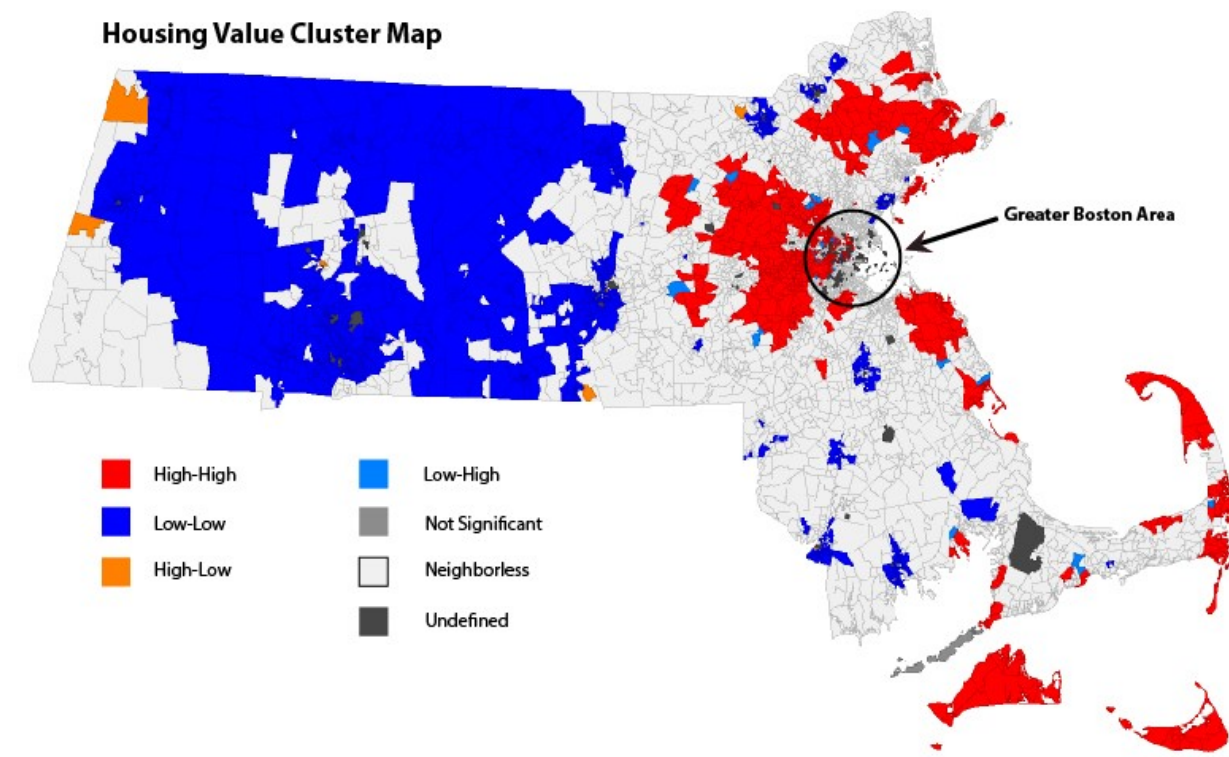
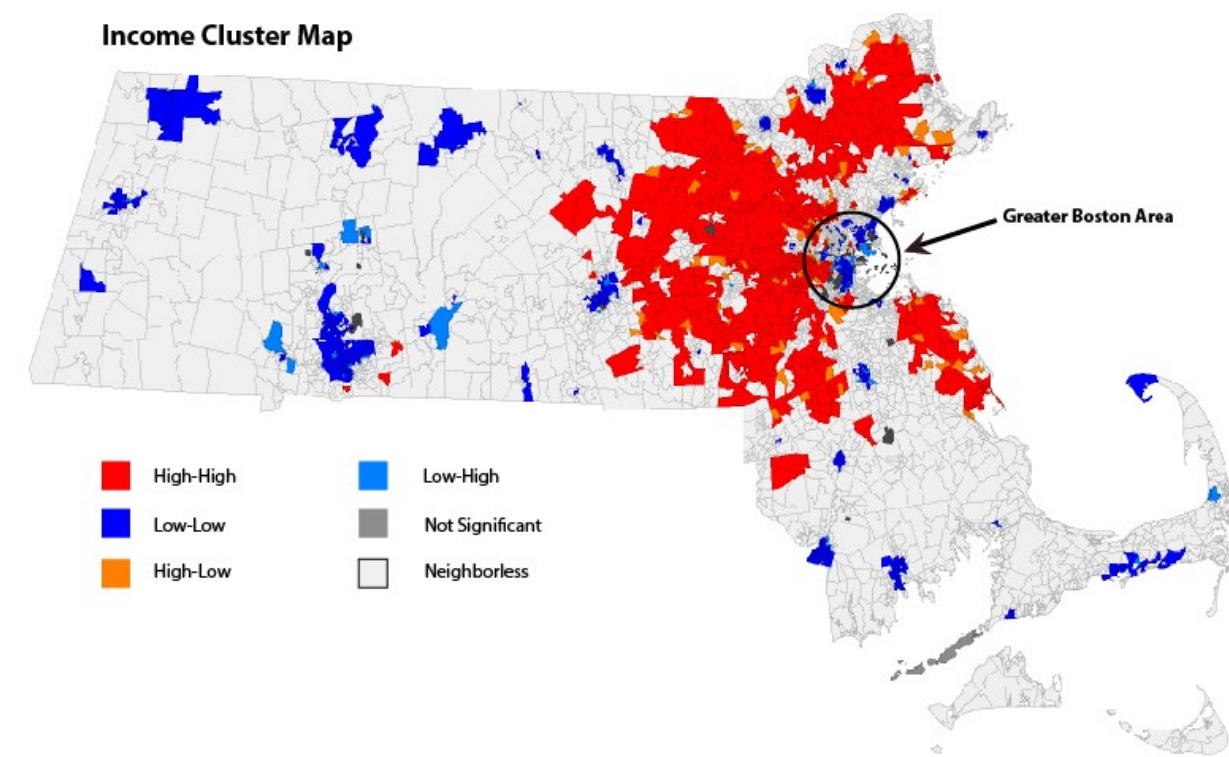
