# Analyzing Site Suitability for School-based Community Gardens in Worcester, MA

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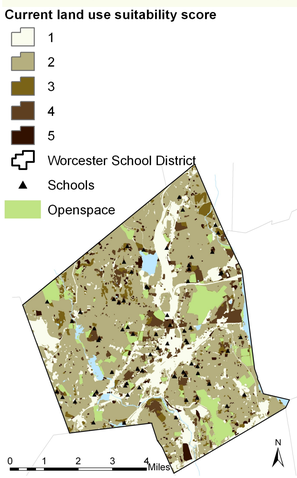
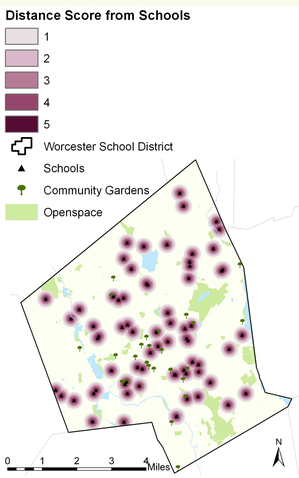
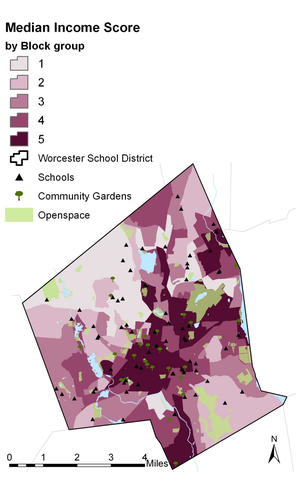
Data from the City of Worcester, the US Census, and MassGIS

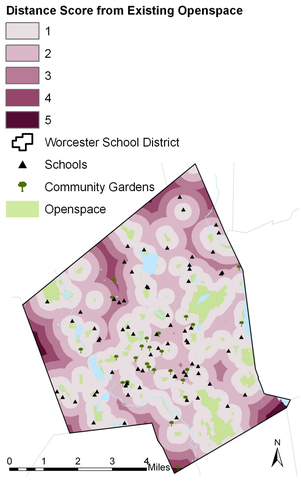
## Introduction

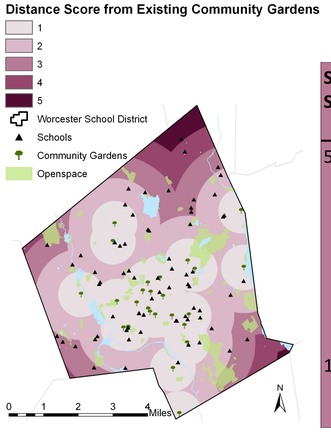
Community gardens have become a familiar concept in many cities in the United States, as they bring benefits to communities through food security, community building, and opportunities for recreation and hands-on learning. These advantages can be especially beneficial to students, and the development of community gardens in association with local schools can increase the likelihood that they will establish positive relationships with food, nature, and community from a young age. Worcester, MA, a city with comparatively little access to green space and a large low-income population, has much to gain from the creation of school programs including community gardens. In this project I display the beginning steps for analyzing site suitability for a new school-based community garden in a low-income area. Using GIS techniques, I present methods for determining desirable sites that can be adapted for use in community planning.

