Greening Somerville

To Improve Environmental Health and Community Well-being

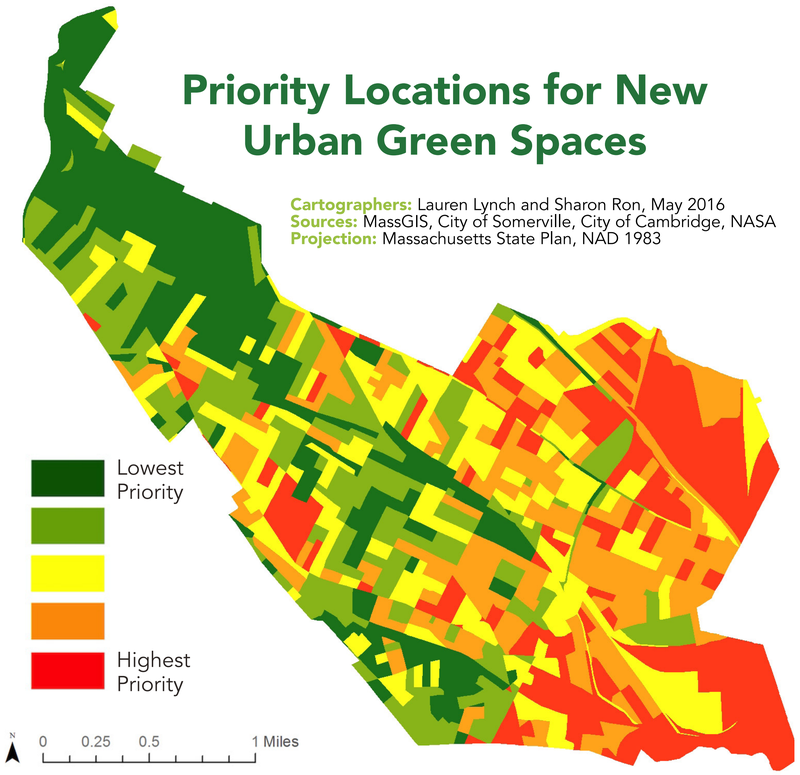
Tufts UNIVERSITY

BACKGROUND

Across the country, recognition is growing of the important role that urban parks and green spaces play in promoting environmental health and community well-being. From serving as spaces that bring people together, build community and provide environmental and health benefits such as purifying the air we breathe and filtering pollutants from contaminated stormwater, public parks and green spaces play a vital role in improving urban livability (Wolch, 2014).

In 2012, the City of Somerville, Massachusetts released their first ever long term comprehensive plan: SomerVision 2010-2030. Among the array of goals outlined in the plan, residents expressed a strong desire to see increased investment in environmental restoration and the improvement of access to, and maintenance of, the City's public green and open spaces. Presently, Somerville has approximately 2.28 acres of open space per 1000 people which, when compared with the neighboring towns of Cambridge (with 7.28 acres/1000 people) and Medford (with 33.75 acres/1000 people) is quite low (City of Somerville, 2011). As a part of the SomerVision plan, the City set forth an ambitious goal of increasing open space by 125 acres by 2030.

This project, completed as part of a 2016 UEP Field Project supporting Groundwork Somerville, aims to assess and prioritize locations within the City of Somerville where the development of new public green spaces will have the largest social, environmental and public health impacts. After consulting the literature on best practices for prioritizing locations for urban greenspace development, we modeled our approach to this analysis off of a University of Vermont study, conducted in support of New York City's MillionTreesNYC tree planting and urban greening initiative (Locke, 2011). This project was conducted in collaboration with Sharon Ron.



SOURCES

Akbari, H., Pomerantz, M., & Taha, H. (2001). Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas. Solar Energy, 70(3), 295–310.

City of Somerville, MA. SomerVision Comprehensive Plan 2010-2030. Adopted April 19, 2012.

City of Somerville Office of Strategic Planning and Community Development, MA. (2011). Trends in Somerville: Land Use Technical Report.

La Rosa, D. (2014). Accessibility to greenspaces: GIS based indicators for sustainable planning in a dense urban context. Ecological Indicators, 42, 122–134.