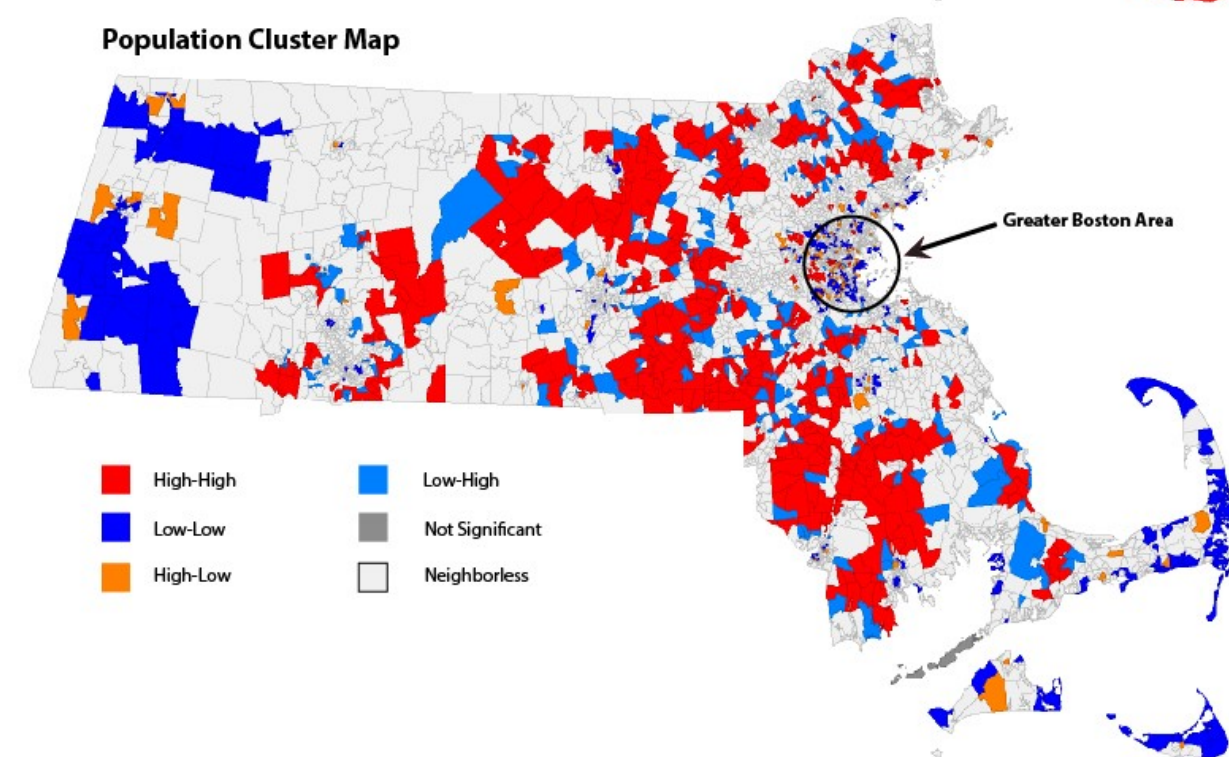
