Greening Lawrence: Finding Areas In Need of Green Space

Introduction:

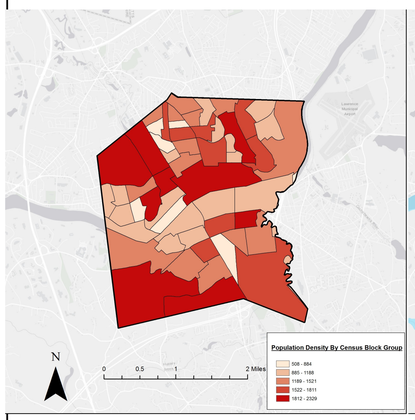
Lawrence is one of the most polluted cities in the state of Massachusetts. Once a booming city with mills and factories utilizing the Merrimack River, Lawrence now suffers the consequences of poor long term planning and inattention to environmental protection.[1] The city is currently addressing pollution issues such as raw sewage, water management and treatment, and air quality. This problem is worsened by the high percentage of land covered by impervious surfaces throughout the city. Impervious surfaces can be detrimental to the environmental quality of a city.[2]

One intervention that urban planners have carried out to address these issues is the inclusion of more green space practicing Low Impact Development (LID). LID is a land development strategy for managing storm water at the source that has been proven to successfully improve water quality and reduce the risk of flooding.[3] When water is unable to soak into the ground where it lands, it flows into the streets collecting pollutants and other debris.[4] Furthermore, excess water adds strain to water treatment facilities. Having better access to parks and green space also provides places for recreation, builds community, and provides environmental and health benefits by naturally filtering storm water and the air we breathe.

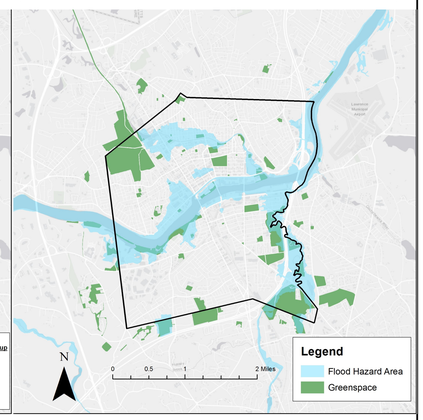
This project was driven by the following questions:

1. Which areas in Lawrence are most at risk due to lack of accessibility to green-space?
2. Where are the areas that the city of Lawrence should prioritize for implementing more green-space?