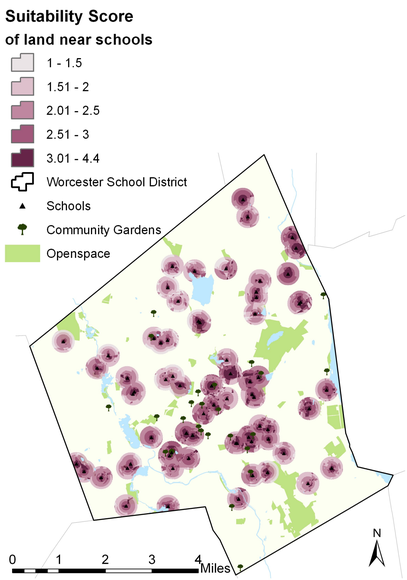


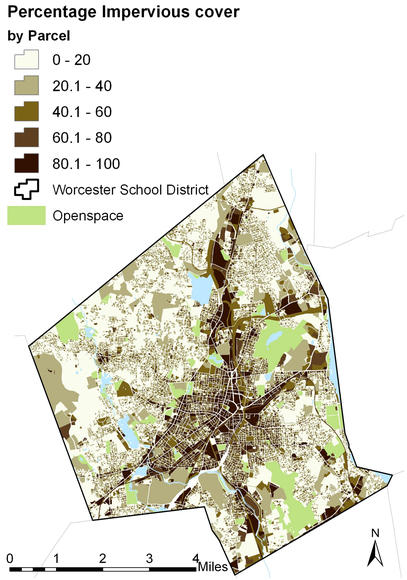




## Variables

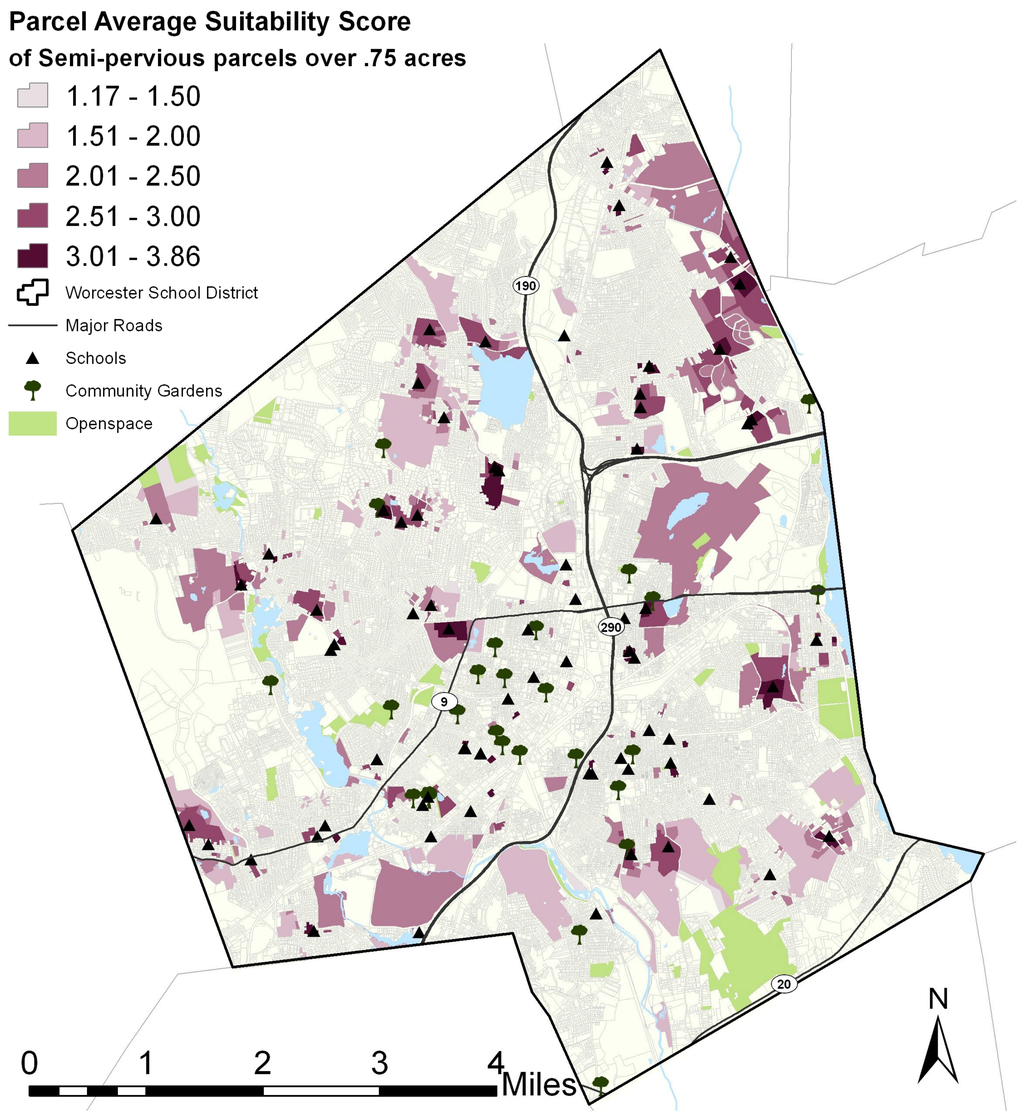
In order to determine which parcels of land would be most suitable, I first determined the characteristics of a location that would be necessary and desirable. Land suitability, based on current land use, is the first technical factor that would need to be determined to assess the feasibility of a new community garden. For this project I also wanted to consider the income level of the surrounding neighborhoods to favor areas with low-income families in order to increase accessibility to inexpensive, healthy food. Since the garden would be school-based, distance to the nearest school is of specific importance. Additionally, in order to increase equity in the distribution of environmental resources, I include distances from existing openspaces and existing community gardens to favor areas where the population may not otherwise be able to easily reach these types of spaces.