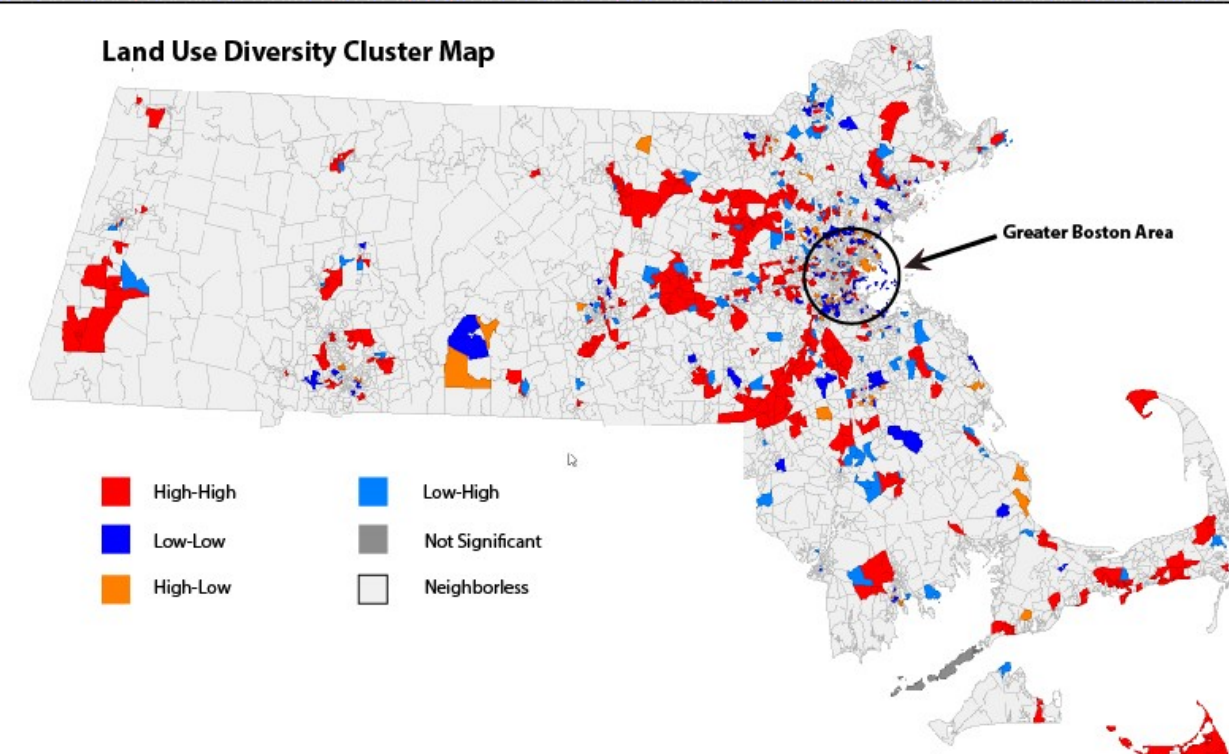
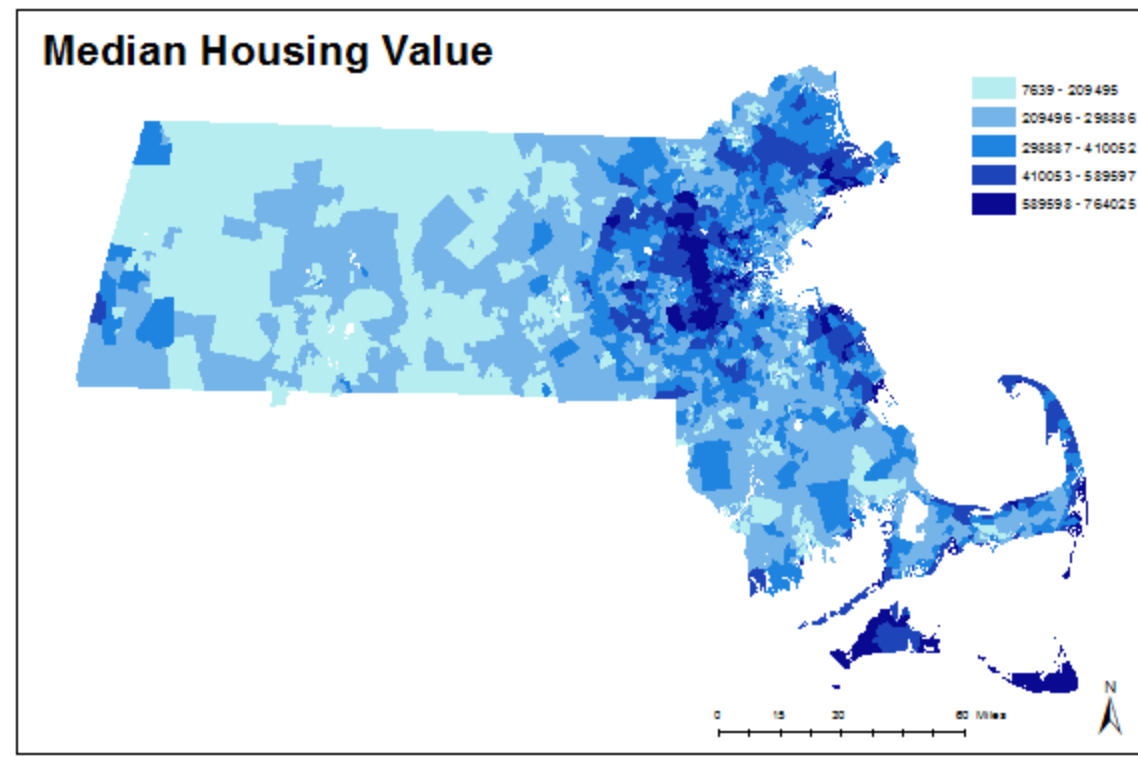
