Summer 2022 Midwest Flooding Event

Assessment Period: July 26-August 8, 2022

Publication Date: August 17, 2022

USDA NASS
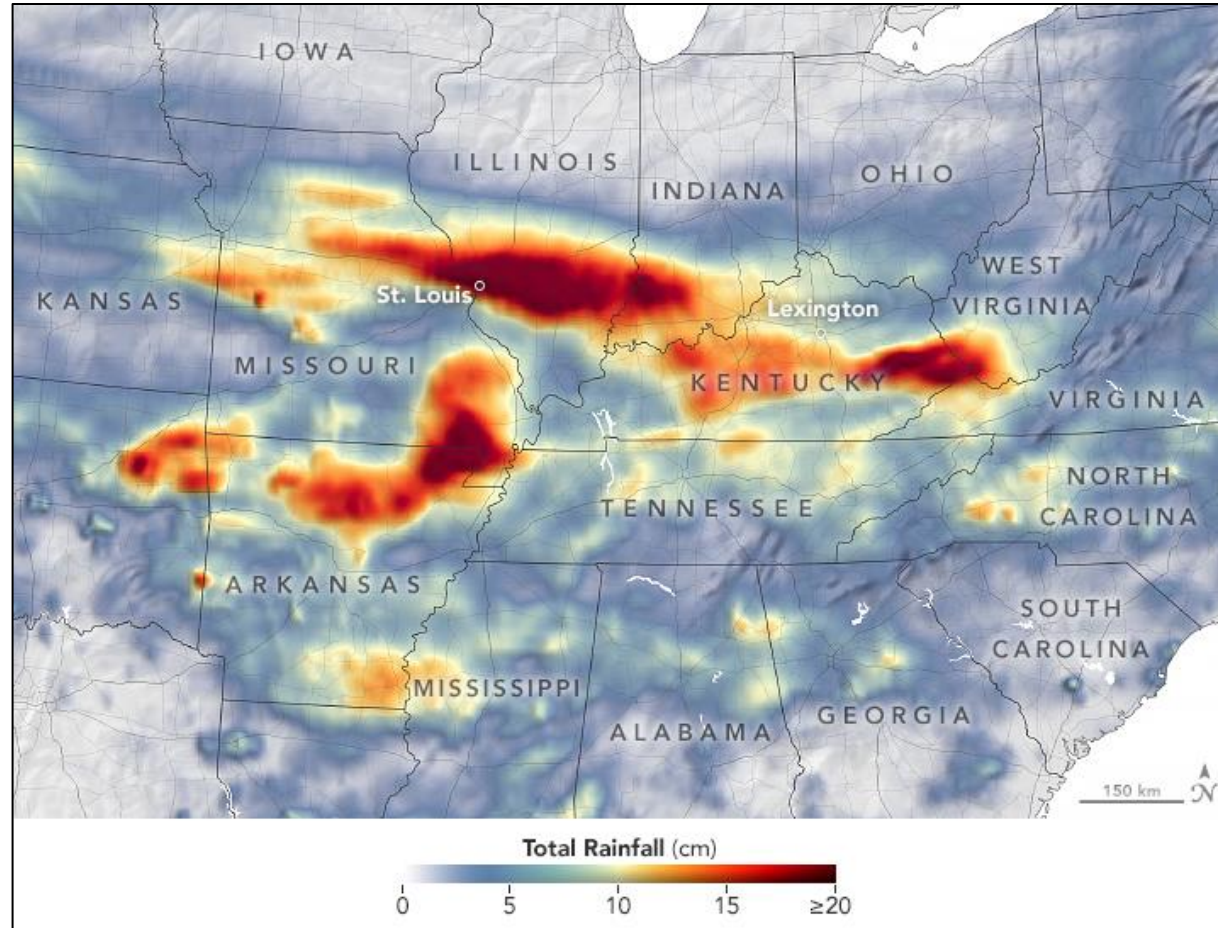
Disaster Monitoring Team

Event Summary

- Greater St. Louis Area, Missouri, Illinois, Kentucky

- Late July/Early August 2022 (July 26-30, 2022)

- Historic Flash Flooding (https://storymaps.arcgis.com/stories/9d10335079444c159966e0a28c90c4df)

- Described as a complex of training thunderstorms set up roughly along the I-70 corridor in Missouri and I-64 corridor in Illinois, and into Kentucky. These thunderstorms, at times, caused rainfall rates in excess of 4"/hr across complex terrain that led to widespread devastating impacts in the region (https://www.weather.gov/lsx/July262022Flooding, https://www.weather.gov/jkl/July2022Flooding, https://weather.com/photos/news/2022-07-26-st-louis-missouri-flood)

Event Summary

Rainfall totals throughout the Midwest from July 25-31, 2022 (https://earthobservatory.nasa.gov/images/150156/extreme-rainfall-leads-to-midwest-flooding).

PRISM Climate Group Data

- Offers an "early glimpse" version of precipitation 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 Aug 2022 - 09 Aug 2022
Period ending 7 AM EST 09 Aug 2022
Base period: 1991-2020
(Map created 10 Aug 2022)

% of Average Precipitation

0	50 - 70	150 - 170
1 - 10	70 - 90	170 - 200
11 - 20	90 - 110	200 - 300
20 - 30	110 - 130	300 - 400
30 - 50	130 - 150	> 400
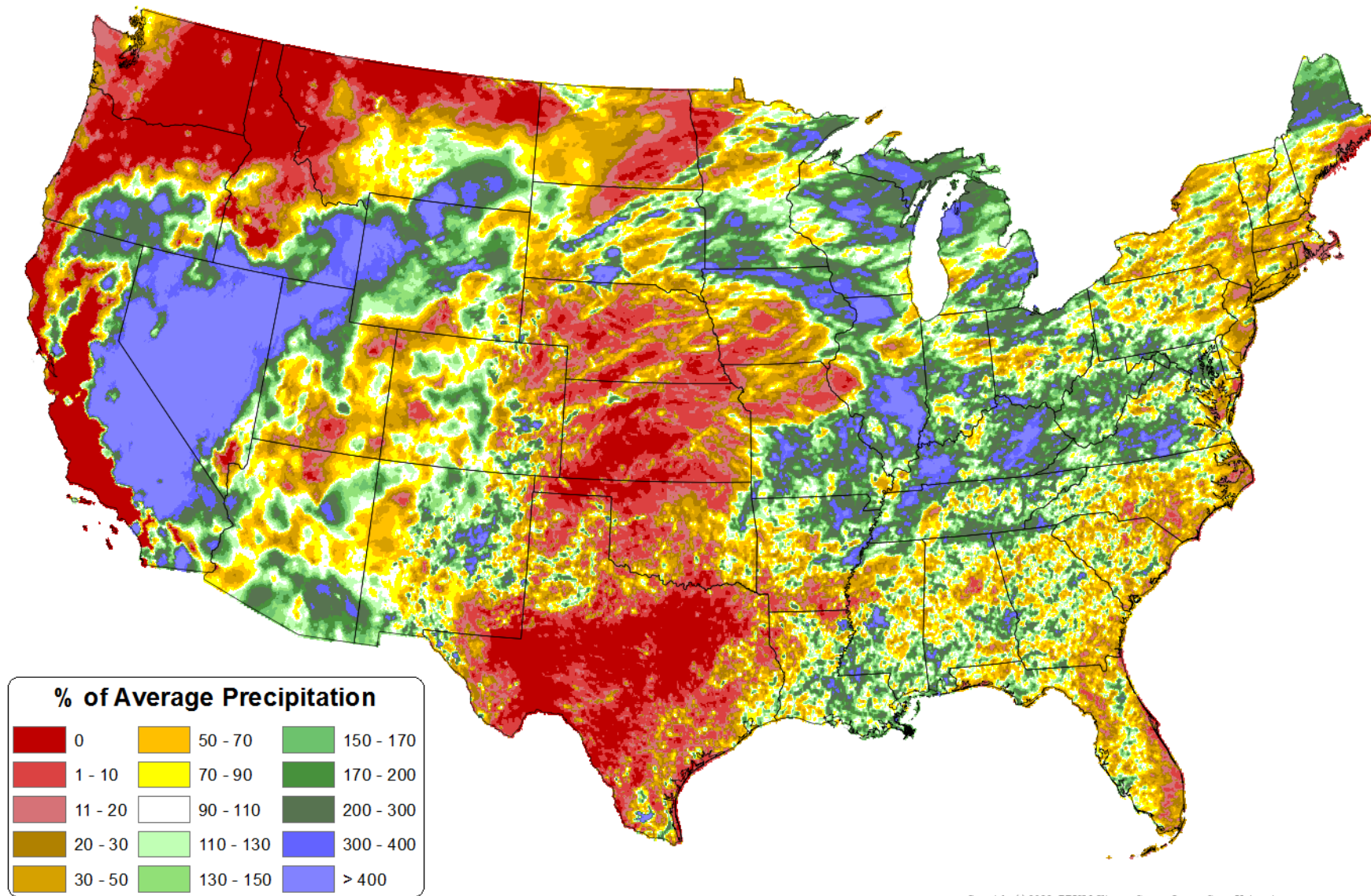
Copyright (c) 2022, PRISM Climate Group, Oregon State University

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

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 SMm denote current soil moisture value and the historical average soil moisture value of a given location.

- Soil moisture anomaly above 30% could be considered very abnormal, which means there is 30% more soil moisture than normal conditions.

