# Flood Risk Assessment of Franklin County, Ohio, US

Oluwaseun Ipede

Department of Geology and Geography

School of Earth, Environment and Sustainability, Georgia Southern University

Introduction

Flooding is an overflowing of water onto land that is normally dry. Floods can happen during heavy rains, when ocean waves come on shore, when snow melts quickly, or when dams or levees break. Floods are the most common and widespread of all weather-related natural disasters. (NOAA, 2022). The Study area of this project is Franklin County, Ohio. It is the most populous county in Ohio and according to the Columbus public health department, Flooding is the third biggest hazard to residents. This project was conducted referencing the Flood Insurance Rate Map (FIRM) by Federal Emergency Management Agency (FEMA).
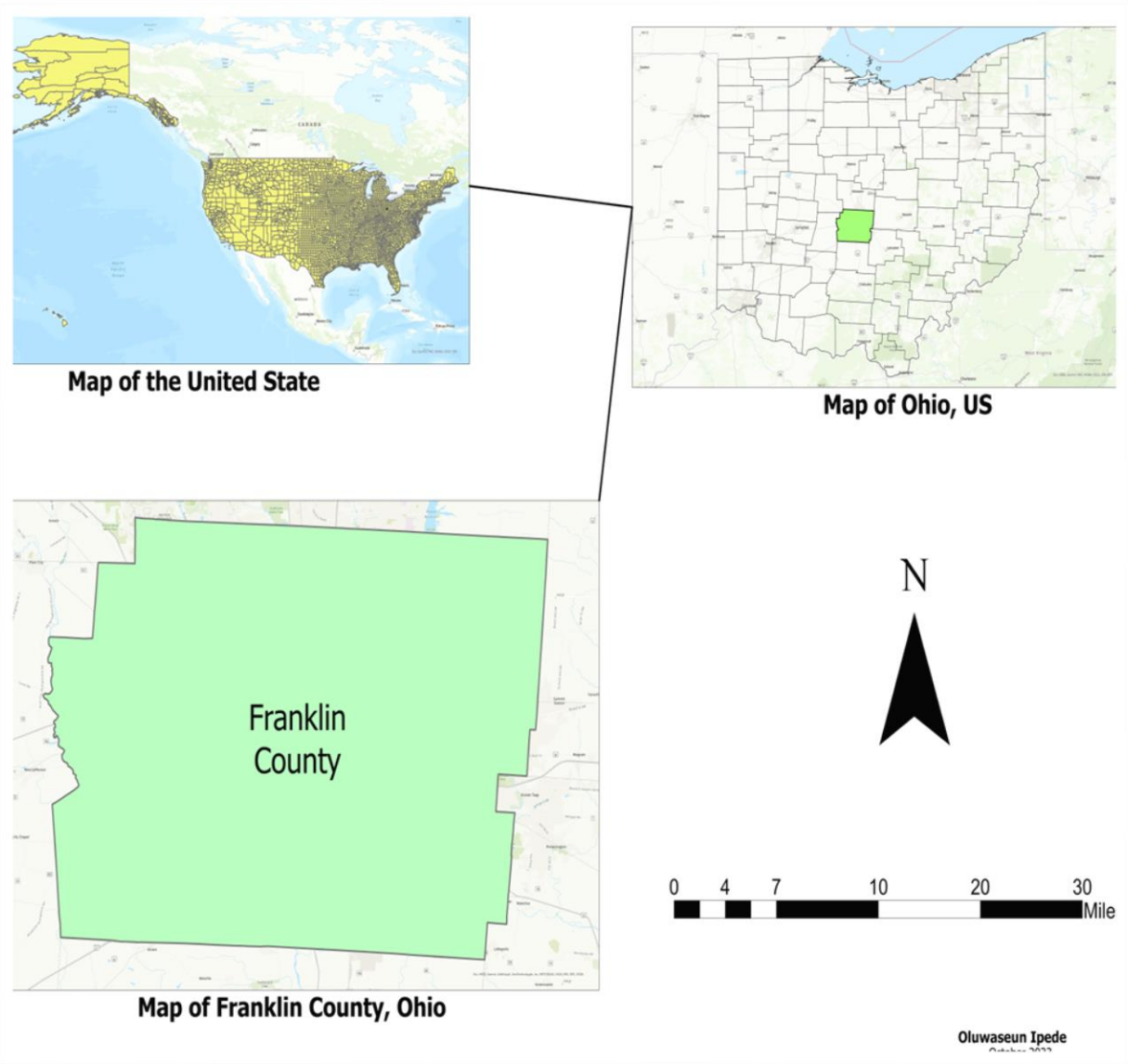
FEMA bases its predictions and designations partly on community surveys. The flood maps are minimum. However, they are not comprehensive in understanding flood risks. Therefore, some factors causing flood were reviewed and the result will be compared with the FIRM.

Hence the significance of this project is to compare and refine FEMA's map to determine areas of flood risk in the county.