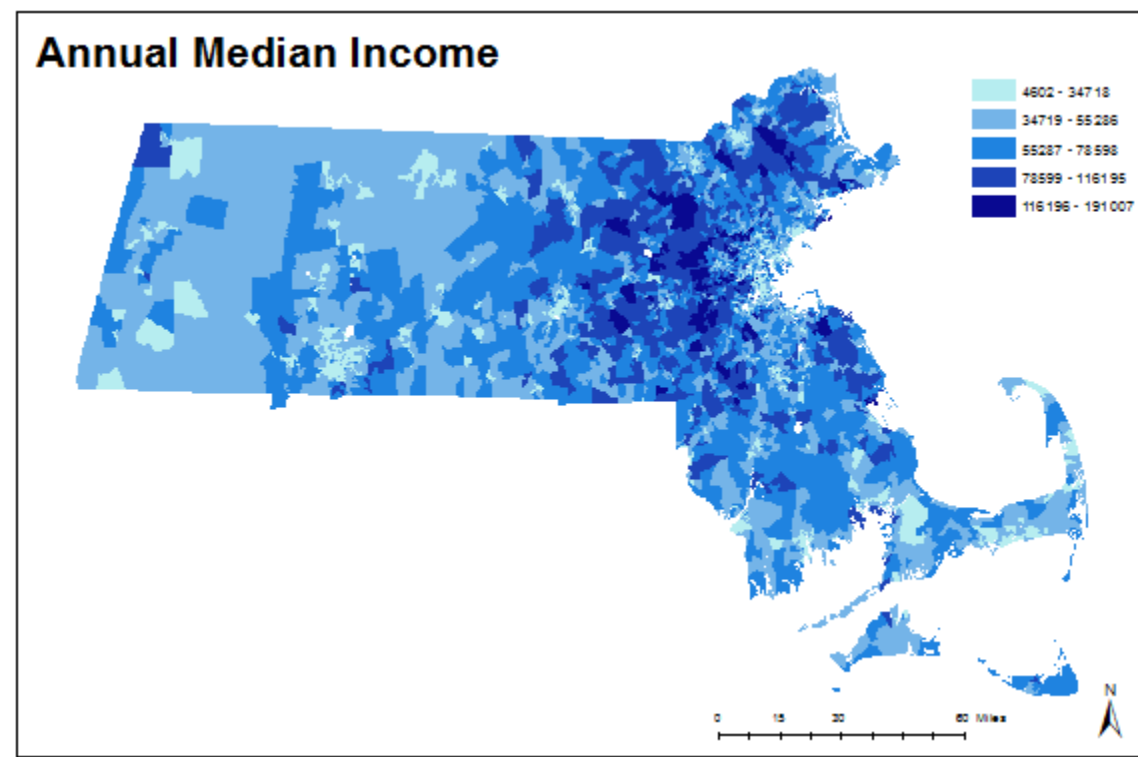
