An Assessment of Urban Park Values and Residential Properties Utilizing GIS in Rochester, Minnesota

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Abstract

Urban parks and open space have always been a valuable asset to human communities. They are multi-faceted in the kind of value that they have provided to local communities. For this reason, parks and open space have been given much attention during the planning processes in the urban environment. Urban parks have not only provided recreation benefits to communities, but have provided much economic wealth to local communities. Community residents have noted the benefits of urban parks. In many urban environments, residential property values have increased near parks as a direct result.

The City of Rochester, Minnesota has been acknowledged as having a very strong urban park system. The city's several ravines, rivers and woodland areas have provided natural corridors for the development of its park system. A strong economy in Rochester has resulted in continuous urban growth. Along with the city's growth, the downtown and residential areas are now becoming more urbanized.

Rochester has also been noted for its stable property and housing prices. City property is in demand, and will continue to be in great demand for years to come. As Rochester expands, its parks system needs to be considered during the urban planning processes to protect the high sense of residential value that Rochester is known for today. This study takes a look at the values that Rochester's urban parks are given by the local communities, and more specifically, the correlation between the urban parks and residential property value. A Geographic Information System (GIS) was implemented to show direct patterns and correlations between the city park system and residential property values.

Introduction

Parks have been important in the urban planning processes throughout the nineteenth and twentieth centuries. In our history, humans placed values on favored possessions. In the nineteenth century, aesthetic values relating to the visual properties greatly influenced urban planning decisions. Planners of this era believed that the quality of the physical and visual environment had a profound impact on the morals, lifestyles and views of the urban communities (Whyte, 1970). This view within urban planning expanded in popularity throughout the start of the early twentieth century. This aesthetic movement is sometimes referred to as the *City Beautiful* movement (Whyte,

1970). This movement is responsible for producing many of the parks in urban areas today. Examples of the *City Beautiful* movement can especially be seen in most of the older cities on the East Coast of the United States. New York City is a prime example. The *City Beautiful* movement can also be seen in other areas of the United States, including Minnesota. Minneapolis has been noted for their prime parks surrounding the lakes of the southern regions of the city. These parks have great value and are well appreciated by thousands of users every year. Activities are abundant throughout the year in these parks. Residential properties surrounding these parks are extremely desired. Housing surrounding these parks is often quite extravagant and expensive. Other cities in Minnesota have seen similar residential appreciation given towards parks surrounding their urban park landscapes.

The appreciation of the public is often referred to as "social value". Eight key factors are deemed to be important for social value (Whyte, 1970). These key factors include urbanization, residential quality, historic value, agricultural value, recreation value, wildlife value, water value, and soil resistance to erosion (Whyte, 1970). Local planners have cited Rochester's parks and communities as possessing most of these key factors that provide social values.

Rochester's city parks are quite diverse. The city provides regional, community and residential parks alike. Some of Rochester's parks provide many of the typical amenities that are found in city parks. These amenities include playgrounds, baseball and softball fields, tennis courts and open space. Parks included in this category include Essex, Silver Lake, Elton Hills and Foster Arend. Other parks within Rochester provide unique amenities, including the Quarry Hill Nature Center, Olin Bird Sanctuary and the Plummer House. Rochester's parks provide a wide array of activities for many levels and types of users. For the size of the city, Rochester provides an excellent park system.

Placing value on land and space within a city is an essential part of urban planning. Placing values is important in urban planning because it shows community support (Johnson, 1989). An example, if a community places high value on increasing its economy, the community may promote and support industrial and/or other business growth within the community. Community residents can show support for urban parks in the same fashion. Those communities that place high value on their park systems will often display and promote their parks with economic support (Nat. Park Service, 1995). For this reason, parks and the general welfare of a city can often be related. If a community is growing economically, then that community may provide a fine park system.

Parks in an urbanized environment also provide people with a feeling of place and identity. Parks provide space for the public because the government owns them. Parks also can instill pride for a community or city, and often give a city an identity (Nat. Park Service, 1995). Central Park in New York City is well recognized, and gives the city a unique character. Rochester is also known for its beautiful downtown park system, but at a much smaller scale. Visitors to the area often notice the city park system immediately. In 1998, Money Magazine ranked Rochester as

being the number one-rated small city in America, partially due to its standard of living (Money Magazine, 1998). Indeed, part of Rochester's character and standard of living can be seen through its city park system.

