City of Flint – City Park System
Park Mapping and Equity Assessment

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December 2012
Prepared for: Healthy Kids, Healthy Communities
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INTRODUCTION

In order to encourage youth and adults to live active lives, the Flint Healthy Kids, Healthy Communities (HKHC) initiative is working to improve the parks in Flint, Michigan so that the population has access to safe and attractive places for physical activity and recreation. This assessment was completed as an update of the report that was submitted by University Outreach, University of Michigan-Flint in November 2010 that used data from the 2000 U.S. census, which was the most up-to-date data at the time. Various models have been developed and utilized for park equity analysis, most notably the model which was developed by the Trust for Public Land’s Center for City Park Excellence (http://www.tpl.org/) for a study in Kalamazoo, Michigan. In order to demonstrate how many children might lack opportunities for outdoor recreation, a four-point “vulnerability index” was developed which accounted for population density, youth, poverty, and racial minority population distribution (Kalamazoo Nature Center, 2009). By replicating this model, this assessment will identify areas of need for parks in Flint as a measure of demand by the Flint population.

Flint Demographic Changes

Between the 2000 and 2010 Censuses, Flint experienced some major changes as illustrated in Table 1. The total population decreased by 18% and the median age increased by approximately 3 years. A greater percent of the population is Black. While there was a slight increase in median household income, there were also increases in the percent of individuals and families living below the poverty threshold.
Table 1: Flint, Michigan Demographic Profile Highlights, U.S. Census

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>2000</th>
<th>2010</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>124,943</td>
<td>102,438</td>
<td>-18%</td>
</tr>
<tr>
<td>Male</td>
<td>47%</td>
<td>47.6%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Female</td>
<td>53%</td>
<td>52.4%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>Median Age (Years)</td>
<td>30.8</td>
<td>33.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Youth (Under 18 Years)</td>
<td>30.6%</td>
<td>28.4%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>One Race</td>
<td>96.9%</td>
<td>96.1%</td>
<td>-0.7%</td>
</tr>
<tr>
<td>White</td>
<td>41.4%</td>
<td>37.4%</td>
<td>-4%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>53.3%</td>
<td>56.6%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>3%</td>
<td>3.9%</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic Characteristics</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Household Income</td>
<td>$28,015</td>
<td>$28,337</td>
<td>1.15%</td>
</tr>
<tr>
<td>Families Below Poverty Level</td>
<td>22.9%</td>
<td>32.1%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Individuals Below Poverty Level</td>
<td>26%</td>
<td>36.6%</td>
<td>10.7%</td>
</tr>
</tbody>
</table>

METHODS

In order to visualize the City of Flint Park System and its relationships with the Flint population, it was necessary to accumulate the pertinent GIS spatial data layers and their attributes. Sources for data included the State of Michigan Center for Geographic Information Framework dataset, University Outreach at the University of Michigan-Flint, the City of Flint Police Department, and National Historical Geographic Information System (http://nhgis.org), which was used to retrieve 2010 U.S. Census Data. The data layers included Flint Census block groups, the Flint city boundary, the transportation network, hydrology, City of Flint Parks, the Flint River Trail network, Flint Schools, and locations of crimes. Population characteristics specific to each of the Flint block groups were obtained from the 2010 U.S. Census Data and joined to their respective block groups within the geographic information system. These characteristics included total population, race, age of population, number of households, number of families, and household income. From these variables, additional characteristics were calculated, including population density, the percent of the population that are youth (i.e. 18 years of age and under), percent of the population that identifies as a minority race (i.e. not white), and the percent of the population living in poverty; these four criteria were used to generate the vulnerability index (Kalamazoo Nature Center, 2009). Where the cumulative values of these criteria were
highest designate where children were in greatest need of natural play spaces. The layers were imported, rendered, and analyzed using Environmental Systems Research Institute, Inc. (ESRI®) ArcGIS Desktop 10 Service Pack 5 software.

Distance is often a limiting factor in terms of access to parks. A walk of about five to ten minutes, or 0.25 mile, is widely accepted as a maximum distance people are willing to walk to gain access to a recreational facility (Kalamazoo Nature Center, 2009). Using a geoprocessing tool within the GIS, a 0.25 mile buffer zone was created around the Flint parks (Figure 1). Displayed in Figure 2 are the population totals within each block group. The 0.25 mile buffer was used to determine how much of the population lives within a walkable distance to a park. Intersecting the buffer polygon with the block groups layer created a new polygon layer of the area considered a walkable distance to a park, which also contains population density information within that same area. The simple multiplication of population density and area yielded an estimate of the number of people living within 0.25 mile from a park in the city.

Population density (Figure 3) was determined by dividing the total population within each block group by the area of the respective block group to yield the number of people per acre. Youth distribution is shown in Figure 4. Youth were defined as anyone age 18 years old and younger. For the purpose of this report, minority population was defined as all individuals identified in the U.S. Census as non-white. The minority distribution in Figure 5 represents the percent of the non-white individuals in each block group. Similar to the previous equity report using 2000 Census data and the report in Kalamazoo, poverty was defined as households reporting a total income of $25,000 or less (Kalamazoo Nature Center, 2009). Level of poverty (Figure 6) was calculated as the percent of households per block group below the defined poverty threshold.