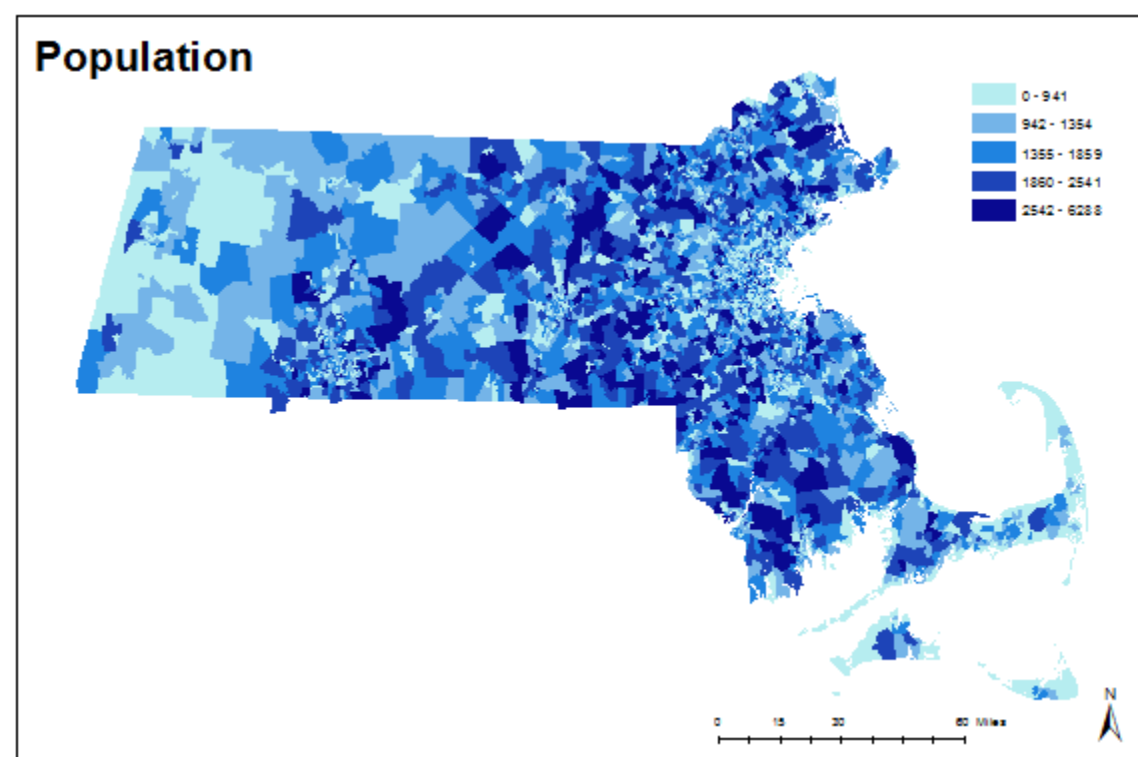
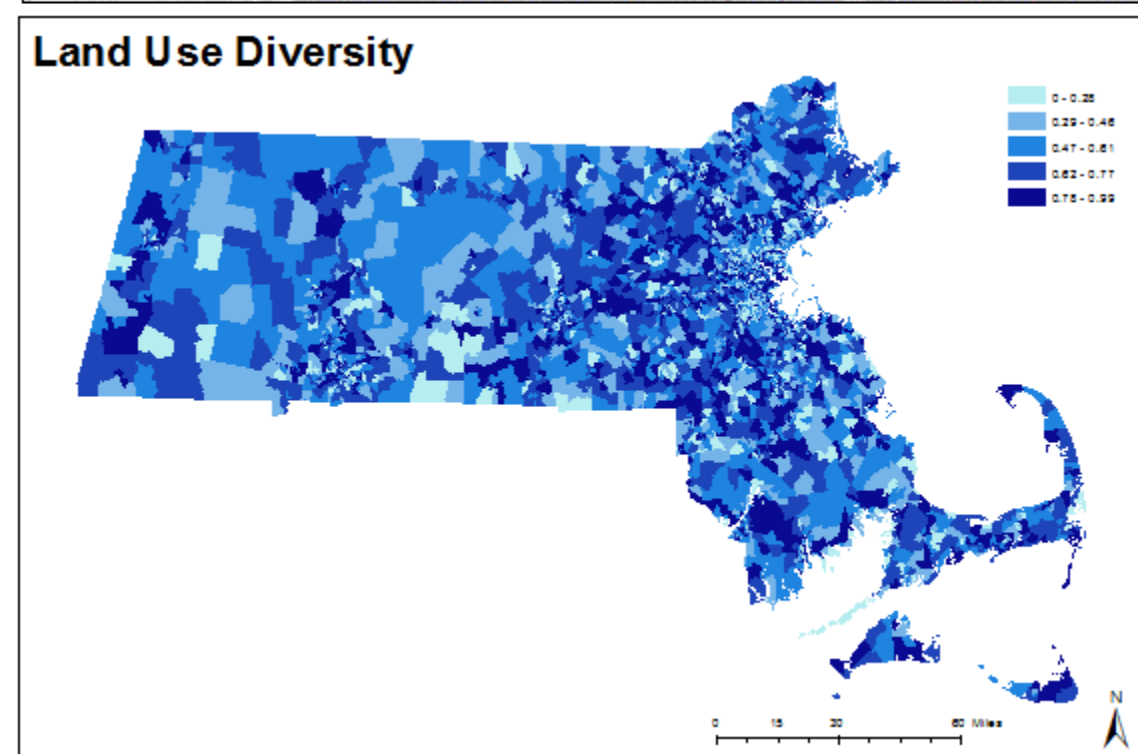