Data & Methodology
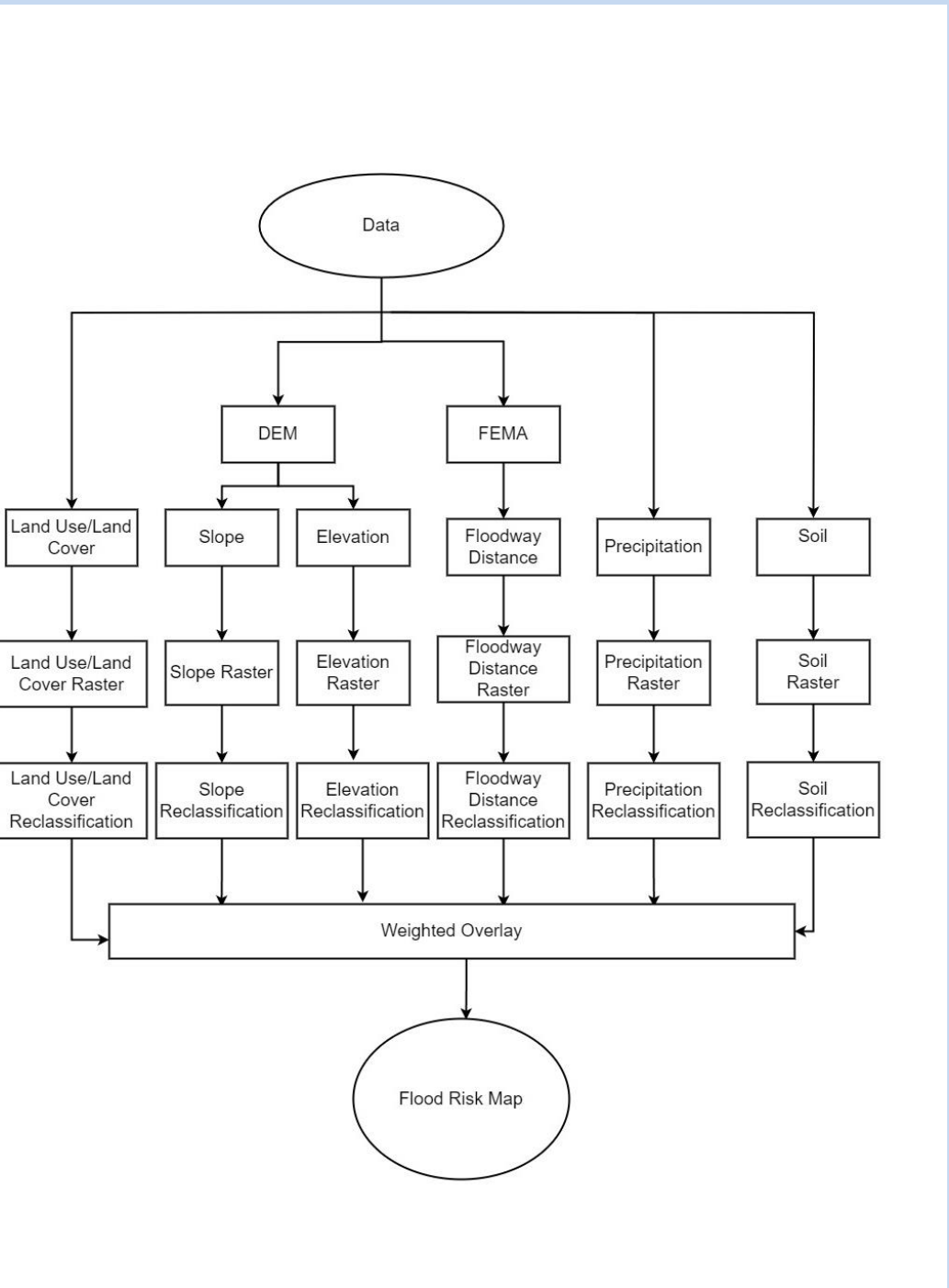
The Administrative shapefile from Census. Digital Elevation Model (DEM) from USGS's website and it was used to generate the both the Elevation and Slope. Land Use and Land Cover data (LULC) was gotten from ESRI. The Precipitation (2018-2022) Data from CHRS. Soil data from USDA and Flood Insurance Rate Map (FIRM) was gotten from FEMA.

The multi-criteria methodology adopted is based on Wondim (2016) and Desalegn & Mulu (2021). This is illustrated in flowchart on the left.

The Raster layer of the dataset were reclassified into five classes on the strength of their contribution to Flooding event. The classes are Very Low, Low, Moderate, High and Very High. Furthermore, the Weighted overlay function was used to perform suitability analysis using multiple criteria on all the raster layer. The Floodway distance generated using Euclidean distance from FEMA's FIRM carried major weight as it has been regulated with historical data of flooding event. The Flood risk factor weights used are shown in the table below;

Flood Factor	Elevation	Slope	Precipitation	Land Use/Cover	Floodway Distance	Soil Type
Weight	24%	16%	22%	18%	7%	13%