Additional to these variables affecting site desirability, impervious cover and the size of the lot were determining factors that ruled out unusable parcels once parcel suitability was determined.

## Methodology and Results

To combine initial site characteristics to create a measure of site suitability, I used the overlay practice in GIS, which allows the user to assign scores to variables and then weight them to compute a total suitability score. Each variable was given a discrete score between 1 and 5, with 5 representing the most suitable value (the table below shows values to which each score was assigned). These scores were attached to each 10X10 meter cell of land. The five smaller maps show the spatial distribution of scores for each of the initial variables.

| Suitability Score | Mean Income (dollars) | Distance from nearest school (miles) | Distance from nearest openspace (miles) | Distance from nearest community garden (miles) | Land use |
|---|---|---|---|---|---|
| 5 (Most) | 8,820 - 28,300 | 0 - 0.05 | 0.941 - 1.17 | 2.63 - 3.29 | Open Land, Very Low Density Residential |
| 4 | 28,400 - 41,100 | 0.049 - 0.1 | 0.701 - 0.94 | 1.98 - 2.63 | Pasture, Urban Public, Institutional, Cropland, Nursery |
| 3 | 41,200 - 47,200 | 0.099 - 0.15 | 0.471 - 0.70 | 1.32 - 1.97 | Low Density Residential, Golf Course, Participation Recreation, Transitional, Brushland, Successional |
| 2 | 47,300 - 55,500 | 0.149 - 0.2 | 0.231 - 0.47 | 0.66 - 1.32 | Multi-Family Residential, Forest, High Density Residential, Medium Density Residential, Cemetery |
| 1 (Least) | 55,600 - 91,800 | 0.199 - 0.25 | 0 - 0.23 | 0 - 0.66 | Commercial, Non-Forested Wetland, Forested Wetland, Transportation, Industrial, Water, Water-Based Recreation, Powerline, Utility, Junkyard, Waste Disposal, Marina |




Next I weighted each of these variables to calculate a score of suitability for the land, with the school variable restricting all suitable land to within one quarter mile of a school. The results of this calculation are shown in the map of suitability scores of land near schools in the center panel.

For the final suitability calculation these suitable lands are then constrained to parcels with sufficiently low percentage of impervious cover to allow for infiltration of water from the garden. The second map in the center shows percentage of impervious cover by parcel.

Using the suitability scores calculated for land in Worcester, I then calculated the average score of each parcel. I constrained the results to only show parcels with less than half impervious land cover, and lot sizes over .75 acres. This produced the final map of parcel average suitability score, shown above.

## Recommendations

The final map shows possible lots for the creation of a school-based community garden, ranked by average suitability score of the parcel. These results are dependent on the valuation of variables that I decided on, and accuracy is limited by the age and validity of the data used. I propose that these methods be employed by communities using greater knowledge of local realities and input from community members, parents, and students, to determine important variables and produce meaningful and useful results.