City parks can provide many opportunities to a community. Not only have urban parks provided a retreat from the noise and bustle of traffic and crowds, they have also provided a stage for a whole range of social activities. Parks can often contribute to the safety, stability and vitality of the surrounding neighborhood. However, it is important to note that it is the people and activities in a park which contribute to a park's positive impact on the community.

Urban parks often provide excellent areas for the public to socialize. They often provide a place for enjoyment, recreation, relaxation, family affairs, socialization, communication areas, and a place for gatherings (Nat. Park Service, 1995). Urban parks also provide aesthetic beauty and natural resource protection.

Urban parks offer much to everyone. Many types of people frequent parks, including developers, property owners, children, businesses, students, government officials, homeless, the elderly and children. However, parks must be properly planned and maintained in order for them to be successful. If a park is not properly planned, it can often bring negative factors into the area. Negative factors often associated with poorly planned urban parks include crime, noise and congestion. Poorly planned parks can also limit certain types of people from accessing the park such as the elderly or children.

Park users show the social values that they put on local parks, and what those parks bring to the standard of living through their support. People and society put high values toward parks that offer them satisfaction. They feel that a jog in the park, a tennis match with a friend, and a neighborhood softball game are all appreciated, and see these park amenities as factors that improve and strengthen one's standard of living. Al Gore, the Vice-President of the United States, wrote about parks and community life, stating that, "we (society) care about this place, and value the quality of life. Parks bring balance to our post-industrial, sped-up lives" (Gore, 1998).

Parks have had an effect on residential neighborhoods due to the many opportunities that they provide. Past studies have shown in fact that parks do have a positive effect on residential property. A study of property surrounding four main parks in Worcester, Massachusetts showed that a house located adjacent to a park sold for $2,675 more than a similar house located 2,000 feet away (Nat. Park Service, 1995). A similar study in Columbus, Ohio showed that homes that faced a park sold for between seven and twenty-three percent more than homes one block away from a park (Nat. Park Service, 1995).

Although many studies show the positive economic impacts of parks, some studies have shown that parks can have negative influences on adjacent properties as well (Lyon, 1972). Lyon showed this in particular study (Figure 1).

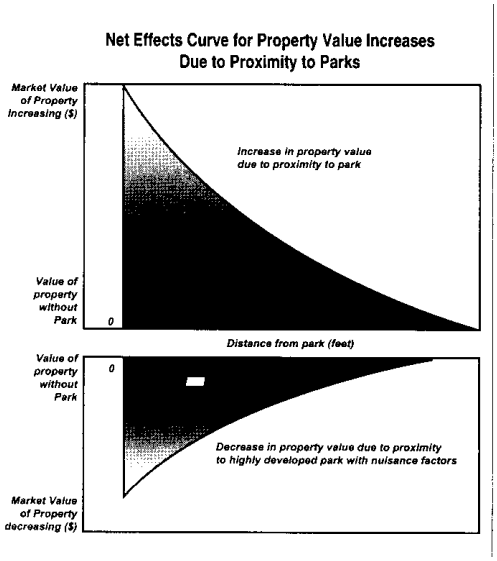


Figure 1. Lyon's Curve for Negative Property Values.

Lyon's upper graph shows the increase in property values due to the proximity to a park. The bottom graph is the effect on property values due to a highly developed and used park. This bottom graph shows that properties closer to parks that have negative factors can depreciate in value because of their proximity to the park.

Local real estate professionals have noted the City of Rochester's park system as having direct effects on residential properties surrounding the city's park system. However, real estate experts disagree about the impacts that parks have on communities in the City of Rochester. While they do recognize that parks effect the local communities, they disagree on the type of impact that parks actually have on local communities. According to Ed Garris, a Certified Residential Specialist (CRS), parks do have a positive effect on residential property values (Garris, 1999). He has seen residential properties that are within three blocks of specific parks appreciate in value of three to five percent annually, compared to a one to two percent increase for residential properties not within close proximity of parks. Although Mr. Garris believes that other factors may influence an increase in property values (such as proximity to elementary schools), he believes that a property's proximity to urban parks is the key to resale. Other real estate experts, such as Mike Nigbur of the Public Works Department, states that only select areas of the city show a correlation between residential property values and the city's park system. He feels that for the majority, most of the city parks often give a negative impact on communities (Nigbur, 1999). He sees parks as being community disturbances that often bring noise, traffic and foul activities closer to the residential communities. He sites the Watson Sports Complex as an example of negative impact. He also feels that many residents within the city limits of Rochester do not value the urban parks as highly as residents living in other cities. Nigbur feels that Rochester residents can easily leave the city to enjoy more rural parks with little time or effort.

