An Accessibility Analysis for the Disabled Population

District of Columbia

INTRODUCTION

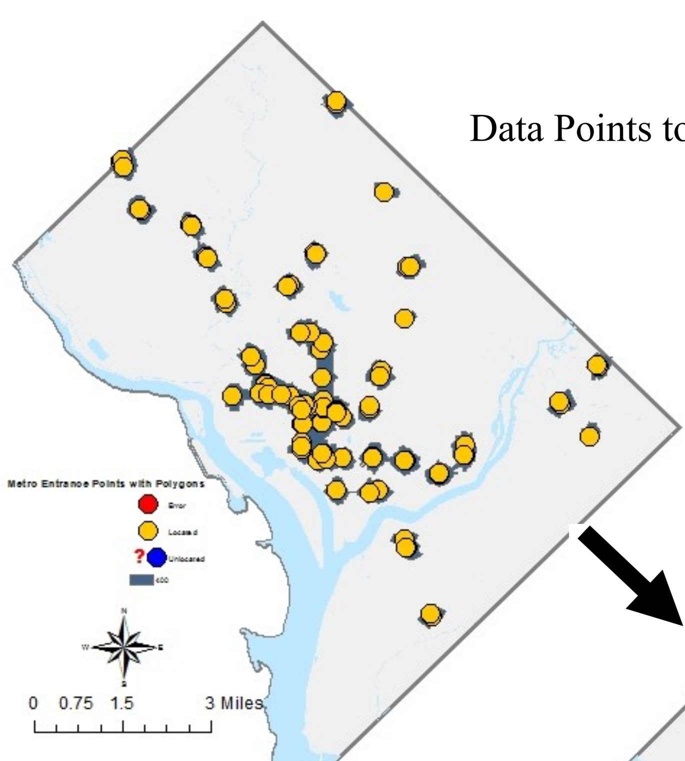
Since the passage of the Americans with Disabilities Act in 1990, federal law mandates handicap accessible options in public spaces ranging from curb cuts, ramps, elevators, automatic doors, and the like. Beyond the implementation of technical changes, a major part of increasing the ease of everyday tasks for disabled people is increased proximity of important community destinations and transportation options to the home. These community destinations include any places that deliver a necessary service or good to ensure health and quality of life spanning from pharmacies to grocery stores to libraries and beyond.

This accessibility analysis uses Gabe Holbrow's methodology for Walkability scores to understand the proximity of community destinations in Washington D.C.. Disability data from census tracts is compared to walkability scores in order to see if disabled people generally live in areas of high proximity to locations of daily importance.

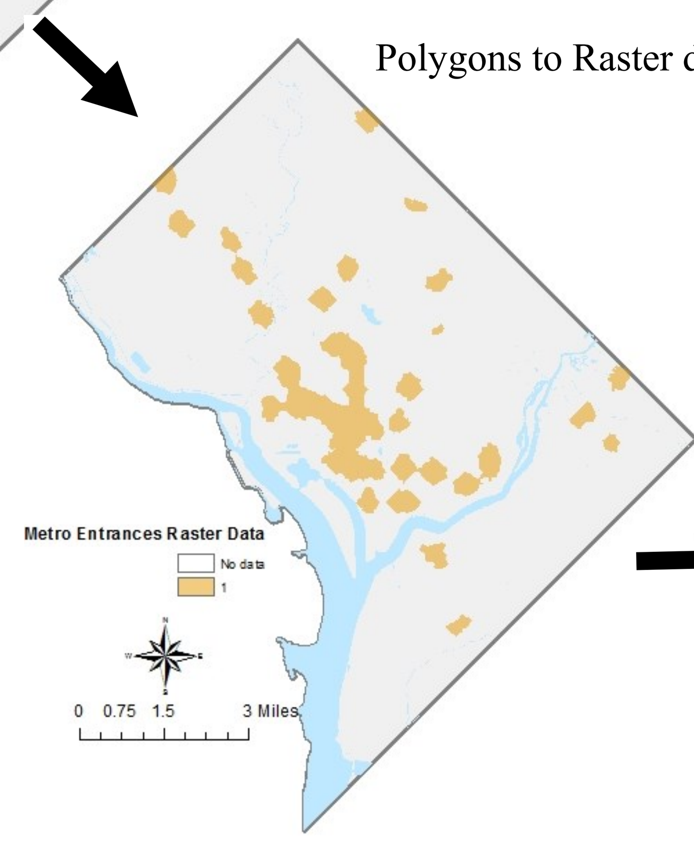
Spatial Questions:

1. What are the most accessible areas of Washington D.C.?
2. What percentage of D.C.'s disabled population lives in areas with low accessibility?

