# Extending the Kansas Flood Mapping Dashboard for Road Network Flooding

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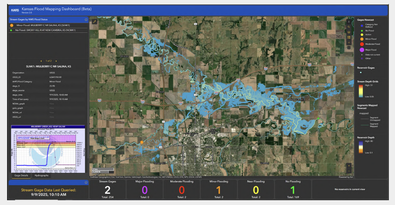
## Background

Flooding of road networks poses significant risks to public safety, emergency response, and evacuation planning. Therefore, developing accurate flood maps of road networks is essential.



Researchers at the Kansas Biological Survey have developed an operational flood mapping tool for eastern Kansas. Over the years, flooding of road networks in the region has become a serious safety concern. Access to timely information about which roads are flooded is crucial for public safety and emergency response.

*Source: Johnson County Post (July 17, 2025)*

*Source: The Emporia Gazette (June 3, 2025)*

*Source: Kake News (May 24, 2019)*


*Source: CNN (June 3, 2025)*

## Objectives

The objective of this research is to develop an algorithm that automatically extracts road network elevations from existing LiDAR data to enable accurate mapping of flooding across transportation networks. The resulting inundation maps will be integrated into the Kansas Flood Mapping Tools to enhance flood risk assessment and decision-making capabilities.

## Study Area

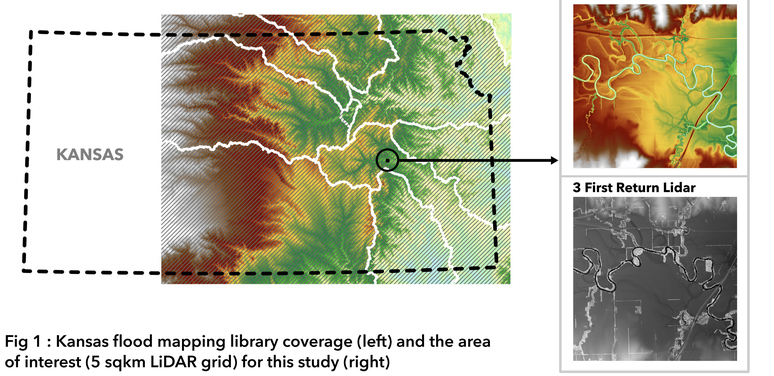


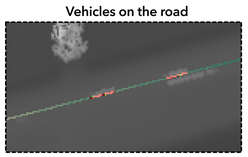

Fig 1 : Kansas flood mapping library coverage (left) and the area of interest (5 sqkm LiDAR grid) for this study (right)

## Method

**Elevation Profiling**

This process consists of four sequential algorithms that run in MATLAB, using input datasets and user-defined parameters.

a. Road Network Segmentation
b. Directional Neighborhood Operation
c. Road and Stream Intersection Identification
d. Composite Elevation Profile Generation



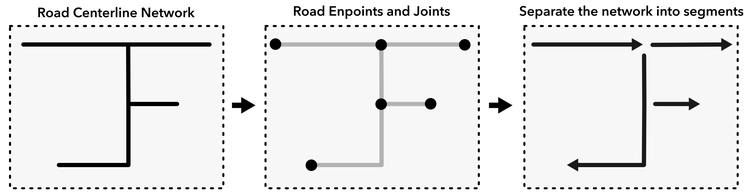
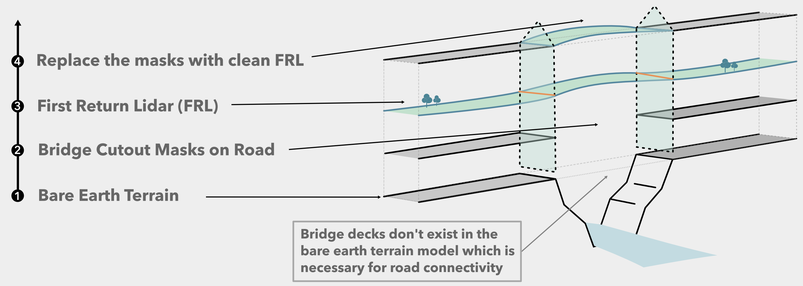




Fig 2 : Concept of how the algorithm seperates the connected road network into segments to apply directional neighborhood operation which cleans out unwanted extreme elevation such as trees and vehicles on the road.

