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

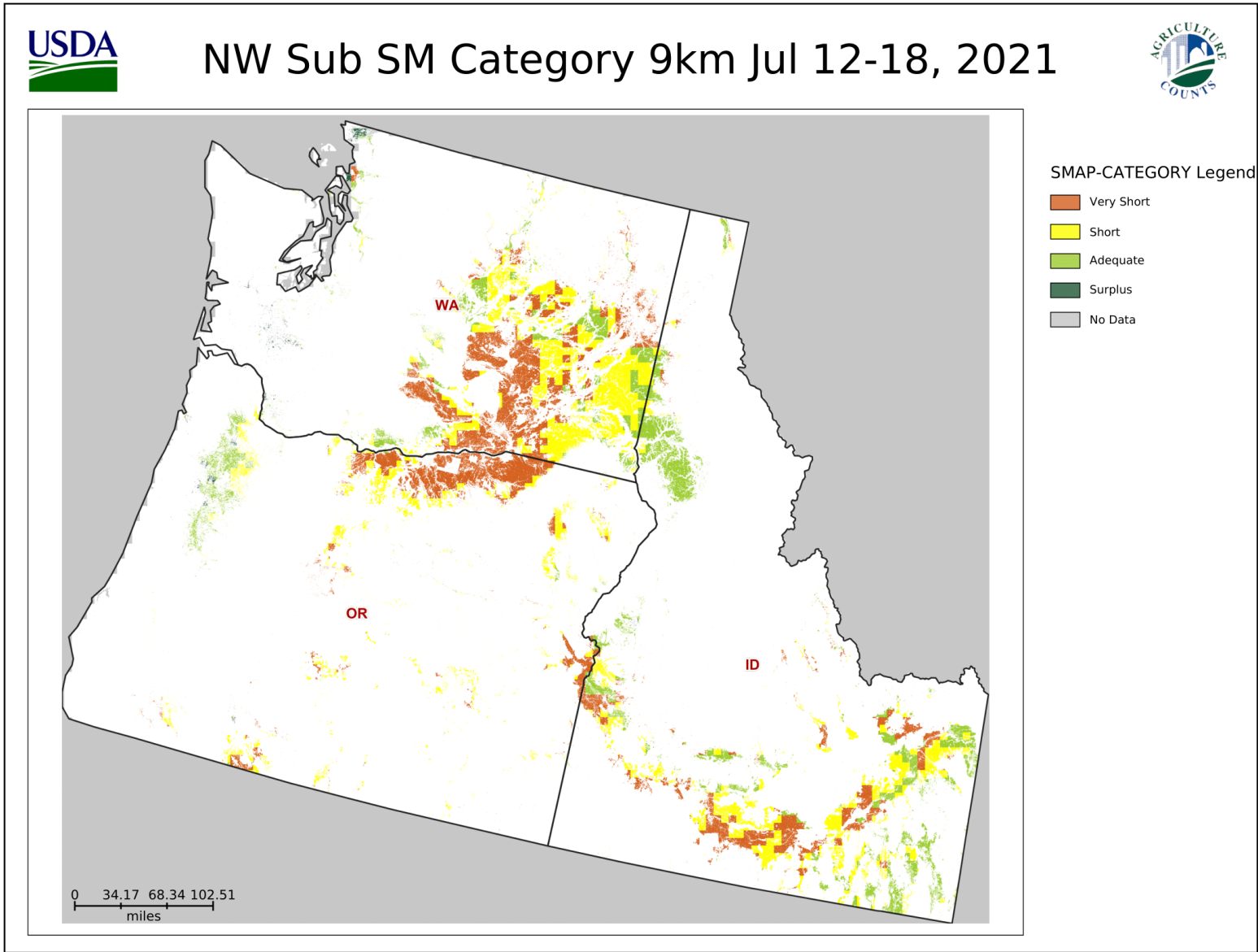


Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



Northwest Region
 Sub Soil Moisture Categorical 9km
 July 12-18, 2021

Sub Soil Moisture Categorical (9km, July 12-18, 2021)				
Categorical Soil Moisture	Northwest Region	Idaho	Oregon	Washington
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
Very Short	36.91%	25.96%	52.14%	38.95%
Short	38.85%	34.74%	36.03%	43.96%
Adequate	23.46%	39.27%	11.09%	15.65%
Surplus	0.57%	0.03%	0.74%	0.96%
No Data	0.21%	0.00%	0.00%	0.48%
Total	100.00%	100.00%	100.00%	100.00%