Results
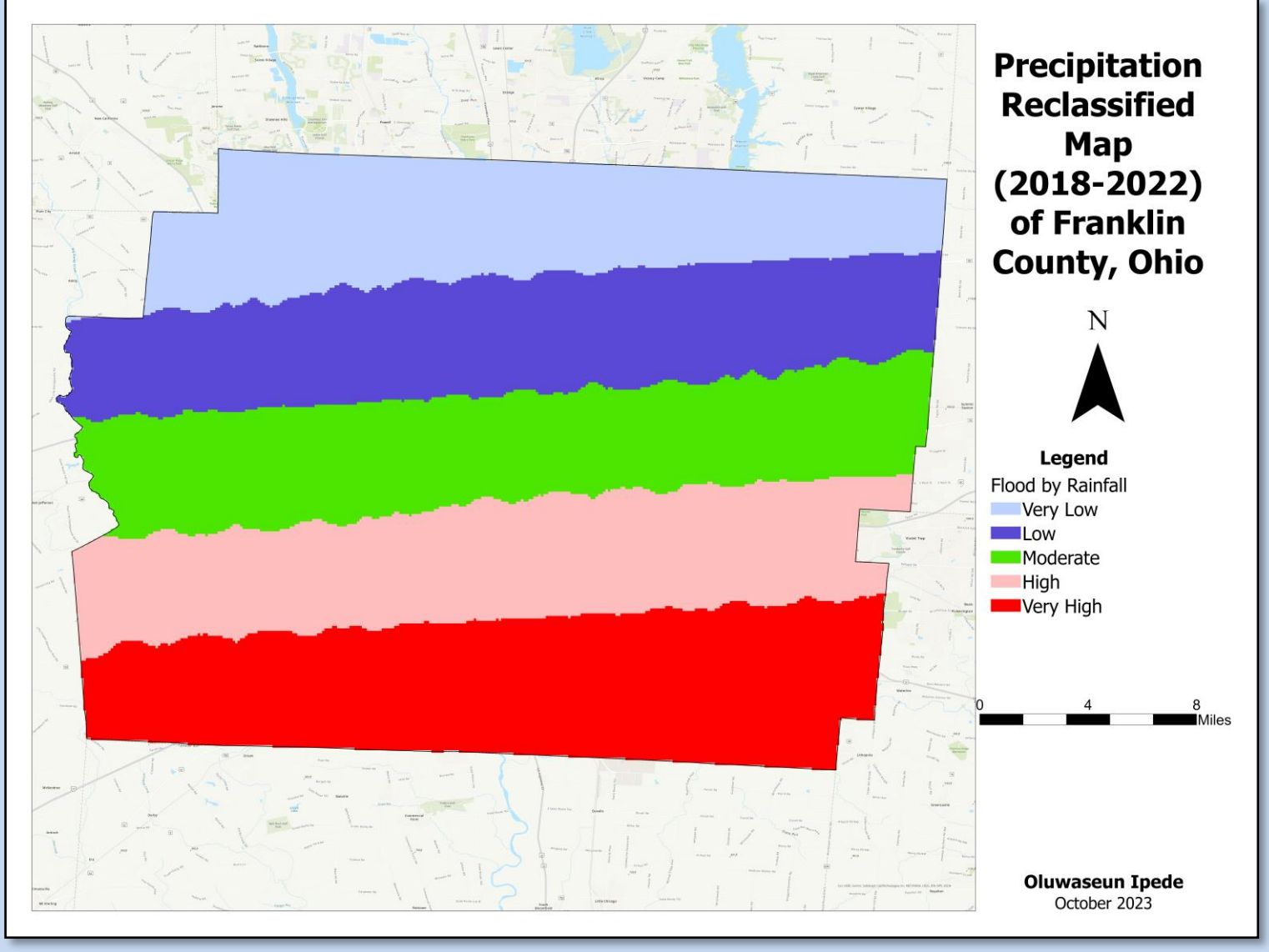