The bare-earth elevation data used for the flood mapping system are hydro-conditioned to ensure continuous water flow. The algorithm then uses this raster data as the spatial reference for the base elevation and incorporates cleaned bridge deck elevations derived from the first-return LiDAR data.



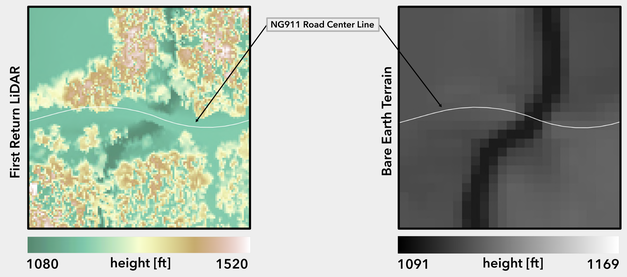




Fig 3 : A 3D view of how the algorithm identifies the stream cutout on a road and replaces the exact patch with original first return LiDAR in a particular region.

**Mapping Inundated Roads**

Following methods are used to mask the flooded roads

a. Compare the road network elevation raster with the flood water surface derived from the Kansas Flood Mapping Tools.
b. Identify road segments from the NG911 centerline that intersect with the flooded areas.
c. Extract a feature dataset of flooded roads and publish it for mapping and analysis.

## Key Takeaways

**1**. This is a preliminary study aimed at developing an algorithm to extract a continuous road network elevation profile for flood mapping.

**2.** The method combines existing LiDAR products and generates a dataset essential for the accurate mapping of road network flooding.

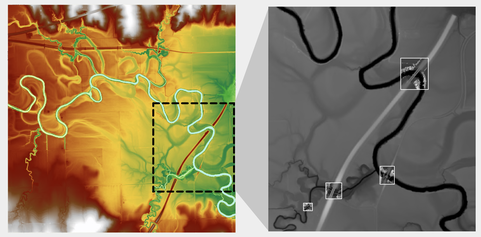
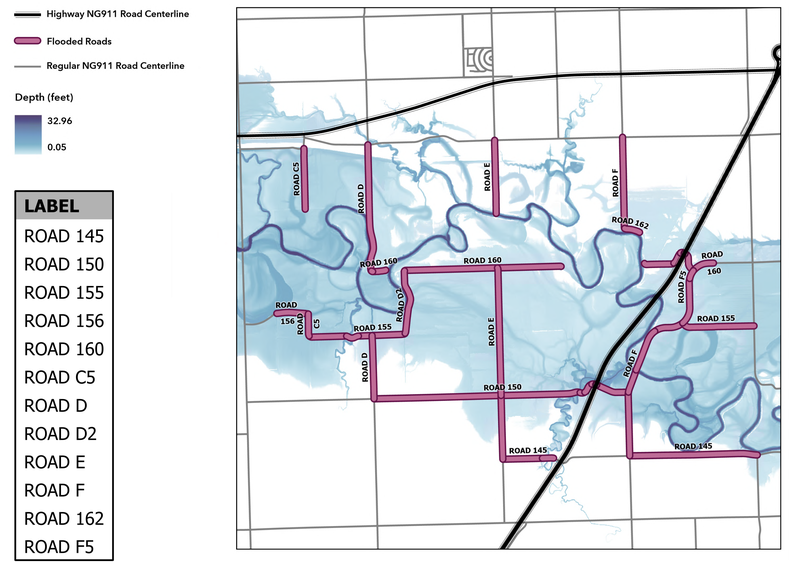


Fig 4 :The Kansas Flood Mapping System relies on existing hydro-conditioned bare-earth LiDAR data, so the algorithm uses only the first-return surface data to fill gaps in bridge deck elevations.

## Future Research

- Improve the algorithm to scale statewide implementation.
- Collaborate with transportation system experts to assess impacts and develop a routing system that avoids flooded roads.

## Result

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| ROAD F |
| ROAD 162 |
| ROAD F5 |

Fig 5 : This figure shows a map of the inundated roads and identified road names that are inaccessible due to flooding.

## Acknowledgments

This work is supported by statewide research initiative called ARISE (Adaptive and Resilient Infrastructures driven by Social Equity) by the National Science Foundation (NSF) Kansas EPSCoR program.

## Resources

[FLDPLN] Kastens, J.H. (2008). http://hdl.handle.net/1808/5354

https://kansasgis.org

https://kars.ku.edu