Produced by VegScape - <http://nassgeodata.gmu.edu/VegScape>



Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>

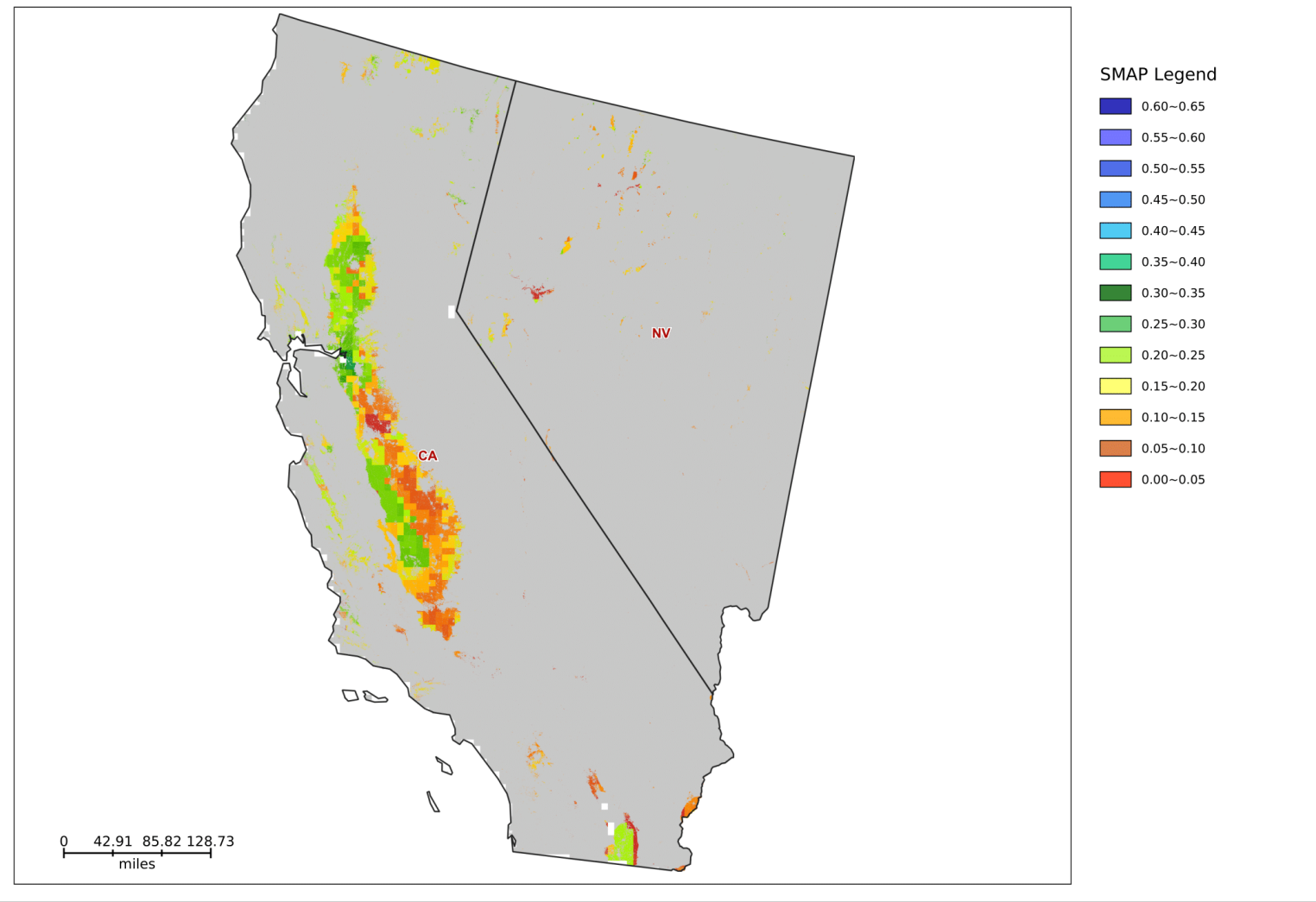


Pacific Region
 Sub Soil Moisture 9km
 July 12-18, 2021

Sub Soil Moisture (9km, July 12-18, 2021)			
Volumetric Soil Moisture (cm ³ /cm ³)	Pacific Region	California	Nevada
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
0.0-0.05	8.79%	8.43%	17.25%
0.05-0.1	20.49%	20.56%	18.18%
0.1-0.15	18.62%	17.91%	35.14%
0.15-0.2	21.07%	21.00%	22.74%
0.2-0.25	29.17%	30.18%	6.13%
0.25-0.3	1.46%	1.50%	0.56%
0.3-0.35	0.41%	0.42%	0.00%
0.35-0.4	0.00%	0.00%	0.00%
0.4-0.45	0.00%	0.00%	0.00%
0.45-0.5	0.00%	0.00%	0.00%
0.5-0.55	0.00%	0.00%	0.00%
0.55-0.6	0.00%	0.00%	0.00%
0.6-0.65	0.00%	0.00%	0.00%
> 0.65	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%



Pacific Sub SM 9km Jul 12-18, 2021



Produced by VegScope - <http://nassgeodata.gmu.edu/VegScope>



Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>

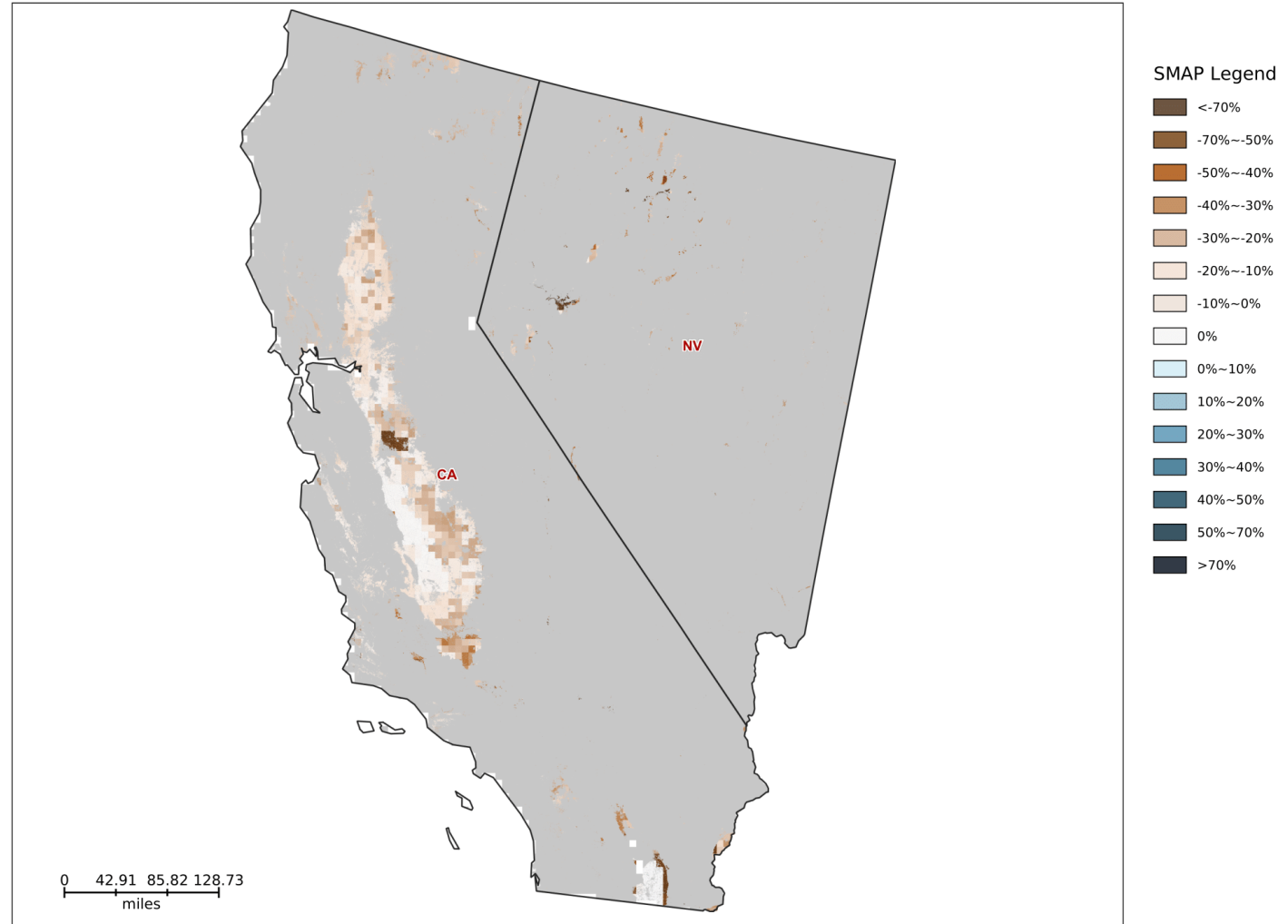


Pacific Region
 Sub Soil Moisture Anomaly 9km
 July 12-18, 2021

Sub Soil Moisture Anomaly (9km, July 12-18, 2021)			
Soil Moisture Anomaly	Pacific Region	California	Nevada
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
<-70%	0.23%	0.00%	5.76%
-70%~-50%	2.63%	2.37%	8.41%
-50%~-40%	0.63%	0.32%	7.54%
-40%~-30%	2.07%	1.55%	14.03%
-30%~-20%	8.12%	7.73%	16.90%
-20%~-10%	36.47%	36.24%	42.38%
-10%~0%	48.14%	50.01%	4.97%
0%~-10%	1.71%	1.79%	0.00%
10%~20%	0.00%	0.00%	0.00%
20%~30%	0.00%	0.00%	0.00%
30%~40%	0.00%	0.00%	0.00%
40%~50%	0.00%	0.00%	0.00%
50%~70%	0.00%	0.00%	0.00%
>70%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%



Pacific Sub SM Anomaly 9km Jul 12-18, 2021



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Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>