Data Points to Polygons



Polygons to Raster data



Community destination	Buffer Distance (m)	Weight
Bus Stops	400	0.15
Grocery Stores	400	0.15
Libraries	800	0.1
Metro Station Entrances	400	0.15
Pharmacies	400	0.1
Places of Worship	800	0.1
Post Offices	800	0.05
Public Schools	800	0.1
Shopping Centers	800	0.05
Universities	800	0.1

SOURCES

Cartographer: Christine Gregory

GIS 101, December 2014

Coordinate system: NAD_1983_2011_StatePlane_Maryland_FIPS_1900 (meters)

Data from the DC Clearinghouse and US Census Bureau

Holbrow, Gabe. "Walking the Network: A Novel Methodology for Measuring Walkability Using Distance to Destinations Along a Network". 2010.

Wolber, Rachael. "Silicon Valley on Foot: Mapping Walkability in Santa Clara County, California". 2011.

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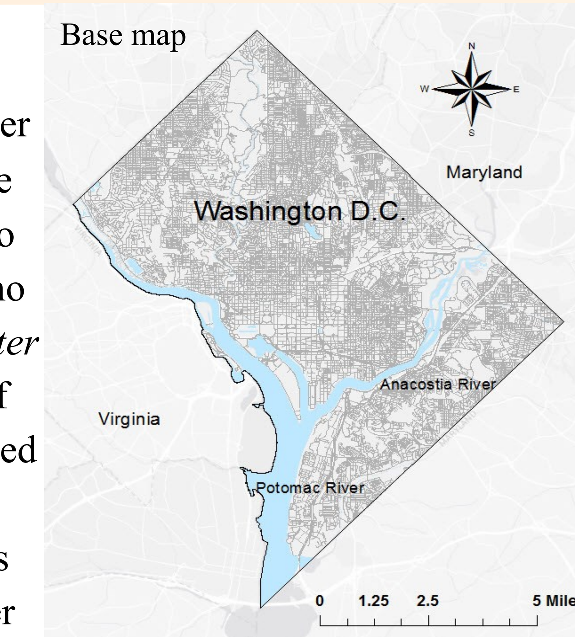
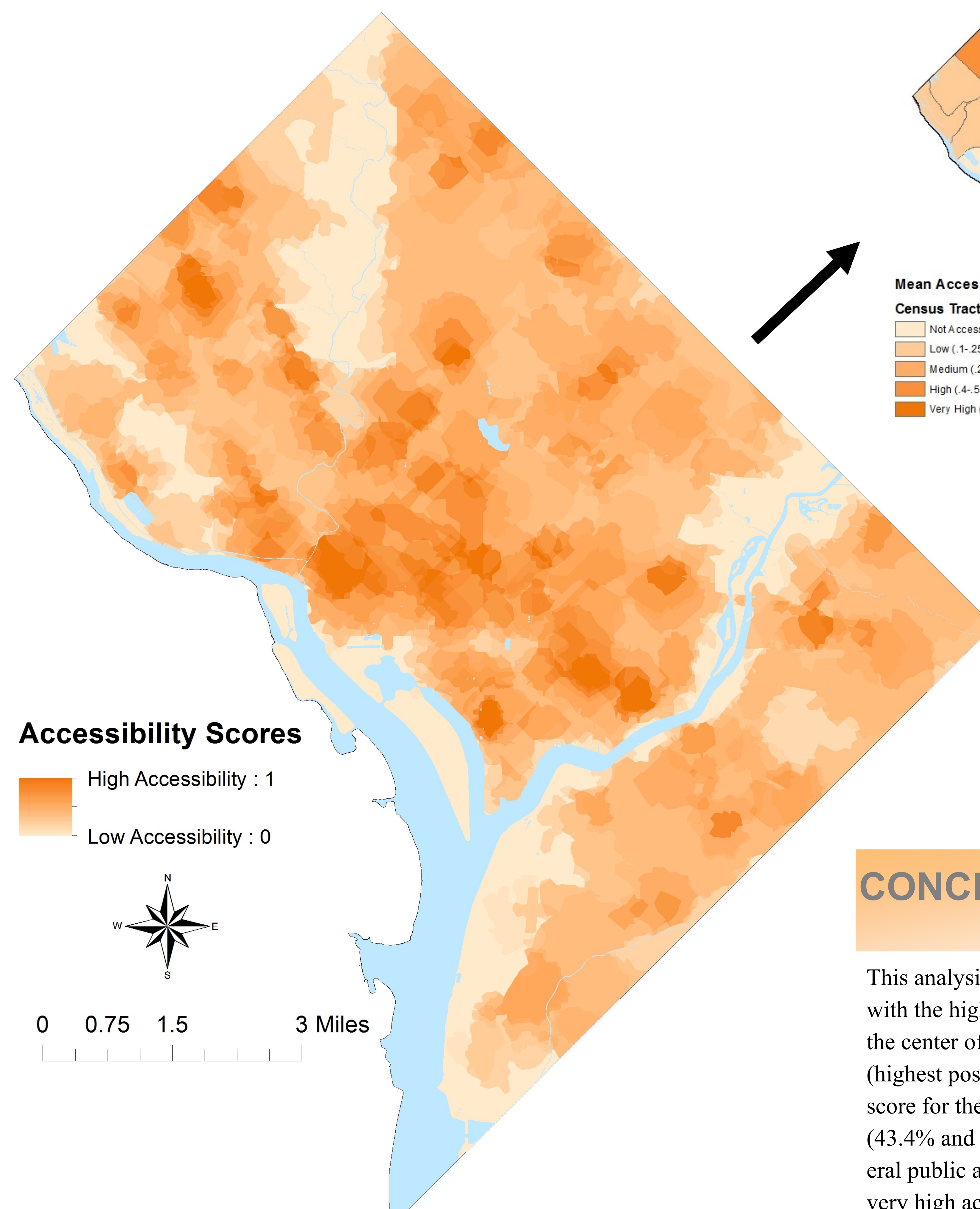
METHODOLOGY

