

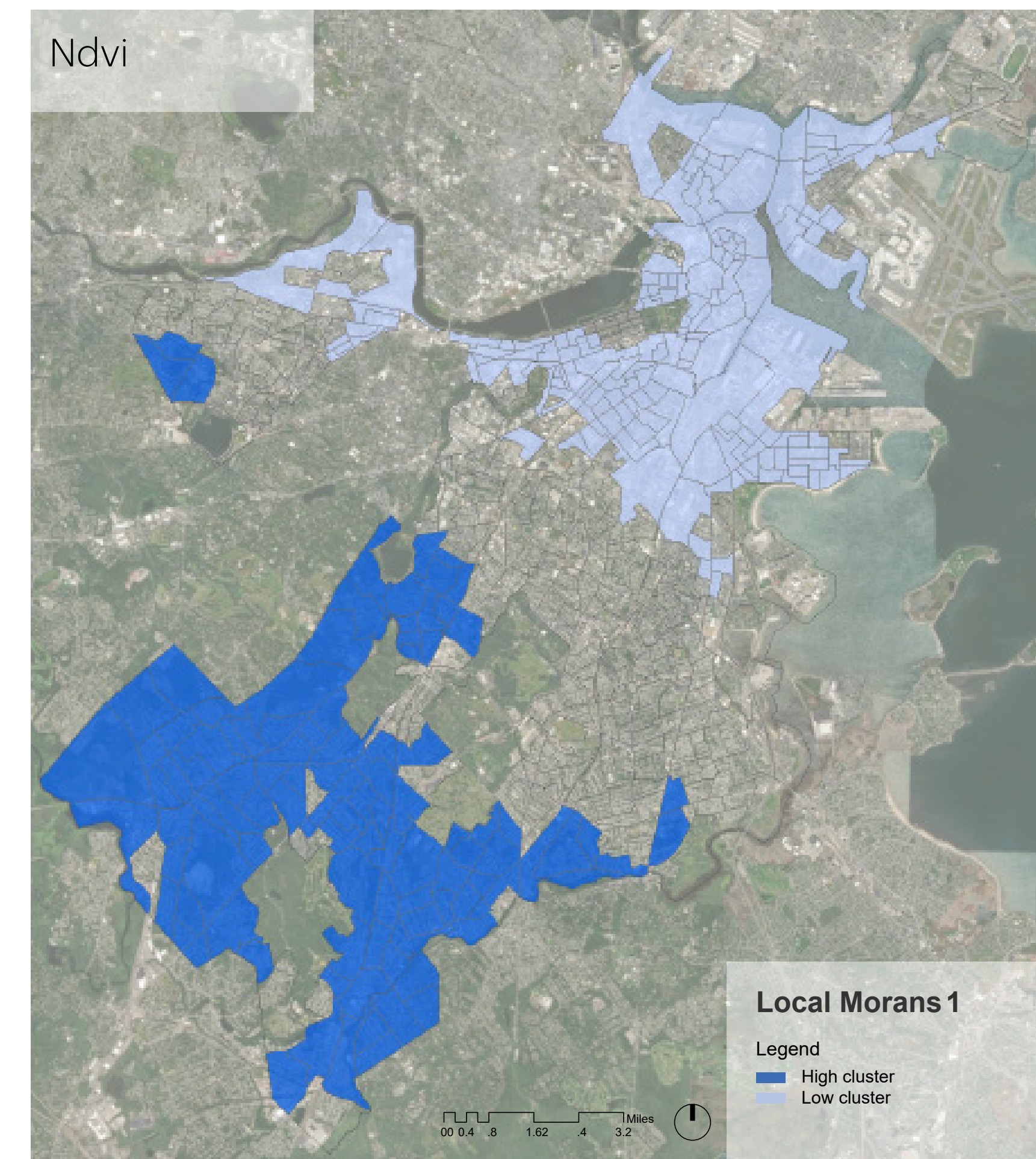
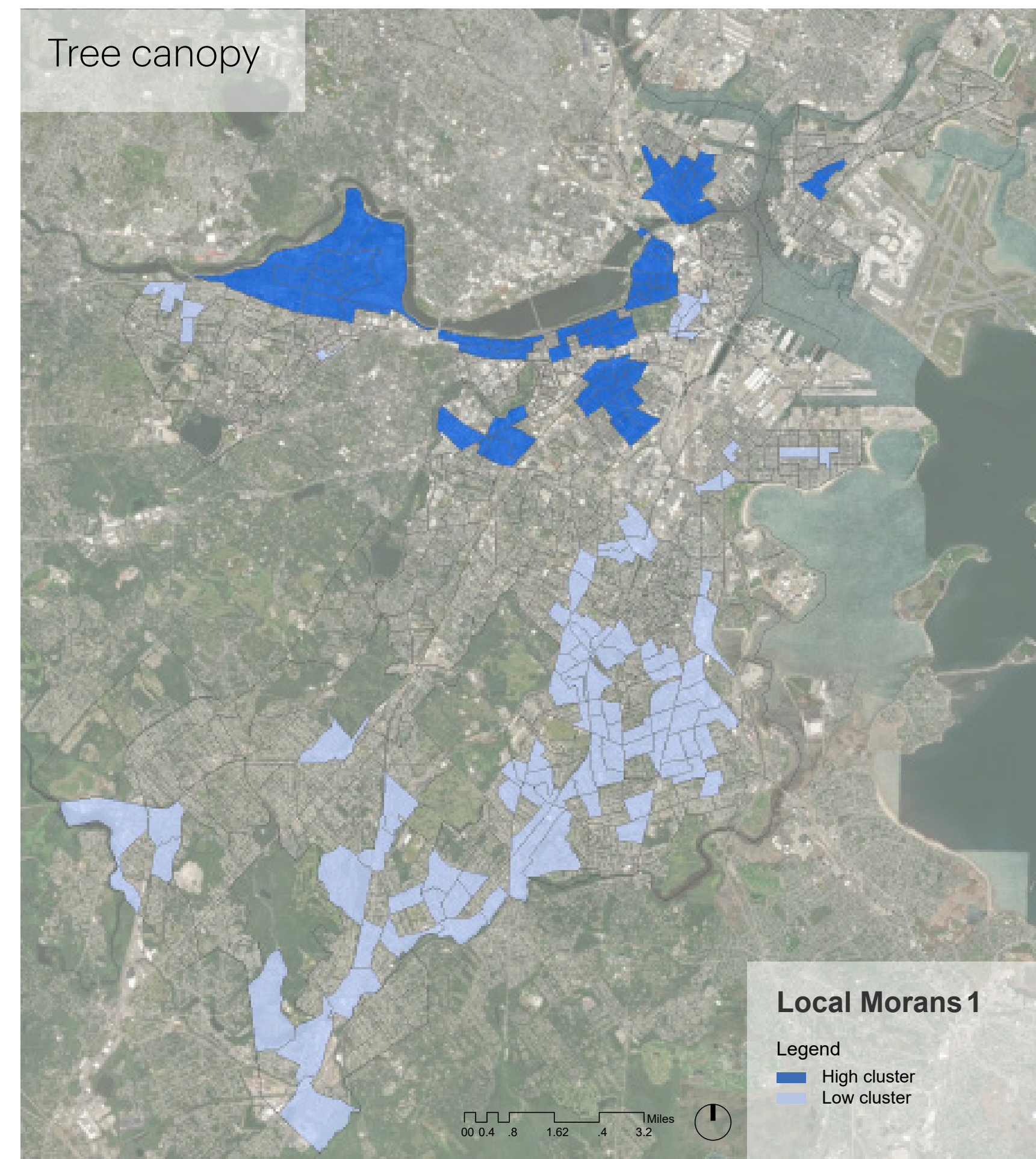
# Access to green space in Boston