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

July 18-24, 2022 Weekly Topsoil Moisture Anomaly
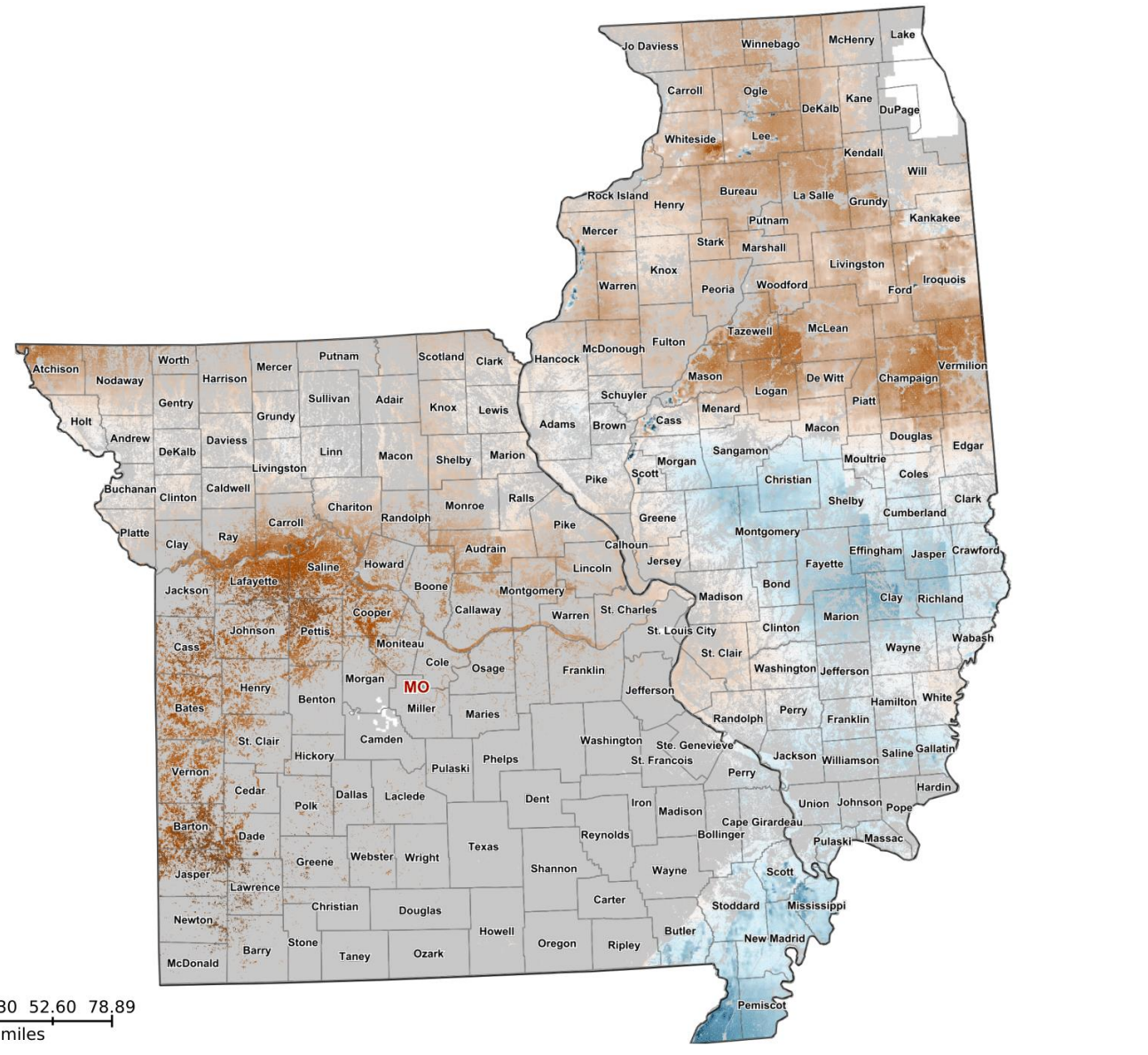
SMAP Legend

- <-70%
- -70%~-50%
- -50%~-40%
- -40%~-30%
- -30%~-20%
- -20%~-10%
- -10%~0%
- 0%
- 0%~10%
- 10%~20%
- 20%~30%
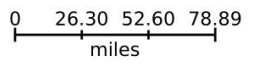- 30%~40%
- 40%~50%
- 50%~70%
- >70%
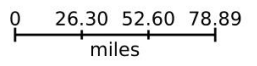
July 25-31, 2022 Weekly Topsoil Moisture Anomaly
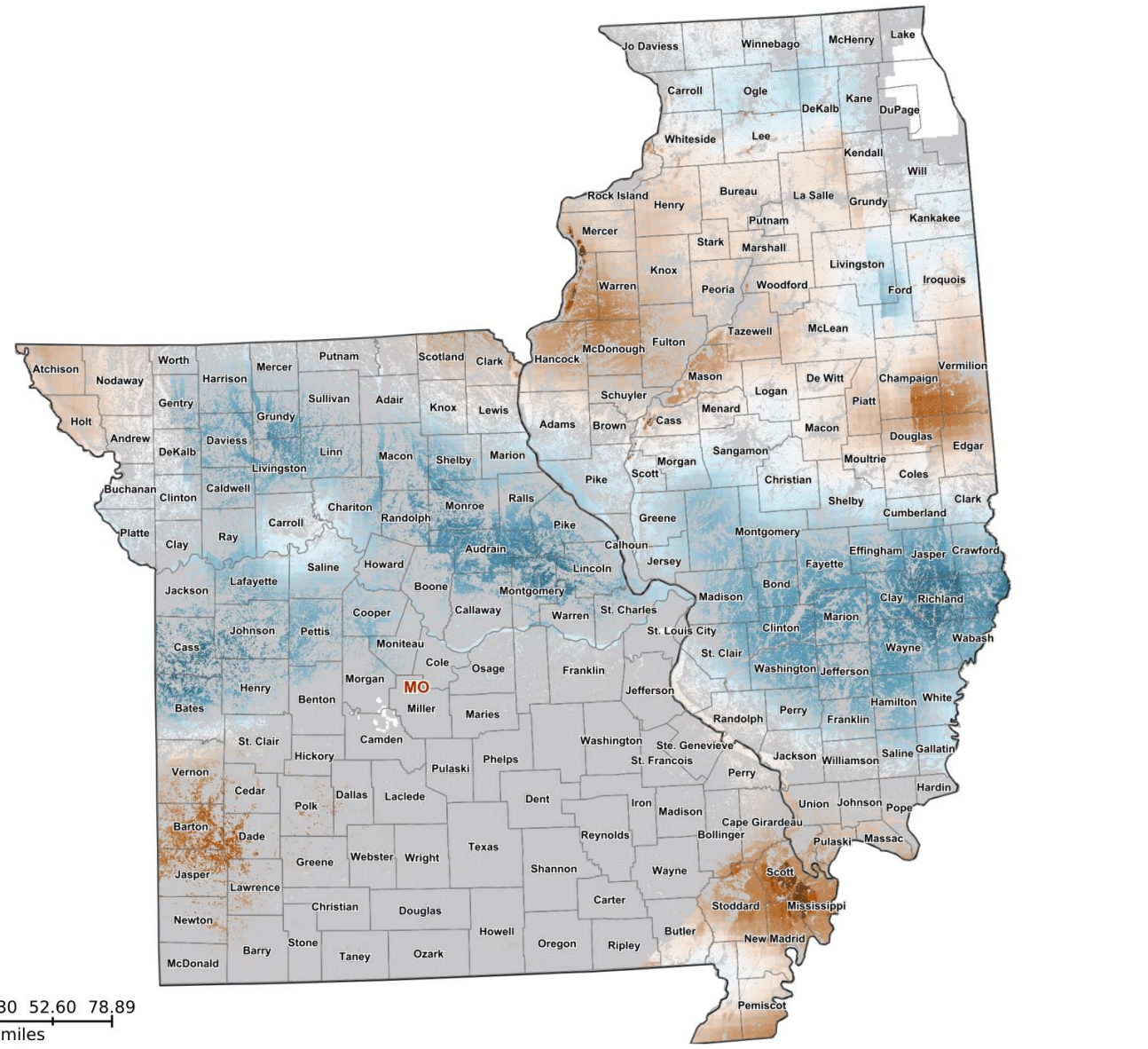
SMAP Legend

- <-70%
- -70%~-50%
- -50%~-40%
- -40%~-30%
- -30%~-20%
- -20%~-10%
- -10%~0%
- 0%
- 0%~10%
- 10%~20%
- 20%~30%
- 30%~40%
- 40%~50%
- 50%~70%
- >70%

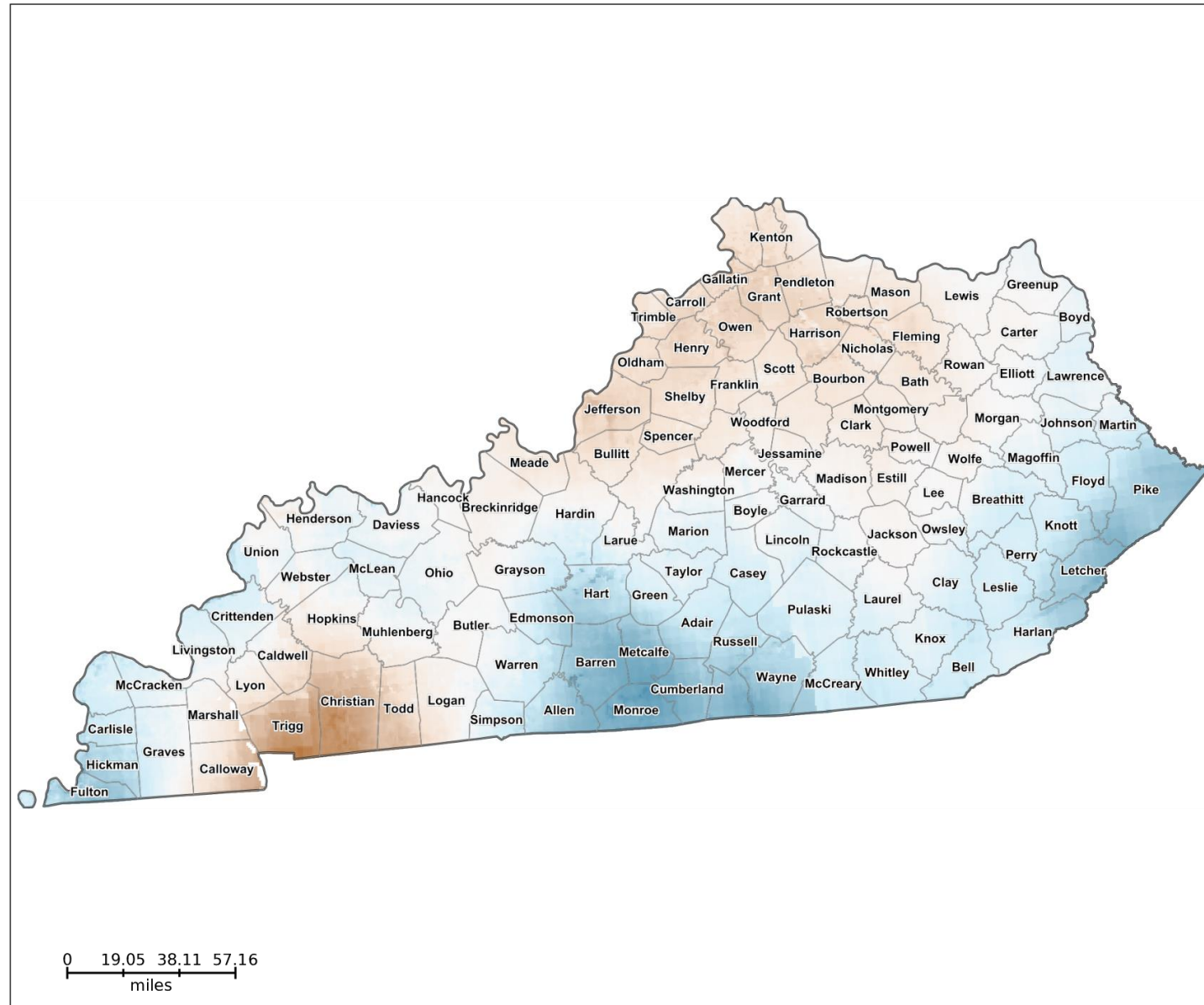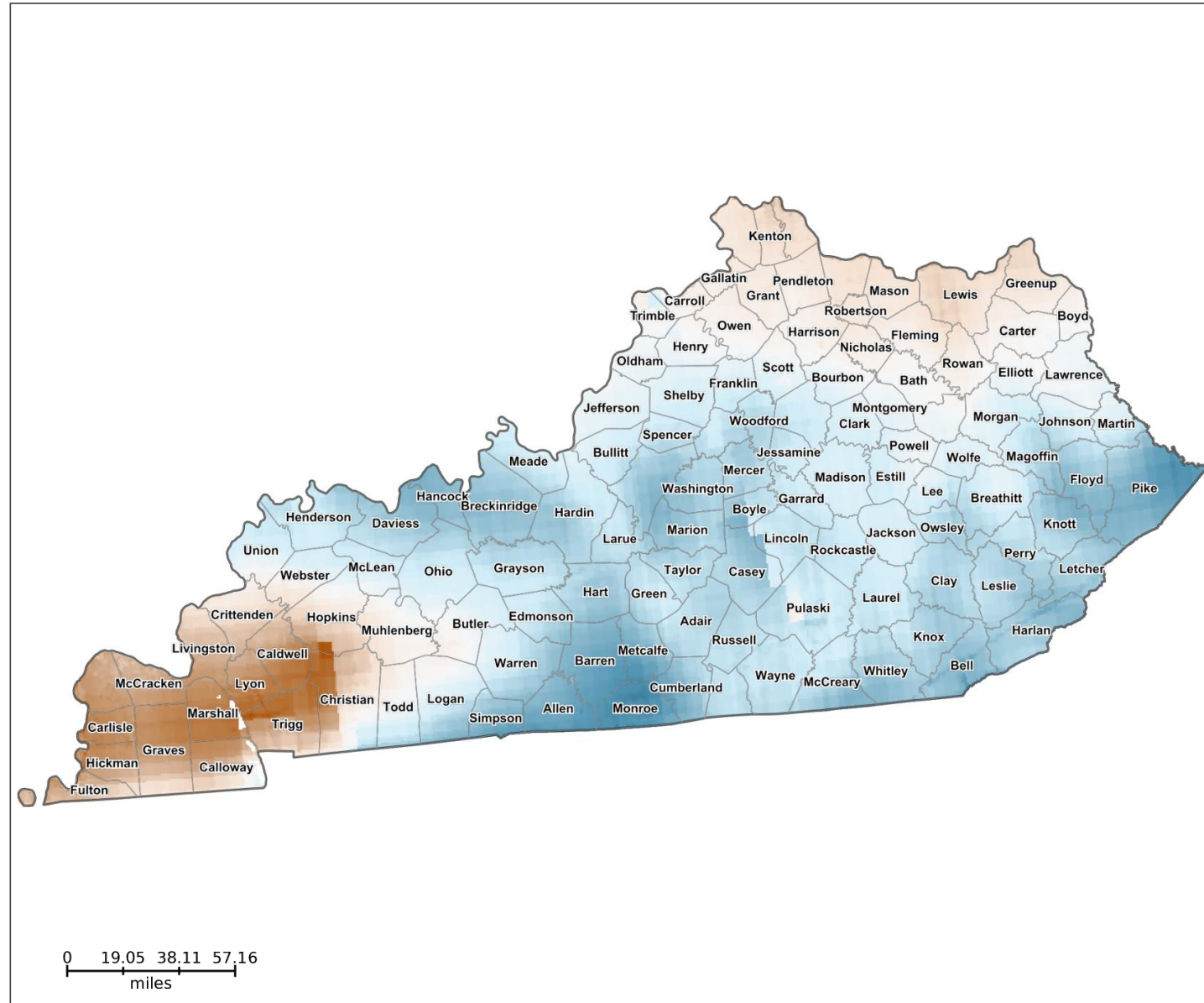# Topsoil Moisture Anomaly (1km, July 18-24, 2022)

