

An Analysis of Urban Green Space in Cuyahoga County, Ohio

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Executive Summary

Urban green spaces perform many important functions for humanity. In urbanized areas, parks remain the only natural asset and provide important environmental services. Such green spaces provide valuable ecological and social benefits for the community including storm water management, recreation, and an escape from the built city. This study investigates the state of urban green spaces in Cuyahoga County, Ohio. Using GIS, green space adequacy was measured in terms of land area and population served. Furthermore, a comprehensive list of amenities at the County's municipal parks was created. It was found that the County is home to over 31,000 acres of green space, accounting for almost 11% of the County's land area. Additionally, 42% of the County's population lives within walking distance of an urban green space.

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1. Introduction

Around the world, urbanization continues to transform our landscapes and diminish human interaction with natural ecosystems. The rate of this transformation has increased dramatically, with urban areas currently expanding on average twice as fast as their populations (Seto, Güneralp, & Hutya, 2012). By 2030, it is estimated that global urban land area will increase by 1.2 million square kilometers, tripling the amount of urban land present in the year 2000 (Seto et al., 2012). As this expansion continues, it is increasingly important to incorporate green spaces into the urban landscape. Such spaces provide valuable ecosystem services while improving the quality of life in urban environments (Cohen, Baudoin, Palibrk, Persyn, & Rhein, 2012).

Such services include providing permeable surfaces for groundwater recharge, heat island mitigation, and removal of aerosolized particulates, which contribute to a healthier population and overall better quality of life. Replacement of these services with human infrastructure would be costly and inefficient. Green spaces also remain one of few linkages to the historic character of the landscape. Preserving the landscape and biodiversity of a region is important for cultural appeal, and parks provide a safe haven and habitat for wildlife in an increasingly urbanized America.

Parks and other green spaces provide populations with recreation, education, and aesthetic appeal. Recreation includes both active and passive activities, such as walking, gardening, bird watching, and sports such as soccer, Frisbee, and catch. Schools throughout the country use green spaces to teach children about nature, ecological systems such as the water and nutrient cycles, and valuable skills such as navigation and farming. Additionally, urban green

spaces provide a change of scenery and a pleasing buffer zone between residential and commercialized or industrialized neighborhoods, providing aesthetic beauty and increasing housing values. With rapid expansion and urban sprawl, parks and other green spaces remain our last link to rural and pristine land, and will become even more important with continued development.

1.1 Types of Green Space

The urban built environment is home to a variety of green spaces. Urban green spaces exist on different scales and serve in different capacities. Small scale green spaces include street medians, bioswales, and green roofs. Green spaces such as these make up urban “green infrastructure,” and perform ecological functions such as storm water management (Stuart, Gardner-Andrews, Hansen, & Grumbles, 2013). Large scale urban green spaces usually exist as parks. While the word park is vernacular, it is quite difficult to define exactly what a park is. According to Lee Springgate, “there is no standard, widely accepted definition of a park” (Lewis & American Planning Association. Planning Advisory, 2008). In fact, even dictionaries cannot agree on a definition. Merriam-Webster defines a park in the following ways: “1a. an enclosed piece of ground stocked with game and held by royal prescription or grant; b. a tract of land that often includes lawns, woodland, and pasture attached to a country house and is used as a game preserve and for recreation; 2a. a piece of ground in or near a city or town kept for ornament and recreation; b. an area maintained in its natural state as a public property (Merriam-Webster, 2013). Dictionary.com meanwhile lists parks as: “1. An area of land, usually in a largely natural

state, for the enjoyment of the public, having facilities for rest and recreation, often owned, set apart, and managed by a city, state, or nation; 2. An enclosed area or a stadium used for sports; 3. A considerable extent of land forming the grounds of a country house” (Dictionary.com, 2013). In *From Recreation to Re-creation*, Lee Springgate proposes to identify parks through four criteria instead of placing upon them a single definition (Lewis & American Planning Association. Planning Advisory, 2008). In his words, a park: 1. is publicly accessible; 2. has identifiable boundaries; 3. contributes to overall community aesthetics; and 4. provides a community gathering place (Lewis & American Planning Association. Planning Advisory, 2008). These criteria allow us to unify the vast assortment of parks under a single umbrella. In order to classify the many types of parks, the National Recreation and Park Association developed the following definitions as part of their *Park, Recreation, Open Space and Greenway Guidelines*:

Classification	General Description	Location Criteria	Size Criteria
Mini-Park	Used to address limited, isolated or unique recreational needs	Less than a ¼ mile distance in residential setting	Between 2500 sq. ft. and one acre in size
Neighborhood Park	Neighborhood park remains the basic unit of the park system and serves as the recreational and social focus of the neighborhood. Focus is on informal active and passive recreation.	¼ to ½ mile distance and non-interrupted by non-residential roads and other physical barriers	5 acres is considered minimum size, 5 to 10 acres is optimal.
School-Park	Depending on circumstances, combining parks with school sites can fulfill the space requirements for other classes of parks, such as neighborhood, community, sports complex and special use.	Determined by location of school district property.	Variable-depends on function.
Community Park	Serves broader purpose than neighborhood park. Focus is on meeting community based recreation needs as well as preserving unique landscapes and open spaces.	Determined by the quality and suitability of the site. Usually serves two or more neighborhoods and ½ to 2 mile distance.	As needed to accommodate desired uses usually between 30 and 50 acres.
Large Urban Park	Large urban parks serve a broader purpose than community parks and are used when community and neighborhood parks are not adequate to serve the needs of the community. Focus is on meeting community based recreational needs as well as preserving unique landscapes and open spaces.	Determined by the quality and suitability of the site. Usually serves the entire community.	As needed to accommodate desired uses. Usually a minimum of 50 acres, with 75 or more acres being optimal.
Natural Resource Area	Lands set aside for preservation of significant natural resources, remnant landscapes, open space and visual aesthetics/buffering.	Resource availability and opportunity.	Variable
Greenways	Effectively tie park system components together to form a continuous park environment.	Resource availability and opportunity.	Variable
Sports Complex	Consolidates heavily programmed athletic fields and associated facilities to larger and fewer strategically located throughout the community.	Strategically located community-wide facilities.	Determined by projected demand. Usually a minimum of 25 acres with 40 to 80 acres being optimal.
Special Use	Covers a broad range of parks and recreation facilities oriented toward single-purpose use.	Variable-dependent on specific use.	Variable
Private Property	Parks and Recreation facilities that are privately owned yet contribute to the public park and recreation system.	Variable-dependent on specific use.	Variable

Table 1: *Park, Recreation, Open Space and Greenway Guidelines*, taken from (Mertes et al., 1995)

While the National Recreation and Park Association's classification is by no means exhaustible, it provides a basic framework for classifying parks around their size, use, and design.

1.2 *Benefits of Green Spaces*

As urbanization continues to spread around the globe, people are left with fewer and fewer natural settings (Cohen et al., 2012). An increasing body of evidence has shown that this decrease in green spaces is negatively impacting the urban way of life (Cohen et al., 2012). Urban green spaces provide convenient recreation opportunities for urban citizens who may otherwise have limited or no access to nature and nature-based recreation (Baur & Tynon, 2010). The presence of such spaces has been shown to provide psychological benefits, health benefits, improvement to urban biodiversity, and hydro-climactic regulation (Cohen et al., 2012). Baur and Tynon argue that “community parks have the capacity to contribute not only to the physical and mental well-being of urban dwellers but also have the capacity to contribute to social capital generation leading to a broader contribution to overall community well-being (Baur & Tynon, 2010). In general the benefits of urban green spaces can be classified as economic benefits, social benefits, and environmental benefits.

Estimating the economic value of urban green spaces is no easy feat. As public goods, urban green spaces are not consumed and have no marketable pricing scheme. The history of quantifying economic values of urban green spaces has a history as long as urban planning itself (Tajima, 2003). Frederic Law Olmsted, the father of landscape architecture and planner of New York’s Central Park and Boston’s Emerald Necklace, tracked the values of real estate surrounding Central Park during its construction (Leinberger & Berens, 1997).

He found that by 1864, when the park was only half-finished, it had begun generating net revenue of \$55,880. He also charted the average increase in property value in the three wards surrounding the park and in the city’s other wards. If the three wards around the park had increased in value 100 percent between 1856 and 1873, as did other wards throughout the city, in 1873 their appraised value would have been \$53 million; instead,

it was \$236 million. Although Olmsted's analysis was simple, the difference was striking (Leinberger & Berens, 1997).

Olmsted's exercise in hedonic pricing displayed one of the earliest and most valuable methods of calculating a park's value. This property value approach to the valuation of urban green spaces "assumes that the benefits associated with these amenities are capitalized into surrounding property prices" (Nicholls & Crompton, 2005). Capturing surrounding property values reflects the aggregate value of all locational advantages and disadvantages of a site, including both positive and negative externalities (Nicholls & Crompton, 2005). In this manner, home prices can provide a proxy measure of homeowners' willingness to pay for amenities such as urban green spaces, thus showing the green space's value (Nicholls & Crompton, 2005). While urban green spaces have been shown to increase surrounding property values, they also contribute directly to the economy. "Research has shown that such amenities help attract new residents, as well as leisure visitors and retirees, all of whom can have a substantial economic impact on the area" (Nicholls & Crompton, 2005). Indeed, "the availability of an attractive parks and recreation system can be a significant influence on the (re)location decisions" of many businesses (Nicholls & Crompton, 2005). A recent study has shown that more cities recognize the strategic advantage of providing urban amenities to attract skilled workers and firms, as major cities compete for these crucial resources (Tajima, 2003). The attractiveness of such parks can be seen with New York's Central Park and Chicago's Millennium Park, both of which are visited by millions of tourists annually.

Urban green spaces are also increasingly important for the many ecological services they provide. "These benefits vary over space and time according to changes in the urban environment, its inhabitants, and their needs. Some benefits are easily expressed in dollars or other values, while some are difficult to quantify using such measures but in the aggregate they

are highly significant to urbanites (Dwyer, McPherson, Schroeder, & Rowntree, 1992). Urban trees “can contribute to energy conservation because they help to reduce the cost of heating and cooling buildings. This is especially true in built urban environments, where the urban heat island effect is prevalent. Urban heat islands are considered to be one of the major problems in the 21st century posed to humankind as a result of urbanization (Rizwan, Dennis, & Liu, 2008). Heat produced by urban structures as they consume energy and solar radiation increases temperatures in urban areas, which leads to increased energy costs and in some cases severe health problems. (Rizwan et al., 2008). Urban green spaces are integral to the mitigation of this effect (Rizwan et al., 2008). Projections from computer simulations indicate that 100 million mature trees in U.S. cities (three trees for every other single family home) could reduce annual energy use by 30 billion kWh, saving about 2 billion dollars in energy costs (Dwyer et al., 1992). Trees are also useful in extracting from the air harmful particulates such as ozone, carbon monoxide, and sulfur dioxide (Dwyer et al., 1992). A study performed in Tucson, Arizona projected an annual implied value of particulate matter control per tree of \$4.16 (Dwyer et al., 1992). Extrapolating this value for the number of trees in urban green spaces leads to a savings in the millions of dollars. Without this natural pollutant removal, people would have to spend millions of dollars annually to control these pollutants through vehicle maintenance, oxygenated fuels, and street paving and sweeping activities (Dwyer et al., 1992). Vegetation in urban green spaces can also mitigate storm water treatment costs, flooding damage, and water quality problems (Dwyer et al., 1992). Savings in storm water management costs were valued at \$0.18 per tree annually in Tucson, Arizona (Dwyer et al., 1992). This cost does not account for additional savings from avoided storm water treatment costs (Dwyer et al., 1992). Urban green spaces also provide valuable habitat for biodiversity. Recently, bees have been disappearing

from around the country (Kasper, 2013). Honeybees are responsible for at least 90% of commercial crop pollination (Allsopp, De Lange, & Veldtman, 2008). A recent study placed the value of these pollination services for the deciduous fruit industry in the Western Cape of South Africa at \$358.4 million (Allsopp et al., 2008). Ecosystem services such as those provided by bees and other animals are integral to the economy. Urban green spaces provide critical habitat for these organisms in a world with increasingly fewer natural areas.

Recent research in diverse fields such as psychology, public health, psychiatry, biology, recreation, and urban planning have shown that nature is “beneficial, perhaps even essential, to human health and well-being” (Maller et al., 2008). Urban green spaces provide many social benefits such as neighborhood and family development, and improved health and safety. Kuo et al. suggest that “trees and greenery help build strong neighborhoods in which residents interact more often, develop closer community ties, and feel safer (Nicholls & Crompton, 2005). In areas with little to no greenery such as the central city, parks and other urban open spaces are crucial for the development of social ties and citizen well-being. In highly developed areas, these green spaces may provide the only interaction with nature that urban dwellers can readily enjoy (Baur & Tynon, 2010). Kuo et al. found that “compared to residents living adjacent to relatively barren spaces, individuals living adjacent to greener common spaces had more social activities and more visitors, knew more of their neighbors, reported their neighbors were more concerned with helping and supporting one another, and had stronger feelings of belonging” (Kuo, Sullivan, Coley, & Brunson, 1998). Contact with nature has also been shown to reduce mental fatigue, relieve feelings of stress and arousal due to stress, and have positive effects on mood (Kuo et al., 1998). “Medical, psychological, and recreation researchers have acknowledged the restorative and stress reducing qualities of activities conducted in natural

settings (Baur & Tynon, 2010). In fact, “hospital patients who could look out on trees and nature from their windows recovered more quickly than those whose views were restricted to buildings (Chiesura, 2004). Additionally, “local, convenient recreation spaces can provide opportunities for healthy physical activities such as walking, sports activities, and imaginative and active play for children (Baur & Tynon, 2010). An increasing body of evidence points to a lack of exercise as a catalyst for childhood and adult obesity along with its associated diseases, highlighting the importance of public open spaces (Baur & Tynon, 2010). With rising healthcare costs across the country, urban green spaces play an important role in promoting healthy lifestyles and a healthy community.