Methods

Data Collection

Data were obtained from the City of Rochester Parks and Recreation Department, Public Works Department and the Rochester/Olmsted County Planning Department. These sources provided a comprehensive collection of information pertinent to the City of Rochester's urban planning issues. Specific coveragages included a city parcel coverage, municipal coverage, street coverage and river coverage. All coverages were shapefile formats for use in ArcView GIS 3.0a. All coverages

were already projected in the State Plane projection, North American Datum 27.

Creation of Coverages

Several city coverages needed to be created for this study. Specifically, the Rochester parks coverage was created since one was not already available. This coverage was created (using ArcView 3.0a) by selecting the appropriate parcels which were listed as being park ownership from the city parcel coverage. Selected parcels were then merged into separate items to create an individual park using the *Merge* command of the Xtools Extension in ArcView 3.0a. All parks were then combined into one coverage. All schools within the City of Rochester were also included in this newly created coverage since the Rochester Parks Department currently maintains school properties. A database was also created for this coverage to show the specific names and GIS identification numbers for each individual park or school. Boundaries were double-checked using a 1994 original city parcel map that was obtained from the city. Knowledgeable Park Department personnel then verified park boundaries. Other databases were then collected containing demographic information about individual parcels. These were readily available from the Rochester/Olmsted Planning Department. These databases proved to be essential to this study because they provided key information about each individual city parcel, including a GIS identification number, parcel type (single families, multi-family, etc.), building value and land value.

Interviews

Important information was also collected from interviews with local and regional experts in this area of study. Interviews were conducted with a) Mike Nigbur, a real estate expert for the Public Works Department in Rochester, b) Jeff Morton of the Parks Department of Rochester, c) Jan Chezick of the Planning Department of Rochester, d) Jonathon Vlaming, a recreation and parks expert from the Metropolitan Council in St. Paul, MN, and e) Laurie Young of the Minnesota Department of Natural Resources, Trails and Waterways Division.

City Tour

A visual tour was performed in the City of Rochester as a means for familiarization of the current park layout. The tour provided an opportunity to develop a personal understanding of the City of Rochester's unique park system. The tour provided an understanding of the natural features, types of parks and residential property types within the city. Also, special consideration was given to those residential properties that were for sale. Some properties located close to parks advertised their close relation to the park system.

With the data available for this study, it was determined that the main two factors providing the most value for this type of correlation included building value and actual property values.

Methods for Building Value Analysis

For the majority of the study, a visual analysis displaying property value provided enough accurate information using ArcView 3.0a. First, building values were classified to show a ranking of their values within the city. Values

were categorized using fifteen classes to show a gradual change in the data for building values.

Next, residential parcels adjacent to the park system were compared to all other residential parcels within the city. To compare these parcels, a 75-foot buffer was created around each individual park to gather the 1,884 parcels of residential property. All parcels falling within the 75-foot buffer were then calculated to find the statistical mean for all building values. These parcels were then compared to other parcels that did not fall within the 75-foot buffer surrounding the parks by comparing the statistical mean of the two data sets. It is important to note that the same number of parcels falling outside of the 75-foot buffer (1,884) were compared to those parcels falling within the 75-foot buffer to create equal sample sizes. A random sample was used to collect the 1,884 parcels falling outside of the 75-foot buffer to avoid any biases in selecting the parcels for this sample.

Methods for Property Value Analysis

To find property values, land property values (minus the building value) were divided by the area of each parcel individually. This gave a property price per square foot value for each individual residential property. The following formula sums up this calculation:

(Land values - Bldg. values) / Area of Indiv. Parcels

This value could now be used to compare all parcels equally by eliminating parcel size discrepancies. Once this value was determined, values were classified to show rankings for property values using ArcView 3.0a. Again original methods classified property values into five classes. Further conclusions visually analyzed property values using fifteen separate classes to show more gradual changes in the data.

To gather more specific analysis for property value, parcels directly surrounding the parks were subset from other parcels within the city. Again, a 75-foot buffer was used to select those parcels directly surrounding the park system. A random sample of the same number of parcels (1,884) was then collected for parcels outside of the 75-foot buffer to avoid any biases in selecting parcels for this sample. The two samples were then compared to one another by comparing the statistical mean of the two data sets.