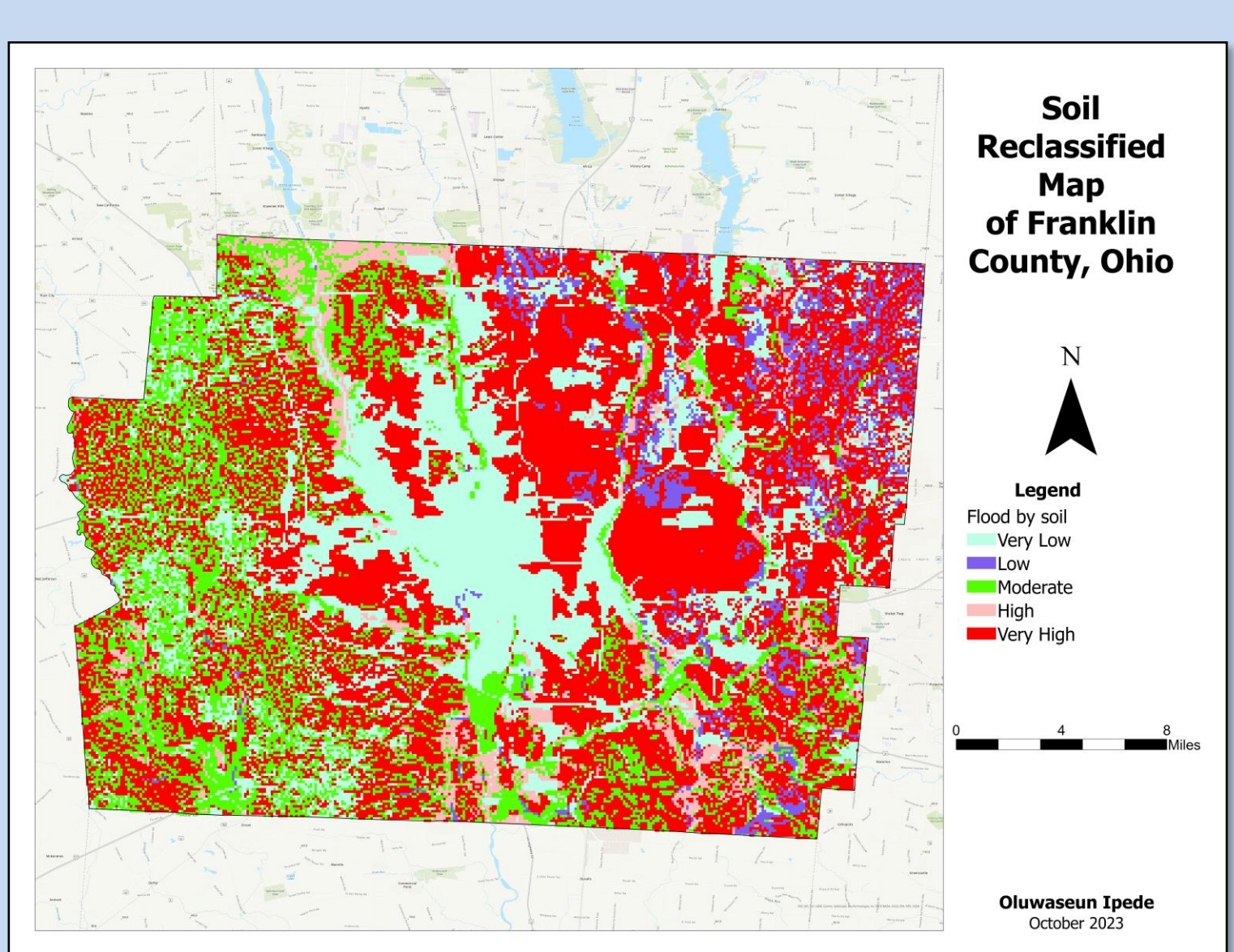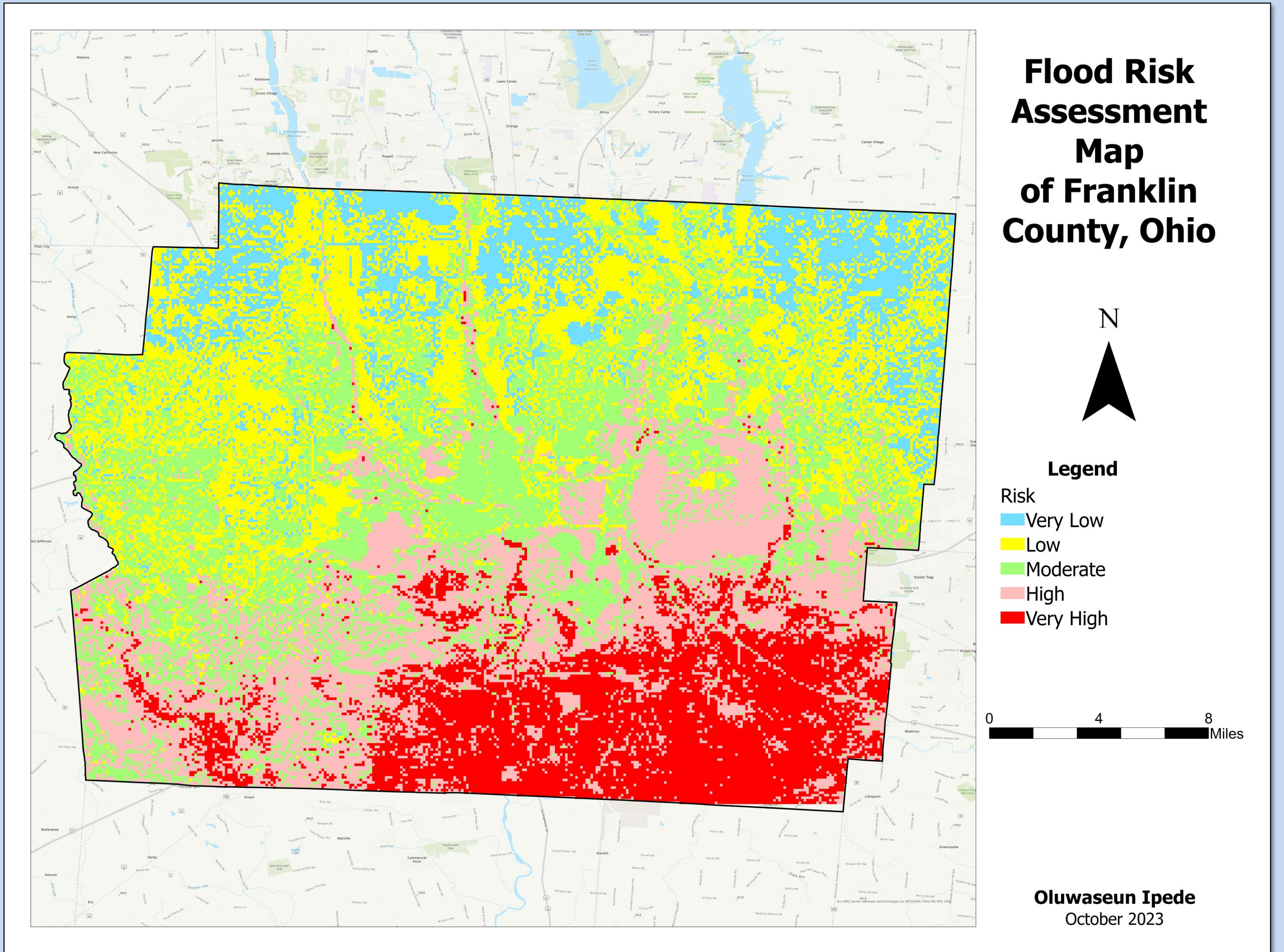