1.3 Costs of Green Spaces

Urban green spaces are not free of costs. As mentioned previously, parks lead to an increase in value of their surroundings. While owners receive the effect of this value increase, “renters may be displaced from [their] current residence because of the increased rent” (Tajima, 2003). Moreover, “in city centers where demand for land is high, open spaces are often subject to development pressures (Tajima, 2003). The presence of parks removes this land from the market, further increasing land costs and possibly infringing upon landowner rights. Additionally, concern by local residents for safety “may compromise the ecological integrity of urban greenways,” and “natural corridors may be perceived as unsafe” (Luymes & Tamminga, 1995). Due to these issues, “many urban and suburban municipalities are reluctant to plan and manage greenways that include natural environments and public use, reducing both the ecological and social richness of these urban greenways” (Luymes & Tamminga, 1995).

1.4 *Study Area*

This paper aims to investigate the state of urban green spaces in Cuyahoga County, Ohio. Located on the southern shore of Lake Erie in Northeast Ohio, Cuyahoga County serves as a regional shipping port and manufacturing and biomedical hub (Plus, 2013). The City of Cleveland is the county seat and largest city in Cuyahoga County in terms of both land mass and population. The County is home to the Cuyahoga River, which empties into Lake Erie in downtown Cleveland. This junction of the Cuyahoga and Lake Erie has historical importance as the origin for the Ohio and Erie Canal, which connected the Great Lakes to the Mississippi River. The canal, which completed an inland water route between the East Coast and the Gulf of Mexico, led to Cleveland and Cuyahoga County becoming one of the largest metropolitan areas in the country (Canalway).

As of the 2010 Census, Cuyahoga County was the largest county in Ohio in terms of population, with 1,280,122 people (Bureau). The county, which rests on approximately 460 square miles of land, is comprised of 59 municipalities, including 38 cities, 19 villages, and two townships (County). As Ohio is a home-rule state, each of these municipalities is free to create its own park system, with the exception of the two townships: Olmsted Township and Chagrin Falls Township.

The County is also home to a large metropolitan park system named the Cleveland Metropolitan Park District, or Cleveland Metroparks. The parks include recreation facilities for a plethora of activities including archery, biking, boating, skiing, fishing, golf, horseback riding, swimming, and hiking (Metroparks, 2013a). The District, the oldest park district in Ohio, was

first conceived of in 1905 by William Stinchcomb who at the time served as Cleveland's Chief Engineer of Parks (Metroparks, 2013d). The system materialized in 1917 when the Ohio General Assembly passed legislation which provided for "the conservation of natural resources by the creation, development and improvement of park districts" (Metroparks, 2013a). As of early 2013, the Cleveland Metroparks had grown to include 18 reservations over 22,218 acres of land (Kutsko & Studniarz, 2012). The Metroparks currently owns land in 48 municipalities including 41 in Cuyahoga County (Kutsko & Studniarz, 2012). The expansive system includes rivers, lakes, beaches, and wilderness encircling the City of Cleveland in what has been called an "Emerald Necklace." Recently, the Metroparks have turned their attention toward completing the "necklace," hoping to preserve lands along Lake Erie (Kastelic). On April 22, 2013, the City of Cleveland leased to the Metroparks 444 acres of land in five parks and a marina along 14 miles of Lake Erie shoreline (Atassi, 2013). This recent land acquisition is not reflected in the above statistics.

Cuyahoga County is also home to the Cuyahoga Valley National Park. The Park became a National Recreation Area on December 27, 1974, and a National Park on October 11, 2000 (Park, 2013). The only national park in Ohio, Cuyahoga Valley includes almost 33,000 acres in Cuyahoga and neighboring Summit Counties (Park, 2013). Situated between the Cleveland and Akron metropolitan area, Cuyahoga Valley National Park is one of the most visited national parks in the United States, averaging around 2.5 million visitors a year (Park, 2013). The park runs along the Cuyahoga River valley as well as the Ohio & Erie Canal (Service, 2012). It offers over 125 miles of hiking, biking, and horseback riding trails, as well as a scenic railroad and five information centers and museums (Service, 2012).

The County is also home to an assortment of beautiful cemeteries and golf courses, including the internationally renowned Lakeview Cemetery, burial place of President James A. Garfield and oil tycoon John D. Rockefeller.

While Cuyahoga County is home to a significant number of urban green spaces, it is important to determine whether these green spaces serve its population adequately. This paper seeks to determine where green spaces exist in the county and what amenities these spaces include. The paper then looks at where urban green spaces are most needed, and how such spaces may be funded.

2. Methods

2.1 Mapping and Data Sources

In performing my analysis, I adapted the National Recreation and Park Association's park classifications to urban green space in Cuyahoga County. Lee Springgate's criteria led me to including the following classifications: campgrounds, cemeteries, conservation easements, golf courses, and Metroparks, and Municipal Parks. An overarching "urban green spaces" layer was also used. Cemeteries were included as they fill all four criteria proposed by Lee Springgate. Cuyahoga County especially is home to many aesthetically pleasing cemeteries including Erie Street Cemetery in downtown Cleveland and Lakeview Cemetery in Cleveland Heights. While conservation easements do not necessarily meet all four criteria, all easements in Cuyahoga County are part of a larger park system.

To aggregate and analyze park data from around the County, I utilized ESRI's ArcMap10 GIS program. All shapefiles were obtained from the Cuyahoga County Open Space Inventory, obtained from Dan Meaney, GIS Manager for the Cuyahoga County Planning Commission. This database contains geospatial data for all public spaces in Cuyahoga County including parks, schools, and houses of religious worship. Park data was extracted from the Open Space Inventory using the "CUR_LU1" and "CUR_LU2" fields. Within the "CUR_LU1" field, all "parks" were selected and exported into a new shapefile. In a similar manner, campgrounds, cemeteries, conservation easements, and golf courses were exported into their own respective shapefiles. The parks shapefile was then further broken up into municipal parks, the Cleveland Metroparks, and the Cuyahoga Valley National Park. The urban green space layer was created by merging the seven park types. Population and race data was obtained on a block group scale from the 2010 US Census (Bureau). Spatial maps of Cuyahoga County block groups and municipalities were obtained from the US Census Cartographic Boundary Files (Census).

2.2 Determining Population within Walking Distance

To find what populations are served by parkland, population data from the 2010 US Census was joined to a county block group map. This data included total population, as well as population by race. A walking distance of $\frac{1}{4}$ mile was chosen based off of research performed by the Fairfax County, Virginia Planning Commission TOD Committee on tolerable walking distances (Fairfax County). A $\frac{1}{4}$ mile buffer was composed around each of the seven park types as well as the urban green space layer. For each park type, an area calculation was performed on the block group shapefile and the walking distance buffer and block group shapefiles were

unioned. Area calculations were performed on the unioned shapefile and area weighted calculations were completed for each race and the total population to determine populations within and outside the buffer. Summarizing this data by “F_ID” allowed populations within and outside buffer to be found. These data were then collated and percent populations were calculated in Microsoft Excel.

2.3 Calculating Green Space Size

To correct for discrepancies between park systems, park size was determined for all park types using ArcMap software. An area calculation was performed for each park shapefile, and this data was summarized and exported to Microsoft Excel. In this manner, parkland was determined for each of the seven park types, as well as all urban green spaces. Theoretical and actual urban green space was then calculated for each city.

To determine theoretical and actual parkland in each city, the amount of land in each city had to be found. Using the block group shapefile, block groups within each municipality were selected and exported as an independent municipality shapefile. For example, all block groups within Bay Village were selected and exported as a new shapefile titled “Bay Village.” Once this had been done for each city, these shapefiles were merged to give a single shapefile with all 59 municipalities. An area calculation was then performed to determine the amount of land in each municipality. This data was summarized by city and exported to Microsoft Excel, where it was converted from square feet into acres and square miles. Percent of the County contained in each municipality was then determined by dividing the amount of land in each city by the amount of land in the county.

Theoretical urban green space was calculated by multiplying the total amount of urban green space in Cuyahoga County by the percent of Cuyahoga County's land in each city.

$$\% \frac{City}{County} = \frac{Size\ of\ City}{Size\ of\ County} \times 100\%$$

$$\frac{Theoretical\ Urban\ Green\ Space}{City} = \% \frac{City}{County} \times Total\ Urban\ Green\ Space$$

The actual amount of green space was then determined for each municipality. This was done by performing a union between the urban green space layer and the municipalities layer. An area calculation was again performed and summarized by municipality, yielding the amount of parkland in each municipality. This data was exported to Microsoft Excel and corrected to acres. Percent actual urban green space was determined in the following manner:

$$\% Actual\ Green\ Space = \frac{Urban\ Green\ Space\ per\ City}{Total\ Green\ Space\ in\ County} \times 100\%$$

Percent difference between the actual and theoretical amounts of urban green space in each municipality was then determined with the following equation:

$$\% Difference = \frac{Actual\ Green\ Space - Theoretical\ Green\ Space}{Theoretical\ Green\ Space}$$

2.4 Municipal Park Conditions

To determine some qualitative measure of service provided by individual municipal parks, “features” at each park were determined. While some cities provided detailed information on their park systems, others did not. In fact, numerous municipalities do not have parks departments. Due to the large number of municipalities in the County with varied amounts of information, data had to be collected first hand. Given time and weather constraints, traveling to each individual park was not feasible. Instead, Google Earth’s satellite imagery was employed.

Prior to listing these features at each park, the Open Space Inventory had to be cleaned. This was done by comparing the Open Space Inventory’s municipal park layer to Google imagery. In this way, various parks were added or removed to get an accurate portrayal of municipal parks in Cuyahoga County. Using Google Imagery, features of each park were determined and concatenated in a Microsoft Excel spreadsheet. Features were identified as passive recreation, active recreation, natural resources, or cultural sites. Each of these fields was then further broken down as follows:

Passive Recreation	Tables/Benches	Pavilions/Gazebos	Paths	
Active Recreation	Playgrounds Basketball Courts Volleyball Courts	Tennis Courts Baseball Diamonds Soccer Fields	LaCrosse Fields Football Fields Multipurpose Fields	Track Pools Skate Parks
Natural Resources	Open Fields	Wooded Areas	Water Features (streams, lakes, wetlands)	Beaches
Cultural Resources	Includes statues, cultural gardens, music venues, historical sites, etc.			

After determining park size and features, each municipal park was categorized. Parks were initially classified solely by size using guidelines from the National Recreation and Park

Association. Parks less than five acres were classified as “mini-parks.” Between five and 20 acres, parks were classified as “neighborhood parks.” The “community park” designation was given to parks between 20 and 50 acres, and parks larger than 50 acres were categorized as “large urban parks.” Parks with special features were then more accurately described in accordance with their use. Sports fields and open areas near schools were reclassified as “school-parks.” Areas solely containing natural resources such as woods, meadows, and wetlands were reclassified as “natural resource areas.” Large open areas used solely for active recreation were reclassified as “sports complexes,” with these parks usually adjoining recreation centers. In accordance with National Recreation and Park Association guidelines, parks devoted to a single use such as pools were reclassified as “special use” parks. Special designations were also given to parks in downtown Cleveland, and parks owned by private entities, named “downtown parks” and “private property,” respectively.

3. Results

3.1 Green Space Size

The majority of urban green space, almost 55%, in Cuyahoga County belongs to the Cleveland Metroparks. Altogether, this amounts to over 17,000 acres of land,

Green Space Type	Total Acreage	Percent of Green Space	Percent of Cuyahoga County
Campgrounds	228.21	0.72%	0.08%
Cemeteries	2,209.38	7.00%	0.76%
CVNP	2,771.24	8.78%	0.95%
Easements	134.85	0.43%	0.05%
Golf Courses	4,370.71	13.85%	1.49%
Metroparks	17,273.92	54.72%	5.90%
Municipal Parks	4,577.34	14.50%	1.56%
All Open Spaces	31,565.64	100.00%	10.79%

Table 2: Urban Green Spaces in Cuyahoga County by: a) acreage; b) percent of total green space and c) percent of County landmass.

accounting for 5.9% of Cuyahoga County’s land area. Municipal parks and golf courses each make up around 14% of the County’s urban green spaces and 1.5% of the County’s land. The remaining urban green space categories amount to less than 1% of the land area. The largest Metropark in the County is Brecksville Reservation at over 3,000 acres. This reservation, entirely in the City of Brecksville, is home to seven glaciated gorges, Chippewa Creek, and two

Reservation Name	Acreage
Acacia Reservation	146.33
Bedford Reservation	2,269.26
Big Creek Reservation	713.70
Bradley Woods Reservation	773.50
Brecksville Reservation	3,336.78
Brookside Reservation and Zoo	301.24
Euclid Creek Reservation	350.19
Garfield Park Reservation	220.31
Huntington Reservation	98.77
Mill Stream Run Reservation	3,168.95
North Chagrin Reservation	1,141.47
Ohio and Erie Canal Reservation	355.19
Rocky River Reservation	2,567.04
South Chagrin Reservation	1,476.58
Washington Reservation	75.55
West Creek Reservation	279.08
Total Acreage	17,273.92

Table 3: Cleveland Metroparks acreage per Reservation.

golf courses (Metroparks, 2013b). The smallest reservation is Washington Reservation at just 75 acres. This reservation, with pieces in Cleveland, Cuyahoga Heights, and Newburgh Heights, is home to a nine-hole golf course, the U.S.S. Maine Memorial and American Legion Memorial, and various sports fields and picnic shelters (Metroparks, 2013c). The Metroparks reservations average just over 1,000 acres with four reservations exceeding 2,000 acres.

Cuyahoga County is home to only four campsites.