SMAP Legend

- <-70%
- -70%~-50%
- -50%~-40%
- -40%~-30%
- -30%~-20%
- -20%~-10%
- -10%~0%
- 0%
- 0%~10%
- 10%~20%
- 20%~30%
- 30%~40%
- 40%~50%
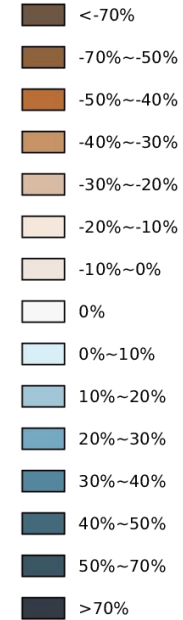- 50%~70%
- >70%

0   19.05 38.11 57.16
miles

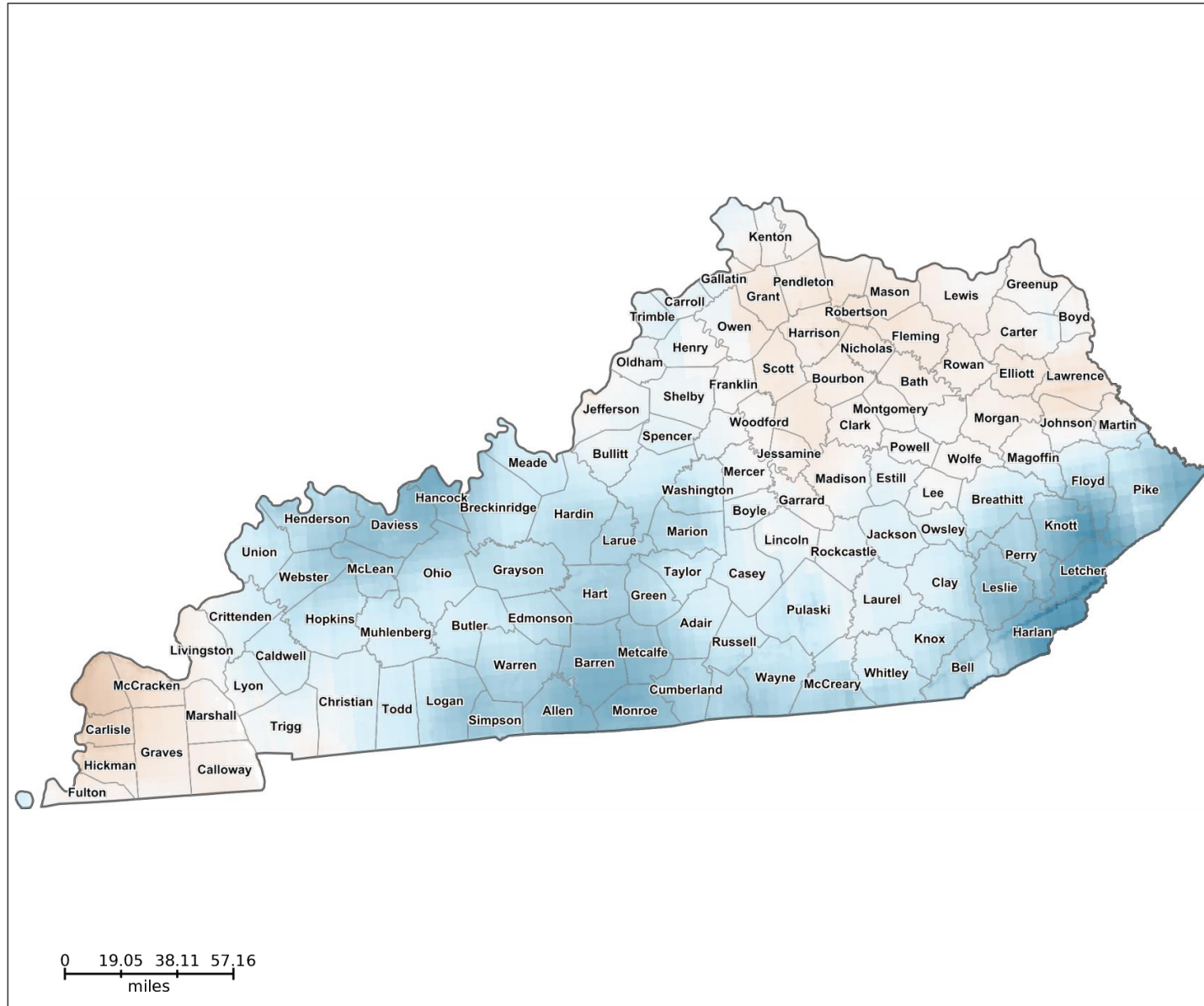# Topsoil Moisture Anomaly (1km, July 25-31, 2022)
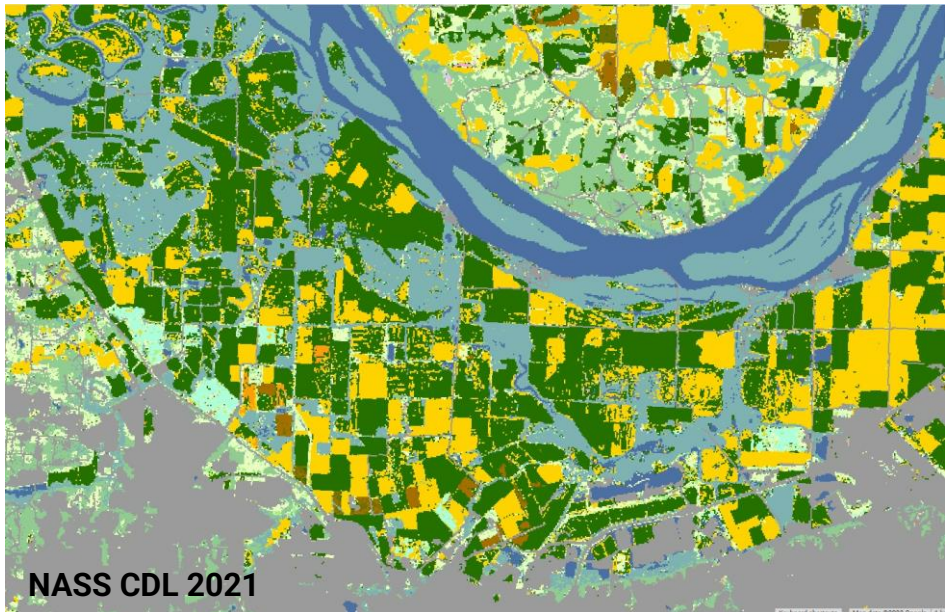
Topsoil Moisture Anomaly (1km, Aug 1-7, 2022)