## Background

Access to green space is known to provide a wide variety of health benefits. Studies show communities with low resource have shown to lack of access to green space [1, 2]. This study adds value to the ongoing research on the relationship between socioeconomic status (SES) factors and access to green space. Currently there appears to be no standard environmental indicators to study the correlation between green space and socioeconomic determinants [1]. In this study, we contribute to the current body of research by using high resolution variables such as the publicly owned street trees and park trees and normalized difference vegetation index (NDVI) to measure correlations of SES variables in a highly urban environment.

## Method

The study estimates green space using NDVI and the availability of tree canopy. To calculate the NDVI value I used the formula  $(NIR - Red)/(NIR + Red)$  from landsat 8 downloaded from earthexplorer. The ndvi value has then been reclassified to 0.3 and above to mark the healthy vegetation threshold. To investigate the relationship between ses factors I selected race, income, housing age, density, and education from the census bureau blockgroup data and converted to percentage. I then joined the NDVI values and park trees data using zonal statistics to each blockgroups. To observe if there are any significant clustering local moran 1 analysis was used for both Ndvi and tree canopy which is shown below. OLS regression is used to observe the correlation between the ses factor and green space.



## Results

tree density	Coefficient	Standard error	Probability
Black alone	-0.000008	0.000002	0.000003
White alone	0.000006	0.000002	0.001751
Below high school	-0.000015	0.000007	0.042474
Population density	0.024116	0.005122	0.000005

ndvi	Coefficient	Standard error	Probability
Black alone	0.000606	0.000295	0.040743
Asian alone	-0.001850	0.000683	0.007015
White alone	0.000006	0.000002	0.001751
Below high school	-0.0004741	0.001135	0.000004
Population density	-9.309180	0.803421	0.000000

## Data Sources

- 2017 Census block group
  - education attainment
  - ethnic group and race
  - median house age
  - population density
  - per capita income
- 2017 Modis-Landsat 8
- 2011 Boston street & park trees

## Conclusion

Our results suggest ses factors may be significant determinant to access to green space. Residents living near the northern portion of the city have higher access to public street trees and park trees while the southern portion of the city have better access to healthy vegetation. This is not surprising since the southern portion of the city where the parks are located constitute parts of the Olmstea's emerald necklace park system. Significant clustering for both public tree and healthy vegetation show the division is apparent between northern and southern portion of the city.



## References

- Nesbitt, L.; Meitner, M.J. Exploring Relationships between Socioeconomic Background and Urban Greenery in Portland, OR. *Forests* 2016, 7, 162.
- Ferguson, M.; Roberts, H.E.; McEachan, R.R.C.; Dallimer, M. Contrasting distributions of urban green infrastructure across social and ethno-racial groups. *Landscape and Urban Planning* 2018, 136-148.

## Demography

