

# Floods Vulnerability Analysis for Environmental Justice Communities in Mystic River Watershed

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## Background

The Intergovernmental Panel on Climate Change (IPCC) predicts that the magnitude of disasters such as floods and hurricanes will get worse, the number of these disasters will increase, and the number of people affected by high tides.

Mystic River Watershed (MRW) is located alongside the ocean, and contains a lot of water bodies. It means this area might be damaged severely by floods.

This study focuses on the floods vulnerability of the Environmental Justice (EJ) communities within MRW.

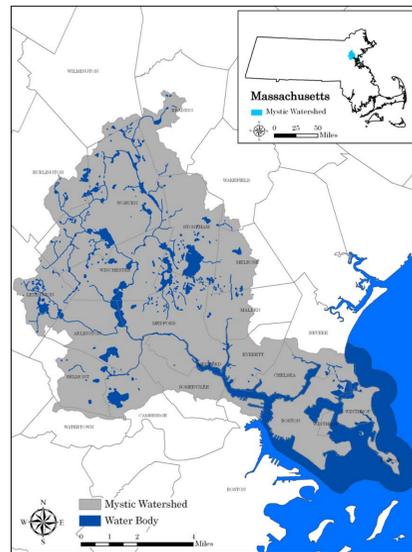


Figure 1. Study Area  
Mystic River Watershed area is located at Suffolk and Middlesex County, MA.

## GOAL

The purpose of project is to determine the vulnerable areas for floods hazards within MRW and to figure out the relationship between floods vulnerability and EJ communities.

## Study Area

Within MRW, there are 180 EJ communities and 423 Non-EJ communities (groupblocks).

	Flood Zone	Popula- tion	Popula- tion
EJ Community	with Flood Zone	80343	230367
	without Flood Zone	150024	
Non-EJ Commu- nity	with Flood Zone	189207	485926
	without Flood Zone	296719	
Total		716293	716293

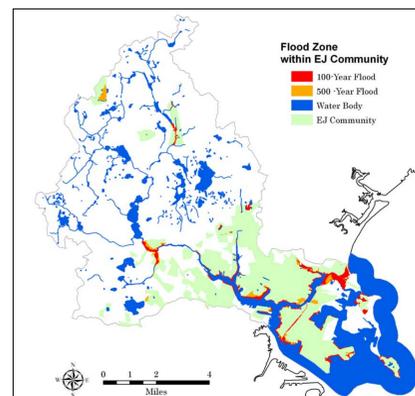


Figure 2. Environmental Justice Communities  
Show location of EJ communities and flood zone data within MRW.

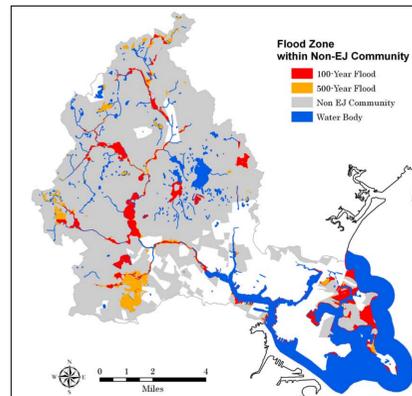


Figure 3. Non-Environmental Justice Communities  
Show location of Non-EJ communities and flood zone data within MRW.

## Methodology

Raster analysis was used for visualizing the vulnerability within the Mystic River Watershed. The raster analysis used below data:

- . Flood zone (100-Year and 500-Year Flood zone);
- . Buffer zones from the water bodies;
- . Distance from Hospitals; and
- . Distance from Fire stations.

Because the flood zone and buffer zones from the water bodies are more relevant to flooding, these data were calculated using weighted values, 0.5 and 0.3 respectively. The weighting scheme in the Raster Calculation is shown below;

## Results

As shown in the right side, the model shows serious vulnerability particularly in coastal areas and bank areas. Some islands and inland areas far from the hospitals and fire stations are also shown as medium-level vulnerable area.

The results shows some EJ communities, located in coastal area, are severely vulnerable for floods. Furthermore, some Non-EJ communities are also vulnerable for floods because of the flood zone data.

## Limitations and Future Study

There are several data limitations to analyze this study. Instead of using the exact location of emergency shelters within the watershed, this analysis used the location of hospitals and fire stations as an emergency evacuation spot. Also buffer zones from the water bodies is not appropriate factor of the analysis in some places, because some places might be located in slightly higher place or bank protection area even though the areas are along rivers or coastal lines.

With more detailed data, the future analysis would be conducted.

Figure 5. Flood-Hazard Risk  
Using the 100-Year Flood and 500-Year Flood zone data, below map show the flood-hazard risk level .

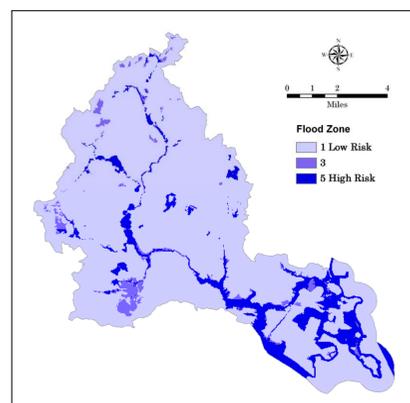


Figure 6. Buffer zones from Water Bodies  
Flood-hazard risk will decrease far from the water bodies.