Inundation Analysis – St. Louis Area

Jun 4 – Jul 22, 2022

Aug 1, 2022

NASS CDL 2021

Aug 6, 2022

Sentinel-2 MSI Images (optical imagery)
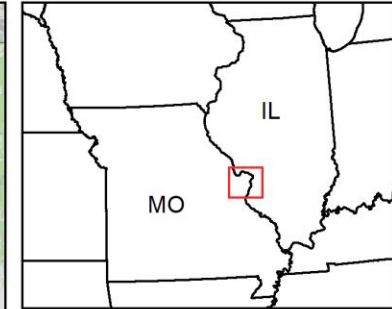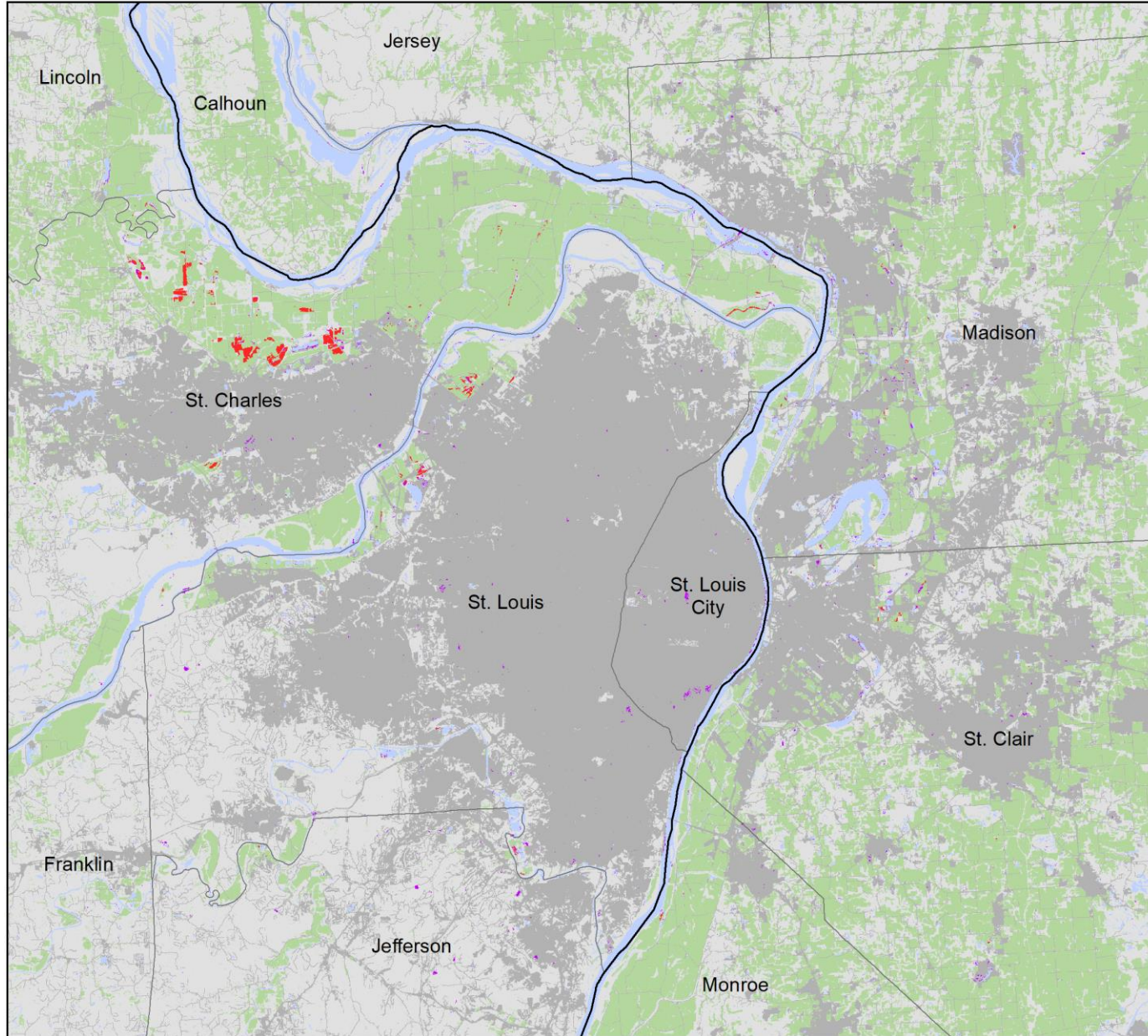
St. Louis Area Flooding Event - August 1, 2022

St. Louis Area Flooding Event - August 1, 2022

Legend:
- Inundated - Cropland
- Inundated - Other Land
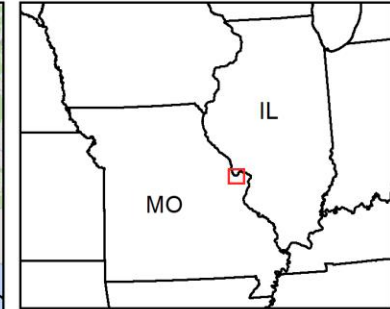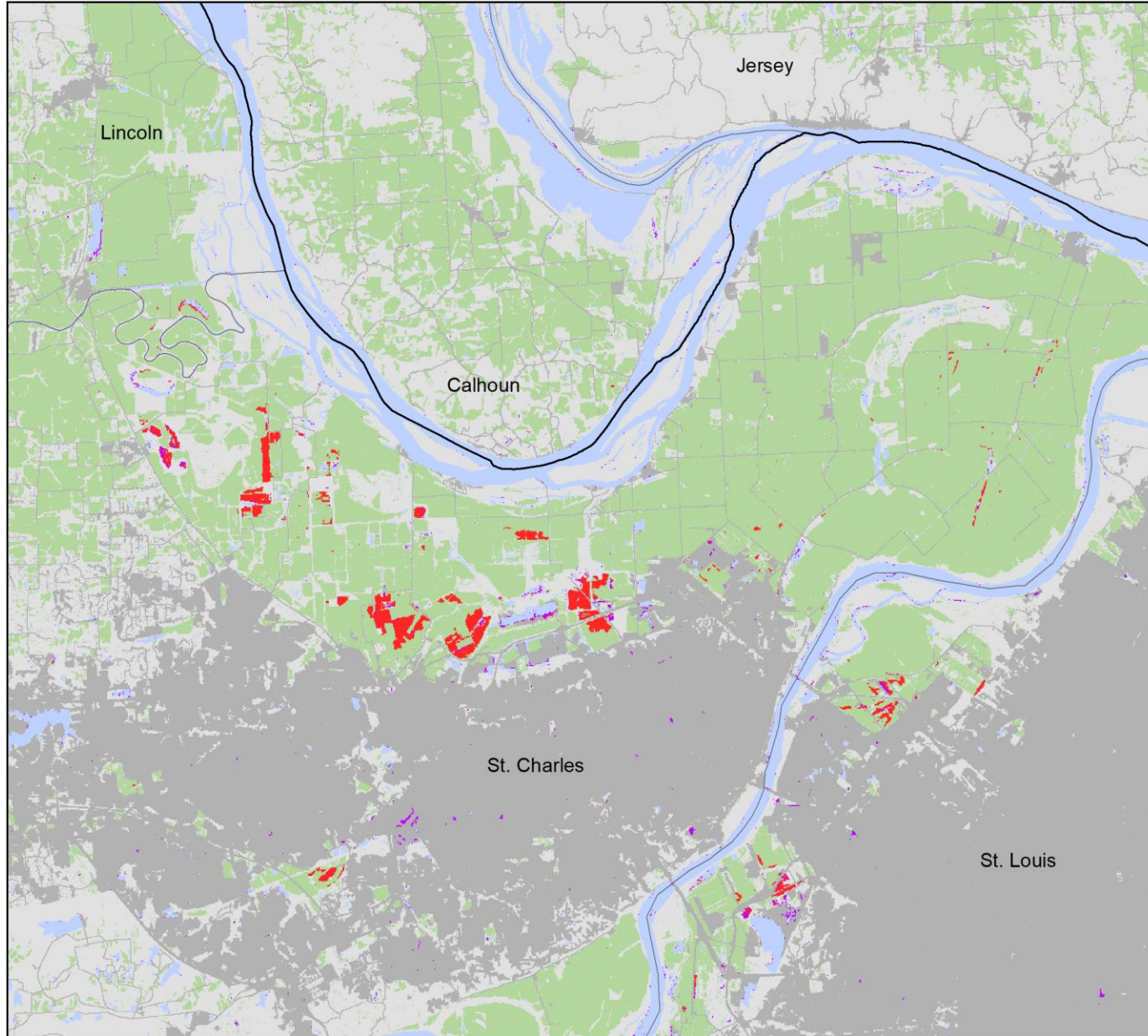- Cropland
- Developed
- Other Land
- Water

Land cover information provided by the USDA NASS 2021 Cropland Data Layer (planted acres). Inundation data derived from Sentinel-2 Modified Normalized Water Index (MNDWI) dated August 1, 2022.
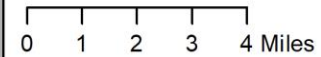
Inundated Cropland – St. Louis Area

St. Louis Area August 1, 2022		Corn		Soybeans	
		Acres Planted	Percent Inundated	Acres Planted	Percent Inundated
Missouri	**St. Charles**	39,500	1.19%	55,000	1.85%
	St. Louis	2,800	1.39%	7,500	1.77%
	Franklin	19,400	0.01%	30,900	0.00%
	Jefferson	3,300	0.09%	7,100	0.04%
Illinois	**Calhoun**	19,900	0.01%	N/A	0.00%
	Jersey	N/A	0.00%	N/A	0.00%
	Madison	105,500	0.03%	116,000	0.04%
	St. Clair	92,300	0.01%	112,000	0.05%
	Monroe	51,400	0.02%	82,600	0.01%

Acres planted are official NASS estimates for acres planted of corn and soybeans in 2021.
Percent inundated derived from Sentinel-2 Modified Normalized Water Index (MNDWI) dated August 1, 2022 and the 2021 Cropland Data Layer (acres planted).
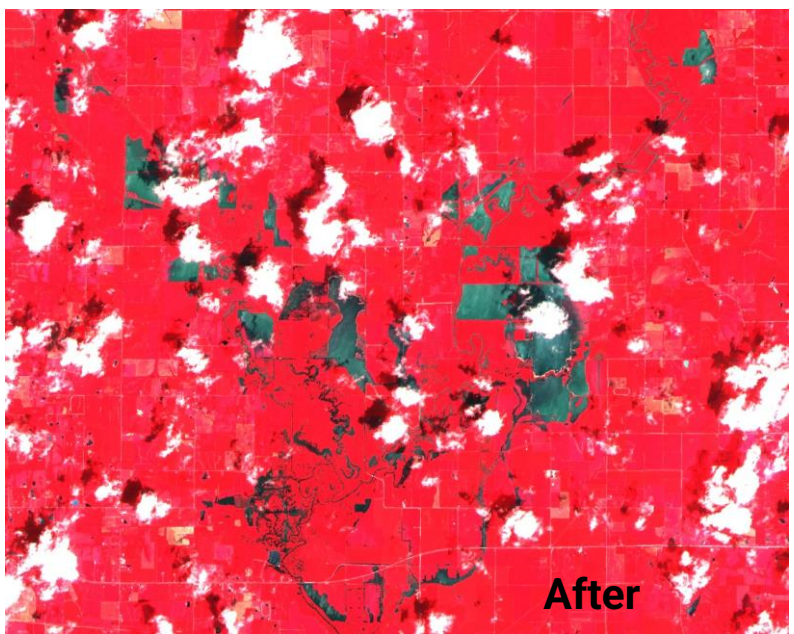
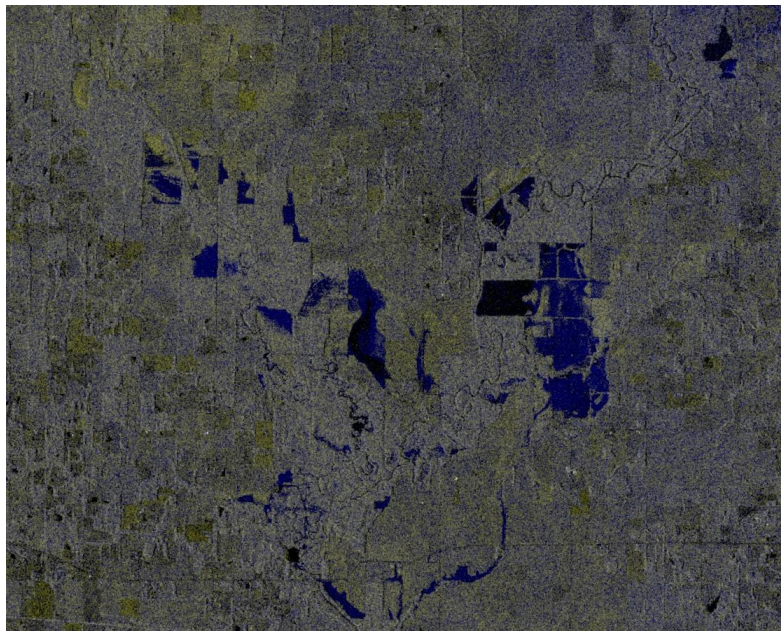# Inundation Analysis – Southern Illinois