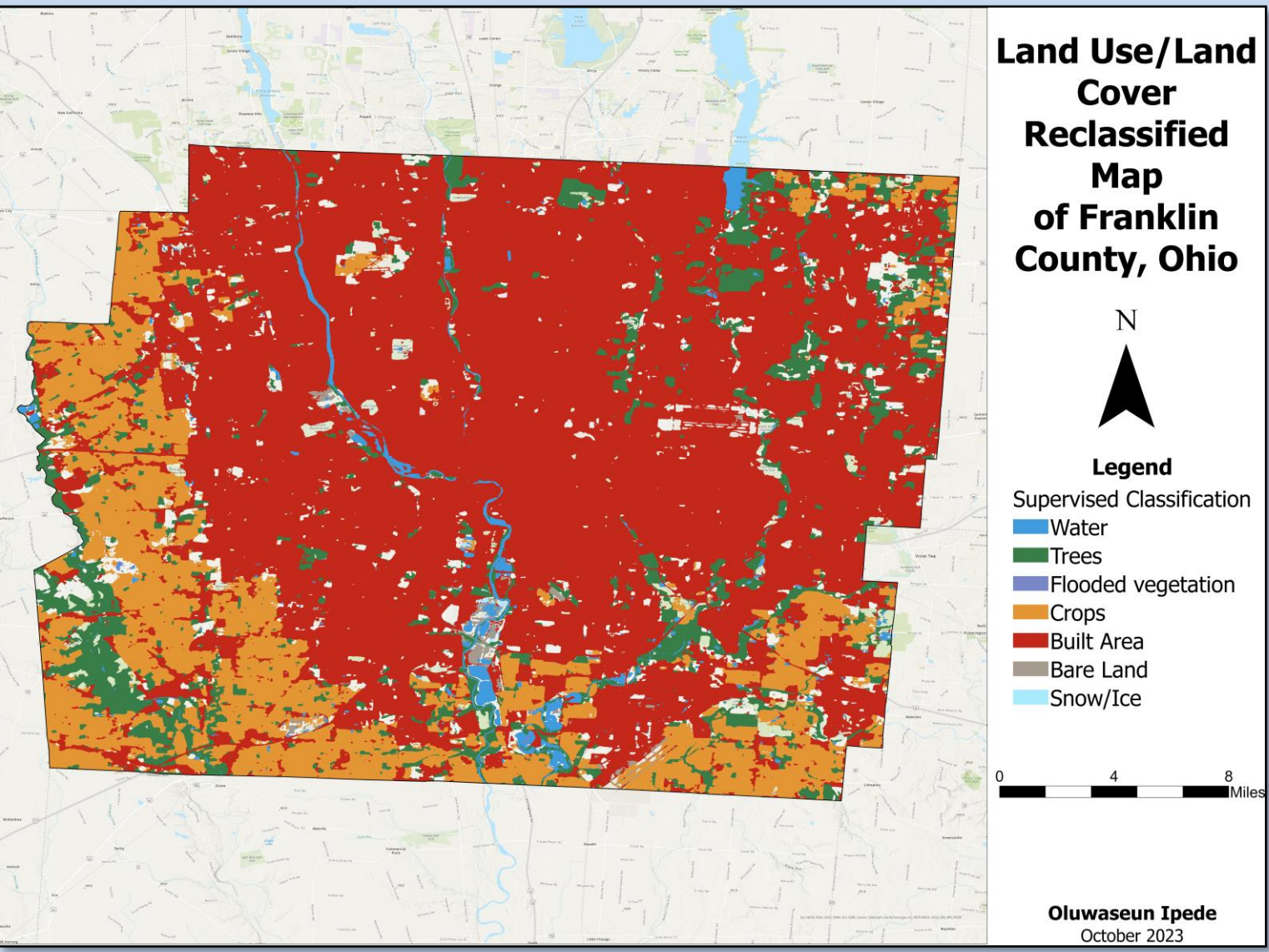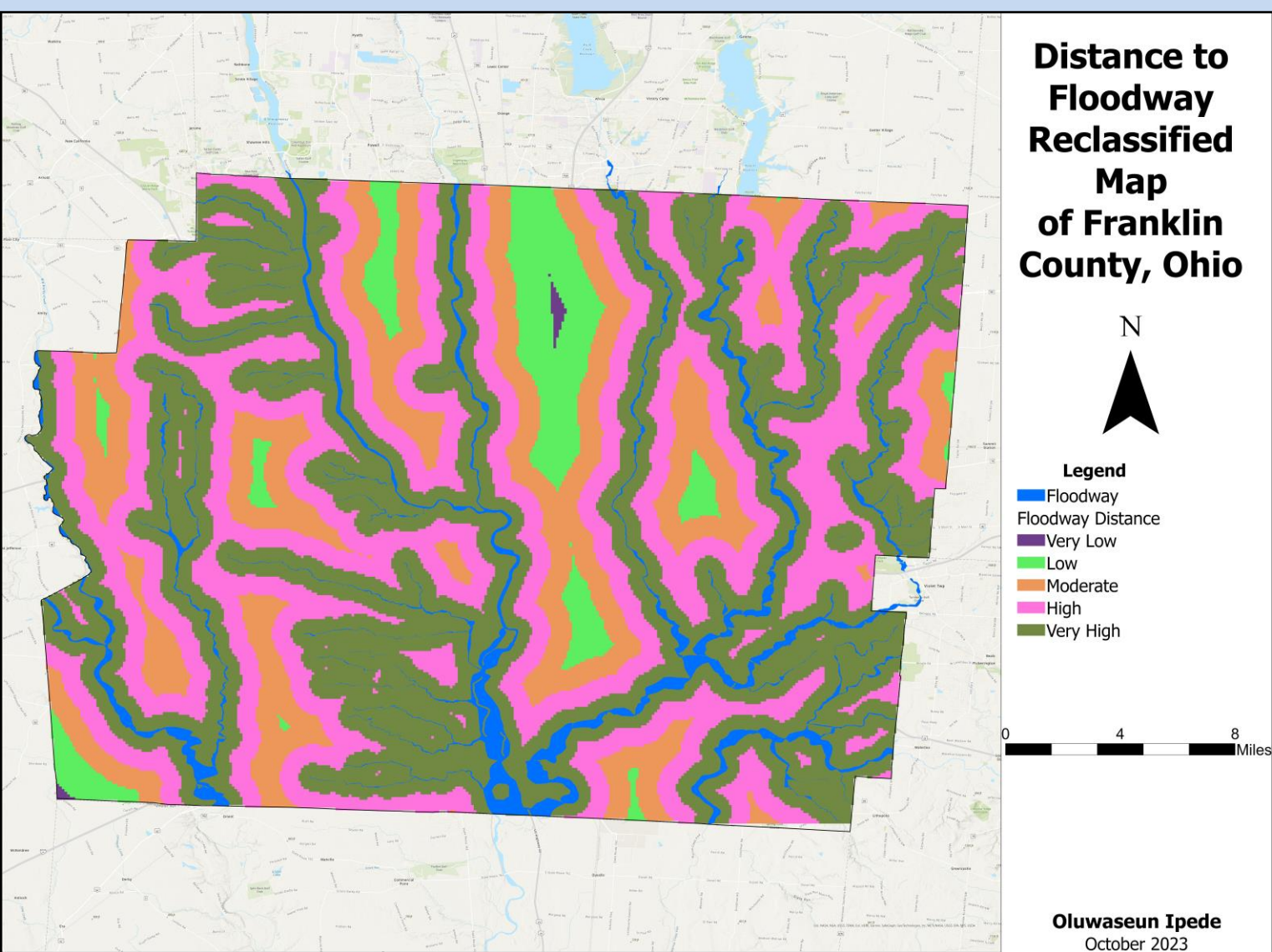