In order to evaluate accessibility of the DC metropolitan area, the Network and Spatial Analyst were used to convert data points to polygons to raster data and then to an accessibility assessment. The methodology includes:

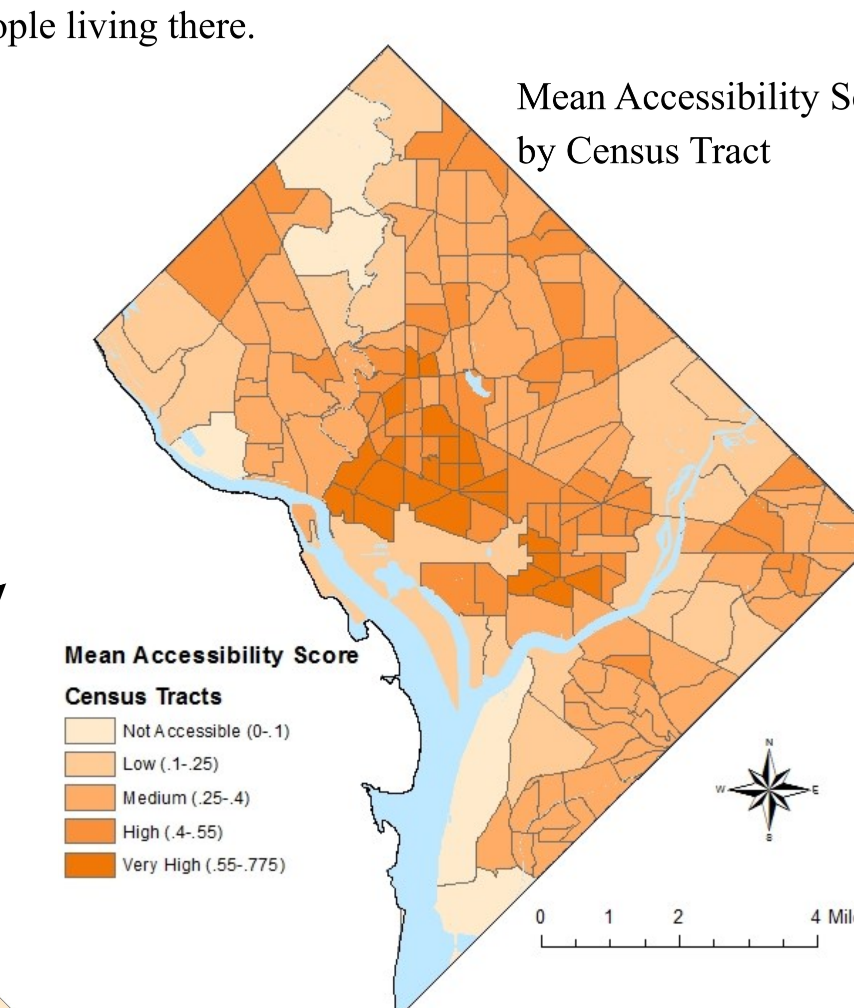
1. **Data Preparation:** Data layers were clipped and projected to the appropriate coordinate system. Walkable streets were selected by the *Select by Attribute* tool which allows Interstates, Expressways, Parkways, and Loops to be excluded. Lastly, a *Network Dataset* was created for the street centerlines.
2. **Network Analyst Service Area Function:** A *Service Area* analysis was performed by uploading a data point layer to the Service Area Facilities tab. 400 or 800 meters were chosen as buffer distances to walk depending upon the importance of the point. Make sure to highlight "Merge by Break Value" under Properties before running the Service Area function. After performing the analysis, the resulting polygon was exported as a data layer and the previous steps were repeated for the remaining data points.
3. **Conversion of Polygons to Raster Data:** Using the *Raster Creation Tool* under Service Analyst, polygons were converted to raster data with a cell size of 5. The raster files were then exported as data layers.
4. **Creation of Walkability Analysis:** The *Reclassify Tool* under 3D Analyst tools was used to set the value within each raster file equal to 1. The area outside the raster with no data was set equal to zero. The *Raster Calculator* then added the values of the raster files which can be weighted depending upon the importance of their accessibility in daily life. This resulted in one conglomerated raster file, the accessibility assessment.
5. **Application to Census Tracts:** Using the *Zonal Statistics* function, mean accessibility was calculated per census tract. By joining the zonal statistics table to the pre-joined disability to census tracts layer, the mean accessibility score per census tract could easily be compared to disability data. The Statistics tool was used to calculate data in the table below to see if a correlation existed between the accessibility of a tract and the number of disabled people living there.