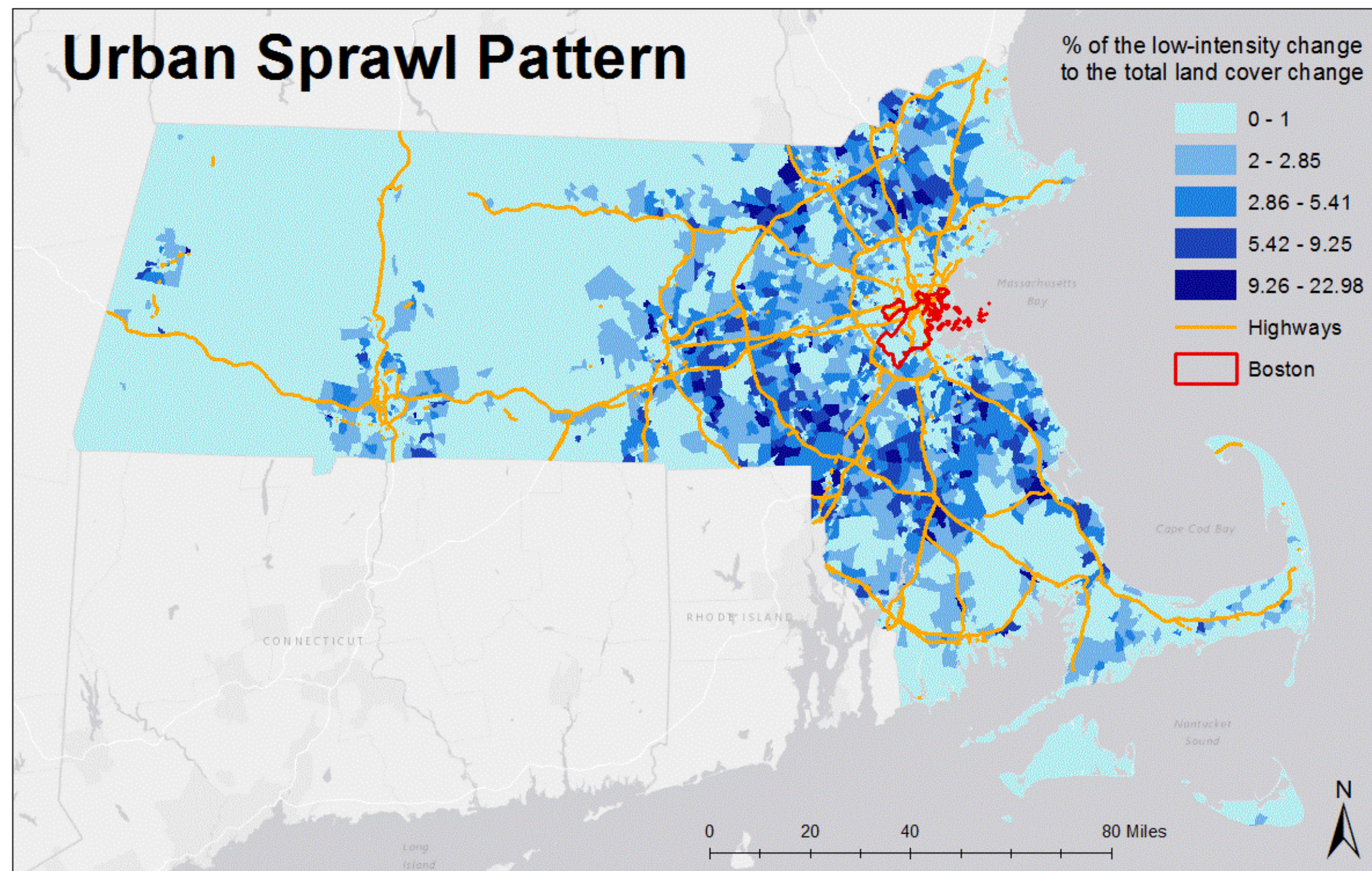