One of these sites, Crystal Springs, is mainly in Lorain County, with only 1.66 acres in

Cuyahoga. The largest campground in the County is Hiram House, at 163 acres. This site, located in Moreland Hills, is home to numerous day camps, overnight camps, and other recreation activities. Campgrounds in

Campground Name	Acreage
Crystal Springs Campground	1.66
Pleasant Valley Park	18.32
Camp George Forbes	45.10
Hiram House Camp	163.14
Total	228.21

Table 4: Campgrounds in Cuyahoga County. Only a fraction of Crystal Springs is in Cuyahoga, with the majority in neighboring Lorain County.

the County average just over 75 acres (excluding Crystal Springs) and total just over 200 acres.

Due to Cuyahoga County's large number of independent municipalities, compiling a comprehensive list of municipal parks was vital to determining the state of Cuyahoga's green spaces. Cemeteries account for just 0.76% of Cuyahoga's landmass, and approximately 7% of the County's green space. Calvary Cemetery in Garfield Heights is the largest in the County at over 300 acre. At just over half an acre, Parma Public Cemetery in nearby Parma is the smallest cemetery in the County. The average cemetery size in the city is just over 36 acres, with an extremely large standard deviation of 57 acres.

Cemetery Name	Acreage	Cemetery Name	Acreage
Acacia Park Cemetery Association	43.15	Lutheran Cemetery	22.35
Alger Cemetery	10.79	Monroe Cemetery	12.17
Beachwood Cemetery	4.78	Mount Olive Cemetery	48.44
Bedford Cemetery	15.20	Mt Sinai Cemetery	12.13
Brooklyn Heights Cemetery	66.03	North Royalton Cemetery	10.33
Brookside Park Cemetery	3.00	Parma Public Cemetery	0.55
Calvary Cemetery	307.86	Polish Catholic Cemetery	3.51
Cemetery	3.22	Ridge Rd Cemetery I	5.90
Center Cemetery	6.60	Ridge Rd Cemetery Ii	8.65
East Cleveland Cemetery	10.68	Riverside Cemetery	78.04
Erie St. Cemetery	8.87	Roselawn Cemetery	3.98
Euclid Cemetery	5.38	St. John'S Cemetery	11.57
Evergreen Cemetery	29.43	St. John'S Lutheran Cemetery	12.05
Evergreen Memorial Park Association	50.49	St. Joseph Cemetery	8.35
Fairview Cemetery	1.37	St. Mary'S Cemetery	7.40
Gates Mills North Cemetery	2.65	St. Paul'S Ukrainian Catholic Cemetery	30.17
Harvard Grove Cemetery	20.14	St. Theodosius Russian Orthodox Church	36.40
Highland Park Cemetery	127.20	Strongsville Cemetery	12.73
Hillcrest Memorial Cemetery	31.58	Sunset Memorial Park Cemetery	174.91
Holy Cross Cemetery	258.14	United Jewish Cemeteries	21.46
Holy Ghost Greek Catholic Cemetery	20.02	West Park Cemetery	82.82
Hungarian Cemetery	5.51	Whitehaven Memorial Park Cemetery	59.93
Jewish Cemetery	10.17	Woodland Cemetery	55.74
Knollwood Cemetery Association	85.94	Woodvale Union Cemetery	24.20
Lake View Cemetery	284.84	Workman'S Circle Cemetery	8.13
Lakewood Park Cemetery	44.40	Total	2,209.38

Table 5: County cemeteries by acreage.

Golf courses in the County account for over 4,000 acres of land making up almost 14% of the County's urban green space. Highland Park at 352 acres is the largest course in the County,

Golf Course Name	Acreage	Golf Course Name	Acreage
Airport Greens	30.36	Mid Pines Golf Club	142.19
Astorhurst Golf Course And Country Club	140.80	North Olmsted Golf Club	57.45
Beechmont Country Club	175.43	Oakwood Country Club	150.39
Briardale Golf Course	125.52	Parkview Golf Course	76.07
Briarwood Golf Course	211.74	Parma Driving Range	13.28
Canterbury Golf Club	135.52	Pepper Pike Country Club	234.52
Chagrin Valley Country Club	196.55	Ridgewood Municipal Golf Course	131.05
Grantwood Country Club	354.01	Seneca Golf Course	346.64
Hawthorne Valley Country Club	172.10	Shaker Heights Country Club	128.61
Hickory Nut Golf Club	0.87	Springvale Golf Course	74.36
Highland Park Golf Course	352.00	Strongsville Golf Facility	12.55
Lakewood Country Club	215.54	The Country Club	226.60
Links At The Renaissance	208.47	Valleaire Golf Club Inc	1.11
Locust Grove Par 3 Golf Course	14.10	Westlake Meadow Golf Course	71.24
Mayfield Country Club	205.48	Westwood Country Club	166.16
Total	4,370.71		

Table 6: Golf Courses in Cuyahoga County by acreage.

while Hickory Nut Golf Club is located almost entirely in neighboring Lorain County, with less than an acre in Cuyahoga County. Excluding Hickory Nut Golf Club, golf courses in Cuyahoga County average 112 acres with a standard deviation of almost 90 acres. The Cleveland Metroparks operate seven golf courses within their reservations which are not reflected in this data. The Metropark's Seneca Golf Course within Brecksville Reservation is reflected in this data and excluded from the Metroparks acreage, a result of how they were categorized in the Cuyahoga County Open Space Inventory. Cuyahoga's municipal parks total over 4,500 acres and average approximately 23 acres. Forest Hill Park in East Cleveland and Cleveland Heights is by far the largest of the municipal parks totaling over 300 acres between the two cities. The land for this enormous park was donated to the cities by John D. Rockefeller from his estate land with the stipulation that the land remain available for recreational purposes. (Foundation,

2012). At less than half an acre, Parma's Green Valley Park is the smallest municipal park in the County.

3.2 Green Space by City

Of the 59 municipalities in Cuyahoga County, 57 contain green space. Neither the Village of Linndale nor the Village of North Randall contains an urban green space. These small villages consist of only 0.09 and 0.78 square miles, respectively, making them smaller than several of the County's green spaces. Correcting for their respective populations, Linndale should have 0.034 acres of green space per resident, while North Randall should have 0.052. With almost 14% of the County's green space, Brecksville leads other municipalities in the green space category, followed by Cleveland with almost 10% and Strongsville with just over 8%. Interestingly, when accounting for Brecksville's size, its theoretical urban green space is only 4.26%, while Cleveland should be allotted almost 17%, and Strongsville should have 5.35%. Correcting for population, Cleveland should theoretically contain 0.014 acres of green space per resident, while it actually contains 0.008 acres per resident. Brecksville on the other hand should contain 0.099 acres per resident and actually amounts to 0.32 acres per resident. Table 7, spread over the next three pages displays the theoretical and actual green space distributions for each municipality in terms of both land area and population.

Municipality	Population	Size (Acres)	Size (sq mi.)	Density (People per Square Mile)	% Total Land	Theoretical Green Space per Landmass (Acres)	% Theoretical Green Space per Landmass	Theoretical Green Space per Population (Acres)	Actual Green Space per Landmass (Acres)	% Actual Green Space per Landmass	Actual Green Space per Population	% Difference in Actual/Theoretical Green Space
Bay Village	15,599	2,963.89	4.63	3,368.43	1.01%	317.56	1.01%	0.020	197.01	0.62%	0.013	-37.96%
Beachwood	11,914	3,387.64	5.29	2,250.75	1.15%	362.96	1.15%	0.030	224.25	0.71%	0.019	-38.22%
Bedford	13,031	3,428.38	5.36	2,432.58	1.16%	367.33	1.16%	0.028	609.74	1.93%	0.047	65.99%
Bedford Heights	10,716	2,903.23	4.54	2,362.19	0.99%	311.06	0.99%	0.029	315.62	1.00%	0.029	1.47%
Bentleyville	861	1,675.25	2.62	328.99	0.57%	179.49	0.57%	0.208	562.37	1.78%	0.653	213.32%
Berea	19,030	3,561.99	5.57	3,419.24	1.21%	381.64	1.21%	0.020	438.81	1.39%	0.023	14.98%
Bratenahl	1,193	656.13	1.03	1,163.73	0.22%	70.30	0.22%	0.059	11.87	0.04%	0.010	-83.11%
Brecksville	13,611	12,553.22	19.61	693.93	4.26%	1,344.99	4.26%	0.099	4,360.43	13.83%	0.320	224.20%
Broadview Heights	19,336	8,356.96	13.06	1,480.81	2.84%	895.39	2.84%	0.046	469.15	1.49%	0.024	-47.60%
Brook Park	11,132	4,823.50	7.54	1,477.06	1.64%	516.80	1.64%	0.046	498.12	1.58%	0.045	-3.62%
Brooklyn	1,538	2,753.15	4.30	357.51	0.93%	294.98	0.93%	0.192	199.95	0.63%	0.130	-32.22%
Brooklyn Heights	19,149	1,134.70	1.77	10,800.35	0.39%	121.58	0.39%	0.006	41.32	0.13%	0.002	-66.01%
Chagrin Falls	4,099	1,348.87	2.11	1,945.07	0.46%	144.52	0.46%	0.035	7.28	0.02%	0.002	-94.96%
Chagrin Falls T.	4,219	330.16	0.52	8,178.49	0.11%	35.37	0.11%	0.008	34.12	0.11%	0.008	-3.55%
Cleveland	395,508	49,925.39	78.01	5,070.07	16.95%	5,349.15	16.95%	0.014	3,133.36	9.94%	0.008	-41.42%
Cleveland Heights	45,969	5,199.74	8.12	5,658.02	1.76%	557.12	1.76%	0.012	457.99	1.45%	0.010	-17.79%
Cuyahoga Heights	636	2,053.22	3.21	198.21	0.70%	219.99	0.70%	0.346	279.91	0.89%	0.440	27.24%
East Cleveland	17,784	1,987.96	3.11	5,725.43	0.67%	213.00	0.67%	0.012	275.84	0.87%	0.016	29.51%
Euclid	48,759	6,852.87	10.71	4,553.67	2.33%	734.24	2.33%	0.015	522.10	1.66%	0.011	-28.89%
Fairview Park	16,771	3,004.99	4.70	3,571.79	1.02%	321.96	1.02%	0.019	702.47	2.23%	0.042	118.18%

Table 7a: Urban green space by municipality in terms of: land area and population. Data is presented by actual and theoretical green space distribution.

Municipality	Population	Size (Acres)	Size (sq mi.)	Density (People per Square Mile)	% Total Land	Theoretical Green Space per Landmass (Acres)	% Theoretical Green Space per Landmass	Theoretical Green Space per Population (Acres)	Actual Green Space per Landmass (Acres)	% Actual Green Space per Landmass	Actual Green Space per Population	% Difference in Actual/Theoretical Green Space
Garfield Heights	28,754.01	4,676.62	7.31	3,935.02	1.59%	501.07	1.59%	0.017	506.01	1.60%	0.018	0.99%
Gates Mills	2,262.53	5,822.61	9.10	248.69	1.98%	623.85	1.98%	0.276	466.52	1.48%	0.206	-25.22%
Glenwillow	919.96	1,740.92	2.72	338.20	0.59%	186.53	0.59%	0.203	14.98	0.05%	0.016	-91.97%
Highland Heights	8,317.52	3,284.48	5.13	1,620.72	1.11%	351.91	1.11%	0.042	71.44	0.23%	0.009	-79.70%
Highland Hills	1,126.28	1,267.39	1.98	568.74	0.43%	135.79	0.43%	0.121	498.31	1.58%	0.442	266.97%
Hunting Valley	702.68	5,108.31	7.98	88.04	1.73%	547.32	1.73%	0.779	1.26	0.00%	0.002	-99.77%
Independence	7,109.51	6,134.63	9.59	741.71	2.08%	657.28	2.08%	0.092	1,016.49	3.22%	0.143	54.65%
Lakewood	51,959.35	3,563.21	5.57	9,332.60	1.21%	381.77	1.21%	0.007	220.24	0.70%	0.004	-42.31%
Linndale	178.41	56.18	0.09	2,032.44	0.02%	6.02	0.02%	0.034	0.00	0.00%	0.000	-100.00%
Lyndhurst	13,954.90	2,809.78	4.39	3,178.59	0.95%	301.05	0.95%	0.022	382.74	1.21%	0.027	27.14%
Maple Heights	23,061.81	3,321.85	5.19	4,443.18	1.13%	355.91	1.13%	0.015	68.38	0.22%	0.003	-80.79%
Mayfield	3,448.61	2,514.14	3.93	877.88	0.85%	269.37	0.85%	0.078	806.94	2.56%	0.234	199.56%
Mayfield Heights	19,091.93	2,699.39	4.22	4,526.51	0.92%	289.22	0.92%	0.015	165.51	0.52%	0.009	-42.77%
Middleburg Heights	15,893.49	5,177.20	8.09	1,964.74	1.76%	554.70	1.76%	0.035	622.74	1.98%	0.039	12.27%
Moreland Hills	3,309.07	4,641.53	7.25	456.27	1.58%	497.31	1.58%	0.150	713.36	2.26%	0.216	43.44%
Newburgh Heights	2,159.86	372.51	0.58	3,710.81	0.13%	39.91	0.13%	0.018	59.21	0.19%	0.027	48.34%
North Olmsted	32,610.27	7,443.19	11.63	2,803.98	2.53%	797.49	2.53%	0.024	947.57	3.01%	0.029	18.82%
North Randall	1,023.62	500.36	0.78	1,309.28	0.17%	53.61	0.17%	0.052	0.00	0.00%	0.000	-100.00%
North Royalton	30,343.76	13,622.08	21.28	1,425.63	4.62%	1,459.51	4.62%	0.048	875.86	2.78%	0.029	-39.99%
Oakwood	3,654.93	2,213.87	3.46	1,056.59	0.75%	237.20	0.75%	0.065	87.60	0.28%	0.024	-63.07%

Table 7b: Urban green space by municipality in terms of: land area and population. Data is presented by actual and theoretical green space distribution.