Wayne County, IL
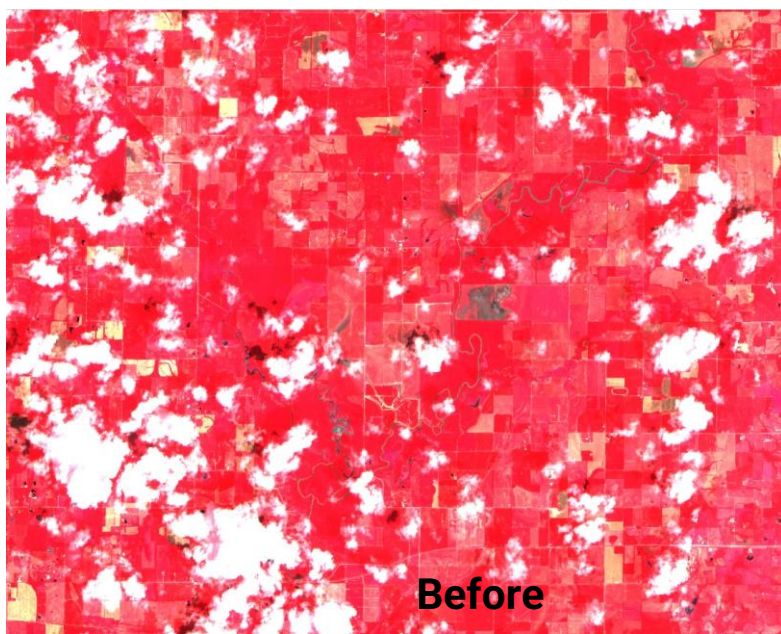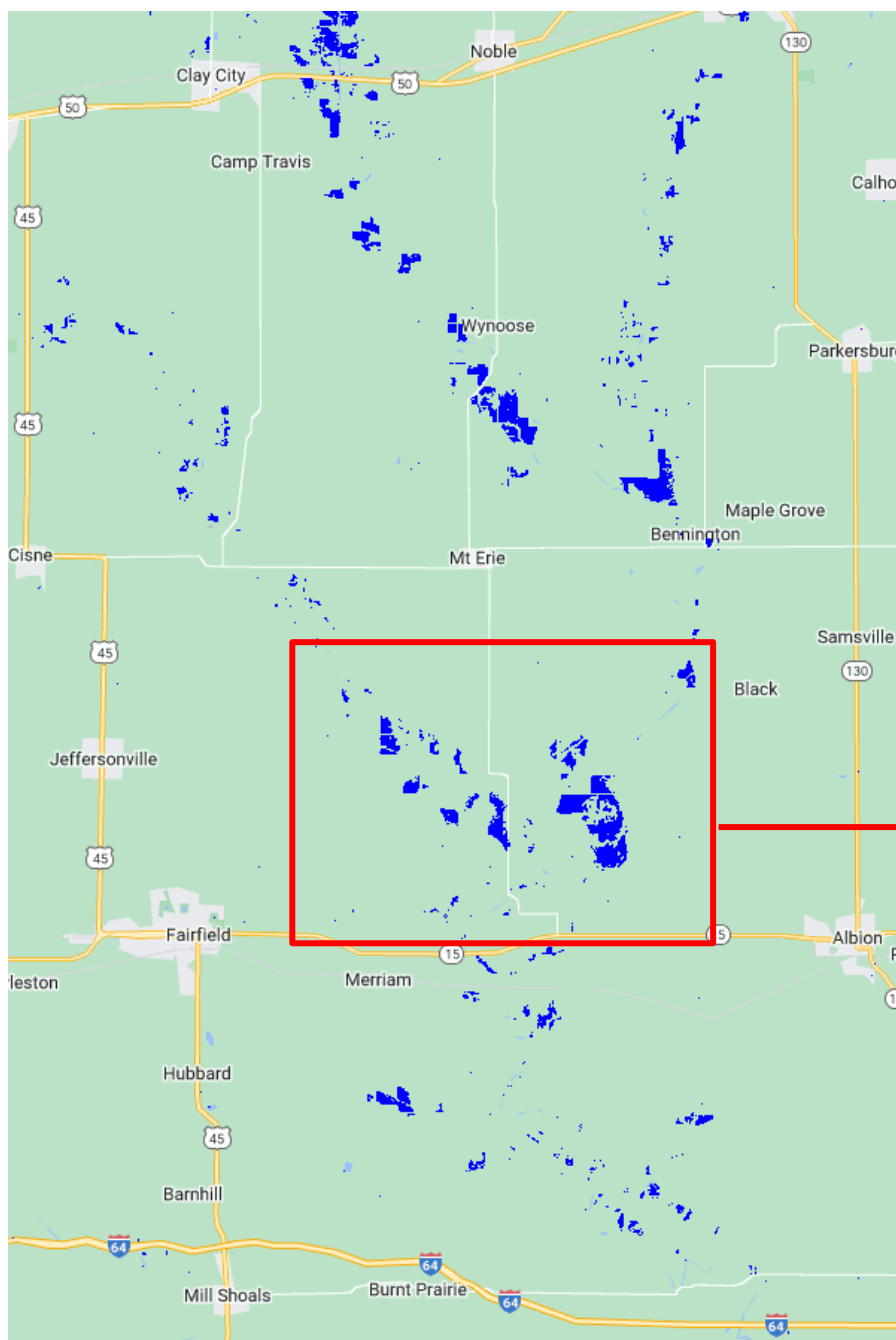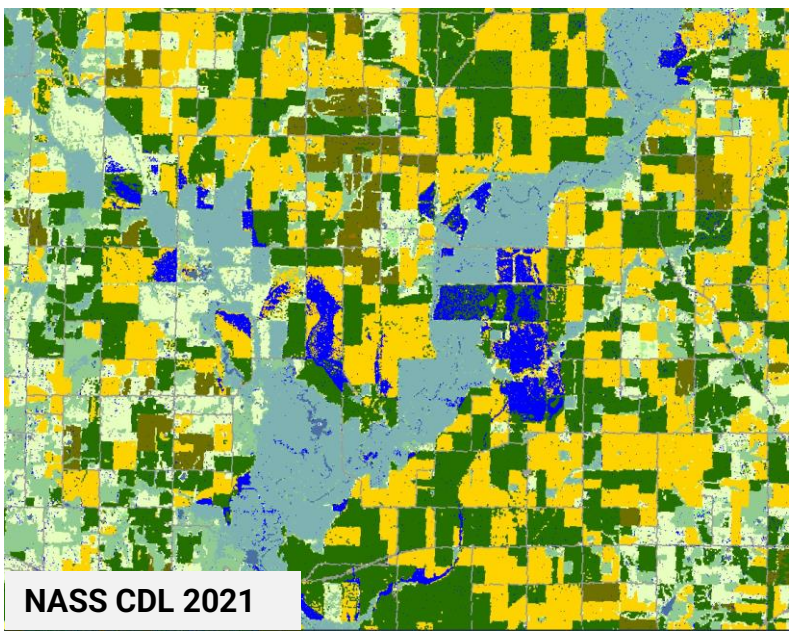
Sentinel-2 MSI images (median of Jul 01 – 21, 2022)

Sentinel-2 MSI images (Aug 3, 2022)