Additional Analysis Using Pearson Correlation Models

The distance to the nearest park was determined for all residential properties in Rochester using the *Nearest Feature* script (created by Timothy J. Fox) in ArcView 3.0a. Distance to the edge of all parks was collected for all residential parcels to see if any correlation actually existed between the individual parcels and the distance to the park system. This distance value was then statistically correlated with property values and building values individually with a two-tailed bivariate Pearson Correlation Model using SPSS software. With the Pearson Correlation Model, a numeric value above zero would suggest that positive correlation exists between the two data variables; distance and building values *or* property values for this study (Zar, 1996) A numeric number below zero would suggest that negative correlation exists between the two data variables.

Six correlation models were conducted in this study. Originally, two Pearson Correlation Models were conducted to determine if correlation existed between distance and property value and building value on all residential parcels within the city. These two correlation models were equally compared to one another by using the same number of parcels (8,434) for each data set. Again, a random sample was used to collect equal sized data sets.

Results from this model could be biased due to the large area being covered during this analysis. To avoid this discrepancy, a one-eighth mile buffer was created around all city parks to further compare building values and distance. Residential parcels falling within the one-eighth mile buffer were then subsetted, and a correlation model was then performed. A random sample was then used to select the equal number of parcels (8,434) falling outside of the one-eighth mile buffer. Again, a Pearson Correlation Model was conducted to show the correlation between distance and building values for parcels falling outside of the buffer. By conducting correlation models with the same number of parcels respectively, the studies eliminated any biases that could have resulted with uneven data sets.

A one-eighth mile buffer was also created around all city parks to further compare property values and distance. Residential parcels falling within the one-eighth mile buffer were then subsetted, and a correlation model was then performed. A random sample parcels comprising of 907,266,037.6 sq. feet. Residential properties make up 22,126 (76.8%) of the total parcels within the City of Rochester. However, this number is quite offsetting, since residential properties make up only 27.3 was then used to select the equal number of parcels (8,434) falling outside of the one-eighth mile buffer. Again, a Pearson Correlation Model was conducted to show the correlation between distance and property values for parcels falling outside of the buffer. Conducting correlation models with the same number of parcels eliminated any biases that could have resulted with uneven data sets.

Results

Data Discrepancies

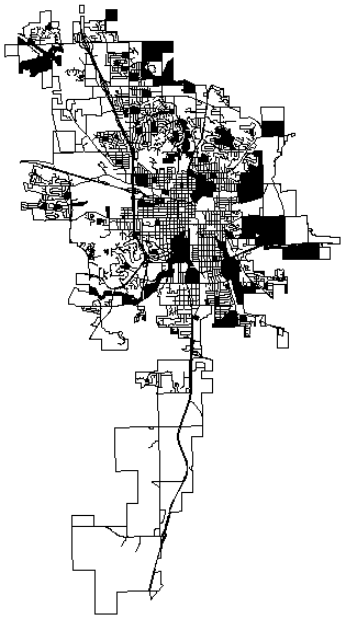
It is important to note that the parcel databases collected for this study were not completely evaluated. Data were looked at in a citywide collection to observe general spatial patterns for property value. Therefore, results will not provide specific statistical analysis for each individual parcel within Rochester. The coverages obtained for this project are being used to provide only general information for further park planning purposes. Also, since this study was specifically directed at those parcels that lie within the City of Rochester, those parcels that fall close to, but are outside of the city limits have not been used for spatial correlation analysis.

Overview

Using the digital city parcel map produced by the Planning Department, it was determined that the city has 28,813 percent of the total area within Rochester.

Rochester is comprised of 74 parks that are spread throughout the entire city (Figure 2). 1,284 residential properties fall directly adjacent to

Rochester's park system. Adjacent



residential parcels make up only 25,035,883.9 sq. feet, or 10.1 percent of the city's parcels (Figure 3).

Figure 3. Location of residential properties in Rochester, shown in black.

Spatial analysis

The main question that was asked during this study was if there was any correlation between the residential property values and the urban parks within the City of Rochester. This correlation was found to be rather difficult because many other factors fall into play when determining residential property values. Other factors that have been suggested in determining property values have included location of schools, transportation routes and the age of properties within a specific community. This study tried to eliminate all other factors by focusing on the distance from

parks to an individual parcel. Interviews with local real estate experts and planners gathered mixed results about the importance of urban parks when considering residential property values. However, most of their results pointed in the direction that parks didn't have much importance regarding residential property values. To further the conclusion given by real estate experts, a Geographic Information System (GIS) was used to show that very few correlation patterns do exist between the city park system and residential property values within the City of Rochester.