Municipality	Population	Size (Acres)	Size (sq mi.)	Density (People per Square Mile)	% Total Land	Theoretical Green Space per Landmass (Acres)	% Theoretical Green Space per Landmass	Theoretical Green Space per Population (Acres)	Actual Green Space per Landmass (Acres)	% Actual Green Space per Landmass	Actual Green Space per Population	% Difference in Actual/Theoretical Green Space
Olmsted Falls	8,994.29	2,643.88	4.13	2,177.23	0.90%	283.27	0.90%	0.031	38.12	0.12%	0.004	-86.54%
Olmsted T.	13,468.51	6,390.25	9.98	1,348.91	2.17%	684.67	2.17%	0.051	536.71	1.70%	0.040	-21.61%
Orange	3,312.06	2,432.54	3.80	871.40	0.83%	260.63	0.83%	0.079	201.31	0.64%	0.061	-22.76%
Parma	81,332.31	12,784.84	19.98	4,071.44	4.34%	1,369.81	4.34%	0.017	893.99	2.84%	0.011	-34.74%
Parma Heights	20,649.78	2,686.91	4.20	4,918.61	0.91%	287.88	0.91%	0.014	225.41	0.71%	0.011	-21.70%
Pepper Pike	5,959.31	4,544.38	7.10	839.27	1.54%	486.90	1.54%	0.082	451.50	1.43%	0.076	-7.27%
Richmond Heights	10,511.28	2,800.35	4.38	2,402.28	0.95%	300.04	0.95%	0.029	54.51	0.17%	0.005	-81.83%
Rocky River	20,146.44	3,042.89	4.75	4,237.33	1.03%	326.02	1.03%	0.016	357.20	1.13%	0.018	9.56%
Seven Hills	11,765.13	3,205.65	5.01	2,348.88	1.09%	343.46	1.09%	0.029	94.57	0.30%	0.008	-72.46%
Shaker Heights	28,354.33	4,044.42	6.32	4,486.86	1.37%	433.33	1.37%	0.015	302.04	0.96%	0.011	-30.30%
Solon	23,271.12	13,179.59	20.59	1,130.04	4.47%	1,412.10	4.47%	0.061	1,213.03	3.85%	0.052	-14.10%
South Euclid	22,221.59	3,001.07	4.69	4,738.92	1.02%	321.54	1.02%	0.014	187.41	0.59%	0.008	-41.71%
Strongsville	44,602.65	15,775.60	24.65	1,809.48	5.35%	1,690.24	5.35%	0.038	2,591.25	8.22%	0.058	53.31%
University Heights	13,494.42	1,173.66	1.83	7,358.52	0.40%	125.75	0.40%	0.009	1.00	0.00%	0.000	-99.21%
Valley View	2,027.30	3,606.50	5.64	359.76	1.22%	386.41	1.22%	0.191	859.24	2.73%	0.424	122.36%
Walton Hills	2,273.49	4,400.54	6.88	330.65	1.49%	471.49	1.49%	0.207	1,668.46	5.29%	0.734	253.87%
Warrensville Heights	13,497.41	2,640.92	4.13	3,270.96	0.90%	282.96	0.90%	0.021	17.00	0.05%	0.001	-93.99%
Westlake	32,621.23	10,176.19	15.90	2,051.61	3.45%	1,090.31	3.45%	0.033	965.53	3.06%	0.030	-11.44%
Woodmere	881.09	210.65	0.33	2,676.98	0.07%	22.57	0.07%	0.026	4.56	0.01%	0.005	-79.80%
TOTAL	1,280,122.00	294,612.31	460.33	2,780.87	1	31,565.64	100.00%		31,529.72	100.00%		

Table 7c: Urban green space by municipality in terms of: land area and population. Data is presented by actual and theoretical green space distribution.

Urban Green Spaces in Cuyahoga County

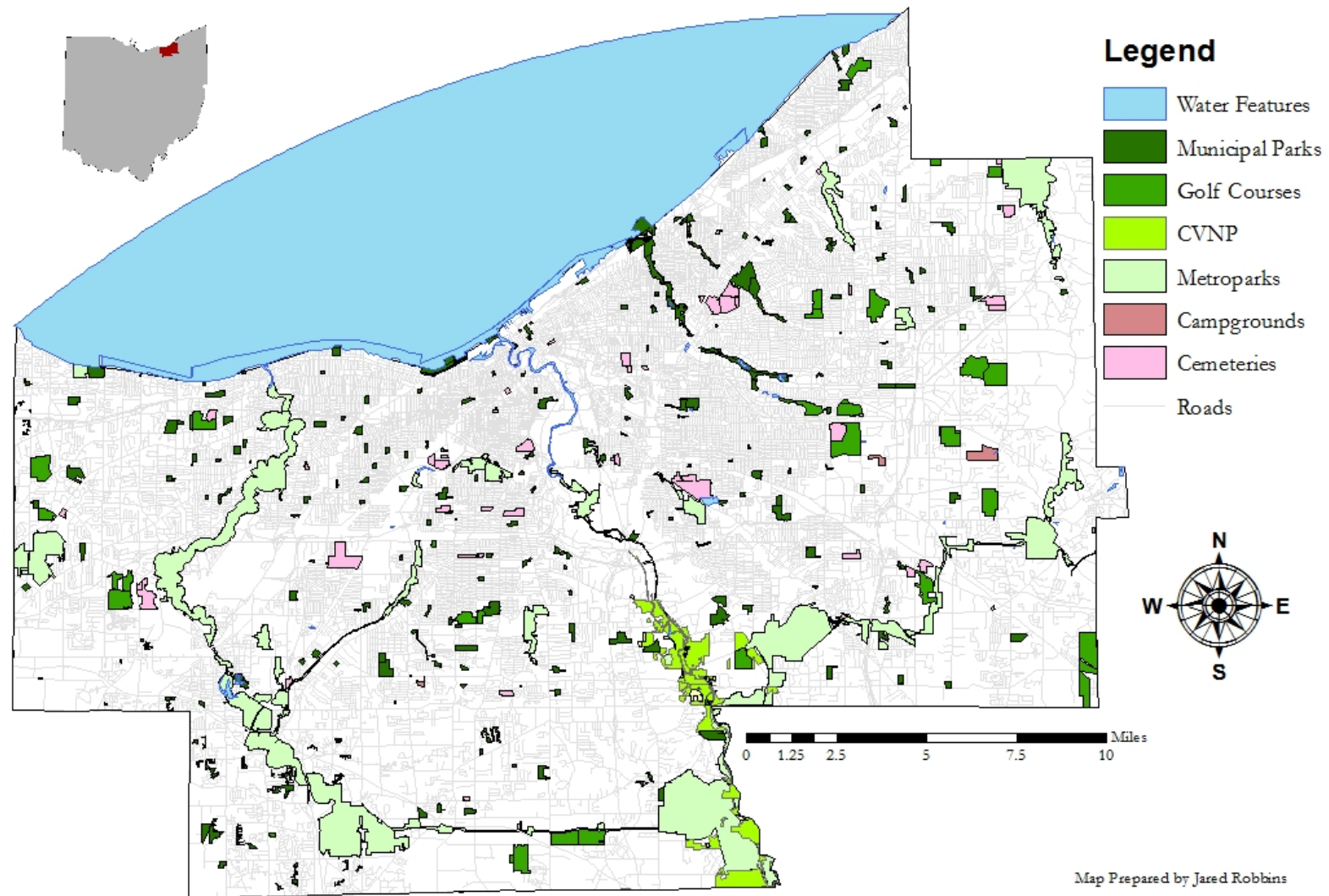


Figure 1: Cuyahoga County green spaces by type.

Walking Distance to Parks in Cuyahoga County

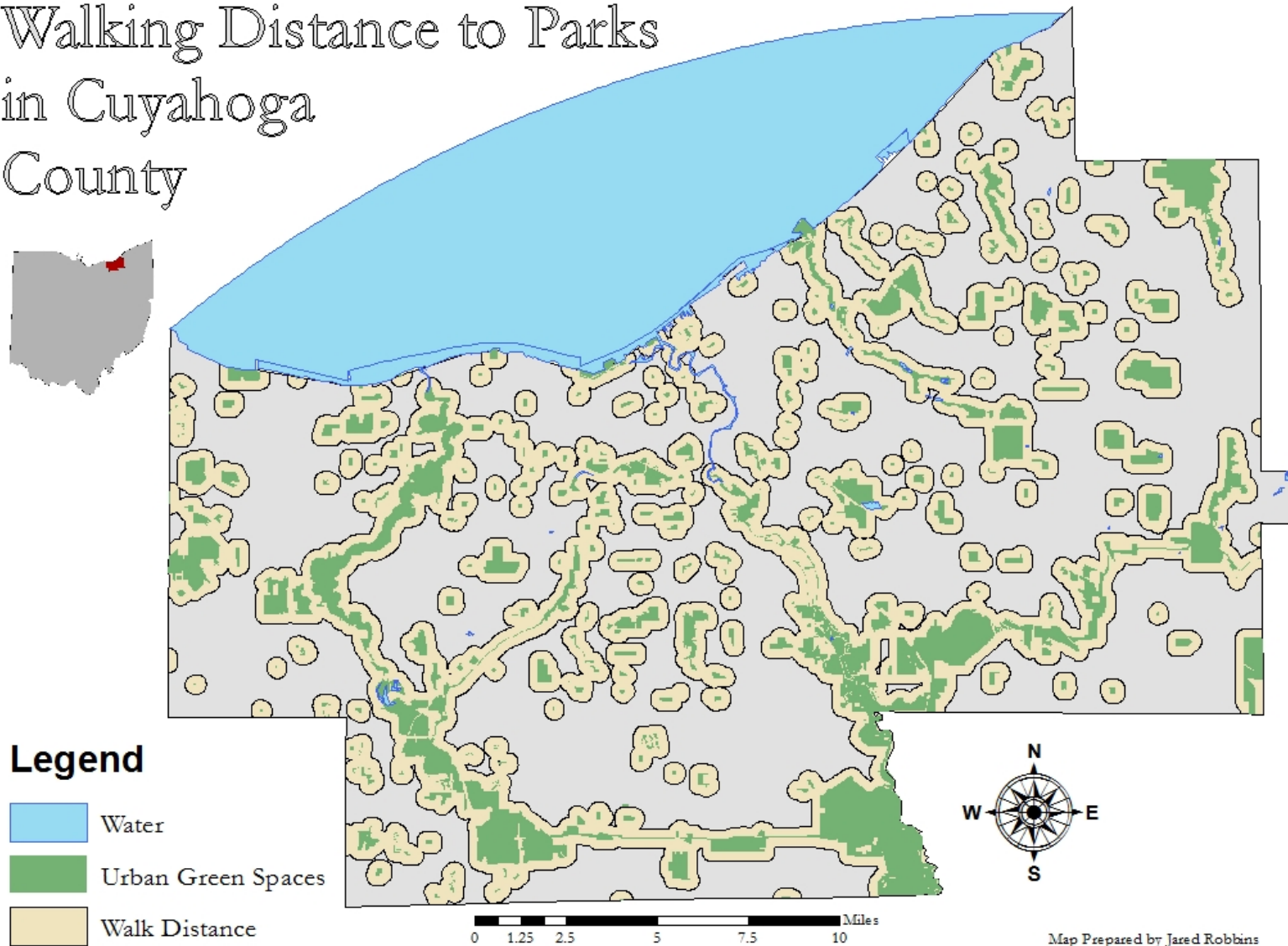


Figure 2: Walking distance buffer to urban green spaces in Cuyahoga County.

3.3 Walking Distance

In total, 533,095 residents live within a ¼ mile of an urban green space, while 747,027 residents do not live within walking distance. This equates to 42% and 58% of Cuyahoga’s population, respectively. Between races, the breakdown of living within and outside of the walking space buffer is fairly even, with approximately

every racial category tested equating to a 40%/60% split. The racial breakdown is fairly equitable for many of the individual green space types as well. With both campgrounds, and

easements, geographically small categories, only about 1% of the population lives within the walking space buffer. A similar situation is seen with the Cuyahoga Valley National Park, which exists solely on the periphery of southeastern Cuyahoga County; only 1% of the County’s population lives within walking distance. Interestingly,

Total Urban Green Space	Not Within Walking Distance	Within Walking Distance	Total Population	% Total Population
White	469,212	344,891	814,103	
% White	58%	42%		64%
Nonwhite	277,818	188,201	466,019	
% Nonwhite	60%	40%		36%
Black	227,466	152,732	380,198	
% Black	60%	40%		30%
Native	1,471	1,107	2,578	
% Native	57%	43%		0%
Asian	19,932	12,951	32,883	
% Asian	61%	39%		3%
Pacific	167	118	285	
% Pacific	59%	41%		0%
Other	13,468	9,871	23,339	
% Other	58%	42%		2%
Multiracial	15,312	11,424	26,736	
% Multiracial	57%	43%		2%
Total Population	747,027	533,095	1,280,122	
%Total Population	58%	42%		100%

Table 8: Population within and outside of a ¼ mile walking space buffer around County green spaces. Information is given by total population and race.