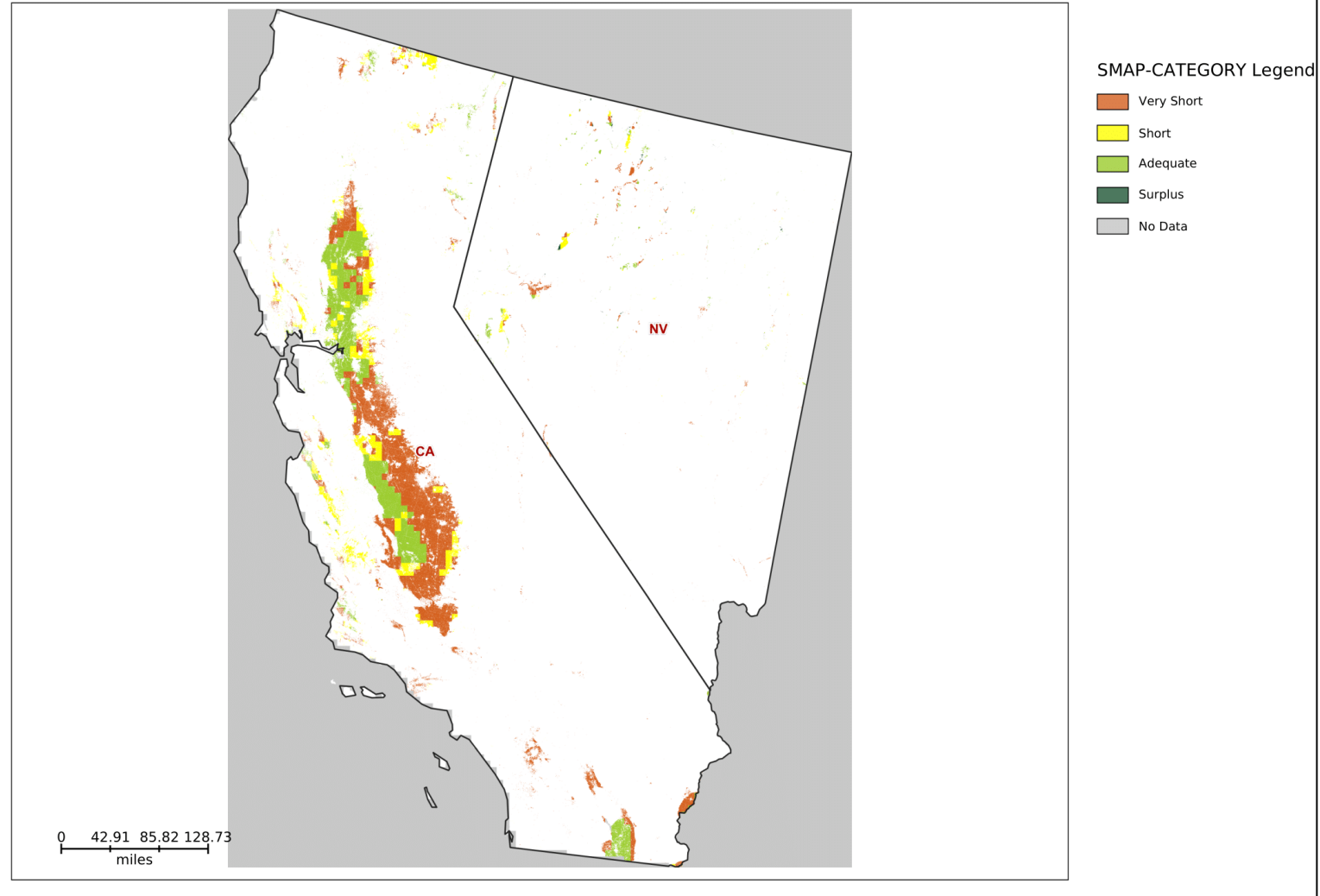


Pacific Region
 Sub Soil Moisture Categorical 9km
 July 12-18, 2021

Sub Soil Moisture Category (9km, July 12-18, 2021)			
Categorical Soil Moisture	Pacific Region	California	Nevada
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
Very Short	51.58%	51.87%	44.43%
Short	16.21%	15.78%	26.34%
Adequate	31.58%	31.87%	24.85%
Surplus	0.18%	0.01%	4.38%
No Data	0.45%	0.47%	0.00%
Total	100.00%	100.00%	100.00%



Pacific Sub SM Category 9km Jul 12-18, 2021



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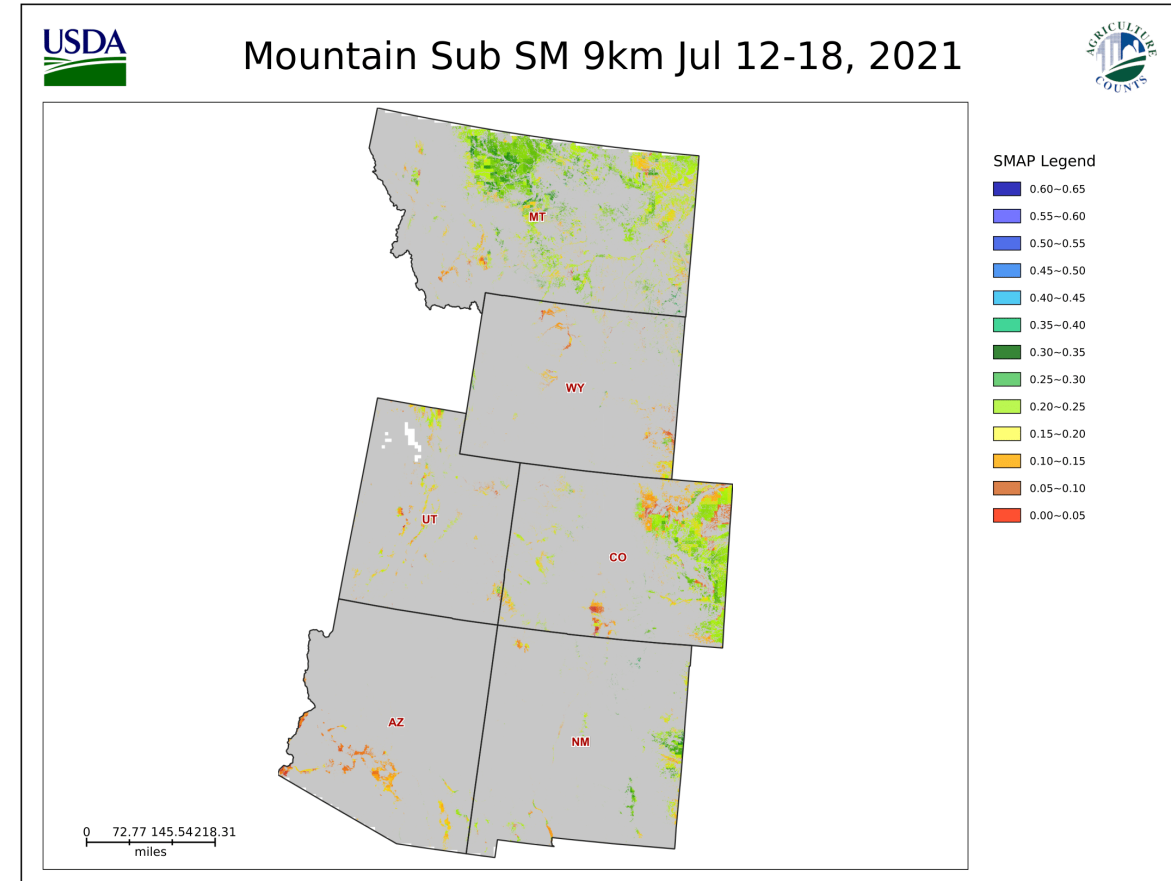


Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



Mountain Region
 Sub Soil Moisture 9km
 July 12-18, 2021

Sub Soil Moisture (9km, July 12-18, 2021)							
Volumetric Soil Moisture (cm ³ /cm ³)	Mountain Region	Arizona	Colorado	Montana	New Mexico	Utah	Wyoming
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
0.0-0.05	1.82%	6.03%	3.16%	0.17%	0.04%	3.10%	7.41%
0.05-0.1	6.95%	39.73%	7.94%	1.27%	6.97%	11.63%	19.53%
0.1-0.15	12.96%	33.42%	16.43%	5.35%	10.15%	30.17%	34.26%
0.15-0.2	30.46%	17.06%	23.62%	34.63%	34.05%	44.25%	24.85%
0.2-0.25	38.00%	3.64%	45.98%	43.78%	25.41%	10.22%	10.63%
0.25-0.3	9.52%	0.11%	2.87%	14.38%	22.27%	0.62%	3.18%
0.3-0.35	0.28%	0.00%	0.00%	0.42%	1.10%	0.00%	0.14%
0.35-0.4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.4-0.45	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.45-0.5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.5-0.55	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.55-0.6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.6-0.65	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
> 0.65	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%