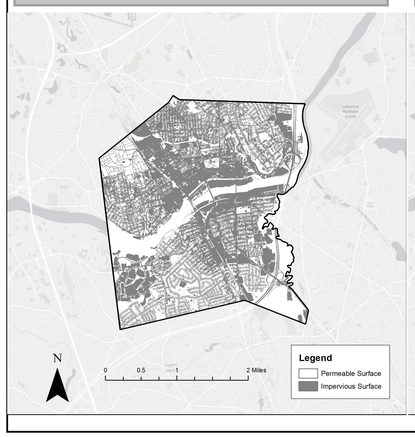
Population Density



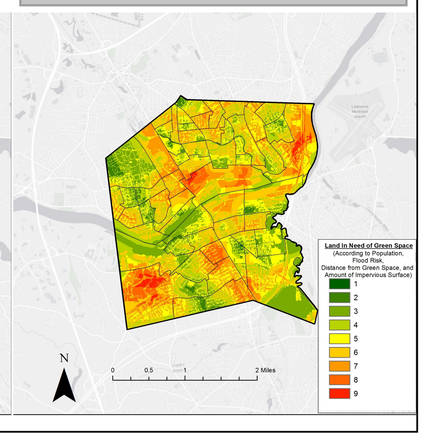
Flood Risk

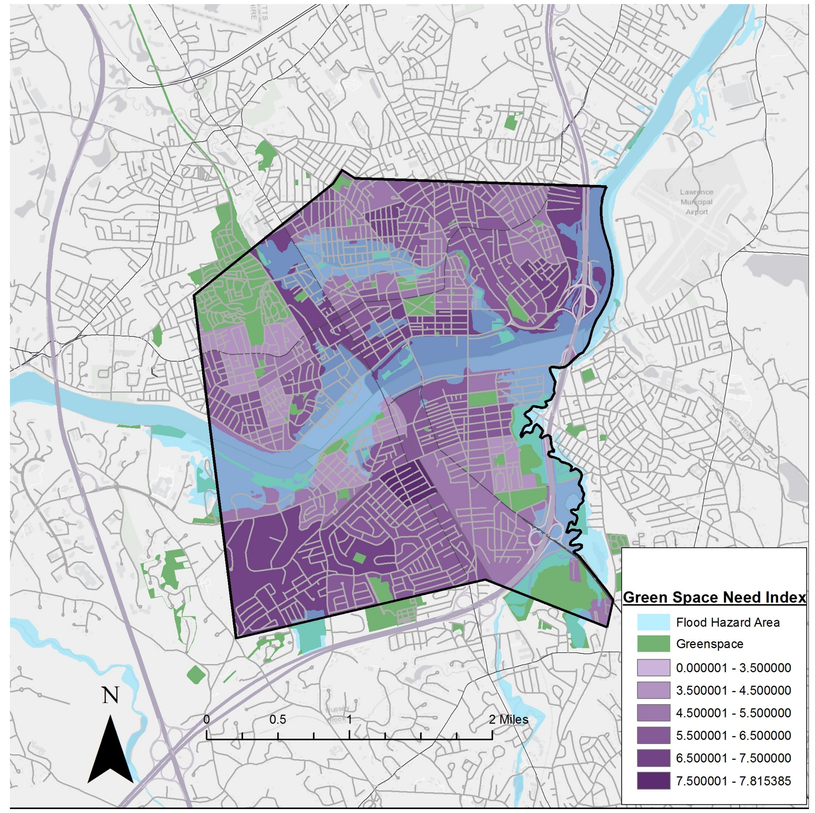


Surface Type



Land In Need of Green Space





Census Blocks In Need of Green Space

Methodology:

The variables in my analysis were:

1. Proximity to FEMA Flood Hazard Area
2. Distance to open/green space
3. Population Density
4. Impervious Surface Density

I chose these variables after reviewing previous studies and literature about environmental vulnerability and low impact development. I assessed the need for more green space by comparing these four variables and creating a composite map. In order to determine land most in need of green space, I created a suitability raster layer combining distance from green space, proximity to flood hazard areas, percentage of impervious surface per block group, and population.

I measured both proximity to flood hazard area and distance from green space using increments of 100 meters. I chose this measurement because 100 meters is a reasonable walking distance and this area will be most affected by storm water being unable to soak into the ground where it lands.

Seeing as this project's goal was to determine which areas of the city are most in need of green space, I decided to weight distance to current green space as the most important factor at 40%, and then weighted the remaining three factors at 20%. This raster layer was then joined to the census block group layer and zonal statistics was used to give each block group an average score.

Results and Conclusion:

This project was able to successfully identify which areas of the city should be prioritized for implementing more green space. This table shows the top ten highest averages of the variables I combined to show which block groups are most in need of green space. The final composite map shows that the center of the city and the Northeast corner are particularly vulnerable due to the factors I have included in this study.

This project provides a solid start to learning about the environmental needs of Lawrence and provides us with areas for future research. Moving forward, one could also include data on surface temperature and poverty rates in order better identify specific population groups that are disadvantaged due to a lack of green space.

Census Block Group	Average of Variables Determining Green Space Need
250092526013	7.815385
250092515003	7.68344
250092532011	7.391305
250092524003	7
250092532024	6.895652
250092513001	6.864709
250092506003	6.815544
250092501001	6.741336
250092508003	6.668972
250092525011	6.631461

Dracut Street, Lawrence

Franklin Street, Lawrence.

Map Projection and References

All maps displayed on 1:50,000 Scale

Projection: NAD 1983 Lambert Conformal Conic

Data Sources: MassGIS, ESRI, U.S. Census

Online sources: Google Street View.

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Literature Cited

1. Greater Lawrence Sanitary District, "History." Online.

2. Brabec, E., Schulte, S., & Richards, P. L. (2002). "Impervious Surfaces and Water Quality: A Review of Current Literature and Its Implications for Watershed Planning." *Journal of Planning Literature, 16(4), 499–514.*

3. Ahiablame, Laurent M., Bernard A. Engel, and Indrajeet Chaubey. (2012). "Effectiveness of low impact development practices: Literature review and suggestions for future research." *Water Air and Soil Pollution 223 (7): 4253-73.*