Campgrounds	Not Within Walking Distance	Within Walking Distance	Total Population	% Total Population
White	811,645	2,458	814,103	
% White	99.70%	0.30%		64%
Nonwhite	465,549	470	466,019	
% Nonwhite	99.90%	0.10%		36%
Black	379,883	315	380,198	
% Black	99.92%	0.08%		30%
Native	2,569	9	2,578	
% Native	99.65%	0.35%		0%
Asian	32,802	81	32,883	
% Asian	99.75%	0.25%		3%
Pacific	283	2	285	
% Pacific	99.30%	0.70%		0%
Other	23,320	19	23,339	
% Other	99.92%	0.08%		2%
Multiracial	26,694	42	26,736	
% Multiracial	99.84%	0.16%		2%
Total Population	1,277,194	2,928	1,280,122	
%Total Population	99.77%	0.23%		100%

Table 9: Population within and outside of a ¼ mile walking space buffer around County campgrounds. Information is given by total population and race.

cemeteries, while more spread out, are also fairly evenly spread among racial groups in the County, with approximately 6% of the population living within the walking space buffer across the racial spectrum. Golf courses in the County are also fairly adequate in terms of racial justice, with just over 4% of whites living within walking distance and just under 3% of nonwhite residents

Easements	Not Within Walking Distance	Within Walking Distance	Total Population	% Total Population
White	810,784	3,319	814,103	
% White	99.59%	0.41%		64%
Nonwhite	465,780	239	466,019	
% Nonwhite	99.95%	0.05%		36%
Black	380,153	45	380,198	
% Black	99.99%	0.01%		30%
Native	2,578	0	2,578	
% Native	100.00%	0.00%		0%
Asian	32,763	120	32,883	
% Asian	99.64%	0.36%		3%
Pacific	284	1	285	
% Pacific	99.65%	0.35%		0%
Other	23,320	19	23,339	
% Other	99.92%	0.08%		2%
Multiracial	26,684	52	26,736	
% Multiracial	99.81%	0.19%		2%
Total Population	1,276,566	3,556	1,280,122	
%Total Population	99.72%	0.28%		100%

Table 10: Population within and outside of a ¼ mile walking space buffer around County easements. Information is given by total population and race.

living within walking distance. When looking at the Metroparks and municipal parks however, some varied trends seem to emerge. Over 12% of the white population of Cuyahoga County

Cuyahoga Valley National Park	Not Within Walking Distance	Within Walking Distance	Total Population	% Total Population
White	808,265	5,838	814,103	
% White	99.28%	0.72%		64%
Nonwhite	465,757	262	466,019	
% Nonwhite	99.94%	0.06%		36%
Black	380,129	69	380,198	
% Black	99.98%	0.02%		30%
Native	2,575	3	2,578	
% Native	99.88%	0.12%		0%
Asian	32,780	103	32,883	
% Asian	99.69%	0.31%		3%
Pacific	282	3	285	
% Pacific	98.95%	1.05%		0%
Other	23,323	16	23,339	
% Other	99.93%	0.07%		2%
Multiracial	26,666	70	26,736	
% Multiracial	99.74%	0.26%		2%
Total Population	1,274,022	6,100	1,280,122	
%Total Population	99.52%	0.48%		100%

Table 11: Population within and outside of a ¼ mile walking space buffer around the Cuyahoga Valley National Park. Information is given by total population and race.

lives within walking distance of the Cleveland Metroparks.

Convsersely, only just over 5% of the nonwhite population of the County lives within walking distance, with less than 5% of the black population living within this area. The inverse is true for municipal parks. While almost 30% of the nonwhite population lives

Cleveland Metroparks	Not Within Walking Distance	Within Walking Distance
White	714,963	99,140
% White	87.82%	12.18%
Nonwhite	441,288	24,731
% Nonwhite	94.69%	5.31%
Black	362,965	17,233
% Black	95.47%	4.53%
Native	2,362	216
% Native	91.62%	8.38%
Asian	30,214	2,669
% Asian	91.88%	8.12%
Pacific	258	27
% Pacific	90.53%	9.47%
Other	21,279	2,060
% Other	91.17%	8.83%
Multiracial	24,241	2,495
% Multiracial	90.67%	9.33%
Total Population	1,156,262	123,860
%Total Population	90.32%	9.68%

a)

c)

Table 14: Population within and outside of a ¼ mile walking space buffer around the County's cemeteries. Information is given by total population and race.

d)

Table 15: Population within and outside of a ¼ mile walking space buffer around the County's municipal parks. Information is given by total population and race.

b)

Golf Courses	Not Within Walking Distance	Within Walking Distance
White	779,115	34,988
% White	95.70%	4.30%
Nonwhite	453,154	12,865
% Nonwhite	97.24%	2.76%
Black	370,164	10,034
% Black	97.36%	2.64%
Native	2,532	46
% Native	98.22%	1.78%
Asian	31,316	1,567
% Asian	95.23%	4.77%
Pacific	275	10
% Pacific	96.49%	3.51%
Other	23,057	282
% Other	98.79%	1.21%
Multiracial	25,815	921
% Multiracial	96.56%	3.44%
Total Population	1,232,266	47,856
%Total Population	96.26%	3.74%

within walking distance of a municipal park, less than 25% of the white population lives within this buffer.

a)

Table 12: Population within and outside of a ¼ mile walking space buffer around the Cleveland Metroparks. Information is given by total population and race.

b)

Table 13: Population within and outside of a ¼ mile walking space buffer around the County's golf courses. Information is given by total population and race.

c)

d)

Cemeteries	Not Within Walking Distance	Within Walking Distance
White	768,848	45,255
% White	94.44%	5.56%
Nonwhite	434,363	31,656
% Nonwhite	93.21%	6.79%
Black	355,376	24,822
% Black	93.47%	6.53%
Native	2,403	175
% Native	93.21%	6.79%
Asian	30,611	2,272
% Asian	93.09%	6.91%
Pacific	265	20
% Pacific	92.98%	7.02%
Other	20,894	2,445
% Other	89.52%	10.48%
Multiracial	24,812	1,924
% Multiracial	92.80%	7.20%
Total Population	1,203,211	76,911
%Total Population	93.99%	6.01%

Municipal Parks	Not Within Walking Distance	Within Walking Distance
White	614,260	199,843
% White	75.45%	24.55%
Nonwhite	327,768	138,251
% Nonwhite	70.33%	29.67%
Black	263,666	116,532
% Black	69.35%	30.65%
Native	1,841	737
% Native	71.41%	28.59%
Asian	25,277	7,606
% Asian	76.87%	23.13%
Pacific	224	61
% Pacific	78.60%	21.40%
Other	17,319	6,020
% Other	74.21%	25.79%
Multiracial	19,441	7,295
% Multiracial	72.71%	27.29%
Total Population	942,010	338,112
%Total Population	73.59%	26.41%

Park Access in Cuyahoga County

Total Population

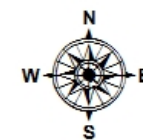
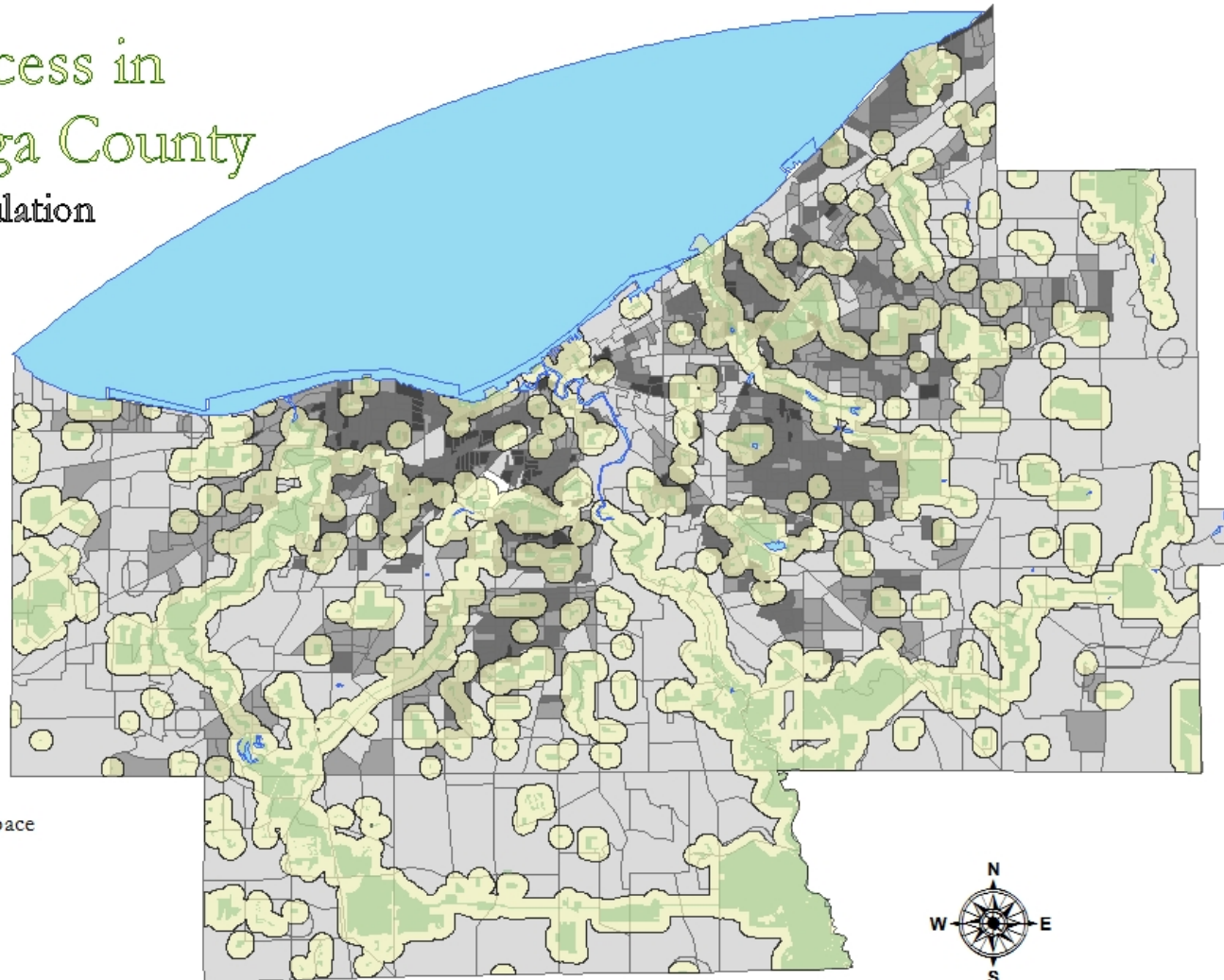


Legend

- Water Features
- Urban Green Space
- Walk Distance

Population
population per sq. mile

- 0 - 3,500
- 3,501 - 7,000
- 7,001 - 12,000
- 12,001 - 40,000



0 1.25 2.5 5 7.5 10 Miles

Map Prepared by Jared Robbins

Figure 3: Park access in Cuyahoga County in terms of population per square mile.

Park Access White

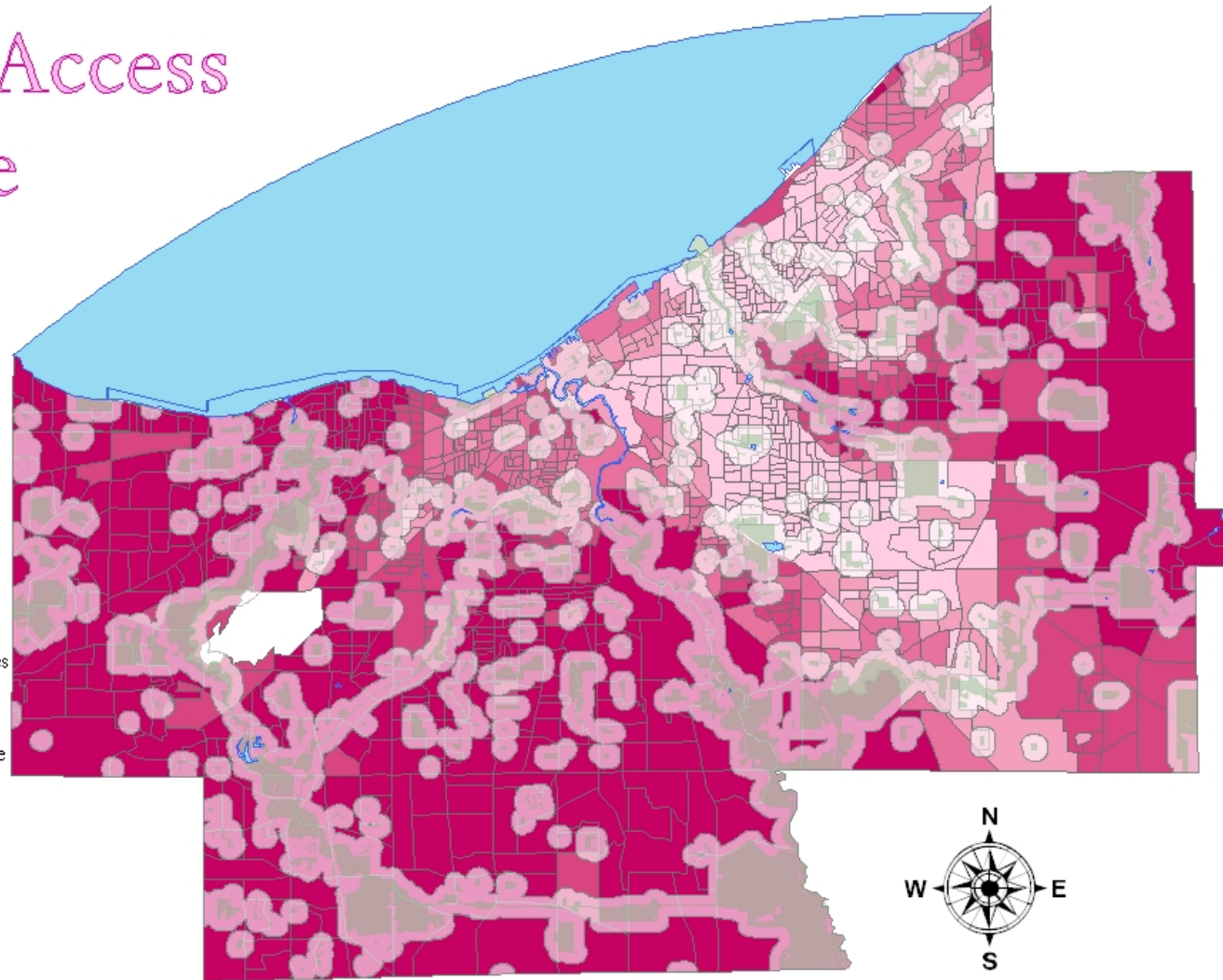
Legend

-  Water Features
-  Green Space
-  Walk Distance

Population

Percent of Total

-  0% - 17%
-  18% - 43%
-  44% - 65%
-  66% - 84%
-  85% - 99%



0 1.25 2.5 5 7.5 10 Miles

Map Prepared by Jared Robbins

Figure 4: Access to parks for white population in Cuyahoga County.

