

Utilizing Synthetic Aperture Radar and NASA Earth Observations to Identify Optimal Transportation Routes to Assist Emergency Responders

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Overview

The Ohio River provides the 13-state region of the Ohio River Valley with economic and social benefits through power generation, industrial manufacturing, drinking water, and recreational uses. While the river is an important environmental and economic resource, the valley is prone to numerous flood events that damage the environment, residential areas, and important infrastructure. The fall 2018 NASA DEVELOP Ohio River Valley Transportation and Infrastructure team utilized Landsat 8 Operational Land Imager (OLI) and Sentinel-1 C-band Synthetic Aperture Radar (SAR), Global Precipitation Measurements Integrated Multi-Satellite Retrievals for GPM (GPM IMERG) data to identify flood events and their intensities and develop flood risk maps of the area. The team partnered with the Federal Emergency Management Agency, the NOAA National Weather Service Ohio River Forecast Center, the Kentucky Division of Water, and the NASA Short-term Prediction Research and Transition Center (SPoRT) to investigate flood risk throughout the Ohio River Valley, identify key infrastructure at risk, and provide favorable transportation routes during these events.

Objectives

- ▶ **Detect** flood waters using the Normalized Difference Flood Index (NDFI) and the Normalized Difference Water Index (NDWI).
- ▶ **Identify** regions and vulnerable populations prone to flooding.
- ▶ **Provide** optimal routes for emergency services during flood events to reduce emergency response times.

