Walk to the Water | assessing the equity of non-motorized access to the Mystic River Watershed

Introduction

Access to green or open space is widely considered an important component of quality of life. Such access has known connections to improved physical and mental health, a greater sense of community, as well as improved property values and other economic benefits. Many studies have been done on the topic as it relates to parks and park equity, but an area's waters are less commonly seen through this lens. The Mystic River Watershed, which is made up of the Mystic River, the Chelsea River, the Middlesex Fells Reservation and many other lakes and ponds, has a great potential to play a similar role in the lives of area residents. Whether as a place for recreation and socialization or simply as a place to form a connection with the natural world, the Watershed is a resource that many residents could find use for. The ability to use this resource is, of course, limited by the presence of available and accessible open space around the Watershed's water bodies. This project aims to map existing access to the Mystic River Watershed, particularly non-motorized access, and analyze the equity of this access based on area demographics.

Figure 1. The Mystic River Watershed's location in the Boston metropolitan area

Methods

This project consisted of two parts: 1) a network analysis to find the service area for non-motorized access and 2) a demographics and land use analysis of the area.

The network analysis was conducted by compiling the coordinates of Watershed 'access points' from the Mystic River Watershed website, GoogleMaps, and getlatlon.com. These 'access points' were points where the street network connected with the path of a waterfront park or conservation area. A highways layer was prepared from the MassGIS roads layer by separating roads of a class 3 or lower. A multimodal network dataset was created from the roads, bike paths, and highways layers, and a service area was found for distances of 400, 800, and 1600 meters from this dataset. To take into account the obstacle that highways pose to non-motorized travel, the highway layer was used as a line barrier. The resulting service area represents distances of about one quarter, one half, and one mile on paths accessible to pedestrians and cyclists. The service area was placed over a one mile Euclidean buffer around the same access points.

The demographics of the area were analyzed using 2010 Census SF1 data and 2011 5-year estimates from the American Community

Network Analysis

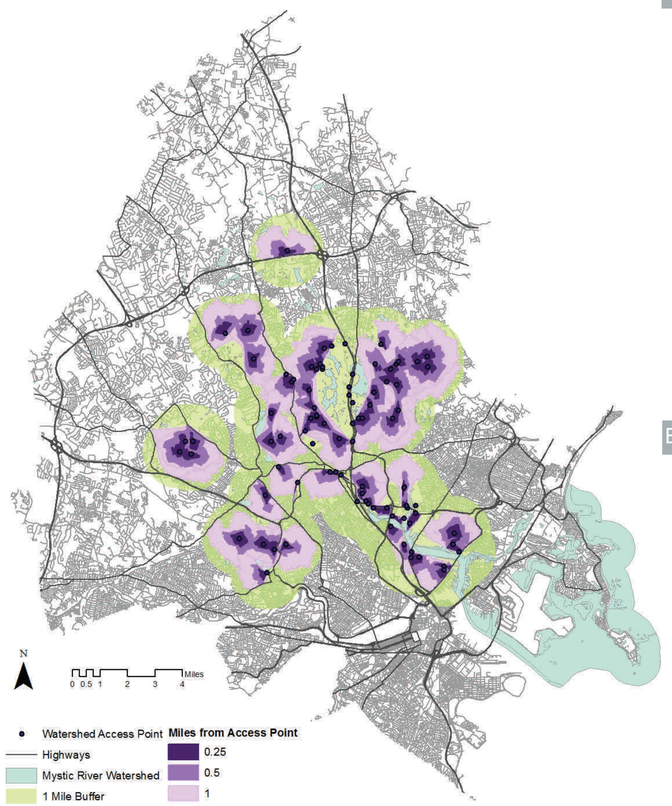

Figure 2. Network and Euclidean distance from Mystic River Watershed access points

Survey. After being downloaded from American FactFinder, the data tables were prepared for ArcMap in Excel and joined to TIGER census tract geometry of the Watershed area. Land use data was downloaded from MassGIS, and a layer for 'Undesirable Land Uses' was created by extracting Industrial, Junkyard and Waste Disposal land uses. By overlaying the service area onto the chloropleth maps of these datasets, the relationship between access and demographics reveals itself.

Analysis

When analyzing the resulting maps, it is important to note the difference between proximity to water and proximity to accessible developed waterfront. Proximity to water, by itself, has little correlation to demographics. However, a coherent pattern appears between area demographics and distance from accessible waterfront open space. The most noticeable correlation is visible in Fig. 5. Chelsea and East Boston have a high Hispanic population and are located on the Chelsea River. However, this waterfront contains no access points. The majority of the access points are located along the Mystic River or around the Middlesex Fells Conservation. This is not surprising, considering these are two of the largest features in the Watershed. Furthermore, access to the closest waterfront parks, which extends to a portion of these neighborhoods on the Euclidean distance buffer, is cut off by a highway in the network service area. An explanation for the lack of accessible waterfront in this area can be found in the presence of undesirable land uses along the Chelsea River. This area appears to still be under the influence of industrial land use.