Locke, D. H., Grove, M., Lu, J. W. T., Troy, A., O'Neil-Dunne, J. P. M., & Beck, B. D. (2010). Cities and the Environment. Cities and the Environment, 3(1).

McPhearson, T., Kremer, P., & Hamstead, Z. A. (2013). Mapping ecosystem services in New York City: Applying a social–ecological approach in urban vacant land. Ecosystem Services, 5, 11–26.

Thrall, G. I., Swanson, B., & Nozzi, D. (1988). Green-space Acquisition Ranking Program (GARP): A computer-assisted decision strategy. Computers, Environment and Urban Systems, 12(3), 161–184.
Planning, 125, 234–244.

The United States Environmental Protection Agency. "What is Green Infrastructure?" Retrieved April 7, 2016. https://www.epa.gov/green-infrastructure/what-green-infrastructure

Wolch, J. R., Byrne, J., & Newell, J. P. (2014). Urban green space, public health, and environmental justice: The challenge of making cities "just green enough." Landscape and Urban

Photo Credits: (Top) Quincy Street Open Space, Lauren Lynch; (Middle) Groundwork Somerville South Street Farm, Sharon Ron; (Bottom) Groundwork Somerville South Street Farm, Sharon Ron

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LAUREN LYNCH, URBAN AND ENVIRONMENTAL POLICY AND PLANNING, INTRO TO GIS 2016

METHODS

Data for each of the variables included in this analysis was first collected from MassGIS, the US Census Bureau, the cities of Somerville and Cambridge, and NASA. All datasets were then clipped to the Somerville Town census boundary. The only exception to this was the open space data, which was analyzed up to 1/4 mile outside of the town boundary. While nearly all of the datasets were already projected in Massachusetts State Plane (meters), the 311 call data needed to be georeferenced using latitude and longitude, before being projected.

After all of the datasets had been processed, we joined each dataset to the Somerville 2010 census blocks in order to generate recommendations at a scale that could later be ground truthed. Specific tools used to aggregate data at the block level included zonal statistics for raster data, and spatial joins, intersections and dissolves for vector data. Once the data for each variable had been joined to the census blocks we used summary statistics to calculate the mean and standard deviation for each variable. We then used the field calculator to calculate z-scores for each census block, for each variable, so that we could compare performance on each measure across all census blocks in Somerville. Z-scores for open space access were then multiplied by -1, to account for the fact that a high z-score for this measure indicates a low priority for urban greening. Z-scores for all variables were then added together to generate composite scores for each census block, which are shown in the map to the left. Per the council of our client, Groundwork Somerville, the composite scores were left unweighted. The final results were then categorized into quantiles. The blocks that emerged as the "highest priorities" for urban greening initiatives in Somerville are shown in red.

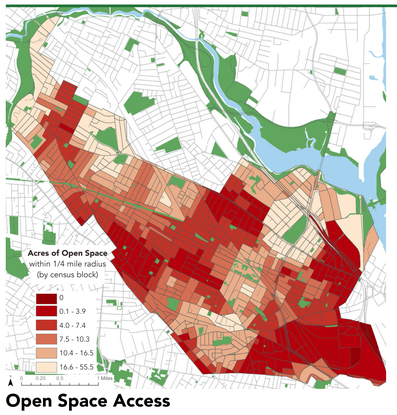
LIMITATIONS

The selection of variables included in this model was based off of a review of similar research. However, this study presents a limited and simplified analysis of urban green space access in Somerville. Additionally, some of the datasets are subject to error and imprecision. For example, the MassGIS Impervious Surfaces dataset has an issue with the orthoimage, resulting an a false north-south division in the center of the City. The 311 call data may include calls that are only tangentially related to flood issues, and represents a limited period of time, from July 2015 - March 2016. As a result of these limitations, our team chose to ground truth our findings to verify the results.