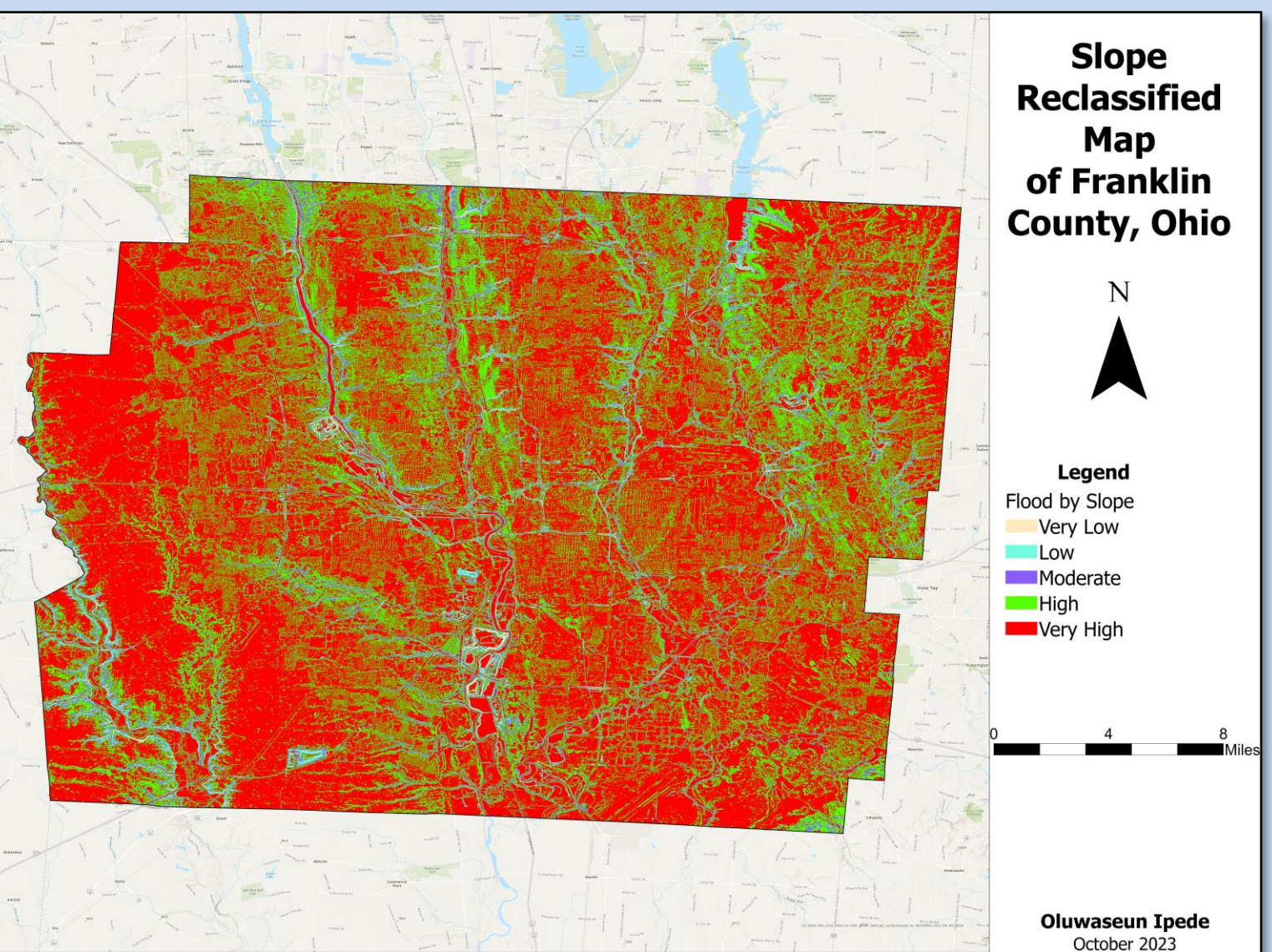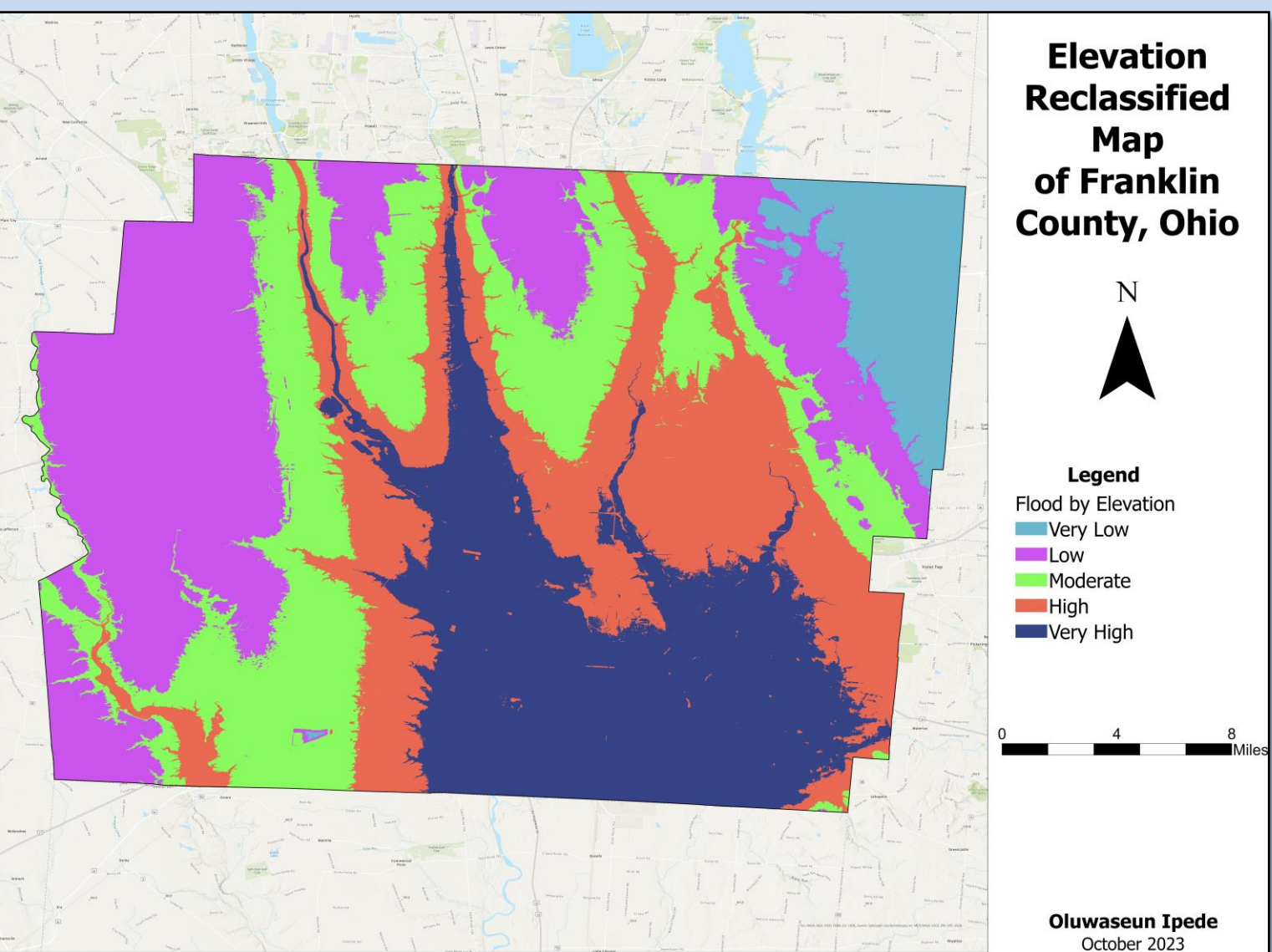