Because the four criteria required for determining a park needs index had different value ranges, it was necessary to normalize them. This was accomplished by setting a uniform index ranging from 0 to 100, where 0 represents the lowest values and 100 represents the highest values. Within ESRI® ArcMap™ 10.0, a spatial analyst weighted overlay was executed by applying an equal weight (25%) to each of the four input layers and summing their values to produce a new GIS layer representing the need for parks. The park needs index would also have a possible range of 0 to 100. Note however, that a need score of 100 would only be possible if a single block group contained the scores of 100 for each of the four input criteria. The resultant park needs assessment is shown in Figure 7.

The index of need for parks within Flint illustrates relative areas of high and low demand for parks by the children of Flint. Just as it was possible to indicate the percent of Flint’s population located within 0.25
mile of a park, the percent of the demand for parks that is covered by the existing parks and 0.25 mile buffer area was also determined, that is to say, how much of the parks demand can be met by the park supply. The total need for parks across Flint was found by summing the need values for every block group. Then all of the park needs located within 0.25 mile of a park were summated. Dividing the park need within the buffer by the total park need across Flint yielded the percent of need that presently can be serviced by the City of Flint Parks System.

Flint has established an unfortunate reputation for high levels of crime. As such, proximity to a park is not the only concern for access to recreational space; crime can also be an inhibitor. In various studies to understand the relationships between real and perceived risks to children in their own neighborhoods, parents most often identified concerns about their children coming into contact with drug dealers (Prezza, Alparone, Cristallo, & Luigi, 2005), heavy vehicle traffic (Gielen, DeFrancesco, Bishai, Mahoney, Ho, & Guyer, 2004), and violence (Timperio, Crawford, Telford, & Salmon, 2004). Therefore, the specific crimes selected for analysis in this report were Aggravated/Felonious Assault, Violation of Controlled Substance, and Hit and Run Motor Vehicle Accident. In order to identify spatial patterns of crime, each type of crime was examined individually. Using the hot spot analysis spatial statistic tool in ESRI® ArcMap™ 10.0, it was possible to identify areas of high and low concentrations of the different crimes (Figures 8-10). The tool utilizes the Getis-Ord local statistic and returns a z-score where a larger, positive z-score indicates a spatial clustering of high values and a larger, negative z-score indicates an area of low values.

With the exception of the park needs weighted overlay in Figure 7, all of the maps represent values within block groups, which are discrete polygons. To symbolize the variables being represented, either a natural breaks or quantile classification method was applied to the range of values specific to each variable. As a standard, five classes were always used. A quantile classification divides the range of possible values such that the number of values is the same in each class. A natural breaks classification method is based on natural groupings of values inherent to the data, setting the class breaks so that similar values are grouped together while maximizing the difference between classes. The choice of the classification method applied was dependent upon the variable represented. Due to the nature of the weighed overlay tool, the park needs index is displayed as a raster. The raster was rendered using the stretched symbology method which displays continuous raster cell values across a gradual ramp of colors.

RESULTS

From the City of Flint Parks system layer, 60 parks totaling 1,206 acres were used in this equity analysis. A breakdown of the number and acreage of each type of park is in Table 4. Golf courses, parkland not owned by the City of Flint, privately
owned recreational facilities, and publically accessible recreational facilities adjacent to schools not identified as school park sites were also excluded from calculations.

The area of park space and the surrounding 0.25 mile buffer (Figure 1) contains a total of 11,980 acres, which is approximately 55% of the 21,789 acres within the City of Flint. From the calculation of population density multiplied by parks area, approximately 61,747 people, or 60% of Flint’s total population lives within a quarter mile of a park.

<table>
<thead>
<tr>
<th>Park Type</th>
<th>Number</th>
<th>Area (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Park</td>
<td>11</td>
<td>662.9</td>
</tr>
<tr>
<td>Neighborhood Park</td>
<td>25</td>
<td>242.7</td>
</tr>
<tr>
<td>Major City Park</td>
<td>2</td>
<td>145.3</td>
</tr>
<tr>
<td>Playlot</td>
<td>9</td>
<td>10.7</td>
</tr>
<tr>
<td>Special Use Park</td>
<td>13</td>
<td>144.1</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>1,205.7</td>
</tr>
</tbody>
</table>
The total number of people residing in each block group is shown in Figure 2. It is apparent that much of the space developed for parks and recreation are situated in areas of high population, some in block groups containing more than 1,000 people. Total population was classified by the natural breaks method.

Population density (Figure 3) was calculated as the number of individuals per acre in each block group. Some of the densest block groups contain more than 15 people per acre, whereas some of the least dense block groups contain fewer than 4 people per acre. It should be noted that in the most southwestern block group of Flint is the Flint Bishop Airport, and while there are no parks in this block group, there is also almost no population there. Population density was classified by the quantiles method.