Produced by VegScape - <http://nassgeodata.gmu.edu/VegScape>

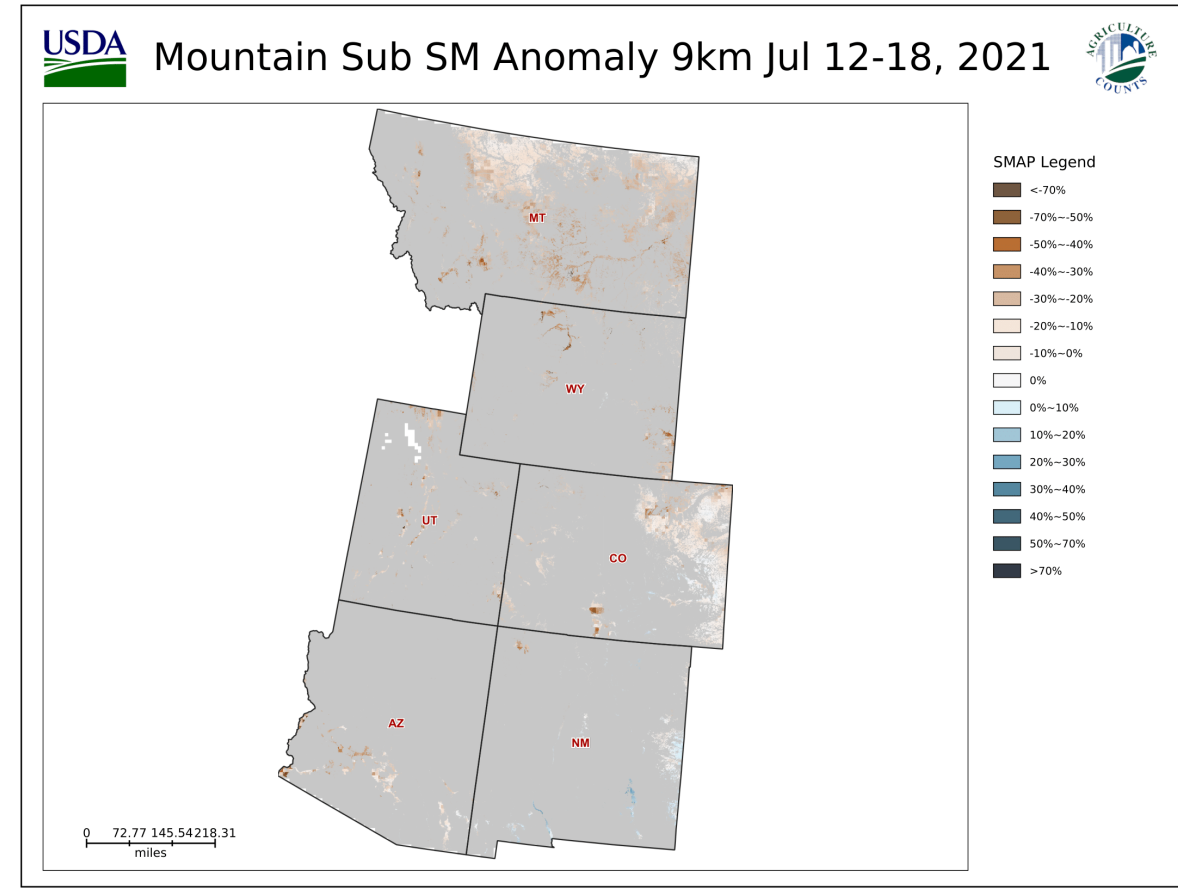


Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



Mountain Region Sub Soil Moisture Anomaly 9km July 12-18, 2021

Sub Soil Moisture Anomaly (9km, July 12-18, 2021)							
Soil Moisture Anomaly	Mountain Region	Arizona	Colorado	Montana	New Mexico	Utah	Wyoming
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
<-70%	0.25%	1.21%	0.00%	0.05%	0.00%	0.00%	0.00%
-70%~-50%	0.83%	2.18%	0.05%	0.04%	0.01%	0.97%	2.31%
-50%~-40%	1.33%	1.25%	0.52%	0.41%	0.02%	2.32%	5.45%
-40%~-30%	11.14%	16.89%	1.09%	0.80%	1.23%	2.99%	7.45%
-30%~-20%	39.05%	32.99%	1.77%	14.79%	2.04%	19.63%	29.52%
-20%~-10%	40.19%	41.93%	19.59%	52.77%	2.94%	63.41%	43.10%
-10%~0%	5.90%	3.47%	67.50%	30.80%	28.57%	10.56%	10.92%
0%~-10%	0.97%	0.07%	9.10%	0.35%	45.89%	0.12%	1.25%
10%~20%	0.29%	0.00%	0.39%	0.00%	14.06%	0.00%	0.00%
20%~30%	0.02%	0.00%	0.00%	0.00%	4.81%	0.00%	0.00%
30%~40%	0.00%	0.00%	0.00%	0.00%	0.42%	0.00%	0.00%
40%~50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
50%~70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
>70%			0.00%	0.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

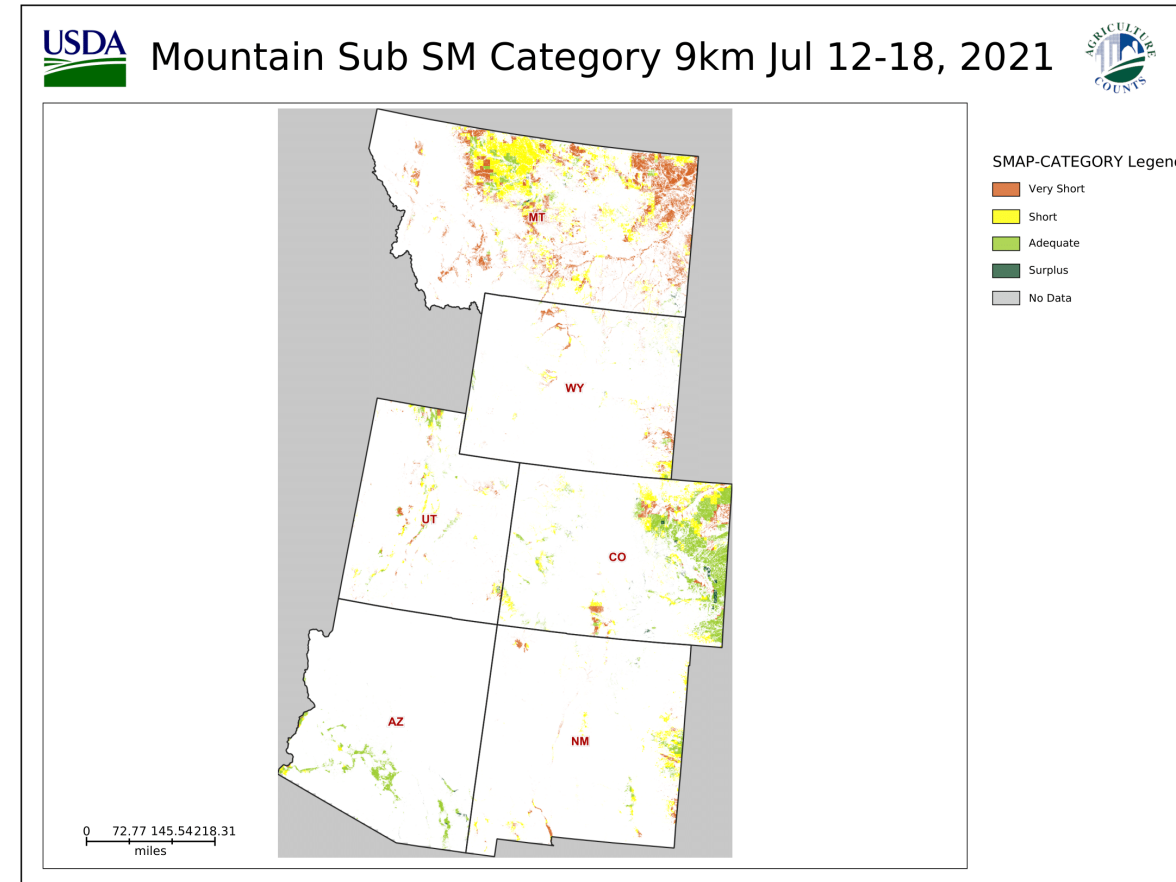


Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



Mountain Region
 Sub Soil Moisture Categorical 9km
 July 12-18, 2021

Sub Soil Moisture Categorical (9km, July 12-18, 2021)							
Categorical Soil Moisture	Mountain Region	Arizona	Colorado	Montana	New Mexico	Utah	Wyoming
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
Very Short	32.42%	0.00%	10.84%	49.17%	21.77%	28.01%	44.50%
Short	35.93%	7.17%	25.90%	41.73%	58.03%	37.89%	38.60%
Adequate	29.78%	90.40%	60.94%	7.18%	19.98%	33.24%	15.80%
Surplus	1.07%	2.40%	2.32%	0.33%	0.21%	0.80%	1.10%
No Data	0.80%	0.02%	0.00%	1.59%	0.01%	0.06%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%