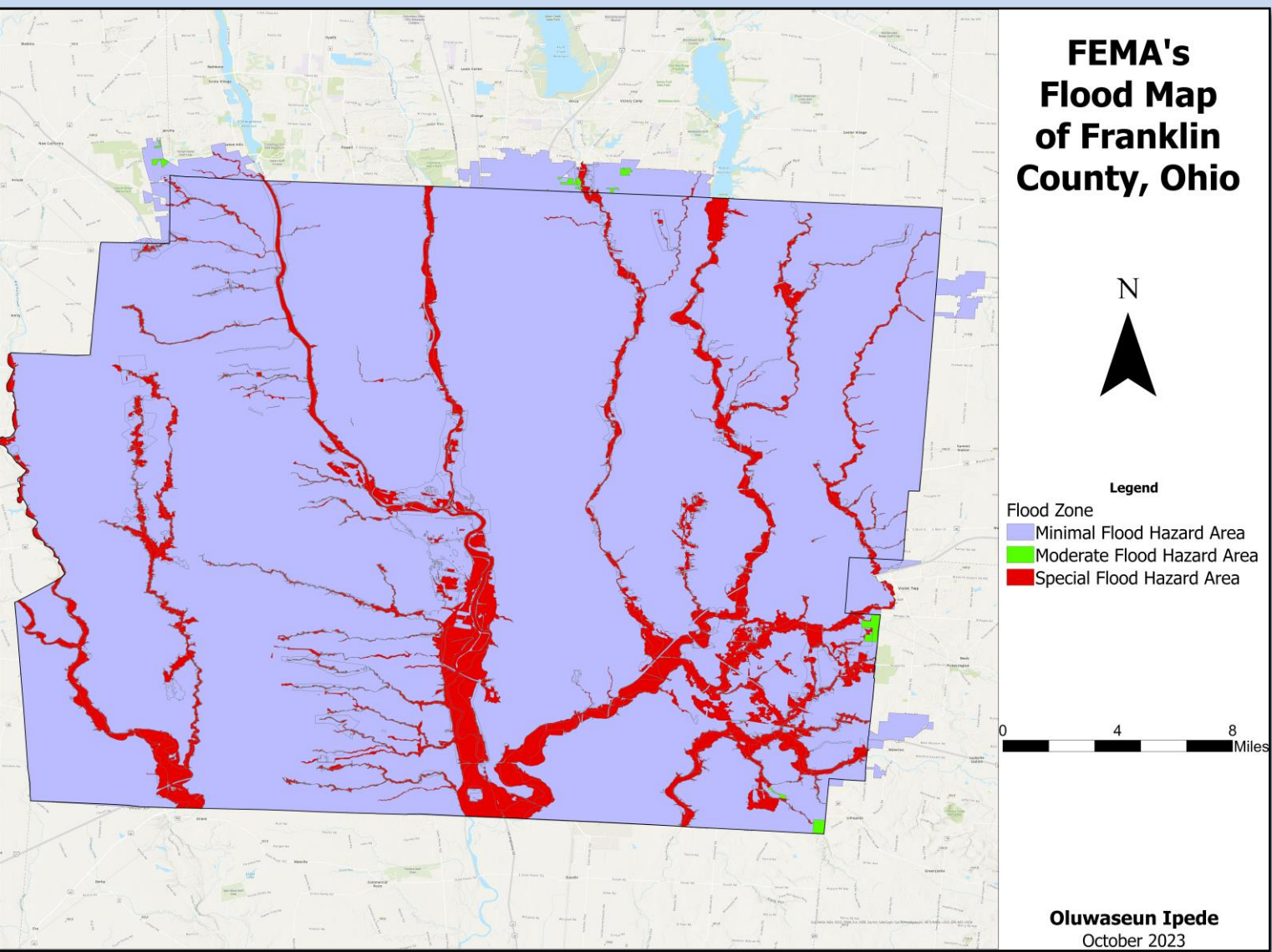
Conclusion