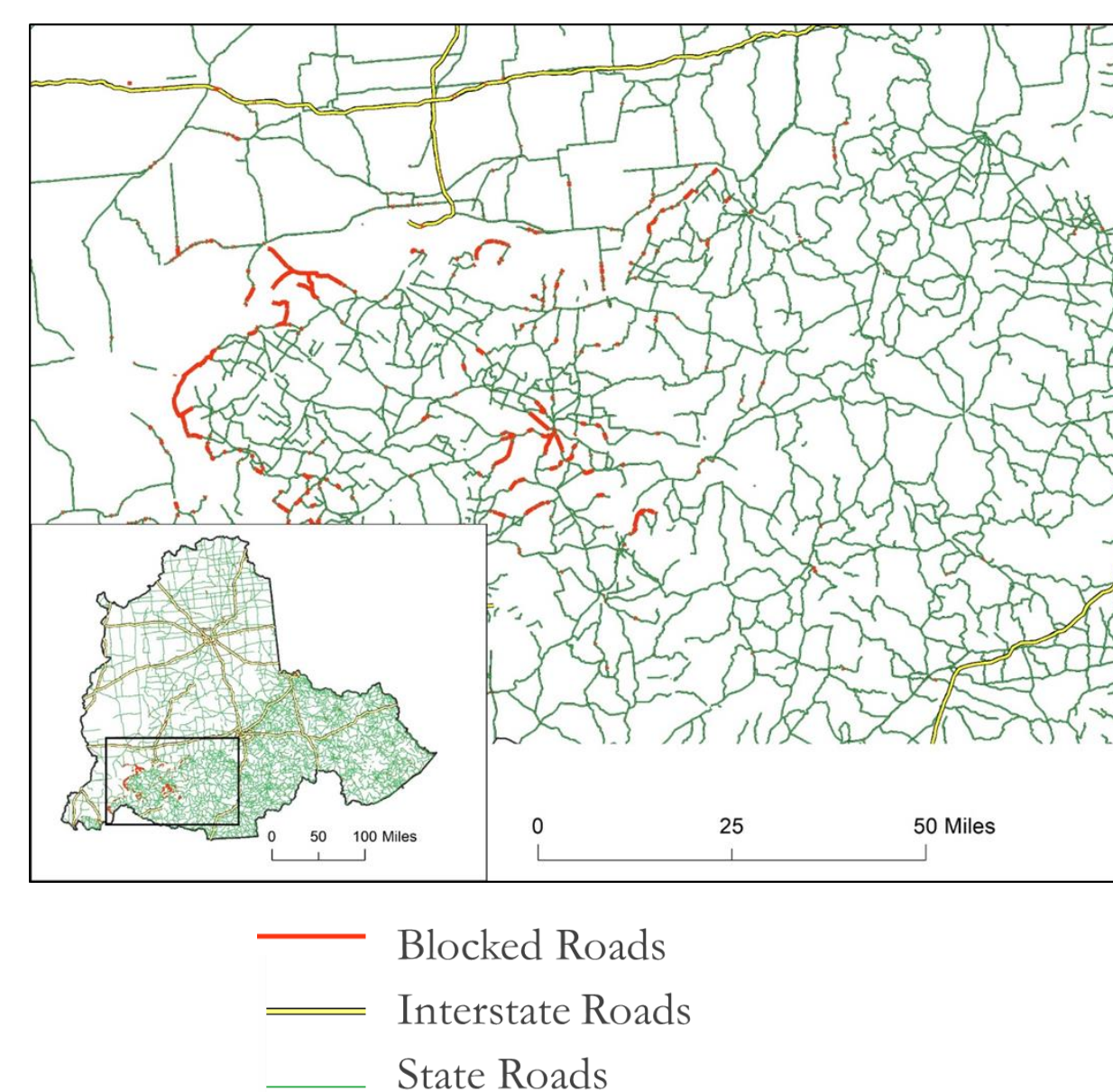
Study Area



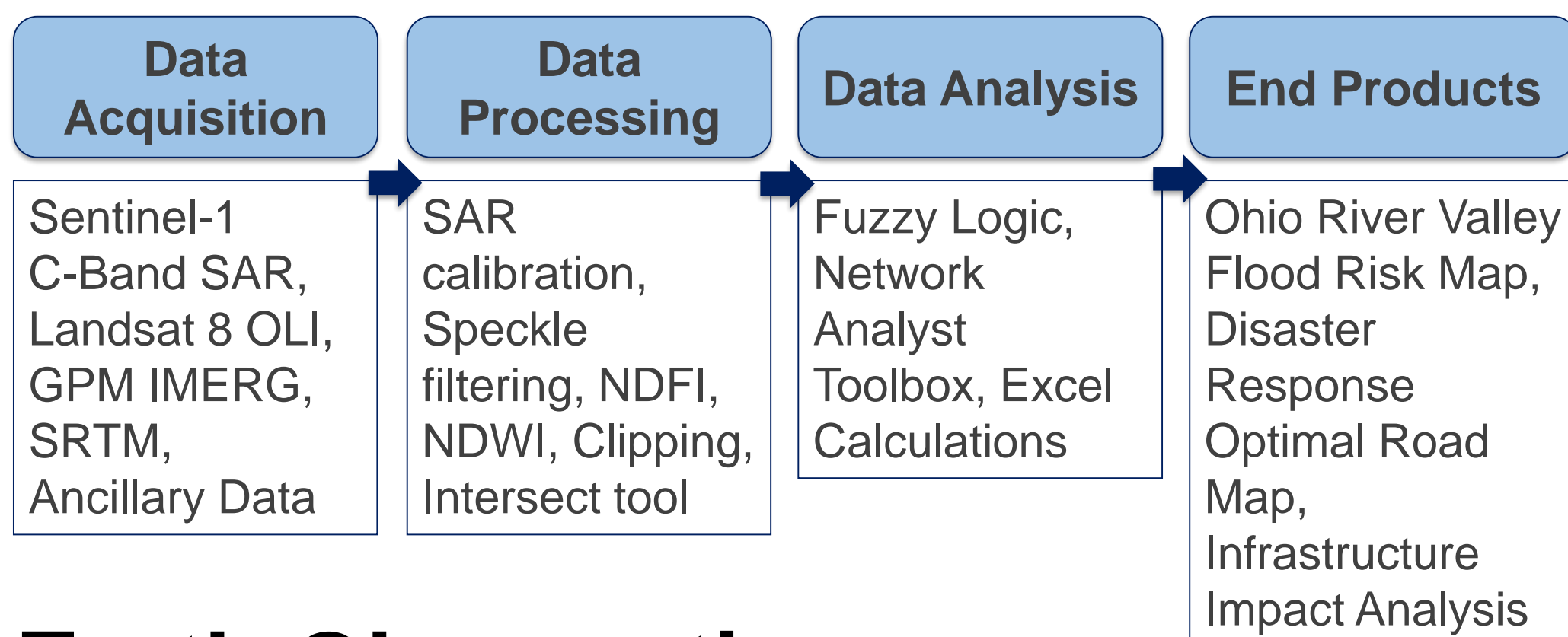
Results

Optimal Road Map

Provides routes that avoid flooded roads for disaster response organizations based on past flood events. This map and the methodology used can assist partners in reducing response times.