Before

After
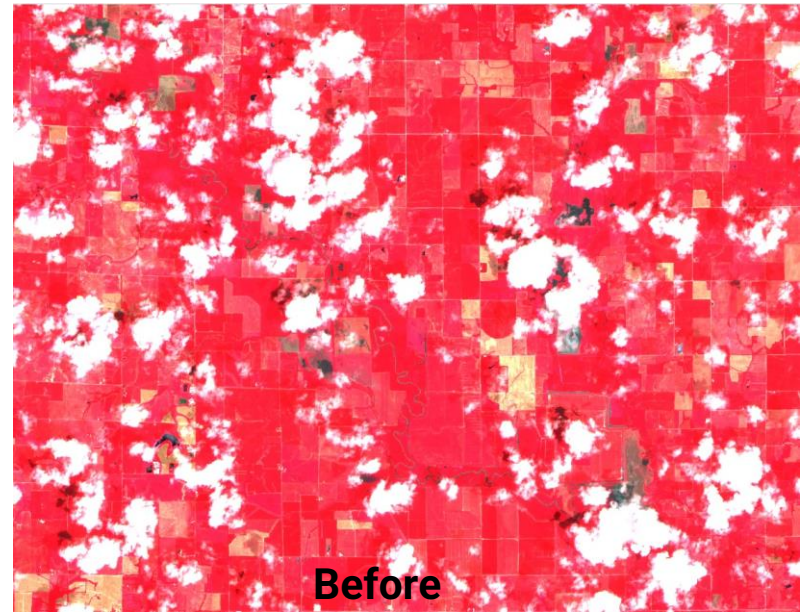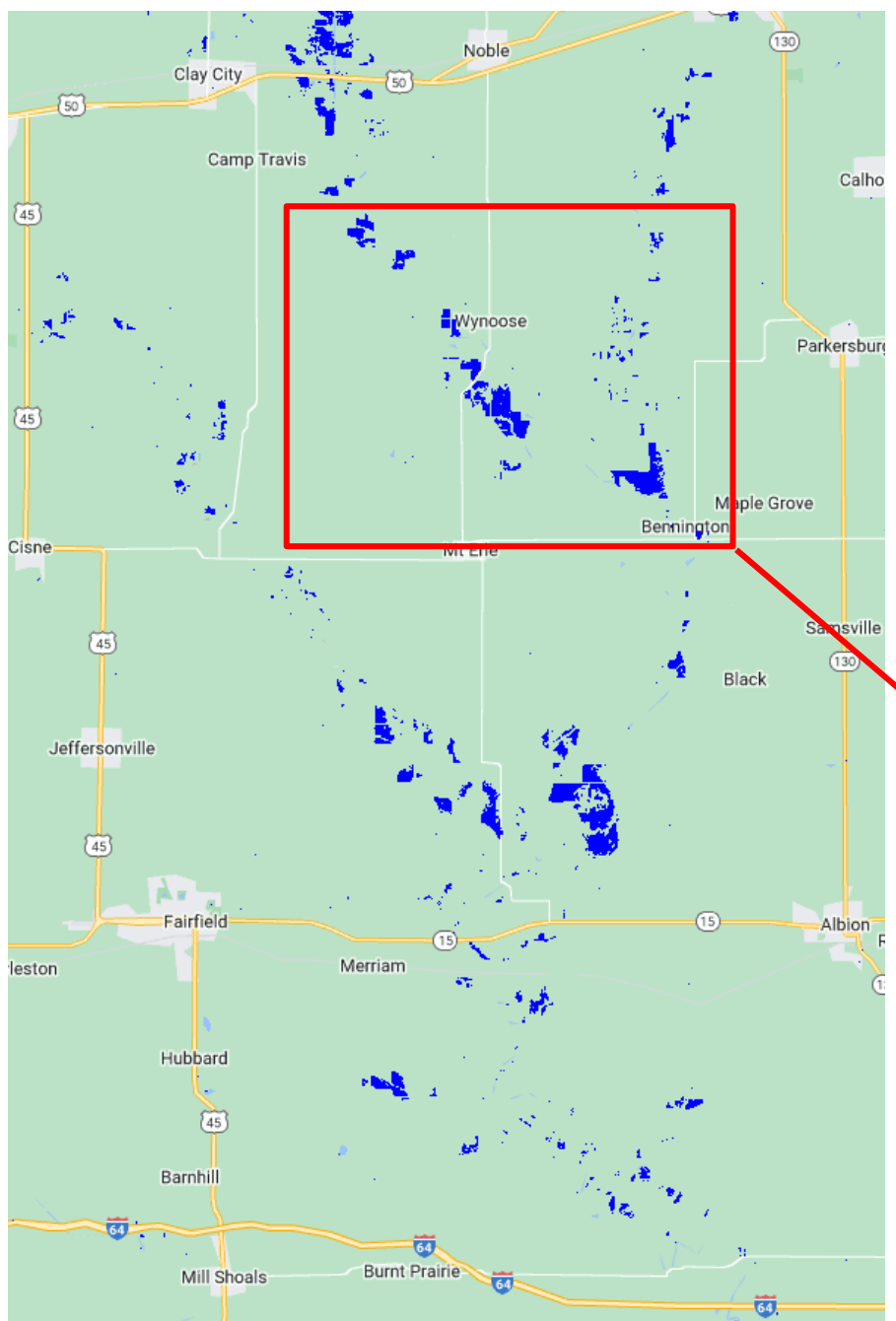
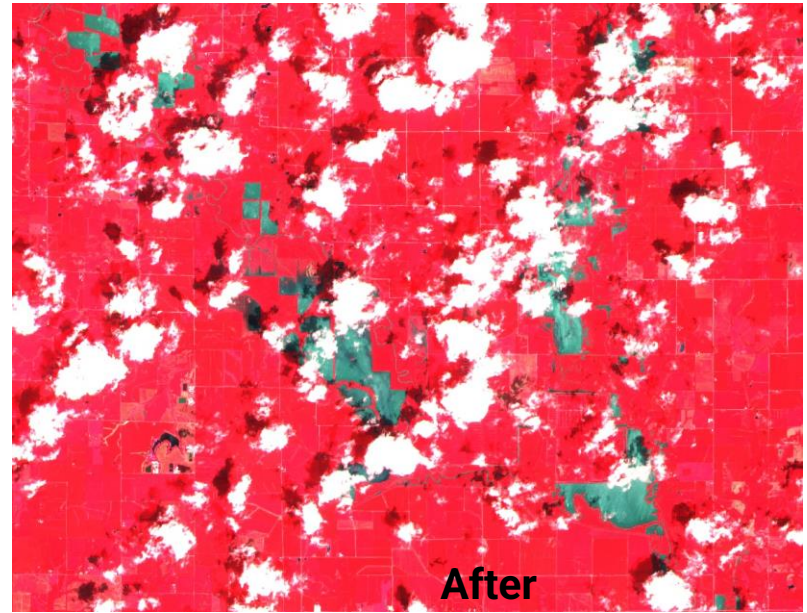Sentinel-1 SAR anomaly (Aug 1, 2022)

NASS CDL 2021

Inundated corn and soybeans (blue) detected from Sentinel-1SAR and Sentinel-2 MSI images

Wayne County, IL

Before

Sentinel-2 MSI images (median of Jul 01 – 21, 2022)

After

Sentinel-2 MSI images (Aug 3, 2022)
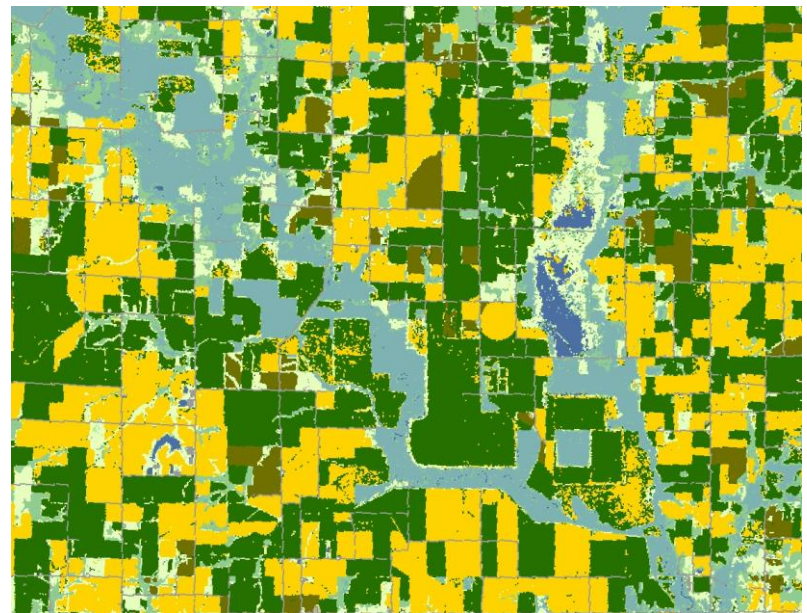
NASS CDL 2021
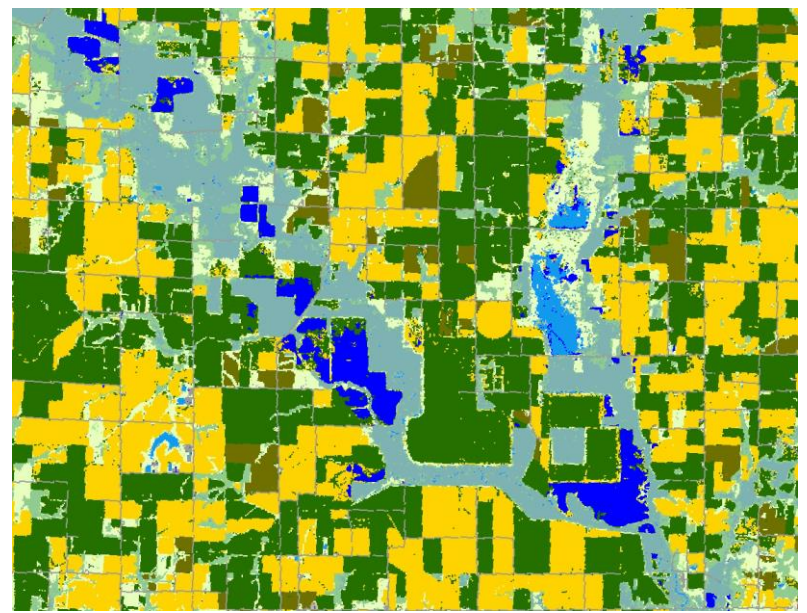
Inundated corn and soybeans (blue) detected from Sentinel-1SAR and Sentinel-2 MSI images

Southeast Illinois Flooding Event - August 3, 2022

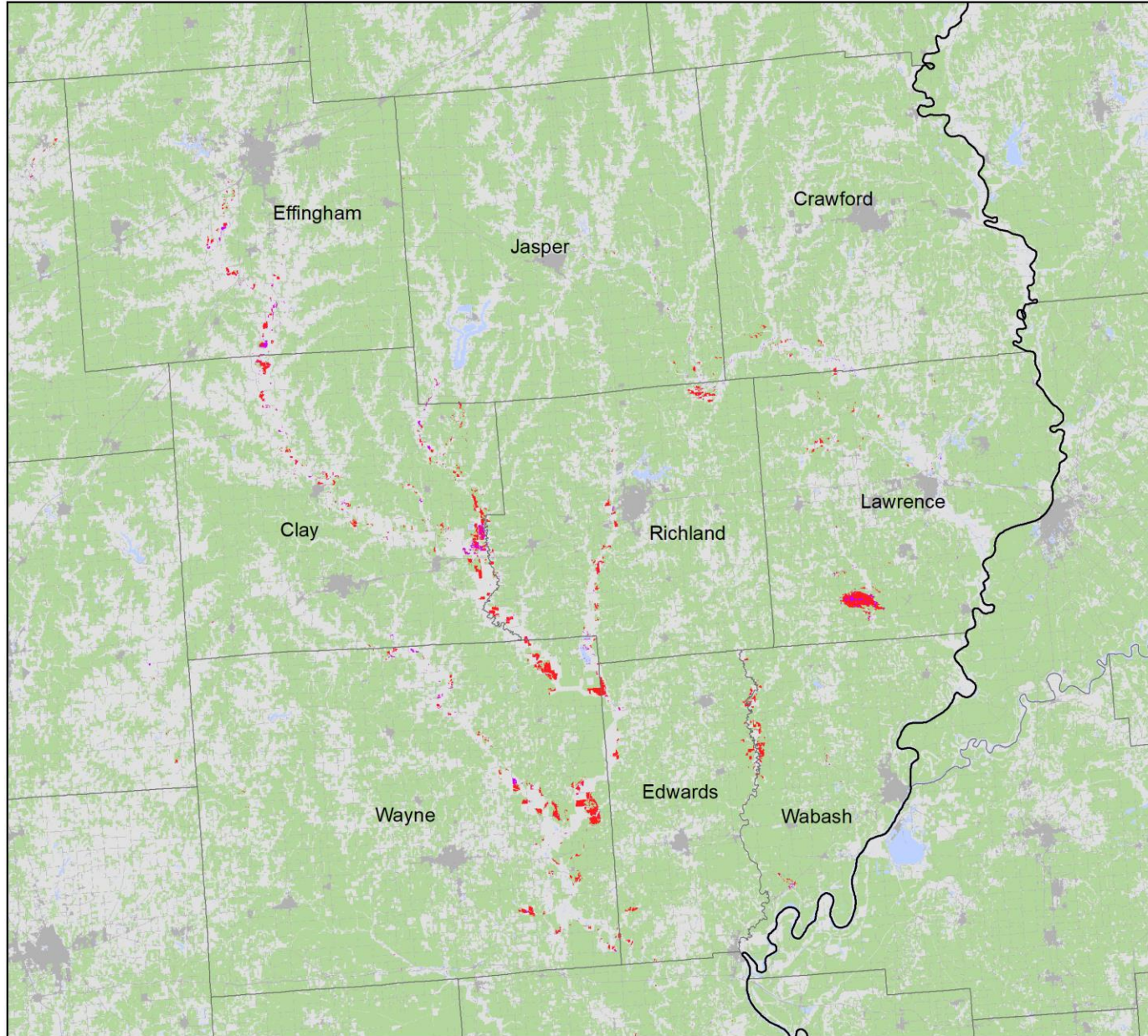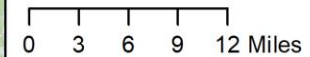Land cover information provided by the USDA NASS 2021 Cropland Data Layer (planted acres). Inundation data derived from Sentinel-1 Synthetic Aperture Radar dated August 1, 2022 and Sentinel-2 Modified Normalized Water Index (MNDWI) dated August 3, 2022.