Base map





Mean Accessibility Score by Census Tract



Accessibility Score (0=lowest, 1=highest) (per Census Tract)	Number of Residents (per Census Tract)	Percent of DC population	Number of Residents with a Disability (per Census Tract)	Percent of DC Disabled Population
Not Accessible (0-.1)	17,943	3	1,566	2.3
Low (.1-.25)	68,190	11.5	9,536	14.2
Medium (.25-.4)	258,393	43.4	32,335	48.1
High (.4-.55)	168,271	28.3	17,810	26.5
Very High (.5-.775)	82,145	13.8	6,039	8.8
Total	594,942	100	67,286	100

CONCLUSIONS

This analysis indicates that the areas in Washington D.C. with the highest mean accessibility score are located in the center of the city. No tract scored higher than .775 (highest possible being 1). The most typical accessibility score for the general and disabled population is Medium (43.4% and 48.1% respectively). Only 13.8% of the general public and 8.8% of disabled people live in areas of very high accessibility. In response to the initial spatial questions, about 16.5% of the disabled population of D.C. lives in census tracts with either low or not accessible scores. This is a slight increase from the general population with 14.5% living in areas of low accessibility. The most accessible areas of a city, typically the center where many destination layers overlap, are often the most expensive places to live. Because of limited ability to work, disabled people often can not afford to live in areas with high accessibility. The minimal difference between the percentage of the general and disabled population living in areas with low accessibility scores is a positive sign.

This analysis is limited in that there are many other factors including smaller, more technical functions like curb cuts, beeping crosswalks, automatic doors, and pavement types that significantly impact accessibility for disabled people. The proximity of one destination to the next is important in minimizing travel time for people with limited mobility, but it is not an all encompassing assessment of accessibility.