

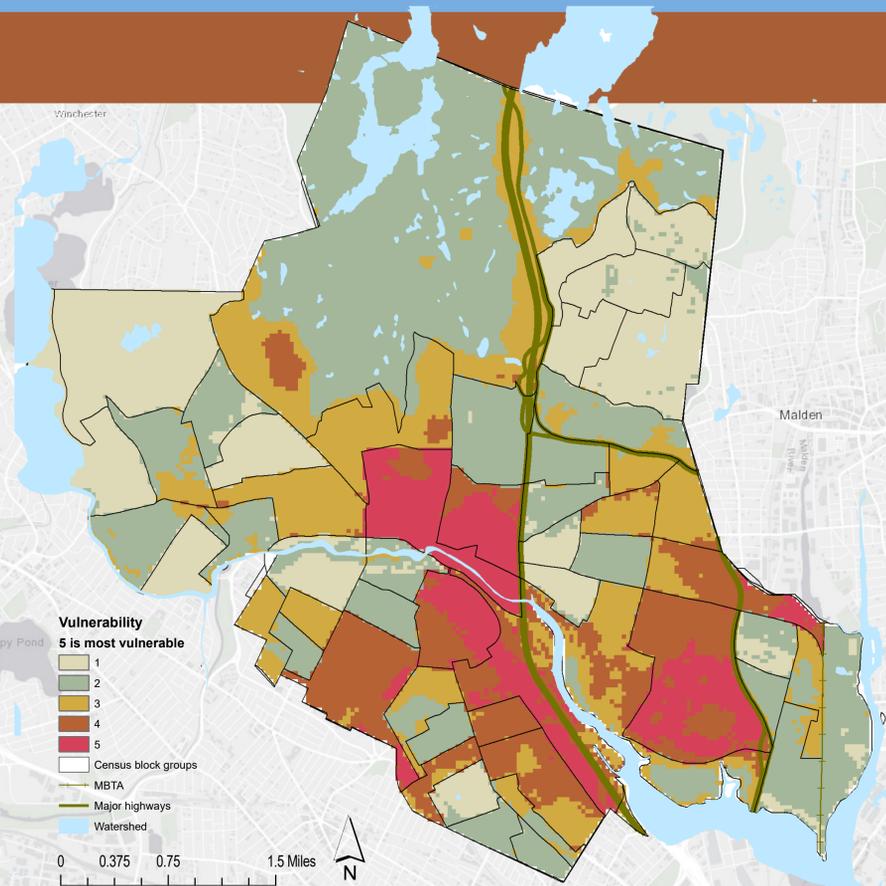
# From Vulnerable to Resilient

A climate vulnerability analysis of Medford, Massachusetts

## Climate Change Affects Medford

Medford is already seeing the effects of climate change, such as more extreme heat, greater frequency of extreme weather and heavy rain, new areas flooding, and stress on our local plants and wildlife. The Mystic River, once tidal and now protected from flooding by the Amelia Earhart Dam, will affect parts of Medford with sea level rise and storm surge over the next generation. This map seeks to supplement the Medford Climate Vulnerability Assessment and spur action, by analyzing which neighborhoods the City of Medford should prioritize for investment in climate adaptation projects and programs.

This project assesses climate vulnerability through two factors: current extreme heat, with the idea that hot areas will only be hotter in the future, and probability of future flooding from sea level rise and storm surge in 2070. Many infrastructure investments are made to last for 50 years, so buildings that are designed in 2020 need to account for 2070 conditions. The final map to the right considers the combination of climate vulnerability and density of resources, including population, environmental justice factors, critical infrastructure, public transit facilities, jobs, and businesses.



## Methods

Vulnerability Factor	Weight	Max Value	Min Value
Extreme Heat	15%	125°F	73°F
Sea Level Rise in 2070	15%	30'	0.00'
Population Density	11%	.001	.00001
Environmental Justice Populations	11%	4	0
Business Density	12%	169	0
Job Density	12%	2,190	0
Critical Infrastructure Density	12%	4	1
Bus Stop Density	12%	18	0

Flood projection data and 2010 surface temperature data are raster layers from the Metropolitan Area Planning Council; the remaining data are vector layers from MassGIS. I clipped the statewide infrastructure layers to the city boundaries. I derived density using a spatial join between census block groups and jobs, transit, and infrastructure, then used the field calculator to divide amount of jobs/businesses/transit/infrastructure/people by area.