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Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



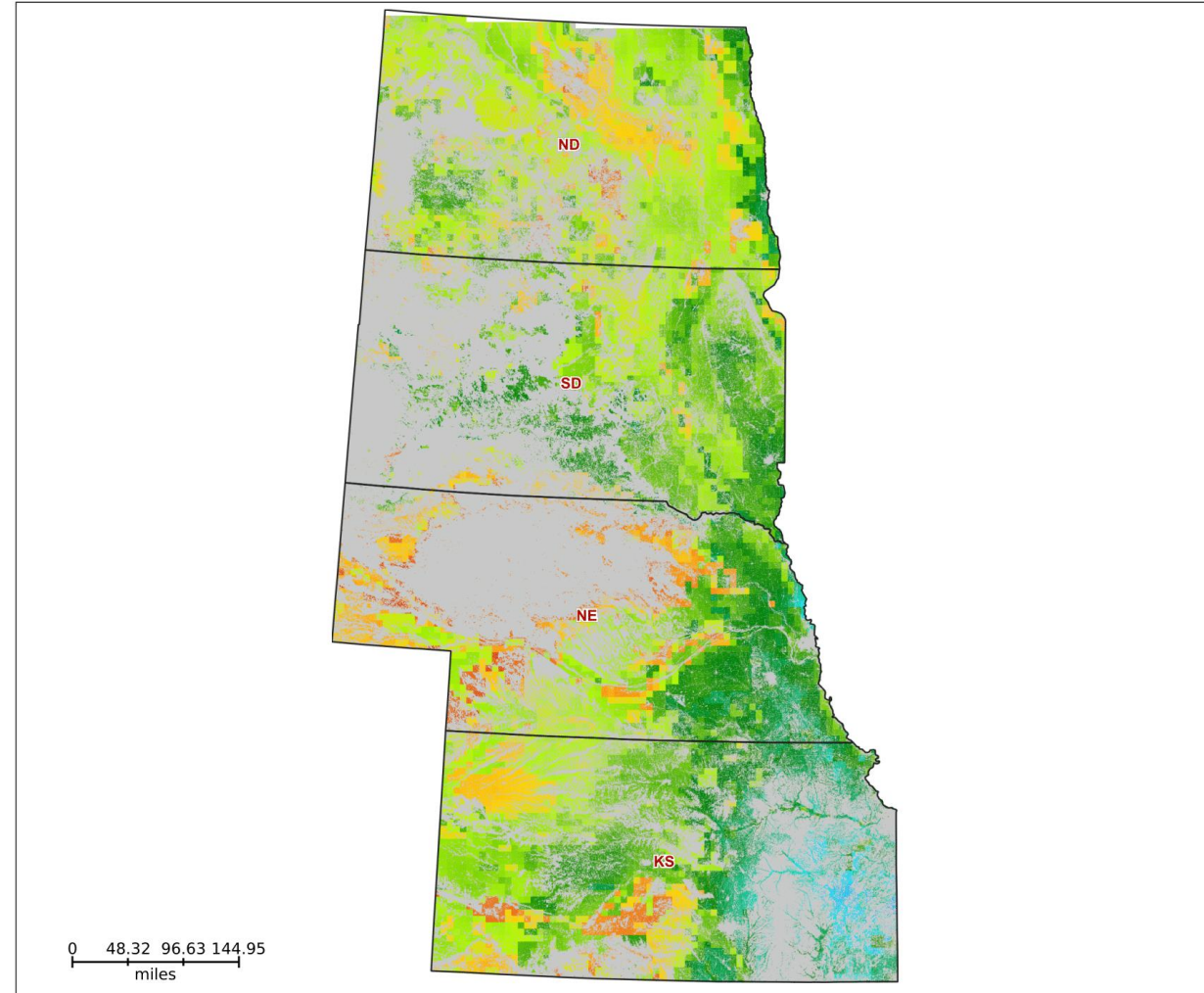
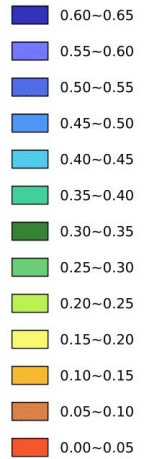
Northern Plains Region
Sub Soil Moisture 9km
July 12-18, 2021



N.Plains Sub SM 9km Jul 12-18, 2021



SMAP Legend



Produced by VegScape - <http://nassgeodata.gmu.edu/VegScape>

Sub Soil Moisture (9km, July 12-18, 2021)					
Volumetric Soil Moisture (cm3/cm3)	Northern Plains Region	Kansas	Nebraska	North Dakota	South Dakota
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
0.0-0.05	0.30%	0.02%	1.16%	0.08%	0.02%
0.05-0.1	3.10%	3.95%	7.35%	0.72%	0.37%
0.1-0.15	8.27%	7.49%	13.42%	7.56%	4.49%
0.15-0.2	21.49%	13.90%	13.69%	42.38%	12.55%
0.2-0.25	33.28%	30.47%	20.42%	39.86%	42.70%
0.25-0.3	22.82%	21.50%	29.95%	7.43%	38.05%
0.3-0.35	8.55%	15.61%	13.38%	1.98%	1.82%
0.35-0.4	1.57%	4.93%	0.63%	0.00%	0.00%
0.4-0.45	0.61%	2.10%	0.00%	0.00%	0.00%
0.45-0.5	0.01%	0.03%	0.00%	0.00%	0.00%
0.5-0.55	0.00%	0.00%	0.00%	0.00%	0.00%
0.55-0.6	0.00%	0.00%	0.00%	0.00%	0.00%
0.6-0.65	0.00%	0.00%	0.00%	0.00%	0.00%
> 0.65	0.00%	0.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%



Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



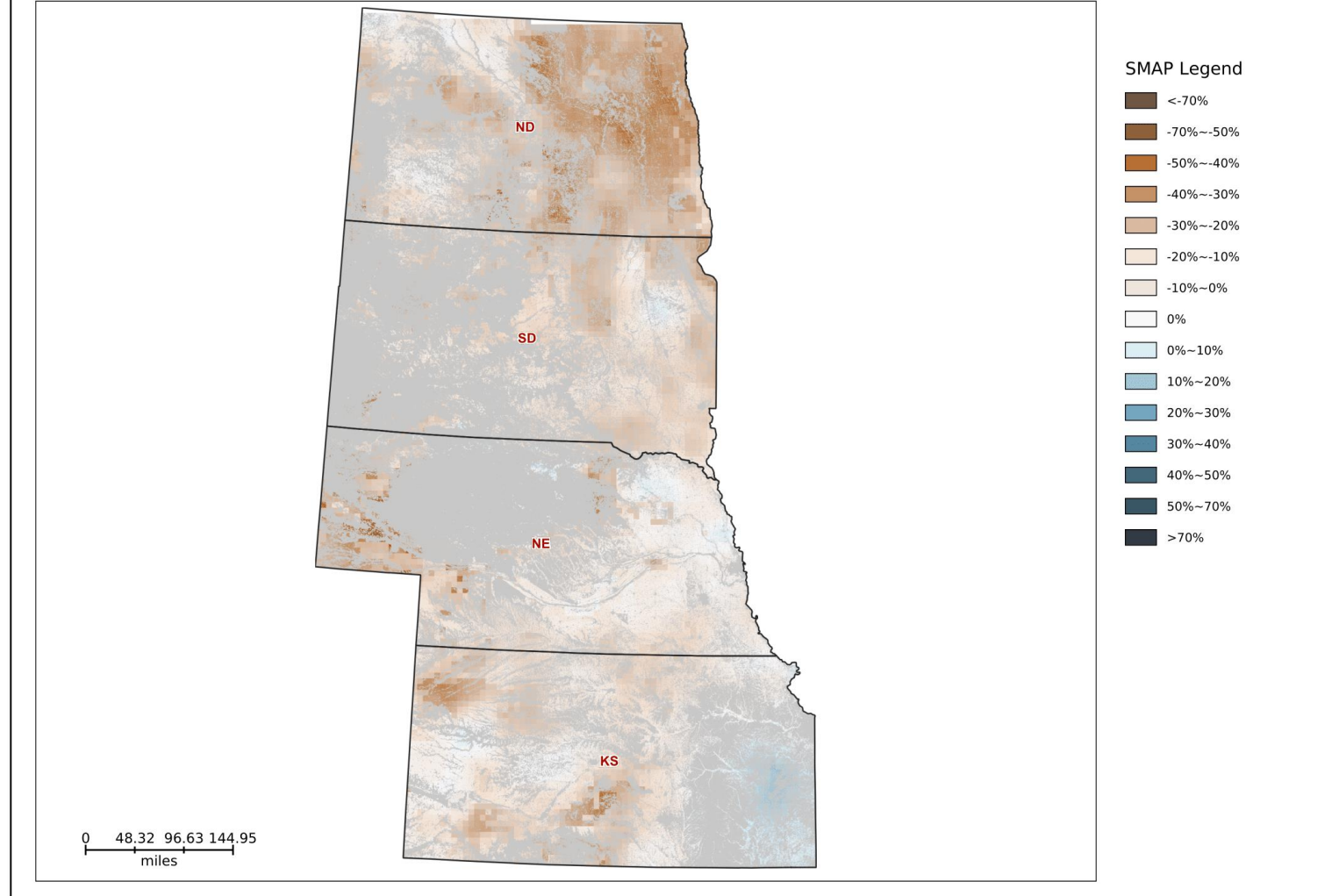
Northern Plains Region
 Sub Soil Moisture Anomaly 9km
 July 12-18, 2021



N.Plains Sub SM Anomaly 9km Jul 12-18, 2021



Sub Soil Moisture Anomaly (9km, July 12-18, 2021)					
Soil Moisture Anomaly	Northern Plains Region	Kansas	Nebraska	North Dakota	South Dakota
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
<-70%	0.00%	0.00%	0.00%	0.00%	0.00%
-70%~-50%	0.00%	0.00%	0.00%	0.00%	0.00%
-50%~-40%	0.09%	0.00%	0.35%	0.04%	0.00%
-40%~-30%	0.94%	0.37%	0.69%	2.33%	0.13%
-30%~-20%	12.61%	4.07%	4.00%	36.27%	2.27%
-20%~-10%	40.79%	34.90%	24.12%	41.25%	67.50%
-10%~0%	40.07%	48.23%	65.01%	19.26%	28.46%
0%~-10%	4.59%	9.31%	5.79%	0.84%	1.64%
10%~20%	0.91%	3.12%	0.03%	0.00%	0.00%
20%~30%	0.00%	0.00%	0.00%	0.00%	0.00%
30%~40%	0.00%	0.00%	0.00%	0.00%	0.00%
40%~50%	0.00%	0.00%	0.00%	0.00%	0.00%
50%~70%	0.00%	0.00%	0.00%	0.00%	0.00%
>70%	0.00%	0.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%



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Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



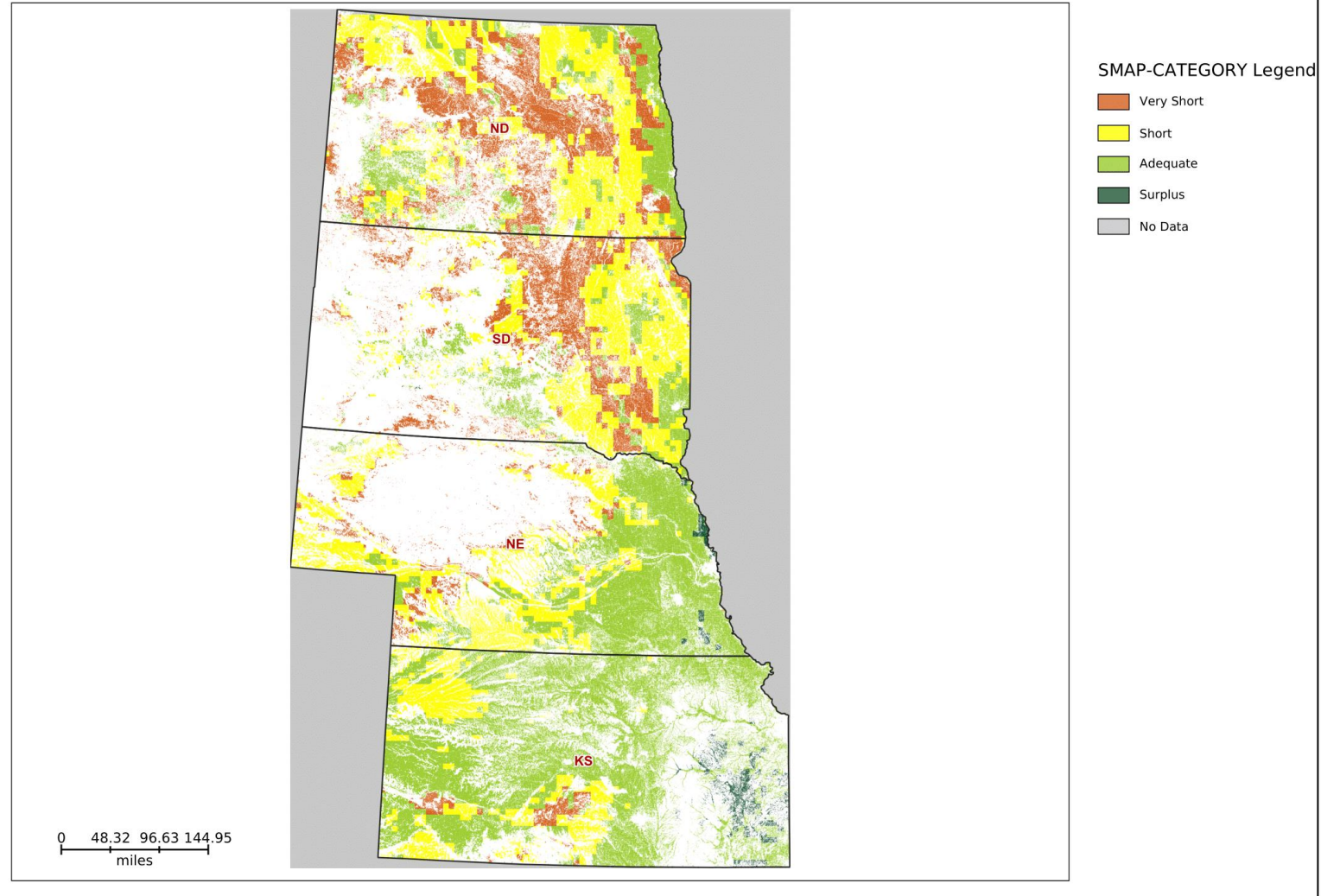
Northern Plains Region
 Sub Soil Moisture Categorical 9km
 July 12-18, 2021