For the majority of this study, the visual analysis provided enough accurate information. The visual analysis did not show significant higher building values near the park system. In fact, building values were quite scattered. Although some high and low pockets did exist within the city, these pockets showed little correlation between the park system and building values. Parcels located directly adjacent to many parks also showed quite sporadic values (Figure 3).

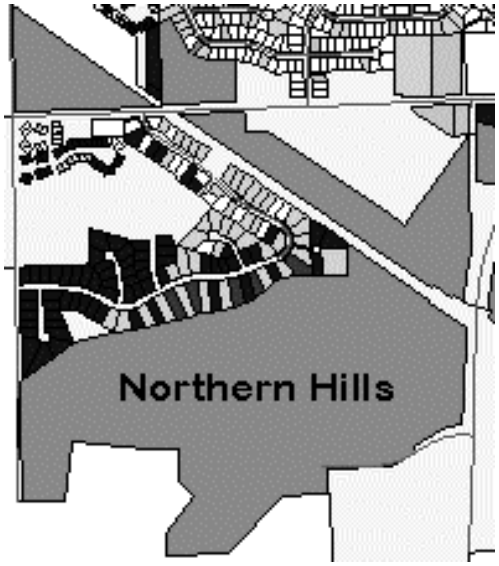


Figure 3. Sporadic building values. Higher building values are shown with darker colors around Northern Hills Park.

The visual analysis showed that townhomes had the highest building and property values. This skewed the data too much during the classification analysis. This result classified all other residential properties being classified much lower than they should. To avoid this problem, all townhomes were then eliminated to show all other residential type parcels for further analysis. Another visual analysis, one without townhomes, showed the true classification scheme for residential properties. This analysis now showed a more gradual change in value classifications. However, the visual analysis still gave similar results.

Next, parcels adjacent to the park system were compared to all other parcels within the city using a 75-foot buffer. Parcels falling within the 75-foot buffer were then calculated to find the statistical mean for all building values. These parcels were then compared to other parcels that did not fall within the 75-foot buffer surrounding the parks. The results comparing the statistical mean showed that residential properties falling within the buffer had a higher (statistical) mean building value compared to the building value of parcels falling outside of the buffer (Table 1). This analysis did show higher building values given for parcels lying adjacent to the park system. However, further analysis determined little correlation.

Table 1. Summary of Building Values in Rochester in Correlation to Parks.

Building Values of Residential Property Parcels	**Building Price**
Parcels within 75 feet of a park	$80,994
Parcels outside of the 75 foot buffer	$69,338
Difference	$11,656

Other analysis looked at actual property values. Again, a visual analysis determined that property values were not consistently larger near or surrounding the city parks. In fact, some parks actually appeared to reduce property value. In some cases, parcels with high and low values respectively appeared next to one another, regardless of the distance from a particular park. A visual analysis did show pockets where high and low values existed. However, the relation to the parks system did not seem to influence these pockets of value for residential properties. In many cases, properties directly abutting a park often had very mixed property value.

To gather more specific analysis for property value, parcels directly surrounding the parks were compared to the other parcels within the city using a 75-foot buffer. The statistical mean for the two samples were then compared to one another. This assessment showed different results than the building value analysis previously discussed. Results found the statistical mean of those

parcels that were adjacent to the park system to be slightly lower than those parcels that did not fall within the 75-foot buffer (Table 2). This assessment could suggest that a negative correlation exists between residential property and the park system for parcels located near the park system.

Table 2. Mean Values of Residential Properties in Rochester.

Mean Values of Residential Property Parcels	**Value of Land/Sq. Foot**
Parcels within 75 feet of a park	$1.88311
Parcels outside of the 75 foot buffer	$1.93965
Difference:	$0.05654

Next, distance was statistically correlated with property values and building values individually with a two-tailed bivariate Pearson Correlation Model using the SPSS software. The Pearson Correlation Models determined that correlation does *not* exist for either property values or building values (Table 3). Pearson Correlation Models were first conducted for property values and building values on all parcels within the city. A negative correlation value of -0.044 for building values and distance indicated that individual building values and the distance to a nearest park represents a slight negative correlation. Also, a negative value of -0.124 indicated that no correlation existed between property values and distance either (Table 3).