Park Access Non White



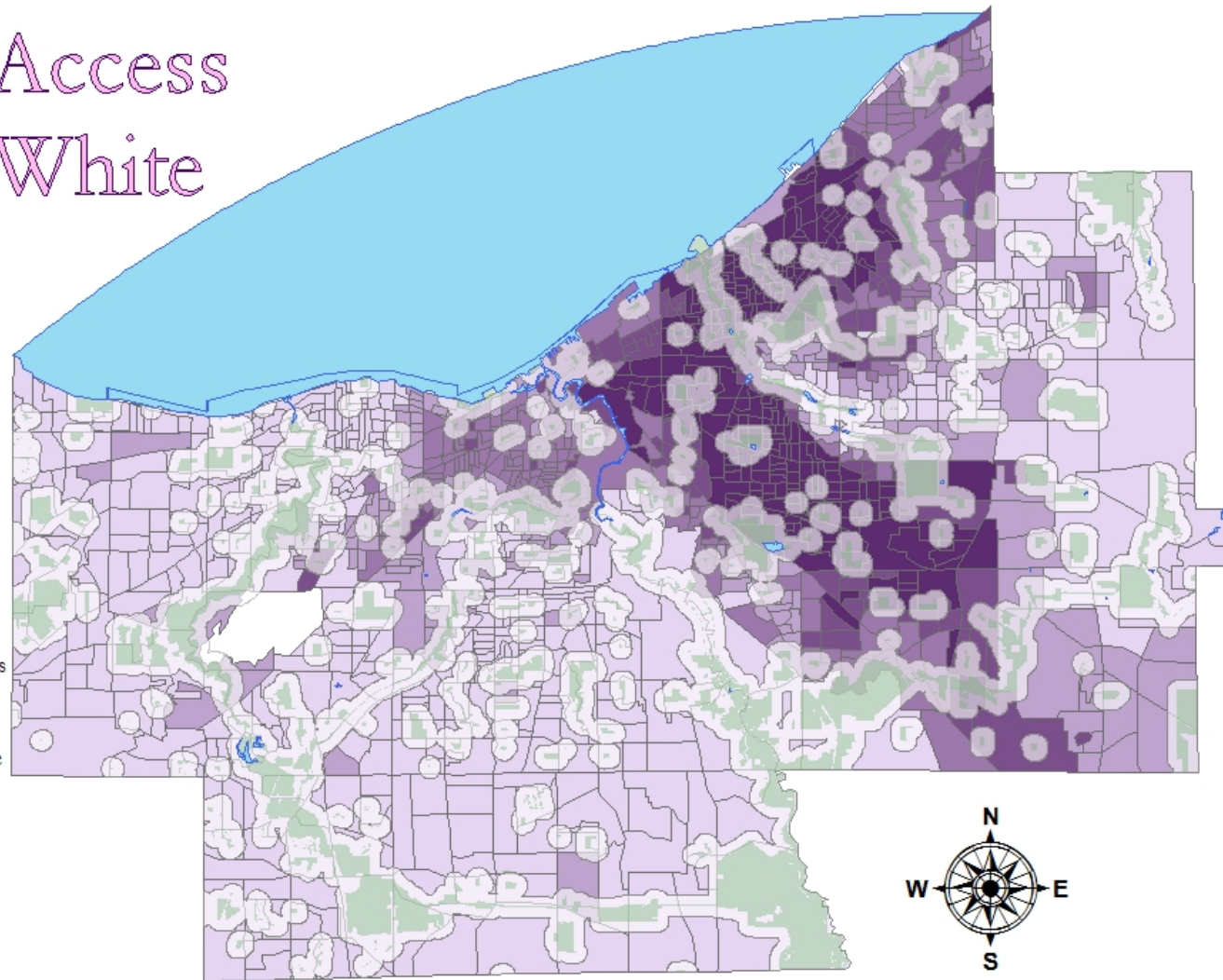
Legend

- Water Features
- Green Space
- Walk Distance

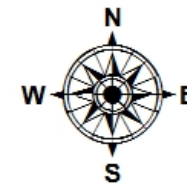
Population

Percent of Total

- 1% - 16%
- 17% - 34%
- 35% - 57%
- 58% - 83%
- 84% - 100%



0 1.25 2.5 5 7.5 10 Miles



Map Prepared by Jared Robbins

Figure 5: Access to parks for nonwhite population in Cuyahoga County.

Park Access Black



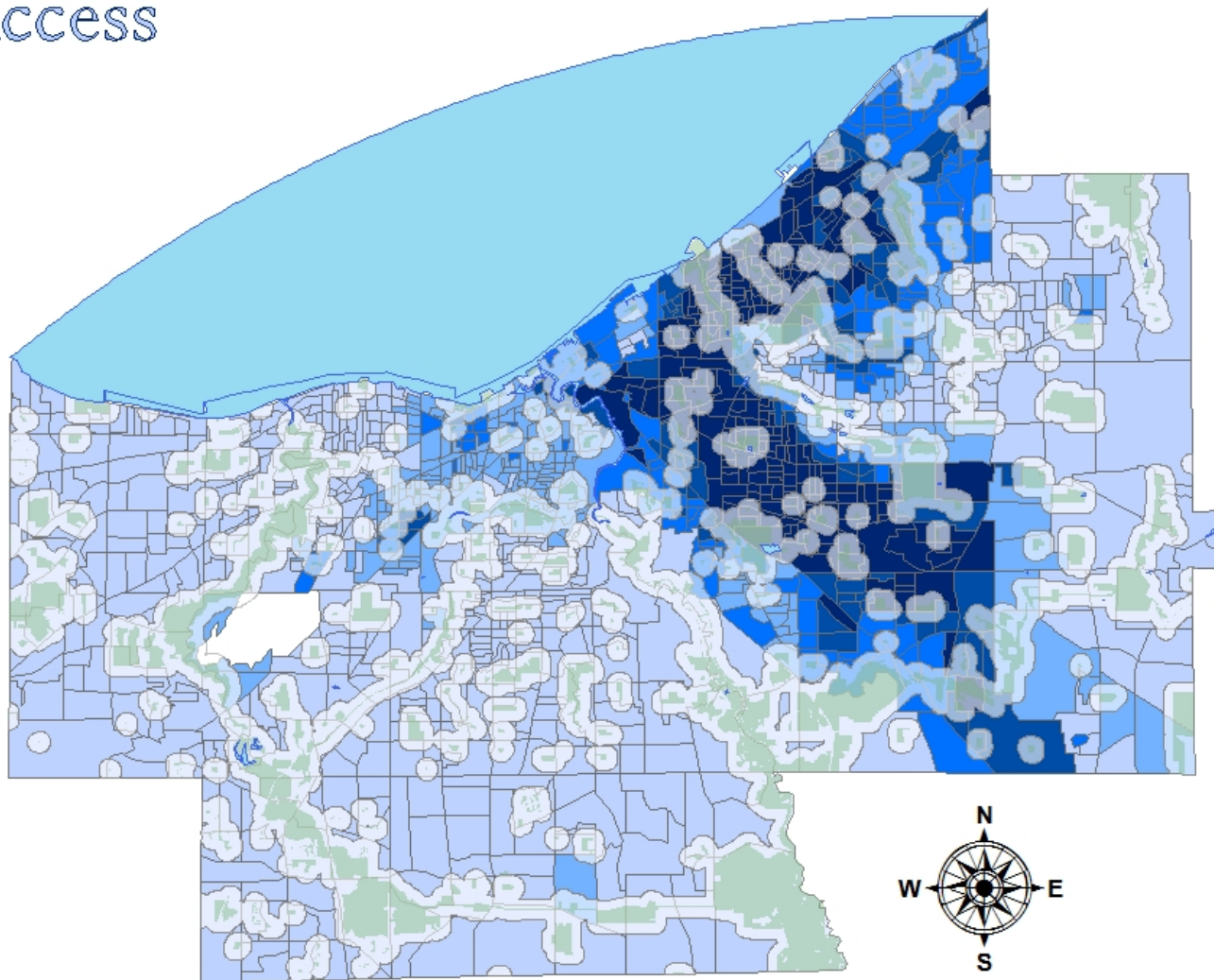
Legend

- Water Features
- Green Space
- Walk Distance

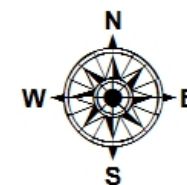
Population

Percent of Total

- 0% - 11%
- 12% - 29%
- 30% - 53%
- 54% - 81%
- 82% - 100%



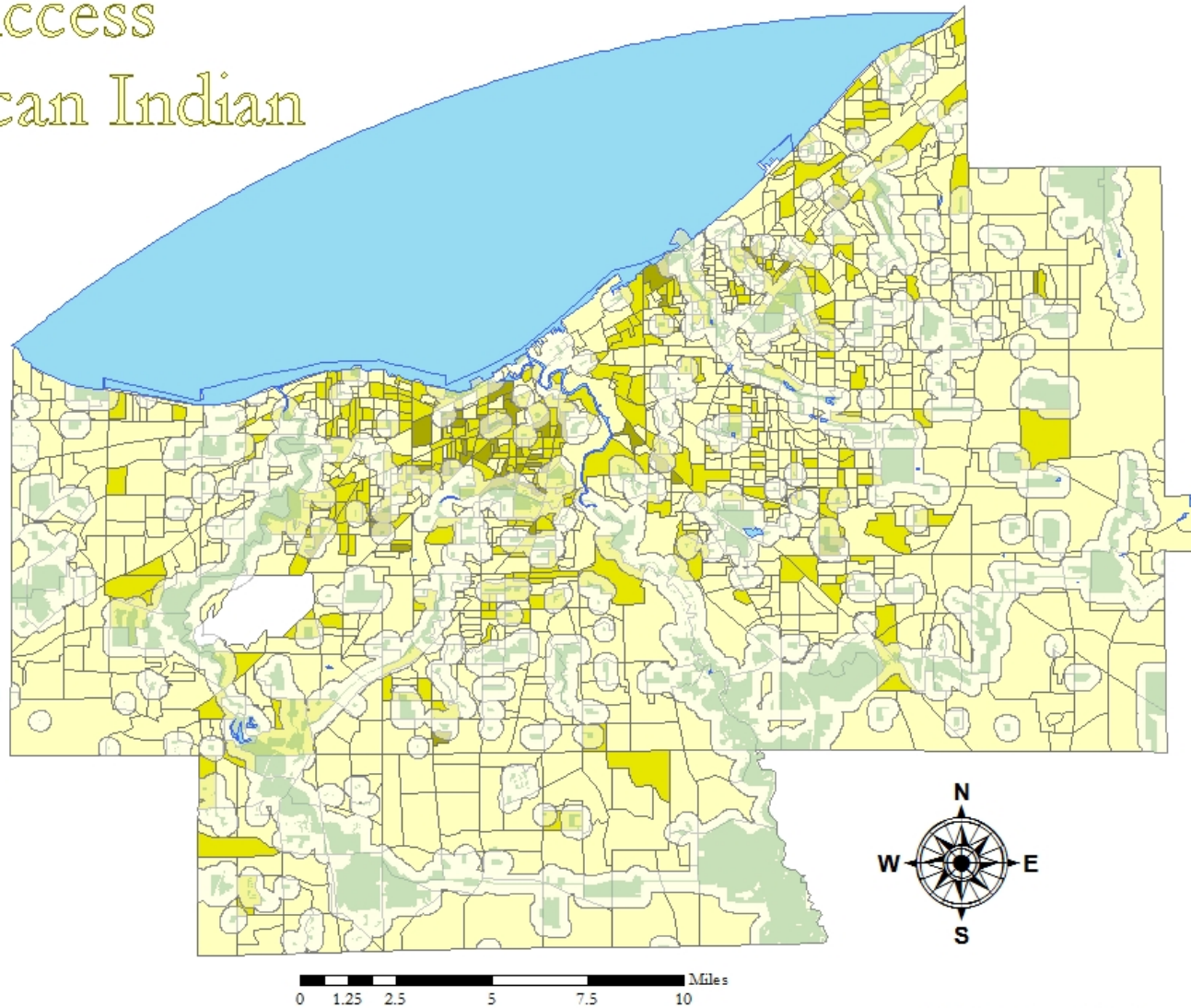
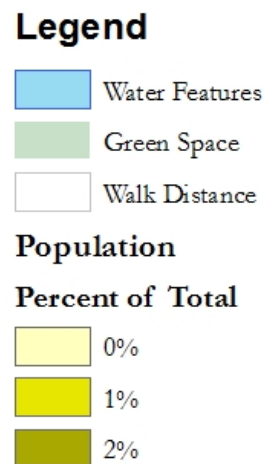
0 1.25 2.5 5 7.5 10 Miles



Map Prepared by Jared Robbins

Figure 6: Access to parks for black population in Cuyahoga County.

Park Access American Indian



Map Prepared by Jared Robbins

Figure 7: Access to parks for American Indian population in Cuyahoga County.