Inundated Cropland – Illinois

| Illinois August 3, 2022	Corn		Soybeans	
	Acres Planted	Percent Inundated	Acres Planted	Percent Inundated
Clay	74,900	1.73%	105,000	0.88%
Crawford	83,400	0.09%	91,400	0.12%
Edwards	43,600	0.90%	50,300	0.76%
Effingham	86,400	0.18%	95,300	0.42%
Jasper	N/A	0.12%	N/A	0.06%
Lawrence	75,800	0.84%	82,800	1.21%
Richland	N/A	0.64%	N/A	0.80%
Wabash	48,700	0.21%	54,400	0.97%
Wayne	N/A	1.28%	N/A	1.25%

Acres planted are official NASS estimates for acres planted of corn and soybeans in 2021. Percent inundated derived from Sentinel-2 imagery dated August 1-3, 2022 and the 2021 Cropland Data Layer (acres planted).

Inundation Analysis – Southwest Kentucky

Trigg County, KY

Median SWI of Jun 2 - Jul 22, 2022

Sentinel-1 SAR anomaly (Aug 1, 2022)

Min SWI Jul 25 - Aug 8, 2022
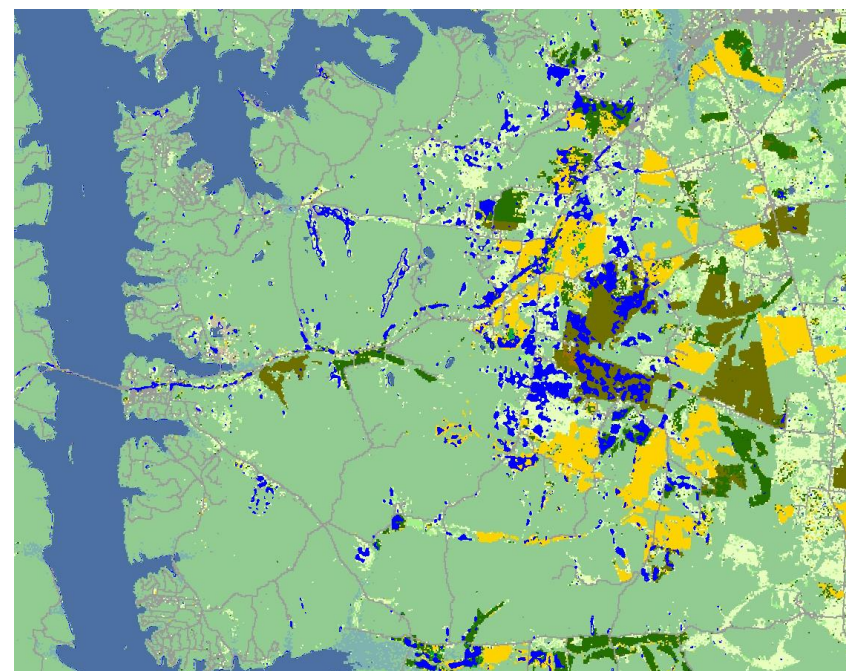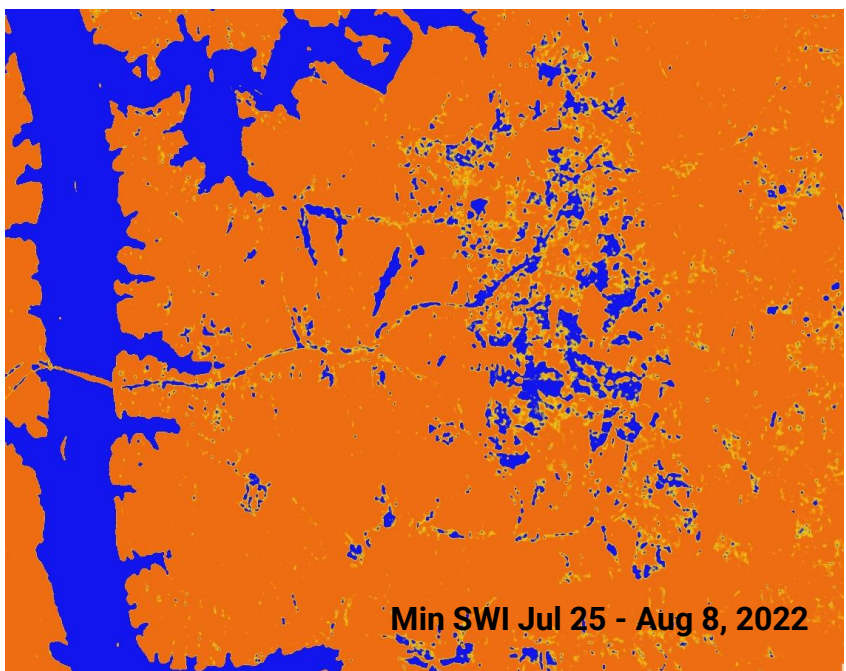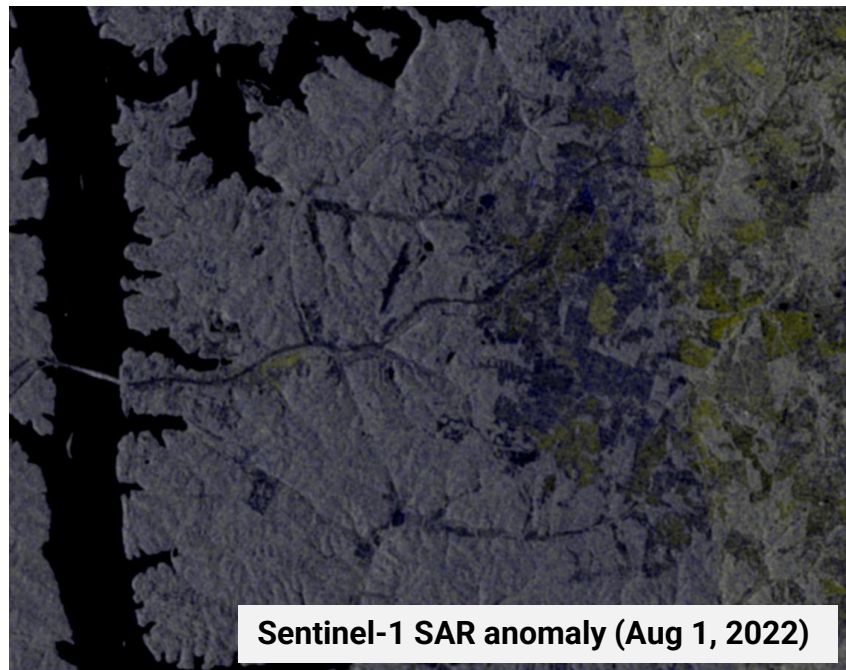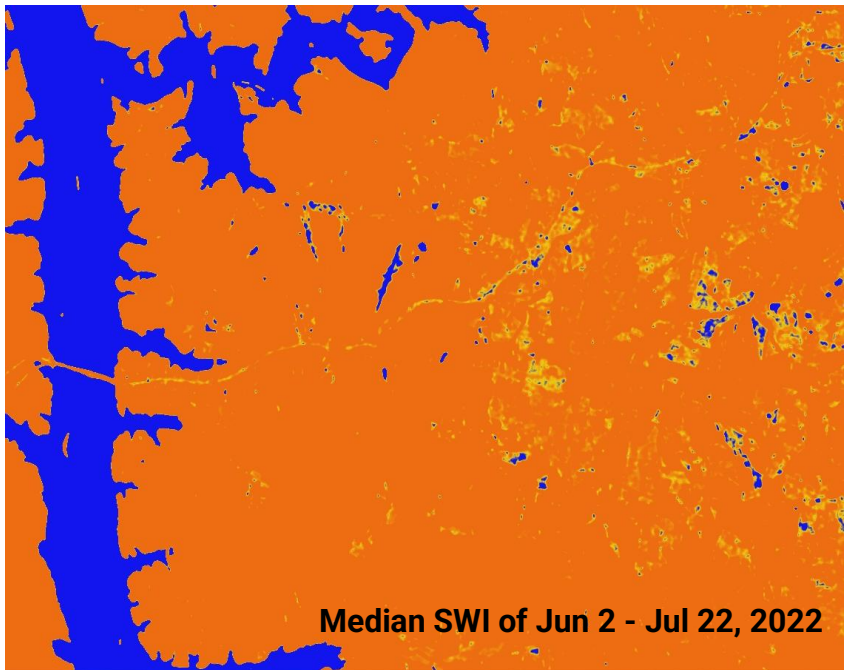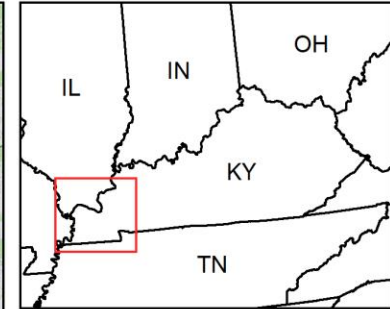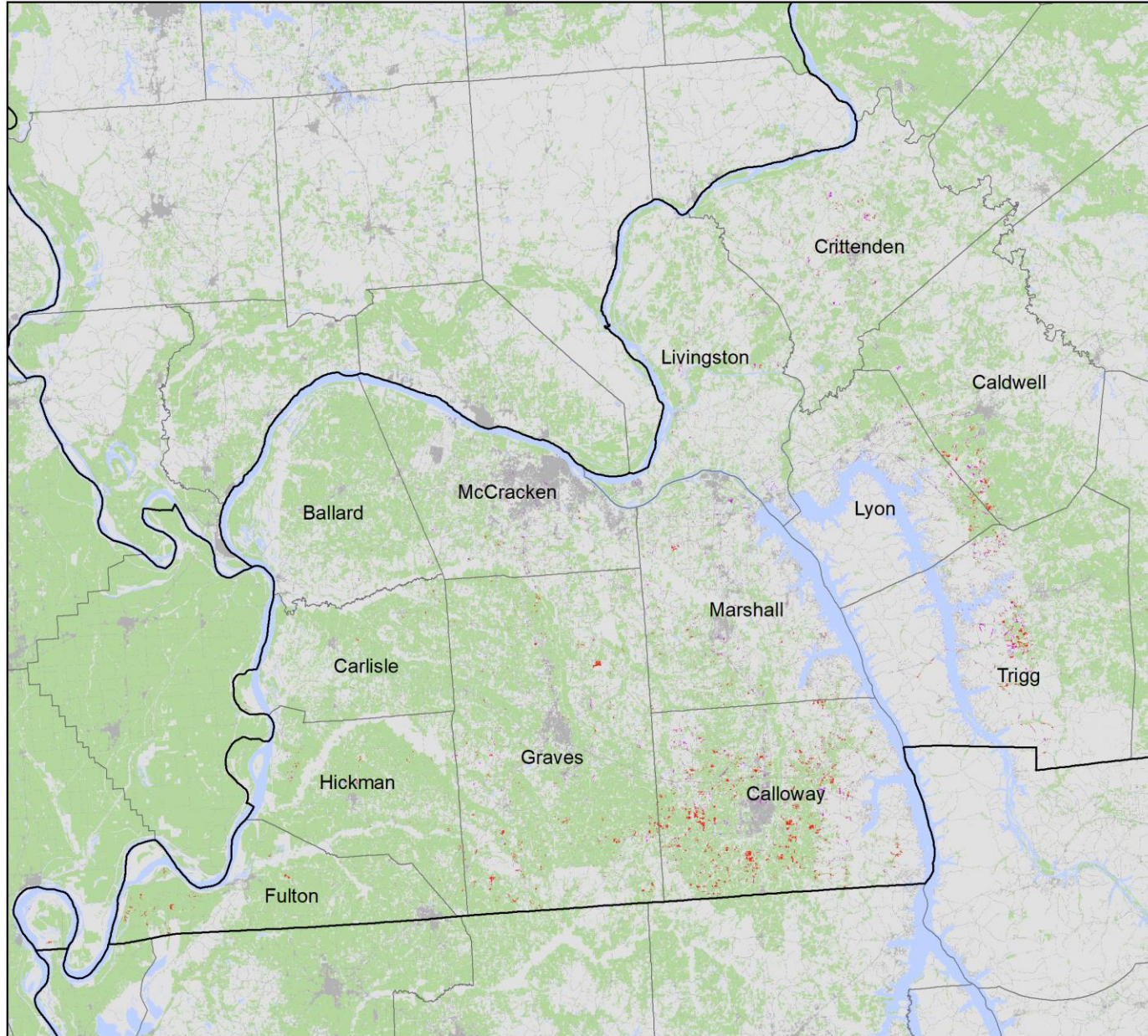
Floods (blue) were detected from Sentinel-1 images of July 27 and Aug 1, 2022, in croplands near Cumberland River, Kentucky. Affected crops may include soybeans, double crop winter wheat/Soybeans, and corn.