N.Plains Sub SM Category 9km Jul 12-18, 2021



Sub Soil Moisture Categorical (9km, July 12-18, 2021)					
Categorical Soil Moisture	Northern Plains Region	Kansas	Nebraska	North Dakota	South Dakota
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
Very Short	19.22%	2.77%	6.65%	34.57%	35.90%
Short	33.40%	17.06%	33.89%	41.53%	45.31%
Adequate	45.85%	76.84%	58.23%	22.91%	18.75%
Surplus	1.25%	3.32%	1.24%	0.00%	0.04%
No Data	0.28%	0.00%	0.00%	0.99%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%



Produced by VegScape - <http://nassgeodata.gmu.edu/VegScape>



Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>



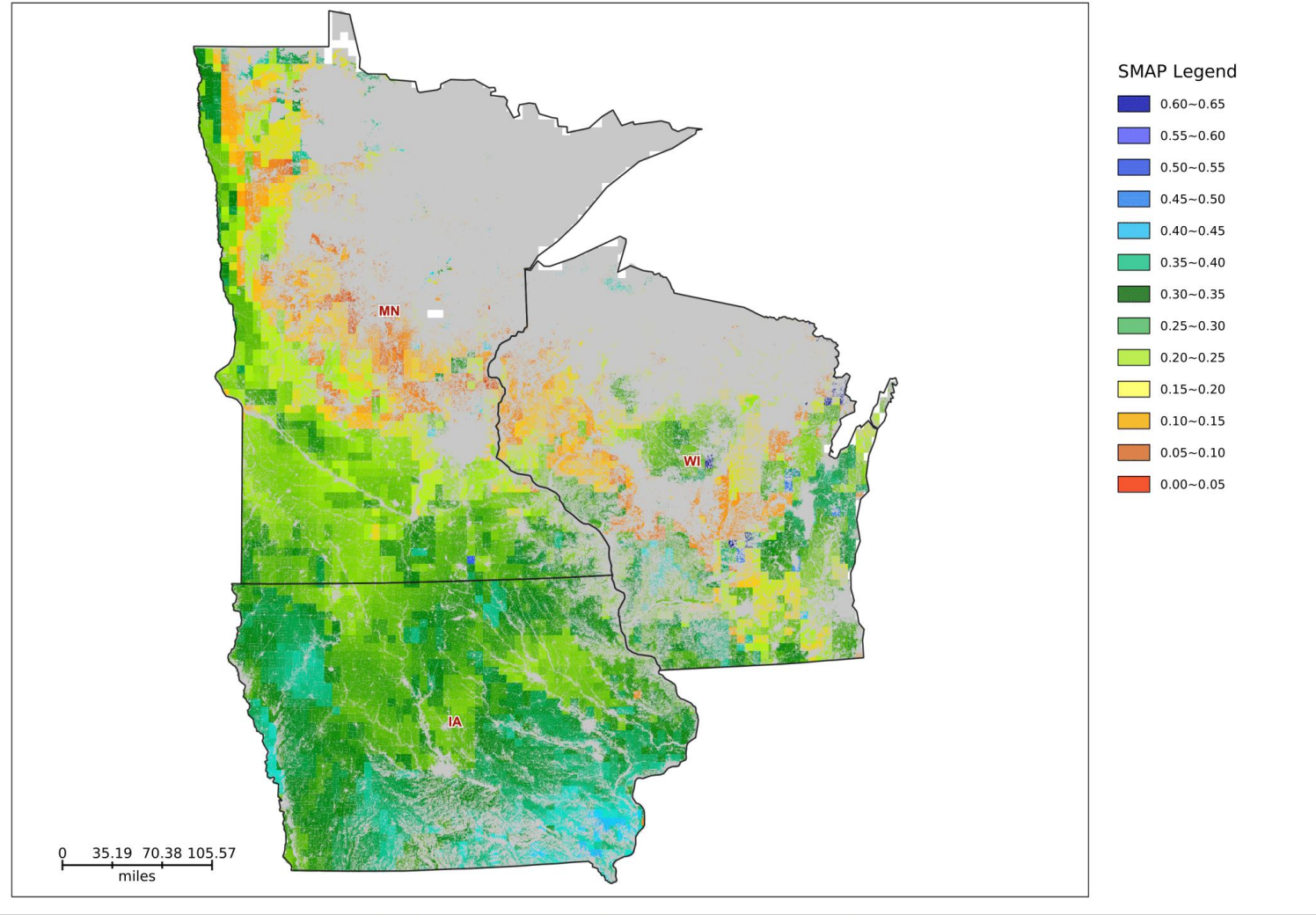
Upper Midwest Region
Sub Soil Moisture 9km
July 12-18, 2021



U.Midwest Sub SM 9km Jul 12-18, 2021



Sub Soil Moisture (9km, July 12-18, 2021)				
Volumetric Soil Moisture (cm ³ /cm ³)	Upper Midwest Region	Iowa	Minnesota	Wisconsin
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
0.0-0.05	0.23%	0.00%	0.57%	0.07%
0.05-0.1	3.45%	0.05%	5.22%	8.50%
0.1-0.15	6.42%	0.00%	11.05%	13.15%
0.15-0.2	8.67%	0.00%	15.73%	16.01%
0.2-0.25	24.26%	11.66%	40.67%	20.94%
0.25-0.3	31.02%	40.85%	21.45%	25.56%
0.3-0.35	20.87%	37.75%	4.76%	12.56%
0.35-0.4	4.26%	8.65%	0.36%	1.50%
0.4-0.45	0.52%	1.05%	0.09%	0.09%
0.45-0.5	0.11%	0.00%	0.09%	0.45%
0.5-0.55	0.10%	0.00%	0.00%	0.57%
0.55-0.6	0.03%	0.00%	0.00%	0.15%
0.6-0.65	0.05%	0.00%	0.00%	0.29%
> 0.65	0.03%	0.00%	0.00%	0.15%
Total	100.00%	100.00%	100.00%	100.00%