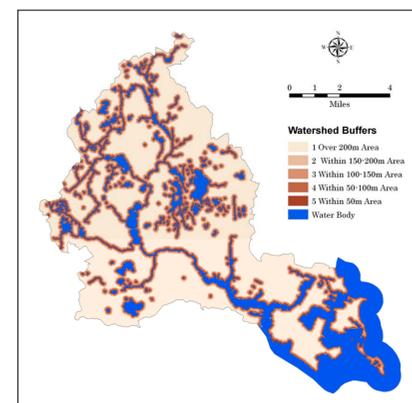


Figure 7. Distance from Hospitals  
Hospitals will be used as an emergency evacuation spot and medical service center in case of the floods.

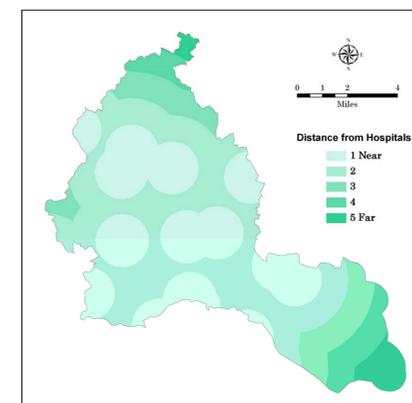


Figure 8. Distance from Fire Stations  
Fire Stations will be used as an emergency evacuation spot and center of the rescue activity in case of the floods.

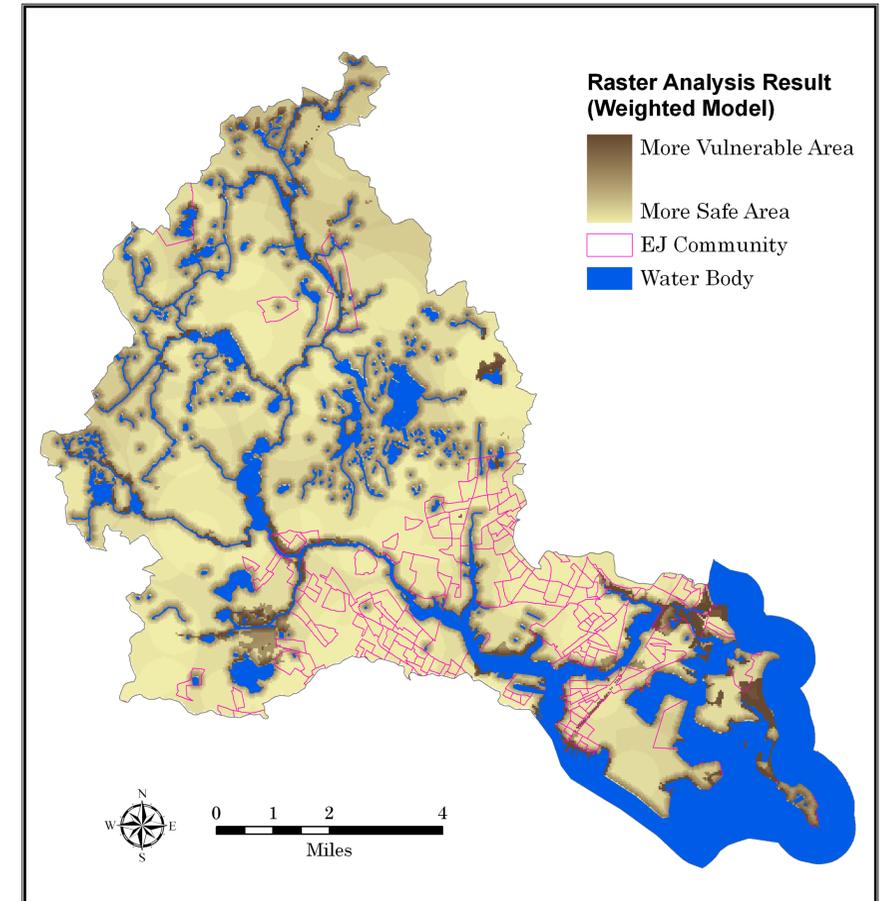
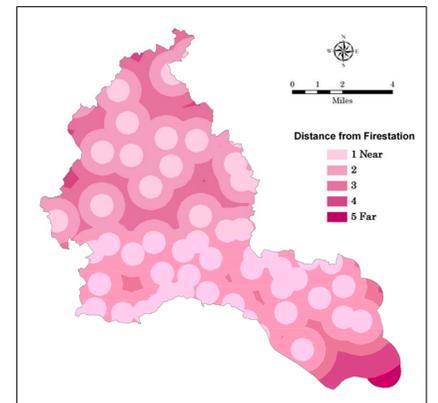


Figure 4. Weighted Model Analysis  
Raster calculated map and boundaries of EJ communities. Details are described at the left.

Map projection: Massachusetts State Plane Mainland, NAD 1983, meters  
Source: MassGIS