Analysis Urban Sprawl Pattern in Massachusetts

Analysis Maps



Introduction

Urban Sprawl is one result of suburbanization in U.S, which is related to the serious poverty problem in the suburban areas. So reducing urban sprawl is one effective way to solve that problem. What are some spatial factors that could affect urban sprawl pattern is worth thinking. The mission of this project is to find out some possible spatial factors and analysis how they are associated with the urban sprawl pattern in Massachusetts.

Urban Sprawl



Urban sprawl is a phenomenon existing in the U.S, which means that more and more people are willing to move from urban areas to suburban areas because of the suburbanization. Some factors such as job sprawl, the tax treatment of mortgage interest and property taxes, zoning codes that favor low density, low gasoline taxes, highway construction and large-lot residential zoning are important causes of this problem. Those factors makes sprawl to be more economically homogeneous.

Methodology

In order to analysis urban sprawl pattern in Massachusetts, some spatial factors, such as land use diversity, population, income and housing value are dependent variables to determine the urban sprawl pattern, based on some researches. And those data are collected by block group. The land use diversity data is collected from EPA, which is calculated by one specific complicated formula. The bigger number, the higher land use diversity. And the land use types are as retail, office space, residential space, entertainment, open area and so on.

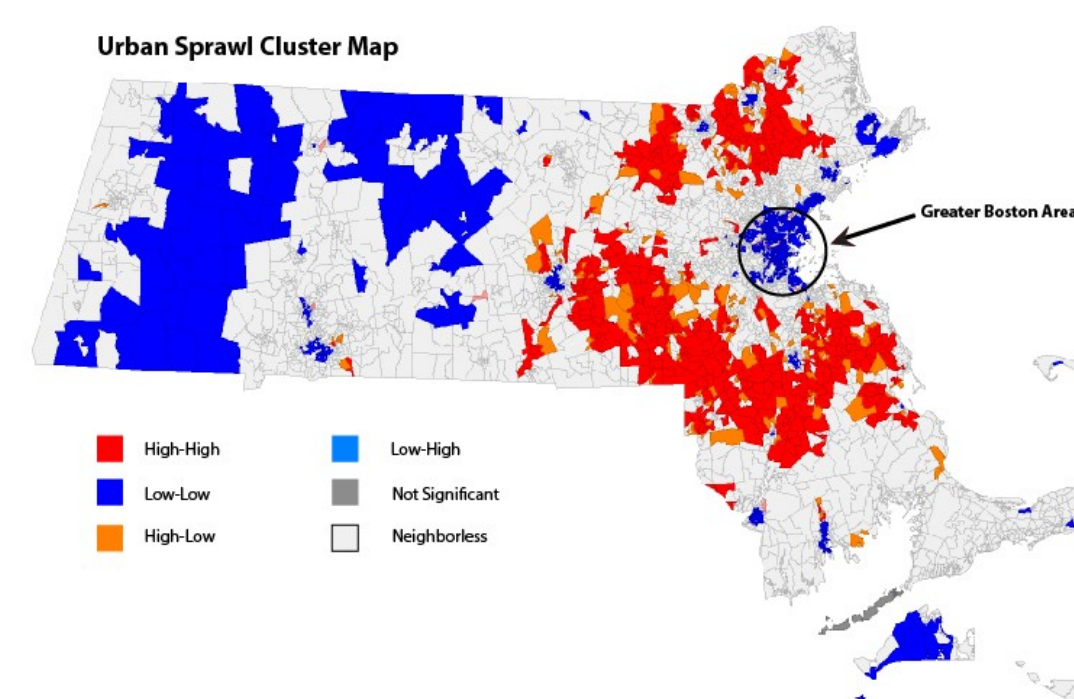
In terms of the independent variable, urban sprawl pattern, there are several ways to measure it. In this project, it is measured by the land cover type changes from 2001 to 2011. The land cover change types are marked by different numbers. Based on its Metadata, only "21, 22, 23 and 24" are related to urban areas, which are useful to this project. Among all 4 kinds of land cover change types, "21" shows places that changed to open space and "22" shows places changed to low-intensity areas. It is supposed that both open space and low-intensity areas refer to fewer human activities, which is associated with more urban sprawl. Then the hundreds percent of low-intensity change as well as open space, to the total land cover change is calculated to measure the urban sprawl pattern. The higher value, the more sprawl happened during the decade from 2001 to 2011.