Produced by VegScape - <http://nassgeodata.gmu.edu/VegScape>



Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>

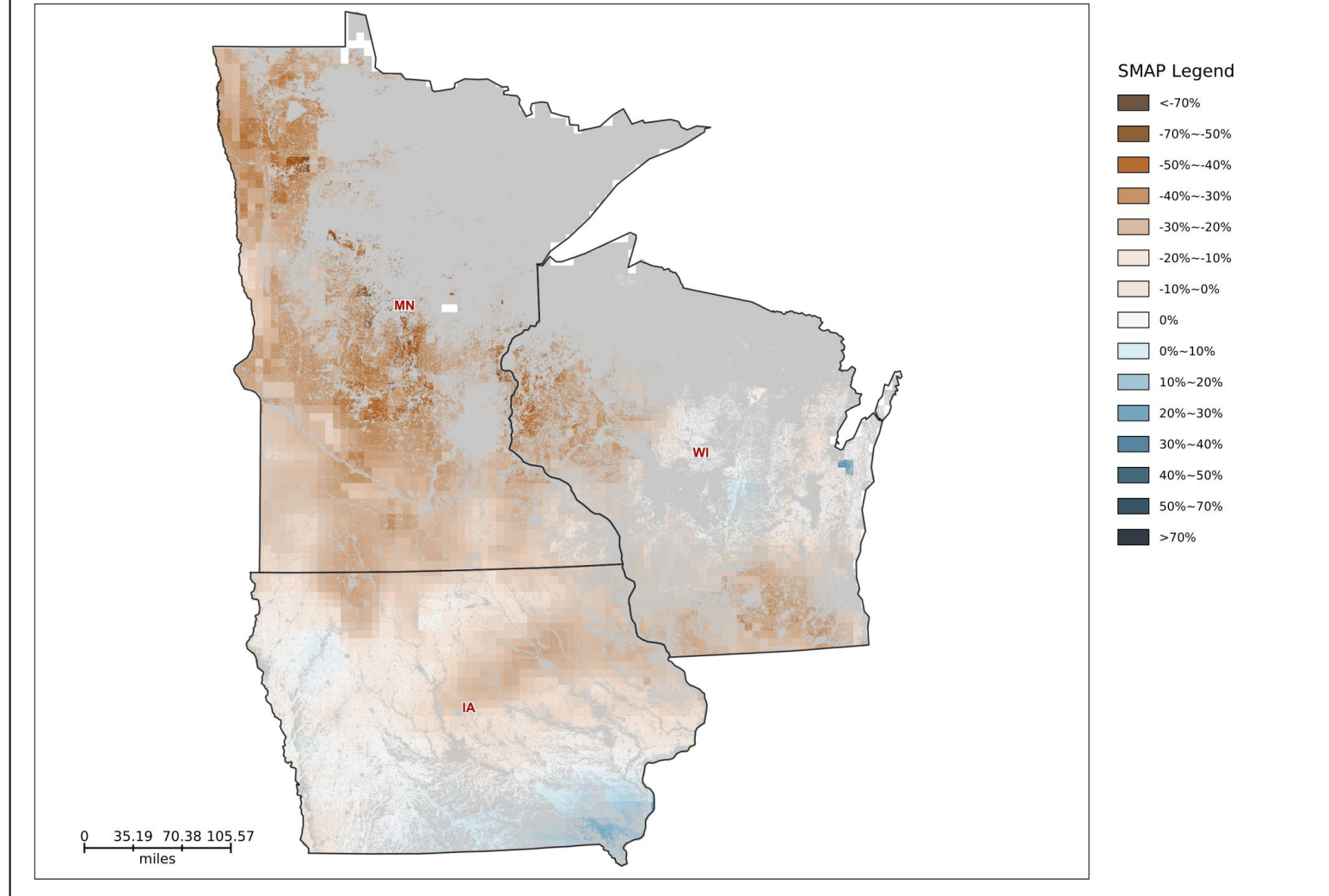


Upper Midwest Region
 Sub Soil Moisture Anomaly 9km
 July 12-18, 2021

Sub Soil Moisture Anomaly (9km, July 12-18, 2021)				
Soil Moisture Anomaly	Upper Midwest Region	Iowa	Minnesota	Wisconsin
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
<-70%	0.00%	0.00%	0.00%	0.00%
-70%~-50%	0.04%	0.00%	0.12%	0.00%
-50%~-40%	0.83%	0.00%	2.06%	0.27%
-40%~-30%	3.22%	0.00%	6.58%	4.30%
-30%~-20%	20.80%	2.12%	41.95%	23.25%
-20%~-10%	39.13%	33.56%	48.57%	31.84%
-10%~0%	26.97%	46.69%	0.73%	33.79%
0%~-10%	6.93%	13.31%	0.00%	5.71%
10%~20%	1.67%	3.55%	0.00%	0.46%
20%~30%	0.39%	0.78%	0.00%	0.23%
30%~40%	0.03%	0.00%	0.00%	0.15%
40%~50%	0.00%	0.00%	0.00%	0.00%
50%~70%	0.00%	0.00%	0.00%	0.00%
>70%	0.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%



U.Midwest Sub SM Anomaly 9km Jul 12-18, 2021



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Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>

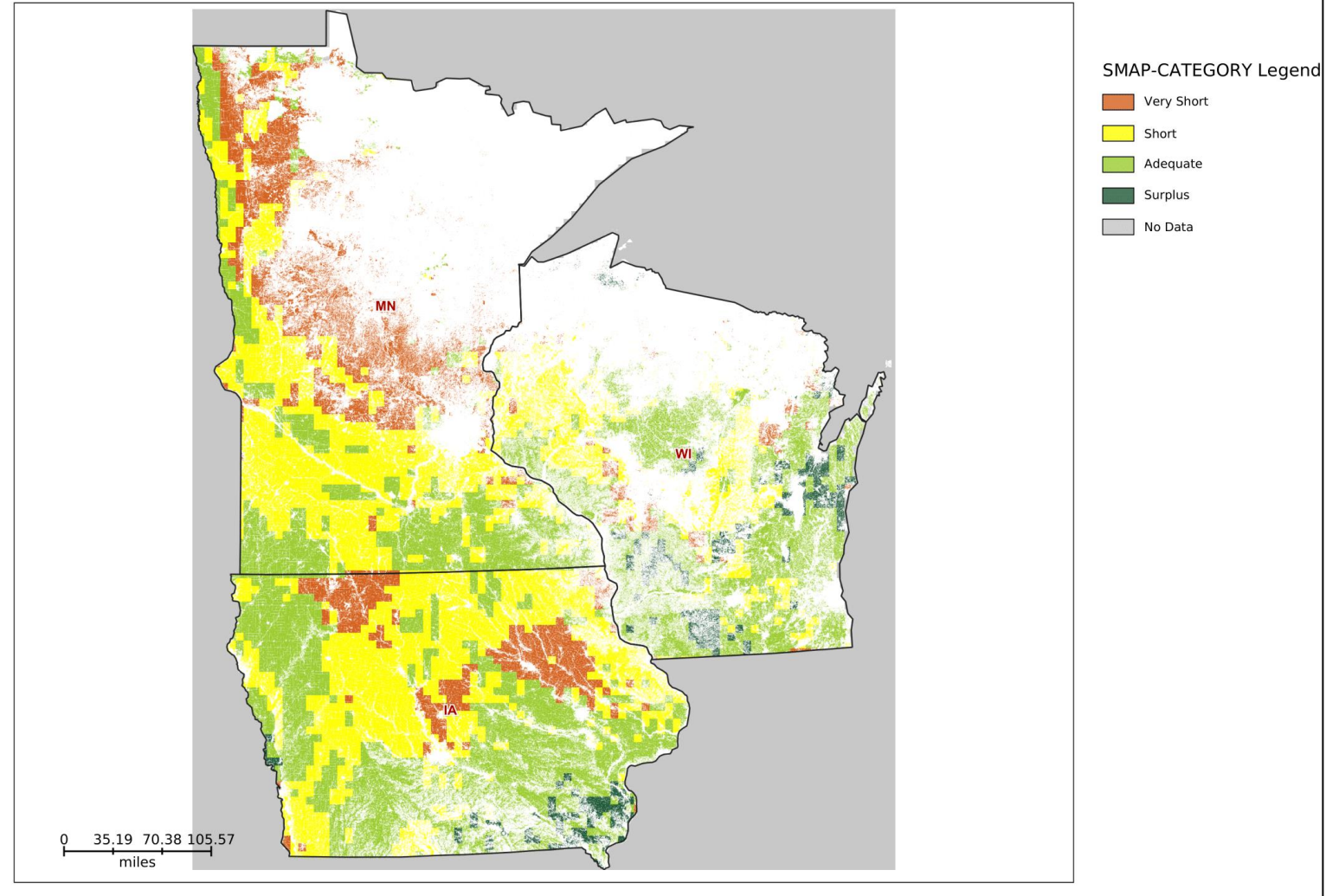


Upper Midwest Region
Sub Soil Moisture Categorical 9km
July 12-18, 2021

Sub Soil Moisture Categorical (9km, July 12-18, 2021)				
Categorical Soil Moisture	Upper Midwest Region	Iowa	Minnesota	Wisconsin
	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland	Percentage of Total Cropland
Very Short	15.70%	12.48%	24.96%	3.56%
Short	40.29%	41.58%	45.61%	25.70%
Adequate	41.03%	43.28%	29.37%	60.49%
Surplus	2.90%	2.67%	0.00%	9.95%
No Data	0.08%	0.00%	0.07%	0.31%
Total	100.00%	100.00%	100.00%	100.00%



U.Midwest Sub SM Category 9km Jul 12-18, 2021



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Crop-CASMA: <https://nassgeo.csiss.gmu.edu/CropCASMA/>

