

Veggies on the way home

A model for siting a new farmers' market in Somerville, Massachusetts

Background

Recent research (Khan et al. 2009) and a USDA report (2010) identified farmers' markets as one tool to increase access to healthy foods for communities because of their flexibility to fit in where needed. Data collected by the Massachusetts Department of Agricultural Resources shows four farmers' markets within Somerville, Massachusetts city limits.



Farmers' markets supply fresh fruits and vegetables to people in urban areas, who need better access to healthy foods. People are more likely to visit markets which are convenient for them, either because they live or work nearby. People only want to walk so far to reach a market and to carry their purchases home. For this project, a comfortable walking distance is assumed to be around 500 meters. Farmers' markets may also compete with each other for consumers, so markets should be located far apart to both give access to a new part of the community and prevent undue competition.

Methods

This model calculates a theoretical site suitability score by calculating suitability in four subcategories: proximity to other markets, the number of people living within 500 meters, the number of people working within 500 meters, and current land use designation.

Market competition is modeled with a raster of distance from the nearest existing market. Population who would gain access is modeled by both estimates of residential population density by blocks and workplace population density by block groups. The American Community Survey (ACS) workplace population data lacks some granularity but does provide important information about a group of people who would realistically shop at farmers' markets. Additionally, land use is an important consideration for where a market would have enough space to set up once or more per week. Each subcategory was assigned a score as follows:

Subscore	Neutral	Good	Better	Best
Distance from nearest market	200-500m	500-700m	700-900m	>900m
Residential population	0-3000 people	3000-7000 people	7000-12000 people	>12000 people
Worker population	0-2000 people	2000-4000 people	4000-6000 people	>6000 people
Land use designation	Commercial	Open land, participation recreation	Spectator recreation (fairgrounds, etc)	Urban open

These subscores were combined, with the workplace and residential population density scores added together and weighted half each compared to the other parameters, in order to produce a final score.

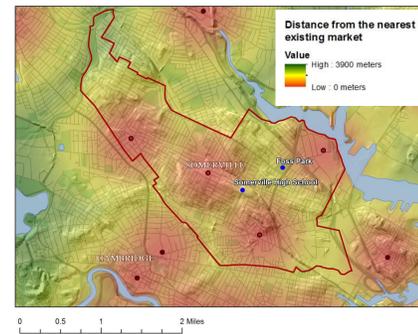
All maps use a State Plane Massachusetts Mainland FIPS 2001 projection

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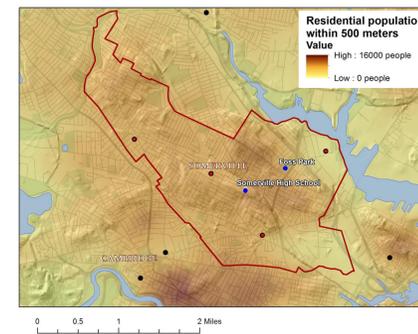
Map Data Sources:

MassDOT Roads, June 2014, Mass Department of Transportation; published by MassGIS, accessed April 2016 at <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/eotroads.html>
 Town boundaries, February 2014, Mass Department of Public Works, published by MassGIS, accessed April 2016 at <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/towns.html>
 MassDEP Hydrography, March 2010, US Geological Survey, published by MassGIS, accessed April 2016 at <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/hydro.html>
 National Elevation Dataset, May 2015, US Geological Survey, accessed April 2016 at <http://nationalmap.gov/elevation.html>

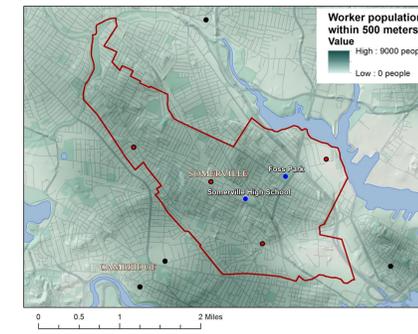
Results



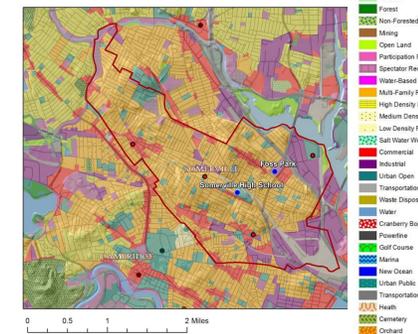
A rasterization of distance from the nearest existing farmers' market shows that Foss Park is roughly 860 meters from the nearest farmers' market, while Somerville High School is around 720 meters from the nearest farmers' market.



A rasterization of residential population from census data shows that Foss Park has roughly 6180 residents within 500 meters, while Somerville High School has roughly 7685 residents within 500 meters.



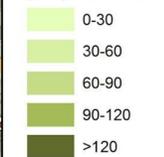
A rasterization of worker population from ACS data shows a similar pattern to residential population, but with lower numbers throughout Somerville. Foss Park has roughly 3224 workers within 500 meters and Somerville High School has roughly 4184 workers within 500 meters.



The Land Use classification shows that Foss Park is located in an area designated Participation Recreation, while Somerville High School is located in Urban Public space.



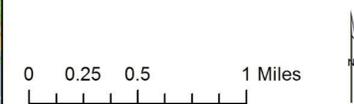
Population density by census block people/hectare



Suitability for a new market



Current farmers' markets' parameters:
 Davis Square Market: within walking distance of 4187 workers, 5712 residents
 Highland Avenue Market: within walking distance of 3972 workers, 6709 residents
 Union Square Market: within walking distance of 3362 workers, 5369 residents
 Assembly Row Market: within walking distance of 135 workers, <10 residents



Conclusions

This model produces a number of potential sites within Somerville, and this analysis should only be the start of assessing locations for a new market.

The ACS workplace data is at the block group level, which makes a raster based on it less reliable. It also has margins of error that are often a third to half as large as the estimate itself, indicating less reliability.

This model may be optimistic since it assumes that all of the spaces in the land use categories above are still classified as such over 15 years later and could be convinced to allow a market to set up once or more a week.

For example, I chose to compare the suitability of two locations at Foss Park and Somerville High School for a new market. Though the score of SHS is higher, the space likely has a very limited number of days that it could be used for a market, if at all.

However, the model predicts good success for 3 out of 4 existing markets, which may help validate it to some degree. The Assembly Row market has extremely low populations around it, which this model predicts would be bad for business.

Sources:

Khan LK, Sobush K, Keener D, Goodman K, Lowry A, Kakietek J, et al. Recommended community strategies and measurements to prevent obesity in the United States. MMWR Recomm Rep 2009;58(RR-7):1-26.
 Strategic plan FY 2010-2015. Washington (DC): US Department of Agriculture, Office of the Chief Financial Officer; 2010. <http://www.ocio.usda.gov/usdasps/sp2010/sp2010.pdf>.
 Image: Culler, Caroline. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Copley_Square_Farmer's_Market.jpg