For further analysis of the urban sprawl pattern in Massachusetts, the Univariate Local Moran's I and Conditional Map are used to determine the cluster maps of those variables. Besides, the spatial regression is run to find out some potential spatial relationships between urban sprawl and those spatial factors.

Results

Variables	Coefficient	Z-Value	Probability
Constant	-0.01	-4.81	0.00
Population	6.35E-6	13.40	0.00
Income	1.31E-7	8.66	0.00
Housing Value	-6.42E-9	-1.84	0.07
Land Use Diversity	0.01	5.93	0.00
Lambda	0.508	29.71	0.00

Conditional Map



The urban sprawl cluster map illustrates that, in the Greater Boston Area, most of the sprawl cluster pattern are low-low. However, the high sprawl pattern is more obvious clustering like a radial pattern with the center of Greater Boston area. It is easy to find that the sprawl is following the pattern of highway construction based on the urban sprawl pattern analysis map. It is claimed by many researchers that the highway construction is one of the significant causes of urban sprawl, and this analysis map strongly supports it. Besides, the large number of automobiles and the low gasoline taxes enhance the urban sprawl since it's easier for people to access to suburban areas. In addition, based on the cluster maps, the Greater Boston Area doesn't have obvious cluster pattern of all those variables but the urban sprawl pattern. The description of urban sprawl is that people are clustering in suburban areas rather than urban areas, which happened several decades ago. The Great Boston Area is regarded as an "urban area", and it has less population and income cluster. The urban area seems to be a place for people to work and entertain instead of living. So those cluster maps could strengthen this theory as well.

In terms of the regression table, only the probability of housing value is bigger than 0.05, which refers to not significant, while others are all significant. This result demonstrates that those dependent variables, income, land use diversity and population are positively associated to the independent variable, urban sprawl, while housing value is not much associated.

The conditional map illustrates the relationship between urban sprawl and income, land use diversity. The top-right corner map shows that those places, with high income and high land use diversity are more associated with urban sprawl. On the other hand, the bottom-left map shows those places with low income and low land use diversity are less associated with urban sprawl. Additionally, the effects of income is more obvious than the land use diversity.

In conclusion, those analysis maps as well as regression strongly support the consensus that urban sprawl is associated with the highway construction, affordable housing, zoning and population migration. In order to alleviate this, researchers should consider more about these fields.

Sources

Reference:

- John M. Marzluff, 2008, Relationship between Urban Sprawl and Physical Activity, Obesity and Morbidity. Urban Ecology, pp 567-582.
- William H. Lucy and David L. Phillips, 2000, Confronting Suburban Decline-Strategic planning for Metropolitan Renewal, Washington D.C. • Covelo, California: Island Press.

Data Source:

- Land Use Diversity dataset of Massachusetts, Smart Location Database from EPA.
- NLCD 2001 to 2011 Land Cover Change.
- Population data, income data and housing value data by block group are from Census 2010.
- Highway data is from MassDOT.

UEP 294: Advanced GIS
Jiao Liu
December 16, 2017