About of 40% of the total land mass of Franklin County is susceptible to high rate of flooding event. Also, more than 60% of the entire county already recorded human activities and density. This can be easily deduced from the land use map. These analysis raises a big concern for the residents and the enormous investment that most have been staked into the development of the county. The flood risk map also shows that not just the region in the 100-year flood plain (Special Flood Hazard Area) is at high risk as predicted by FEMA's flood map but other areas around the mid-belt region of the county.

Reference

Hunegnaw Desalegn, Arega Mulu. (2021). Flood vulnerability assessment using GIS at Fetam watershed, upper Abbay basin, Ethiopia. National Library of Medicine.

Kin. (2022). Are FEMA Flood Maps Accurate? Retrieved from https://www.kin.com/blog/fema-flood-maps/#:~:text=FEMA%20Flood%20Maps%20Fail%20to%20Reflect%20Climate%20Change&text=FEMA%20bases%20its%20predictions%20and,Higher%20water%20levels.

Wondim, Y. K. (2016). Flood Hazard and Risk Assessment Using GIS and Remote. Journal of Environment and Earth Science.

Yonas Gebresilasie Hagos, Tesfa Gebrie Andualem, Mesenbet Yibeltal & Mequanent Abathun Mengie. (2022). Flood hazard assessment and mapping using GIS integrated with multi-criteria decision analysis in upper Awash River basin, Ethiopia. Applied Water Science - SpringerLink.

Discussion & Limitations

The result of the Flood Risk Assessment produced the level of risk across the county and is also represented in the table below

SN	Flood Risk	Area
1	Very Low	14%
2	Low	24%
3	Moderate	26%
4	High	23%
5	Very High	15%

The Southeastern part of Franklin county appears to be at higher risk of flood risk at the slightest event.. The rate of built-up areas is inversely proportional to the Flood risk. This lays heavy task on the city planning agency to plan with respect to the risk assessment. However, majority of the risk is around the tributaries of the floodway, there would be need to conduct in-depth analysis with the current conditions of the floodway and activities around it. The locations of dams should also be considered in this regard.

Future Research

Future research would be to model the dynamic impact of climate change to predict flood. For example, increasing rainfall would increase the risk of flooding in Franklin county.