Kentucky Flooding Event - July/August 2022

Legend:
- Inundated - Cropland
- Inundated - Other Land
- Cropland
- Developed
- Other Land
- Water
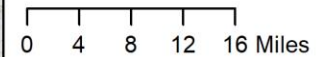
Land cover information provided by the USDA NASS 2021 Cropland Data Layer. Inundation data derived from Sentinel-1 Water Index (SWI) imagery dated between July 27 and August 8, 2022.

Kentucky Flooding Event - July/August 2022

Kentucky Flooding Event - July/August 2022

Legend:
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- Other Land
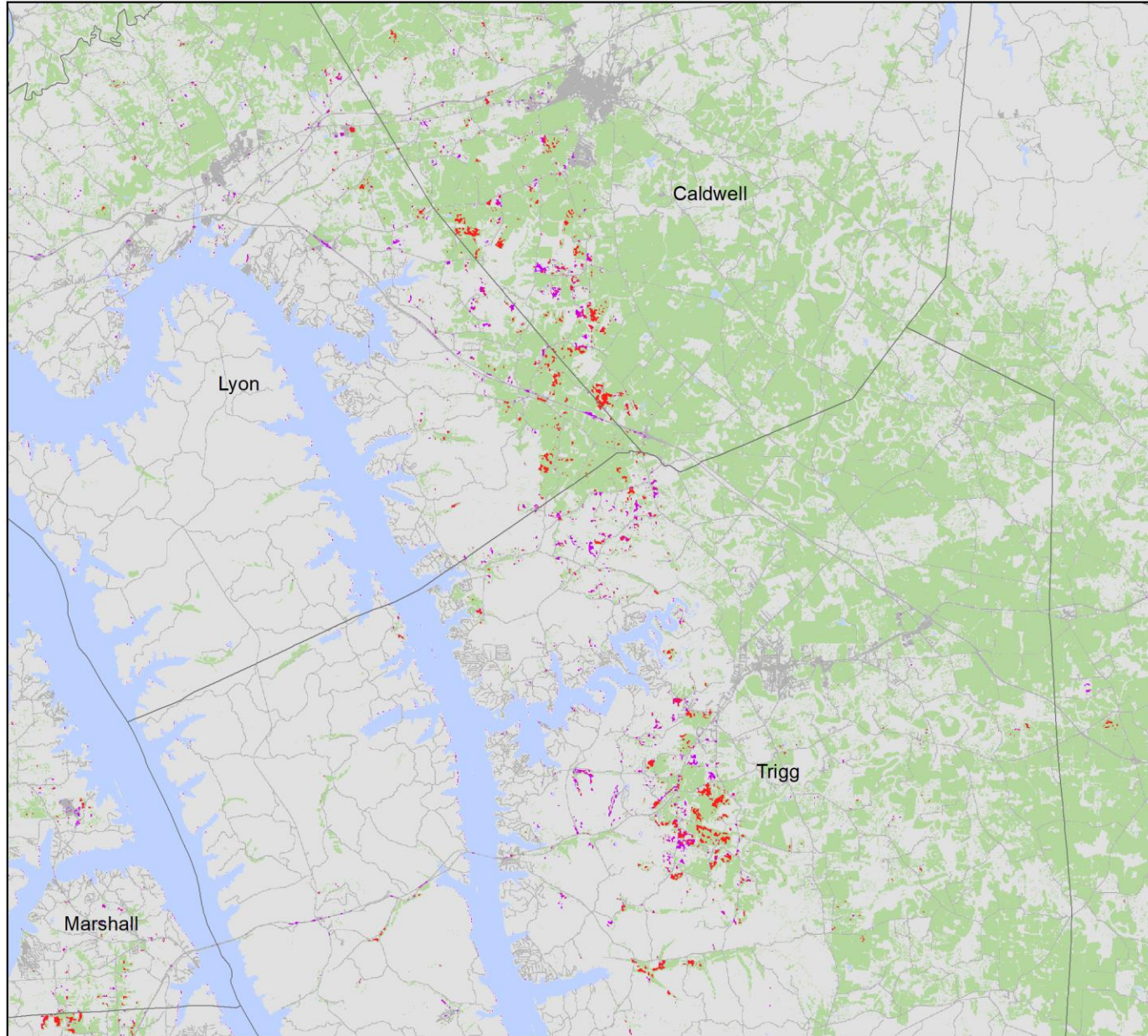- Water

0   2   4   6   8 Miles

Land cover information provided by the USDA NASS 2021 Cropland Data Layer. Inundation data derived from Sentinel-1 Water Index (SWI) imagery dated between July 27 and August 8, 2022.
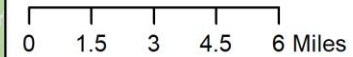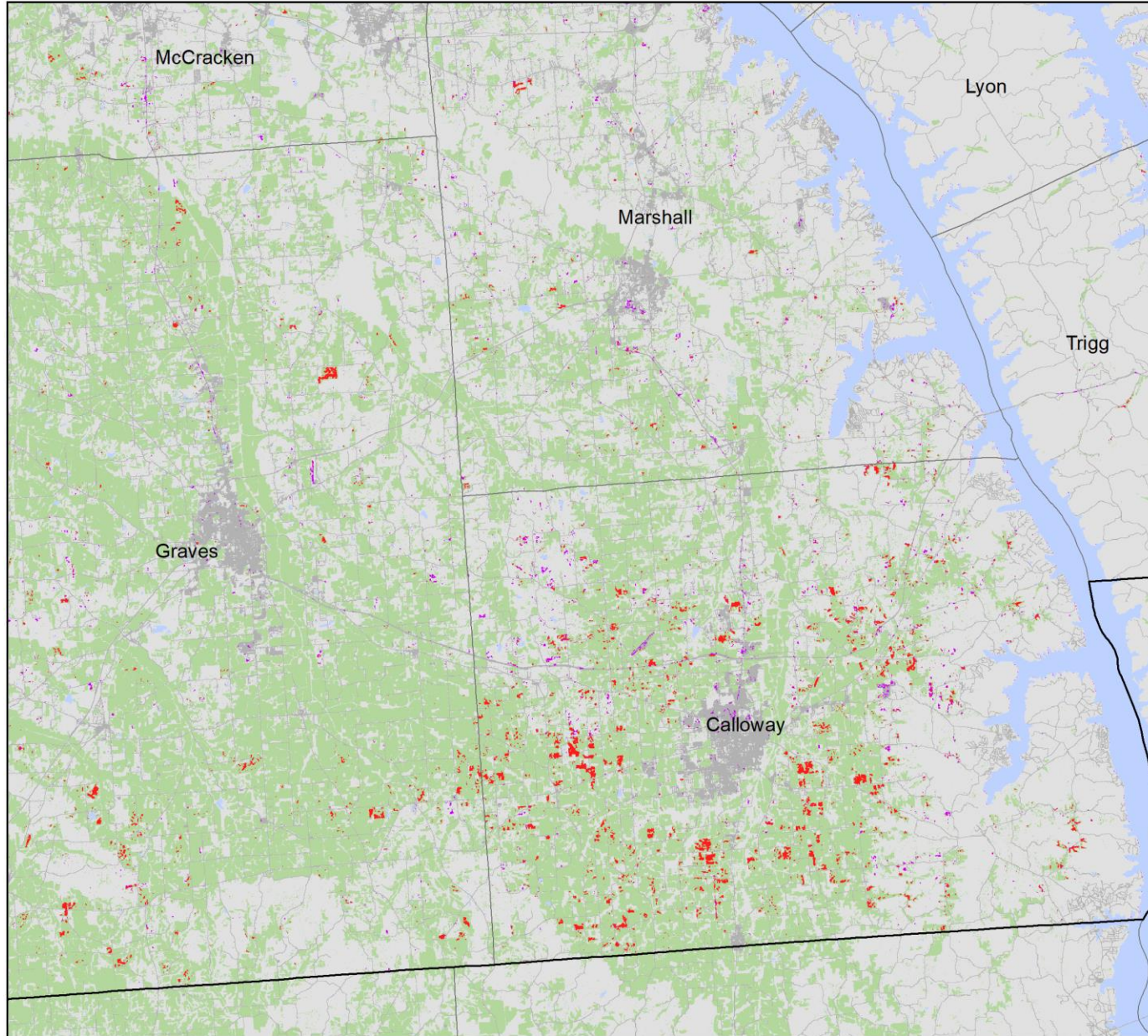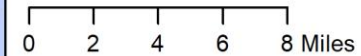
Inundated Cropland – Kentucky

Kentucky August 8, 2022	Corn		Soybeans	
	Acres Planted	Percent Inundated	Acres Planted	Percent Inundated
Ballard	33,700	0.01%	N/A	0.03%
Caldwell	33,700	0.29%	38,100	0.89%
Calloway	39,500	1.51%	44,200	7.18%
Carlisle	26,600	0.01%	34,700	0.21%
Crittenden	22,700	0.12%	24,500	0.20%
Fulton	30,000	0.19%	52,700	0.67%
Graves	N/A	0.31%	89,000	1.35%
Hickman	44,000	0.09%	51,700	0.33%
Livingston	18,400	0.13%	21,200	0.11%
Lyon	N/A	0.22%	N/A	2.05%
Marshall	12,900	0.57%	20,300	0.85%
McCracken	12,700	0.27%	29,800	0.33%
Trigg	22,700	1.00%	27,600	1.27%

Acres planted are official NASS estimates for acres planted of corn and soybeans in 2021.
Percent inundated derived from Sentinel-1 Water Index (SWI) imagery dated between July 27 and August 8, 2022. and the 2021 Cropland Data Layer (acres planted).