Park Access Asian



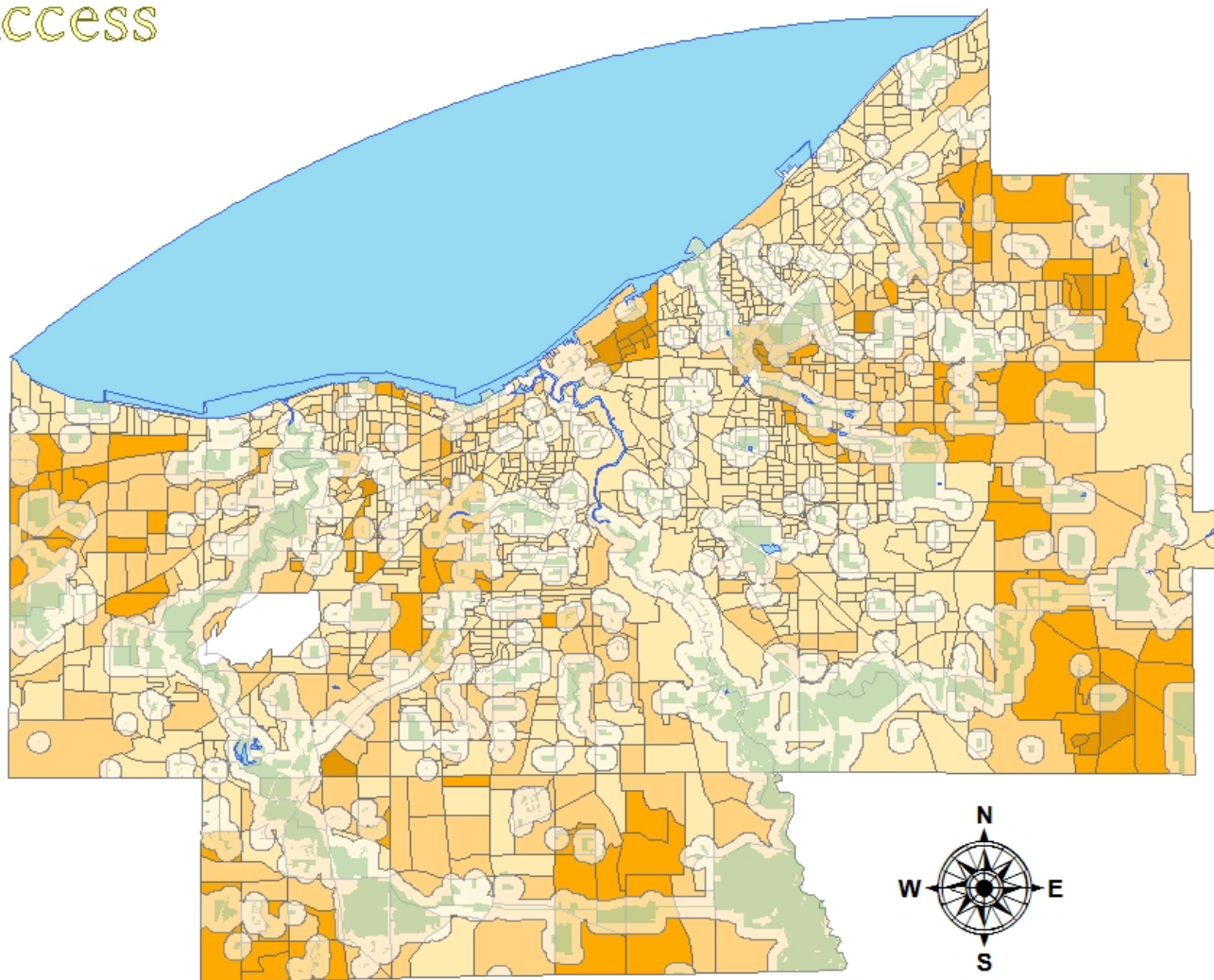
Legend

- Water Features
- Green Space
- Walk Distance

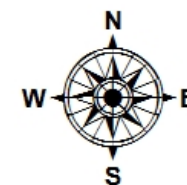
Population

Percent of Total

- 0% - 2%
- 3% - 5%
- 6% - 13%
- 14% - 67%



0 1.25 2.5 5 7.5 10 Miles



Map Prepared by Jared Robbins

Figure 8: Access to parks for Asian population in Cuyahoga County.

Park Access Pacific Islander



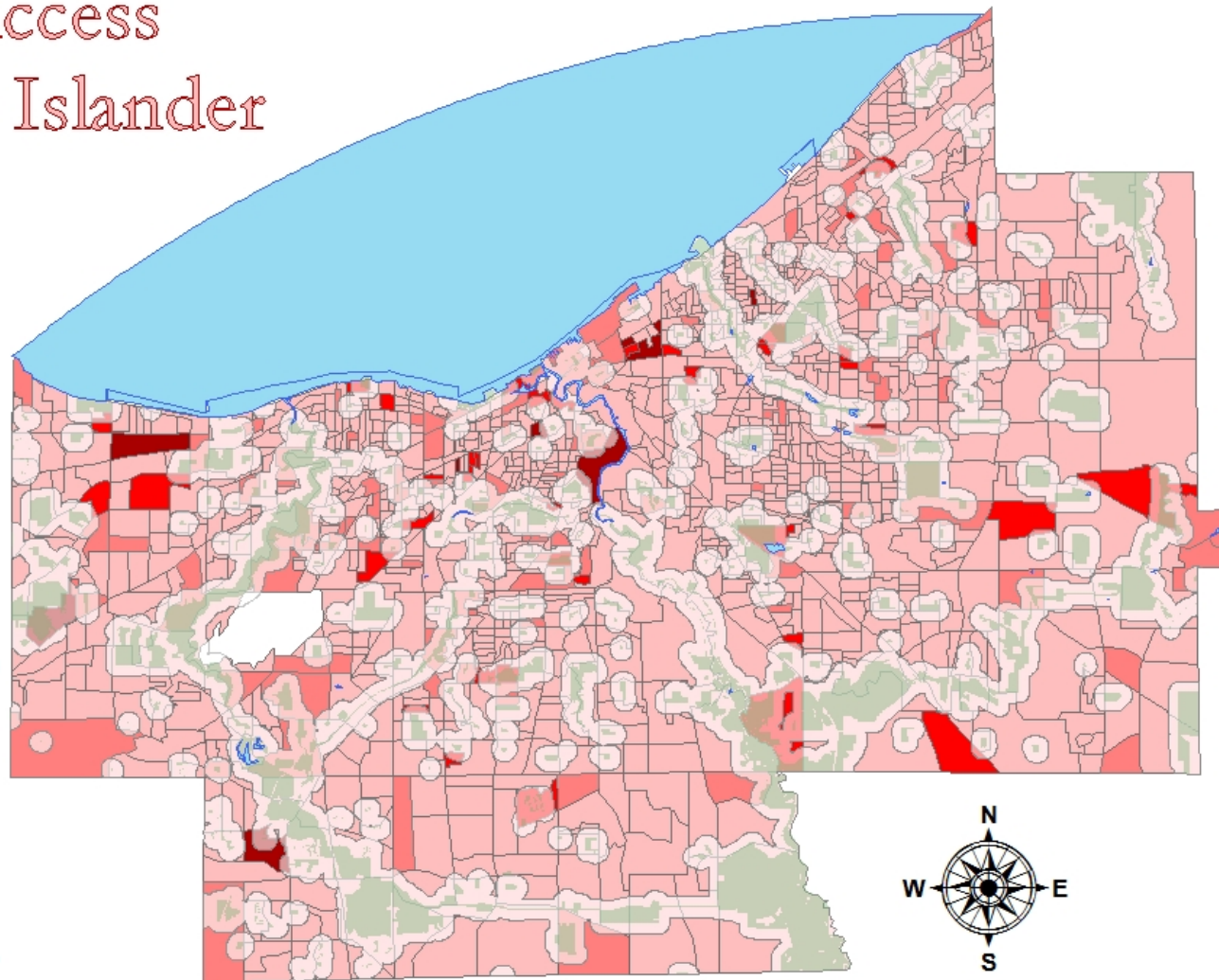
Legend

- Water Features
- Green Space
- Walk Distance

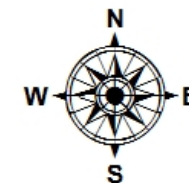
Population

Percent of Total

- 0% - 0.05%
- 0.06% - 0.16%
- 0.17% - 0.45%
- 0.46% - 1.15%



0 1.25 2.5 5 7.5 10 Miles



Map Prepared by Jared Robbins

Figure 9: Access to parks for Pacific Islander population in Cuyahoga County.

Park Access Other Race



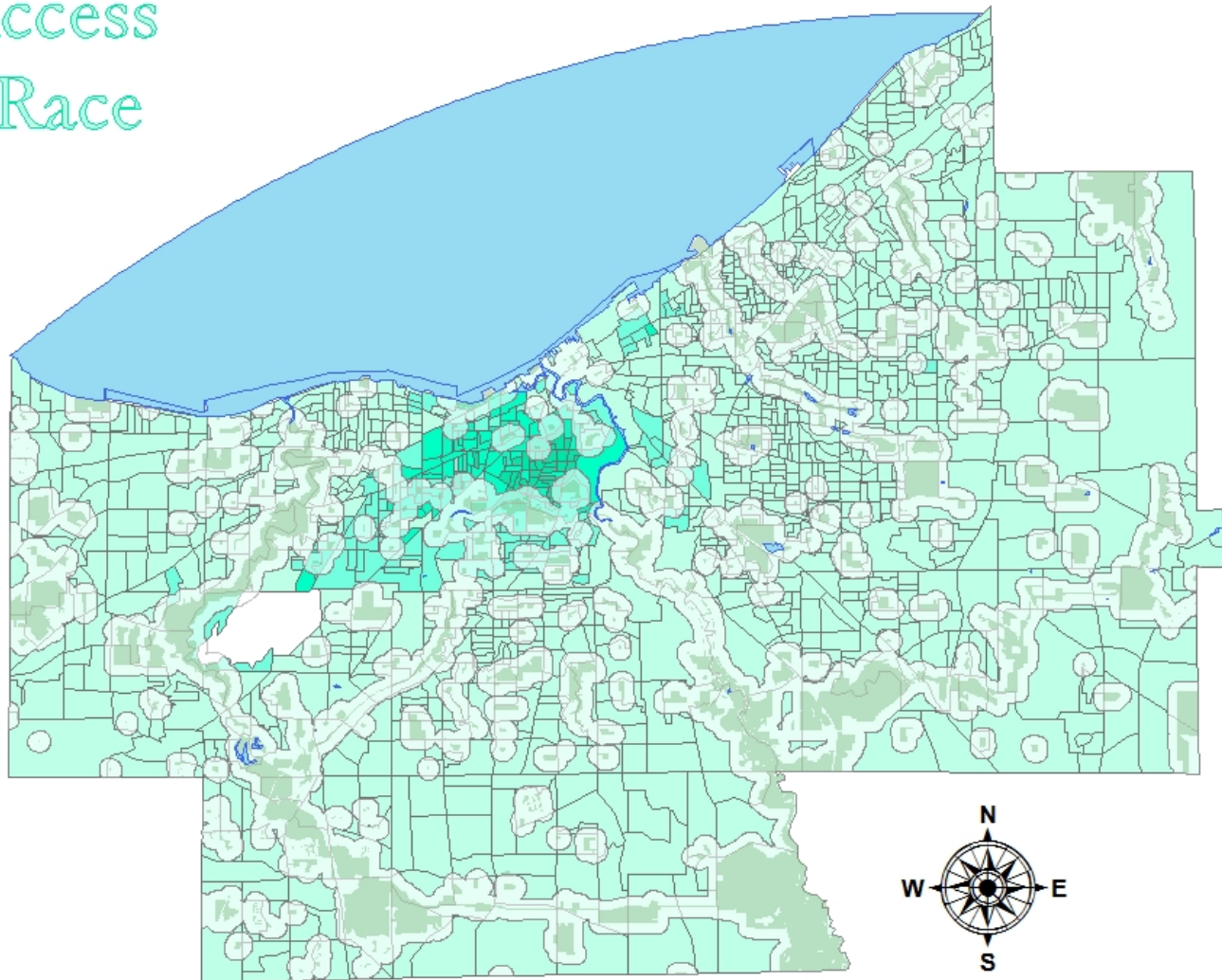
Legend

- Water Features
- Green Space
- Walk Distance

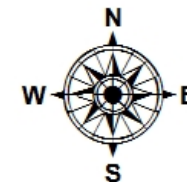
Population

Percent of Total

- 0% - 3%
- 4% - 9%
- 10% - 17%
- 18% - 30%



0 1.25 2.5 5 7.5 10 Miles



Map Prepared by Jared Robbins

Figure 10: Access to parks for “other race” population in Cuyahoga County.