A similar pattern exists in the distribution of racial minorities and poverty. The presence of these two groups has a positive correlation with network distance from access points. Areas with a higher percentage of minorities or where families have experienced an income level below the poverty line within the last twelve months were more likely to be living out of range of the Watershed's accessible waters.

Overall, the majority of the Watershed's existing access points are found in areas with fewer minorities and less poverty. The service area for these points is often cut short by highways, leaving fewer neighborhoods with walking access. The neighborhoods that are isolated from access points by highways, in several cases, have a high percentage of either racial or ethnic minorities or those with very low-income. This illustrates the impedance that highways play in access to the Mystic River Watershed and the equity issue that arise from it.

Demographic and Land Use Analysis

Racial Minorities

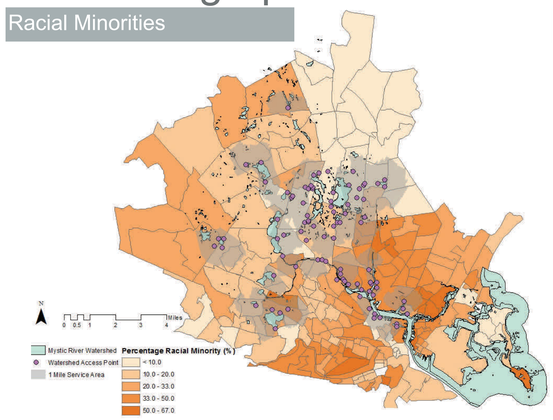

Figure. 3 Percentage of total population a racial minority

Income Below Poverty Line

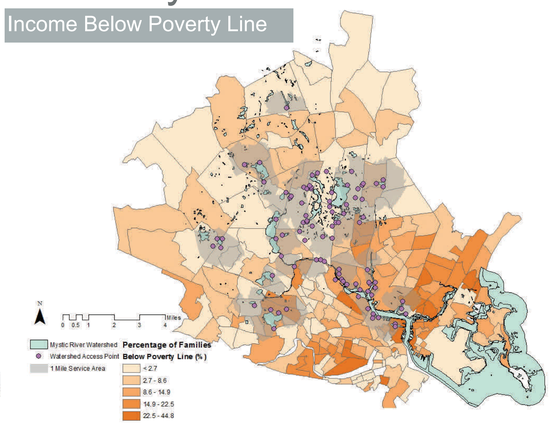

Figure 4. Percentage of all families with an income below the poverty line within the last 12 months

Ethnic Minorities—Hispanic

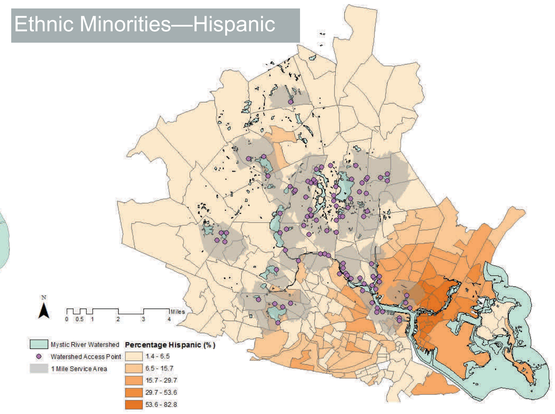

Figure 5. Percentage of total population Hispanic

Undesirable Land Uses

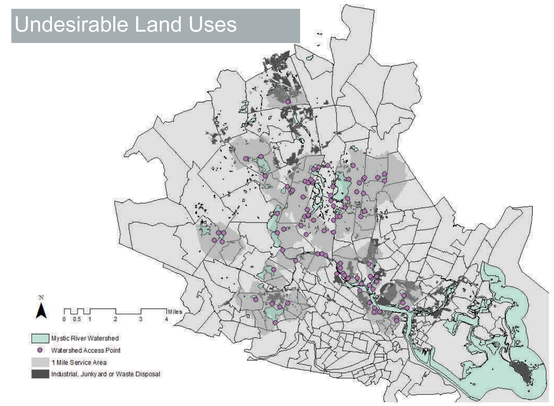

Figure 6. Location of industrial, junkyard or waste disposal land uses

Limitations

One challenge this project presented was finding accurate and complete data for the access points layer. The methods used for collecting this layer reflects, to a certain extent, the information generally available to the public. However, these sources could easily be incomplete or overly optimistic, so a more thorough evaluation of this layer could increase the accuracy of this analysis. Along the same lines, using larger roads as a line barrier may have modeled the impedance incompletely if certain roads classified higher than class 3 - for example, major arterials - are similarly difficult or intimidating to navigate or cross. A more in-depth analysis could evaluate on-street bike infrastructure as a component of the network analysis as well. Further research could also take into account other demographics that often relate to environmental justice populations, such as language exclusion.

Cartographer: Hannah Reckhow

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Class: GIS 101

Data Source: MassGIS, census.gov, MyRW.org, Google Maps, getlatlon.com

Projection: NAD 1983 StatePlane Massachusetts (Lambert Conformal Conic)

References: "The Benefits of Parks" San Francisco: The Trust for Public Land, 2006.