Next, a one-eighth mile buffer was created around all city parks to further compare building values and distance. Parcels within the buffer were compared to those parcels falling outside of the one-eighth mile buffer. The results showed negative correlation for both the parcels falling within the one-eighth mile buffer and also for those falling outside of the one-eighth mile buffer. In fact, a negative value of –0.044 existed for parcels falling within the one-eighth mile buffer, while the correlation analysis on samples falling outside of the buffer was –0.40 (Table 3).

Similar results were determined for the correlation models comparing property values and distance. A negative value of –0.069 existed for parcels falling within the one-eighth mile buffer, while the same analysis of samples outside of the buffer showed –0.124 (Table 3).

Table 3. Pearson Correlation Models Determining Correlation factors

	Building Values	**Property Values**
All residential parcels within Rochester	- 0.044	- 0.124
Residential parcels within 1/8 mile buffer	- 0.044	- 0.069
Residential parcels outside of 1/8 mile buffer	- 0.040	- 0.142

Discussion

Originally it was believed that property and building values would be much higher for parcels directly surrounding and adjacent to the park system, similar to the patterns of residential values surrounding many lakes today. Although the parks do provide many of the key factors leading to strong social values, the parks in Rochester do not give positive correlation to property or building values.

Several reasons may contribute to the lack of correlation patterns between property values and urban parks

within the City of Rochester. First, although Rochester is the main city within the area, it does not possess any suburban cities on its peripherals. Therefore, the City of Rochester has not been in great demand of land located near the center of the city. "Prime" real estate for residential growth has been shifted to the edges of the city. Growth patterns show that Rochester is expanding outward. Less focus is given for redevelopment of inner-city areas.

A second reason that residential property is not valuable around parks in Rochester is due to the city's ease of access to the rural communities surrounding the city. If a resident has access to any means of transportation, that person can easily escape the city limits quickly. Without any suburbs surrounding Rochester, residents often find extremely rural, natural areas within ten minute drive time of any part of the city. Residents feel that they can escape the urban environment fairly quickly, so parks within the city limits do not provide that sense of "escape" that can be seen in other urban areas.

Third, residents feel that the parks do not bring much benefit to their properties, even if their properties are located near parks. Rochester residents often see the negative attributes of local parks. They see the crowds and late night activities as being a nuisance, and do not want their personal properties to be located near these activities.

Placing value on public land is very subjective. This procedure can be extremely biased if the researcher and the public alike have personal opinions regarding public open space. This study was intended to be neutral; however, it was biased because it assumed that residential property directly influences all of the public's social values towards parks. However, property values only show importance for those residents who have the income to live near more desirable locations, such as being closer to a park. This assumption means that residents who cannot afford to buy property in more desired locations are not given the same attention in this study. A further study could possibly be conducted to show the percentage of a person's income in which they pay for placement of their residential property locations. Although people with less money probably do not value parks any less, this study does show that people are willing to pay more to live in higher valued areas.

Another future study could also include the use of a public survey. A public survey of residents could provide an excellent backup to the findings in this study. Information gathered in a future survey could provide insight to local planners regarding the public perception of Rochester's park system. Also, public input could determine residential social values, which would provide models for community growth.

The potential for use

The GIS model was effective for this study. It is important to note that although few patterns were discovered near parks using a GIS, it is the "non-pattern" discovery by the GIS that provided the beneficial information. This study's original hypothesis was to prove that a specific correlation existed between urban parks and residential property values in the City of Rochester. A GIS proved this hypothesis wrong. This study does show that although the City of Rochester has an impressive urban park system, local residents do not

place significant values towards parks in locating their own properties.

This information can be used in several ways. First, city and park planners can realize parks may need to be improved to provide more adequate satisfaction of local residents. Specific activities could also be changed to strengthen the residential satisfaction of the local park system. Planners can also use this information in a local recreation plan, in hopes to improve the conceptions of the park system by the public.

Also, neighborhood safety groups can use this information to see exactly where the least desirable parks are located (according to local residents) within the city. Neighborhood safety groups could also use this information to campaign for more usage of the parks by local residents and neighbors living close to particular surrounding parks.

The GIS showed potential for use for long-term planning activities and the everyday decision processes of those affiliated with city planning processes. I was able to use the GIS to show general property value patterns that may not have been produced without the use of one. Demographic data should be continuously sought after by local planners in Rochester to produce similar studies in the future. However, accurate and current data are very important. Past property data should be saved by the city for future studies that may deal with change of property information over time.

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