Park Access Multiracial



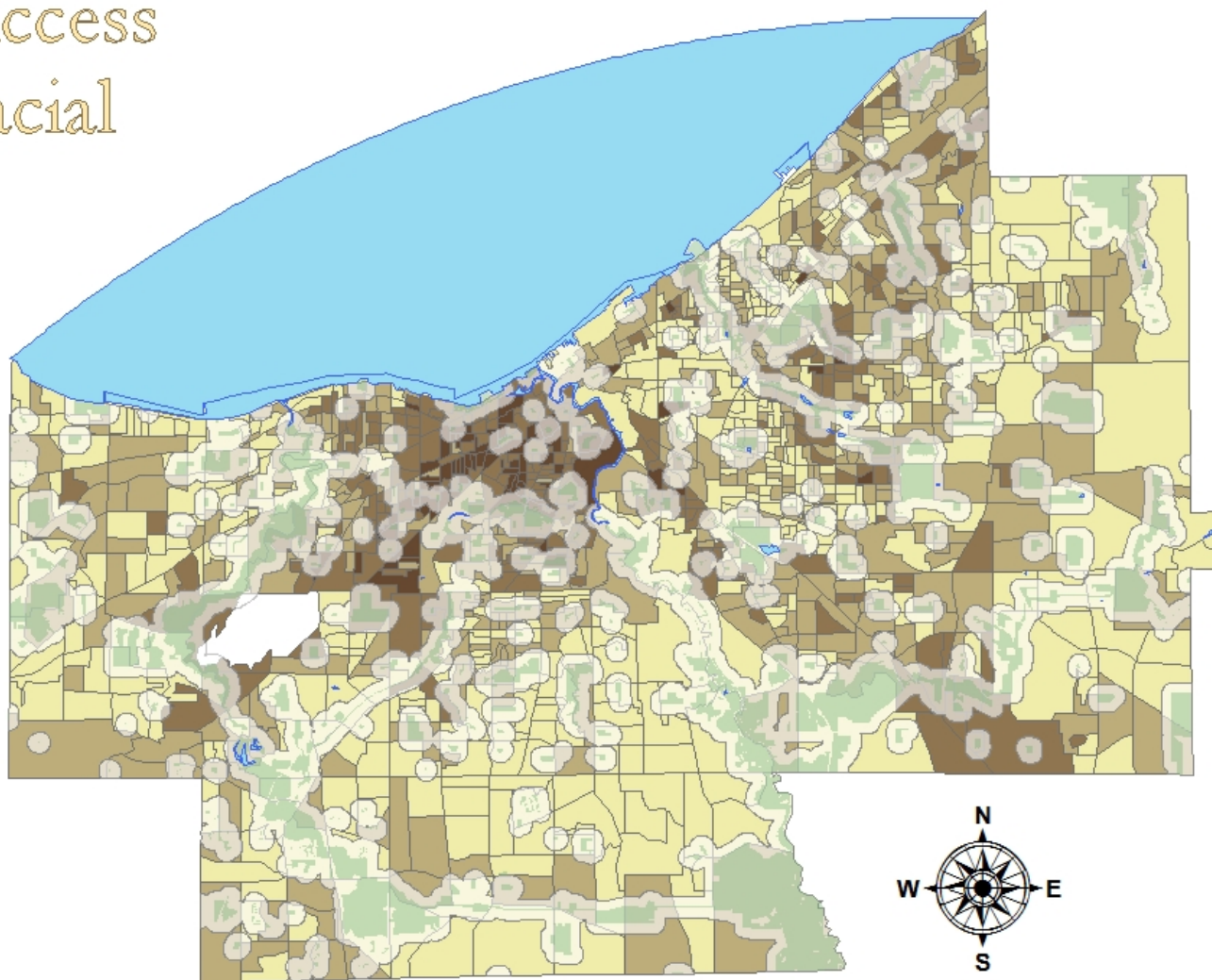
Legend

- Water Features
- Green Space
- Walk Distance

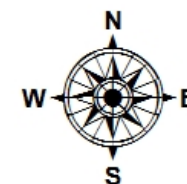
Population

Percent of Total

- 0% - 1%
- 2% - 3%
- 4% - 5%
- 6% - 11%



0 1.25 2.5 5 7.5 10 Miles



Map Prepared by Jared Robbins

Figure 11: Access to parks for multiracial population in Cuyahoga County.

3.4 Municipal Park Features

As previously mentioned, municipal parks in the County total just over 4,500 acres. This land is spread over 198 parks in 46 municipalities. Cuyahoga's municipal park system includes 15 large urban parks, 37 community parks, 71 neighborhood parks, and 26 mini-parks. Additionally, the County contains 15 natural resource areas, 8 school-parks, 7 special use parks, 8 sports complexes, 6 downtown parks, and 5 parks on private property. Table 16 lists each of these parks by name, municipality, park type, size, and amenities (see attached spreadsheet).

4. Discussion

4.1 Adequacy of Green Space

Almost all land in Cuyahoga County is within two miles of parkland within the County. The only portion not within this 2-mile area is in the Southwest section of Olmsted Township. It is possible that this area is near parks in neighboring Lorain and Medina Counties. Areas of the county

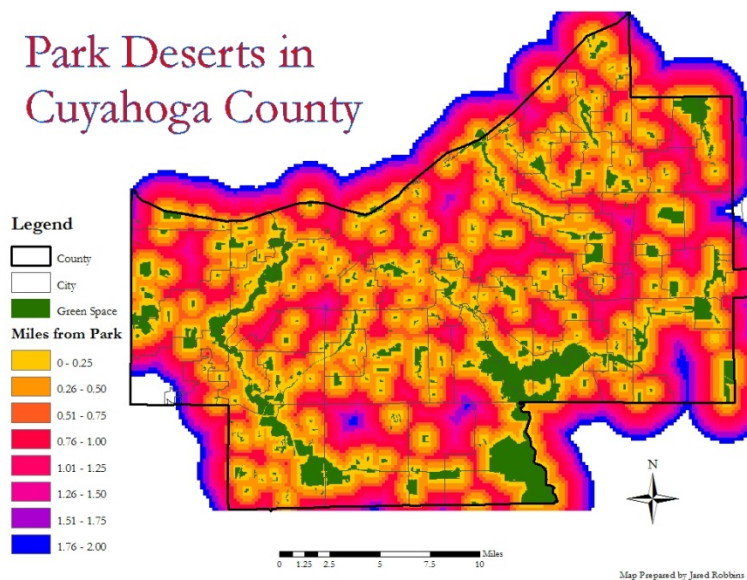


Figure 11: Distance from parkland given in miles. Yellow shows closest proximity to parks while red and blue show further, respectively.

furthest from parks include sections of Cleveland, North Royalton, the border of Broadview Heights and Independence, and sections of Solon and Hunting Valley. It is important to note that much of this land may be undeveloped wooded areas not included in this analysis. Linndale and North Randall are small municipalities, and while they don't have any public parks, their populations seemed to be served by neighboring municipalities. Due to the large number and small size of Cuyahoga County municipalities, it is difficult to measure green space adequacy based on municipality alone.

Throughout the green space categories, only a minority of Cuyahoga County's population lives within walking distance. When amassing all urban green spaces, approximately 40% of the population lives within walking distance.

Interestingly, this figure holds true across the racial spectrum. It is worth noting the racial discrepancies between the Cleveland Metroparks and municipal parks. The Metroparks, run by an independent entity with its own revenue scheme, are well managed and maintained, impressive, and complete with an assortment of recreational activities. These parks are more often in more affluent communities along the County's periphery. The absence of large Metroparks in the inner-city makes it increasingly difficult for disadvantaged populations to access these parks. This disparateness is intensified more when one takes into account that lower income families in the central city often lack access to efficient transportation. In fact, a few of the Metroparks are not directly served by public transportation in the County, making these parks impossible to reach for individuals with no cars.

Municipal parks, meanwhile, are more prominent among nonwhite individuals than white individuals. This fact may stem from population trends in the County. With the creation of the interstate system and populating of the suburbs, the more affluent and mainly white population

left the central city, leaving behind an economically disadvantaged and majority nonwhite population. Cleveland and its inner-ring suburbs are built with more density than the Cleveland's outer-ring suburbs, with many properties having little to no green space. On the other hand, the outer-ring suburbs are populated with large plots of land, sometimes exceeding dozens of acres. These tracts contain reasonable green spaces within their property, mitigating the need for public parks. While age was not looked at in this study, a previous study states the highest served age group is those over 65 years of age, with 45.92% within walking distance (Robbins, 2012). As the elderly often do not have access to transportation and cannot walk very far, easy access to urban green space is very important for this age group.

4.2 The Case for Cuyahoga

In 1914, Charles Downing Lay, then landscape architect for the New York State Department of Parks estimated that 12.5% of a city's total area should be parkland (Moeller, 1965). Extrapolating this information to the County level, Cuyahoga is approximately 2% short in terms of land area reserved for green space. Mr. Lay estimated for every 100,000 people, there should be 700 acres of reservation, 400 acres of large park, 250 acres of neighborhood parks, 100 acres of playgrounds, and 50 acres of gardens and squares (Moeller, 1965). The County does meet and even exceed these targets. More recently, the NRA suggested 10 acres of park per 1,000 residents. Accounting for all urban green spaces in the County, Cuyahoga far exceeds this minimum, however remains far below it in terms of solely municipal parks. Overall, while the County is home to a large number and varied types of parks, these parks do not adequately serve all populations in the County. With health problems on the rise, it is more

important than ever to bring recreation to disadvantaged populations. As evidenced above, not only is physical exercise necessary for human health, but access to natural green spaces remains critically important, both in terms of physical and psychological health. Large parks such as the Metroparks must be interspersed among the inner-city. Additionally, smaller recreational parks should be placed in more areas around the suburbs. In many regions of the suburbs, children cannot walk to a nearby park in order to swim, play, or exercise. Mini parks do much to support healthy lifestyles, strong families, and strong communities. Such parks should not be forgotten as suburban growth and development continues.

4.3 Future Park Financing

As public goods, green spaces do not benefit a single person. This fact makes it incredibly difficult to create financing schemes for public green spaces. In most instances, they are supported financially by state and federal governments (Knudson, 1977). Most governments finance these public lands with tax revenues (Samnaliev, More, & Stevens, 2006). Due to economic pressures, however, government budgets are becoming increasingly tight, which trickles down directly to the parks departments. In New York City, the Parks Department's operations and maintenance budget has been slashed for the past five years and its staff cut by more than 30 percent (Ulam, 2013). Some cities have turned to private sources to create and maintain parks. "In 1968, the New York City Department of Planning outsourced the development of more than five hundred privately owned public spaces. In exchange for providing 'public space,' private developers were granted the right to build more than twenty million square feet of residential and office floor space that would not otherwise have been

permitted under zoning regulations” (Ulam, 2013). Much of this land, however, was useless, with a 2000 study showing that “about 40 percent of the public space created [had] lackluster designs, few amenities, and little or no sunlight. Some of the public spaces were in fact inaccessible to visitors (Ulam, 2013). Other parks, such as the Hudson River Park in New York City, “must raise [their] own funds through income generated from concession fees, grants, donations, and rents from commercial tenants within the park” (Ulam, 2013). Hudson River Park and municipal park agencies “have become charity cases, overly dependent upon support from conservancies and Friends (sic)” groups in order to fulfill their missions (Ulam, 2013). This private source funding creates two classes of users, the funders who profit from these parks and the citizens that use the sites (Ulam, 2013). In fact, “much of the corruption that attaches to urban politics relates to how public investments are allocated to produce something that looks like a common but which promotes gains in private asset values for privileged property owners” (Harvey, 2012). To combat the takeover of public lands by private entities, public green spaces should remain financed by the public realm. For this to happen, a true value must be placed on urban green spaces which reflect citizens’ willingness to pay for their use.

As mentioned previously, hedonic valuation methods afford suitable monetary valuation of non-priced services, and have been widely used to value public spaces (Jim & Chen, 2006). Contingency valuation provides another method with which a public space’s value can be found (Jim & Chen, 2006). Such methods, which ask a population’s willingness to pay provides a reasonable worth for parks and other open spaces. A study in Guangzhou, China estimated the average willingness to pay for urban green spaces at RMB17.40, or about \$2 per person per month (Jim & Chen, 2006). A 2012 study by Leon Younger, former executive director of the Lake Metroparks in Lake County, Ohio showed that 85% of those surveyed in Cuyahoga County

would pay \$15 more in taxes for the Metroparks to operate the Lakefront parks (Ewinger, 2012). To the owner of a \$100,000 house, this value accounts for an almost 25% increase. Armed with contingent valuation, parks departments can yield a quantitative value for the importance of their services. Such information is integral to changing the amount of public money allocated toward urban green spaces.

Furthermore, parks departments should work in tandem with other government agencies. Working with Departments of Transportation, Planning, Health, and other government services increases the amount of money available to creating and maintaining urban green spaces. As parks provide services for each of these departments, such interagency interaction should not only be welcome, but actively encouraged.

4.4 Project Limits

All calculations and maps created in this study are based off of the Cuyahoga County Planning Commission's Open Space Inventory. This collection of data is the most comprehensive and complete anthology of urban green space in existence in the County, however it is not perfect. Park shapefiles are not always true to scale. For instance, while the Cleveland Metropark's owns 18,123 acres in the County, this analysis yields 17,283.92 (Kutsko & Studniarz, 2012). This error is pervasive yet consistent throughout the green space data. Furthermore, there may be small or new parks throughout the County that are not present in the Open Space Inventory. Without knowledge of these parks, they were not able to be included in the case study.

Cuyahoga County is home to a growing number of community gardens. As of this time, there is no comprehensive public record of these gardens in existence. Due to time constraints, an independent collection of urban garden data was not possible, they were thus left out of the green space case study.

Inaccessibility to property data on a scale smaller than block group made it impossible to analyze whether proximity to parks affected property value. While this correlation has been shown in many studies, it was left out of this study.

Because of weather and time constraints, as well as limiting source error, municipal park amenities were determined via satellite imagery using Google Maps. While effective, this method is by no means infallible. Satellite images used on Google Maps are not always up to date; therefore park changes may not be reflected in their imagery. In addition, not all amenities are always viewable by satellite. This is even truer for small amenities, or amenities that may be hidden by tree cover. Originally a ranking of urban green spaces was to be included in this analysis, however, a fitting hierarchy could not be created without some sort of qualitative analysis such as a survey.

5. Conclusion

While the County does have a significant number of urban green spaces including a portion of the only National Park in the state, Cuyahoga is still underserved by green space. Additionally, different portions of the County are served by vastly different types of green space. The periphery of the County is served by the vast Emerald Necklace of the Cleveland Metroparks and Cuyahoga Valley National Park, while the center of the county is served only by

smaller spaces with minimal exception. This dilemma has both ecological and cultural consequences. Smaller parks and green spaces are not as influential in storm water management and other ecological services as are larger green spaces tied to watersheds. This means that the central city and inner ring suburbs see less groundwater percolation and natural water cleaning, while they suffer from increased runoff, erosion, and pollution. This “pocket park effect” also limits migration routes for wildlife, making many of these areas almost inaccessible for larger animals. Culturally the disparateness between inner and outer Cuyahoga County leads to changes in quality of life. Smaller inner-city parks do not have a number of recreational activities available in the larger suburban parks including hiking, bird watching, creek walking, and horseback riding. As previously mentioned, these large wooded parks also provide a vast array of emotional and social benefits, which are lost on urban residents. Further analysis of this situation should involve some aspect of qualitative measure for green space adequacy in the County. Additionally, open space upkeep and other factors that may affect park use were not looked at and should be incorporated into future analyses. With a glut of underutilized and vacant land in the inner-city, it is possible to create park corridors to truly make this region a “green city on a blue lake.” As we move forward into the 21st century, it is integral we preserve and extend our park system, providing green space and ecological services to our entire population.

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