RESULTS

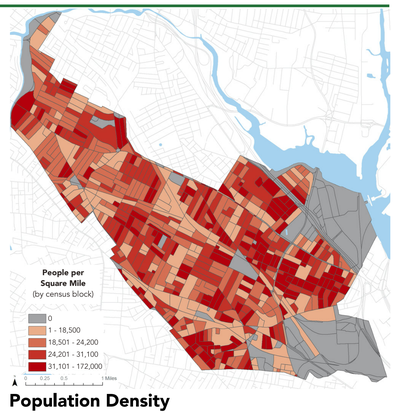
While the "highest priority" blocks are distributed throughout the City, there is a clear concentration of priority blocks in the northeastern and southeastern portions of Somerville. Following the production of this map, our UEP Field Projects team conducted preliminary ground truthing in these areas to investigate possible parcels for greening. For more information visit http://ase.tufts.edu/uep/Degrees/FieldProjects.aspx to read the full report.

SOCIAL VARIABLES



Open Space Access

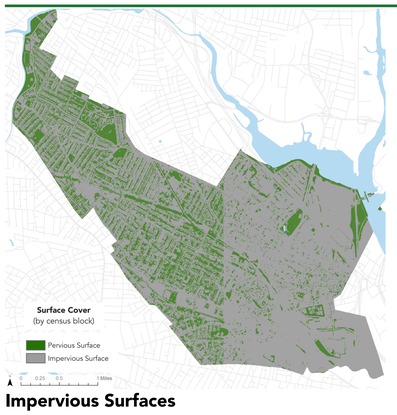
This variable was measured as the amount of public open space within walking distance (1/4 mile radius) of the center of each census block. This measure was included in order to determine which parts of Somerville are currently the most "park and open-space poor."



Population Density

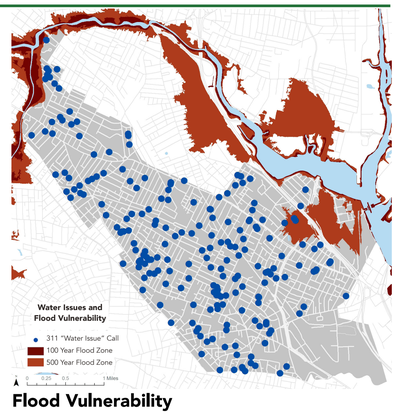
This indicator was included so that our analysis prioritized areas of Somerville where the most people would be impacted by the addition of new public green spaces.

ENVIRONMENTAL VARIABLES



Impervious Surfaces

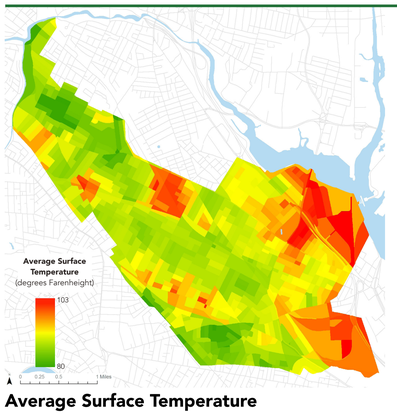
Somerville has a high level of impervious surface cover, at ~77% of the total land area. The addition of new pervious green spaces has been demonstrated to improve stormwater management (EPA, 2016). Our analysis aimed to target census blocks with the highest percent of impervious surface cover.



Flood Vulnerability

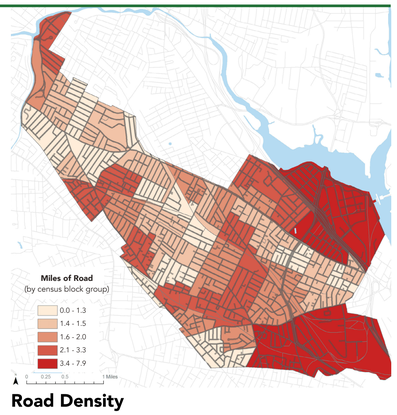
We included data about the location of FEMA flood zones as a measure of natural flood vulnerability. 311 "water issue" call data was added to the analysis to provide supplemental information about where stormwater infrastructure may be failing.

PUBLIC HEALTH VARIABLES



Average Surface Temperature

Urban heat island effect is a well documented phenomenon characterized by unusually high temperatures in densely developed, urban areas. Green infrastructure can help to reduce urban heat islands by providing shade and releasing moisture through transpiration (EPA, 2016).



Road Density

Road density was included in this analysis as a surrogate measure of air pollution. Green infrastructure can be an effective tool for removing air pollutants and reducing ambient air temperature (Akbari, 2001).