For each of my vector layers I used the polygon to raster tool to convert each into a raster. To arrive at my final vulnerability map I did a weighted analysis using the raster calculator to add together the resource density factors with heat and flood vulnerability, using the weights and factors in the table depicted at left.

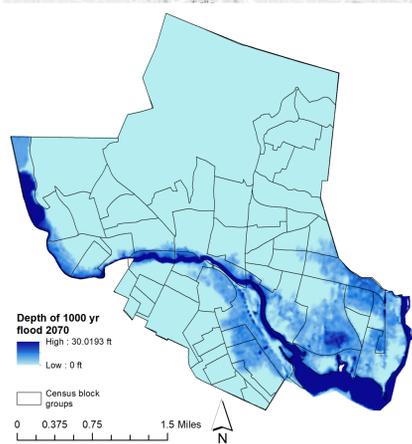
## Conclusions

The map above indicates that Medford has an opportunity to identify systemic climate resilience projects in Medford Square, parts of South Medford, and parts of the Wellington neighborhoods that can simultaneously address their various vulnerabilities. Not all areas of the City are being affected in the same ways by climate change. This map indicates the need for a localized approach, in collaboration with residents and business owners, to create a more resilient community.

Note that the above map juxtaposes 2019 infrastructure, business and census data from 2005-2010, and a prediction of where it will flood in 2070; it does not consider projected increases in precipitation. This makes it helpful for considering new large infrastructure and construction projects but may be less helpful for short term planning by current renters or homeowners.

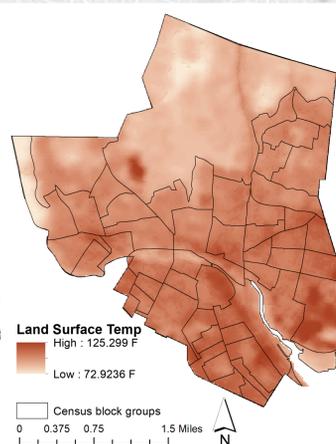
### 2070 Flooding

Neighborhoods closest to the Mystic River and at low elevation are vulnerable to future sea level rise.



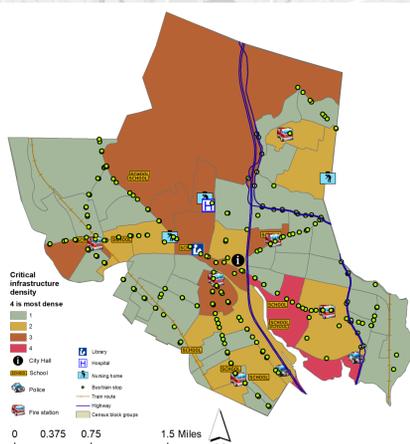
### Heat

Neighborhoods with the highest average surface temperatures are most vulnerable to extreme heat.



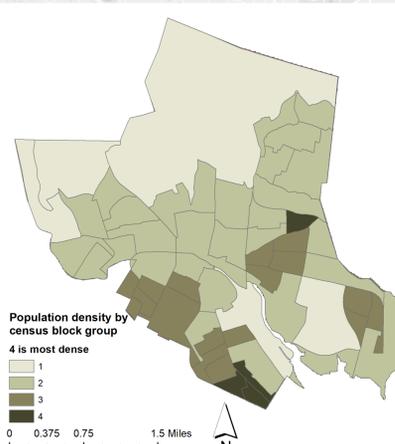
### Critical Infrastructure

Neighborhoods with high concentrations of community and emergency resources and public transit are more vulnerable.



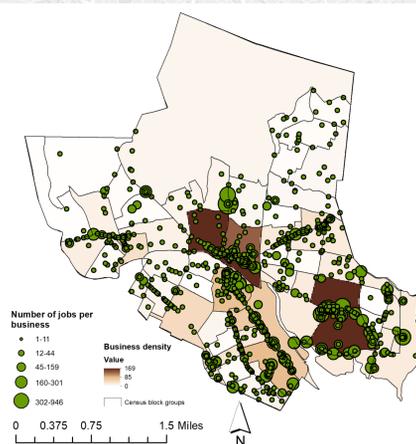
### Population

Neighborhoods with the highest number of residents per square acre and environmental justice factors are more vulnerable.



### Business and Job Density

Neighborhoods with the highest number of businesses and jobs per square acre are more vulnerable.



All maps displayed on 1:37,511 scale  
 Projection: State Plane, Mainland Zone (Fipszone 2001)  
 Data Sources: MAPC, ESRI  
 Online sources: MassGIS, images from commons.wikimedia.org

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