Figure 4 reveals the distribution of Flint’s youth, which is based on the percent of the population in each block group that is 18 years of age or younger. Some of the densest areas of youth are in the northeast, where there are several block groups in which more than 50% of the population are youth. Youth distribution was classified by the quantiles method.
In following with the previous report, minority persons were all those who identified themselves in the 2010 census as non-white. The distribution of the minority population shown in Figure 5 is based on the percent of individuals in each block group who identified themselves as non-white. The most obvious concentration of minority people is in the northwestern quadrant of the city. Minority population was classified by the natural breaks method.

For the purpose of this report, the definition of poverty was a reported total household income of $25,000 or less. In all of Flint, 47% of households are below this poverty threshold. Most of the block groups with the very highest percentage of poverty are dispersed throughout the city, with the exception of a small cluster of block groups in the northeastern part of Flint (Figure 6). Poverty was classified by the natural breaks method.
Aggregating the values of population density, youth distribution, minority population distribution, and poverty produced a city-wide park needs index for Flint. The resultant index ranged from 0 to 83.25. This means that no single block group contained the highest score for all four of the input needs criteria. Areas in greatest need for parks are in the north and northwest sections of Flint. It is apparent in Figure 7 that there are also many parks located in the vicinity to service the areas in greatest need for parks.

It is clear that simply living near a park does not mean the park is fully utilized. Fear of crime by parents and children is a barrier to park access. As an initial exploration of patterns of crime and its spatial relationships to parks, three types of crimes were selected for hot spot analysis. The crime database included incidents reported to Flint Police for the year 2012. The analysis revealed that locations of concentrations of high incidence of crime were dependent on the type of crime. Aggravated assault (Figure 8) had concentrations in the northwest and south central parts of Flint. Controlled substance violations (Figure 9) were most prevalent in central and south central Flint. Hit and run vehicle accidents (Figure 10) had a
significant concentration in central Flint, northwest of the intersection of Interstates 475 and 69.

Figure 8: Hot Spot - Aggravated Assault

City of Flint Parks System
Crime: Aggravated Assault

Figure 9: Hot Spot - Controlled Substance Violations

City of Flint Parks System
Crime: Controlled Substance Violation
CONCLUSION

The City of Flint Parks System is well-planned and distributed throughout Flint. A total of 60 recreational areas out of the City of Flint Parks system were used in the parks need analysis. The 1,206 acres of park land and their surrounding 0.25 mile buffer cover 55% of the total area in Flint. From the population density of the block groups covered by the 0.25 mile buffer approximately 60% of the Flint population resides within walking distance of a park. The summation of the park need index values within the 0.25 mile buffer indicates that 80% of the demand for parks can be met with the current supply of park space. This indicates that the existing parks are located in areas where they are needed. In particular, Atherton Park and Brennan Park in southeastern Flint are smaller parks, but they are located in areas with some of the highest needs for parks. In the northwest region of Flint, surrounding Flint Park Lake, Max Brandon Park, and Hasselbring Park, there is also a high concentration of need. However, those same areas have high concentrations of aggravated assault. It is likely that crime is an inhibitor to park utilization there and in other areas around Flint.
Appendix A: Figures 1 -10
Figure 1: Geographic Distribution of the City of Flint Parks System- Quarter Mile Buffer

City of Flint Parks System
Geographic Distribution of Parks - 1/4 Mile Buffer
Figure 2: Total Population

City of Flint Parks System
Total Population by Block Group (2010 Census)
Figure 3: Population Density

City of Flint Parks System
Park Needs: Population Density

Population Density
Persons per Acre

- Parks
- Golf Courses
- Cemeteries
- Rivers and Lakes

Map created by Laura Gallagher
Figure 4: Youth Distribution

City of Flint Parks System
Park Needs: Youth Distribution
Figure 5: Minority Population Distribution

City of Flint Parks System
Park Needs: Minority Population

Minority Population Distribution
Percent Non-White

- 0.00 - 23.55
- 23.56 - 34.53
- 34.54 - 61.77
- 61.78 - 87.69
- 87.70 - 99.26

Legend:
- Parks
- Golf Courses
- Cemeteries
- Rivers and Lakes

Map created by Laura Gallagher
Figure 6: Poverty

City of Flint Parks System
Park Needs: Poverty

Percent of Household Income Below $25,000

Map created by Laura Gallagher
Figure 7: Weighted Overlay, Park Needs Index

City of Flint Parks System
Park Need
Weighted Overlay: Population Density/Youth/Poverty/Minority

Park Needs Assessment
Value
- High: 83.25
- Low: 0

Map created by Laura Gallagher
Figure 8: Hot Spot - Aggravated Assault

City of Flint Parks System
Crime: Aggravated Assault
Figure 9: Hot Spot - Controlled Substance Violations

City of Flint Parks System
Crime: Controlled Substance Violation
Figure 10: Hot Spot- Hit and Run Vehicle Accidents

City of Flint Parks System
Crime: Hit and Run Vehicle Accident
Resources:

City of Flint-City Park System Park Mapping and Equity Assessment, University Outreach, University of Michigan-Flint November 2010