Methodology



Earth Observations

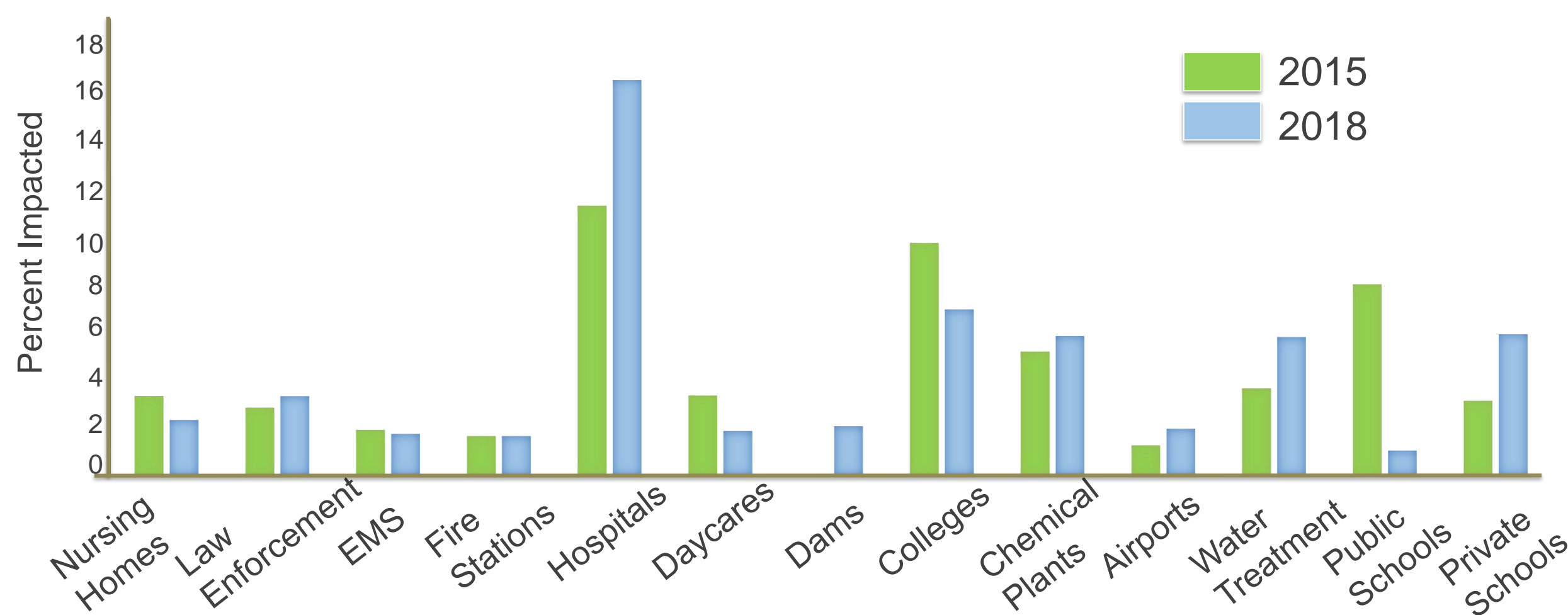


Conclusions

- ▶ Combining NDWI and NDFI allows for an improved temporal resolution in flood-mapping
- ▶ Cities with the highest risk of flooding include Louisville, KY and Paducah, KY
- ▶ During the 2018 flood event, 667 miles of major roadways were inaccessible and 16% of hospitals in the study area were affected

Infrastructure Impact Analysis

Shows key infrastructure impacted by flooding in 2018 to inform partners of services and facilities impacted during the flood event.



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